AN APPROACH TO SUSTAINABLE RECOVERY OF URBAN WATER SUPPLIES IN WAR-AFFECTED AREAS

with specific reference to

The Tuzla Region of Bosnia and Herzegovina

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Abstract

The subject of this thesis is the recovery of urban water supplies in war-affected areas. The study focuses on the development of a set of recommendations that can be utilized by implementing agencies in the field to provide improved water supply response. The aim is not to set up guidelines which can be universally applicable, but to provide comprehensive, transferable and achievable frameworks to the post-war recovery of urban water supplies in other similar situations. The problem addressed in this thesis is that:

> Current praxis in the field of post-war reconstruction of urban water supplies is often carried out by NGOs on an ad-hoc basis and purely from a technical perspective resulting in detrimental effects on the long-term sustainability of water systems and hence on the overall development of war-affected communities.

Therefore this research was carried out using literature reviews and field investigations in order to respond to the following question:

> How can the repair, reconstruction and development of urban water supplies be carried out in a way that would contribute to the realization of positive and sustainable socio-economic recovery of war-affected communities?

This thesis first presents an overview and exploration of the context of the research in order to develop a theoretical understanding and evaluate dilemmas faced in the current praxis. Following this, it proposes the framework of Appropriate, Targeted, Applicable and Maintainable (ATAM) water supply recovery as an approach in order to provide improved water supply response. It then examines this framework in the context of the Tuzla Region of Bosnia and Herzegovina. Through the subsequent analysis of field research findings, the thesis recommends an operational checklist for initial programming and eventual evaluation of urban water supply recovery programmes.

For my Family and Michael...

Contents

CHAPTER 2
CONTEXT OF POST-WAR RECOVERY PHASES OF URBAN WATER SUPPLIES AND SUSTAINABLE DEVELOPMENT

CHAPTER 3
DILEMMAS OF POST-WAR URBAN WATER SUPPLY RECONSTRUCTION

CHAPTER 5
TARGETED, APPLICABLE AND MAINTAINABLE POST-WAR WATER SUPPLY RECONSTRUCTION

PART THREE: Lessons From the Field

CHAPTER 6
METHODOLOGY AND RESEARCH DESIGN FOR FIELD WORK

CHAPTER 7

POST-WAR RECOVERY OF WATER SUPPLIES IN THE TUZLA REGION OF BOSNIA AND HERZEGOVINA

List of Figures

List of Tables

Preface

During the course of this thesis, a number of papers have been published by the author within journals and at conferences:

Özerdem, A. 1998. 'Training of Professionals for the Field of Post-war Recovery', paper presented at *Forum II: Architectural Education for the 3rd Millennium*, 22-24 April 1998, Gazimagusa, North Cyprus

Özerdem, A. and Lander, N. 1998. 'Rebuilding Afghanistan', *The University of York Magazine*, p:7, February

Özerdem, A. and Lander, N. 1998. 'MA Field Visit to the Land from which the Sun Rises', *Revival*, Issue 9, pp: 6-7, February

Özerdem, A. and Barakat, S. 1997. *Water under Fire Workshop Report: The Challenge of Post-war Reconstruction of Water Supplies*, PRDU, The University of York

Barakat, S. and Özerdem, A. 1997. (Eds.) Indigenous Recovery and Peace Building Workshop Report, 11-12 December 1997, Peshawer, Pakistan

Özerdem, A. and Atmar, H. 1997. 'Field Visit News from Iran', *Revival*, The University of York, Issue 8, pp:4-5, August

Özerdem, A. and Atmar, H. 1997. 'Into the Mystic', *Aspect*, The University of York, Issue 5, August

Özerdem, A. and Atmar, H. 1997. 'Post-war Reconstruction in Iran', *The University of York Magazine*, p:11, July

Özerdem, A. and Barakat, S. 1997. 'Workshop Review: Water under Fire', *Crosslines*, No: 29, pp:59-60, May-June

Özerdem, A. 1997. 'Water under Fire: The Challenge of Post-war Reconstruction of Water Supplies in the Tuzla Region of Bosnia-Herzegovina', paper presented at *Water under Fire Workshop*, 21-22 November 1996, PRDU, York

Özerdem, A. 1996. 'Water under Fire', paper presented at *Reaching the Unreached - Challenges for the 21st Century, 22nd WEDC Conference*, 9-13 September 1996, New Delhi, India

Özerdem, A. 1996. 'Relief Aid: Creating a Dependency', *Revival*, The University of York, Issue 6, June

Özerdem, A. 1996. 'Water Supplies: A Sustainable Recovery', *Revival*, The University of York, Issue 5, January

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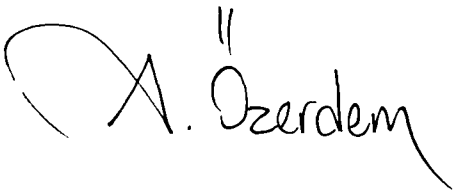
Author's Declaration

I declare that this thesis is my own unaided work. It is being submitted for the degree of Doctor of Philosophy at the University of York. It has not been submitted before for any degree or examination in any other University.



Alpaslan Özerdem

Monday 7 September 1998

The Preamble

P. 1. The Research Defined

This research is concerned with the issue of reconstruction of urban water supplies in war-affected areas. The need for this study became apparent as a result of the following primary considerations:

1- Recent experiences of civil conflicts showed an alarming tendency for urban water supplies around the world to be damaged by war either directly or indirectly.

2- Current praxis in the field of post-war reconstruction of urban water supplies is often carried out by NGOs on an ad-hoc basis and from a technical perspective resulting in detrimental effects on the long-term sustainability of water systems and hence on the overall development of war-affected communities.

3- There is a paucity of research on the context of post-war reconstruction of urban water supplies.

P.1.1. Urban Water Supplies in Post-Cold War Armed Conflicts

The armed conflicts of the 1990s show a tendency to change from interstate to intrastate struggles which can cause much more severe destruction of lives, livelihoods, physical environments, infrastructure and public services. Intrastate armed conflicts differ from interstate conflicts because of their distinctive characteristics such as multiple tensions, high civilian involvement, brutal violence, mass population movements and long duration (Minear & Weiss, 1993; UNRISD, 1995; Wallensteen & Sollengberg, 1996). Plant (1995:88) describes the nature of post-Cold War armed conflicts as follows:

> "With the breaking up of countries, nationalistic energies are being released which are conducive to the attitude resulting in wanton destruction, 'If I

> cannot have it, then neither can you or anyone else'. In the worst cases, there is the complete breakdown of any semblance of governmental authority and so the disappearance of any feeling of restraint".

As a consequence of these characteristics, the experience with intrastate conflicts in very different parts of the world such as Afghanistan, the Former Yugoslavia, the Commonwealth of Independent States (CIS), Iraq and Rwanda shows that there is an alarming tendency for urban water supplies to being vulnerable to, and affected by war either directly or indirectly. The author fully supports this comment by the ICRC (1994) which highlights this tendency and urges the international community to take urgent precautions:

> "...the suffering and death caused by the disruption of water supplies in times of armed conflicts has reached a critical level and this problem requires urgent attention".

The reason why urban water supplies in armed conflicts are often damaged deliberately is the basic fact that: water is an indispensable resource for the continuation of life on Earth. The history of evolution shows that this characteristic of indispensability has in fact created a long-term partnership between humanity and water. It is a partnership that has woven very close interactions during the process of learning to live with each other. This learning process started as utter dependency for humanity, as water was not only the life giving source that made the environment inhabitable, but also it was a god like the fire, the sun and the moon. In Greek Mythology, the god of water was not always at ease and in good humour, but he was sometimes very mean, fiercely angry and destructive. This is how humanity began to learn the necessity of respecting water as a source, which without life cannot exist.

In Islam, the Verse number 30 in the Holy Qoran states the importance of water for life, which tells humanity: "We made every living thing of water". This holy verse explains the role of water for the continuation of life very plainly and distinctly, as there are no substitutes for water's four main functions which are habitat, health, carrier and production. As a result of these functions, water has always received much more attention than any other resource, as illustrated by Parakrama Bahu of Sri Lanka (1153 - 1186 AD): "...not even a little water that comes from the rain must flow into the ocean without being made useful to man" (Lundqvist, 1993:1). Furthermore, water has been a major concern for communities echoing in religious texts, rituals and poems with the evolution of cultures and societies

throughout history. Fuzuli, the great 14th century poet, wrote his beautiful Water Eulogy to praise the Prophet Mohammed and used water to describe the most sublime human feelings (Cecen, 1996).

It should also be pointed out that water is not only a resource without a substitute, but also it is a finite resource and vulnerable to irresponsible exploitation and pollution. Considering the rapid population growth in many parts of the world; it is not hard to claim that water scarcity will be a more contentious issue in the near future than it has been in the past, causing not only setbacks to socio-economic development but also armed conflicts over shared water resources. The issue of 'water as cause of war' is only one aspect of the close woven relationship between water and war. The second aspect, as has already been pointed out, is the issue of 'water as a weapon of war' which was one of the reasons for conceiving and pursuing this research.

Although water has been used as a weapon of war in different ways, such as for both offensive and defensive military purposes throughout history, urban water supplies are disrupted directly by war through two main ways: firstly; the destruction of water supply facilities by bombing and shelling, and secondly; the deliberate withholding of water sources against the adverse party. The bombing of a pumping station in the capital of Yemen during the 1994 civil war was reported by the ICRC (1995:107-108) as follows:

> "A statement issued by the southern military on Saturday, 11 June said that enemy aircraft had bombed the main water plant near Bin Nasser, damaging some pipes, pumps and electrical connections. Maintenance crews had repaired the damage, but the northern forces raided the plant again on the following Monday, cutting water supplies to Aden".

Urban water supplies are particularly vulnerable to the direct impacts of war because of their complexity. An urban water supply system can be divided into four subsystems of collection, transmission, treatment and distribution, where each of them consists of various components such as pumping stations, boreholes, treatment plants, mains and house connections. Therefore the damage caused on a subsystem of a water supply such as a treatment or a transportation facility, can mean a complete halt to the operation of a whole system as happened in the preceding example of Aden.

The complexity of urban water supplies also means that they cannot be operated without a

source of power such as electricity or fuel. This characteristic exacerbates the vulnerability of water supplies to war even further, as power stations and electricity lines are often damaged in armed conflicts. Therefore the interdependence between lifelines such as water, sewage, electricity and communication systems needs to be considered and integrated into the overall water supply improvements. However this is not the only indirect impact of war on urban water supplies; the lack of personnel, materials, chemicals and equipment for operation and maintenance also pose serious setbacks on the provision of water.

P.1.2. Current Praxis in Post-war Recovery of Urban Water Supplies

The proliferation of intrastate conflicts since the end of the Cold War, which was marked by the collapse of the Berlin Wall in 1989, has inevitably brought a new set of challenges to the international humanitarian community. The provision of water to war-affected people is one of these challenges which is often considered only from a technical perspective in terms of pumps, pipes, volume and chlorine. On the other hand the author believes that the post-war recovery of urban water supplies is a social, economic, organisational, institutional and political issue as much as it is a technical one. This claim which is based on the close interaction between water and development has also been pointed out by many organisations and researchers (Gibbons, 1986; Grigg, 1986; McDonald & Kay, 1988; Klotzli, 1994; Falkenmark, 1995; Murakami, 1995; Habitat, 1996; Habitat II, 1996; WEDC, 1996). Discussing the issue of water supply management, Smith wrote (1976:204):

> "Although the twin problems of providing adequate water quantities and ensuring their quality do pose significant challenges to engineering, they also raise even bigger political, economic, environmental and social issues. Already these are of considerable magnitude and they will undoubtedly become much more important".

His estimates have been proved to be right, as the UN Conferences from Habitat I in 1976 to Habitat II in 1996 highlighted that the provision of water does not only consist of physical issues such as water quantity and quality; but also organisational ones in terms of institutional development, political environment, local participation and human resource development, and finally, financial issues such as water charges, affordability and state subsidies. Therefore without having a clear understanding of all these different aspects and issues; the programmes implemented to improve water supplies in war-affected areas cannot be efficient and effective which would result in setbacks to the long-term

sustainability of communities.

The author also believes that the post-war recovery of urban water supplies should not only aim at the alleviation of suffering caused by inadequate and unsafe water supplies. This should be the initial objective which is indispensable to ensure the survival of war-affected people; but considering the characteristics of post-Cold War armed conflicts, it can also be clearly seen that water can be used as a tool to consolidate the establishment of peace. This should be considered as a further goal which can be utilized as a peace-building measure for social reconstruction. Following this, the overall aim of post-war reconstruction of urban water supplies can be to assist and ensure a process of sustainable development. To consider the aim of reconstruction in three consecutive stages also points out an important necessity which is a progression from emergency measures to reconstruction. In other words, water supply interventions during and after war should not be taken on an ad-hoc basis, and they should aim at a continuity where positive impacts of each phase can provide a foundation for the next.

The experience with the involvement of NGOs to improve the quantity and quality of water supplies in different war-affected countries from Bosnia Herzegovina to Cambodia, Rwanda and Yemen shows that the post-war recovery process of water supplies often face several dilemmas. These dilemmas that NGOs often deal with in the recovery process can be categorized as political and strategic, operational and technical and, personnel and moral. Although some NGOs often consider themselves to be well equipped in terms of knowledge, experience, finance and personnel to deal with these dilemmas successfully, they do not seem to understand the special characteristics of urban water supplies. The scale of the area, technological considerations and the large scale of funding requirements are only a few of these distinctive characteristics. They often misjudge the huge scale of the task they are undertaking, as the provision of water in war-affected urban areas differs widely from similar interventions in rural areas and refugee camps. Therefore it is important to identify those issues that can be borne in mind by NGOs during their post-war recovery interventions to improve the quantity, quality, availability and reliability of urban water supplies.

P.1.3. The Paucity of Research

The literature in the fields of humanitarian aid, post-war recovery and development studies is growing rapidly. There have been for example, many researchers in recent years who investigated specific areas of these fields from complex political emergencies and humanitarianism (Weiss and Minear, 1993; Duffield, 1994; Adams and Bradbury, 1994) to the reconstruction of settlements (Zargar, 1987; Barakat, 1993), and the provision of shelter during and after war (Zetter, 1987; Ellis, 1996). However, the post-war reconstruction of urban water supplies is one of these areas that has not been investigated in scholarly research before, though the urgency of the matter and its importance for the long term sustainability of war-affected communities have been underlined so many times by various organisations and researchers.

The organisation of the 1994 International Symposium on the issue of 'Water in Armed Conflicts' by the ICRC in Montreux, Switzerland, represented a landmark in this field. This symposium mainly focused on the protection of water in armed conflicts in a framework of international humanitarian law. The case studies presented at the symposium, were from five different countries: Lebanon, Yemen, Iraq, Rwanda and the Former Yugoslavia, and highlighted two main issues very clearly. The first one was that the armed conflicts in the post-Cold War era have devastating impacts on urban water supplies both directly and indirectly; and the second one was the nature of response to urban water supply problems in war-affected areas, which is often on an ad-hoc basis and from a technical perspective. As explained earlier, these two issues also formed the two main reasons for this research.

In addition to lack of research in this field; the experience of many agencies who are involved in various urban water supply improvement programmes during and after war, have not been documented systematically and their evaluations have often been neglected. It should also be pointed out that most agencies tend to be reluctant to disseminate and share their experiences. It is due to these reasons that some of the programmes carried out by agencies like ICRC and Oxfam are referred to frequently in this thesis.

P.2. The Research Question and Hypothesis

Following to the primary reasons for this research, the research question for this thesis can be summarized as:

> Considering that water is indispensable for the continuation of life and development, how can the repair, reconstruction and development of urban water supplies be carried out in a way that would result in positive and sustainable socio-economic recovery of war-affected communities?

Therefore, the argument of this thesis is built around the following hypothesis which consists of four sub-sections:

If post-war reconstruction of urban water supplies through a progression from relief to reconstruction is:

- Appropriate to local environment and the level of existing technology, and as a result of this provides water of adequate quantity and quality for health and development needs,
- Targeted at the strengthening of existing communal and institutional structures through partnerships between the involved agencies, the reconciliation of divided communities and the revitalization of local economy,
- Applicable in war-affected areas by considering logistics and having built-in flexibility, accountability, coordination and monitoring measures,
- Operational and maintainable by existing local resources,

it can contribute to the realization of positive and sustainable socio-economic recovery of war-affected communities.

P.3. Aim and Objectives

Through addressing the research question and building on the preceding hypothesis, this research aims at exploring and identifying the context of the provision of water in war-affected urban areas, and thereby reaching conclusions through a case study that could form a basis for guidelines regarding future interventions. Although these guidelines cannot attempt to be universally applicable, they are meant to provide transferable frameworks to the post-war recovery of urban water supplies in other similar situations.

To address the aim of this research, the following objectives are set up to provide a framework for the development of this work.

Objective 1- To develop a theoretical understanding of the field of urban water supply reconstruction in war-affected areas, through examining the issues of:

- the inter-relationship between water and war through two main aspects: 'water as cause of war' and 'water as a weapon of war', highlighting the vulnerabilities of urban water supplies to post-Cold War armed conflicts
- the concept of a progression from emergency measures to reconstruction
- the role of water as a peace-building tool in a framework of social reconstruction
- the concept of sustainable development and its interaction with urban water supplies

Objective 2- To investigate the current praxis of urban water supply reconstruction, through examining secondary case study examples in Northern Iraq, Rwanda, Cambodia, Bosnia-Herzegovina and Yemen, and addressing the issues of:

- political and strategic dilemmas
- operational and technical dilemmas
- personnel and moral dilemmas

Objective 3- To investigate the framework of Appropriate, Targeted, Applicable and Maintainable (ATAM) urban water supply reconstruction.

Objective 4- To examine the proposed ATAM framework through the evaluation of a number of Scottish European Aid (SEA) assisted water supply reconstruction programmes in the Tuzla Region of Bosnia Herzegovina.

Objective 5- To analyse the findings from the field work in order to form a basis for guidelines on the post-war reconstruction of urban water supplies.

P.4. Scope and Limitations

The research explores the post-war reconstruction of urban water supply systems not just

from a technical perspective, but more importantly from social, economic, political and organisational ones. Technical issues are brought into the equation through their inter-relationship with these aspects, and the framework of technological appropriateness and long-term sustainability.

This research will limit itself to the above mentioned framework of 'urban' post-war reconstruction of water supplies. The issues regarding provision of water in emergencies will only be explored to enable the understanding of post-war recovery of water supplies, without aiming at their full investigation.

The research focuses on the context of urban water systems, excluding rural water supplies and the provision of water in refugee camps from the main research question. However, it should be pointed out that the concept of an urban water system in this thesis is not necessarily of the western understanding of supplies. Many urban areas in developing countries are supplied with water by less complex systems such as hand pumps and standpipes. It is in fact, a difficult task to make a distinction between 'rural' and 'urban', as there is no satisfactory agreement among researchers and governments on thresholds for this differentiation.

Hardoy and Satterthwaite (1986:10-13) look at possible thresholds such as the level of occupation in agriculture, population and forms of administrative areas for setting some kind of distinction between them. Their examination of this issue concludes that: "...we chose to describe settlements with 5,000 or more inhabitants as 'urban centres' and those with less than 5,000 inhabitants as 'rural'". However, they still point out that these kind of arbitrary cut off points can be varied from one country to another. For example, they point out that "...the chosen thresholds vary enormously from nation to nation. They can be as low as 1,000 inhabitants (or indeed, in a few nations, as low as a few hundred); alternatively they can be as high as 10,000 or more, although most generally fall into the 2,000-5,000 inhabitant range". Therefore this thesis will consider any settlement with more than 1,000-2,000 inhabitants as an urban area in order to avoid the use of an unsatisfactory threshold.

P.5. Methodology

The research methods which were employed to accomplish the development of this thesis, are varied, because of two primary reasons: first; as explained earlier, there is a paucity of research in the field of post-war reconstruction of urban water supplies, which meant a lack of information on the methodology to be utilized, and second, the paucity of literature in this field, which meant the necessity of using other methods, in addition to literature review, for collection of information. Although a full discussion of these methods is presented in Chapter Six, they can be summarized as follows:

- **Literature review:** Over the past four years, a comprehensive literature review has been conducted in order to develop a theoretical understanding of issues and previous related work in this field. The fields of humanitarianism, development studies and water engineering were the main focusing areas. Apart from this literature review, the author also had the opportunity of reviewing published and unpublished literature and reports at the Water Engineers Development Centre (WEDC) and the Registered Engineers for Disaster Relief (RedR). The literature review has constituted the basis for Chapters One to Five.

- **Questionnaire survey:** In addition to the initial literature review, due to the paucity of documented first hand experience it was felt that the experience of a specific group of professionals working in this field should be learnt by a small-scale enquiry in order to support and enrich both the context and the content of this study. A questionnaire survey entitled 'The Reconstruction of Water Supply Systems in Post-Disaster Areas' was carried out with 60 RedR engineers who had relevant experience in countries like Afghanistan, Bosnia and Herzegovina, Chechnya, Croatia, Iraq, Kenya, Rwanda, Somalia, Sudan, Tanzania and Zaire. The responses to both closed and open questions in this questionnaire, which were received from 33 engineers, have played a significant role in investigating and learning the current praxis of water provision in war-affected areas. The findings of this questionnaire has helped the development of a set of dilemmas faced by practitioners, which were dealt with in Chapter Three.

- **Field work:** The field study in the Tuzla Region of Bosnia Herzegovina was conducted in two phases: the first phase took place from 15 March to 5 April 1996, and the second one was for a month in the Spring of 1998. The primary focus during the first phase was the data collection on several SEA assisted water supply programmes in the region, which was carried out through site visits, interviews and working with local water engineers. It was after this phase that the structure of the dissertation was modified in order to incorporate the lessons learned in the field. The aim of the second phase of the field work was to examine the proposed ATAM framework through the utilization of a log book which was based on the discussions in Chapters Four and Five, in order to recommend an operational checklist for future implementations.

- **Other Learning Tools:** Considering the paucity of information in the context of this research, the participation in several national and international workshops, conferences and visits was employed as an important tool for data collection and development of this thesis. The initial research findings after the first phase of the field work and literature review were utilized in the process of forming discussions in an international workshop which was convened and directed by the author.

  The workshop which was entitled "Water under Fire: The Challenge of Post-war Reconstruction of Water Supplies" was jointly organized by the PRDU, RedR and SEA. More than forty participants identified opportunities and challenges for post-war reconstruction of water supplies, through their experiences of working on such projects in Cambodia, Liberia, Ethiopia, Zaire, Rwanda, Afghanistan, the Middle East, the former Soviet Union and the Former Yugoslavia. After identifying those opportunities and challenges, the workshop recommended some approaches such as "the progression from preparedness to reconstruction" and "participation, co-operation and empowerment", which would build on the opportunities and overcome the challenges.

P.6. Structure

The chapters in this thesis are categorized in three main parts where Chapters One to Three form the first one presenting an overview and exploration of the context of the research in order to develop a theoretical understanding and evaluate dilemmas faced in the current

praxis. Following this, in the second part which consists of Chapters Four and Five, the context of Appropriate, Targeted, Applicable and Maintainable (ATAM) post-war water supply reconstruction was investigated in order to set up criteria to be used during the field work. The focus in Part III which contains Chapters Six to Nine, was the field research in Bosnia Herzegovina presenting an analysis of the findings and recommendations for future work.

The thesis begins with the presentation of the relationship between water and war through its two primary aspects of 'water as cause of war' and 'water as a weapon of war' in **Chapter One**. Through investigation of the outcomes of UN Conferences since Habitat I in 1976 and the UN Water and Sanitation Decade between 1981 and 1990, the chapter first identifies water issues and challenges faced by humanity in peace. One of those challenges identified is the threat of water scarcity as a result of finite and vulnerable water sources, and the increasing trend of world population. This challenge under the heading of 'water as cause of war' is investigated in four flashpoints where armed conflict is likely over shared water sources. Following this, the framework of war is brought into the equation in order to explore the context of 'water as a weapon of war', which highlights the increasing involvement of urban water supplies as a target and a weapon in post-Cold War armed conflicts. The chapter points out that urban water supplies are particularly vulnerable to armed conflicts' direct and indirect impacts because of their complexity and interdependence on other life lines. Furthermore, this chapter also sets up three stages of objectives, as the alleviation of suffering caused by inadequate and unsafe water supplies, the consolidation of peace, and the ensuring a sustainable development for the recovery of urban water supplies during and after war.

Chapter Two scrutinizes the preceding three stages of objectives, starting with the investigation of water provision in a context of post-war recovery phases for urban water supplies. The first section of this chapter not only clarifies the understanding of post-war recovery phases for water supplies, but also the concept of a progression from relief to reconstruction. Following this, the possibility of using water supply reconstruction as a tool to enable the establishment of peace is explored in the second section. Finally, the chapter discusses the concept of sustainable development in order to explain that sustainable post-war water supplies can be an essential component of the long-term sustainability process.

The last chapter in Part I sets out to analyse three sets of dilemmas which could possibly be experienced during urban water supply recovery. Through examples of specific implementations from five different countries, **Chapter Three** explores these dilemmas under the headings of 'Political and Strategic', 'Operational and Technical' and 'Personnel and Moral'. In the light of this exploration the chapter first of all presents a number of key issues to bear in mind during water supply implementations in war-affected areas. Building on these issues it then proposes an approach consisting of four main aspects. The framework of this approach advocates that if the post-war reconstruction is appropriate, targeted, applicable and maintainable, it can have positive impacts on long-term sustainability.

Part II begins with **Chapter Four** where appropriateness issues of post-war water supply reconstruction are explored in three main sections. In the first one; the chapter explains the concept of an holistic approach in the context of this thesis. Thus the section scrutinizes four subsystems of an urban water supply in order to show interconnection and interdependence between them, and derive criteria for technological appropriateness. The following section focuses on health considerations in terms of water quantity and quality from emergencies to reconstruction, pointing out criteria to bear in mind. Through exploring the concept of environmental appropriateness in the last section, the chapter also highlights the importance of an integrated approach for long-term sustainability.

Chapter Five explores other three main aspects of the proposed framework of ATAM approach. The discussions in this chapter first focus on ways of enabling the consolidation of peace through using water supply reconstruction as a peace-building measure. A number of local participation and partnership strategies are explored to draw a framework for socially targeted reconstruction programmes. Building on the unifying characteristic of urban water supplies, the possibility of utilizing opportunities to build trust and confidence between the warring sides is explored. In addition to this, the targeted reconstruction section also scrutinizes the involvement of commercial companies in the recovery process. The second part of this chapter investigates the concept of applicability, explaining the importance of logistics, flexibility, coordination and accountability for successful implementation of programmes and their long-term sustainability. The chapter further discusses sustainability of recovery programmes in the final section where monitoring and evaluation, operation and maintenance, financial sustainability and training issues are

explored to draw lessons for the field work.

Part III begins with the methodology of field research in **Chapter Six**. After explaining the research's combined strategy which employs a quantitative method such as a questionnaire survey in the framework of an exploratory research, the data collection methods such as the utilization of a log book during the field work are highlighted in this chapter. In addition to this, Chapter Six also includes the utilization of other 'learning tools' such as the convening of the Water under Fire Workshop, and the participation in several national and international conferences and workshops.

Following this, **Chapter Seven** presents the general framework of the case study in the Tuzla Region of Bosnia and Herzegovina. First, the Bosnia conflict is analyzed from its causes in the context of the collapse of Yugoslavia to the hierarchial structures created by the Dayton Accords. Following this, the necessary quantitative background information on SEA assisted water supply recovery programmes is presented in the framework of the region's socio-economic, demographic and physical characteristics.

The two subsequent chapters present the analysis of findings from the field work in the Tuzla Region. Thus, **Chapter Eight** presents the analysis on the issues related to appropriateness of SEA assisted water supply recovery programmes, while **Chapter Nine** includes the analysis on the remaining three aspects of the ATAM framework.

Having derived a set of recommendations for sustainable recovery of urban water supplies in war-affected areas, **Chapter Ten** is concluded with the presentation of an operational checklist for initial programming and eventual evaluation of these recovery programmes.

"As a result of war you are thirsty; yesterday you took the water supply for granted, but today it is no longer possible to turn on a tap and drink.
The water infrastructure where you live was damaged during the fighting.
You have walked for days to escape the violence unleashed in your own country.
Terrified and tired, you cannot carry the water necessary to sustain you on this endless journey.
Water supplies are frequently compromised in times of conflict.
For those who stay and those [who] flee, water is the first priority for survival" (ICRC, 1994).

"National hostilities overarch the severe social and economic conditions...Future conflicts may occur within drainage basins between up and downstream riparians, mainly because of the degradation of water quality with possible repercussions on a substantial level, aggravating existing ethnic and social cleavages" (Klotzli, 1994).

"During the conflict between the Croatian and the Muslim Forces in Central Bosnia,over 200,000 people were deprived of an adequate water supply, when valves were closed to Vares, Vitez and Zenica" (Baechler, 1995).

"We made every living thing of water" (Holy Qoran, Verse Number 30).

The post-war recovery of urban water supplies is a social, economic, organisational, institutional and political issue as much as it is a technical one.

"Fresh water is a **finite** and **vulnerable** resource, **essential** to sustain life, and development and the environment" (SAFEWATER 2000).

PART ONE:

An Overview and Exploration of the Context of the Research

Chapter 1 : Water and War

1.1 Introduction

This chapter will attempt to explain the relationship between water and war from the two main perspectives; of water as a cause of war and water as a weapon of war. Water issues will, first, be identified through the outcomes of UN Conferences held within last twenty years. The focus will be on the UN Water and Sanitation Decade between 1981 and 1990 which was one of the most important steps towards the provision of drinking water for about one billion people, almost every fifth person of the world population. Following this, the water issues identified will be elaborated in the context of the world's increasing population trend and its limited fresh water resources. The examples of four flashpoints where military action is likely to escalate over shared water resources will be given in order to explain the 'water as a cause of war' perspective of the water - war relationship. The world water situation with issues such as water scarcity, increasing water demand, water shortages faced by millions of people will be further elaborated through some challenges put by armed conflicts. Water is a vital resource for every aspect of life from personal hygiene to socio-economic development. It is this indispensability that makes water a vulnerable and an important target in warfare.

Armed conflicts are as numerous as ever, affecting different regions of the world, and the increasing trend of intrastate conflicts means that more civilians are involved in the effects of warfare. The majority of these civilians are women, children and elderly. Their lives and livelihoods are shattered by the horrors of guns, bombs, displacements, ethnic massacres and genocides. These innocent civilians not only pay the wages of war by their lives and pains but also by their suffering from lacking the very basic necessities like food, shelter, and water.

Furthermore, urban water supplies are particularly vulnerable to war because of their

complexity and their interdependence on power supplies. These issues will be identified in the second section of this chapter, defining the impacts of war on water supplies both directly and indirectly.

1.2 An Indispensable Resource for Life - Water

Water is not only significant for our very existence, but also for the continuation of physical, social and economic aspects of everyday life. Without adequate means of water, the development of society and satisfaction of human aspirations cannot be managed. Since there is no substitute for water, humanity's existence totally depends on it.

Water use in general can be categorized as municipal, industrial, irrigation, recreation, navigation, and hydropower. This research will mainly focus on municipal water use which encompasses two main purposes: residential and public.

- Residential water use includes indoor purposes such as drinking, cooking and bathing, and outdoor purposes such as washing cars, watering lawns and filling swimming pools. .
- Public water use on the other hand, includes purposes such as fire fighting, environmental hygiene, public building and ground maintenance, and commercial and industrial uses (Gibbons, 1986).

Furthermore for descriptive purposes, water's functions for the continuation of life can be summarised under four headings:

- **health function:** safe drinking water is a basic precondition for the provision of a hygienic environment which is indispensable for socio-economic development;
- **habitat function:** ecosystems cannot exist without water;
- **carrier function:** water has a hydrological cycle through atmosphere, soil and water courses which is essential for renewing fresh water resources while it can also have serious negative impacts such as erosion and leaching of nutrients unless necessary precautions are taken;
- **production function:** water is the main element for biomass production where it is used for photosynthesis and for societal production where it is needed for industrial and domestic uses (Falkenmark, 1995:14-15).

As a result of water's indispensable multifunctinal character for life, the last two decades particularly, witnessed an increasing awareness of water related issues in the international community. From the Habitat I Conference in Vancouver, Canada and the Earth Summit in Rio de Janeiro, Brazil to the 1992 Dublin Conference in Ireland and the Habitat II in

Istanbul, Turkey , water was presented as one of the most important concerns for humanity. Consequently, the multifunctional character of water will be investigated through the perspective of these UN summits with particular reference to the International Drinking Water Supply and Sanitation Decade, 1981-1990.

1.2.1 The UN Water Decade and Following Summits

Following the recommendations from HABITAT I and the 1977 UN Water Conference in Mar del Plata, Argentina, the period between 1981 and 1990 was declared as the International Drinking Water Supply and Sanitation Decade (IDWSSD). The decade set ambitious goals such as providing all people an adequate water supply and sufficient sanitation by the end of 1990. It was claimed that during the Water Decade, 330,000 people in developing countries gained access to safe water on an average day. However, by the end of the decade, 245 million urban dwellers and over one billion rural dwellers still had no means of adequate safe drinking water supply because of the increase in population of developing countries which was about 200,000 per day (HABITAT,1996). Table 1.1 shows the increase in the proportion of the population with access to water between 1975 and 1990 for low-income and middle-income countries.

	Coverage in low-income countries		Coverage in middle-income countries		Coverage in high-income countries
	1975	1990	1975	1990	1990
Water	23%	42%	44%	68%	95+%

Table 1.1: *The expansion in water supply, 1975 - 1990 (percentage of population with access) (Source: World Bank, World Development Report 1994; Infrastructure for Development, 1994. Oxford University Press, Oxford)*

Although huge efforts were made by governmental and international organisations to meet the IDWSSD's targets, they were not achieved. It is stated by UGI (1992:8) that "...some 13% of urban dwellers have no access to safe water while 28% have no safe means of excreta disposal. An estimated 32% of those in rural areas are without clean water and 52% are without sanitation".[1] The lessons learned from the IDWSSD can be summarized as follow (Dangerfield, 1983; Bourne, 1984; UGI, 1992; Chaguill et al., 1993; Habitat, 1996):

1 UGI: Understanding Global Issues

- There is a need to integrate sector strategies into broad development plans to avoid duplications causing the wastage of scarce resources.
- Investments on 'hardware' such as handpumps, water intakes, treatment facilities are not adequate without the provision of 'software' investments such as hygiene education and community development.
- Community participation in all aspects of water supply development and management is essential to ensure their long-term sustainability.
- There is a need for comprehensive and balanced area-specific approaches to the water and sanitation problem.
- The achievement of goals set at the beginning of the decade would require more time and money than was initially anticipated.

On the other hand, it is important to clarify what constitutes an "adequate" amount of safe drinking water from country to country. According to HABITAT II (1996:20), the existence of a water tap within 100 metres of a house is considered as "adequate" for many governments; however, it does not guarantee that the individual household will be able to secure enough water for good health. The "adequate water supply" context was further explained as follows:

> "Communities of 500 inhabitants or more are often served by one tap. Communal taps often function only a few hours each day, so residents must wait in long lines to fill even one bucket... In Rajkot, India, for example, a city with a population [of] 600,000 the piped water runs [for] only 20 minutes each day".

It was also pointed out that the per capita availability of water in marginal settlements of many cities in developing countries can be anywhere from 3 to 10 times less than that in better-off neighbourhoods. Consequently, most of the poor in developing countries buy water from vendors at costs of anywhere from 4 to100 times higher than the cost of water from a piped city supply. "In Lima, Peru, a poor family pays more than 20 times what a middle class family pays for water". Additionally, over 30% of the rural population in the South with "safe" water supplies depended on boreholes and hand pumps or protected dug wells. Figure 1.1 shows the number of people with access to functioning, safe water supply in 1991 by region, and the form in which the water was provided.

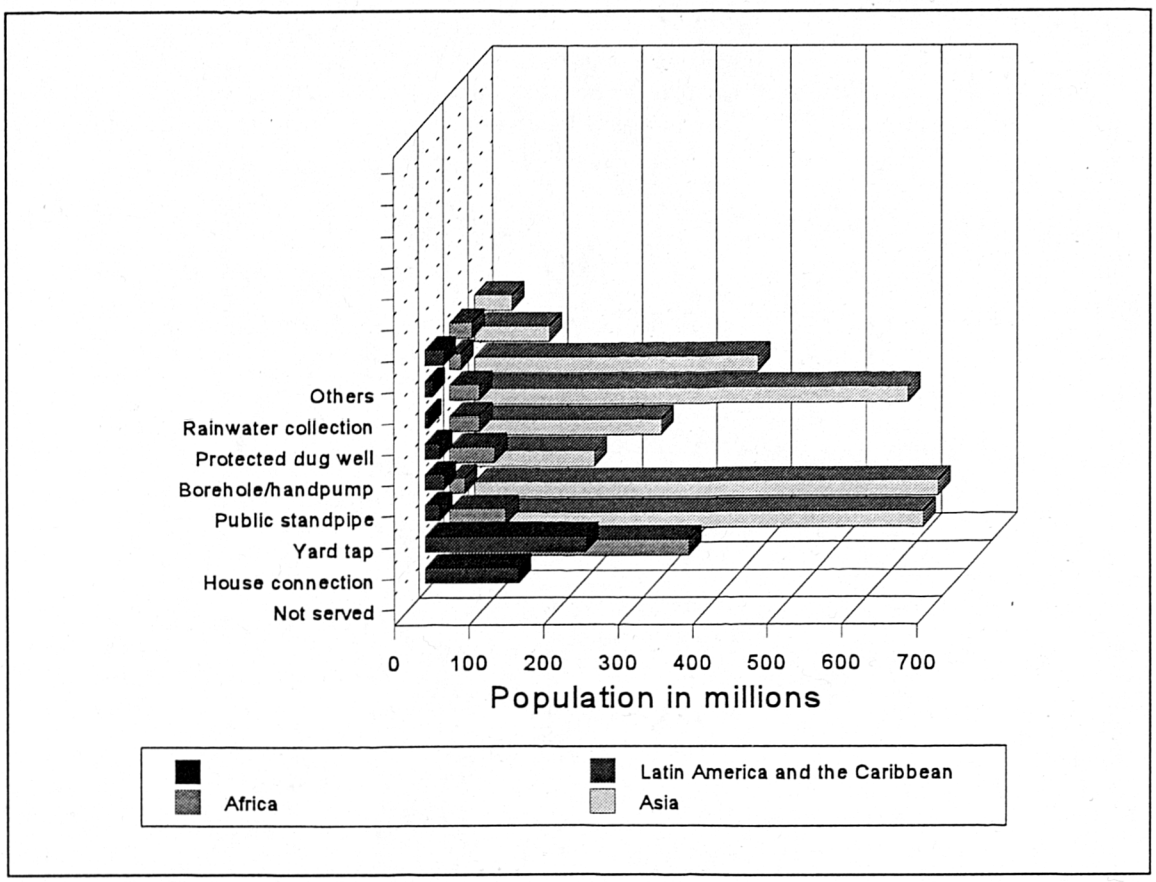


Figure 1.1: *The number of people with access to a functioning, safe water supply in 1991 (Source: HABITAT, 1996:265)*

The United Nations Development Programme organized SAFEWATER 2000 in 1990 to review the progress made during the Water Decade. Although the conference in New Delhi claimed the Water Decade had increased access to safe water and sanitation, it pointed out that : "...much still remained to be done and "business as usual" would not suffice - things [had] to be done differently and better". It was also recommended that women had to be involved in every aspect of water resources development to improve the sustainability of installed water facilities. The principles adopted by the SAFEWATER 2000 (Wirasinha,1996:2) are:

- "Protection of the environment and safeguarding of health through the integrated management of water resources and liquid and solid wastes.
- Institutional reforms promoting an integrated approach and including changes in procedures, attitudes and behaviour, and the full participation of women at all levels in sector institutions.
- Community management of services, backed by measures to strengthen local institutions in implementing and sustaining water and sanitation programmes.
- Sound financial practices, achieved through better management of existing assets, and widespread use of appropriate technologies" (emphasis added).

SAFEWATER 2000 was followed by the International Conference on Water and the Environment in 1992, which was important for the principles it proposed for consideration at the Earth Summit. Some of the principles put forward by the conference in Dublin were:

- "Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment" (emphasis added). It is finite because, although the amount of water that can be made accessible is dependent on the hydrological cycle, its availability is reduced over time as a consequence of the population growth in the world. Water is vulnerable because it absorbs various pollutants and substances on its hydrological cycle and there is no substitute for water in the functioning of life-support systems (Lundqvist, 1993). Therefore, these three important aspects of fresh water resources bring the prerequisite of a holistic approach bridging socio-economic development with protection of ecosystems.

- "Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels". There is a need to increase awareness for the necessity of participatory approach among planners and general public which means that "...decisions are taken at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects" (UNCED, 1992).[2]

- "Women play a central part in the provision, management and safeguarding of water". The Dublin Statement points out that the important role of women as carers and users of water has rarely been reflected in water resource development and management programmes. However, by emphasising this principle, the governments were urged to take necessary precautions for empowerment of women to enable their participation at all levels of water resources programmes.

- "Water has an economic value in all its competing uses and should be recognised as an economic good". Although this principle emphasizes water as a basic right for all, it also points out the importance of recognising water as an economic good to prevent its further wasteful uses and taking action for future conservation, protection and efficient consumption. (emphasis added) (UNCED, 1992; HABITAT,1996).

The Earth Summit in Rio de Janeiro in 1992 re-emphasized the importance of caring for water and the need for the achievement of universal availability of safe water. The Chapter 18 of Agenda 21 contains the following seven programme areas:[3]

- Integrated water resources development and management;
- Water resources assessment;

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2 UNCED: United Nations Conference on Environment and Development which is commonly referred to as the Earth Summit in Rio de Janeiro in June 1992.

3 The title of Chapter 18 in Agenda 21 is 'Protection of the quality and supply of freshwater resources: Application of integrated approaches to the development, management and use of water resources'.

- Protection of water resources, water quality and aquatic ecosystems;
- Drinking-water supply and sanitation;
- Water and sustainable development;
- Water for sustainable food production and rural development;
- Impacts of climate change on water resources.

The most important contributions of the chapter 18 are that first, it established key issue programme areas for which individual countries can formulate and implement national agendas; second, it emphasized an integrated approach for water resources development and management; and finally, the chapter brought the concept of water being an economic and social good. The Agenda 21 (HABITAT,1996) states that:

> "...the planning and implementation of drinking water and environmental programmes should be in the context of an holistic water resource development framework, taking an ecosystem approach to water resources development and management, including the health dimension" and "..in order to enable drinking water supply and environmental sanitation facilities to operate on an economically sound basis, it is critical to aim for the most efficient, effective use of available funds, particularly in view of the increasing global demand for drinking water and environmental sanitation and the trend towards decreasing availability of external funds for the sector".

These principles were included into the Action Plan of the 1994 Ministerial Conference on Drinking Water and Environmental Sanitation in the Netherlands, which was later endorsed by the United Nations Commission on Sustainable Development.

The Beijing Conference in March, 1996 was important for the action continuum from Agenda 21 to the Habitat II Agenda. The conference which was also called "Water for Thirsty Cities", created a forum for exchanging information, ideas and experience on successful practices in freshwater and waste management in urban settlements. This conference in China underlined the principle which was adopted at the Earth Summit four years ago: "Freshwater is a finite, vulnerable resource, essential to sustain life, development and the environment" (HABITAT, 1996a).

The last major UN Conference of this millennium, HABITAT II, or the "City Summit", was held in Istanbul in June 1996. The conference was a platform for exchanging experience and ideas among governments, non-governmental organisations (NGOs) and local authorities. It addressed almost every aspect of urban life from housing, infrastructure, and

pollution to health, democracy, and education, etc. The Habitat II Agenda pointed out that (HABITAT,1996):

> "Everyone has the right to an adequate standard of living for themselves and their families, including adequate clothing, housing, water and sanitation, and to the continuous improvement of living conditions".

Therefore it was declared at the end of the conference that:

> "We shall also promote healthy living environments, especially through the provision of adequate quantities of safe water and effective management of waste".

The outcomes of these different UN Conferences in last twenty years can be summarized and analysed under four issue headings as physical, organisational, financial and sustainability.

Physical Issues:

It can be claimed that these conferences were not held because of the international community's foresightedness of possible future human settlement and environmental problems, but its attempt to respond to them before it is really too late. However, they played a significant role in changing the international community's view of water and sanitation issues by: first, increasing public awareness; second, pointing out present realities of water shortages and future dangers; and thirdly, bringing together governments, agencies, local authorities, academics to address these problems and make commitments to solve them. Water and sanitation problems have already been affecting millions of people in the world, and this situation unfortunately, is not very likely to get a great deal better because of two main facts. First, fresh water resources on Earth are finite, and depend on the hydrological cycle. Humanity has already started to exploit unrenewable underground resources in many parts of the world. Secondly, the world population increases rapidly, mainly in developing countries where water problems are more acute. The world population has multiplied five times, from 1 billion in 1830 to 5.6 billion in 1994 (UGI, 1994). Thirdly, the level of the problem has been further exacerbated as a result of water pollution. Most of the scarce and vulnerable water resources of the world are now polluted because of sewage and industrial effluent discharges. These physical issues need to be addressed urgently because water is indispensable for the continuation of life. They will be further explored in the section 1.2.2.

Organisational Issues:

The international community was urged to ensure first, an holistic and integrated approach for a water resource development framework; and secondly, the participation of local authorities and consumers in the process of not only development of water resources, but also their implementation and management. The participation of women was specifically underlined at all levels of water supply programmes. The importance of these 'software' aspects is often not recognized by decision-makers and planners. The concept of water provision is often considered only as a technical issue, creating serious operational, financial and environmental setbacks.

Financial Issues:

It was recommended that water should be considered as an economic good. This is often challenged on the basis that to access water is a basic right. However this tends to work for the disadvantage of the poor and the unreachable. In many cases, subsidising the cost of water in urban areas for example, result in cheaper water for the rich while the poor who live in cities' peripheries need to obtain their water from vendors, not only paying more but also being exposed to likely health risks. Charging for water is also essential to ensure its efficient use. Industry is often provided with continuous water supply even when residential areas are affected by water shortages. Low water charges would not encourage industry to improve technologies to use less water. Although domestic use of water is rather small in a comparison with irrigation and industry, metering and charging for water can also reduce the level of wastage and its non-essential usage such as lawn watering and car washing.

Sustainability:

The preceding issues were also identified as key components for the safeguarding of the sustainability of water systems. Without a participatory approach, it is not viable to obtain a good working system of operation and maintenance. Furthermore, the projects need to be financially sound to create revenues both for water supply management and the expansion of systems according to increasing needs. The concept of sustainability will be further investigated in the next chapter.

1.2.2 A Finite, Vulnerable Source to Quench the Billion's Thirst

Abundant as water may appear to be, humanity can only access a tiny fraction of the water on earth. The apparent abundance of water is an illusion, as 97 per cent is salty, filling the oceans and the seas. In fact, 99 per cent of the remaining three per cent is out of reach of mankind, being either frozen in icebergs and glaciers or buried deep underground (Bays,1992:11). Therefore, the amount of freshwater that is available for human consumption and use, is only 0.3% of the total water resources on earth (Engelman & Leroy, 1993:5).

The renewable water resource is a function of the hydrological cycle of evaporation, transpiration, precipitation and run-off. This cycle is shown in Figure 1.2, where the percentage of global water resources is indicated based on work by Overman (Dangerfield,1983:87).

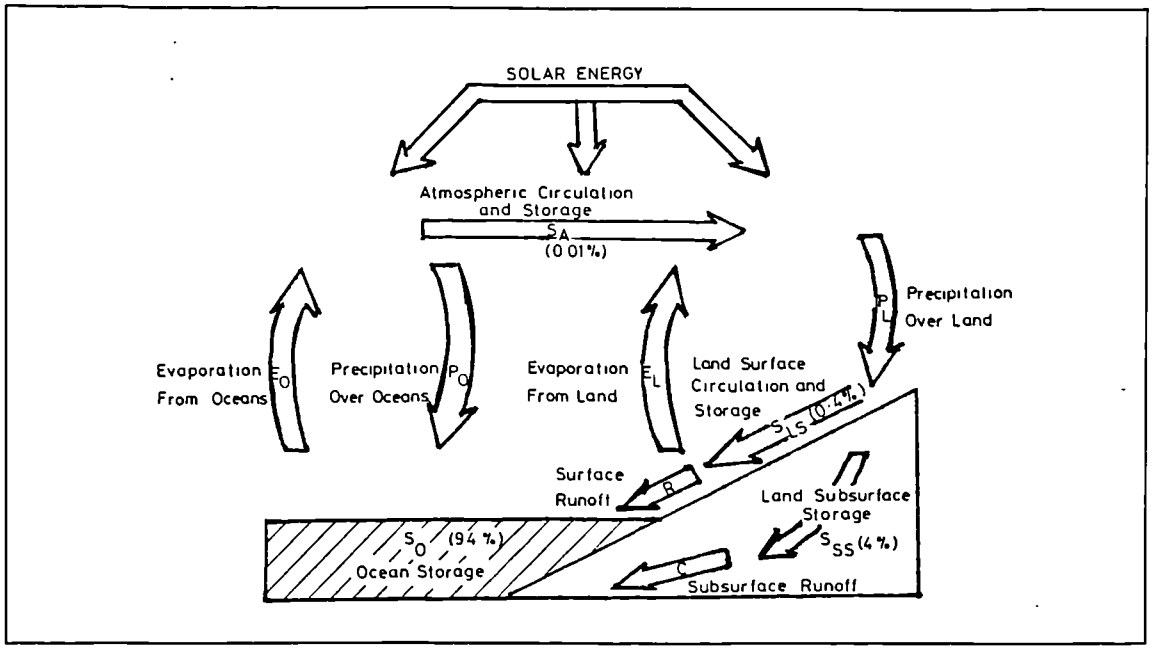

Figure 1.2: *The hydrologic cycle (modified after Overman) (Source: Dangerfield, 1983:91)*

It is estimated that only approximately 9,000 - 14,000 cubic kilometres of water in the hydrological cycle may be utilised (ODA, 1995:6).[4] For example, the amount of precipitation that falls each year on the land surface of the earth is enough to cover the

4 The continents lose about 70,000 cubic metres of water through evaporation while gaining 110,000 through precipitation. (Postel, 1992:28).

United States to a depth of 4.5 metres or to fill all lakes, rivers, and reservoirs fifty times over. However, two-thirds of this precipitation evaporates back into the atmosphere, and more than half of the remaining flows, unused by humans, to the sea (Serageldin, 1995). It is also pointed out that: "...the distribution of this water is skewed temporally, spatially and socially" (ODA, 1995:6).

According to Serageldin, the global average annual supply of renewable freshwater is about 7,400 cubic metres per person per year and if supplies fall below 1,700 cubic metres per person per year, a country or a region experiences periodic water stress (Serageldin, 1995:1-2). Consequently, if the average annual supply is below 1000 cubic metres/capita/year , there is a water scarcity and the lack of water begins to hamper health, economic development and human well-being; while less than 500 cubic/metres/capita/year is an absolute scarcity, and is the level at which lack of water is the primary constraint to life (Postel, 1992:28; ODA, 1995:6). In fact, there were 28 countries with populations totalling 335 million, that experienced water stress or scarcity in 1990. It is estimated that the number of countries falling into this category will increase from 46 to 52 by 2025 and as a consequence of this, the affected population will be between 2.782 billion and 3.290 billion, depending on the population growth rates (Engelman & Leroy, 1993).

Theoretically, the world's renewable water resource, which is less than 1% of the earth's water should be sufficient for 20 billion people - nearly four times the world's current population. However, water resources are spread unevenly around the world; with Latin America faring the best, and while North Africa and the Middle East experience serious water shortages. By 2000, there will be 11 African and 9 Middle Eastern water-scarce countries (Postel, 1992). On the other hand, the world's population increases by more than 90 million each year and the Johns Hopkins University's estimates show that: "...by 2025, human numbers may be 50% more than they are today...". According to the UGI, the increasing trend of world population is a recent phenomenon. For example, 75 per cent of the last 12,000 year world population growth has taken place during the 20th century (UGI, 1994:1).

Due to this increase in the world population, the water demand by 2000 will be double, with 69% of the world's fresh water being used for irrigation, about 23% for industry and only

8% for household use (The Johns Hopkins University, 1994:1-17).However, water use in different countries show huge difference according to their degree of economic development. Annual domestic water withdrawals in selected countries are shown in Table 1.2.

	Water withdrawals for:	
Country	Industry	Agriculture
Botswana (4.9)	9.8	83.3
Burundi (7.2)	-	12.8
Canada (192.9)	1,401.2	157.9
China (27.7)	32.3	402.0
France (116.5)	502.3	109.2
Germany (66.8)	467.6	133.6
India (18.4)	24.5	569.1
Japan (156.9)	304.6	461.5
Peru (55.9)	26.5	211.6
Somalia (5.0)	-	162.0
USA (259.4)	994.5	908.1
World average (52.8)	151.8	455.4

Table 1.2: *Annual domestic water withdrawals in selected countries (cubic metres per head) (Source: UGI, 1992:10)*

Subsequently, water shortages will be acute in many regions of the world. Bulloch and Darwish point out that by the year 2000 many countries will have only about half as much water as they had in 1975 (Bulloch and Darwish, 1993:19).

On the other hand, water shortages in urban areas are not only the result of the world population growth but also the increasing population density beyond the level that nearby water supplies can serve in mega-cities of the world. Although municipal water use does not account more than one tenth of the world's overall water use, urbanization increases the per capita demand for water for domestic purposes. Lundqvist pointed out that there will be an increase of the urban population in the South by some 2 billion between 1990 and 2020. It is also estimated that over 1 billion people in Africa and South Asia will live under conditions of severe water scarcity by 2025 (Lundqvist, 1993).

According to the United Nations Centre for Human Settlements (HABITAT), 21 ten-

million-plus megacities (18 of them in developing countries) and many smaller cities and towns will have to satiate their thirst by carrying water from further distances and developing degraded freshwater resources (HABITAT,1996). For example, the water resources in Oman, Yemen and Jordan are being used at a rate faster than their renewal, while finite underground resources are being steadily depleted in the Gulf. Almost 90 per cent of water consumption in Egypt goes on irrigation, and in fact Nile water will have reached capacity use by the year 2000 (Bulloch and Darwish, 1993:189). It is also pointed out that "...many cities in the world are withdrawing water from aquifers faster than natural rates of replenishment, leading to salinisation and subsidence". For example, the central area of the Mexico City Metropolitan Area has fallen by an average of 7.5 metres over the past 100 years as a consequence of the rapid depletion of aquifers beneath the city (HABITAT, 1996:64).

As it was explained earlier, the recent UN Conferences have urged the international community to take a more comprehensive water resource development and management approach for the long-term sustainability of "finite, vulnerable and indispensable" water resources which have become scarce in many parts of the world. Ramachandran, the director of the Dublin Conference in 1992, claimed that: "...profligate waste and degradation resulted from neglect of effective water resource management". He continued: "Lack of water will soon be seen to be at least as critical as lack of oil in conditioning the pace of national development" (Bulloch and Darwish, 1993:19). Lundqvist (1993) also pointed out that:

> "The stiff competition for water contributes to the build-up of tensions in parts of the world which now and then explode in open hostilities. It is enough to point at the situation in the Middle East, along the Nile, between countries and states in South Asia, USA and Mexico, etc."

Bulloch and Darwish (1993:189) explained the other important interaction between water scarcity and armed conflict by claiming that "...the most acute shortages are in the poorest countries, and it is in these places that populations are growing fastest". Although Serageldin agreed with Bulloch, Darwish and Lundqvist on the likelihood of water scarcity leading to conflicts by pointing out that: "As populations and demand for limited supplies of water increase, interstate and international frictions over water can be expected to intensify" ; he also concluded that water can be used as a tool for peace building

(Serageldin, 1995:2):

> "Agreement on access to water is an important part of the peace accords between Israel and its neighbours. A water treaty has also helped to maintain peace between India and Pakistan".

The Peace Treaty of 1994 between Israel and Jordan recognized the implications of water scarcity for both countries and emphasized the need for regional and international cooperation to improve water supplies in the region by using various methods. These methods, the treaty explained, should include the minimizing of water wastage through the chain of its uses, the prevention of contamination of water resources, and the transformation of information, joint research and development for the enhancement of water resources development. The Article 6 - Water, of the Peace Treaty concluded that (Jordan Media Group, 1994):

> "The parties, [recognize] the necessity to find a practical, just and agreed solution to their water problems and [accept] that the subject of water can form the basis for the advancement of co-operation between them,...".

In a similar vein, the ex-President of Turkey, Turgut Ozal, King Hussein of Jordan, and President Sadat of Egypt have all stated that (Bulloch and Darwish, 1993):[5]

> "...while water could be a cause of war it could also be an excellent focus for inter-state cooperation".

A case study from Sarajevo presented by Conti at the Water under Fire Workshop in York also shows the need for the collaboration of both Pale and Sarajevo Water Boards across the Dayton Line, which emphasized the possibility of providing water which can be used as a 'peace tool'. It is pointed out that this project was realised by the collaboration of the British and German Red Cross, the Water Boards of Sarajevo and Pale and the ICRC. It is stated by Conti et al. (1997:5) that: "The proposed project will require the collaboration of the two Water Boards,...which must now be strengthened, bearing in mind the common interest they have in maintaining this line in working conditions". He further explained:

> "For instance, the water distribution in Sarajevo will improve, as it will not be anymore necessary to pump water from Bacevo along a very complicated scheme (via several pumping stations and reservoirs) in order to supply a little

5 In 1987, Turkey proposed the transfer of fresh water from the Seyhan, Ceyhan and Euphrates basins through a series of dams and tunnels to the countries of Syria, Jordan, Saudi Arabia, Kuwait, Bahrain, Qatar, the United Arab Emirates, and Oman. The Peace Pipeline would have a length of 6,550 km and a capacity of 6 million m^3 per day (Murakami, 1995).

> amount of water to the old part of Sarajevo, and the same is true for the remaining Serbian part of the town and the numerous houses situated along the pipeline".

Although water initiated the cooperation between old enemies, Jordan and Israel in the preceding example, it can also cause problems between countries like Jordan and Saudi Arabia, even though they have a tradition of friendly cooperation and similar political systems. Bulloch and Darwish (1993:15) pointed out that:

> "Water is so vital in this most volatile of the world's troubled regions that it could be a force for peace, inducing old enemies to cooperate for the common good; but history and current events show that it is more likely to be a disruptive influence, a cause of conflict".

1.2.3 Water as a Cause of War

It is stated that: "...there are 214 international river and lake basins in the world, of which 155 are shared by two countries, 36 by three and 23 by up to a dozen". A consequence of these shared water basins: "...any conflict will be bound to involve national rivalries, some in the best-armed and most volatile regions of the world, particularly the Middle East" (Bulloch and Darwish, 1993:15). Zemmali (1994) also points out that:

> "When it comes to the appropriation, control or sharing of water resources, the situation is invariably hedged with opposing interests and rivalries which can even result in armed conflict".

Bulloch and Darwish (1993:199) concluded their book "Water Wars" by claiming that:

> "Although the battles may appear to be about land, autonomy, or human rights, or protecting borders, every confrontation in the future will be affected by the hydrography of the region. Water wars are on the way".

The literature on shared water resources tend to identify several flashpoints where disputes over shared water resources can result in armed conflicts. This section will only focus on four river basins which are the Euphrates and the Tigris in the Middle East; the Nile in North Africa; the Ganges and the Indus, and the Amu Darya and Syr Darya in Asia in order to elaborate the inter-relationship between water scarcity and armed conflict. It should be pointed out that the aim here is not a thorough water situation analysis in these river basins.

The main reason behind the Arab-Israeli war in 1967 was the policies of Israel to set the

borders of their new state to access the then-plentiful supplies in Lebanon. Zemmali also agrees on this view which is supported by Chesnot:[6]

> "...control of the waters of Jordan played a crucial role in the outbreak of the Six Day War in 1967....One of the objectives of the occupation of the Golan Heights since 1967 has been to control water resources. Similarly, the waters of the Litani are a major factor in the occupation of southern Lebanon".

According to one report, quoted by Zemmali (1994), the control of water inside the occupied Palestinian territories causes serious problems:[7]

> "...apart from the reduction of the areas cultivated by the Palestinians, the policy of the Israeli administration in the domain of water is decisive...All the water resources of the West Bank and Gaza are placed under Israeli control. Anyone wishing to drill a new well has to apply for a permit to the military government - a permit more often than not refused to Palestinians but granted to Israeli settlers".

The Golan Heights are also in the Galilee Sea water catchment area which forms Israel's largest surface water source. Therefore, whoever controls the heights can have very important strategic advantage to control the riparian rights to the Yarmuk River.

Boutros Boutros-Ghali, the former Secretary General of the United Nations warns that: "...the next war in the Middle East will be over water". A sentiment supported by Professor Elias Salameh of Jordan University who says that: "Water will determine the future of the Middle East" (Bulloch and Darwish, 1993). Additionally, a Central Intelligence Agency risk assessment paper shows that the Middle East is a region where war could erupt over shared water resources. The study undertaken by the Pentagon in 1992, claims that a war between Turkey and Syria over their shared water resources might call for American intervention.

The Euphrates and The Tigris: Turkey has an abundance of water supplies and has been implementing the South-Eastern Anatolia Project which consists of several dams and irrigation schemes on the Tigris and Euphrates Rivers for boosting its agricultural and

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6 Christian Chesnot, *"La bataille de l'eau au Proche-Orient"*, Paris, L'Harmattan, 1993, p.67

7 Palestine et droit, Revue du Comite international permanent de juristes sur la Palestine et la paix au Moyen-Orient, 1987, No.1, AIJD, Brussels, report quoted in *"Israel et Palestine, de l'affrontement a la coexistence"*. Information file published by GRIP (Groupe de recherches et d'information sur la paix), No. 14-15, Summer-Autumn, 1988, Brussels, p. 50.

hydroelectric energy productions.[8] According to Murakami, 80 per cent of the natural run-off of the Euphrates was developed by the completion of the Ataturk Dam in 1989, which is the biggest dam in Turkey and now the fifth largest rockfill dam in the world, with an effective reservoir storage volume of 19.3 km^3 (gross volume, 48.7 km^3), as well as Keban and Karakaya dams in Turkey and Tabqa in Syria (Murakami, 1995).[9] Both Syria and Iraq strongly opposed the construction of the Ataturk Dam; however, according to the protocol signed between Syria and Turkey in 1987, Syria is provided with 500 cubic metres of water per second which is a continuous supply. even in periods of draught (Yakis,1996). Consequently, the importance of water for both Syria and Iraq's economies in the lower-Euphrates-Tigris-basin puts Turkey in a stronger position with its affairs with these Middle Eastern countries. There are two important factors behind Turkey's water policy. First of all, although Turkey has an abundance of water, at least at the moment, it has not got what the Arab countries have in plenty which is oil.[10] Neale reported that the then Turkish prime minister in 1994 responded to Syrian requests for more Euphrates water with the words: "We do not say they should share their oil resources. They cannot say they should share our water resources" (Neale, 1996). Secondly, both Syria and Iraq can affect the Kurdish insurgency problem in Turkey by giving or withholding support for the Kurdish rebels.

However, the problem of sharing Euphrates and Tigris' waters between Iraq and Syria has a longer history. After Syria built three dams across the Euphrates in 1975, the two countries became very close to a war as Iraq accused Syria of holding back the waters of the river to damage Iraq's economic interests. In fact, one of these hydroelectric dams known as Tabqa or Esad, which is Syria's sole source of electricity, was built by the Former Soviet Union with a design mainly used in Siberia requiring a high level of water for electricity production. For example, while average hydroelectricity production is one kilowatt for every five cubic metres of water, this dam requires eight cubic metres.

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8 "The lengths of the main streams are 2,330 km for the Euphrates, 1,718 km for the Tigris, and 190 km for the Shatt al-Arab. The catchment area of the basin is 423,800 km^2, of which 233,000 km^2 is that of the Euphrates, 171,800 km^2 of the Tigris, and 19,000 km^2 of the Shatt al-Arab (Shanin 1989)" (Murakami, 1995:37).

9 Murakami gives this figure as 19,3 billion cubic metres which was changed into cubic kilometres with a calculation that 1 billion cubic metres equals 1 cubic kilometre.

10 In 1993, the annual water supply per capita in Turkey was 3000 cubic metres, however, this would fall to 2000 cubic metres in the year 2000 (Karakaya,1996).

Consequently, for this reason, Turkey refuses to comply with Syria's demands for additional water (Karakaya,1996).

The River Nile basin is another sensitive area for possible water wars in the Middle East Region.[11] Egypt has always made it plain that any threat to the Nile waters would be a cause of war (Bulloch and Darwish, 1993; Murakami, 1995; Zemmali, 1995).

The Nile: According to Murakami, Egypt is totally dependent on the Nile River; he claimed that: "The country owes its existence to the river, which provides water for agriculture, industry, and domestic use" (Murakami, 1995). The description given by Herodotus also underlined the importance of the River Nile for Egypt: "Egypt is the gift of the Nile" (Zemmali, 1994). Winston Churchill gives an elaborate and opposite description of the Nile in his book 'The River War' (Bulloch and Darwish, 1993:25-26):

> "...like a huge palm tree with its roots spread over central Africa - in lakes Victoria, Albert and Keoga - a long trunk in Egypt and Sudan, and its crown in the delta in Northern Egypt. If the roots were to be reduced, then the crown would dry and the rest of the tree would eventually deteriorate and die".

Although the waters of the Nile are of direct interest to several African countries, there are hardly any treaties or agreements among these countries for the sharing of the waters of the river, apart from the Egyptian-Sudanese Agreement in 1959.[12] According to Abu-Zeid and Rady, this agreement entitled Egypt with 55,5 km^3 of Nile water per year while Sudan has a share of 18,5 km^3 for its needs.[13] However, Egypt's water needs are likely to increase from 63,5 km^3 in 1990 to 69,4 km^3 by the year 2000, putting more pressure on the fragile co-operation for sharing the waters of Nile. Besides, Egypt and Sudan have had a border dispute in the Halayib region since the early 1990s and the governments of these two countries have been accusing each other of supporting opposition groups active in each

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11 The Nile is 6,690 km long, flowing from south to north and covering approximately one-tenth of the African continent, with a catchment area of 3,007,000 km^2. Its main sources are found in Ethiopia and the countries around Lake Victoria (Murakami, 1995).

12 Burundi, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda and Zaire. About 85 per cent of the Nile waters arise in Ethiopia and flows as the Blue Nile until meeting the White Nile whose headwaters are at Lake Victoria in Tanzania, in Khartoum, Sudan (Starr&Stoll, 1988).

13 Abu-Zeid, M.A & Rady, M.A., 'Egypt's Water Resources Management and Policies' presented at World Bank International Workshop on Comprehensive Water Resources Management Policies, Washington, D.C., June 24-28, 1991. It is quoted by Postel (1994:78).

other's territory. Consequently, Egypt considers the possibility of Sudan using the Nile's waters as a weapon against its neighbour, though, it must be said that Sudan does not seem to be moving in that direction (Postel, 1994; Zemmali, 1994).

On the other hand, there is a worrying tendency for the Middle East's water problems to spread to areas which are geographically far from the primarily affected region. This is due to socio-economic, political and cultural interactions among the countries in the Middle East-Africa region. For example, Ethiopia is caught up in the Arab-Israeli dispute because of Israel's involvement in the development of water projects in Ethiopia for use as a political weapon against Egypt. Israel is also accused of aiming to sever the southern parts of Mauritania from the rest of the country, and consequently, to separate a member state of the Arab League from its main water resources.[14]

The Mauritania-Senegal water dispute was identified by Mazhloum as one of five flashpoints where military action is likely to escalate over shared water resources.[15] The other regions were Turkey-Syria, the Israeli Occupied Territories, Ethiopia and Egypt-Libya (Bulloch & Darwish, 1993). The dispute between Senegal and Mauritania started as a confrontation over water and ethnic differences. It escalated rapidly however, because of the involvement of other countries such as Iraq which gave aid to Mauritania to obtain land for a missile testing range in the country.

The other potential conflicts over water in Africa would be over a 2,400 km long navigable canal called the Jonglei Canal, if a Nigerian scheme for irrigation is ever realized with the support of Libya. Any action affecting the Nile by Central African states causes concerns in Egypt and Sudan, and the realization of this scheme can change power balances in the region. Another plan to build a navigable canal, starting from Burundi and circumscribing the rim of the Zaire basin worries Egypt even more as it is very close to the headwaters of the Nile near Lake Victoria. All these proposed projects can have effects on the Nile waters which bring life to Egypt, this is perhaps why Boutros Boutros-Ghali told the delegates of

14 The Arab League has twenty-three members and believes firmly (officially)that Israeli meddling in Central Africa is part of a thought-out plan to divide and weaken the league to gain control of their water resources in Africa.

15 Dr Gamal Mazhloum is a strategist who advises several research institutes.

an African water summit in Cairo in 1990 that: "The national security of Egypt, which is based on the waters of the Nile, is in the hands of other African countries" (Bulloch and Darwish, 1993).

The Ganges and The Indus: The construction of the Farakka Barrage on the Ganges to improve navigation for the Calcutta Port was considered as a threat to sovereignty by Bangladesh. Although there was a proposition by India to link the Brahmaputra river in Bangladesh to the Ganges by a canal to prevent frequent floods, it was rejected because of historical dislikes between these two countries. The 1977 agreement allotted 63 per cent of the flow from the Farakka Barrage to Bangladesh while India was given the rest. This agreement also guaranteed a minimum flow to Bangladesh during the dry seasons which was not included in the 1982 accord. However, after this agreement expired second time in 1988, the two countries have not reached any agreement on this matter so far.

On the other hand, the waters of the Indus river have caused far more serious problems to the relations of India and Pakistan after India built the Wuller Dam.[16] After the partition in 1947, the first dispute experienced by two countries was over the Indus River which feeds the world's largest irrigation system watering an area of 15 million hectares. The 1960 Indus Waters Treaty ensured an equitable share of the Indus River and established a committee to monitor the treaty's implementations in both countries, though the treaty could not secure a joint management of the river (Mehta, 1988; Khan, 1990; Kirmani, 1990; Zemmali, 1994).

The Amu Darya and Syr Darya: The rivers, Amu Darya and Syr Darya flow through the "Mesopotamia" of Central Asia which consists of the fertile irrigated areas like Fergana, Samarkand and Khiva.[17] The water demand in the region has increased dramatically since the 1960s as a consequence of rapid population growth and the extreme specialization of

16 The Indus is the second longest river in western Asia with an annual discharge of 207.5 km^3. Its catchment area extends over four countries - China, India, Pakistan, and Afghanistan - with the portion in Pakistan accounting for more than 50% of the total (Murakami, 1995).

17 The Amu Darya with a length of 2540 km from the confluence of the Pyandzh and Vakhsh to the Aral Sea is largest river and drainage basin in Central Asia. Whereas the second river, the Syr Darya, stretches some 2200 km in length from the Naryn River in Kyrgyzstan through the Fergana Valley, the Hunger Steppe and the Kysyl Kum desert (Klotzli, 1994).

cotton monoculture. The cotton monoculture was introduced by the Soviets because of the favourable thermal and soil conditions in the region. However, this monoculture has caused the depletion of soil and water in the Central Asian Republics.[18] The other characteristic of the region is its highly mixed ethnic structure which was again a result of the policies implemented by the Soviets to keep inter-ethnic balance among its member states. Consequently, as Klotzli (1994) pointed out:

> "National hostilities overarch the severe social and economic conditions...Future conflicts may occur within drainage basins between up and downstream riparians, mainly because of the degradation of water quality with possible repercussions on a substantial level, aggravating existing ethnic and social cleavages".

For example, the Uzbeks clashed with Meskhetians Turks who were deported from Georgia by Stalin, in the Fergana Valley in 1989. "At least 100 people were killed and more than 16,000 were evacuated" (Klotzli, 1994).

It can be clearly seen that the international community's present approach for dealing with shared water resources would be very ineffective to deal with these problems. The water disputes can easily turn into armed conflicts, as water will be such a scarce resource in many parts of the world like the Middle East and Central Asia. As it was explained earlier, these are the areas where a high rate of population increase is expected. Therefore it can be claimed that the humanity faces a set of serious challenges to provide 'adequate' amounts of 'safe' water to everybody in the world. In short, the water provision challenges faced by humanity in peace can summarized as:

- water scarcity
- increasing water demand
- rapid urbanisation
- water pollution
- implementation of inappropriate technology
- institutional and organisational shortcomings
- lack of maintenance
- lack of financial resources for new water systems
- lack of a participatory approach
- lack of an integrated and holistic water resource development
- lack of financial sustainability

18 Turkmenistan, Uzbekistan, Kazakhstan, Kyrgyzstan and Tajikistan.

On the other hand, this research would like to put these challenges in the framework of post-war areas where their physical, social, economic and political aspects add a completely different perspective to them. Current armed conflicts with their multiple tensions, high civilian involvement, long duration and mass population movements bring various pressures on urban water supplies, which will be investigated through the rest of this chapter

1.3 Post-Cold War Armed Conflicts

The new millennium is at our doorstep and the world is going through turbulent social and political changes. The collapse of the Berlin Wall in 1989 heralded to humanity the end of the Cold War. However, the new world that has emerged since, is described as (Eliasson, 1993:308): "...a chilly new dawn that left the protagonists stumbling uncertainly in the pale light rather than marching with the confidence of victors". Although, the end of the Cold War has enabled the resolution of some of protracted political disputes, it has also exacerbated tensions in various regions of Africa, Asia, Eastern Europe and the Commonwealth of Independent States (CIS).

Consequently this last decade of the Twentieth Century has been witnessing an explosion of ethnic and civil conflicts affecting very different regions of the world from Rwanda, the Former Yugoslavia, and Chechnya to Afghanistan, Somalia and Iraq. According to the Department of Peace and Conflict Research at the University of Uppsala in Norway, there were 96 armed conflicts in 66 different locations between 1989 and 1995.[19] On the other hand, the Table 1.3 shows that the number of armed conflicts decreased after reaching its peak in 1992.

Although this decrease might give the humanity a little hope that there are now fewer countries involved in armed conflict with each other, the Figure 1.3 points out an alarming tendency of armed conflicts from interstate to change from intrastate where increasingly more innocent civilians become tools of warfare (Wallensteen and Sollengberg, 1996).

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19 An armed conflict is identified as "...a contested incompatibility which concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results an at least 25 battle-related deaths" (Wallensteen&Sollengberg, 1996: app 2).

Level of Conflict[20]	1989	1990	1991	1992	1993	1994	1995
Minor	14	16	18	23	15	16	12
Intermediate	14	14	13	12	17	19	17
War	19	19	20	20	14	7	6
All Conflicts	47	49	51	55	46	42	35
All Locations	37	39	38	41	33	32	30

Table 1.3: *Armed conflicts and conflict locations between 1989 and 1995*
(Source: Wallensteen and Sollengberg, 1996:353)

Figure 1.3: *Number of Interstate and Intrastate Armed Conflicts from 1989 to 1995*
(Source: Wallensteen and Sollengberg, 1996:354)

1.3.1 Characteristics of Intrastate Armed Conflicts

According to the UNRISD (1995), the extent of the destruction caused by intrastateconflicts is much more severe than that inflicted by interstate conflicts for several reasons:

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20 An armed conflict is identified as "...a contested incompatibility which concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results an at least 25 battle-related deaths" (Wallensteen&Sollengberg, 1996: app 2).

Multiple tensions, duration and lack of a clear resolution:

The increasing number of intrastate conflicts tend to be the result of political exploitation of ethnic, religious and cultural differences in addition to other root causes such as poverty, social inequalities, and lack of access to socio-economic and political mechanisms. Intrastate conflicts last for many years. The wars in Angola, Mozambique, Afghanistan, and Sudan have been running for more than a decade (Adams & Bradbury, 1994; Cuny & Tanner, 1995). For example, the massive level of disruption to socio-economic, political and cultural life in Afghanistan was started with the Soviet invasion in 1979, and further and more deeply exacerbated by the civil conflict among the various Mujahideen factions from 1992 to the present time. According to UNRISD (1995:111), intrastate conflicts:

> "...rarely come to a sudden end. Rather, peace and war seem to co-exist for a long period: fighting may stop in some areas, but linger sporadically in others".

Civilian involvement:

Intrastate conflicts are often fought between armed civilians. The concept of fighting armies of contending countries in interstate wars is replaced by hostile groups of armed civilians. Consequently, it is the main characteristic of contemporary conflicts that more civilians lose their lives and livelihoods, get injured and become displaced. For example, according to UNICEF (Minear & Weiss, 1993:7):

> "Only 5 percent of the casualties in the First World War were civilians. By the Second World War, the proportion had risen to 50 percent. As the century ends, the civilian share is normally about 80 percent - most of them women and children".

Furthermore, it is stated that in 1988 there were more than 200,000 child soldiers under the age of 15 (UNRISD,1995).

Brutal violence:

Intrastate conflicts mainly target civilians, civilian infrastructures and services, leaving behind communities with destroyed built environments, crippled economies, minefield where once grew crops, bombed hospitals, poisoned water wells, malnutrition, women-headed households, child soldiers, people uprooted and displaced from their homes and livelihoods. Hence, their impacts on population are not limited only to human destitution such as killing, displacement and maiming, but also they have serious long-term negative impacts on social services, networks and the economy.

Social and economic destruction:

Intrastate armed conflicts also wreck social structures of communities through manipulation of ethnic identities, destruction of long standing reciprocal relations between different groups, and the "...dehumanising acts of torture, rape and mutilation". The wars in the Former Yugoslavia and Rwanda witnessed terrible atrocities of ethnic cleansing destroying long lasting relationships between different ethnic communities. It is pointed out by Plant (1994:88) that:

> "...the nature of warfare is changing into something that is both cruder and more sophisticated at once...It is cruder in that the civilian population is increasingly being targeted, either to force migration, or as a means of terror in its own right".

The pictures of starved Muslims behind the barbed-wire fences in Serbian concentration camps reminded many of the persecutions of Jews in Nazi Germany. The report by Eastmond, et al. (1994:7-9), gives an example of a southern Bosnian town with a population of 12,000, comprising a majority of Serbs with 20% Muslim minority, did not experience any ethnic conflict until the war in 1992. "Kinship was important in structuring social and economic life and vital sense of purpose and emotional wellbeing". However, the report explains that many Muslim men in June 1992 were put in a prison camp experiencing "...different degrees of physical and psychological violence...being forced to watch others being abused or killed, and suffered death threats of different kinds; there was random shooting in the camp". It is pointed out that these atrocities aim "...to destroy the social fabric of society, and thus the first level of 'coping' or 'survival' mechanisms. The trauma, dislocation, and loss of a 'sense of community'".

The disintegration of socioeconomic structures can mean huge losses in a community's agricultural and industrial productivity. Physical destruction inflicted on the infrastructure, health and education services, bring a halt to economic activity. For example, the death tolls of war in Mozambique amounted to almost a million people, who lost their lives through not only guns and bombs but also hunger and disease. Besides this human tragedy, the total cost of war is estimated to be around $15 billion (Waterhouse, 1996:14). The devastating effects of war on Rwanda's economy are summarized under four main headings: first, it brought a halt to coffee and food production in the north through displacement of farmers; second, the road to Mombasa which is Rwanda's main connection to the outside world

was cut off; third, the third biggest income of Rwanda's economy - tourism - was destroyed; and finally, scarce resources which were urgently needed for the provision of basic health and education services were spent on armament (Vassall-Adams, 1994:13). According to the World Bank in 1992, the cost of war in Rwanda was about $1 billion a year (Waller, 1996:12).

Media coverage:

War means a fresh ongoing source of news for the media which plays such an important role in generating public opinion in favour of agencies taking action to ease the sufferings of war-torn people. Cuny (1993) pointed out that:

> "...it cannot be denied that the press has enormous influence on the workings of the relief system at all levels. Extensive press coverage of a disaster can create tremendous pressure on agencies and governments to become involved".

However, Cuny explained that the media can also change public opinion quite significantly from one extreme to another by creating stars of certain kinds of victims, simplifying complex emotional issues and making myths about war and its victims. Mark Laity, BBC's defence correspondent who has worked in many war zones, claimed quite rightly that "...the media is only interested in ratings not rationing..." to explain the media's lack of interest for the problems of post-war communities.[21] It is pointed out that (UNRISD, 1995:111):

> "The media now influence, or even dictate, the agenda of confrontation, the pace of escalation and the response of the international community. But international media coverage can be extremely superficial: in Somalia, for example, most reports were based on interviews with expatriate aid workers".

It is also stated (Revival, 1996:3) that:

> "What makes every politician wary is that journalists excel in covering and portraying strong, sensational images. Wars are very complex, but a successful journalist does not have to delve deep to get a 'good' story these days, when we encourage exclamation marks rather than question marks".

Use of light weapons:

According to UNRISD (1995:111);

> "Most conflicts are fought not with tanks, aeroplanes or heavy artillery, but with small arms and light weapons such as sub-machine guns, bazookas and rocket-

21 This was Mark Laity's response to the author's question at his lecture held at the University of York.

> propelled grenades. These are relatively cheap and widely available. In parts of West Africa, an AK47 rifle costs no more than a radio-cassette player".

Besides its huge material losses, conflicts also leave their mine fields behind making their effects felt long after cease-fires are signed. Mine fields result in fertile agricultural lands being laid waste while societies lose their productive skills, face threats of famine and become dependant on international relief aid. It is stated by Cuny and Tanner (1995:13) that "Often, mines are laid precisely for the purpose of breaking down normal socioeconomic patterns". According to McGrath (1994:4-6), "Children are especially vulnerable to anti-personnel mines, not just, as with adults, as a result of their involvement in vulnerable occupations but quite simply because they are children". The particular vulnerability of children to mines is explained in an example:

> "Some months ago I was examining the site of a mine incident where a six-year-old boy died while playing in northern Iraq/Kurdistan...The area was grassland meadow and it was only when I crouched to inspect the accident site that I suddenly realised why the boy had died. Although the grass was no more than six inches high, from my new position I could see no mines: I could see only grass. My eye-level was roughly that of a little boy of six. The victim died because he was too small".

Mass population movements:

This increasing trend of intrastate conflicts has also caused a tremendous growth in the number of refugees and internally displaced persons. It is stated that the war in Mozambique forced almost two million people to take refuge in neighbouring countries while four million were internally displaced in a country with a population of only 17 million (Waterhouse, 1996:14). According to the USCR in 1993, the number of refugees increased from 2.5 million in 1970 to 17.5 million in 1992, with a further 24 million displaced persons.[22] Following this, the numbers of refugees and displaced persons reached to 59 million by 1994 (UNHCR, 1995). Furthermore according to the UN, there were 26 complex emergencies in 1993 and they were the main reason behind this rapid increase of refugees and displaced persons.

22 USCR: United States Committee for Refugees. The information was taken from the committee's 'World Refugee Survey' by Adams & Bradbury in 1994.

1.3.2 Complex Emergencies

The term 'complex emergency' is frequently used by the international community to describe "a variety of humanitarian crises" since the end of the 1980s. According to Slim and Penrose (1994), it is applied to "...a new breed of post-Cold War humanitarian crises, which are distinguished by multiple and simultaneous factors such as civil conflict, famine, displacement and a breakdown of national government" each exacerbating the effects of the other. It can be seen from this description that the 'complex emergency' term seems to make distinctions between 'simple' humanitarian crises such as natural and manmade disasters, and so called 'complex' humanitarian crises which can be the combination of several factors mentioned.

The description of 'complex emergencies' given by UNDRO (1992:37) also emphasizes the presence of two main factors that are first, the interaction of more than one cause, and second, the existence of a protracted political crisis:

> "Essentially a complex disaster is a form of a human-made emergency in which the causes of the emergency as well as the assistance to the afflicted are bound by intense levels of political considerations".

The single most prevalent political condition of a complex political emergency is civil conflict, resulting in a collapse of political authority in all or part of a country...The disaster becomes 'complex' because either the collapse or diffusion of political control makes assistance highly problematic. Solutions ultimately depend upon agreements with all parties involved in the conflict to permit assistance to be provided to recognized civilian noncombatants. This view is supported by Duffield (1994:9) pointing out that complex emergencies:

> "...relate to the emergence of protracted political crises in the new economic and strategically marginal areas of the global economy".

It can be argued that the term 'complex emergency' may be used to emphasize the interaction of more than one factor such as drought and civil conflict or famine and displacement. However, to identify complex emergencies as multi causal might imply that other disasters are monocausal which is misleading. Also, it is important to note that natural disasters are not the outcome of only a single cause but of hazards and vulnerabilities.

Duffield also points out that the term is "...somewhat limited and inappropriate" because first, "...it does not fully describe what can be argued to be, in effect, deep and protracted political crises engendered by profound social change" and second, it in a way implies that some emergencies are simpler than others. This view is also supported by Barakat who refers to "complex emergencies" as "political emergencies" or "war", pointing out that it would otherwise be patronizing to claim some emergencies are more complex than others.[23]

It is also ironic to see that while some of the poorest parts of the world are affected most by current armed conflicts, more than 90 per cent of the world arms exports are accounted by developed nations. For example, the six countries forming the UN Security Council had arms exporting shares of 88 per cent in the 1993 world market. Britain captured a quarter of the £20 billion world arms contributing to the maintenance of 360,000 jobs in the British defence industry (Bellamy, 1997:11). These are the arms which are used in many intrastate conflicts today; killing and injuring civilians; destroying lives and livelihoods; collapsing productivity in agriculture and industry, and leaving not only socioeconomically crippled communities but also psychologically affected individuals. To investigate all the consequences of war is not however in the scope of this research; therefore, the focus now will be the impacts of armed conflicts on water systems.

1.3.3 Impacts of War on Urban Water Systems

At this point, it should be useful to clarify certain definitions regarding urban water supplies as far as this research is concerned before investigating war's impacts on them.

A 'water supply system' is an arrangement of operational methods and / or equipment constructed and devised in order to provide water to a community. In the case of an 'urban water supply', it incorporates four subsystems which are collection, transmission, treatment and distribution (American Water Works Association - AWWA, 1984). Each of these subsystems consists of components such as water boreholes, pipelines, reservoirs, booster stations, treatment plants and mains. These components are designed, constructed and operated to become an integral part of an urban water supply (Tebutt, 1973; Dangerfield,

23 Barakat, 1996 Personal Communication

1983; Tworth el al., 1994). On the other hand, an 'urban water system' includes three water sections which are an urban water supply, a discharging system of treated wastewater to the receiving waters and a system of handling the storm and flood waters as they pass through the city (Grigg, 1986). Additionally, the interrelationship and interdependency between an urban water system and other utilities such as power supply, water users, maintenance and administration create a 'total urban water system' (AWWA, 1984). The Figure 1.4 shows the components of the urban water system.

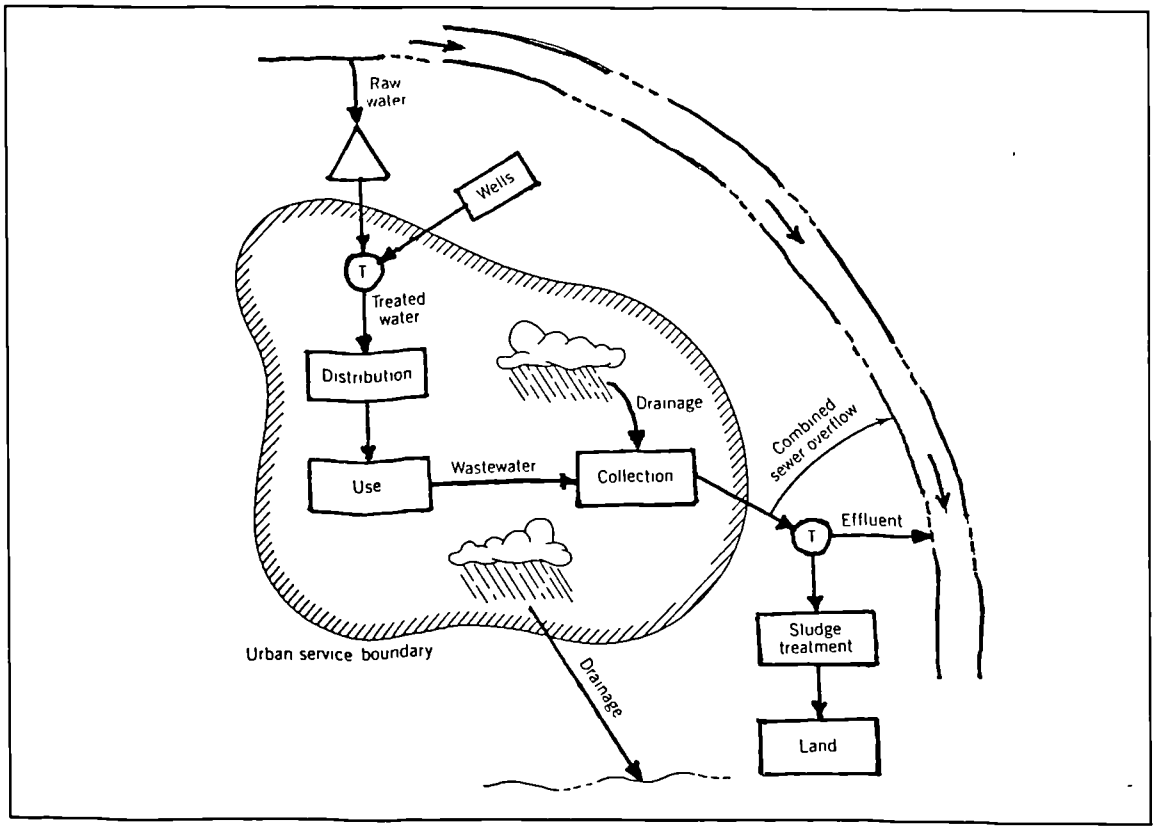

Figure 1.4: *Components of the urban water system (Source: Grigg, 1986:16)*

It should also be pointed out that there is a considerable interdependence between the lifelines such as water supply, sanitation, telecommunications, and transport in an urban infrastructure. Failure of one element can mean failures or disruptions of others. The Table 1.4 shows this interdependence. According to this table, water supply has the highest total importance which shows other elements' dependence on water. The dependency of lifelines on each other is marked in a range from 1 to 5 ('5' shows the highest degree of dependency).

As can be seen from these definitions, urban water systems are very complex structures.

However it should be pointed out that the concept of an urban water system in this research is not necessarily in the western understanding of water supply. It is not too unlikely to see some less complex water systems in many urban areas of the developing world: for example, wells, hand pumps, standpipes, etc. In other words, although this research focuses on the post-war recovery of urban water systems, it does not exclude less complex water systems, serving in urban areas.

Dependent lifeline \ Support lifeline	Water supply	Gas and oil supply	Sanitary drainage	Storm drainage	Electricity supply	Telecom services	Highways	Railways	Ports	Airports	Media	Fuel supply	Fire-fighting	Buildings	Building services	Health	Food supply	Total dependence
Water supply	•	•	5	3	5	5	3	•	•	•	•	5	•	•	•	5	5	36
Gas and oil supply	5	•	•	•	5	5	3	3	3	•	•	3	5	•	•	5	5	42
Sanitary drainage	5	•	•	5	5	3	3	•	•	•	•	5	•	•	•	5	5	36
Storm drainage	5	•	5	•	3	•	3	•	•	•	•	3	•	•	•	1	1	21
Electricity supply	5	•	•	•	•	5	5	5	5	•	3	5	•	•	•	5	5	43
Telecom services	5	•	•	1	5	•	5	•	•	•	•	5	•	•	•	5	5	31
Highways	5	•	•	5	3	3	•	•	•	•	3	3	•	•	•	5	5	32
Railways	5	•	•	3	5	5	5	•	3	•	3	5	•	•	•	5	5	44
Ports	3	•	3	3	3	5	5	5	•	•	•	5	5	5	•	3	3	48
Airports	3	•	3	5	3	5	5	3	•	•	5	5	5	5	5	3	3	58
Media	5	•	•	•	5	5	3	3	•	5	•	5	•	5	5	5	5	51
Fuel supply	5	•	•	•	5	5	5	5	5	•	•	•	•	•	•	5	5	40
Fire-fighting	5	•	•	1	1	3	5	•	3	•	3	5	•	•	3	5	5	39
Buildings	•	•	•	5	5	5	5	•	•	•	•	3	5	•	5	5	5	43
Building services	5	5	5	•	5	•	1	•	•	•	•	3	•	•	•	•	•	24
Health	5	•	5	3	5	5	5	•	•	3	5	5	3	5	5	•	5	59
Food supply	5	5	5	3	5	3	5	5	5	3	3	5	3	5	5	5	•	70
Total importance	71	10	31	37	68	62	66	29	24	11	25	70	26	25	28	67	67	

5 = High; 3 = moderate; 1 = low; • = none.

Table 1.4: *Interdependence of lifelines (Source: Institution of Civil Engineers, 1995:59)*

At this point, it is also important to clarify the main differences between the provision of water in urban and rural areas. First, the quantity of water to be provided in urban areas is much higher; second, urban systems need to supply much wider areas; third, the water quality expectations in urban areas are also higher; and finally as a result of the preceding differences, urban water supplies are much more complex systems, requiring advanced technology, skilled personnel, and continuous maintenance.

Having made brief descriptions of certain concepts in regard to urban water supplies, the impacts of war on urban water supplies can be categorized into two main groups as direct and indirect effects. This section will first concentrate on direct impacts such as damaged caused by intentional and targeted bombing, and the withholding and poisoning of water

resources. This will be followed by the indirect impacts like the disruption of operation and maintenance due to lack of power, spare parts and personnel.

Water has been used as a means of war throughout history. Its indispensable nature for life and the survival of mankind creates the environment in which water is used for offensive and defensive military purposes (Baechler,1995; Zemmali, 1994; ICRC, 1996). The use of water as a weapon of war tends to be in terms of either excess of water or shortage of water. For example, the Egyptians and the Babylonians used the waters of the Nile, the Euphrates and the Tigris for both offensive and defensive purposes by constructing water barriers. In fact, "...the mud walls of Babylon crumbled when the city was flooded by the Assyrian ruler Sennacherib (705 - 681 BC)".[24] It is stated that the Chinese "...constructed defensive dykes which could be quickly breached to submerge the aggressor..." in the fifth century BC (Zemmali, 1994:73).[25]

The other way of using water as a war weapon has been the destruction of water installations. The cessation of water supplies was frequently applied in battles throughout the ages. For example, Nebuchadnezzar took over the city of Tyre in 596 BC after a long siege by breaching the aqueduct which supplied the city. The British air force deliberately bombed the dams supplying water to the Ruhr during the World War II to damage German industry (Zemmali, 1994). In a Vietnamese example, dams and dykes were deliberately damaged, and it is stated that: "...the Democratic Republic of Vietnam recalled that 661 sections of dyke had been either damaged or destroyed during the course of the war".[26] It is also claimed that the traditional irrigation system of Afghanistan was destroyed during the early days of conflict following the Soviet invasion, and also that the Allies deliberately targeted the water installations of Iraq during the Gulf War (Zemmali, 1994).

The contamination of water also has a long history of being used in armed conflicts to bring an enemy to his knees. Aeneas, the ruler of Troy, even issued instructions on "...how to

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24 Jacques Sironneau, "L'eau ressource stratégique", in Géopolitique, No. 43, Autumn 1993, p. 48.

25 J. Sironneau, op. Cit., p. 47.

26 CDDH, Official Records, Vol. XIV, p. 161, and Commentary on the Additional Protocols, para. 2144, p. 667.

make watering places unusable" to kill the enemy and destroy his means of livelihood.[27] The trend of using water as a war tool still continues in modern day conflicts. Conti, head of the ICRC's water and sanitation unit, explains that (ICRC, 1996):

> "In volatile situations where factions are struggling for control, a water supply system, such as that in Mogadishu, is a prime target. Gaining control of the water supply means political and military power".

Zlatko Sahadzic, UNICEF assistance programme officer in Sarajevo clearly points out that (Stoullig, 1995):

> "Since the start of the war in May 1992, water has been used as a weapon of war".

According to Baechler (1995), the water supplies in Former Yugoslavia were disrupted by mainly three ways:

- **The destruction of water supply facilities**, which involved the deliberate bombing of pump stations, mains and treatment facilities. For example: "In April 1994, the retreating forces blew up the major water mains in Gorazde, leaving 20,000 people without piped water" (Baechler, 1995). In Sarajevo, 30% of the water pumps were already out of use only a month after the beginning of the conflict (Stoullig, 1995).

- **The deliberate withholding of water supplies** was used as a bargaining counter when they fell into the hands of the adverse party. For example: "During the conflict between the Croatian and the Muslim Forces in Central Bosnia, over 200,000 people were deprived of an adequate water supply, when valves were closed to Vares, Vitez and Zenica" (Baechler, 1995).

- **The disruption of operation and maintenance**. As war disrupts normal life, technicians and engineers cannot carry out necessary operation and maintenance work. Personnel is drafted by the army or access to necessary chemicals like chlorine and aluminium sulphate and spare parts, is extremely difficult under war conditions. For example: "In Sarajevo, losses due to leakages were estimated by a specialized company to about 40% before the war, since then, they have doubled. In Mostar, some 50,000 persons have used untreated water from the river Neretva for half a year,..." (Baechler, 1995).

The above categorization also shows that although water supply services are targeted frequently in current armed conflicts, urban supplies also get affected by war indirectly because of their dependence on power. Modern city water networks often obtain their water from resources available from great distances and deep underground aquifers. For example,

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27 Quoted by J. Sironneau, ibid.

Mexico City draws its water from 180 km, and the new water supply project in Istanbul plans to get water from more than 200 km distance. To enable water to be taken from these resources and supplied to people means that these systems should be supplied with continuous electricity. However, not only water supplies are damaged by direct targeting but also power plants. Water shortages caused by lack of electricity are a common feature of current conflicts: Mostar, Sarajevo, Monrovia and Mogadishu are typical, for example; the direct attacks on Iraqi power plants by the Allies between August and September 1991, brought a complete halt to the operation of water supply systems.

It is stated by Nembrini (1995:36-38) that as consequence of the damage caused on power plants, the volume of output at water stations decreased considerably. Large stations with emergency generators such as Khark, Saba Nissan, Karama and Dora in Baghdad with maximum capacity per day respectively 1,135,000 m^3, 454,000 m^3, 100,000 m^3 and 95,000 m^3, were able to return to production fairly quickly. However, it took much longer for some stations in Qurnah and Basra to return to acceptable production levels. According to an international team which carried out the inspection of 26 stations - 18 drinking water and 8 wastewater treatment in 13 towns in August 1991:

> "...the production of drinking water had returned to levels between 30 and 70 per cent of pre-war capacity, the main problem being a shortage of spare parts. There was also a critical shortage of chlorine for disinfecting water, the reserve stocks running to between a few days and a few weeks".

Nembrini further elaborates water shortages faced by people in smaller size Iraqi towns:

> "These were generally supplied from compact stations with a capacity ranging from 50 to 200 m^3 per hour. In the country as a whole, there were more than 1,000 of these connected to the main electricity grid. Almost all these units stopped operating after the first attacks on the large power stations and it was sometimes several months before they could be started up again".

Baechler's views about the disruption of operation and maintenance activities, are supported by Nembrini (1995) in the case of the war in Rwanda. He summarised the main problems within the major water treatment plants supplying the cities in Rwanda as follow:

> "...personnel was absent, chemicals to carry out treatment were lacking, most of the maintenance tools were looted,...".

This is further elaborated by Fahdruddin Pilardzic, general manager of the Water Supplies Company in Sarajevo, who said that "...one of Sarajevo's main problems is the enormous

number of leaks, due to lack of maintenance and shelling", additionally, the number of his employees decreased from 1,400 before the war to 400 in 1996, 50 of them were killed while 127 were wounded during the war (Stoullig, 1995).

As a result of armed conflicts' direct and indirect impacts on water supplies, war-affected communities go through the burden and hardship of lacking 'adequate' supplies of 'safe' water for their well-being and health. The consequences of direct and indirect damage inflicted on water systems in addition to mass population displacements were pictured by the ICRC (1994) as follow:

> "As a result of war you are thirsty; yesterday you took the water supply for granted, but today it is no longer possible to turn on a tap and drink. The water infrastructure where you live was damaged during the fighting. You have walked for days to escape the violence unleashed in your own country. Terrified and tired, you cannot carry the water necessary to sustain you on this endless journey. Water supplies are frequently compromised in times of conflict. For those who stay and those [who] flee, water is the first priority for survival" (emphasis added).

1.4 Summary and Conclusions

This chapter shows that there is a close woven relationship between water and war, which can be categorized as water as cause of war, and water as a weapon of war.

Humanity faces the difficult challenge of providing 'safe' water in 'adequate' amounts to everybody in the world. While fresh water resources are finite, the demand for water has been increasing rapidly. There are several reasons for the rapid increase in demand such as the fast population growth in developing countries, the growth of irrigated agriculture and industry, and also humanity's raised expectations both for water quantity and quality. Although water is taken for granted when supplies are plentiful, water supplies are inadequate to satisfy even basic needs in many parts of the world. On the other hand, it is hard to claim that humanity safeguards this scarce resource at all. Lakes and rivers in many parts of the world are heavily polluted by untreated municipal and industrial discharges. In addition to the pollution danger on surface water resources, chemicals used as pesticides in agriculture pollute underground water resources. Furthermore, some of world's

unrenewable underground water resources have already been exploited and the rate of exploitation is often much faster than their replenishment period. It can be claimed that the world has already entered the process of a major water crisis, which will definitely have serious setbacks on the socio-economic development of communities in many parts of the world. Unfortunately, it is very likely that the impact of water scarcity will not be only socio-economic development setbacks, but also potential armed conflicts over shared water resource disputes.

However inadequate provision of water is not always the result water scarcity. Economic scarcity often plays a more defining role for inadequate provision of water in many urban areas of the world. Financial investments allocated to meet increasing water demand in urban areas are also often overtaken by the magnitude of rapid urbanisation. Urban water systems usually do not catch up with fast expanding city peripheries. On the other hand, the problem is not also only rapid urbanisation but also the lack of organizational and institutional structures such as a working order of operation and maintenance. Financial sustainability of water systems tends to be jeopardized by the lack of adequate metering and charging for water. Furthermore, heavy subsidises provided by governments in an attempt to supply consumers with cheap water result in serious inequalities at the expense of the poor. This is why water development and management should have an holistic approach, considering the water provision challenge not only through its technical perspective but also social, economic and organizational.

The scope and magnitude of these challenges are further exacerbated by the impacts of armed conflicts. Water is often used as a weapon of war because it is vital to the continuation of life. Vulnerability of urban water supplies due to their complexity is often manipulated by warring parties in armed conflicts. They are directly targeted by mainly two ways: first, water system components such as pipelines and treatment facilities get destroyed by bombing and artillery; and secondly, water sources are cut off when they are in the hands of opposing side, and made unusable by poisoning. The intrastate character of many protracted political emergencies of today exacerbates this vulnerability even further as warring ethnic or political groups often wish to inflict harm on the other side in a more advanced way and without considering its long-term consequences.

Armed conflicts have also great indirect negative impacts on urban water systems. The interdependence on electricity and fuel for their operation makes them very vulnerable to war conditions. When water systems escape bombing, the damage inflicted on power stations can also mean a halt to running water in pipelines. If there is no power, then there is no water unless it is a gravity-fed system.

The other indirect effect of war on urban water systems is the lack of personnel, materials, equipment and chemicals for their operation and maintenance. War conditions make transportation very difficult and dangerous. Consequently without these essential items, water cannot be treated, leaks cannot be stopped and broken components cannot be replaced. Even if they are obtained through great efforts, the lack of personnel can still pose a great challenge for the improvement of supplies. Water board staff can be under conscription, they might be ethnically cleansed and displaced, injured or dead.

Water shortages caused by these direct and indirect impacts of war on water supplies are required to be alleviated immediately because of the water's importance for survival. In the light of the preceding examples, it can be claimed that water shortages are already commonly experienced in many parts of the world in even peace times. On the other hand, working under war conditions to improve water quantity and quality have their own framework whose borderlines are defined by dilemmas imposed by war. These dilemmas experienced during interventions taken by the international community and local agencies can be categorized as:

- Strategic and political
- Operational and technical
- Moral and personnel

The dilemmas pointed out above would have different types of effects on interventions taken during the immediate, short and long-term post-war recovery stages. For example; while strategic and political dilemmas play a very important role for the interventions during or just immediately after the war, moral and personnel dilemmas would replace them in the long term. The assistance to be provided in emergencies entirely depends on the political relationship between the international community and the country where the armed conflict is taking place. The strategic position of a war-affected area also plays an important role both for the willingness of the international community to take actions to alleviate sufferings

caused by water shortages and also in terms of accessibility to the area, especially when a quick response is essential. Later in the progression from relief to reconstruction, the operational and technical, and moral and personal dilemmas would become more important for the successful continuation of water supply interventions. The Table 1.5 shows this inter-relationship between post-war recovery stages and the type of dilemmas experienced during water supply interventions in war-affected areas. The circles from very big to small show how likely it might be to experience certain types of dilemmas during the particular stage of post-war recovery. However it should be pointed out that this analytical approach brings certain questions into the equation. First of all, it is constructed on the assumption that it is possible to divide the post-war recovery into stages as immediate, short and long-term. Secondly, it does not acknowledge that the dilemmas to be experienced can be very different from one situation to another. On the other hand, this analytical approach is only proposed to investigate the current praxis of post-war water supply interventions.

Post-war Recovery Stages	Type of Dilemmas		
	moral & personnel	operational & technical	strategic & political
Immediate term	•	●	●
Short term	●	●	●
Long term	●	●	•

Table 1.5: *The relationship between post-war recovery stages and type of dilemmas (Source: Author)*

However before looking at the current praxis, there is a need to identify the aims of water supply interventions. It can be claimed that these interventions to be satisfactorily implemented have three main aims which are:

- To alleviate suffering caused by inadequate and unsafe water supplies.
- To consolidate the establishment of peace in war-affected areas.
- To ensure a sustainable development.

The Table 1.6 shows goals and objectives for water supply improvement in war-affected urban areas.

	STAGES		
	Immediate Objectives - STAGE I: To alleviate suffering caused by inadequate and unsafe water supplies	**Further goals - STAGE II:** To consolidate the establishment of peace in war-affected areas.	**Further goals- STAGE III:** To ensure a sustainable development
OBJECTIVES	To improve the quality, quantity, availability and reliability of the supply	To have positive impacts on the peace building process	To operate and maintain water supplies in a sustainable way.
MAIN AREAS OF CONCERN	FUNCTIONAL Health Technology Environment	SOCIAL ECONOMIC POLITICAL	OPERATION MAINTENANCE SUSTAINABILITY

Table 1.6: *Goals and objectives for water supply improvement in war-affected urban areas (Souce: Adapted from Intermediate Technology Development Group, 1978:1110)*

The next chapter therefore will first of all investigate the provision of water in a progression from relief to reconstruction, which at the same time will test the assumption of dividing the post-war recovery process into stages in the framework of urban water supplies. This will be followed by the relationship between peace building efforts and post-war recovery of water supplies. Finally, the concept of sustainability will be investigated in the last part of the next chapter.

Chapter 2 : Context of Post-war Recovery Phases of Urban Water Supplies and Sustainable Development

2.1 Introduction

After looking at the interaction between water and war in Chapter One, this chapter is to scrutinize the relationship between the post-war recovery phases of urban water supplies and sustainable development. Both sides of this relationship include concepts that are frequently seen in disaster and development related literature, but often misused and changed in meaning according to author's or interest group's point of view. However, the chapter will attempt to clarify these concepts in regard to this research's aim and scope.

The general concept of post-war recovery phases will first be investigated to ascertain whether it would be relevant to assume that there is really a framework of phases such as relief, rehabilitation and reconstruction, which follow one to another in war-affected areas. This investigation will be carried out by bearing in mind that the real emphasis of this research is on urban water supplies.

Following this, the objectives therefore in this chapter are, first to investigate the conventional phases of post-war recovery in terms of their application on urban water supplies. Second, to question the concept of sustainable development through a post-war recovery framework. This chapter will achieve this by using the three main aims of urban water supply interventions identified in the previous chapter. The first aim which is to provide 'adequate' amounts of 'safe' water to war-affected people will be explained in the concept of a 'progression from relief to reconstruction'. This will also clarify the understanding of post-war recovery phases for urban water supplies.

This will be followed by the investigation of second general aim which is to enable the establishment of peace by improving water supplies in war-affected areas. Peace building issues such as social, economic, physical and political reconstruction will be explained to see their interrelationship with the post-war recovery of urban water supplies. This section will attempt to clarify whether interventions to be taken to improve water supplies can be used to support the establishment of peace.

The last section of this chapter will look at the concept of sustainable development through two main perspectives. First, sustainability will be discussed in terms of socio-economic development of a war-affected community, then it will be explained in terms of urban water supplies and their long-term operation and maintenance. Although the sustainable development of war-affected communities depends on so many other factors, the clarification of the sustainable urban development concept and its relation to water will show that sustainable post-war urban water supplies can be an essential component of long-term sustainability process.

2.2 Post-war Recovery Phases of Urban Water Supplies

Literature related to natural disasters tends to categorize three main phases for the aftermath of a hazard: relief, rehabilitation and reconstruction. This categorization is based on activities carried out in a sequence of time-frames to alleviate sufferings caused by the disaster. For example, the relief period is identified by UNDRO (1982) as a phase where "... exceptional measures have to be taken to search and find the survivors as well as meet their basic needs for shelter, water, food and medical care" emphasizing the need for quick response for meeting survivors' basic needs "... immediately following the occurrence of a sudden disaster". Therefore, the relief period is immediately after a disaster and the activities carried out are concentrated on rescue of survivors and the provision of basic needs such as water, food and shelter.

While the relief period is given a time frame such as "immediately after", the time frame for the rehabilitation period seems to be overlapping short and long-term recovery processes. Operations during rehabilitation are taken "...with a view to restoring a stricken community

to its former living conditions, while encouraging and facilitating the necessary adjustments to the changes caused by the disaster". The same UNDRO publication states that rehabilitation " ...may be considered as a transitional phase between (i) immediate relief and (ii) more major, long-term reconstruction and the pursuit of ongoing development".

While the relief and rehabilitation periods are identified as phases which are closely interactive with each other in terms of activities, the definitions of the reconstruction period proposes a final aim (UNDRO, 1982):

> "Reconstruction is the actions taken to reestablish a community after a period of rehabilitation subsequent to a disaster. Actions would include construction of permanent housing, full restoration of all services, and complete resumption of the pre-disaster state".

However, UNDRO in the same publication, brings a different framework for rehabilitation and reconstruction which contradicts this description. It is urged that these phases of post-war recovery should not simply be aimed for returning to pre-disaster conditions. Implementations to be carried out should be integrated into the future development strategies "...to reconstitute services and renovate or replace essential structures such that vulnerability is reduced". This is further elaborated by stating that "Assistance to rehabilitation and reconstruction must therefore be planned on the basis of a thorough assessment and appraisal of the technical and social issues involved". Supporting this view, Sirleaf (1993:303) claims that:

> "...rehabilitation and reconstruction traditionally has referred to the process of returning disaster-affected populations and development assets to the *status quo*. This approach, however, will merely replicate the vulnerability that caused the disaster in the first place".

It has already been noted that the categorization of these phases is made for natural disasters, and therefore it should be questioned whether it is possible to imply the same categorization for the aftermath of war which is also considered as a man-made disaster. The concept of war as a man-made disaster has been addressed in great details by a number of researchers during the last few decades (Cuny, 1983; Davis, 1986; Zargar, 1988; Anderson and Woodrow, 1989; Carter, 1991; UNDRO, 1992; Barakat, 1993; Davis & Lambert, 1995). Consequently, the differences and similarities between natural and man-made disasters have already been identified. For example, the scope of war, the speed of

attack or onset, the duration of war, and methods of destruction are only few characteristics identified by Barakat to distinguish war phenomena from disasters. It is also pointed out that (Barakat, 1993:11-14):

> "...it is important not to mix and confuse disasters with war because: (1) war is distinguished from virtually all other disasters (**natural and man-made**) by the deliberate and conscious attempt by the warring parties to inflict harm, suffering and damage...(2) war in general and civil strife in particular are characterised by social and political conflicts, a phenomenon that is not readily found in disaster situations".

Barakat concludes that:

> "Unlike natural disasters war is initiated by man, and no matter how idealistic this might sound, there should always be a hope to eliminate the cause of war. In our view, war cannot be compared to earthquake and other natural phenomena, as being the source of hazard that might trigger a disaster; war by itself is a long-term disaster that is usually triggered by a political question; assassination, kidnapping, military border operations or even just the threat of political interests (these are all types of hazards)".

Therefore, as far as this research is concerned, war is considered as a long-term disaster with a political dimension.

The previous chapter identified some characteristics for intrastate armed conflicts such as the existence of multiple tensions, long duration, lack of a clear resolution, high civilian involvement, brutal violence and causing mass population movements. These characteristics show major differences from the characteristics of natural disasters. For example once an earthquake strikes, which usually lasts in terms of seconds, then the recovery process can start immediately. However this would not be the case in the event of a protracted political emergency where an armed conflict can easily go on for a couple decades. Consequently, to identify when relief ends and rehabilitation starts, and when the reconstruction period can follow could be very difficult.

2.1.1 Progression from Relief to Reconstruction

The United Nations General Assembly adopted the resolution 46/182 in December 1991,

which led to the establishment of the Department of Humanitarian Affairs (DHA).[1] The resolution emphasizes the importance not only of addressing the root causes of disasters, but also of ensuring a sustainable continuum from relief to development (Slim and Penrose, 1994). It is stated that (Eliasson, 1993):

> "The provision of humanitarian relief in isolation is, in a way, like putting a Band-Aid over an infected wound. This is in the interest neither of the recipients nor of the donor community".

Sirleaf (1993:307) also emphasizes the importance of a continuum from relief to development by claiming that this concept is "...more than an empty piece of development jargon". He continues to support his view :

> "Development is so clearly affected by disasters and has such a key role to play in reducing vulnerability that the full and systematic commitment of the development establishment is required. In the areas of disaster preparedness and disaster management, development institutions have such an essential supportive role that effective systems will be severely compromised by their absence. In the areas of vulnerability reduction and rehabilitation and reconstruction leading to resumed development, there is no alternative to the development of community but accepting its leadership role".

It should also be noted that the assumption of an existing ongoing development before the disaster is even further insisted on by UNDP emphasizing that: "Reconstruction must be fully integrated into ongoing long-term development plans" (UNDRO, 1992:13-89). The principle recommended by Blaikie, et al., (1994) for disaster recovery also points out the need for maximizing the transition from relief to development. However, this principle is based on an assumption that there had been a development process before the disaster and that returning to this process can be possible. This assumption might prove to be false as there is a decline of developmental progress in many parts of Africa and Latin America.

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1 The framework of the DHA's responsibilities includes "...information gathering; early warning and preparedness; prompt and effective response; resource mobilisation; the management of the relief-development transition; training and capacity building; and accountability". Although this framework emphasized the important and indispensable components of disaster recovery as mentioned above, the DHA has not achieved all of its objectives. The first reason for this failure is "...inappropriate personnel and the lack of an emergency cadre of humanitarian professionals"; secondly, the lack of donor support as donors committed only half of the $6 billion, which they were asked to contribute; and finally, the DHA was also slow in taking "...firmer and swifter measures to determine its role and identity by building on the full range of functions covered by resolution 46/182". The resolution stresses the necessity of having full respect for the sovereignty, and national unity of states in the event of UN humanitarian assistance. On the other hand, the responsibility of states is stressed as taking care of the victims of emergencies occurring on their territory, and the necessity of access to those, who are in need of humanitarian assistance (Slim & Penrose, 1994).

There is no doubt about the importance of integrating the reconstruction operations into "ongoing long-term development plans", if only they had ever existed. For example, 29 developing countries were poorer in 1995 than they were in the 1960s. Therefore it is not definitely feasible to rely on the assumption that development is a linear, continuous, process and that in the event of a disaster, this continuum gets interrupted but the process can be regained by following the post-disaster recovery.

On the other hand, Duffield (1994:2-3) claims that the concept of a continuum from relief to reconstruction "rings hollow". According to his view, donor countries and relief agencies tend to consider development as:

> "...a linear or normative process of becoming: a series of interconnecting movements leading from poverty and vulnerability to security and well-being. This process is regarded as the normal and long-term direction of social change. Relief, in contrast, belongs to the realm of the temporary and abnormal. Emergency situations are associated with external or short-term shocks to a system whose normal or inner inclination is development".

In this argument it is explained that the basic idea behind a continuum from relief to reconstruction is the need for an interactive system realizing the best benefits from the relief period and incorporating these into later rehabilitation programmes. However, what Duffield claims is that:

> "...the complex emergencies that have arisen in Africa and the Balkans, for example, have done so because of the failure of development".

This view is supported by Adams and Bradbury (1994:27) claiming that armed conflicts should not be considered in isolation from the concept of development as their consequences are poverty, social trauma, and environmental damage for war-affected people. However, it is argued that the international community's conception of armed conflict remains that it is an exceptional event interrupting socio-economic development. The best example for this misconception is the drastic shift from international developmental aid to relief assistance. It is stated that:

> "Short term relief assistance, it is argued, is becoming institutionalised as the main response of the international community to situations of armed conflict".

The main concept behind this argument, elaborated by Adams and Bradbury, is that to see aid as neutral would only be an illusion because: "In a war, any intervention can potentially

affect, positively or negatively, the dynamic of conflict". Bosnia and Rwanda are given as examples where humanitarian aid was used as an excuse for the inability of donors to find a political solution to these problems. In contrast, what is sought in this section is not the understanding of humanitarian aid in forms of relief and development used by international donors in their conflict interventions, but whether it is feasible to talk about a progression from relief to development in the framework of post-war recovery.

It is clear that there are two main arguments about the concept of progression from relief to reconstruction. The first argument claims that there is continuum from relief to reconstruction which can even lead to development, while the second argument completely rejects this idea. Although this research also supports the latter argument, it should be pointed out that interventions taken to improve water supplies from short to long term should be planned and implemented in a progression to avoid duplications, expensive mistakes, and the possibility of endangering their sustainability. Therefore Boutros-Ghali's (1995:21) explanation of the interaction between relief and development can help to clarify the concept of progression from relief to reconstruction in the context of this thesis.

> "Although development activities yield their best results in conditions of peace, they should start prior to the end of hostilities. Emergency relief and development should not be regarded as alternatives; one provides a starting point and foundation for the other. Relief requirements must be met in a way which, from the outset, provides a foundation for lasting development".

Boutros-Ghali's views on a progression from relief to reconstruction conflicts with UNDRO's time framework for post-war recovery activities. UNDRO (1982) points out the possibility of not being able to carry out reconstruction works under conflict conditions, recommending the need to wait until the peace allows them. However, experience in Rwanda , Yemen, Cambodia and parts of Former Yugoslavia has shown that the activities carried out by agencies to improve urban water supplies can start well before peace is established.

Barakat and Hoffman (1995) also give a matrix of needs and capabilities which show that the relief period is designated until the cease-fire, while rehabilitation takes place between cease-fire and peace; and consequently reconstruction after the peace. This view is supported by Oxfam (Eade and Williams, 1995:826-836) stating that:

> "... the conventional division of programmes into the categories of relief, rehabilitation or development is not only unhelpful - and more importantly - does not reflect the reality on the ground, where roles traditionally associated with development are possible in relief situations, and vice-versa. From Bosnia to El Salvador or Somalia, Oxfam has supported many initiatives where local and international NGOs have undertaken innovative and creative reconstruction and development work even before peace has been achieved".

It is explained that dividing phases of post-war recovery is even more difficult when political emergencies extend over a long period of time. Finally, it is concluded that:

> "Rehabilitation and reconstruction are areas where relief and development become inseparable from each other".

When the experience of post-war recovery of urban water supplies is scrutinized, it can be seen that it is rather difficult to find a distinct division between relief, rehabilitation and reconstruction. It is not really possible to talk about clear divisions among activities carried out during conventional post-war recovery phases in regard to urban water supplies. The Jahorina-Brus Gravity Line case study example in Sarajevo given by Conti at the Water under Fire Workshop, and the author's observations in the Tuzla Region of Bosnia Herzegovina which will be examined in a case study as part of this research, showed that interventions taken even during the emergency period can have long-term impacts on the future of supplies. Therefore, it is usually necessary to include any temporary arrangements established as a part of the emergency response into the reconstruction process.

2.2.2 Preventive Measures vs Emergency Measures

Sarajevo was supplied with water, mainly from the Bacevo well field, at a rate of more than 1,000 litres per second before the war. The other water supply was the Jahorina - Brus gravity line, which was built during the early 20th century, and includes three spring catchments - Bistrica, Praca and Stansko. The vertical layout of the Jahorina Gravity Line is shown in Figure 2.1.

Although the productivity of the line was considerably reduced because of losses at different locations, it has become a very feasible option to supply water to around 30,000

people on both sides of the Dayton Line.[2] There were two main advantages for this: first, the gravity line's independence from any fuel supply or electricity power. During the war, the power supplies suffered direct damage resulting in irregular electricity supplies. Second, the Bacevo well field was located in the area which was no man's land between the Muslims and the Serbs.

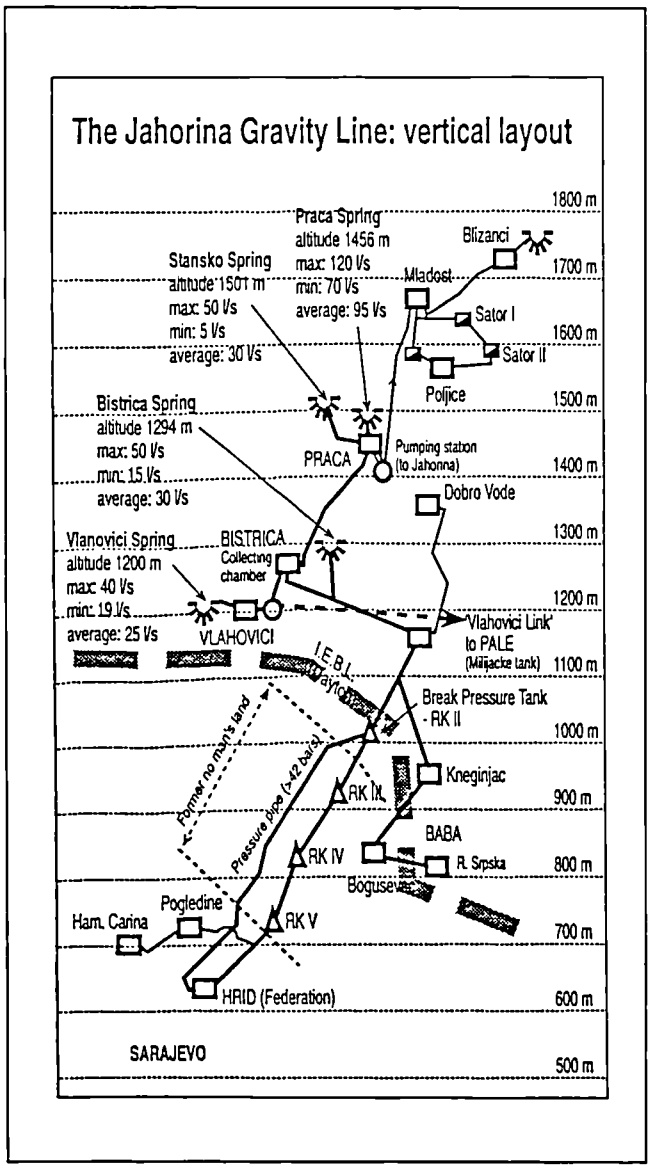

Figure 2.1: *The vertical layout of Jahorina Gravity Line (Source: Conti, 1997:24)*

After carrying out some emergency repairs to increase the flow of water from 30 litre/second to 60 litre/second during the war, the ICRC carried out a feasibility study with the Pale Water Board in mid 1996. According to the results of this survey, the reconstruction work included two phases. The first phase, which was implemented in the second half of 1996 with a cost of US$ 1,000,000, included various construction and replacement work shown in Table 2.1. The second phase of this project will be carried out after more detailed study is done in 1997.

This research believes that the designation of post-war recovery phases according to the framework of conflict and peace may not always be accurate, especially regarding post-war recovery of urban water supplies. There will be examples given in following sections showing that reconstruction of water supplies can start much earlier than the

2 The flow measured just after the Praca collection chamber was 170 litre/second but it was reduced to 43 litre/second just after the Bistrica collecting chamber (Conti,1997).

signing of peace agreements and, in fact, the unifying character of water supplies can be used as a tool to help consolidate the possibility of establishing peace between warring parties. To wait until the peace agreement is signed can be too long for war-affected people since the armed conflicts in some countries have been continuing for more than a decade.

First Phase
* replacement of air valves (single and double stages DN 50 PN 10/16), mud valves, section valves, repair of washouts; *construction of anchor blocks; *repair of main leaks with new joints; *construction of a new river crossing at KM 10.187; *reinforcement of sliding areas; *repair of leaking house connections (connected directly to main line); *rebuild original hydraulic gradient at KM 9.300 by rehabilitating and reconnecting the old pressure chamber (reducing maximum pressure from 17 down to 10 bars).
Second Phase
*stabilisation of further potential sliding areas (due to deforestation) *installation of pressure reducing systems and small reservoirs for numerous house connections connected directly to main line; *leakage repair on main line at Brus-Hrid-Sarajevo and Brus-Baba reservoir, including main leaks on secondary network; *eventual further measures to correct hydraulic gradient (prevention of exhaustive pressure or vacuum).

Table 2.1: *Main interventions on Jahorina gravity line (Source: Conti, et al., 1997:26)*

There can be short term solutions such as water tankering and digging wells within special circumstances. On the other hand, there can be repairs and replacements at distribution systems and pipelines, or at power plants and lines, or at water intakes and treatment facilities, but what is common to them is that they are all transitional activities. Hence a different approach is essential in the case of urban water supplies since any adjustments to be done in the emergency period would have its long-term effects.

Evolution of the relations between needs and services with time illustrated in Figure 2.2 shows the importance of the time factor for the implementation of different programmes to provide water in war-affected urban areas.[3]

3 This relation is also structured on the assumption that there was a balance between needs and services before the war. However the shortage of water is a 'normal' fact for millions of urban dwellers in the world. In a conflict situation these inadequacies are exacerbated by the influx of refugees and displaced persons.

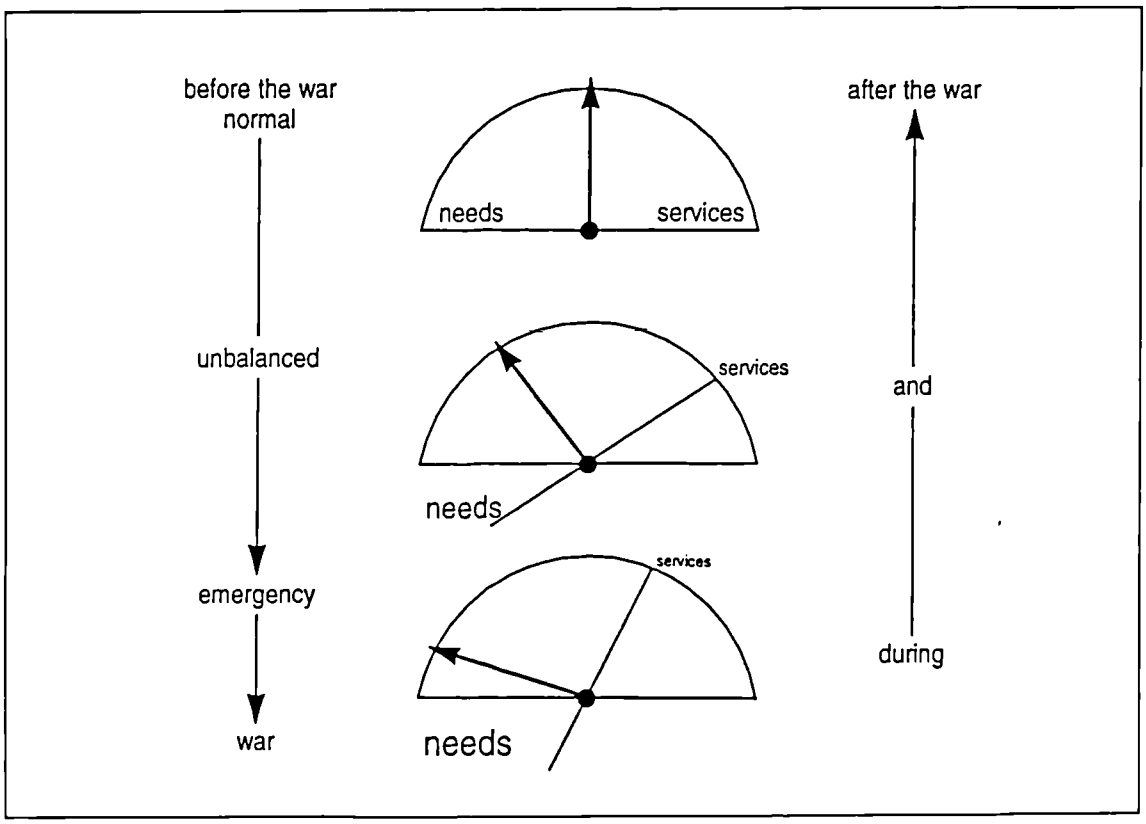

Figure 2.2: *Evolution of the relations between needs and services with time (Source: Nembrini, 1997:18)*

In these kinds of emergencies, the distribution of water by tankers is a popular option for donors, because they are so likely to catch media attention. There can be circumstances in which water tankering would be the only feasible solution, for a certain period of time to satisfy urgent water needs. However it is important to see the situation from a different perspective as explained by Nembrini (1997:18):

> "...in unbalanced situations it may be more efficient to support the services and to build on their still organized structures. Tools, instruments, spare parts, funds may be the appropriate assistance and the role of the organization's engineers is only to assess properly their needs, to define priorities and, last but not least, to monitor the impact of activities carried out by the assisted services on the affected population. This may help to avoid a further degradation of the situation and such programmes can be defined as preventative ones".

The relationship between preventive intervention and post-war recovery phases is shown in Figure 2.3.[4]

4 From Riccardo Conti's presentation on "Emergency repair and reconstruction of the Jahorina - Brus gravity line supplying Sarajevo from 1994 to 1996" at the Water under Fire Workshop on 21-22 November 1996.

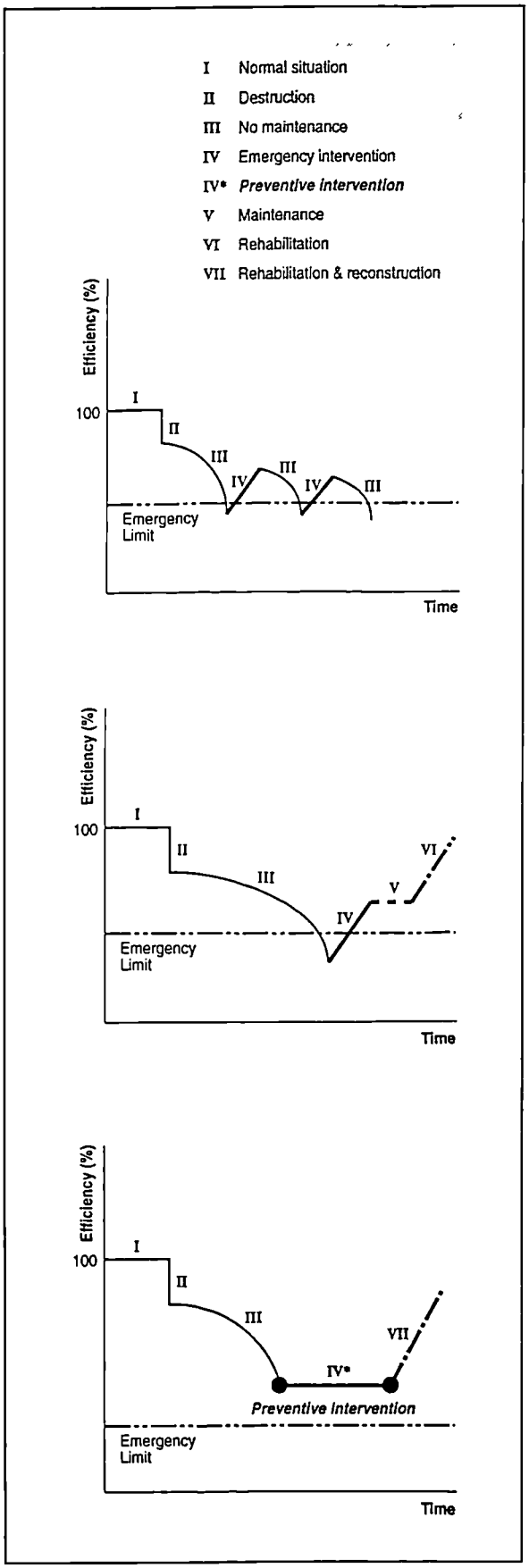

Figure 2.3: *The relationship between preventive interventions and post-war recovery phases (Source: Conti, 1996)*

It may be summarized by saying that the phases for post-disaster recovery would not be really relevant to describe post-war recovery because of the different characteristics of armed conflicts from natural disasters. Instead of applying a framework of phases identified on a time scale such as relief, rehabilitation and reconstruction periods, the type of activities carried out should be the main focus point. In other words, the post-war recovery phases should be identified according to the type of activities. If they aim to relieve life threatening human suffering, then they can be identified as relief period activities; but if they aim at assisting the socio-economic development of a community, then they should be considered as reconstruction period activities. However, if we attempt to identify the post-war recovery phases of urban water supplies, their complexity brings a challenging dimension into this argument. No matter how basic the type of activities to be carried out on water systems, they would have serious implications on the supplies' long-term operation. Experience shows that any intervention to be taken to improve the operation of a water system would have long-term impacts. Therefore preventive measures such as maintenance works can prevent the situation from deteriorating to

such a level that more complex and expensive emergency measures become essential.

The analysis of post-war recovery phases of urban water supplies show that there are two main periods which can be categorized as emergency and reconstruction. It is possible that water utilities can be prepared for emergencies by identifying possible effects of the armed conflict on the water system. However this can be done only hypothetically, because some of these impacts would be inflicted deliberately, and therefore it would be very difficult to estimate the damage caused by them. On the other hand, this concept of emergency planning at least identifies the major issues of emergency water in urban areas.

Having done the analysis of vulnerabilities for each component to war, the population's possible water requirements, both in terms of quantity and quality, should be estimated by bearing in mind that there can be high level of population movements as a result of the war. Comparing the remaining system capability and the population's needs by incorporating specific priorities and available resources, would make it possible to set out what the specific tasks are to satisfy emergency water needs (AWWA, 1984). It is questionable how far emergency planning like this can work in a war-affected area, but it identifies several important issues for post-war water provision. They can be categorized as:

- Vulnerabilities of water supply components to armed conflicts.
- Changing water needs as a result of war.
- Priorities for water use in emergencies.
- Availability of water resources.
- Financial constraints.
- Availability of personnel, equipment and materials under conflict conditions.

The vulnerabilities of water supply components will be explained here, and the general concept of vulnerability will be investigated in more details later in this chapter. The other issues identified will be looked at in the following chapters. The Table 2.2 shows the probable effects of an armed conflict on each component of an urban water supply. This is only to give an example of vulnerability analysis for water supplies, otherwise it should be pointed out that both the effects and components would be varied according to the armed conflict and the water supply itself.

The degree of likeliness for probable effects of war, which is categorized as none, partial and total, is inserted as low, medium and high in this table on an assumption that there can

be water source withholding, poisoning at the source, and bombing at the following components. Probable conflict conditions were considered for personnel, and materials and supplies elements. As it was already pointed out, these are only hypothetical estimates.

COMPONENT	EFFECTS OF WAR				CORRECTIVE MEASURES
	None	Partial	Total	TYPE & EXTENT	
Source	*	**	***		
Collection works	*	**	***		
Transmission system	**	**	*		
Treatment facilities	*	***	***		
Distribution system	**	*	*		
Personnel	*	***	***		
Power	*	***	**		
Materials & supplies	*	**	***		
Communications	*	***	**		

Table 2.2: *The probable effects of war on each component of an urban water supply (Source: Adapted from AWWA, 1984:29)*
*The degree of likeliness: * Low, ** Medium, *** High*

The preceding analysis shows that it is very difficult to estimate possible water supply problems to be encountered in a conflict situation. There are so many external factors that make an analytical approach for emergency planning a very difficult task. There is no doubt that preparedness plans would make the challenge of water provision in an urban area affected by an armed conflict much easier. However, many of the decisions need to be made according to changing aspects of the situation. In other words, responding to conflict to alleviate suffering caused by water shortages requires a proper situation analysis and also flexibility. In addition to the damage assessment, the present water needs should also be determined and available capacity should be allocated according to priorities such as minimum amount of safe water for survival, hospitals, feeding centres, fire fighting, etc. Once these remaining water system capacities and the population's needs are identified, then the activities to improve water quality and quantity should be done by using all possible resources such as water sources, manpower, and materials.

2.3 Peace Building and Post-war Recovery of Urban Water Supplies

The concept of 'post-war recovery' does not, or at least should not, only embrace the physical rebuilding of war-affected communities, but also its social, political and cultural aspects. This is especially significant for contemporary conflicts as their nature and magnitude have changed quite drastically in recent years. The increasing number of intrastate conflicts which tend to be the result of political exploitation of ethnic, religious and cultural differences in addition to other root causes such as poverty, social inequalities and lack of access to socio-economic and political mechanisms, have created a new set of challenges for peace-building.

Peace building is a long-term task whose success entirely depends on a holistic and integrated implementation of various post-war recovery programmes from deployment, demilitarization and mine clearance to political, economic and social reconstruction. All of these post-conflict activities have their own significance for the establishment of peace which can only be sustained by addressing the root causes which led to the conflict. On the other hand, the concept of post-war recovery poses more complex challenges in countries emerging from multi-ethnic and religious intrastate conflicts, since these conflicts do not only destroy buildings, water supplies, bridges, hospitals and schools but also the very social fabric of a society. Afghanistan, Bosnia, and Rwanda are only a few examples where civil-conflicts have left behind communities divided according to their social, cultural, ethnic and religious origins. Fischer (1995:66) points out that:

> "Following sub-national conflicts involving disputes amongst ethnic groups, any new Government must adopt non-partisan policies to set the conditions for the unification of a divided population and to ensure broad-based participation in the development process".

On the other hand, to ensure willing participation of all ethnic groups in this reconciliation process can be a difficult task as civil conflicts exploit the existing differences to such a level that the tension between divided communities may remain for a long time. Therefore to investigate the relationship between peace building and post-war recovery of urban water supplies, this section will first need to look at the concept of 'vulnerabilities' such as socio-economic, ethnic, cultural and political differences, as they play such a decisive role for the triggering of armed conflicts.

To explain this, it is required to look at the general causes of war. The causes of armed conflicts range from local socio-economic inequalities to power struggles in international political and military structures. In an attempt to classify types of internal conflicts, Adams and Bradbury (1994:8) divide conflicts into five main headings which are: Ideological, Governance and Authority, Racial, Environmental, and Identity.[5] However they point out one commonality among these conflicts which is "...war is an organised act (usually) of men and therefore it can be modified by political and economic interventions". This is an argument which considers armed conflicts as "...struggles over power and rights to 'ways of life'.

Harper (1995:6-11) for example, gives 'human greed', 'political dogma', 'religious fundamentalism' and 'access to resources' as some of the broad causes of armed conflicts bringing 'vulnerability' phenomena into this discussion. For example, according to the analytic vulnerability and capacity framework designed by Anderson and Woodrow (1989:13-15), socio-economic and cultural vulnerabilities of a community can make a conflict to be triggered more easily. They claimed that:

> "Social and organisational vulnerability are obvious when there is prejudice, or conflict within a society. Divisions according to race, religion, ethnicity, language, class or caste can weaken the social fabric to such an extent that people are more vulnerable to crisis".

Besides, it was concluded that:

> "The most obvious and devastating disaster resulting from social vulnerability is war when conflict becomes overt".

2.3.1 Vulnerability Analysis

According to Davis' pressure and release model (1978), a disaster occurs when its two main components - hazard and vulnerability coincide in time and place. Without vulnerabilities such as unsafe environment, fragile socio-economic structures, or lack of disaster preparedness, hazards would remain only as natural phenomena. For example, when a volcano erupts in an uninhabited place, this is only a natural hazard without causing a disaster; or when settlements in Japan are affected by earthquakes frequently, they do not

5 Source: Rupesinghe, K. 1992, Internal Conflict and Governance

usually experience major disasters because of the preparedness and mitigation measures (Ellis,1996).

The concept of pressure and release for disasters was later improved by showing the progression of vulnerability from root causes to unsafe conditions. Although the main concept of a hazard triggering a disaster only in a vulnerable environment remained the same, this model connected the disaster to "...processes that are sometimes quite remote and lie in the economic and political sphere" which are called 'root causes'.

Figure 2.4 illustrates this pressure and release model, which identifies 'dynamic pressures' such as rapid population growth, rapid urbanization, foreign debt, war, and environmental degradation as a channel between root causes and unsafe conditions (Blaikie, et al., 1994:23-25).

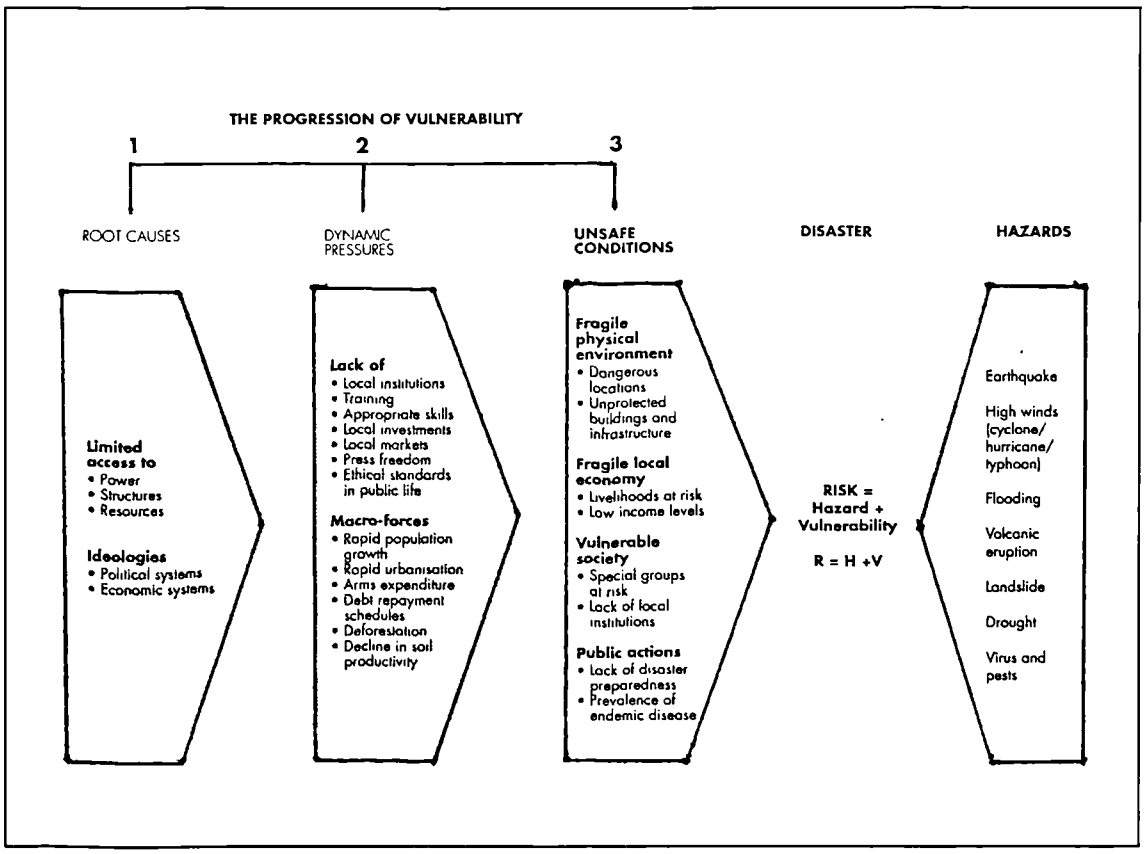

***Figure 2.4:** Pressure and release model (Source: Blaikie, et al., 1994:23)*

Vulnerability is described as a "...combination of characteristics of a person or a group, expressed in relation to hazard exposure which derives from the social and economic

condition of the individual, family, or community concerned".[6] This description defines a link between how much a community is affected by disasters and the degree of its social and economic development.[7] However, before this interaction, an important point should be pointed out in regard to the dynamics of a community. One of the main characteristics of a community is that it includes various dynamics such as ethnicity, class, gender, or age. Consequently, these different dynamics of a community are affected by disasters in different ways. The poor, women, the elderly and children are bound to be more vulnerable than others to suffering, loss and damage caused by natural and man-made disasters (Blaikie, et al., 1994:6-9).

For example, although wars are often fought by men they tend to put much more stress on women. According to UNHCR, 85 per cent of 20 million refugees in 1991 were women and children, and according to El-Bushra and Piza-Lopez (1993:6-7) it is a reality that:

> "Women refugees are particularly vulnerable to rape and sexual harassment as social control breaks down, in addition to the problems they face of resource loss, cultural dislocation, and psychological trauma".

As a consequence of these population displacements, while women are "...carers and providers" and responsible for "...maintaining the social fabric and managing food deficits", they are denied access to the necessary support mechanisms and production tools. It is elaborated that (Adams&Bradbury, 1994:6):

> "Access to resources and credit, difficult in normal times, is likely to become harder for women without a male interlocutor. In Somalia, some women have resorted to marrying gunmen for protection".

On the other hand, vulnerabilities may also be a reflection of a community's social and economic development. In other words, the severity of a disaster does not only depend on the natural hazard's space, time and intensity dimensions but also on the degree of socio-economic development of a community. For example, long-term negative impacts of a flood tend to be more severe in a developing country like Bangladesh than the USA because of

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6 A hazard is a rare or extreme event in the natural or human-made environment that adversely affects human life, property or activity to the extent of causing a disaster (UNDRO, 1992:4).

7 A disaster is a serious disruption of the functioning of a society, causing widespread human, material, or environmental losses which exceed the ability of affected society to cope using only its own resources. Disasters are often classified according to their speed of onset (sudden or slow), or according to their cause (natural or man-made) (UNDRO, 1992:4).

the differences between their mitigation and recovery capabilities. It can be argued that in the event of a flood, the extent of losses incurred is likely to be much higher in the USA because of the nature of investment. However, the degree of socioeconomic development in the USA would still make recovery much quicker (Anderson and Woodrow, 1989; Sirleaf, 1993) .

Vulnerability has also implications for post-disaster recovery where high vulnerability is linked with a long or permanent recovery situation. First attempt to explain the concept of post-disaster recovery used the linear model which considered a disaster as an unfortunate event which struck a community and whose devastating effects could be alleviated through the phases of relief, rehabilitation and reconstruction . These phases were considered as following one another smoothly in post-disaster recovery without any regard to community's vulnerabilities and capabilities.

However, it became soon evident that disasters are in fact the product of some root causes interacting with hazards, and, without addressing these root causes the disaster would re-occur. The cyclical model was proposed by acknowledging this important fact. The main short fall of this model was that it assumed the disaster would re-occur at exactly the same place and affecting the same dynamics of a community. Therefore, this model also needed some adjustment as it did not consider the impacts of post-disaster recovery phases on the community. This was a general assumption that the aid provided from emergency relief to reconstruction would have only positive impacts which would enhance the continuum towards development.

The spiral model of disaster and recovery shown in Figure 2.5 was developed by taking the possibility of vulnerability reduction into consideration.[8] The model shows the possibility of reducing the level of disasters and their devastating consequences through a progression from relief to preparedness. It should be pointed out that the success of this model also relies on an important assumption which is the existence of a continuum through the post-war recovery phases (Ellis, 1996:15-19).

8 Spiral model of disaster and recovery based on the model presented by Barakat and Davis, 1995.

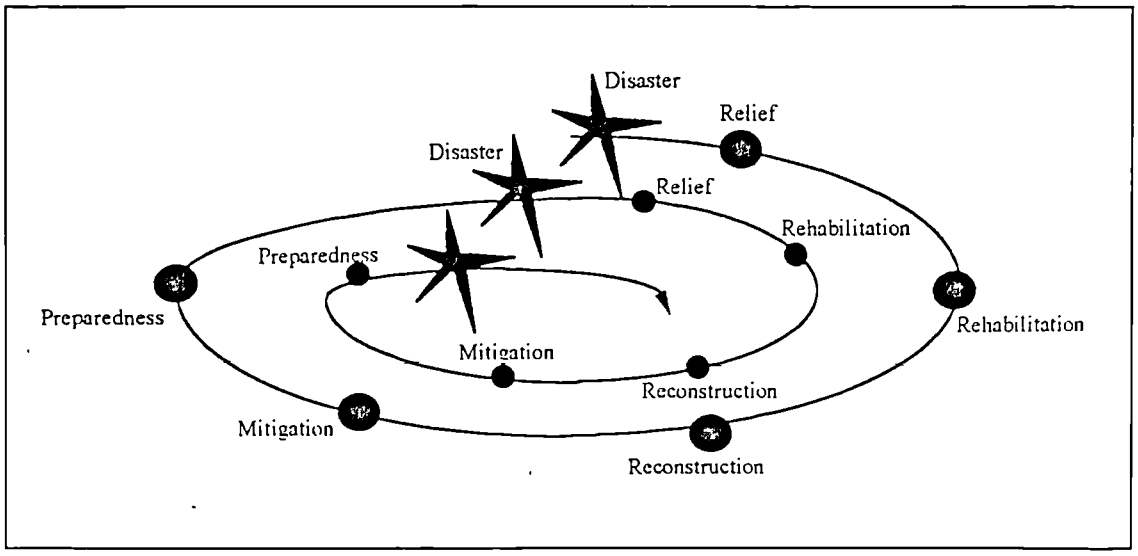

Figure 2.5: *The spiral model of disaster and recovery (Source: Barakat and Davis, 1994)*

It can be seen that the vulnerability and capability concept is very important to the way humanitarian aid is provided in post-war recovery (Anderson and Woodrow, 1989). It is also pointed out that under-development "...in times of emergencies, hindered relief operations and served to retard the rehabilitation and reconstruction process" (Farah, 1993:260). [9] Therefore it can be claimed that the way communities are affected by war varies according to their capabilities and vulnerabilities. Vulnerabilities precede wars, contribute to their severity and impede effective post-war reconstruction, while capacities can govern how well a community will cope with the effects of the war.

2.3.2 The Framework of Social Reconstruction

It can be seen from the preceding analysis that without social reconstruction, the post-war recovery of a community cannot be ensured by only implementing physical rebuilding programmes. It is pointed out by Leslie (1995:27) that:

> "It is only by dealing with both the issues of social and institutional disintegration as with the technical needs, that durable solutions to post-conflict situations, based on trust and collective responsibility, will be found".

9 Whereas a disaster is bound by a specific period in which lives and essential property are immediately at risk, an emergency can encompass a more general period in which there is a clear and marked deterioration in the coping abilities of a group or community, or coping abilities are only sustained by unusual initiatives by the group or community or even by external intervention (UNDRO, 1992:4).

The post-war recovery of urban water supplies therefore should be integrated into a social reconstruction framework, which can enable the establishment of peace. Supporting this view, Barakat and Hoffman (1995:75-95) identify a number of issues and dilemmas regarding post-war reconstruction:

- The continuation of war.
- National political, economic and ideological aspects.
- Social and psychological aspects.
- The establishment of a reconstruction strategy.

These identified issues and dilemmas show that reconstruction is more than physical rebuilding. It also involves social, economic and psychological rebuilding. It is explained that: "...reconstruction is that range of integrated activities and processes that have to be taken to 'kick-start' the development process that has been interrupted by a war". Housing is given as an example to play an important part of this physical rebuilding. Besides, reconstruction of water supplies can also play a significant role to create economic spin-offs. Consequently to look at the relationship between peace building and the post-war recovery of urban water supplies, the social reconstruction framework can be analysed in "...the three-fold human goals of **hope**, **healing** and **reconciliation**"(emphasis added) (Barakat & Hoffman, 1995:76).

Hope - the bread of peace

According to Barakat and Hoffman (1995:97):

> "Hope finds its expression in relief, rehabilitation and reconstruction projects that the UN and other agencies conduct with the victims of wars. Concrete initiatives, even during protracted conflicts when peace appears to be an illusive goal must be forthcoming and must be executed in a manner so that they enjoy the respect and participation of people in their communities".

This concept of broad-based participation in the progression from emergency to recovery is further explained by Cuny and Tanner (1995:12-20) in their 'spot reconstruction' policy which is defined as: "...those activities that are undertaken to provide comprehensive, integrated reconstruction and development assistance to communities where conflict is relatively low". Although the scope of discussion here is mainly regarding post-war

rebuilding and social reconstruction, it should be pointed out that 'peace' seems to mean only 'the absence of violence'. Therefore the advocacy of this concept should still be considered for those war-affected countries where the volatility of disputes has been taken under control.

The concept of 'spot reconstruction' suggests the provision of economic support and assistance to war-affected people to rebuild their lives, which would first engage them in productive activities whilst discouraging them taking an active part in the conflict, and secondly, increase their resistance against the pressure of warring parties to engulf them in further conflicts. Consequently, the foundations of peace can both be laid and sustained by the initiatives concentrating on war-affected people's economic regeneration by investment and employment.

The ten guidelines of good recovery practice proposed at the end of the 'Urban Rehabilitation in Kabul' Workshop include the recommendation of: "Investing in rehabilitation can be a means of investing in peace, no matter how far away peace might seem.[10] The only way to assess whether it is suitable to initiate rehabilitation projects or not is by actually starting something" (Barakat, et al.,1996:49) supporting not only the concept of 'spot reconstruction' but also the importance of giving hope by taking initiatives at the earliest possible opportunity to alleviate suffering and damaged caused by the war.

The programmes implemented by UNCHS in Afghanistan have been aiming not only at physical recovery, but also at a social one by "...encouraging those affected by the conflict to themselves invest in the process of rehabilitation". It is explained that this is done by activities including the "...supplies or manufacture of essential building materials for sale through existing markets, establishment of workshops to produce components (pipes, pumps) for infrastructure, as well as direct support for the rehabilitation of basic infrastructure, or repairs to community facilities..." (Leslie, 1995:28). This is very important in a country like Afghanistan where a large proportion of the population has been

10 The workshop was jointly organised by the PRDU, UNCHS, Norwegian Church Aid and Norwegian Refugee Council on 5-6 September 1995 and was facilitated by Dr Sultan Barakat.

displaced by the war.[11] As a result of the armed conflict for almost two decades, there are still more than 2.7 million refugees remaining in neighbouring countries - 1.4 million in Iran, 1.2 million in Pakistan and 70,000 in the CIS countries and India (UNHCR, 1997).

Therefore any initiative to be taken in Afghanistan today should involve a social and ethnic balance to minimise further conflicts in addition to the facilitation of economic empowerment to rejuvenate the capabilities of society. This is particularly a prerequisite because the demographic, social and economic structures of Afghan society have changed considerably during the turbulent eighteen years of armed conflict. These changes are explained by Barakat, et al. (1996:14-15) as follows:

- A third of the population mainly from rural areas became internally displaced and refugees.
- After living in camps close to cities, war-affected rural people experienced a better level of public services such as health and education, which in return changed their attitudes and aspirations.
- It is more than likely that those people will prefer to settle down in cities to going back to their original homes as they will have a better chance of getting employment and education for their children.

Leslie (1995:29-31) also points out that the most important lesson learnt during the involvement of UNCHS in Afghanistan was "...the value of encouraging a process that helps to bring communities and institutions together in pursuit of a common goal, in the face of the upheaval of conflict". In order to develop a sense of 'community' UNCHS started 'a neighbourhood action programme' in several urban areas of Afghanistan. Apart from the main aim which was rehabilitation of infrastructure, the secondary aim was "...to serve as a catalyst for the restoration of a degree of social organization in the communities concerned". For example, Mazar i Sharif in Northern Afghanistan is an urban centre which is facing the dilemma of having a rapid urban growth while there is an institutional degradation. In other words, the problems with the town's infrastructure were not only the result of technical deficiencies, but also a lack of institutional management. As a result of

11 The massive level of disruption to socio-economic, political and cultural life in Afghanistan was started with the Soviet invasion in 1979 and further and more deeply exacerbated by the civil conflict among the various Mujahideen factions from 1992 to the present time. The situation at the moment on the other hand can hardly be considered as'peaceful'. The new actor called the Taleban who control a large proportion of the country at the moment, have deepened the devastation of social fabric even further by implementing their strict Islamic views in all aspects of the Afghan life. After the capture of Kabul by the Taleban in September 1996, the political forces have also had re-alignments. Now, Afghanistan is partitioned between Pashtun - the Taleban and non-Pashtun forces.

this, the surface irrigation system has become neglected and broken down. It is pointed out by Leslie (1995:29-31) that:

> "This is not because of any physical failure of the channels, but because of difficulties in organizing the communal labour on which the system depends. It seems no coincidence in these circumstances that, in present day Mazar i Sharif, those neighbourhoods with the strongest sense of community are those which still enjoy an effective system of water distribution".

Therefore, the post-war rehabilitation process in Afghanistan should address these needs and aspirations of a changed demographic structure stimulating livelihoods and economic viabilities and investing in employment-creating projects with an emphasis on the utilization of local natural and human resources. This may create an environment in which war-affected Afghans would firstly be less dependent on external humanitarian aid and secondly, better enabled to take initiatives to rebuild their own future. However in order to achieve this, the impacts of a long civil war need to be healed by appropriate actions taken by local institutions and international agencies.

Healing - how and by whom?

Wars do not only devastate human environment but also destroy the truth, confidence and trust between different social, ethnic and cultural groups in a society. As was pointed out earlier, the intrastate conflicts are in fact often the result of exploitation of these differences. Consequently, healing is a huge task as it includes both immediate and long-term social reconstruction needs. According to Barakat and Hoffman (1995:77):

> "Healing is realized through long-term, comprehensive multi-faceted strategies to end violence, rehabilitate communities, including those individuals and groups vested in waging wars".

Therefore, the discussion here will concentrate on three main aspects of social reconstruction which are first, initiatives that can or should be taken by NGOs; second, the repatriation of internally displaced persons and refugees; and finally, cooperation and coordination of activities in order to ensure that they aim for the healing of social wounds which would lead to reconciliation.

According to Fischer (1995:55), the international community through multi-lateral agencies

and NGOs should take the facilitator role in social reconstruction programmes as local institutions 'may only be partially functioning at best'. On the other hand, it is pointed out that: "...locals should be participating in both the design and implementation of social projects from the very beginning". These empowerment and capacity building initiatives by the international community should aim for constructive peace-building and NGOs can achieve a great deal in this process. For example at the end of the "NGOs and Peace-building in Afghanistan" Workshop, the participants recommended several initiatives that should be taken by NGOs.[12] Some of these recommendations in the context of healing (Barakat, et al., 1994:44-45) are:

- Make every effort to maintain and demonstrate their neutrality in the conflict.
- Mobilise available resources to promote social reorientation towards peace and reconciliation and encourage people to realize the importance of social cohesion.
- Use religious and traditional values as a motivator for peace-building.
- Strengthen local institutions and provide resource material training for them, as required.
- Promote exchanges between groups of people of differing ethnic and religious backgrounds.

The practical experiences of local NGO Cooperation for Reconstruction of Afghanistan (CRA) in Kabul will be given here in order to put these recommendations into a field experience context. Kabul consists of 16 districts which are divided into sub-districts (Gozars).[13] See Figure 2.6.

The 1993 fighting between different political groups in Kabul's districts No. 1, 2, 3, 5, 6, 7, 8, 9 and 16 forced some residents to leave Kabul and some were displaced to districts No. 4, 11, 15. As a result of this, the water needs in these three districts increased drastically. For example, the Panjsad Family Neighbourhood in the District 15 was facing severe water shortages. There were not even wells in the houses to meet emergency needs as the neighbourhood was supplied with a piped water system before the war. As a response to this, the CRA started to implement a Neighbourhood Project which was supported by UNCHS. First of all, a sub-district representative (Wakile Gozar) organized

12 The workshop was jointly organised by the PRDU, Norwegian Refugee Council, Norwegian Church Aid and Responding to Conflict to explore the possibilities of building peace in Afghanistan through the work of the NGOs and the UN on 3 -7 April 1994.

13 The number of Gozars are varied from one district to another. For example; while district one has 41 Gozars, district two has 15 (Barakat, et al., 1995:33).

a three day meeting in which 45 people took part, to identify problems, priorities and suggestions.

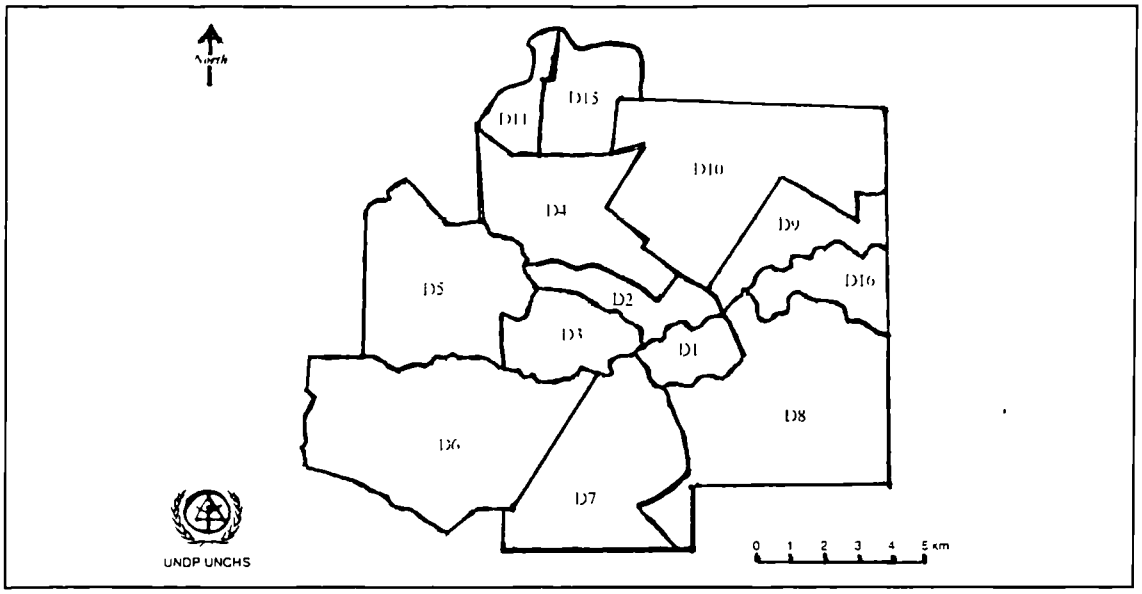

Figure 2.6: *Kabul city is divided into 16 districts which work under the supervision of Kabul municipality (Source: Barakat, et al., 1995:33)*

Following this meeting at which also a representative group (Shora) of four members were elected, the water provision programme was started by signing contracts to dig a well. After two weeks, the digging process resulted in a well with enough water. The hand pump for the well was supplied by the UNCHS office, which was installed by local plumbers. Although the pump handle was broken not long after the installation, it was quickly repaired by the residents (Barakat, et al., 1995:33-35).

The recommendations of NGOs and Peace-Building in Afghanistan Workshop also include the repatriation of internally displaced persons and refugees pointing out that NGOs should seek opportunities to encourage this integration process and sustain it by providing equal rights and employment opportunities both to local and displaced people. The other important aspect of repatriation should be to address specific needs of certain vulnerable members of society such as the elderly, the disabled, widows, ex-combatants and children as this may bridge differences between different ethnic, religious and political groups. According to UNHCR (1995a:144-145), reintegration of returnees is an indispensable part of the healing process as they tend to represent 'the opposition faction within the country during the conflict'. It is further explained that: "Without their (returnees) participation in the recovery process, there can be no durable political solution of a conflict, and thus no

stability". The connection between this integration and the process of building trust and confidence in 'governors' is pointed out as:

> "...reintegration in the home country is the first step towards forming a credible government, upon which a long process of rebuilding of local and national political and administrative institutions can begin".

The concept of reintegration also has close links with the issue of empowerment and capacity building initiated by the international community. According to Barakat & Ellis (1996:109): "...international actors should be careful of over-empowering governments to the extent that refugees become victims for a second time". Therefore, there is a need to find the right balance between the empowerment of local authorities in the social reconstruction process and addressing the needs of returnees to enable their full integration into society. The approach for the repatriation of returnees is suggested as follows:

> "...there is an overwhelming need for them to be involved in decision making about their own lives. This would assist in making the aid provided more appropriate and increase the sustainability of the positive impacts".

Therefore, it should be pointed out that repatriation should not simply be considered as a process of encouragement to return but as an integration process by stimulating 'sustainable development activities in areas of origin'. These activities should be on a community-wide basis distributing benefits equally between the returnees and the local community in a progression from relief to reconstruction, which would in return decrease the overall dependency on external assistance and maximize programmes' positive impacts (UNHCR, 1995:145-146).

Reconciliation

The main difference between physical and social reconstructions is that the former is easier to achieve and measure than the latter, though their long term sustainability depend on each other's successful implementation as part of post-war recovery. Without building up a post-war society that can live in harmony with the all existing ethnic, religious and cultural differences, the continuity of positive impacts gained by post-war reconstruction programmes cannot be long lasting. Consequently, post-war recovery projects implemented should aim at reconciliation between these ethnic groups. The project - '216 Steps to Reconciliation' in Kabul which was initiated by Habitat is a good example of this kind of

process as the project not only secured the steep path for a Panjshiri housing area on the hillside against flood and mud slides, but also created an environment of trust and confidence between people from the two warring factions.[14] When Hazara workers were asked to work in this project, they were suspicious about Panjshiris as those communities fought against each other during the civil conflict. After being assured by Habitat, they accepted to work with Panjshiri workers, though the uneasy feeling of mistrust remained in the group for the first couple of weeks. For example, on one occasion they were suspicious about drinking water provided by a Panjshiri family. They wanted to see the Panjshiri workers drinking this water first as they had thought it might have been poisonous. After seeing that it was safe, they also drank the water. In the following days, there were more examples of rebuilding trust and confidence which led to the realisation that "...they were all brothers, and the Panjshiris had asked the Hazaras to continue to work as water bearers" (SAFE, 1996:10-11).

Barakat and Hoffman's (1995:77) views on reconciliation also support the concept of reconciliation through socio-economic regeneration programmes :

> "Reconciliation is nurtured by conflict resolution initiatives which ensure that the past is adequately addressed while the future is kept in focus. Mechanisms to address trauma and practical conflict resolution skills required to work toward mutually acceptable future outcomes must accompany structural measures and reconstruction initiatives".

The conflict resolution with a future outlook explained here has close links with the level of successful collaboration between actors involved in post-war recovery such as UN agencies, NGOs and local authorities.

Different types of relationships between those agencies would have different impacts on communities. For example, cooperation and coordination of actors involved in social reconstruction should be dealt with carefully as they can have both detrimental and positive impacts on the overall sustainability of peace. Fischer (1995:56) summarizes his experience from past peace-keeping operations as follows:

"...coordination of inputs provided by agencies assisting with humanitarian

14 The main ethnic groups in Kabul are Tajiks who are also called Panjshiris as they are mainly from the Panjshir Region of the country, Hazaras who are followers of Shia Islam , and Pashtuns who form 45 per cent of the population in Afghanistan

> assistance needs to be streamlined and strengthened considerably from the outset. The lack of coordination and the absence of a coherent policy largely contributed to low aid effectiveness".

On the other hand, he recommends that this coordination should be done in cooperation with a local agency identified by the local government. However, the appropriateness of 'coordination' should be questioned in terms of reconciliation. There are several reasons for this such as existing and exploited ethnic, social and cultural differences which bring each group's individual agenda and aspirations for peace, in addition to the possible mistreatment of returnees in their areas of origin by local authorities. Nembrini (1997) looks at types of relationships between agencies in his paper presented at the 'Water under Fire' Workshop pointing out the huge scope of the challenge.[15] According to him, 'coordination' under the responsibility of UNHCR is commonly exercised in situations where refugees are involved; however, this can be adjusted towards a more 'consultative' type of relationship as this would establish clear relationships among agencies 'based on mutual respect and personal contacts'. 'Concerted' relationship is also proposed as a relationship type where responsibilities can be shared in terms of, for example, geography or post-war recovery phases. He concludes that:

> "Experience has proven that soft mechanisms like consultation and concertation must be privileged for the respect of the mandates and objectives of the respective agencies involved and that coordination may be felt as too directive and sometimes too heavy, reducing the necessary flexibility, essential for any quick response to the evolution of the situation".

Barakat and Hoffman (1995:80-81) investigate the 'coordination' concept through three levels which are:

- *Central* coordination on a national level in terms of all reconstruction efforts.
- *Regional* coordination which could be carried out by a central regional authority.
- *Communal / local* coordination for war-affected people's immediate concerns such as water, sanitation, housing, etc.

Following those different levels of coordination, they identify local participation as the most essential component for a sustainable peace which strengthens public accountability, local

15 The workshop was jointly organised by the PRDU, Registered Engineers for Disaster Relief (RedR) and Scottish European Aid to explore the context of post-war reconstruction of water supplies and its socio-economic impacts on communities, which was held in York on 21-22 November 1996 (Özerdem & Barakat, 1997).

capabilities and enablement. Kabul Emergency Sanitation Programme which was jointly carried out by UNCHS, Support for Afghan Further Education (SAFE), and NCA is an excellent example of the ways of incorporating local participation into post-war recovery programmes and subsequently its positive impacts on reconciliation. In other words, the project was not only significant for its physical positive impacts, but also the approach taken to conceive and execute the task.

The participation of different ethnic groups in this programme was achieved as follow:

> "Working with zones and wards within city districts, Habitat encouraged communities to suggest projects for their area or street and appoint 'wakils' (local representatives) to discuss these with Municipal liaison officers. The community must work out what it can contribute to the project - labour, materials, food for workers, etc.".

Meanwhile, Habitat provided necessary equipment and tools which were collected on the completion of the programme and given to the Municipality. In addition to this, the payment to municipal workers was made in wheat - 3.5 kg wheat per week. This approach's most important effect in Kabul in terms of reconciliation was that it enabled different ethnic groups to come together to work for a common aim, which was a significant step to rebuild ethnic harmony in the city (SAFE, 1996).

On the other hand, the importance of participation is often overlooked in post-war recovery processes. For example, according to Özerdem and Atmar (1997), the eight years of post-war reconstruction experience in Iran shows that the top-down approach allowed only a minimum amount of local participation in decision-making and implementation. However, some of the housing programmes limited themselves to the provision of materials and funds leaving the planning and construction of houses to war-affected people.

After the analysis of the three-fold human goals of hope, healing and reconciliation in the context of Afghanistan, it can be concluded that:

- Initiatives for social reconstruction should be taken at the earliest opportunity.
- Peace cannot be sustained without the implementation of successful post-war social reconstruction.
- The establishment of peace can be initiated by economic and physical regeneration programmes by including objectives to rebuild confidence and bridge the gap between different ethnic, social and religious groups.
- Economic regeneration can play an indispensable role to bring warring factions

together as long as the process is broad-community base oriented and incorporates war-affected people as partners.

- The international community should choose more consultative and cooperative approach rather than coordinative ones in the social reconstruction process of Afghanistan.
- The changed social and demographic structures in Afghanistan should be incorporated into both the ongoing and new post-war recovery programmes.
- NGOs working in Afghanistan should take action towards the rebuilding of social cohesion by creating working environments which would encourage different ethnic, religious and social groups to mix together.
- The reintegration of Afghan refugees will play an indispensable role for the healing process because of their large numbers.
- Empowerment of local authorities should be done by taking the Afghan returnees' future into consideration as their full integration into society is essential for the sustainability of the peace.

These conclusions show that there is a close woven relationship between social reconstruction and a sustainable peace. It is therefore so important that physical recovery and economic regeneration programmes should not only be targeted at quantitative aims, but also incorporate other objectives such as confidence building and partnerships between warring factions. Although the post-war recovery of urban water supplies might seem an entirely technical issues, it in fact includes a much wider area, because of water's importance for the continuation of any aspect of life. Hence it is almost impossible to see the provision of water in isolation in a technical framework. One is required to consider a wide range of issues from political to social, cultural and financial. It is this interaction that makes a successful social reconstruction indispensable for sustaining the benefits gained through physical and economic programmes.

Following this, it can be said the post-war recovery of urban water supplies can be used to assist and support the social reconstruction process which in return can enable the peace to be sustainable. In the last chapter, peace building was proposed as a second step aim for the reconstruction of water supplies. It can be claimed that it is possible to achieve this as long as certain objectives and approaches are incorporated in the post-war water supply planning and implementation processes. This chapter now can look at the third step which is to ensure a sustainable development. It should be pointed out that post-war recovery concerns issues of material, physical, social and psychological well-being, as well as justice, empowerment and participation, all themes that form the rhetoric of long-term development. Besides, as it was already explained, the eradication of vulnerabilities is a

prerequisite to ensure a development process, which claims that there is a close link between a community's vulnerabilities and the likeliness of its post-war socio-economic development. Therefore the first step will be to analyse the relationship between vulnerability and development before investigating the concept of sustainable development.

2.4 Post-war Recovery and Sustainable Development

2.4.1 Vulnerability and Development

It may seem obvious that, whether natural or man-made, disasters have serious long-term negative impacts on the development of a community. However, the interaction between vulnerability to disasters and socio-economic development is not a well-understood concept. UNDP and DHA (1994) suggest that there are two main aspects for this relationship, which are positive and negative. According to this analysis which is also supported by Sirleaf (1993), the relationship between community development and vulnerability to disasters can be summarized under four headings. See the diagram in Figure 2.7.

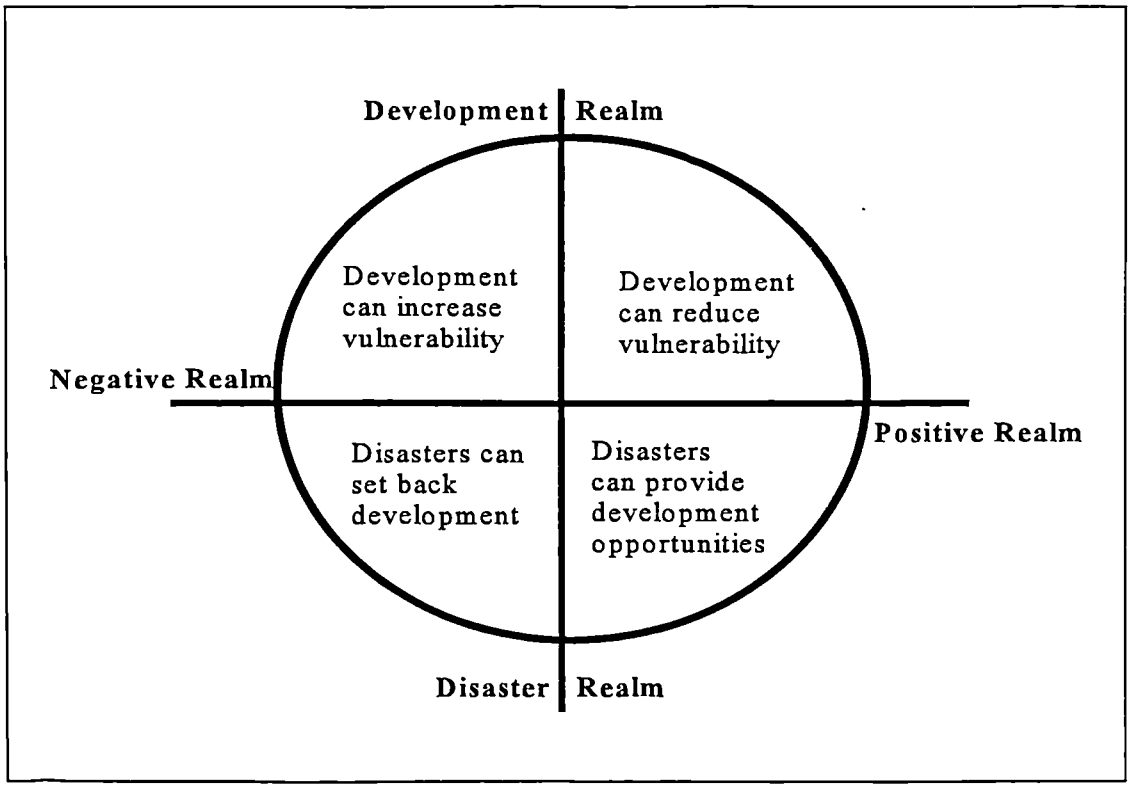

Figure 2.7: *The relationship between development and vulnerability to disasters (Source: UNDP - DHA, 1994:8)*

The negative realm of this relationship includes:

First, poorly planned development programmes increase vulnerability. If development efforts are not appropriate to existing environmental factors and their impacts on the environment have not been assessed properly, they may increase vulnerability to disasters. For example, the problems like the salinisation of soil and depletion of underground water resources due to vast irrigation schemes in Central Asia (Klotzli, 1994).

Second, disasters can set back development initiatives in several ways such as loss of resources, interruption of programmes, impact on investment climate, impact on the non-formal sector, and political destabilization (UNDRO, 1992:16). The set back effect of disasters on development is explained (Boutros-Ghali, 1995:34):

> " Natural disasters can have an enormous and dramatic impact on development efforts. Because natural disasters can quickly devour hard-won achievements, planning must focus on ways to cushion the inevitable shocks, so that social structures will not be irreparably damaged, economic initiatives will not be forever set back, and natural disaster victims will not be condemned to perpetual dependence on external assistance".

On the other hand, the positive realm includes:

First, sustainable development can reduce vulnerability. However, it should be pointed out that post-disaster environments are often seen to be too turbulent to implement developmental programmes. Donor countries and relief organisations often ignore the interactive relationship between disasters and socio-economic development. Consequently there is a tendency to avoid the root causes of disasters such as poverty, lack of access to economic and political tools, etc., when they decide to alleviate sufferings through their relief and rehabilitation programmes.

Second, disasters can provide opportunities for sustainable development (Sirleaf, 1993:300):

> "...disaster sometimes can provide development opportunities hitherto overlooked by exposing the multifaceted relationship between disasters and development, leading to remedial action in policies and programs".

UNDRO (1992:19) states that:

> "Disasters often create a political and economic atmosphere wherein extensive changes can be made more rapidly than under normal circumstances. For

> example, in the aftermath of a disaster, there may be major opportunities to execute land reform programmes, to improve the overall housing stock, to create new jobs and jobs skills, and to expand and modernize the economic base of the community - opportunities that would not otherwise be possible. The collective will to take action is an advantage that should not be wasted".

Therefore, to enable the use of opportunities created by war, the multiple relationship between disaster and development should be explored by identifying the main components of the progression from relief to reconstruction.

Although all these four aspects of the development - vulnerability relationship deserve to be investigated in more detail, this chapter will only concentrate on the last aspect which is 'Disasters can provide development opportunities'. However instead of looking at the whole disaster context, the focus point here will be a type of man-made disaster: war.

2.4.2 Opportunities Created by War

The opportunities created by the impact of war for development by "...changing the environment and the point of departure, both in terms of physical structures and/or social patterns and attitudes" should be seized as risk reduction and preparedness measures (UNDRO, 1992) (emphasis added). Supporting this view, Barakat (1993) points out:

> "There is no stronger indicator than a national war to highlight the inherent weaknesses within a society and within its governmental organisations. Certainly, not all the problems we face in a post-war situation are caused purely by the war. The war may have acted beside its destructive role as a means of bringing into sight long existing problems that have only been magnified by the war".

At the international Workshop entitled 'Water under Fire', convened by the author on 21-22 November 1996 in York, the participants identified opportunities and challenges for post-war reconstruction of water supplies, through their experience of working on such projects in Cambodia, Liberia, Ethiopia, Zaire, Rwanda, Afghanistan, the Middle East, the former Soviet Union and the former Yugoslavia. These opportunities created by war for post-war reconstruction of water supplies are:

- War highlights inherent physical and social vulnerabilities within an urban area.
- Attracting external funds to implement developmental water supply programmes.
- Improving quantity and quality of existing water supplies.

- Documentation and standardization of existing and new water supply systems.
- The use of water as a 'peace tool' either through utilising the unifying character of urban water supplies, or involving local authorities from each of the warring factions during the implementation.
- The integration of different infrastructures and services like sanitation, nutrition and health education with water supply improvements.
- Enabling economic spin-offs through creating employment opportunities and the utilisation of local resources.
- Local communities and authorities can be more open to change and can, therefore, be encouraged towards taking more local initiatives.
- Local empowerment through provision of technical, institutional and professional assistance.
- Sharing the experience of international engineers and other qualified personnel, and incorporating this knowledge into existing local professional and institutional structures.

Amirahmadi (1986:129) points out similar opportunities in Iran after their 8 year long devastating war with Iraq:

> "War destruction has also presented policy makers with new opportunities to change existing policies and priorities and has created enormous possibilities for the modification of physical, socio-economic and political structures".

However, these opportunities created by war should be realized by using time in the best possible way. It is stated that:

> "...the need for immediate action cannot justify unplanned and non-coordinated programs, projects or activities. Otherwise, the risk of chaos, duplication, and wasteful use of the scarce and valuable resources would be high".

During the 3rd International Conference on Reconstruction of War-damaged Areas in 1997, it was observed that this warning by Amirahmadi in 1986 was prophetic. As part of the conference programme, the participants were taken on a five day site visit in war-damaged areas of Iran including Khuzestan, Ilam, and Kurdestan. There was no doubt that the political will, mainly inspired by the late Imam, Ayatoullah Khomenie, has been to reconstruct these war-damaged areas by providing huge sums of funds and administrative support. It was also observed that a good opportunity created by the war in areas such as town planning, and architectural integrity had not been utilized properly as most of reconstructed towns were identical from their parks to their street furniture though they possess completely different geographical, social, and cultural qualities. Mokhber (1986:139-145) from the University of Tehran points out that:

> "The five western provinces of Iran include the war-stricken areas in which

> nearly 4,000 villages and 15 towns and cities are in need of reconstruction and renovation. Ethnic, cultural and climatological characteristics of these regions are quite different".

In the view of the author, this is mainly caused by a lack of local participation in decision making and implementation, which will be discussed more in details in Chapter Five.

Zargar's presentation at the 1997 Conference in Tehran entitled 'Evaluation of housing in rural areas of Khuzestan', pointed out three different phases for the reconstruction of rural areas in this region which is one of the war-damaged western provinces of Iran.[16] According to him, the first phase was a 'spontaneous and planless' period where different governmental bodies and local authorities were carrying out various housing reconstruction programmes without any comprehensive plan. The second phase was identified as 'utopian reconstruction', which included projects unrealistic and inappropriate, using strongest building materials without considering appropriate architecture styles and building techniques for local environment. For example, a village with a 45 m wide boulevard was built during this period. During the third phase there was a big shift towards working with the war-affected people, with a general framework which included the provision of materials and financial support but leaving planning and implementation of construction to beneficiaries. In his presentation, Zargar concluded that the war provided several opportunities to improve the socio-economic level of rural areas in Khuzestan by the utilization of local resources and giving more attention to water and sanitation aspects of the reconstruction. However, it was an unfortunate fact that environmental issues, employment and sanitation aspects, did not have a high priority in local authorities' reconstruction programmes.

At the same conference, Azizi (1997:66) presented his findings from the evaluation of reconstruction in Abadan, which included several important issues showing that opportunities created by war for the rebuilding of Abadan have not been seized. He criticised the lack of people's participation in decision-making mechanisms, the lack of flexibility at a time of changing in demographic environment and economic trends, and also

16 Dr Akbar haj-Ebrahim Zargar completed his doctoral research on 'post-war reconstruction of war-damaged rural areas in Khuzestan' at the University of York in 1989.

the lack of coordination among regional and national bodies. He stated that:

> "...many weaknesses have been identified in the trend of reconstruction, among them disintegrated management and organization, lack of synchronization in the execution of substructures, in proportionate number of specialized manpower with that of the needs, lack of establishment of priority in reconstruction of the elements and activities, and lack of determination of different phases of reconstruction".

This thesis focuses on the challenge of post-war reconstruction of water supplies where the permanent construction or replacements of damaged systems take place. But as recontructing war-damaged societies is a complex business (as we have seen in the preceding pages) so reconstructing water supplies involves more than just repairing damaged installations. The challenge of post-war reconstruction of water supplies should be fully integrated with long-term development plans taking account of future water needs for the socioeconomic development of a community. However, the activities necessary in this phase should also consider the root causes of the problem, taking actions for the reduction of vulnerabilities by appropriate mitigation measures. Humanitarian assistance in the relief period should consider the long-term developmental and political impacts as understanding the two ends of the emergency spectrum is important - root causes and long-term outcomes - and their interaction with each other (Anderson, 1993).

2.4.3 What is Sustainable Development?

It is quite a common practice that concepts like modernization, social change, and economic growth are considered as if they are identical in meaning to development. Development is often considered as that process that every community or country goes through in their evolution in history. This is a misconception which has roots in the Western understanding of the world. The Western countries tend to consider the world into two parts as "we" and "they" . Consequently, "we" are civilized, modern, developed, and "they" are not. The concepts belong to "us" are true, but "theirs" not (Roberts,1984). According to Manzo, "The idea of the modern West as a model of achievement, and the rest of the world as an inferior derivative, remains integral to the concept of development". This Western approach towards development, is also criticised by Esteva (Manzo, 1995: 228-252):

> "Development implies that one has started on a road that others know better,

> to be on one's way towards a goal that others have reached; to race up a one-way street. Development means the sacrifice of environment, solidarities, traditional interpretations, and customs, in the name of ever-changing expert advice. Development promises enrichment, although for the overwhelming majority, it has always meant the progressive modernization of their poverty; growing dependence on guidance and management" .

This misunderstanding of development is also the framework of some economic development theories which have been prescribed for solving the economic problems of developing countries. For example, after the success of Marshall Plan to assist the post-war recovery of Europe, it was thought that the same formulae could work for the developing countries of the 1960s. The conservative view of development was developed on the assumption that all that was needed was a massive injection of capital to trigger the development process. However, it was soon realized that the reason behind post-WW 2-Europe's recovery success was not only the financial aid provided, but also the existence of the necessary socio-economic structures and institutions, such as well-trained manpower, well-integrated money markets, and transport facilities (Todaro, 1989:64-78).

"Under-development" was seen as "...a vicious circle of overpopulation, hunger and illness brought about by poor administration (corruption and inefficiency), superstitious beliefs among the population (reluctance to use contraceptives, or introduce modern technology, plus a general lack of knowhow, work discipline and entrepreneurial spirit" (Roberts, 1984:8-10). The main failure of the conservative view was that it did not appreciate the importance of utilisation of local resources and the integration of local participation into developmental programmes. Because development as a concept according to the conservative view, was "ours" and its framework was drawn by "us" and it could have been implemented on "them" without considering their appropriateness, applicability, and long-term sustainability. Even today, development circles claim that there is an urgent need to empower certain dynamics of a community as a precaution for the eradication of the poverty, but what is still not realized is that it is "...a question of helping the poor to empower themselves, to discover, or perhaps rediscover, their power and glimpse the hope of improved lives" (Madeley, 1991:124).

The False-Paradigm Model, for example, looks at the concept of "under-development" from a different angle. According to this model, the under-development of developing

countries is a consequence of "sophisticated" and "inappropriate" economic models imposed on them by "...well-meaning but often uninformed, biased and ethnocentric international" experts from multinational donors and NGOs. This model also claims that even the intellectual elite of developing countries tend to get their education and training in the Western countries, which leave them with "...little or no really useful knowledge to enable them to grips in an effective way with real development problems, they often tend to become unknowing or reluctant apologists for the existing system of elitist policies and institutional structures" (Todaro, 1989:80-81). Supporting this view, the development issues most overlooked in post-disaster areas by external NGOs and donors may be summarized as:

- Lack of cooperation with local authorities;
- Lack of local participation in decision making;
- Creating socio-economic dependency due to inappropriate aid;
- Lack of holistic approach for addressing root causes; and
- Creating unrealistic expectations (Cuny, 1983:92-93).

Therefore, development should not purely be considered in terms of economic growth as it is not only a financial phenomenon, but also in terms of the social, cultural, and political contributions. Development is a process of change, growth and enrichment that cannot be considered as a race to meet certain aims and objectives. It is only a part of the social, economic, cultural, ethnic evolution of society in time. For example, since 1990 the Human Development Report published by the UNDP includes indicators relating to education, health, political involvement, and the status of women (Anderson, 1993).

Additionally, economic growth does not always ensure the equitable allocation of benefits, the eradication of poverty and the protection of the environment. However, economic growth can be an important factor to increase the range of human choice, if it is distributed equally. To succeed in this, development should be considered as a multi dimensional concept which requires other support systems. It is stated that (Boutros-Ghali, 1995:69):

> "Successful development cannot be achieved by pursuing any one dimension in isolation, nor can any one dimension be excluded from the development process. Without peace, human energies cannot be productively employed over time. Without economic growth, there will be a lack of resources to apply to any problem. Without a healthy environment, productivity will devour the basis of human progress. Without societal justice, inequalities will consume the best efforts at positive change. Without political participation in freedom, people will have no voice in shaping their individual and common destiny".

On the other hand, individual targeted projects that are appropriate to local physical, environmental, social and economic local facts, can be "vehicles or catalysts" for sustainable development. Sustainable development was defined by the World Commission on Environment and Development (WCED) in 1987 as follows (Eade & Williams, 1995:20):

> "A process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations".

It has today a central place in scientific, environmental discussions, and developmental research; it is a concept which does not only engage development agencies, planners, and environmentalist but also local authorities, NGOs and governments. It can be claimed that the Brundtland Report in 1987 is responsible for the most frequently cited definition of sustainable development "to meet the needs of the present without compromising the ability of future generations to meet their own needs" (WEDC, 1987).[17] Sustainable development is a 'catch-word' of the 1990s, which is often misused. For example, a literature review shows that 'sustainable development' and 'sustainability' are often used in different meanings. Reid (1996:xiv) points out that 'Sustainable development' tends to refer to "the process 'developing' in a sustainable way, while 'Sustainability' is the concept of sustainable development (Roberts, 1984; Pearce, et al., 1990; Reid, 1995; Blaikie et al., 1994). It is important that before looking into the term itself, the concept of 'sustainable development' should be investigated.

The concept, according to Ponting (1990), can even be seen in early civilisations, dating back to the ancient Mayan, Mediterranean, and Sumerian, regarding the use of natural resources. When the concept is questioned with its two main components - sustainability and development - it can be argued that a major contradiction is hidden in the concept. On the one hand sustainability advocates the 'carrying capacity' of the earth without any attention to social issues like poverty and equity, and on the other hand development would appear to assume the necessary continuation of economic growth without any consideration to this 'carrying capacity'. However, this is a consequence of the multi-dimension character of the concept including social, ecological and economic dimensions.

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17 The WCED report is commonly called "The Brundtland Report" after the commission chair, Norwegian Prime Minister Gro Harlem Brundtland.

The ecological dimension can be considered as the most straightforward, measuring physical and biological processes. For example, Levett sees the whole concept through this dimension:[18]

> "There is no mystique or obscurity about the central meanings of sustainable development. They are rooted in perennial themes of responsibility to others, providing for the future and dependence of life on the natural environment...since time immemorial".

On the other hand, social and economic dimensions of the concept are more contested by different interest groups. The discussions involve various disagreements such as the difference between sustainable economic development and economic growth, with its feasibility while there is an uncertainty regarding future generations' needs, and compromising the full satisfaction of the present generation's needs for the plight of future generations.

Samson (1995:6), from Green Cross International, argues that "Just as various groups hold different perspectives on the 'environment, each attaches its own meaning to sustainable development. Each of these views is given as 'proof' for the necessity of particular strategy or action". He later concludes that these different views and contradicting ideas are in fact necessary for future implementation of sustainable development:

> "Sustainable development can be successfully implemented only if each view makes its unique contribution to the solution. Since each represents only a part-truth, there is no single solution to a given environmental problem. In other words, sustainable development strategies cannot be attained through the dominance of a single view or by the exclusion of others; instead they require continual evolution and balance".

2.4.4 Water and Sustainable Urban Development

Dieterich and Henderson emphasize the relationship between water and economic development by pointing out that:

> " Water supply has become a critical factor in public health and economic development in most parts of the world, particularly in the developing countries. Deficiencies and backlogs have created conditions that call for

18 Quoted by Reid in 1995: Roger Levett, 1993,A Framework for Local sustainability: A Response by Local Government to the UK Government's First Strategy for Sustainable Development, Luton, LGMB.

> immediate efforts by governments and local agencies to promote the construction of new supplies. Also, the influence of water supplies on conditions of health and economic progress throughout the world opens a wide field for action by international bodies concerned with such problems".[19]

Although this important relationship was urged as early as the 1960s, after three decades the world was warned again by the Agenda 21 to take necessary precautions. However, it is still common problem for many countries to have fragmented institutional structures for water development and management. The rapid urbanisation, as a consequence of increasing population growth and economic constraints, in developing countries put serious setbacks on Chapter 18's expected achievements for urban water supply services. Insufficient funds and inadequate pricing to enable sustainable operation and maintenance still make Agenda 21's objectives far from achievable. Lack of investment in peri-urban areas and inappropriate prioritisation decisions regarding beneficiaries' real needs and aspirations, resulted in inadequate water supply services for the poor of many urban areas. In addition, lack of maintenance causes a considerable level of leakage from water distribution systems putting extra pressure to develop more water resources. These increasing demands are satisfied by transporting water greater distances and more dangerously exploiting unrenewable water aquifers causing serious environmental problems.

Moreover, efficient remuneration, transparency and accountability, are far from being key objectives of public water boards.

The theoretical curve given by Lee in Figure 2.8 shows a simplified relationship between water supply and economic development based on three assumptions.

- Water supply in Phase 1 is essential for protecting well-being and health, which is essential to sustain economic and urban growth.
- The increase in water supply is no longer necessary between the points A and B as basic water needs for health and development have been already satisfied earlier. Therefore, "investment in increased water supply should be reduced to a level consistent with the maintenance of these minimal standards"
- On the other hand, "The relationship between urban water supply and economic

19 Quoted by Lee (1969:19)

development can be used to formulate a policy in regard to the provision, organization, and pricing of water that will bring the greatest constructive benefits for economic development at least cost" during the Phase 3 (Lee, 1969).

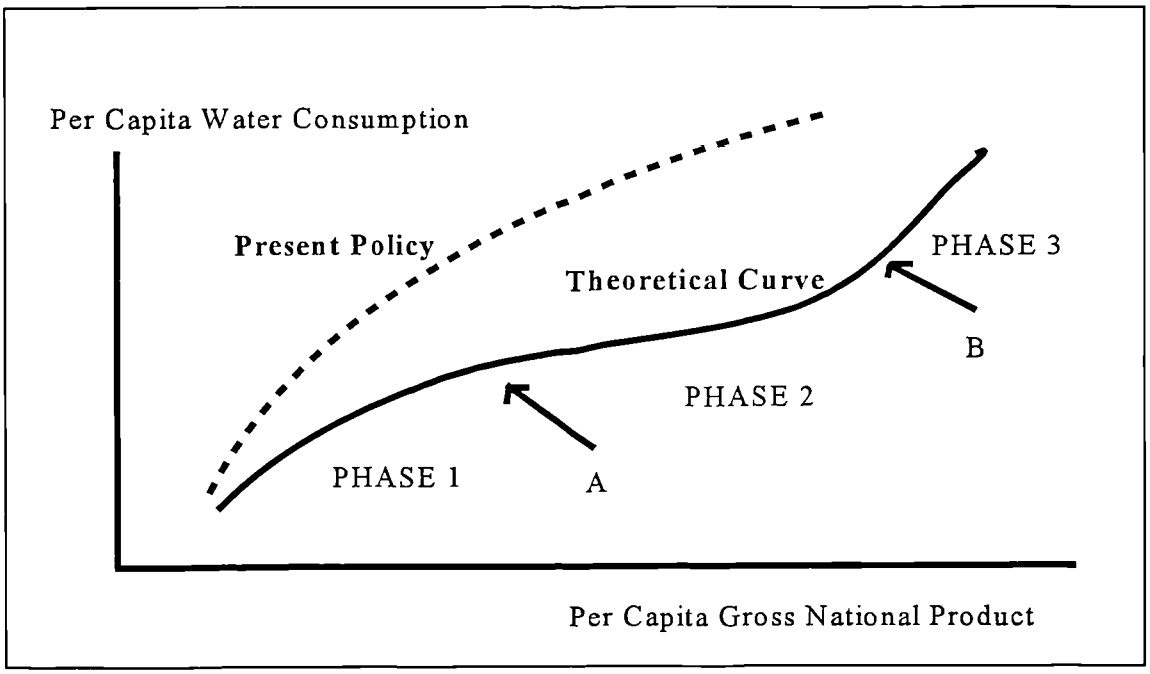

Figure 2.8: *Water supply and economic development (Source: Lee, 1969:36)*

Supporting this argument further, the diagram in Figure 2.9 shows the impact of investments made to improve water supplies. It can clearly be seen that water plays an indispensable role for the realization of development objectives directly or indirectly. First of all, the availability of water for hygiene is perhaps the most important factor for protecting and improving public health, especially combined with sanitation, appropriate nutrition, environmental health measures, and education. Consequently, people with good health and financial resources, are more likely to have more time and access for education and have opportunities to become involved in social, cultural and political activities. Secondly, sustainable water supplies can be an important part in the stabilization of post-war economy by both creating employment and being an indispensable component for the development of industry and agriculture.

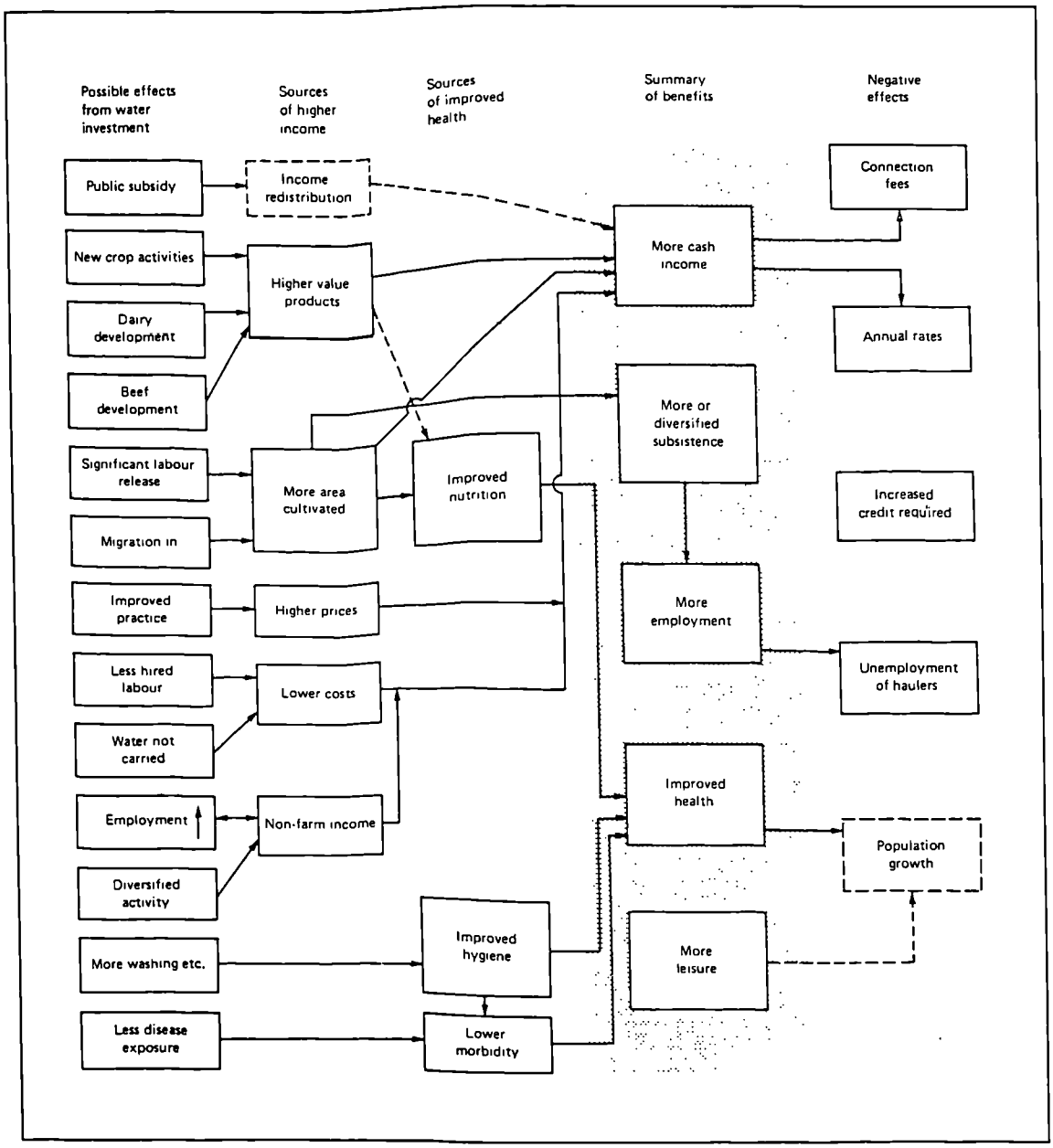

Figure 2.9 : *The impact of water investment (Source: Feachem, et al., 1977: 139)*

On the other hand, the implementation of the sustainable urban development concept relies on the three pillars as pointed out by Habitat (1996:422-423), which are environmental, economic and social sustainability. When these three components are applied to the sustainable urban development concept, it can be seen that sustainable urban water supplies can play an important role for the realisation of these goals. For example, it is pointed out by Habitat that meeting the social, cultural and health needs of the present includes: "...a shelter which is healthy, safe, affordable and secure, within a neighbourhood with provision for piped water, sanitation, drainage, transport, health care, education and child care" as well as considering economic and political needs. However, this should be done by

considering the needs of future generations. Therefore, it is recommended that use and waste of non renewable resources such as fossil fuel, should be minimized, 'absorptive capacity of local and global sinks' such as rivers and atmosphere, should be protected, and cities should draw freshwater resources at levels which can be sustained.

These are only a few examples given by Habitat; however the aim here is to point out the significance of urban water supplies for sustainable urban development. This research is not claiming that urban sustainability can be achieved by only sustainable water supplies, because the scope of urban sustainability is much wider. However, it can be claimed that sustainable post-war reconstructed water supplies would have direct and indirect effects on every aspect of life. Therefore, the overall sustainability of urban development can be assisted and supported by implementing sustainable post-war urban water supplies.

McDonald and Kay (1988:79-84) also point out that it is not very relevant to attempt to differentiate water-related health benefits, from social and economic benefits which will be initiated through a working supply of water. They quote from Cvjetanovic regarding a water supply scheme in Bara Banki, India. According to his observations:

> "The initial effects of water supply and sanitation in Bara Banki, besides being beneficial to health, also triggered economic development, transforming poor villages with a subsistence economy into marketing areas. This led to economic prosperity and wellbeing".

The experience in Mraclin, in the former Yugoslavia, again quoted from Cvjetanovic, describes similar positive socio-economic effects of water supplies while playing an important role in reduction of water-related infectious diseases:[20]

> "Even the second world war did not stop the progress initiated in 1926 in Mraclin, a village that continued to lead in health and wellbeing in the area for decades. The elimination of enteric infections resulted in a ten fold decrease in infant mortality rate and brought about changes in the appearance of the village and the lifestyle of the population, with the advent of prosperity and good health. The provision of safe water supply and sanitation undoubtedly played a role in this process of development although their exact contribution cannot readily be measured".

Direct and indirect effects of water supply and sanitation in a health and socio-economic

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20 Cvjetanovic, B., (1986), Health effects and impacts of water supply and sanitation, World Health Statistics Quarterly 39(1), 105-117.

development framework are shown in Figure 2.10.

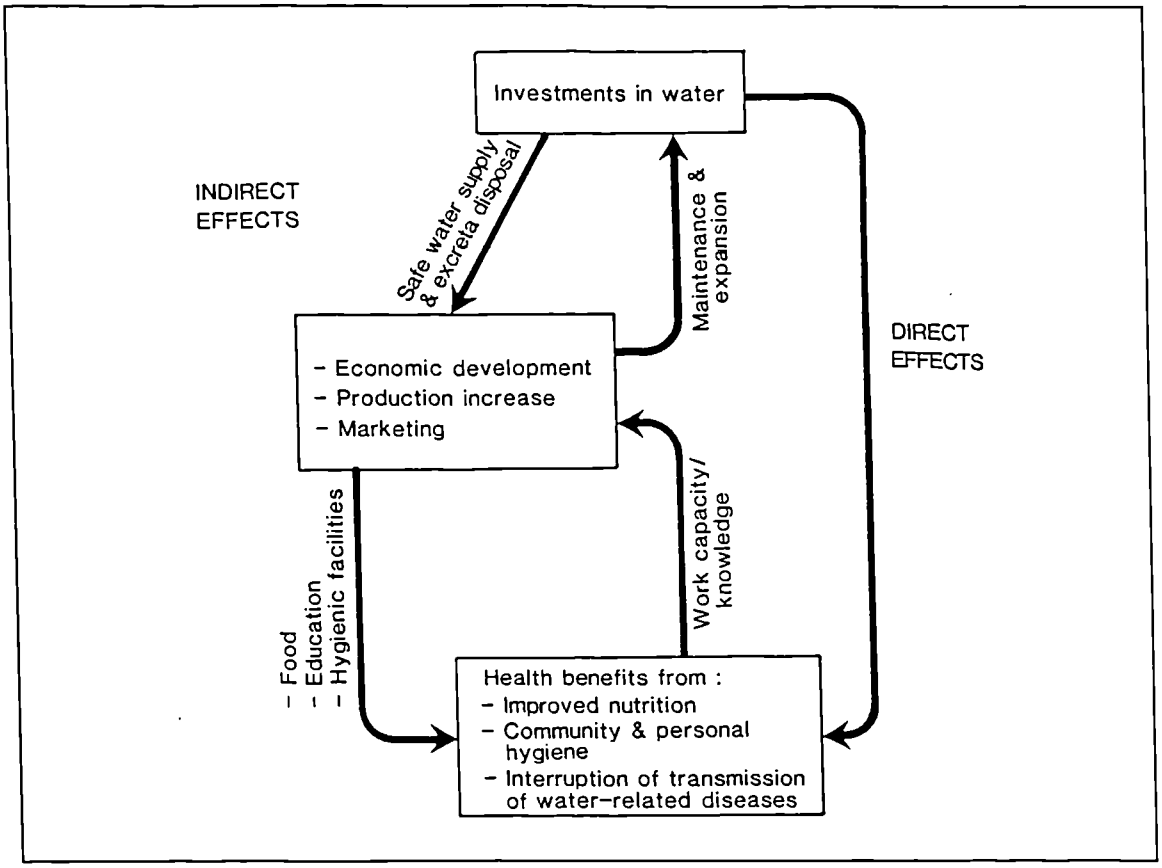

Figure 2.10: *Direct and indirect effects of water supply and sanitation on health: a conceptual framework*
(Source: McDonald and Kay, 1988:84 taken from Cvjetanovic, 1986:109)

According to Aviguetero, the provision of infrastructure such as water supply and sewerage systems not only stimulates economic growth, but they also "...pave the way for the evolution of new concepts and ideas that will ensure man's triumph over wars and other factors leading to the disintegration of human society".

It is explained that the magnitude of implementation of infrastructural systems can be used an index of development per se. On the other hand, we agree with the view that: "...the correlation between an efficient public facility and the assumed economic growth can be highly established on the basic function of the infrastructure system". It is concluded by Aviguetero (1986:85-87) that:

> "Adequate power and water supply is basic to an expanded economic and social development program. The growth of industries and the increase of population require a corresponding expansion in the supply of power and water".

2.5 Summary and Conclusions

This chapter demonstrates that the progression from relief to reconstruction can be the most beneficial approach for post-war reconstruction of urban water supplies. This progression would aim to transfer benefits gained by every intervention without any regard to its scope and magnitude, to the next. There is no distinct division between post-war recovery phases in terms of time as far as urban water supplies are concerned.

However, interventions taken can be divided in terms of activities as immediate, short-term and long-term according to their main goal and other secondary goals. For example, an intervention as an immediate measure aims to alleviate suffering caused by water shortages. Consequently, activities to be carried out can vary from basic repairs on a water supply to the installation of emergency power and water distribution by tankers. Therefore the strategy to alleviate water shortages should focus on the framework of interventions to prevent problems before they deteriorate so far that emergency measures become unavoidable.

On the other hand, short-term activities consist of more comprehensive works such as carrying out leakage survey and remedial works, repairs and replacements of water supply components, etc. Following this, long-term activities can include various programmes acting on the findings of such works as the leakage survey, water quality monitoring, and further improvements to ensure that both the quality and quantity of supply are satisfactory for the post-war social and economic needs of the population. Besides, the objectives of interventions in the short and long terms should be directed more towards the enablement of social reconstruction, the consolidation of peace and the sustainable development.

Although there are contradicting views regarding the progression of post-war recovery phases leading to the sustainable development of a war-affected community, it can be claimed that it can certainly have positive effects in the process of enabling this sustainable recovery. It is essential that there is no assumption of a pre-war development concept which is only interrupted by war, because this would divert the understanding of post-war water problems from its main focus. Instead the approach should regard the problem with its past,

present and future perspectives.

The importance of sustainability is pointed out by Etienne and Nembrini (1995:18-26) as they claimed: "Emergency planning of water and sanitation programmes in war situations poses special problems - especially in the very first stages of implementation...In view of the complexity of factors to be considered, the problem identification phase and especially the setting of priorities are the cornerstone of the planning stage...Solving urgent problems through efficient, short-term action will always constitute one of the essential priorities of all programmes. But from the outset one principle must remain uppermost in every programme planner's mind: that of semi-sustainability, which is precisely the way to prevent new emergencies".

There is no doubt that interventions should tackle the root causes to enable their positive impacts to be sustainable. However the assumption that every intervention would have only positive impacts would be as dangerous as assuming that the development process can be regained without a holistic approach. Therefore, water supply improvement programmes implemented in post-war areas should have a holistic approach including not only technical aspects of the task, but also social, economic and political. Following this, the current praxis of water provision in war-affected areas will be scrutinized through the three sets of dilemmas that were pointed out in the last chapter. The dilemmas are:

- Political and strategic
- Operational and technical
- Moral and personal.

Chapter 3 : Dilemmas of Post-war Urban Water Supply Reconstruction

3.1 Introduction

The previous chapter analysed the aims of interventions taken to improve water quantity and quality in war-affected urban areas. This analysis shows that the post-war recovery of urban water supplies should not only aim at the provision of adequate amounts of safe water in order to satisfy urgent needs, but also to consider water as a tool for the consolidation of the social reconstruction process. In addition to this, the chapter also clarified the close link between sustainable water supplies and socio-economic development. It is concluded that the sustainability of post-war urban water supplies can be ensured only by carrying out activities in a progression from emergency to reconstruction.

Following this, Chapter Three aims at drawing out a number of dilemmas that are often experienced during urban water supply recovery. The three aims of water supply reconstruction - to satisfy urgent water needs, to consolidate the social reconstruction process, and to enable a long-term sustainability - will be used as phases in the investigation of these dilemmas through the secondary case study examples from Cambodia, Bosnia-Herzegovina, Northern Iraq, Rwanda and Yemen. The map in Figure 3.1 shows the location of these countries in the world. Some refugee crises will also be included in this investigation to derive useful lessons for the purpose of chapter. The main sources of information for this chapter are the general literature review, technical reports from Oxfam, ICRC, and RedR, and the responses received to a questionnaire survey with RedR Engineers, which was conducted by the author.

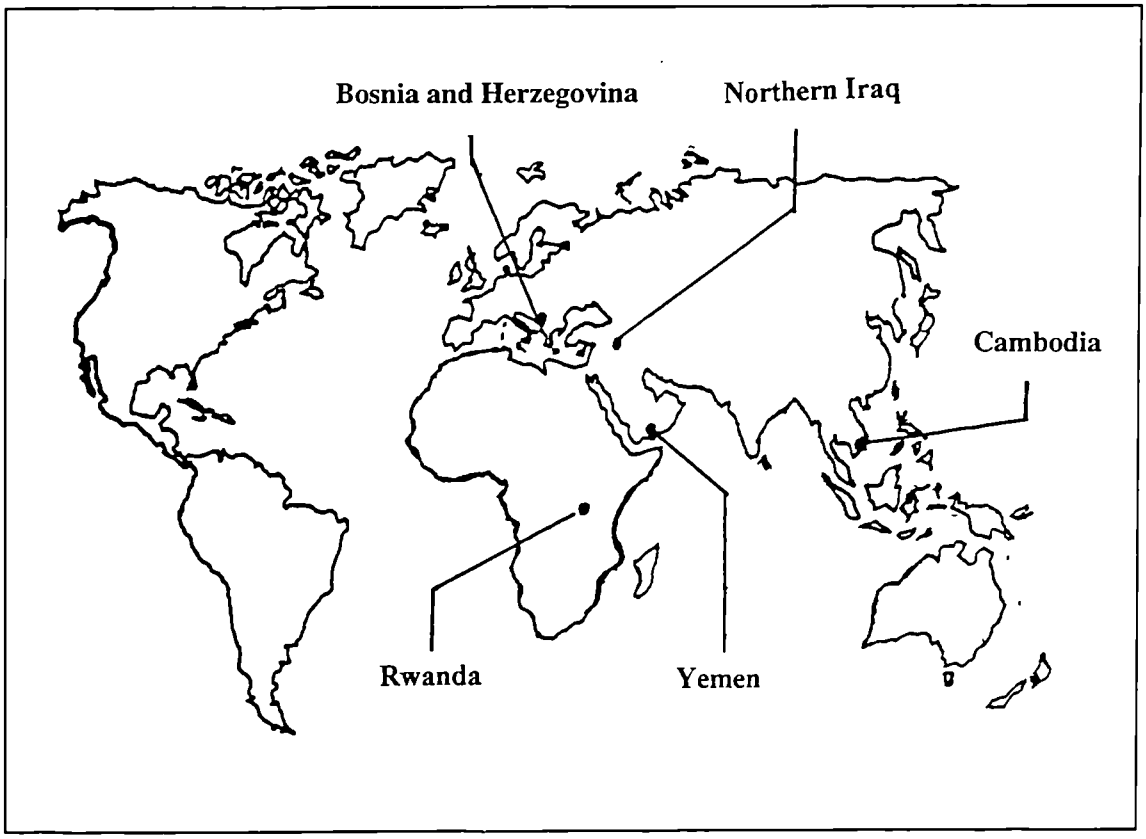

Figure 3.1: Countries where the secondary case study examples were taken: Cambodia, Bosnia-Herzegovina, Northern Iraq, Rwanda and Yemen

3.2 The 1991 Kurdish Crisis in Northern Iraq

Political and Strategic Dilemmas

Kurdistan is where approximately 22 million Kurds live in the most mountainous region of the Middle East straddling the frontiers of Turkey, Syria, Iraq and Iran. After the Gulf War in 1991, the uprisings first, by the Shias in the South and later the Kurds in Northern Iraq, were brutally crushed by the Iraqi regime. As a result of this, "About one and a half million people headed east to Iran. Another 500,000 Iraqi Kurds, Christians, Turkmens and Arab deserters arrived at remote outposts in the Turkish mountains,..." (Stanton, 1991; Pope & Pope, 1997:228).

As a consequence of the great media interest in the crisis, there was a huge international humanitarian relief effort in the South East region of Turkey to satisfy the urgent needs of refugees such as clean water, adequate sanitation, shelter and food. However the first

obstacle to reaching these refugees was the political volatility of the region. The Turkish government refused to allow international agencies to cross the Turkish border. This reluctance was apparently caused by their experience with 55,000 Iraqi Kurdish refugees three years earlier. Although the West made promises to help Turkey with this influx in 1988, it did not produce anything constructive to rebuild these refugees' lives. It is pointed out that after three years, half of these refugees were still living in camps and houses built for earthquake victims in South-eastern Turkey. Therefore Turkey determined to keep the refugees on the snowy mountains with heights of 2000 metres (Pope & Pope, 1997). This decision made the progress of humanitarian aid to reach the refugees a very difficult task. The situation of Iraqi Kurdish refugees is described as "They had almost no food, water or shelter and in the months of March and April the mountains froze, while the reducing snowfall was their main source of water" (Pots, 1993:13). Consequently, thousands of them died because of cold, the food shortage and the lack of water and sanitation in the refugee camps. It has been pointed out that the lack of water and sanitation in the Isikveren refugee camp resulted in diarrhoea affecting almost all the refugees and killing 20 to 30 people each day (Swenson, 1991). Figure 3.2 shows the region affected by the Kurdish refugee crisis in 1991.

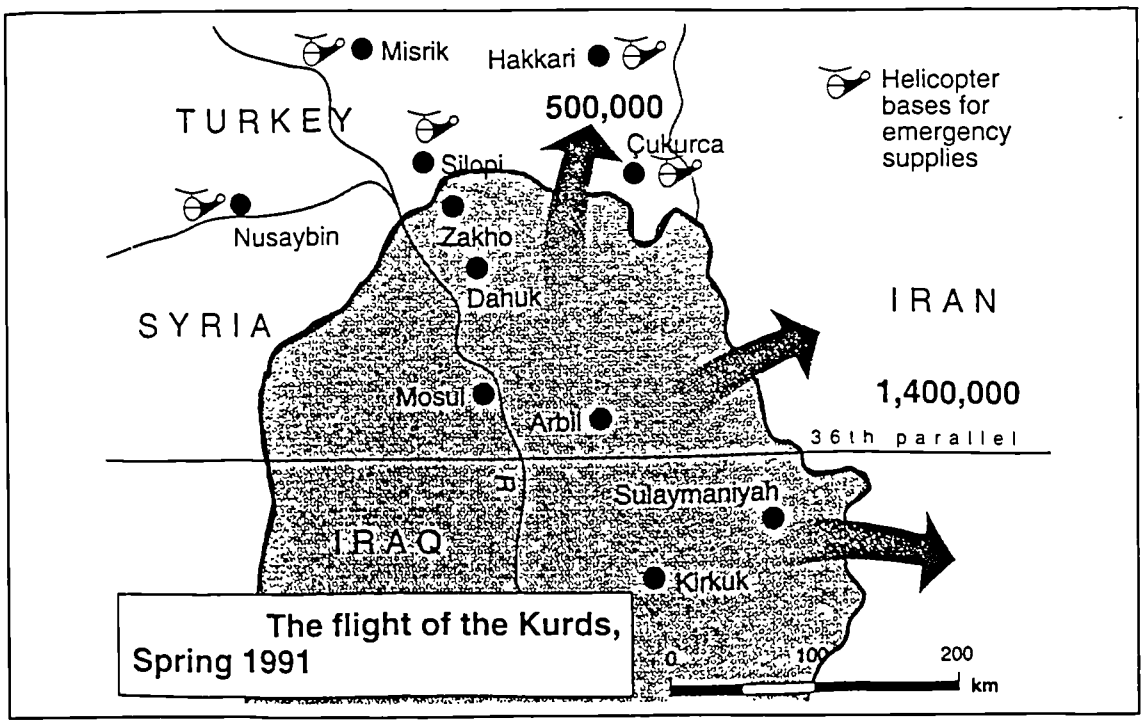

Figure 3.2: *The map of area affected by the 1991 Iraqi Kurdish refugee crisis (Source: UGI, 1994a:9)*

On the other hand, the level of suffering experienced by the Kurdish refugees in Iran was even worse because of their larger numbers and the lack of aid sent to the area by the international community. The West's preference to concentrate on relief programmes in Turkey instead of Iran, though the latter had three times more refugees, was explained as purely political; a reward for Turkey's assistance to the Allies during the Gulf War (Stanton, 1991). The Association of Pioneer Rescue Officers (APRO) offered their assistance to Iran, which was readily accepted. However, the processing of the APRO staff's visas was delayed because of the political problems between Iran and the UK. In addition to this, there was a serious lack of coordination between the Iranian Foreign Ministry and the Red Crescent. The operation 'Lifeline' which was started as a response to the reconnaissance and assessment works carried out by the APRO also experienced similar political and strategic difficulties. For example, the water purification equipment sent from the UK could be found and taken from the customs only after several meetings with Iranian officials and resorting to a manual search at the Tehran Airport's customs warehouses (Stanton, 1991). The problems with visa extensions, getting equipment and materials through the customs and their transportation to the refugee camps were repeated throughout this operation.

Operational and Technical Dilemmas

The Gigaran refugee camp in the Bakhtaran province of Iran, which was five kilometres away from the Iraqi border, was coping with 150,000 refugees. Water in this camp was mainly supplied by tankers, which was far too inadequate for the requirement. The Red Crescent staff also admitted privately that "...some of the water delivered was polluted but they had no method of controlling the situation". It was also pointed out that "...it was pointless appealing to the international community for field hospitals to treat the sick and yet at the same time avoiding dealing directly with the main cause of the problem", because, 80% of illnesses and deaths were the result of polluted and inadequate water supplies (Stanton, 1991).

RedR suggested that NGOs involved in health projects in the refugee camps should include at least one water and sanitation engineer/technician in their health teams in each site. The United Nations Disaster Relief Co-ordinator (UNDRO) also supported this view by pointing out the importance of sanitation in disaster-stricken areas: "...effective sanitation

is likely to save more lives than immunization. The early concentration on sanitary standards helps to reduce medical needs later on. Lack of adequate sanitation is often the biggest factor in the morbidity rate after a disaster". UNDRO (1982:16) also criticised some agencies on their approach to health issues in disaster-affected areas:

> "The need to give priority to sanitation may seem obvious but in the past many relief agencies, governmental and non-governmental organizations, have spent vastly more on medical relief than on sanitation".

The intense lobbying in the UK, which was initiated by the reconnaissance and assessment report prepared by the APRO resulted in a donation of 9 Stella Meta ST1 Water Purification Units. This equipment had a capacity of treating water to sustain 300,000 refugees for several weeks. However, the main problem with the installation of the first two water purifiers was finding a suitable water resource. The nearest stream to the Gigaran camp was utilized by the THW's water programme, and the next nearest stream was 11 kilometres away. Although the purification of water was done by the installation of the APRO's purifiers at this stream, there were then serious problems with the distribution as there were not enough tankers available for the task. Some of the refugees had suitable vehicles which could have been used for the distribution, but this was not allowed by the Iranian authorities as the refugees could drive their cars outside the camp only to leave for Iraq. This distribution problem at the Gigaran camp was never really solved properly (Stanton, 1991).

On the other side of the border in Northern Iraq, the Mobile Support Team (MST) was a new approach by ODA, who normally help countries in need with financial aid. The MST was a direct action group to give a rapid response to disaster, especially when the UN agencies were uncomfortable with military forces of any type; the ODA was a civilian buffer between the military and the UNHCR. The MST members were initially asked to stay for four weeks; however, on arrival, it was found that the mission had been expected to take three months. Although some of members agreed to extend their stay, a new group of 50 MST members had to be sent to the area . "There was little hand-over between [arrivals] and departees, sometimes complete teams were replaced and continuity lost". The discontinuity between these two groups resulted in significant problems. "The second wave of MST personnel had few apparent difficulties, but continuity of some ongoing work faltered,..." (Pots, 1993:14-19). A RedR engineer worked as a member of MST pointed out

that the four-week assignment time allocated was not long enough for their task to be completed. The main problems with equipment sent from the UK are summarized by him as follows:

- some of the pumps provided were not appropriate for the task,
- certain pipe fittings were limited,
- spare parts for the British made pumps were not supplied.

Therefore technical problems were not only caused because of hold ups at the Turkish border, but also inappropriate materials and equipment supplied to the area (Barlow, 1991).

The emergency intervention for providing clean water and adequate sanitation experienced considerable operational challenges as the international NGOs were unprepared to respond to a crisis like this, and unfamiliar with the local environment. It is reported that, ordering of equipment and materials for projects and their arrival was one of the main concerns.[1] The confused and conflicting management, and the lack of coordinated transport caused long delays during this emergency intervention. An engineer of the MST in Northern Iraq in 1991 was still waiting for the borehole pump switchgear when the team left the area. If there had been an initial appraisal and planning operation, which need not have taken more than a few days for the first procurement schedule, such vital components like capacitors for switching on borehole pumps would not have been omitted. The engineer pointed out that: "...there were a lot of *basics* that could have been anticipated, particularly plumbing tools (taps and dies), pipe, tanks and electrical parts". Another engineer who also worked for ODA in Northern Iraq in 1991 complained about a "headless chicken" syndrome as decisions made in the morning were inadequate by later in the day, which again was the result of the lack of preparedness for this kind of emergency in the area.

Wakeling (1991) was also a member of MST, who worked in a Northern Iraq town, Begova with a population of 6,000 plus 1,000 refugees living in tents. His water situation assessment shows that the town was supplied with water from a 20m deep borehole. Water from the borehole was pumped to a reservoir with an approximate 100 m^3 capacity. This water supply system was facing several operational problems which were:

- the pump required replacing as it was very old,

1 These examples are taken from the Registered Engineers for Disaster Relief, RedR debriefing reports.

- there were numerous leaks through the pumping main,
- many of the houses receiving water did not have taps, therefore when water was supplied which was for very short while every day, it was left running,
- distribution pipes needed to be enlarged to adjust the water pressure level.

These are only a few of the problems which were assessed at this system in Begova. They show that none of them is really a direct consequence of the armed conflict. They were mainly inherited from the pre-crisis era. However, the increase in the population as a result of the crisis made the system more inadequate. Besides, there was also lack of power as the power lines from Zakho to Begova were damaged during the conflict. A 100 kVA generator was used to run the pump at the borehole until the power supply was restored in June 1991. The MST team's intervention in Begova amounted to nothing more than the installation of a number of taps in houses where they had been removed to increase the pressure further down the network, and an Oxfam tapstand with 12 taps and a 1,500 gallon water bowser with 10 additional taps. This shows that the capacity of MST to respond the problems of even a very simple water supply was extremely limited both in terms of time and technicality.

The lack of preparedness combined with political and strategic challenges meant the implemention of such water provision methods which were not adequate, safe or sustainable. The Water and Sanitation for Health Project (WASH) published its field report No.339 on Water and Sanitation Efforts Among Displaced Kurdish Civilians.[2] The report covers Office of Foreign Disaster Assistance (OFDA) and Disaster Assistance Response Team (DART) activities during the early unsettled period of Kurdish displacement and also focuses on the design, construction, and utility of facilities within the Zakhu camp. Swenson conducted an assessment of the water and sanitation conditions of the Isikveren Refugee Camp, where Kurdish displaced civilians were located in Southeastern Turkey. The main water supplies for refugee camps were:

- **Stream Water:** "The stream was difficult to access because of the steepness of the terrain, and the water was very muddy and obviously contaminated by faeces". Lack of preparedness caused the wrong choice for camp location where the river was underground in the gravel bed when it flowed through the camp area, yielding very little.

2 Swenson, R.H., Rahe, T.M., Water and Sanitation Efforts Among Displaced Kurdish Civilians, Prepared for the Office of Foreign Disaster Assistance under WASH Task No.246, WASH, Water and Sanitation for Health Project, Washington, D.C., October 1991.

- **Snow:** The process of transporting snow to the camp, and melting it, was obviously unproductive because fuel was at a premium and water produced by this process was low in volume, and the snow itself was dirty and had an oily smell.

- **Bottled Water:** This third method applied was even more amazing, which was the air drops of bottled water. Many of the bottles were broken upon impact and they were not brought up into the camp area in any large quantity as they were inadequate for 70,000 refugees.

- **Hauled Water:** "Water was beginning to be hauled into the camp area using tanker trucks and 250-gallon water trailers towed by tractors...since the tank lid was not watertight the water would spill onto the road...the road turned into a quagmire...Distribution at first was very unorganized,..."

Personnel and Moral Dilemmas

Most of the MST members were sent to deal with this Kurdish refugee crisis did not have experience in man-made or natural disasters. Only very small number of them had some experience with refugee situations. Therefore this lack of training resulted in the preceding examples of technical and operational problems. Although political and strategic dilemmas also caused considerable delays, the lack of training to deal with this kind of emergencies caused serious setbacks. It is very interesting that firefighters who tend to be well trained because of their jobs, were much more adaptable and flexible to the changing character of the situation in the Northern Iraq. Besides, it was pointed out by Pots (1993:18-20) that:

> "There was a tendency for them to help others rather than be independent, but when independent their abilities and willingness became examples. Their most noteworthy roles were when working as community developers".

For example; while the water supplies for those Kurdish farmers in the Resettlement Village Programme were rebuilt by the military, the MST and Kurdish engineers, "...the firemen helped the villagers to rebuild a social structure with leaders, administrators and planners".

The Technical Support for Refugees Conference which was organized by the WEDC (1993) in 1991 also recommended that:[3]

> "There is no really satisfactory substitute for on the job training, either for nationals or expatriates...In-country training, especially disaster preparedness training is viable and useful".

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3 WEDC: Water Engineers Development Centre, Loughborough University, UK.

Meanwhile, the second discussion group recommended awareness training in the resources available:

> "This should be central in the approach to assisting NGOs and governments...Training should include sensitivity and awareness about the existing local potential and existing social/political situation...Build and disseminate experience between local and foreign workers".

The Action Plan after the relief programme to the Kurdish refugees announced by Mrs Lynder Chalker, the then Minister for Overseas Development, laid three stages for ODA's new disaster initiative:

- rapid assessment of need
- coordination of the relief
- deployment of skilled personnel: the Disaster Relief Teams

The Minister's statement declared (Pots, 1993): "Training is Essential".[4]

On the other hand, the unwillingness, and the lack of sense of ownership among the host countries' staff can make local training a very difficult task in refugee crisis. An APRO engineer, Michael Marchant's experience in the Giragan refugee camp is an example of this. The two Iranians he was supposed to train for the operation of the water purifier did not show any real interest in their task. The whole attempt at training was a failure, as they spent more time doing deals with refugees. Their uncooperative and irresponsible behaviour even caused damage to the equipment at several occasions, as they opened the autopacked air release valve (Stanton, 1991). The other important personnel problem working in a refugee crisis is the lack of cooperation of local authorities. They often find the intervention of international agencies interfering and unsuitable to their system of working. This uncooperativeness can cause serious delays, when a quick response to the situation is a great necessity. Stanton (1991) points out that:

> "Aims that would have taken half the time to achieve had it not been for the interference of petty and arrogant bureaucrats whose constant political squabbles, prejudice and ignorance were the main obstacle to an otherwise successful intervention".

However in some cases, this kind of problems are caused by the international agencies' patronizing behaviour towards local authorities. It should not be denied that the local authorities of host countries in refugee crises tend to bear the real brunt of refugee fluxes.

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4 Pots, Eddie, Ibid.

Therefore it can be claimed that to deal with refugee crises, personalities are as important as skills for a successful relief effort.

3.3 The 1994 Rwandan Crisis

The ICRC reported that there was a great deal of political turmoil caused by the delays in the implementation of Arusha Peace Agreement in Rwanda at the beginning of 1994.[5] The political turmoil gained a different momentum when President Habrayimana of Rwanda and President Ntariyamira of Burundi were killed during their return from the peace talks, when their plane was shot down while coming in to land at Kigali Airport on 6th April 1994.[6] The assassination of the President was followed by a horrifying wave of massacres between the two ethnic groups of Rwanda, the Batutsi[7] and the Bahutu.[8]

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5 After reaching a peace agreement on 'the technical modalities of the peace process' between the Rwandese Patriotic Army (RPA), Parti Libéral, Parti Social Démocrate and Mouvement Démocratique Républicain on 7th June 1992 in Paris, RPA announced that the armed struggle was over. Following this, the actual peace talks started at Arusha in Tanzania and a cease-fire was signed on 14th July 1992 (Prunier, 1995:150).

6 After independence on 1 July 1962, the administrative structure started to change in the Bahutu's favour, resulting in a period of violence between 1962 and 1973 conducted by Batutsi refugees called 'Inyenzi' (the 'cockroaches') based in Uganda and Burundi. It was this turbulent period that created the conditions for Habyarimana's coup d'état in July 1973. Habyarimana's regime on the one hand, achieved a well-managed economy and on the other hand, exacerbated the long-term refugee crisis as the refugees were not allowed to repatriate unless they proved they could support themselves. During his power, the country's infrastructure systems were well implemented such as the provision of water systems which supplied 70 per cent of rural population with safe drinking water. However, the improving trend of economic development in Rwanda was seriously affected by the collapse of the International Coffee Agreement in 1987. As a result, the Rwandese Franc was devalued by 67 per cent having major impacts on living standards, health, and education service provisions. Thus the turmoil of 1994 was preceded by a series of ethnic, political, social, and economic factors which were either created or affected one way to another by policies and interests implemented by the West (Vassall-Adams, 1994; Waller, 1996).

7 In Rwandan language - Kinyarwanda, Ba is a noun prefix that signifies 'people' (Waller, 1996:5).

8 The ethnic problems in Rwanda had a much longer history beginning with the European interventions at the end of the 19th century. Before western colonialism, these two main ethnic groups, land and cattle owner group the Batutsi ruling over the Bahutu who were farmers, lived in a unified manner sharing the same language and culture. Their complex social order originated from an oral mythology which believes the Batutsi's superiority to be ordained by God. Consequently, when Rwanda was formed as a feudal kingdom four hundred years ago, the Batutsi formed the ruling class over the larger Bahutu group - almost 90 per cent of population. In the 1890's German Colonialists governed Rwanda through the ruling Tutsi King and, even after Rwanda was taken over by the Belgians at the end of the WWI, the administration structure was not changed. Keeping the Batutsi monarchy in power required only few external administrators which were a cheap option for both German and Belgian colonialism. In fact, the Belgian governors continued to favour the Batutsi, especially during their forced labour period in the 1930s. The Batutsi were appointed as administrators to supervise the Bahutu labourers. However, the census conducted in 1930 had perhaps the most severe effects on exacerbating ethnic differences as it designated 14 per cent Batutsi and 85 per cent Bahutu populations, based on a classification of people according to the number of cows they possessed - owning more than 10 cows meant being registered as a Tutsi.

It is described by ICRC (1994) that:

> "Armed militia groups led by extremist politicians systematically set about eliminating anyone who did not support their cause, principally people of the Tutsi ethnic minority, but also moderate Hutus. The Prime Minister was executed in the first few days of the violence, along with the United Nations soldiers guarding her...The capital, Kigali, was plunged into total chaos. Killings, generalized looting, and lawlessness were the order of the day".

By 12 April 1994, 10,000 people had lost their lives in massacres and, during the following week, massacres were already spread to the south and west of the country. Vassall-Adams (1994:37) describes a horrific picture of ethnic conflict:

> "Across Rwanda, the story was the same. Defenceless men, women, and children were being cut across the neck with machetes, and beaten to death with hoes and iron bars. There are several accounts of victims pleading to be shot, rather than face the terror and agony of being cut to death. Those in danger did their best to flee, but the killers respected no sanctuary; militiamen sought out victims in churches and hospital wards".

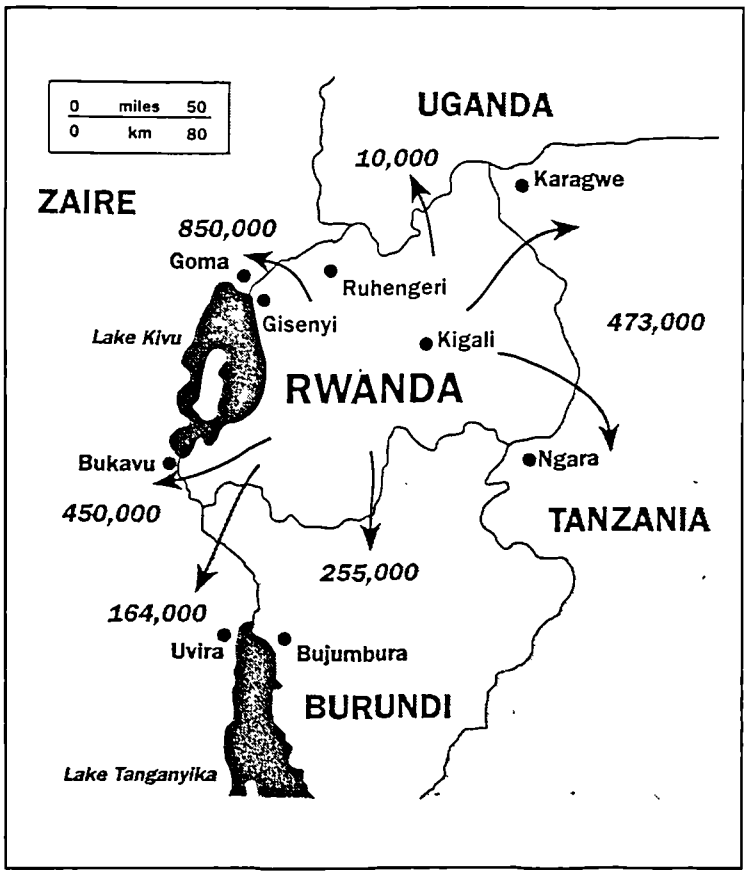

Figure 3.3: *Movements and numbers of Rwandanese refugees since April 1994 (Source: Vassall-Adams, 1994:40)*

The ICRC's 1994 Annual Report shows that 2,000,000 Rwandese fled to Zaire, Tanzania and Burundi and a further 500,000 people were displaced within the country. Movements and numbers of refugees since April 1994 are shown in Figure 3.3.[9] The vast majority of refugees were deterred from going back to their homes by the Interehamwe leaders and officials from the previous government (ICRC, 1994; Boyle, 1995; ICRC, 1995).

9 These numbers of refugees and their movements were taken from the UNHCR.

Political and Strategic Dilemmas

The Goma influx in July 1994 was one of the most unprecedented refugee crises ever experienced in the world because of its scale, rapidity and geographical concentration. Approximately 850,000 Rwandese refugees, over a period of four days, poured into the North Kivu provinces of Zaire, between Goma and Katale. See Figure 3.4. It is pointed out that (Millwood, 1996:35):

> "...much of the terrain is waterless lava fields, and the distance to the planned (but still unequipped) site at Katale was too great for many of the refugees: hundreds died of dehydration during the long walk up over the lava fields towards Katale, whilst tens of thousands decided to settle at Kibumba, a wholly inappropriate location, 27 km from the nearest water source, Lake Kivu".

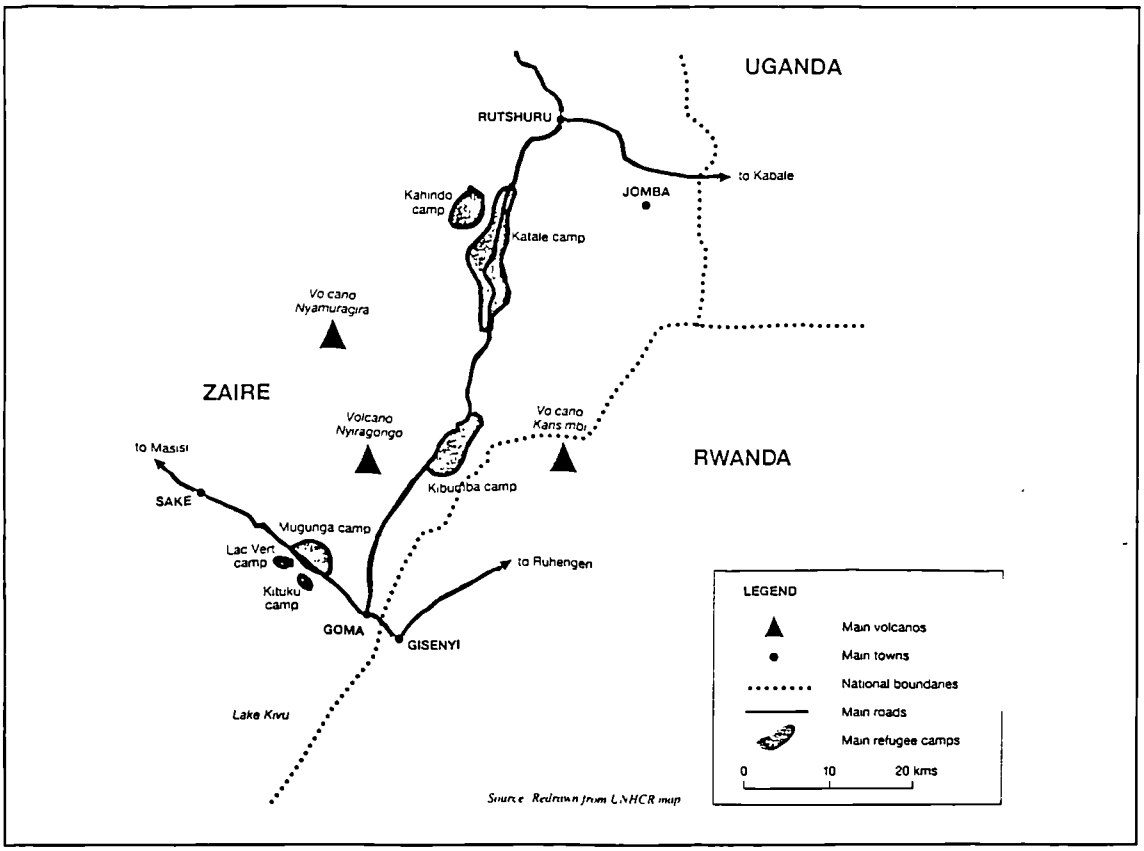

Figure 3.4: *Camps in the Goma area (Source: Millwood, 1996:36)*

The condition of refugees near Goma was described in a RedR report as follows:

> "The refugees are exhausted, dispirited and lack basics such as adequate living space, food, sanitation and clean water. The massive outbreak of cholera in an endemic area is, in retrospect at least, hardly surprising. Katale Camp with 250 cases reported in half a day on 23.07.94 against 50 cases on 21.07.94 and five the day before".

It is pointed out that: "...in Goma 100% of the refugees were infected with cholera within 2-3 weeks". Consequently according to Millwood (1996:69),

> "Almost 50,000 people (between 6-10% of the total refugee population) died during the first month after the influx, principally from cholera and dysentery, which began a few days later".

It should be noted that only Katale Camp had readily available water, which was a stream running alongside the camp, where Oxfam started water production within a few days of the influx. The other northern camps had no water nearby "...the refugees from the Kibumba Area have to walk up to 20 km either north or south to find water....Within Goma Town and in the western camps, water is drawn directly and untreated from Lake Kivu (in which there are dead bodies)" (RedR, 1994). According to Millwood, Oxfam initially refused to develop water systems in Kibumba Area because of the inappropriateness of location and suggested the Kahindo site for a new camp site. However, this was not accepted by other agencies which made water tankering only option for the Kibumba camp. Consequently, "Kibumba alone required a tanker fleet capacity of 600 cubic metres, which was equivalent to 30 tankers of the common 20-cubic-metres capacity operating throughout daylight hours".

Hayes, a RedR engineer working for Oxfam to provide safe drinking water to Rwandanese refugees in Tanzania, quantifies the magnitude of this influx of refugees.[10] There were 360,000 refugees in Ngara and 90,000 in Karagwe camp, putting enormous pressure on available ground and underground water resources. The project implemented to overcome the lack of fresh water resources in the area included the treatment and transportation of water from the Ruvubu River, more than 30 km away, which was the nearest reliable source. The water situation in the Karagwe camp was similar: inadequate ground water and insufficient surface water resources. Therefore, water for the camps was pumped from two large lakes 15 and 25 km distant. Finance of these water supply solutions was one of the major constraints in the relief operation. The proposal for piped water supply to Benaco camp, in Tanzania, would involve a 10 km pipeline from the Ruvubu river. This would cost US$ 5.1 million but the Tanzanian Government does not wish the camp to become a long-term settlement and has been reluctant to give support. Funding was also unavailable to

10 From the Questionnaire 'The reconstruction of water supply systems in post-disaster areas' conducted with RedR engineers by Alp Ozerdem in 1996.

date (Millwood, 1996:77-78).

Operational and Technical Dilemmas

The ICRC's involvement with the rehabilitation of water supplies in Kigali (the schematic diagram of Kigali Water Supply is shown in Figure 3.5) during and after the 1994 war in Rwanda faced several operational and technical dilemmas. The first assessment visit to the Kigali water treatment plant could not be carried out before the end of July because of security reasons. According to the information obtained from local staff, the amount of water produced by the main Kimisagara treatment plant was reduced from 1,000 m³/h to 250-550 m³/h. The main causes of this reduction can be categorized as:

- The treatment plant was completely dependent on electricity, supplied by a standby generator as the main power lines from the Mukungwa hydropower station were damaged. There was only enough power to run two out of five pumps at the treatment plant as some power was needed to run two water pumps at the town centre or one of the backwash pumps at the treatment plant.
- The main water intake was on the other side of the front line; consequently, an old intake system which was an open conduit at a rate of 375 m³/h was supplying raw water.

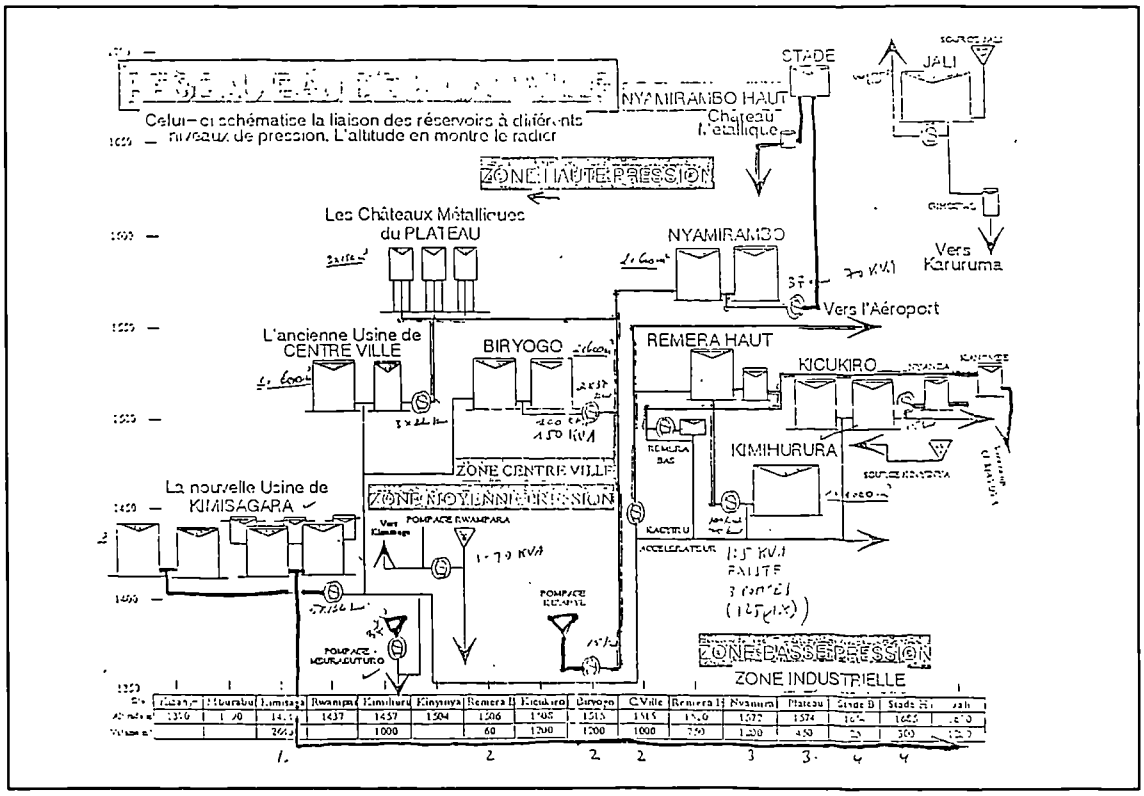

Figure 3.5: The schematic diagram of Kigali Water Supply

After control of Kigali was taken by the Rwandan Patriotic Front army on July 4th, the security situation in the town improved which allowed the first assessment to be carried out. The assessment was followed by cleaning of water intakes which returned the amount of water sent to the treatment plant to 550-600 m^3/h. The eight rapid sand filters were also backwashed by using extra power supplied by an ICRC provided generator. Although all these activities were carried out in a short period of 3 months, logistic problems of working in war-affected areas caused serious set backs. For example, the daily consumption of fuel by the various generators was around 3,000 litres, which the ICRC tried to supply in two deliveries of 30,000 litres. However, this supply of fuel could not last more than 20 days.

Meanwhile, a total of 50 MT of aluminium sulphate had to be supplied for the continuation of water treatment. Therefore the work to rehabilitate power supplies had to be started as early as possible. By the end of August necessary repairs were carried out at the Mukungwa hydropower station, as well as the installation of three new electrical generators at the various pumping stations. It was reported by the ICRC (1995:126-129) that water distribution in Kigali was back to 'normal' by 26th October 1994. Although it is not clear what 'normal' really means from this report, it can only be assumed that water had started to be distributed at its pre-war level.

On the other hand, the experience shows that urban water supplies in developing countries are affected by technical and institutional problems even in peace. Therefore aiming at returning to pre-war water provision level would not necessarily mean providing adequate and safe water to war-affected people. The criticism here is not directly on the ICRC's good intentions during this intervention in Kigali, but it is the common shortsightedness of many agencies in their post-war water supply programmes. The return to 'normal' can mean the provision of an inadequate supply of unsafe water.

The following experience in Kigali is given to elaborate the preceding point. A RedR engineer, Ryan (1994) who worked on the rehabilitation of Kigali water supply in 1994, examined the condition of scheme and made recommendations on how to restore a regular supply to all areas of the town. According to Ryan, "The single most urgent requirement at the treatment works and at the pumping stations is the restoration of a continuous power supply". Although there was not any major damage at the treatment plants, the lack of

chemicals caused dissatisfaction in the operation. It was also pointed out that adequate provision of water testing to monitor the quality of water is essential. Consequently, the WHO was approached for the provision of a laboratory to carry out necessary water quality tests. The extent of leakage could not be ascertained either, until a consistent power supply was restored.

He concluded that the reduction in the quantity of water and the area served by the scheme was due to a combination of inadequate power and leaks in the distribution system. The recommendations to improve water quantity and area served were categorized as immediate, short-term and long-term. The installation of generators at the main water treatment plant was called for as an immediate action, and also at the main pumping station to provide backup as well as installing tanks at sites in the areas of town not currently getting any water supply. The filling of these tanks by mobile tankers was suggested. The recommendations for short term concentrated more on the assessment of leakage and the repair of the system. For example, carrying out a leakage survey of water distribution system, the restoration of original sources of power, the repairing or replacement of defective valves, motors, etc. Meanwhile, the repairs to the distribution system according to the findings of the leakage survey, and the repairs to the national grid, were recommended for the long-term (Ryan, 1994).

Personnel and moral dilemmas

Ryan's report also identifies several personnel dilemmas experienced during this mission. First, the detailed drawings of the water supply could not be obtained as the local water board, Electro-Gaz was not able to provide them. The whole assessment was carried out by using a large scale drawing of the network, visual inspection and information obtained from present and former employees of the water board. However it is pointed out that "The author's lack of fluency in French, the unreliability of transport and the unavailability of key personnel were other drawbacks...".

Boyles (1995) who is also a RedR engineer, worked on the provision of emergency water

supplies in Nzangwa, Burenge, Rutonde and Nyuragenge camps in South East Rwanda.[11] His experience at personnel level points out the importance of being able to speak the local language and the training of conflict-affected people for operation and maintenance of the systems implemented by international agencies:

> "Initially, to overcome language problems, the team sought English speakers and were lucky to find two Burundi students who, although young, were able managers. Local Rwandans were also employed and it soon became apparent who among them were the organizers...Some had been in the Rwandan military and were capable of achieving agreed work targets...With plant and personnel spread out over seven kilometres, delegation was essential. The workers chosen for training were eager to learn, able and totally committed to their jobs".

After the growth in the number of these camps as a result of the 1994 Rwanda Crisis, these trained workers according to Boyles, "...are now in other camps using their skills to provide water supplies with Oxfam".

Although Hayes (1994) worked on an assignment to UNHCR Kayanga, Tanzania to assess the condition of roads for Rwandan refugees, his experience at personnel level should also be pointed out here. He first of all criticizes the involvement of large numbers of press and unqualified staff who he calls "disaster tourists" as a response to the crisis, while "The UNHCR office at Ngara was understaffed and overcrowded from morning to night". Secondly, the lack of transport reduced his effective working days to five though his mission was for two weeks. Finally, he points out the absence of professional expertise in the planning of interventions. For example, "...an experienced civil engineer was not involved in any of the negotiations with the Italian construction company who were carrying out the site development work for UNHCR".

3.4 The Phnom Penh Waterworks[12], Cambodia

The involvement of Oxfam in the improvement works of water supplies in Phnom Penh,

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11 Approximately 100,000 Burundi Hutu refugees were accommodated in these camps after the 1993 military coup attempt which rekindled an ethnic conflict between the Hutus and the Tutsis in Burundi.

12 The evaluation report of the Phnom Penh Waterworks (KAM 021) was obtained from Oxfam, therefore it should be pointed out that the author considers this as an excellent example of sharing lessons learned in the field - whether they are positive or negative. The evaluation was carried out by Peter Robertson as Team Leader and Dr Adrian Coad, Technical Specialist from 16 May to 2 July 1994.

Cambodia started in 1979 and covered a period of thirteen years.[13] The time period can be divided into three main phases according to the level of support provided to the Regie des Eaux (RdE), Phnom Penh Municipality to improve quality and quantity of water supplies:

- Emergency Response from 1979 to 1981,
- Ad hoc Support from 1981 to 1986, and
- Rehabilitation of the Phum Prek Waterworks from 1986 to 1992.

Political and Strategic Dilemmas

Oxfam's initial involvement in Cambodia started in mid-1979 to provide support for an airlift of food and medicines after the West became aware of shortages and the people's suffering caused by Khmer Rouge regime.[14] The first assessment was carried out by Jim Howard, also included the Phum Prek Waterworks.[15] Meanwhile there was tremendous media interest in Cambodia, which attracted great public attention and resulted in a doubling of Oxfam's annual budget to £23,8 million. Fifty per cent of this budget was allocated for Kampuchea (Oxfam, 1994:10).[16]

The involvement of Oxfam during the emergency period is evaluated by Black (1994:234-235) stating that:

> "...There were over-expenditures, there was operational confusion; there was political naivety; expectations of Oxfam's partnership with government were misplaced; above all there was a failure to recognise what pressures such a vast, unprecedented programme would place on Oxfam and expand administrative capacity fast enough to meet them. There had been great strains within Oxfam during much of the emergency period".

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13 Cambodia gained its independence from France in 1953. From 1955 to 1970, Prince Sihanouk kept Cambodia neutral though there were escalating wars in Vietnam and Laos but he was ousted by Marshal Lon Nol in 1970. After the coup, Prince Sihanouk formed an alliance with the Khmer Rouge in China (Willem, 1995:5).

14 The Khmer Rouge is a radical communist guerilla movement which captured Phnom Penh from the US backed Marshal Nol Pol and setting up an agrarian society causing the death of over 1 million people because of hunger, disease and overwork. Some of the defectors formed another movement called Khmer People's Revolutionary Party (KPRP) in Vietnam. After the attacks on the Cambodia - Vietnam border, Vietnam invaded Cambodia in late 1978 helping the KPRP to form the new regime. The KRPR changed the country's name to the People's Republic of Kampuchea at this time but the country was renamed to Cambodia in 1991 (Willem, 1995:5).

15 Jim Howard was the head of the technical unit of Oxfam.

16 The journalist John Pilger's Daily Mirror articles and TV program 'Year Zero' are only few examples (Oxfam, 1994).

It should be pointed out that Oxfam managed a £22 million emergency programme on behalf of an NGO consortium and consequently the works carried out to improve water supplies were only a small part of their general involvement during the emergency period in Cambodia.

According to the evaluation report, the period from 1981 to 1985 was occupied by the provision of ad hoc support such as spare parts, tools, and chlorine gas. A series of events in late 1983 brought new focus to Oxfam's involvement leading to a full rehabilitation of the Phum Prek Waterworks. Firstly, there was no interest from other agencies to get involved in this project. Secondly, the western governments were refusing to recognise the regime in Kampuchea and therefore their support was out of question. Finally, World Vision was interested in funding some projects in Kampuchea. It is pointed out that:

> "...World Vision had underspent their international budget of the previous year and 'were looking to improve their image' but were hampered by the US Congress, Trading With the Enemy Act".

Therefore it was decided that World Vision would fund Oxfam on the condition of "no publicity...and no strings attached" to rehabilitate the waterworks of Phnom Penh. Meanwhile, the unfortunate developments in East Africa made this financial agreement unnecessary. The 1984 famine in Ethiopia and Sudan increased the Oxfam's funds to £50 million which consequently made Oxfam able to fund the rehabilitation programme in Phnom Penh itself. Therefore ironically, the suffering of people in one part of the world resulted in the flow of funds to be used in the other. The initial five year budget of this programme was £500,000 but in total £1.2 million was spent on the project (Oxfam, 1994:11-18; Ockelford, et al., 1995:20).

Operational and Technical Dilemmas

After the second assessment in November 1979, which focussed specifically on the waterworks, a laboratory was established to monitor water quality.[17] The Phnom Penh water treatment facilities are shown in Figure 3.6. However the municipality was more concerned about the reliability of water flow. Consequently, Oxfam provided a back up

17 This assessment was carried out by a microbiologist called Dr Barry Lloyd.

pump for the three raw water intake pumps in June 1981. This shows the lack of consultation and cooperation between Oxfam and the local board. It seems that Oxfam had aimed to improve water supplies in Phnom Penh according to their own agenda without any regard to the local experience. It was noted that:

> "...the distribution system was in a very poor state of repair with illegal connections, open pipes and consequently numerous opportunities for back flow of waste water into the system. Electricity restrictions limited the pumping of water to 12 hours per day".

Therefore the water supplies in Phnom Penh were affected mainly by inadequate operation, maintenance, funds, and power.

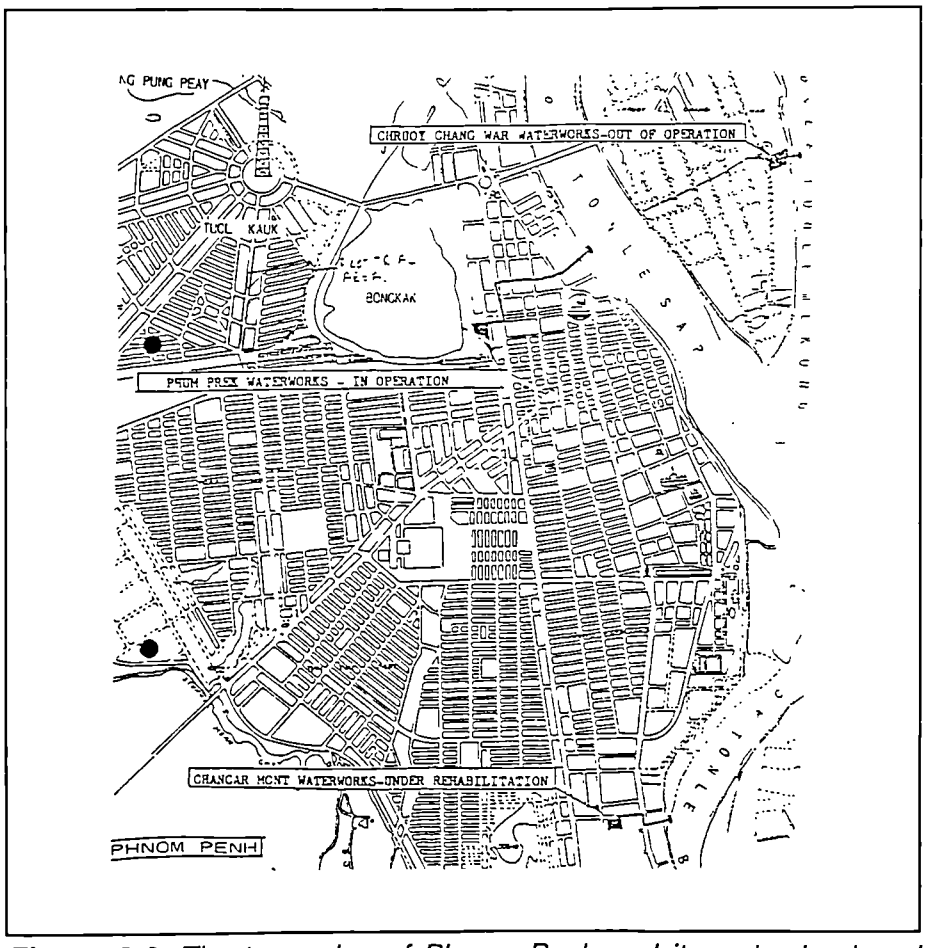

Figure 3.6: *The town plan of Phnom Penh and its water treatment facilities (Source: Oxfam, 1994)*

The main concentration during the rehabilitation process was on the treatment facilities, as the aim was to supply 'safe' drinking water.It was explained that:

"By 1992, the flash mixer motors for alum dosing had been replaced and/or

> repaired with new lines and alum pumps installed. All twelve flocculation motors were replaced along with three of the twelve flocculation paddles, so that all flocculators were operational".

While all these repairs and replacements were carried out at the treatment process the filtration process received limited attention. The report points out that "The twelve filters which were in serious state of disrepair in 1986 were not much better in 1992". In addition, the distribution system was not included in the rehabilitation programme at all. From the Municipality's point of view, the most important benefit of the project was that it ensured a reliable flow of water by the four raw water intake pumps. However it should be pointed out that the works at the water intake were mainly carried out during the emergency period, as is mentioned earlier. Therefore what the local municipality considered the most beneficial was the outcome of emergency period not the rehabilitation programme.

Overall, the involvement of Oxfam with the Phum Prek Waterworks for 13 years resulted in a supply of safe drinking water from treatment process to distribution system. However, the distribution system was not included in the rehabilitation programme, consequently, the quantity and quality of water are bound to be affected by the leakage in the distribution system. Therefore, the aim of the project 'to ensure safe drinking water' was not matched by the outcome. If the aim was 'to ensure supply of safe drinking water for distribution to residents' then it could have been claimed that the outcome of programme met its initial objective. This demonstrates the need for a more holistic approach towards urban water supplies if the aim is to provide safe drinking water supplies. According to the evaluation report:

> "A key lesson from the Phnom Penh Waterworks,...is that Oxfam's institutional capability and capacity needs to be realistically addressed in the strategic decisions that are made in the identification and formulation of large scale projects and programmes".

In addition, special attention should be paid to the framework of technology transfer which requires appropriate technical and administrative staff for effective implementation. On the other hand, it is also essential to think about these technologies' operation and maintenance once the implementing NGO pulls out from the area, which means that there should be adequate means of training and enablement of local authorities to ensure the sustainability of implemented programmes.

Personnel and Moral Dilemmas

Apart from Oxfam's involvement, there was a brief period when World Vision was involved in provision of spare parts and chlorine gas on an ad hoc basis. During this period there was an interesting attempt as a joint work between Oxfam's technical assistant and a representative from World Vision to establish a new water testing method that does not require outside inputs. However, the evaluation team could not find any document showing whether this new method was tested. It should be pointed out that it seems rather peculiar to have such an attempt like testing a new method in a situation where people's safe water needs are very urgent. Although it is sometimes inevitable to try new technologies when the old ways do not work or are inadequate, this should be done by bearing in mind certain aspects of a water system such as operation and maintenance. Therefore this is another example of the inadequate approach some 'experts' can have with their way of handling water issues in war-affected areas.

Through the evaluation report, there are quotation from different people giving different figures for the town's population. For example, the Project Application Summary Form mentions "the health of 600,000" while the other reports read: "improve the health of the 800,000 residents of Phnom Penh City", "to ensure safe drinking water for an estimated urban population of 700,000". It is also pointed out by the evaluation report that the figures quoted for the population of Phnom Penh varied from 500,000 to 700,000 "depending it seems on the whim of the author" (Oxfam, 1994:17). To estimate a war-affected town's population can be a very difficult task because of internally displaced people and refugee movements. However it should not be forgotten that the estimation of population needs to be as accurate as possible, as the planning of water supplies at least theoretically, has to be done according to the number of people to be served. On the other hand ironically, it should be accepted that the planning of systems is often done according to the availability of funds but not the needs of war-affected people.

In addition to the physical improvements achieved by this programme the improvements in non-physical aspects are detailed as: "Oxfam Technical Advisers left behind a number of staff - technicians, artisans, labourers and a couple of engineers whose technical skills and practical experience of operating a Waterworks had developed considerably over the

period". In summary, the staff left behind were "...capable of at least knowing what to do, if not why and when". Therefore the future sustainability of the system was left to the technicians who can only operate on a day-to-day basis but not maintain it. The training of local staff should have not only consisted of basic technical knowledge, but also the knowledge of implementing necessary tasks at the right time to ensure the sustainability of the system.

The key points regarding the rehabilitation of Phnom Penh Waterworks by Oxfam are summarized as (Ockelford, et al., 1995:20):

- the support after 1985 was approached from a civil engineering point of view;
- the major objective was to improve health, but this was not looked at holistically;
- there were basic differences between Oxfam's objectives and Regie des Eaux's objectives;
- it was an ambitious and unusual programme for an NGO.

3.5 Examples from Bosnia-Herzegovina

Political and Strategic Dilemmas

The war in Bosnia created a divided Mostar, both physically by the River Neretva and politically, Bosnian Croats and Muslims living at the western and eastern sides of the river respectively. According to Mehmed Sarić, Manager of East Mostar Water Supply (9 March 1998, Mostar):

> "After the supply was cut off by the Croats on 9 May 1993, the population in East Mostar was supplied with 3 - 5 litres of water per day for 430 days. Consequently, many inhabitants were obtaining their water from the River Neretva. They were not only exposed to the danger of water-related diseases, but also they became easy targets to sniper fires from the West Mostar".

A temporary supply to relieve the water shortages faced on the eastern part of the city was implemented by a joint work between the ODA and EU Task force engineers. Hardman who worked for ODA Emergency Engineering Unit (EEU) in Mostar from March to September 1995, also points out that:[18]

18 From David Hardman's response to the questionnaire survey , 'The Reconstruction of Water Supply Systems in Post-Disaster Areas'.

> "Water source (surface water) was not a problem. The problem was to provide basic service levels by using existing infrastructure, as quickly as possible after hostilities ceased, to the entire population of East Mostar...Therefore the main constraint was political".

Meanwhile the joint programme between the ICRC and British Red Cross (BRCS) involved in repairing distribution systems in both sides of the town progressed very slowly because of two major factors. First, the truce between the Muslims and Croats was not quite settled, therefore there was a hesitation about investing money on easily destroyed installations. Second, there were problems with the cash-flow from donors to the NGOs involved in the programme. For example, the grants to the BRCS did not get approval from the donor before the end of June and then the procurement and delivery of supplies took more than a month from Croatia and Italy. It is concluded by Hodgson (1997:35) that:

> "Although the BRCS programme continued for two years and achieved most of the physical objectives, it is disappointing that the ultimate aim of reuniting Mostar water systems (and populations) took far longer than at first expected. There was little progress by mid 1995; at this time, East Mostar residents still experienced interruptions to water supplies for 22 out of 24 hours".

In 1997 water is supplied to East Mostar 24 hours a day, but the political constraint still continues to threaten the continuous flow of water. Whenever disagreements between the two sides go out of control, the Croats close the water supply valve at its source leaving the east side of the town without water (Kurt, 1997).[19]

Gorazde also experienced severe water shortages during the Bosnian civil war.[20] Starting from 1992, for three and half years the town was besieged by the Serbs until the Dayton Peace Agreement. The town's water supply was cut off during the siege as the Serbs simply closed a water valve, and ironically this crucial point was not included in the peace deal. Afful who worked on several ODA - ECHO funded water supply rehabilitation projects in Central Bosnia for six months in late 1993, explains that although fresh water

19 Tajma Kurt who is on the MA in Post-war Recovery Course in York, comes from Mostar. This is from the author's personal communication with her.

20 Gorazde covers an area of 383 km² and it was one of the 'safe' areas created by the UN to protect a population of 60,000 with an 80% of Muslim majority (Malcolm, 1996:251-256).

sources were often available, the problem was due to a fragmented population.[21]

> "It was rarely possible to pipe water from the original sources to the areas of need". As the preceding Mostar and Gorazde examples pointed out, the withholding of water sources was often implemented by warring parties in Bosnia. It is further pointed out that "Also pumping water across front lines was close to impossible".

The ethnic differences caused similar problems during the rehabilitation of water supplies in Sarajevo. Parker's six month mission as a RedR engineer, working for the British Red Cross on the Jahorina-Brus Gravity Water Supply experienced several operational and technical obstacles caused by these exploited differences.[22] The goal of her task was to restore water flow in the system to its pre-war levels by carrying out basic repair techniques for cast iron pipes and replacing centrifugal pumps. The local authority engineers assisted her with the implementation and maintenance; however she points out that the local authority in Pale (Serb) tried to divert part of water away from Sarajevo. She further emphasises the importance of political issues in this project:

> "...the political issues were very strong. I had to persuade Serb staff to repair a water system serving a Muslim part of Sarajevo. The Serbs wanted part of the water themselves to boost supplies to Pale, which had an enlarged population. It was a matter of persuading them to work and not saying outright they would not have the water themselves".

Operational and Technical Dilemmas

The ODA-EU project was to supply water by pumps through 1100m long, 150 mm diameter twin pipes to an existing header tank. Although it was completed before July 1994, the project did not bring the benefits expected because of the severe leakages in the distribution system. Meanwhile the repair work to the main water supply stations which was undertaken by the THW experienced an interesting dilemma about using materials and equipment from local or international suppliers. It was not really that local suppliers were particularly expensive but it was international suppliers' willingness to enter the market. It is stated by Hodgson (1996) that:

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21 From Jo Afful's response to the questionnaire survey, 'The Reconstruction of Water Supply Systems in Post-Disaster Areas'.

22 From Jo Parker's response to the questionnaire survey, 'The Reconstruction of Water Supply Systems in Post-Disaster Areas'.

> "It seems that, under the previous communist system, Mostar Water Board (Vodovod) had been tied to particular suppliers. Where possible these were used again and found to give good service at reasonable cost. One surprise was that suppliers from elsewhere in Europe entered the market with offers that could only be loss-leaders, which placed the agency concerned in a quandary".

During the author's field visit to Mostar in March 1998, both Sarić and Denan Šabanović, a mechanical engineer from East Mostar Water Utility Company, supported Hodgson's preceding claim. It was pointed out that some of the suppliers' offers seemed to them "too good to be true" too, but the utility company which had to overcome the challenge of establishing a completely new water supply for the east side was not in a position to turn them down. As the pre-war water sources with a capacity of 1,100 l/s were in the west Mostar, the east Mostar Water Company initiated the construction of several water wells in July 1994.

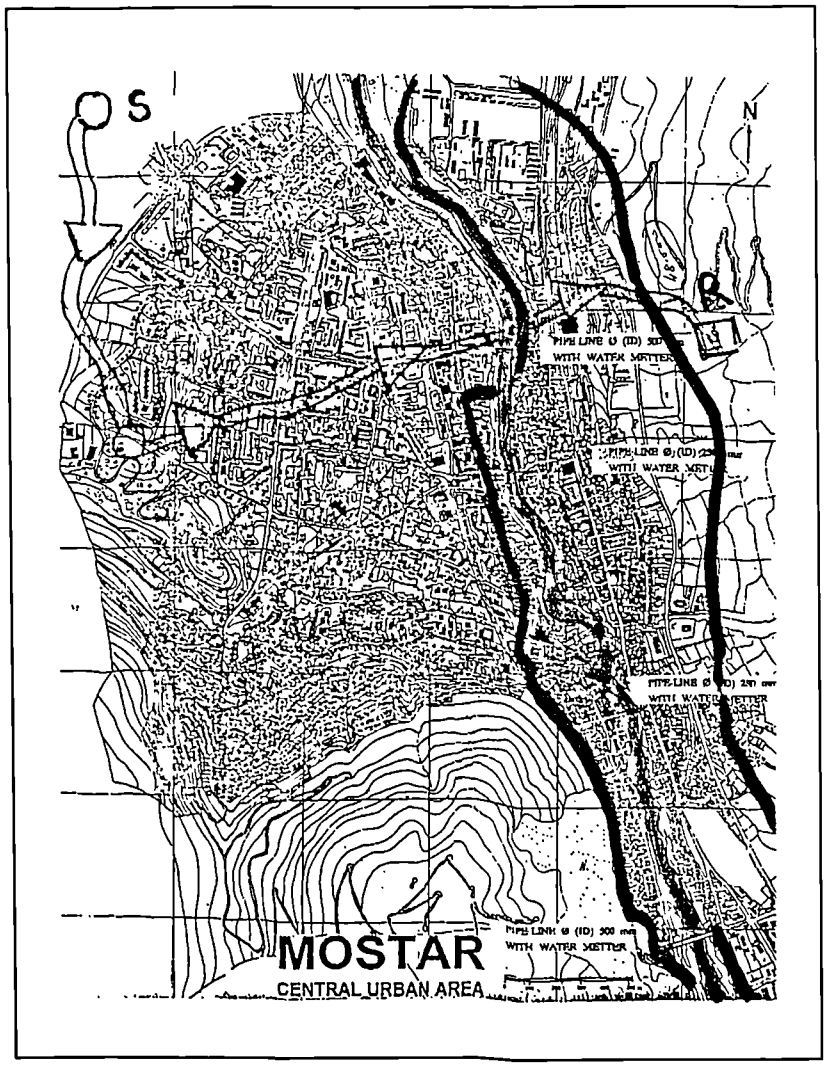


Figure 3.7: *The east Mostar waterworks which were constructed since July 1994 (Source: Author)*

The east side now obtains its water from five different set of sources such as four boreholes in Grabcić, five boreholes in Vrapõići, a water intake at the Spring Bošnjaci, the River Neretva and three boreholes near to Blagaj. The the map of Mostar is shown in Figure 3.7.

The area designated with red colour indicates Muslim-controlled East Mostar, while the rest of the

town is under the control of Bosnian Croatians. The above mentioned areas for new water sources for the east side cannot be indicated in this map as they are either in further north, or further south of Mostar. However, the River Neretva is indicated with blue colour, and the yellow colour highlights the route of the East Mostar Water Supply before the war.

The main shortcomings of the present water supply system in east Mostar are the lack of reservoirs which result in the direct pumping of water from the sources to the distribution network and the high level of leakage from the distribution network. It is explained by Sarić, et al., (1998) that the system faces "...undesirable increase in power consumption per flow unit" because there is no reservoir to regulate the pressure of water. In addition to this, the high level of leakage from the distribution network means large quantity losses and water quality problems. The causes of poor water quality in the suburbs of east Mostar is pointed out as the technical incompleteness of the system and illegal tapping.

On the other hand, operational and technical dilemmas in Gorazde were much more overwhelming. According to Pomfret's article in the Washington Post on Sunday 13 October 1996, the first attempt to alleviate this water shortage came from the French government who granted US$ 1 million to Action Against Hunger, a French NGO, to purchase a treatment plant from a French water company called Lyonnaise des Eaux.[23] The intention was to pump water from the River Drina to the town after going through this treatment plant. Although the project promised a reliable water supply before October 1996, it is pointed out that: "But it remains essentially dry". Following this, it was claimed by the Action Against Hunger that the work was progressing slowly because they could not obtain permission from the government, but estimated that implementation would start in December, supplying water in January. On the other hand, the local authorities pointed out the difficult winter working conditions in this region, demonstrating that the agency's claim was very badly assessed and took little account of the local environment.

Meanwhile, the ICRC tried to increase the project's speed by testing the distribution system using water pumped first from the river to an unused cistern then into the system. A Red Cross official described what came out of the taps as "Chocolate ran from the pipes for the

23 The article is called 'Gorazde's water woes typify obstacles facing nation' and obtained from the web site: bosnet-digest@applicom.com on 14 October 1996.

first week"; this was followed by improvements made to the quality of water which delivered: "...water that is safe for washing for about an hour a day" (The Washington Post, 1996).

The delays with the French agency's programme had encouraged another Red Cross attempt to solve the water problem at a cost of US$ 500,000 by converting an old factory on the outskirts of town, which already had a sand filtration system and pumps. However the interest expressed by donors from Saudi Arabia brought a different perspective to the project, the Saudi donors agreed to provide US$ 2 million for almost the same project. Consequently, the ICRC pulled out its team on 3 October 1996 as result of the local officials' opting for "the less efficient, more lucrative Saudi deal". It is concluded in the Pomfret's article (The Washington Post, 1996) that:

> "A Western expert predicted that minus the ICRC's expertise, Gorazde will have no water until next spring at the earliest - almost two years after the end of Bosnia's war".

The piped water supply is also important to prevent war-affected people from being exposed to direct shelling when they try to obtain water from public standpipes and wells. For example, the Teresija 1 water tank which was constructed by UNICEF in Sarajevo to provide water to 10,000 people in Bistrik at a cost of 70,000 DM did not only provide water but also reduced the risk of being shelled or shot at by Bosnian Serb soldiers from the overlooking cliffs as 61 year old Bristrik resident, Mr Ramiz Vraco explained. The UNICEF's other activities to improve water supplies in Sarajevo included:

- The distribution of 3 million individual purification tablets in the summer of 1993.
- The provision of chlorine powder, which is less dangerous to transport in a war zone than chlorine gas.
- The installation of 110 hand pumps as a precaution against power cuts.
- The installation of solar powered purification pumps for the two hospitals.

Farooq Shamsul, UNICEF's Senior programme Officer for the Former Yugoslavia claimed that 70% of Sarajevans had direct access to clean water as a consequence of the UNICEF's inputs in the area. However, Shamsul pointed out that UNICEF will continue their efforts in Sarajevo by carrying out an extensive needs assessment of the damage and costs before letting big donors, "...like the World Bank and other more specialised agencies undertake the costly repair of the water and sewage systems of the city" (Stoullig, 1995).

Since 1995, various international organisations were assisting the local water utility company for the improvement of water supplies in Sarajevo. However, Fahrudin Pilavdžić (1997:97-98), General Director of Sarajevo Water and Sewage Utility Company pointed out that the need for external funds to initiate further rehabilitation programmes is still urgent as the utility company can only generate enough income to cover some of operation and maintenance costs. He urged the international community:

> "Expectations that serious works will be (*sic.*) [would have been] executed in 1996 did (*sic.*) [were] not realized. The hope that EC, the World Bank and other donor will finally realize the most urgent projects - tenders in this year still remains (*sic.*)...This year [1998] brings insecurity, because there are demands for big investments and we cannot influence on potential source of financing. It should be stressed that even if all these announced investments would be realized, they would present only [in]significant participation in total costs of this Company, especially in water supply and sewerage systems maintenance and in reliable operation of [the] wellfield Bačevo".

It can clearly be seen from the preceding situation analysis made by Pilavdžić that the long-term sustainability of water supplies in Sarajevo still faces big challenges. Considering that the level of water losses from the distribution network is around 50 % and water charges can only generate 20 - 25 % of the needed funds for reconstruction and maintenance costs, the local utility company will require the continuation of international financial assistance for the coming years. However, the question is how long this assistance will continue and how the local utility company will manage to generate adequate funds for the operation and maintenance, once the international assistance is over.

Personnel and Moral Dilemmas

Parker's involvement in the rehabilitation of water supplies to Sarajevo points out extensive personnel dilemmas. First, she was working on her own with the assistance from the Serb local authority, and second she did not receive any technical back up from her organisation. Consequently she experienced extensive organizational problems. She explains:

> "No one back in Belgrade to deal with purchasing so I had to travel backwards and forwards. ICRC transport not designed for technical projects".

It is also pointed out that the British Red Cross, which was the NGO which sent her to this mission was not aware of its capacities and weaknesses before taking on this project. There

were also further personnel problems caused by lack of coordination between NGOs working in the same area. For example, "UNICEF turned up at the local authority with chlorine powder. I did not even know they were working there".

The most important problem with the repair works in Mostar was also to find skilled workers, a problem illustrated in the examples of Kigali and Phnom Penh. Besides, local engineers working for the project did not have access to their pre-war offices, and most of the drawings were destroyed during the war; consequently there was a lack of knowledge about underground installations.

Experience in different parts of Bosnia and Herzegovina shows that the lack of skilled personnel is not only a problem for interventions taken during the war, but also post-war periods. There are several reasons behind this shortage such as being injured, killed or displaced, which are also reasons for the lack of skilled workers during the war. However, it is also a fact that skilled water supply personnel tend to be attracted to better financial prospects provided by international organisations. In regard to his organisation's primary shortcomings, Mirsad Nazifović (1997:40) from the Sarajevo Water Utility Company stated that:

> "Low salaries, bad prospects in future lead to departure of skilled labour, necessary for normal operation of companies".

As a result of the above reasons, many public utility companies in Bosnia and Herzegovina experience trained staff shortages. For example, Ante Iličić (1997:93-94) from Prozor-Rama Water Utility Company points out that the water board had 31 personnel working in the finance and operation departments. The war did not only devastated all documentation on water charge services, but also had a serious impact on the number of personnel working for the company. According to Iličić, the present number of 16 administrative personnel are not adequate for the necessary responsibilities. The post-war situation with water charge collection and other operational services is described as alarming, because "...it is not possible to collect the bills, there is no equipment, there is no trained staff, ...".

3.6 Water in Aden during the 1994 Yemen Civil War

The guerilla fighting in the mid-sixties resulted in a British withdrawal from Aden in 1967. However Yemen was divided into two countries on 30 November while the effects of Suez Canal crisis brought the Yemen's economy to a halt. During the cold war, the People's Democratic Republic of Yemen was supported by the communist block, having cross-border problems throughout the 1970s, with the North Yemen which was allied with the US led capitalist countries. The 1980s became a decade of negotiations between the two sides resulting in a merging deal on 22 May 1990 (ArabNet, 1997).[24] However the peace did not last long and the civil war started again on 4 May 1994; this was followed by the declaration of independence by the South Yemen on 21 May.

Operational and Technical Dilemmas

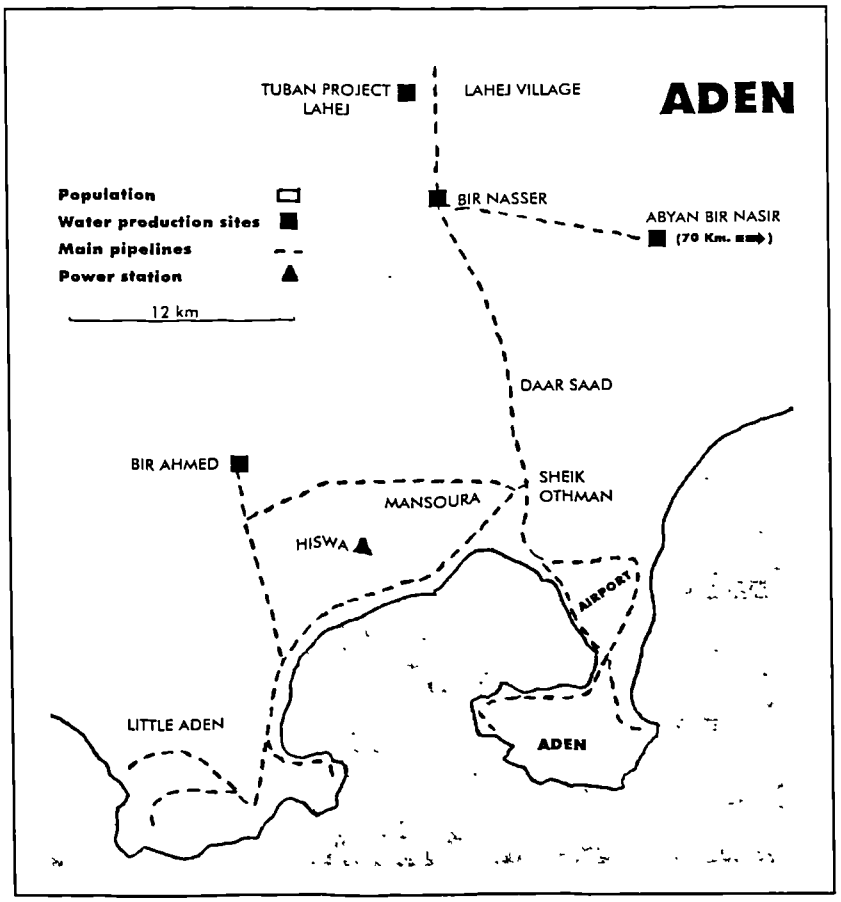


Figure 3.8: *The map of Aden showing water production sites, main pipelines and power stations (Source: ICRC, 1995:106)*

The involvement of the ICRC with the provision of water in Aden was during a period from June to September 1994. Aden was supplied with water from the Abyan and Bir Nasser well fields while the Bir Ahmed well field was supplying Little Aden before the conflict. The main power sources were Hiswa and Mansoura plants. See Figure 3.8.

24 http://www.arab.net/yemen/history/yn_unification.html

During the early days of the fighting the Bin Nasser pumping station was one of the first targets shelled by the North Yemen forces, stopping water flow to Aden which had a population increased from 350,000 to half a million. While the repair to the damaged pumping station was being carried out water was mainly supplied from the desalination plant at the Hiswa power station, which was working only with its quarter of capacity. A supply of 100 litre per second was nowhere near to the needs of 500,000 people.

Consequently the inhabitants of Aden started to dig new wells and restored more than 70 wells in Crater, Tawahi, Maala and Sheikh Othman areas. The other source of water for a very short time was the residual water in the delivery pipelines which were broken by people, leaving them unrepaired. By mid June, water was available for three hours a day, with a low pressure reaching only the ground-floor level. A secondary case study from the ICRC (1995:106-111) points out the deterioration of the water situation at the end of June, after the Bir Ahmed well field was overrun. There were only a few tankers available, which were needed to distribute water to hospitals. The situation is described as follows:

> "There was not enough power to drive the 50 well pumps, nor were any disinfecting agents available. The situation in Aden was very difficult, with people queuing 24 hours a day at all available water sources, and could potentially deteriorate into a life-threatening disaster in the event of a complete power failure".

Before Aden was taken over by the North Yemen forces on 7 July 1994, the ICRC's activities were limited to the repairs carried out to the power lines and pipelines at the Tuban Project in Lahej. After the ICRC's assessment it was decided that the repairs to the distribution network would take up to two months. Therefore tankering water from Lahej was chosen as the only viable option for these particular circumstances. The main problem with the tankering method was frequent looting experienced; for example, tankers were mobbed, equipment and materials from the Lahej well-field, and the water board stores, were stolen. By the end of July, a fleet of 25 tankers were providing 100,000 litres of water a day to the northern suburbs of Aden, but Little Aden still did not have a regular water supply.

The water tankering method was stopped in late August after the repairs were carried out at the Bir Ahmed well-field, providing a 'fairly regular supply of water'. The ICRC's report

(1995:111) describes the water situation when their involvement was ended in September 1994:

> "On 30 August, the high-tension power line between Bir Nasser and Lahej was completed, and the electric power supply in Lahej fairly stable. Four wells out of six were working in Lahej and twelve wells out of 20 at the Tuban pumping station. The Bir Nasser chlorination station was operational".

3.7 Dilemmas, Issues and Lessons Learned

After investigating these five case study examples from Northern Iraq, Rwanda, Cambodia, Bosnia-Herzegovina and Yemen; the issues, dilemmas and lessons learned can be categorized under the headings which were identified as the three aims of post-war recovery of urban water supplies in the previous chapter. In other words, the dilemmas and issues derived in this chapter will be divided under the headings:

- Aim One: To alleviate suffering caused by inadequate and unsafe water.
- Aim Two: To consolidate the establishment of peace.
- Aim Three: To ensure a sustainable development.

Although only five country examples are taken here and it is accepted that the characteristics of water supply can be very different from one situation to another, these lessons learned can still be applicable to similar situations. It should also be pointed out that although there are unique aspects in these five secondary case study examples, there are also very many commonalities with other countries and interventions which the international and local agencies are involved with today, and maybe in the future.

Political and Strategic Dilemmas

Aim One:

- Water source withholding is a common phenomena in intrastate conflicts.
- Water supply networks can be prime targets in armed conflicts. Damage caused to water supplies in intrastate conflicts can be very severe as they are deliberately targeted by warring parties.
- Host countries can be unwilling to let refugees to cross their borders for fear of these temporary settlements becoming permanent.
- International humanitarian aid can be concentrated on certain regions because of international politics and other strategic reasons.
- Political and strategic dilemmas faced by the international agencies in the process of post-war water supply improvements can be very decisive on the success of their

interventions.

Aim Two:

- Aid politics can mean the continuation of suffering for war-affected people.
- Political constraints posed by ethnic fragmentation can cause long delays to water supply improvements in war-affected areas.
- Urban water can unify divided communities, however this can be a difficult challenge as the reconciliation of exploited social, ethnic and political differences can take a long time.
- Local authorities of conflicting sides can easily attempt to leave the 'other' side facing severe water shortages.

Aim Three:

- The political willingness at local, national and international levels is essential in order to achieve institutional empowerment to ensure the post-war water supplies' operation and maintenance.

Operational and Technical Dilemmas

Aim One:

- The main methods of post-war water supply rehabilitation are repairs and replacements of broken components, and adding new ones in order to improve water quantity and quality. However, it is very important to choose an appropriate method, as otherwise the implementation can have serious detrimental effects on the operation of the system.
- Apart from gravity fed ones, urban water systems depend on power supplies. Therefore the rehabilitation of power supplies should be integrated in the water supply improvement programmes.
- Post-war urban water supplies inherit various technical, organisational and institutional problems from the pre-war era. These inherited problems, such as leakage from distribution systems, need to be addressed as part of rehabilitation programmes.
- Lack of financial funds and an ineffective cash-flow can cause long delays during the implementation period.
- The reconstruction interventions should bear in mind the following technological criteria: suitability, compatibility, efficiency and maintainability.
- Without providing an adequate amount of safe water, it is pointless to provide health treatment.
- Leakage from the distribution affects not only the quantity of water, but also its quality.
- Water tankering can only be a temporary solution under certain circumstances.
- An holistic and integrated approach is required to deal with complex urban water supply issues.
- The reconstruction programmes should be appropriate to the local environment.

Aim Two:

- Post-war urban water supply implementations need to be considered not only from the technical perspective but also from social, economic and political ones.
- The situation in emergencies can change very rapidly, therefore the response to crisis should be flexible to changing needs.
- Lack of preparedness can cause confused management, delays and inappropriate implementations.
- NGOs should be aware of their vulnerabilities and capabilities before undertaking programmes, as the response to improve urban water supplies tends to require more time, funds and advanced technology than meeting the water needs of people in refugee crises.
- There is a need to deal diligently and cautiously with the international companies' willingness to enter into the reconstruction market.
- Assessment of local resources and capabilities is essential.
- The water supply interventions in war-affected areas are often to deal with problems like the shortages of materials, equipment and chemicals. Therefore logistics of working in conflict-affected areas need to be taken into account to ensure successful implementation of projects.

Aim Three:

- Interventions comprising technology transfers should bear in mind economic and technical needs for operation and maintenance.
- Objectives should be set up according to resources and capacities, and monitoring should be carried out during the implementation with appropriate indicators.
- Continuous evaluation is needed to respond to changes as they arise.

Personnel and Moral Dilemmas

Aim One:

- The ability of communicating with war-affected people in their own language can be an important advantage for the progress and success of international interventions.
- The technical information on war-affected water supply systems can be very difficult as the plans, drawings, etc., either get lost or damaged during the war, and local water boards' personnel are likely to be either injured, dead or in the army.

Aim Two:

- The current praxis show that participation of war-affected people tends to be at minimum, while in fact it can be utilized in a productive way for long-term sustainability.
- Appropriate qualifications and experience should be allocated into international response teams.
- Identification of a working framework with local authorities during the formulation phase is essential.
- Lack of coordination between international agencies causes the wastage of time and

scarce resources.
- There is a need for cooperation and coordination between field and HQ levels.
- There is a need for accountability which can otherwise mean the exploitation of human suffering by some international agencies.

Aim Three:

- The international agencies should train their staff before sending them to respond to conflicts.
- Lack of skilled personnel to work in water supply programmes tends to put serious obstacles on the success of interventions.
- The scope of training should also include locals to ensure the operation and maintenance of systems.

3.8 Summary and Conclusions

It is estimated that 60% of the world's population will be living in urban areas by the year 2050. In fact much earlier than 2050, by the turn of the century, 18 of the 21 ten-million-plus megacities of the world will be in developing countries, which alarmingly tend to become involved in civil conflicts or wars (HABITAT, 1996). The ICRC also support this view by claiming that warfare tends increasingly to occur in urban environments and consequently, water infrastructure in modern cities is particularly vulnerable to attack or disruption owing to its complexity (ICRC, 1994).

Urban water supplies with their complex structures and their dependence on power present different challenges in war-affected areas to the provision of water supplies in refugee camps and rural areas. Human suffering caused by lack of water cannot be compared between war-affected rural and urban areas. However, it should be pointed out that water provision issues during and after the war in urban areas are considerably different from similar challenges in refugee camps and rural areas. There is a big difference between provision of emergency water such as on the Zaire - Rwanda border in 1994 or refugee camps where a quick response is required to satisfy urgent needs, and the rehabilitation of water treatment and distribution facilities in Sarajevo after the war. In refugee emergencies, water is usually provided by aid agencies because of the urgency and humanitarian need. However in the latter, it is more than likely that reconstruction of water supplies will be carried out by commercial companies contracted by local authorities working in conjunction

with national or international aid (Sherlock, 1997). The relationship between humanitarian and commercial aspects of post-war water supply provision will be discussed in Chapter Five. Therefore at this point, the identification of differences should be made between urban and rural post-war water concerns, which are:

- **The scale of the area involved:** Urban settlements tend to spread in wide areas with their suburbs and marginal settlements to accommodate their large populations. The Table 3.1 below shows the large areas that some world cities spread across. Therefore, the provision of water and sanitation facilities to 200,000 people in a camp is easily more achievable than trying to provide for 200,000 people spread across a town or city (Chalinder,1994:78).

City or metropolitan area	Date	Population	Area (sq. km)
Beijing, China	1990	10,819,407	16,808
Dhaka, Bangladesh	1991	< 8,000,000	1,530
Mexico City, Mexico	1990	18,000,000	8,163

Table 3.1: *Examples of some urban settlements with the area they cover (Source: Habitat, 1996:15)*

- **The scale of the task:** The urban population with a higher expectation of life standards requires better quantity and quality of water, especially for their future needs. The urban population can take the burden of water shortages in relief period but the reconstruction planning of water supplies should consider much higher expectations for both quality and quantity. Consequently, the capacities and vulnerabilities of the post-war reconstruction actors from NGOs and UN agencies to beneficiaries and donors should be considered before undertaking any post-war urban water supply implementation. For example, OXFAM was involved in the rehabilitation of the Phenom Penh water system, and spent 12 years working on it (Chalinder,1994:79).

- **Technological considerations:** Urban water supplies are complex systems with their water resource development, treatment, storage, pumping and distribution components. However, a high level technology means that the system requires

specialised spare parts; high level of skill and technical knowledge, and an existing pool of trained and skilled personnel and perhaps most importantly, the whole operation is dependent upon power supplies.

- **Availability of water resources:** Water resource development for urban areas would bring another challenge to overcome because of possible problems with obtaining the amount of water required together with an acceptable quality in the hinterland of urban settlements. It is a common problem, as a consequence of large industries and population; surface water sources in urban areas are liable to be chemically polluted. If the use of such a source is being considered, appropriate treatment processes have to be considered.

- **The large-scale funding required:** As a consequence of the complexity of urban water supplies, in the event of their rehabilitation or reconstruction, large-scale funding will be required to carry out necessary repair and replacement activities.

- **The root causes:** Post-war urban water supply problems tend to have a much longer history as a result of deeply rooted economical, social and political vulnerabilities. In fact, according to Chalinder, previous experience in these situations has shown that technical problems which at first seem to be easily reconcilable and possibly the direct result of conflict, bombing, etc., are in fact long-standing problems due to poor maintenance and under-funding of local departments charged with managing the systems (Chalinder,1994:78).

War-affected people go through the burden of water shortages causing great danger to health and well-being. The chapter demonstrates that the problems faced are not only a result of war's direct and indirect effects, but may also be inherited shortcomings due to lack of funding, operation and maintenance. While war highlights these inherent vulnerabilities, at the same time, it makes local communities and authorities more open to change. Therefore, the activities carried out during the reconstruction process should also consider the root causes of the problem. Attempts to alleviate water shortages in post-war urban areas therefore need to have a holistic approach, considering not only implementation of certain components but also the long-term sustainability of systems.

In the light of the preceding secondary case study examples, this chapter can suggest some key points to bear in mind in post-war reconstruction of urban water supplies:

- There should be an holistic approach for the provision of water in a progression from emergency to reconstruction.
- The well-balanced interaction of water supplies with other infrastructure programmes should be provided.
- The issue of urban water shortages in post-war areas should be considered with the root causes of the problem.
- Post-war water resource development and management should be in line with the overall development objectives of society and the prevailing culture and become part of the more general process of social change.
- The involvement of local participation and the utilisation of local resources in every phase of the post-war reconstruction of water supplies should be ensured.
- The actors of post-war reconstruction - UN agencies, governmental organisations, NGOs, beneficiaries, etc. - should aim for a beneficiary oriented approach instead of conventional donor-driven implementations.
- The circumstances created by war could be used as an opportunity for improving urban water supplies as there is the trend towards decreasing availability of external funds for the water supply sector while the global demand for water is increasing.
- The monitoring and evaluation of water supply projects in post-war areas should be integrated into every phase of the progression from emergency to reconstruction.
- The post-war reconstruction of water supplies should aim for the long-term sustainability of communities.
- The technologies and approaches chosen for post-war reconstruction of water supplies should be appropriate, targeted, applicable and maintainable (ATAM).

The lessons learned from the secondary case study examples in this chapter and also the relationship between the post-war recovery phases and sustainable development investigated in Chapter Two enable this research to propose a response which may lead to the sustainability of urban water supplies. The proposed response include four main aspects which will be investigated in detail in the next two chapters. The post-war reconstruction of water supplies in urban areas would demand the interventions to be appropriate to the

socio-economic, cultural and environmental characteristics of war-affected communities; targeted to their long-term sustainability; applicable in the post-war reconstruction period and maintainable in the future. The diagram in Figure 3.9 shows the structure of the ATAM concept. These main aspects will later be tested in the case study of the Tuzla Region in Bosnia Herzegovina before developing a set of guidelines for the sustainable post-war reconstruction of water supplies.

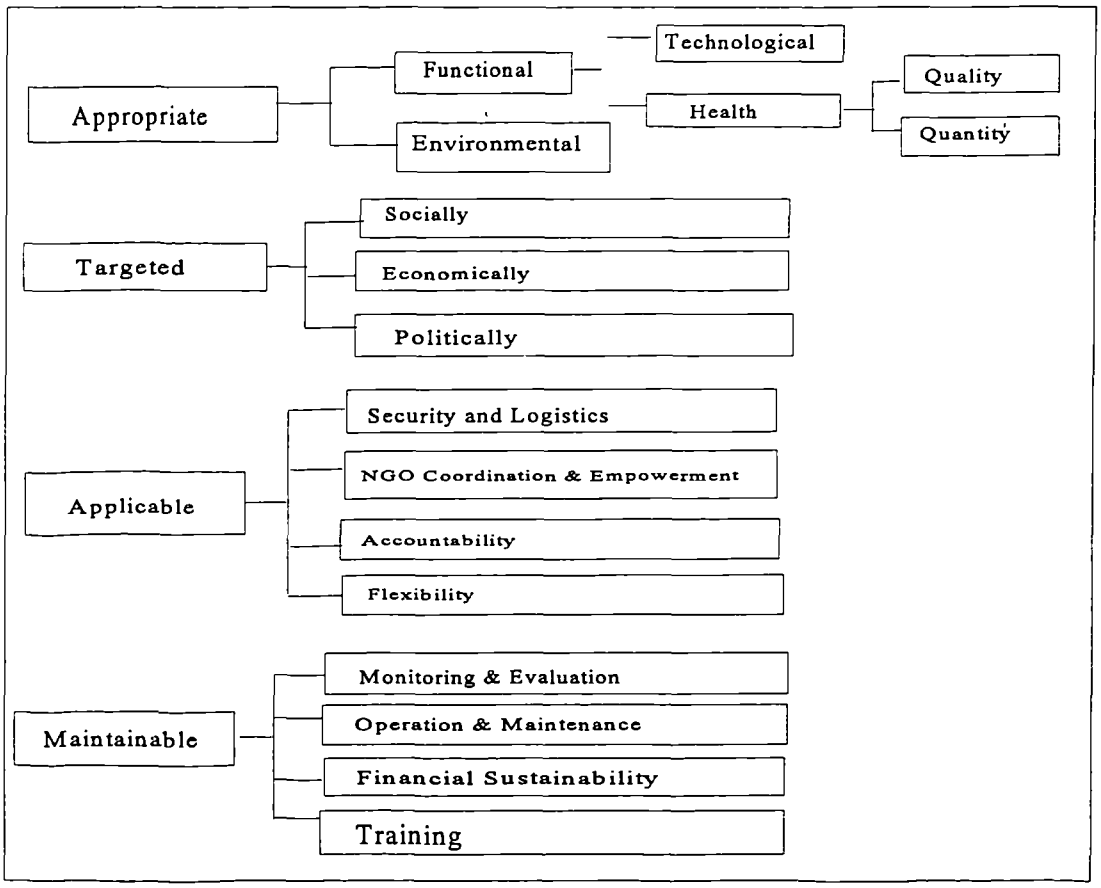


Figure 3.9: *The diagram showing the structure of the proposed ATAM approach to the post-war recovery of water supplies (Source: Author)*

The matrix in Table 3.2 is given to explain the interaction of the dilemmas and issues identified in Section 3.7 with the proposed framework in Figure 3.9.

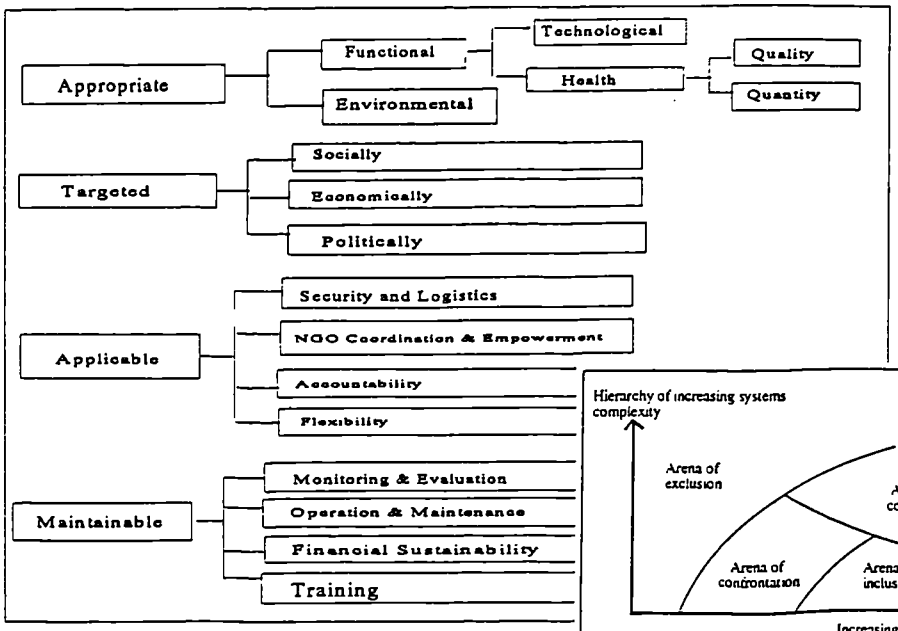
AIMS	DILEMMAS		
	Political & Strategic	Operational & Technical	Personnel & Moral
ONE: To alleviate suffering caused by inadequate unsafe water			
TWO: To consolidate the establishment of peace			
THREE: To enable a sustainable development			

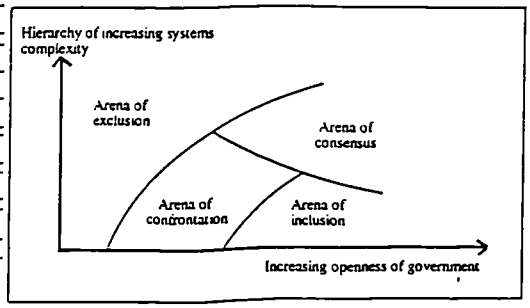
Appropriate	Targeted	Applicable	Maintainable

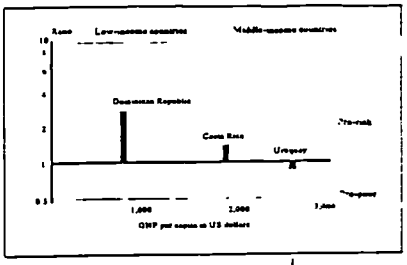
{-----Chapter Four--}{----------Chapter Five----------}

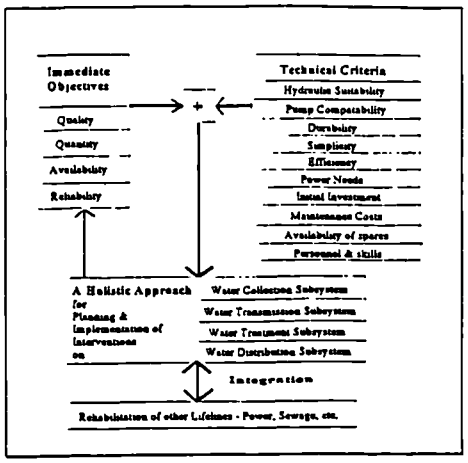
Table 3.2: *The matrix between aims and dilemmas (Source: Author)*

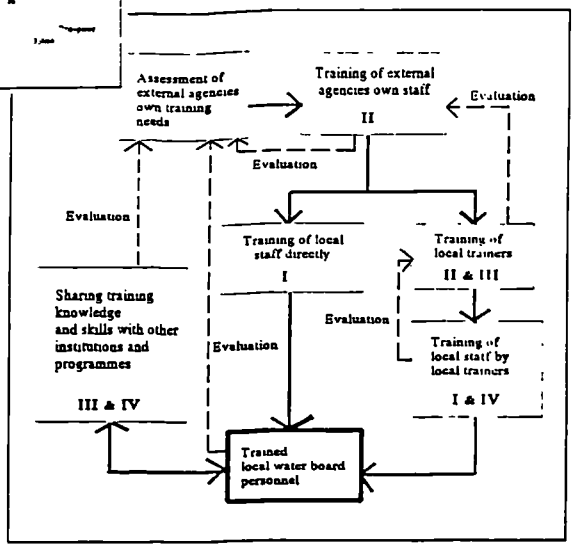
As shown in the above matrix, the following two chapters will present discussions on the four main aspects of the proposed ATAM framework. While Chapter Four is allocated to the issue of appropriateness, focusing on operational and technical issues, Chapter Five will cover socio-economic, political and organisational issues in the scope of targeted, applicable and maintainable recovery interventions.











PART TWO:

The Context of Appropriate, Targeted, Applicable and Maintainable (ATAM) Post-war Water Supply Recovery

Chapter 4 : Appropriateness Issues of Post-war Water Supply Reconstruction

4.1 Introduction

The derivation of some key points and dilemmas in the previous chapter, which are often faced by international agencies in the process of water supply recovery resulted in the proposition of an approach that can be utilized during the initiation of these programmes. The framework proposed, including four interwoven areas of considerations claims that interventions to be taken need to be appropriate, targeted, applicable and maintainable (ATAM), if a sustainable recovery is to be ensured. The structure of this proposed ATAM framework, as shown in Figure 3.5, includes various concepts and areas of concerns which are based on lessons learned from the secondary case study examples of Chapter Three. However, the formation of a framework through the interrelationships of different discourses presents a need for the exploration and articulation of their context in the scope of this research. It is the result of this need that this chapter and the following one are allocated to the discussions on the proposed ATAM framework. Subsequently, the concepts of a holistic and integrated approach, the technological appropriateness criteria, and health and environmental considerations will be investigated under the heading of appropriateness in this chapter, while the next chapter will focus on the other three aspects of the proposed framework.

4.2 An Holistic Approach for the Recovery of Post-war Water Supply

The current praxis of post-war water supply implementations show that these interventions tend to be fragmented and on an ad-hoc basis. Different agencies involved, international or local, carry out their programmes without any particular attention to water systems as a whole. Examples in the previous chapter pointed out several times that the lack of a holistic

and integrated approach in post-war programmes is unfortunately a common phenomenon. On the other hand it seems that it is not very clear what these terms really mean, which can be something different from one discipline to another. Therefore there is a need to identify what this research means by the notion of holistic.

Chapter One defined an urban water supply as an arrangement of operational methods and / or equipment constructed and devised in order to provide water to a community, consisting of four subsystems which are collection, transmission, treatment and distribution. A holistic approach therefore should consider a water supply as a whole, with its all subsystems. The example of Phnom Penh in the previous chapter shows that Oxfam's rehabilitation programme which was mainly concentrated on the treatment phase, resulted in neither adequate nor safe water. The results of this programme are that the water supplied in Phnom Penh is inadequate because the rehabilitation of collection subsytem was neglected, and the quality of water can not be ensured because the treated water is supplied to a distribution system which is heavily affected by the leakage. In other words, Oxfam's programme was lacking an holistic approach. The main reason behind a need for an holistic approach is that there are two phases of relationship between the subsystems of an urban water supply: interconnection and interdependence.

The subsystems of a water supply are interconnected because they are designed, constructed and operated as an integral part of a whole system. Without connections, in other words as individual subsystems, they cannot produce water. Following this, they are interdependent because of the need for a continuation of working order from collection to distribution in order to supply adequate and safe water. For example, without pumping facilities water cannot be transferred from water intake to storage unless it is by a gravity line, and water should be treated to make it safe for human consumption before it is supplied through the distribution system, and finally, the distribution system should be in such an order that water can reach consumers without being polluted through leakage. In other words, these inter-relation types advocate the importance of a holistic approach to deal with urban water supply problems.

After identifying what this research means with the notion of 'holistic', it seems that the four subsystems of a water supply need to be further investigated in order to show

interconnection and interdependence between them, and also to derive certain criteria which are identified as technological dilemmas in the previous chapter.

4.2.1 Water Collection Subsystem

The conventional sources of water for urban supplies can be categorized as surface water such as upland catchments, lakes and rivers, and groundwater reservoirs. Impounding reservoirs are often used to maintain a continuous abstraction from the flow of upland streams. Rivers can also be abstracted at their lowland reaches where the flow is less variable, and consequently the large capital cost of impounding schemes can be avoided. However, the experience shows that the operating cost of a lowland abstraction would be much higher, as water would need to be pumped to higher ground into the treatment subsystem and the supply. The other disadvantage of water intakes at lowland reaches is that water tends to be more polluted from natural run-off and effluent discharges. The raw water intakes from surface resources can be divided into three groups which are side intakes, exposed intakes and infiltration galleries.[1] The most critical issues with raw water intakes in post-war areas can be:

- Direct damage by bombing.
- Blockage of strainers by excessive water pollution and debris.
- Pumping problems.
- Lack of electricity.

The groundwater reservoirs are utilized by three methods: dug wells, hand drilled and jetted wells, and machine drilled boreholes. Dug wells are used in emergencies affecting urban areas as the method is simple, and does not require machinery and advanced technical expertise. However, they can only give satisfactory results in ground which can be dug

1 The type of intake is decided according to river size and type of flow. If it is a moderate size of river which does not carry a high level of debris, a side intake can be used. Meanwhile, an exposed intake such as a pump with suction can be used only on rivers where there are small variations between low and high flow level. The difference between the pump and the mouth of the intake should not be more than four metres. If the river bed carries a heavy load of silt during floods, another type of exposed intake - a floating intake - can abstract water from near to the surface of the river. It is difficult to secure this type of intake during a flood, and floating debris can also cause damage to the intake but they provide the advantage of flexibility with the river's rising and falling levels. (Dangerfield, 1983:120-122; Smout, 1991:90; Tworth, et al., 1994:172). The third type of river intake - infiltration galleries - is used in situations where the surface flow of rivers disappears during hot seasons but subterranean flow continues. These intakes comprise unjointed concrete or porous, and perforated pipes with 200-300 mm diameter laid in gravel filled river bed, connected to a sump with a submersible pump. In rivers carrying fine sediment it is likely to have blockage problems (Smout, 1991:92; Tworth, et al., 1994:171).

safely and quickly, and where water table is not below 30 m. Otherwise the process can take months.

Machine drilled boreholes are the most common method of utilizing underground water sources for urban water supplies, which is a complex activity involving several stages:[2]

- Siting
- Testing
- Construction of design
- Development
- Pump installation

A borehole should at least have a yield of 5,000 m^3 per day for most public supply purposes. This means that the diameter of the borehole needs to be at least 300 mm to accommodate a pump which is powerful enough to get this necessary yield to the surface. However, the diameter is often around 450 - 600 mm to allow for any lack of verticality in the hole and to gain necessary flow characteristics. On the other hand, a borehole with a diameter not more than 600 mm would allow only a single pump in the hole which can cause problems with the reliability of supply in times of breakdowns and maintenance. Therefore there should be either two borings or one boring with two pumps for a single supply. The two pump in one boring can be a viable option in ground where the water table is not too deep underground. A borehole drilling is an expensive task; for example, the cost of a borehole in sub-Saharan Africa can be between US$ 4,000 and 30,000. Therefore the preceding stages mentioned should be carried out step by step. This is considered a prerequisite in areas where there are no existing boreholes (Tworth, et al., 1994:172-175; Davis & Lambert, 1995:258).

Consequently in terms of reconstruction of urban water supplies, the rehabilitation of existing old and damaged boreholes should be considered first before attempting to drill new

2 All these stages are significant in a borehole drilling process for a sufficient yield. For example, the determination of aquifer locations should be carried out as a first step by using geological maps, geophysical surveys, etc. followed by pumping tests to determine the characteristics of the aquifer. This is essential because it can give important clues regarding suitability of water for utilization. Electrical conductivity is one of them which gives a good indication of whether the borehole is likely affected by surface water pollution. This characteristic indicates the level of dissolved solids in water. Therefore, the longer time water spends underground, the higher its electrical conductivity to be; assuring that it is less likely to have surface water pollution moving to wells and boreholes (Hammer, 1977; Dangerfield, 1983:124; Davis & Lambert, 1995:224-256).

ones. The main problem areas in a borehole could be broken down and damaged pumps and pipes, blocked screens and insufficient yield. Davis and Lambert (1995:282-283) explain several possible problems and necessary actions to be taken in the rehabilitation process of boreholes:

- If pumping equipment is damaged, there can be two solution options. First, carrying out necessary repairing or replacing work, but it must be born in mind that to obtain spare parts or sending components to their manufacturers for their repair can take a long time in war-affected areas. The second option would be the installation of new pumps but in this case, several technological appropriateness characteristics such as hydraulic suitability, compatibility and efficiency should be considered in the intervention process.
- Steel pipes in boreholes are under corrosion attack, that especially damages ungalvanized pipe threads, causing cracks and breaks and eventual dropping away. In this kind of situation, these pipe pieces should be removed by 'fishing tools'. Afterwards, these broken pipes need to be replaced with new ones. However if there is a close monitoring of yield, this pipe corrosion problem can be detected at early stage, before the problem becomes more complicated. This is a difficult challenge in war-affected areas as there tends to be a shortage of local water board staff.
- If a borehole is blocked with debris, a percussion rig with a bailer can be used to solve the problem. On the other hand, this can be a difficult option in emergencies but the method to be used instead, which is drilling a new borehole nearby or using a different source can be even more time consuming. However, the rehabilitation option should be taken if it is still feasible that the borehole would provide a sufficient yield for supply.
- The other possible problem which might be encountered would be the blockage of screens. Possible remedies in these circumstances would be surging and jetting used during the borehole development process.
- In circumstances where water in a borehole has been standing for a long time, borehole should be cleared by pumping and then chlorinated.
- Low yield level can be increased by different methods according to the characteristics of the ground. If it is possible, the length of rising main can be increased to lower the pump. On the other hand if the borehole is in a fractured rock, the hydraulic fracturing method can be used to open up the fractures surrounding the borehole.

4.2.2 Water Transmission Subsystem

This subsytem covers the transportation of water from the collection point to the treatment works and then to the supply. In parallel to the increasing population, the water demand in urban areas outstrips the locally available sources. Many urban areas in the world today collect their water from far distances. Therefore the good working order of water transmission by pipelines is indispensable for the availability and reliability of water supply.

The main components of a pipeline can be categorized as pipes, pumps and valves.[3] Tworth, et al., (1994:438) points outs that there are no general rules for the choice of pipe type as any of the pipes listed in the footnote below can be used according to prevailing circumstances. This is also the case for valve types, as the decisions on these technical components are made according to project needs, soil and water characteristics, and the capital cost. Pumps will be looked at in more detail later on in this chapter. More detailed technical information on all water supply components can be found in the work of Hammer (1977), Hobbs (1981), UNICEF (1988), Tworth et al., (1994), Davis & Lambert (1995). Therefore this section will limit itself to pointing out possible problems with a transmission system in war-affected areas. The most encountered three of which are:

- Leakage from the broken pipes, joints and valves.
- Lack of electricity
- Lack of local water board staff to carry out maintenance works.

However it is clear that the interconnection and interdependence aspects of a transmission subsystem between water collection and treatment emphasize once again the need for an holistic approach for post-war water supply interventions.

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3 Pipes used for water transmission and distribution are made from the following materials:
- "cast or 'grey' iron
- ductile iron
- steel
- asbestos cement
- prestressed concrete
- reinforced concrete cylinder
- uPVC (unplasticised polyvinyl chloride)
- GRP (glass reinforced plastic) or RPM (reinforced plastic matrix)
- polyethylene of low, medium, or high density" (Tworth, et al., 1994:423).

Valves used in waterworks can be classified as stop valves, non-return valves, flow control valves, pressure control valves, energy dissipators and air valves (Tworth, et al., 1994:443).

4.2.3 Water Treatment Subsystem

Water treatment is an indispensable component of urban water supplies to enable the protection of public health as there is a close interaction between polluted water and infectious diseases. Following this, the main aim of water treatment is pointed out by World Health Organisation (WHO, 1993:132) as: "...to protect the consumer from pathogens and impurities in the water that may be offensive or injurious to human health". The impurities in water occur in three forms - 'suspended, colloidal and dissolved', requiring different methods for their treatment. While surface waters are likely to have all of these three forms, underground waters would probably have only dissolved impurities.[4] Figure 4.1 and 4.2 show the flow diagrams of typical groundwater and surface water treatment systems.

In other words, water treatment consists of a multiple-barrier concept including 'the four lines of defence' - pristine catchment, long storage, filtration and chlorination (McDonald & Kay, 1988:134-135). In terms of surface water, this multiple-barrier process includes:

- Pre-treatment[5]
- Coagulation, flocculation and sedimentation[6]

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4 The processes to remove these impurities are given by Smethurst (1983:130-137) as follows:
- "floating object and weed - by screening;
- algae (if present) - by micro straining;
- excessive iron, manganese and hardness in solution - by precipitation in basins after the addition of chemicals;
- normal suspended solids - by settling;
- the remaining fines and some bacteria - by filtration;
- excessive bacterial pollution - by pre-chlorination; and
- final bacteria surviving filtration - by chlorination".

5 Faecal related pathogens can be reduced by 99 per cent by sedimentation during impoundment of water in reservoirs as the ultraviolet content of sunlight has a lethal effect in surface layers of water. If water is abstracted and treated without storage, pre-disinfection can be required to reduce pathogen level and to assist the removal of algae during sedimentation. Turbidity level is also reduced as a result of natural settlement during storage. The other phase of pre-treatment after storage is aeration which is essential to remove tastes and smells caused by hydrogen sulphide and bacterial matter in ground and surface waters respectively. Aeration is also important to enable the oxidation of iron and manganese, the reduction of water's corrosiveness and the raising of its pH value by decreasing carbon dioxide levels.

6 Colloidal forms of impurities in raw waters especially from surface resources remain suspended unless they are agglomerated with some chemicals which are called coagulants such as aluminium sulphate, lime, ferrous or ferric sulphate and ferric chloride. Forming heavier particles which are called flocs during the flocculation process, reduces turbidity and the level of pathogen existence in water.

- Filtration[7]
- Disinfection[8]

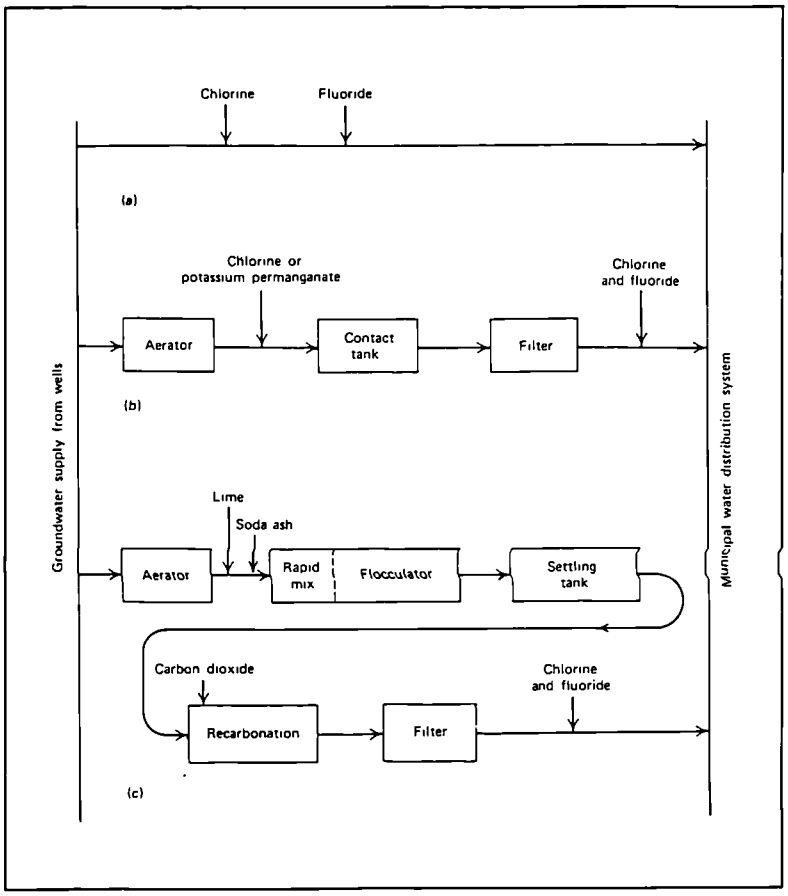

Figure 4.1: *Flow diagrams of typical ground water treatment systems. (a) Disinfection and fluoridation. (b) Iron and manganese removal. (c) Precipitation softening. (Source: Hammer, 1977:217)*

The examples of Phnom Penh, Kigali and Aden in the previous chapter showed that water treatment facilities are often the most affected subsystem by the war. The example of Beirut also supports this view. After a period of indiscriminate shelling in May 1989, one of the main water treatment stations in the city, Daichounieh was damaged to the extent that the capacity fell by 50 per cent to about 14,000 m³ a day (ICRC, 1995:95-99).

The ICRC states that the repair works at the treatment stations were done under constant danger of shelling as they were quite near to the Green Line dividing the city into two main parts: western and eastern sectors controlled by Muslims and Christians respectively. It was very important to carry out these repairs and replacements urgently as the city was experiencing severe water shortages. Considering the UNHCR recommendations of a

7 It is the last barrier to stop suspended matter and microorganisms which are resistant to chlorine entering the final phase of the treatment process. There are two main types of filtration - slow sand and rapid filters. The former is more suitable for emergency purposes as the latter - the process consisting of water which passes vertically downwards through a layer of sand between 0.6 and 1 m deep requires backwashing at intervals of between one and three days. On the other hand, slow sand filtration can be very effective reducing E. Coli by a factor of 1000 and achieving 98 - 99.5% bacterial removal if it is designed correctly (WHO, 1993:134-135).

8 The last phase of the treatment process aims to remove pathogens by using various disinfectants such as chloramine, ozone, chlorine dioxide and chlorine, which is most widely used.

minimum 40 litres/person/day for post-war urban areas and 15 litres/person/day for refugee emergencies, the water supplied in some parts of Beirut was not sufficient at all. For example, the water supplied to "...the southern Muslim outskirts had fallen from about 40,000 m^3 a day to 13,000 m^3, that is about 26 litres/person/day (population 500,000)" (ICRC, 1995:98).

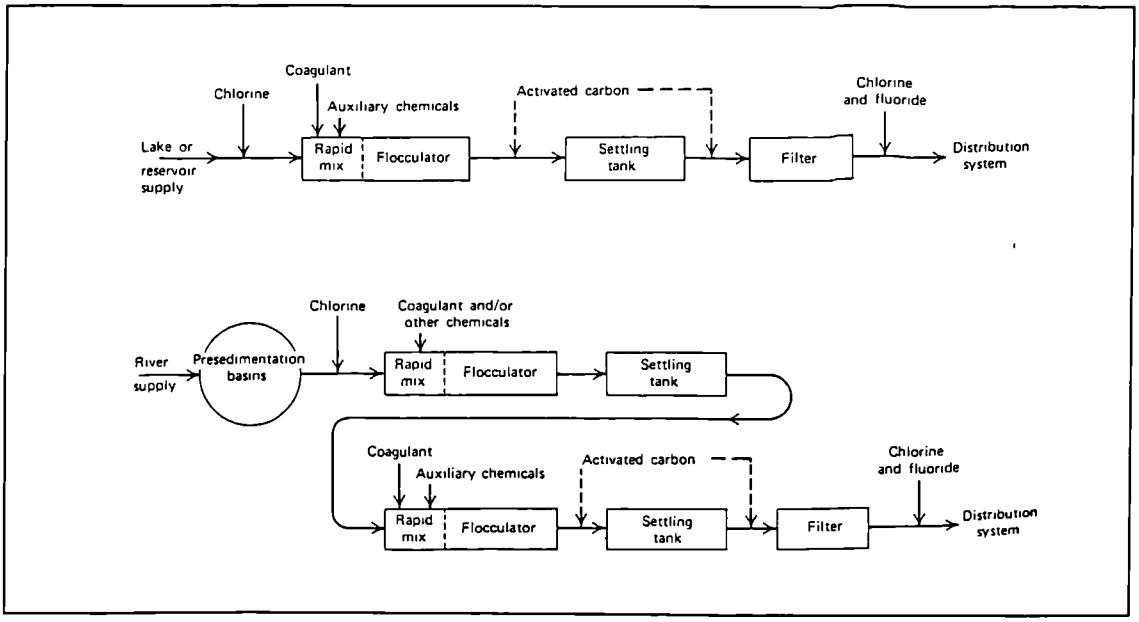

Figure 4.2: *Schematic patterns of typical surface-water treatment systems (Source: Hammer, 1977:218)*

The ICRC survey in February 1990 showed that the fighting between the two main Christian factions in Eastern Beirut caused huge damage to the Dbaiye treatment station as it was located near an army compound. It was reported that (ICRC, 1995:100):

> "Raw water was still reaching the station but most of the sand filters were dry, the backwashing control panels were out of order, one of the transformers had been hit by a shell, and there was major damage to ten of the 44 rapid sand filters. The main control room had been severely hit, as had the fuel storage tanks which, fortunately, had been empty at the time of the attack. Only the three old slow sand filters, theoretically capable of treating about 40,000 m^3 of water a day, remained untouched".

The chlorination room was also damaged, but the two 500 kg of liquid chlorine were intact. Following this, the repair work under the supervision of the Office des Eaux de Beirut (OEB) was carried out by two specialized Water Board teams with some technical assistance from the Lebanese Army. "As from 21 February, the station managed to feed about 18,000 m^3 / day into the mains, but pressure was not yet sufficient to reach the main

suburbs" (ICRC, 1995:101). Consequently, The ICRC's rehabilitation works which were carried out at the Dbaiye and Hazmieh stations are as follow:

- The restoration work of main back-up generators.
- The supplying of equipment for electrical control panels and fuel for pumps.
- The transportation of liquid chlorine to a safer area as it could have been highly dangerous in the event of a toxic gas release triggered by shelling.

As can be seen from the preceding example, water treatment subsystems are affected by war directly and indirectly. The direct damage is easier to inflict on treatment works, as they are not buried underground like pipelines. The indirect effects such as lack of power, personnel and chemicals on the other hand, can also bring the treatment process to a halt very easily.

Although the water treatment process is indispensable for the provision of safe drinking water with its all physical, biological and chemical quality aspects, it would not ensure that water supplied to consumers will still contain these qualities unless the distribution system is in a good working order. In other words, this would ensure only supplying treated water to a distribution system but not to consumers. Distribution systems are often affected by leakage problems, even in industrialized countries. For example, water lost through distribution systems in cities like London and York are more than 30 per cent of water initially pumped into systems. Consequently, a post-war urban water supply intervention aiming for supplying safe water to consumers should consider the system as a whole.

4.2.4 Water Distribution Subsystem

After the treatment works, water is transported by the trunk main to the point at which the distribution system starts to convey it to all consumers. A distribution system is one of the most complex components of a water supply system which comprises:

- kilometres of pipeworks including trunk distribution mains, secondary mains, service mains and service pipes of different sizes, materials and ages with large numbers of valves and joints that are buried underground, usually under roadways
- reservoirs and water towers, and
- pumping stations.

The basic elements of a typical distribution system is shown in Figure 4.3.

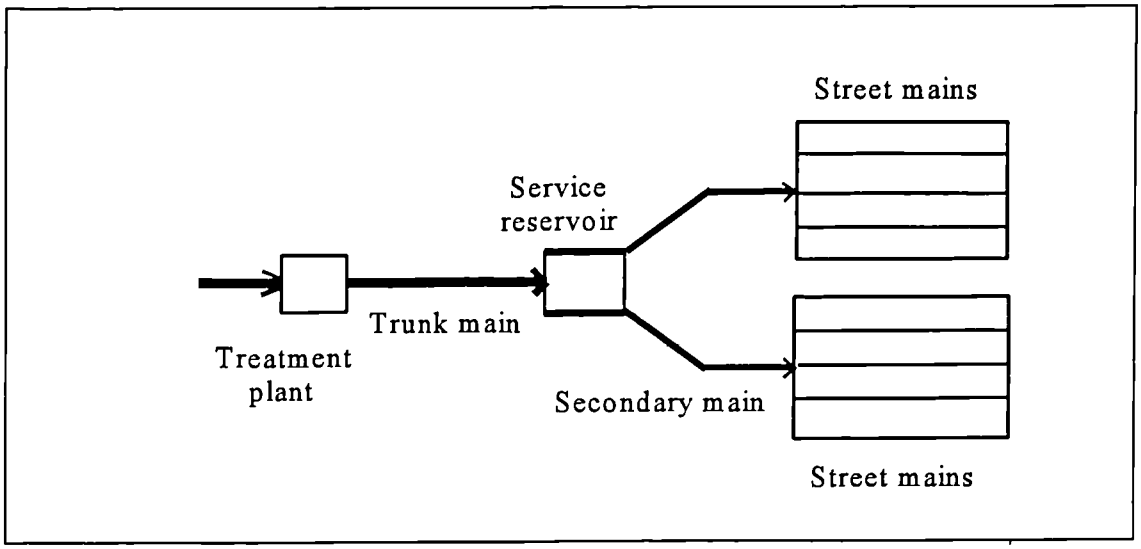

Figure 4.3: *Elements of a water distribution system (Source: Tebbutt, 1973:85)*

As a consequence of this complexity, distribution systems require continuous maintenance which makes them particularly vulnerable to war conditions. First of all, they rely on power supplies as water often needs to be lifted to higher ground to water towers in areas where the consumers' demand is more than the inflow in the trunk main. In addition, pumping and booster stations are required to increase the flow through the system to meet the demand at peak periods. Reservoirs and water towers are especially important to ensure first, to provide a reserve of water in case of failures of the incoming supply; second, to maintain the water pressure in the system at all times. The function of a service reservoir is shown Figure 4.4. There are several reasons why water pressure should be kept at a certain level, such as to prevent pressure surges and water hammer in domestic installations as demand varies considerably from the early hours of the morning to peak hours, but most importantly, it is essential to prevent the contamination of water caused by leakage (Dangerfield, 1983:178-188).

Leakage is a common problem with distribution systems caused mainly by the deterioration of joints and pipes, and broken down valves.[9] It can be said that inevitably all distribution systems leak, but it is important to keep the leakage level under control by carrying out

9 Various types of pipe are used for water mains, including cast iron, spun iron, steel, concrete and plastics.

regular surveys and remedy works. It is clear that the leakage level plays a significant role for the quantity of water supplied to consumers.

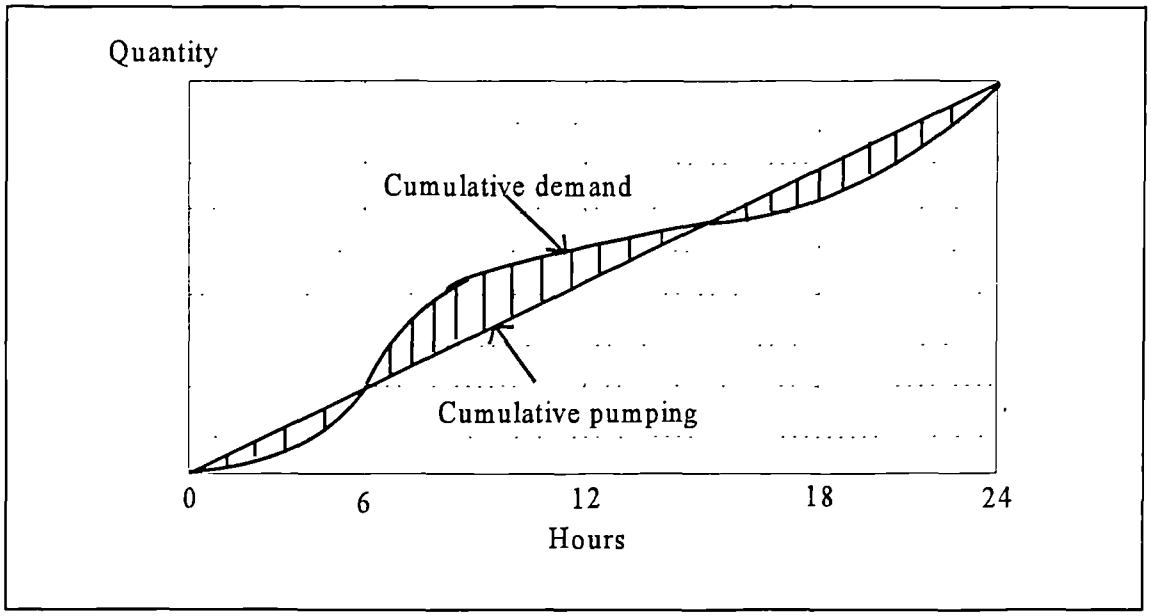

Figure 4.4: *Function of a service reservoir. Storage, indicated by the hatched areas, enables a fluctuating demand to be provided from a constant rate supply (Source: Tebbutt, 1973:96)*

The problems with the reliability of water could have several detrimental effects. If consumers are not supplied with enough quantity, they would have to obtain their water needs from others sources such as vendors or to build their own storage units. It is inevitable that the more water is handled with unhygienic methods such as storage in contaminated containers and water tanks, the more likely it is that war-affected people will be affected by water-related infections. On the other hand, the effects of leakage are not only limited to the quantity of water supplied but also the quality which can cause considerable danger to public health.

When the pressure is maintained high enough in the system, water only leaks out of the system but if the pressure falls to negative or even becomes neutral, water in the surrounding ground starts to leak back into the system, contaminating the water. This is especially a great danger in circumstances where leakage is not only from the water distribution system but also the sewerage system too. In situations where the damage to pipeworks caused by ground subsidence, the likelihood of having leakage from sewerage is particularly high as changing of ground layers would affect both systems. If this is the case, then the water

entering back into the distribution system could contain highly dangerous pathogens. Therefore, the quality of water cannot be ensured by only carrying out a stringent treatment process as water can still get polluted during its conveying through the distribution phase. Following this, it would be right to enquire whether there would be any substantial purpose for treating water in the first place. This can be explained in terms of the misconception discussed by Kolsky (1993) regarding safe and unsafe water. According to him, it is not relevant to claim that there is no middle ground between them. In fact, the concept of 'safe' water depends on the number or level of disease causing pathogens in water, which can be adjusted by for example free residual chlorine in water.

4.3 Technological Appropriateness Issues of Post-war Water Supply Reconstruction

The concept of 'technological appropriateness' was introduced as a reaction to the failure of the western approach to solve the problems of developing countries. The western approach was criticized by development researchers like Schumacher and McRobie for creating dependency and wasting scarce resources in order to implement water systems like they are in the West. The concept of 'intermediate technology' was proposed by Schumacher (1973:167) in 'Small is Beautiful' to create a better living environment for the poor in developing countries. Intermediate technology is explained as an approach which is "...immensely more productive than the indigenous technology....but it would also be immensely cheaper than the sophisticated, highly capital-intensive technology of modern industry". However it should not be forgotten that the context of technology choice is not just about the cost, but also the provision of employment, the utilization of local equipment and materials, and long-term operation and maintenance. This argument was elaborated by the Intermediate Technology Development Group (ITDG) in the context of appropriate technology.

The ITDG (1980:17) emphasizes that "Appropriate technology is that which makes the best use of available [human] resources (skilled and unskilled), capital, and natural assets, taking into account operation and maintenance as well". In addition, the ITDG (1978:1107) investigates the concept of 'appropriate' technology from a distinct perspective, stating

(McDonald & Kay, 1988:68):

> "So technology by itself promises nothing; there is no purely technological solution to the problems of poverty and underdevelopment. Technology only yields its full benefits when used within a framework of social development and strengthened organization".

Supporting this view, McRobie (1982:76) also states that "...technology must spring from local culture and not dominate it runs counter to the centralist trend in all societies". Therefore the notion of 'appropriateness' should not only be considered in a technical perspective, but also social, economic, and environmental. On the other hand, Smethurst (1983) argues that although the implementation of 'appropriate technology' in developing countries by investing scarce financial resources "...as thinly and effectively as possible by adopting lower standards..." has made important achievements, it also has certain limitations. He explains that high technology should be implemented if it is 'appropriate' to local environmental, financial, and organisational structures. It is stated (Dangerfield, 1983:129-132) that:

> "...although it (appropriate technology) has been used to advantage in certain areas of the world it has also been misused. Technology can be spread so thinly that it ceases to be effective, and where communities are in an early but active stage of development appropriate technology can in fact rapidly become 'inappropriate'".

Schumacher (1973:173) accepts that the concept of intermediate technology cannot be applied in every sector:

> "There are products which are themselves the typical outcome of highly sophisticated modern industry and cannot be produced except by such an industry".

He claims that these products are not an "...urgent need of the poor". On the other hand he gives the provision of water as one of those urgent needs, which conflicts with the fact that water in urban areas is often produced by complex systems. As far as urban water supplies are concerned, no matter they are in a town in the West or in a developing country, there is a certain demand for technology. Therefore this research does not agree with the idea that intermediate technology can always be prescribed as an ideal solution. ITDG (1978:1106-1107) also points out that the emphasis on the type of technology used for water supplies, divert the attention from more essential issues. It is claimed that although some intermediate technology such as solar energy for the desalination and wind-driven

pumps can be effective in the short term, without being operated properly and maintained regularly they can deteriorate quickly in the long term. The intermediate technology therefore, should be considered when it is appropriate to the aim of intervention based on local demands and socio-economic and physical environment. The point made by Smethurst on the 'inappropriateness' of 'appropriate technology' in certain circumstances definitely reserves its relevance. It can be concluded that this research considers the concept of 'appropriate technology' as being appropriate to local realities and structures, without making judgement on the level of technology to be implemented whether it is high or low.

After looking at the concept of 'appropriate technology' in general terms, this chapter will now put this concept in the framework of post-war reconstruction of water supplies. As is shown by the preceding examples in Chapter Three, the most common methods of post-war rehabilitation of urban water supplies are repairs and replacements carried out on water supply subsystems and their components. Therefore the aim in this section is to point out some criteria such as hydraulic suitability, efficiency, compatibility, durability, simplicity vs. complexity, quality control, electrical protection and existing experience for the technological appropriateness of reconstruction programmes in post-war areas. It is also pointed out by ITDG (1978:1107) that the concern should not be the "...promise of new water technology, but simply about the choice of technology and the criteria needed to make sound choices" (emphasis added).

4.3.1 Hydraulic Suitability and Pump Compatibility

Pumps are one of the most important components of all water supply subsystems. They can be classified into two main groups as positive displacement pumps and rotodynamic pumps.[10] In the former group water is induced to move by a pumping element such as a

10 Positive displacement pumps can be subdivided into two groups as:

- Positive rotary pumps where a helical rotor pump is used for supplying water from boreholes. Their discharge rates are not dependent on water heads and pump speeds as much as it is for rotodynamic pumps, which can be an important advantage in emergencies where these kind of characteristics are not known in advance.
- Reciprocating pumps which are the earliest type of pump invented, involve the reciprocating process of a piston within a cylinder. The traditional handpump, bucket and windlass, Persian wheel are still commonly used in some developing countries and can play important roles in emergency relief.

piston or helical motor, while pumps in the latter use a rotor or impeller rotating inside a casing. Rotodynamic pumps are more commonly used in urban water supplies, therefore, pump compatibility in this section will only be concerned with this types of pumps.[11] Pump compatibility will be considered in three hypothetical cases:

- pump compatibility for the right purpose;
- having more than one but the same type of pumps;
- more than one but different type of pumps.

In the first case, if it is necessary to replace a pump at a water intake - surface or underground, certain characteristics such as the relationships between 'head' and output; and, Net Positive Suction Head (NPSH) and output should be checked to ensure that the new pump will give sufficient performance in existing circumstances.[12] The diagram in Figure 4.5 shows the comparison of pump characteristics in terms of the relationship between head and quantity. According to this diagram we can see that different type of pumps produce different rates at different heads. Therefore it can be claimed as an extreme example given by Oxfam (1994:40) that:

> "... there is a head or pressure against which a particular pump is unable to move any water, even though it is still operating as its normal speed and

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11 Rotodynamic pumps can be subdivided into three groups according to the principle of force used in their operation; they are:

- Centrifugal pumps - comprising an impeller rotating at high speed and causing the suction of water via the 'eye' into the pump casing. Multistage, vertical spindle and submersible pumps are various types of centrifugal pumps used at different components of a public water supply. They are widely used in disaster relief especially for surface water intake. In addition, they are commonly used in circumstances where distances are large and required heads are high as they have the capacity of pumping up to 100 m.

- Axial flow pumps - inducing water flow forward by propeller type of rotation as a boat propeller or a water turbine. They are particularly suitable for irrigation as they allow the passing of reasonable amount of debris.

- Mixed flow pumps - a combination of the principles adopted for centrifugal and axial flow pumps. They are especially efficient in circumstances where high discharges under medium head are required (Hammer, 1977; Hobbs, 1981:288-289; Tworth et al., 1994:397-405; Davis & Lambert 1995:384-385).

12 'Head' is measured in terms of metres of water showing the existing pressure. For example, 30 m head means the amount of pressure at a 30 m depth below water surface. Meanwhile, 1 atmosphere is 10,33 m head of water which equals to 1,01325 bar or 100 kN/m² (Hobbs, 1981:288; Davis & Lambert, 1995:704).

Meanwhile, NPSH=(atmospheric pressure)-(vapour pressure of water)-(friction losses in the suction pipe)-(static suction head). The available NPSH of the system must always be greater than the required NPSH stated by manufacturer.

consuming a large amount of electrical power".

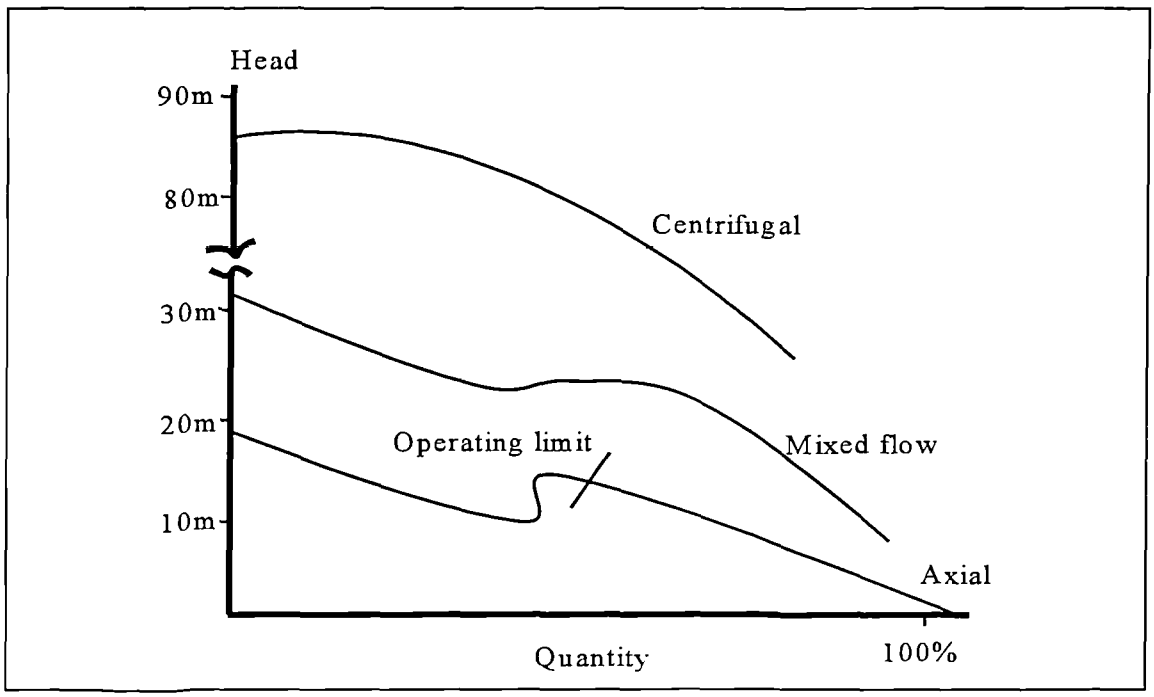

Figure 4.5: *Comparison of pump characteristics (Source: Hobbs, 1995:290)*

On the other hand as can be seen in the second hypothetical case, the flow of water cannot simply be doubled by the implementation of two identical pumps. Characteristics of pipeline and pumps in the form of graphs should be compared before any further decision taken to improve existing water supplies.

In the third case, replacing a pump at a surface water intake or a borehole can prove incompatible with other existing pumps, as each size and type of pump has its own characteristics. For example, a small pump's performance can be quite sufficient when it is operated on its own. However, if the characteristics of the new pump are not compatible with other existing pumps, the intervention's positive impact to increase output could be minimal or none while its level of power consumption is very high.

For example, it is pointed out in the evaluation report regarding the Oxfam's involvement in the Phnom Penh Waterworks improvement that a pump replacement at the river water intake proved incompatible with other existing pumps. The pump installed was a mixed flow type with a rate of 2270 m^3/hour at a head of 14 m. This intervention was necessary as there

were only two of the three pumps at the intake which were in working condition in 1980 to meet the water demand of 100 Ml per day. Although the new pump was purchased in December 1980, it was not installed until June 1981 when there was only one of the pumps operational. The incompatibility with the system was mainly caused by first, the lack of power and second, the new pump's unsuitable hydraulic characteristics. The explanation given in the evaluation report as follows (Oxfam, 1994:40):

> "The most probable explanation for how this occurred is that the pump was specified by someone who did not understand how pumps should be selected, or who did not have access to the characteristics for the existing and proposed pumps".

4.3.2 Durability and Reliability

The basic goals and objectives of post-war interventions on a water supply were given as the improvement of quantity, quality, availability and reliability in Chapter One. Durability which can be identified as the ability of components to keep working without need for repairs, is essential to ensure the reliability of supplies. It is not unusual to experience water shortages in war-affected areas, but it is important to ensure that water is supplied on a regular basis. This can be several hours a day or much less; but as long as the consumers know that the water will be running between certain hours a day, then they can take necessary precautions such as storage at home.

The capital cost of equipment and materials to be used in the rehabilitation of water supplies can be quite high. However, the durability of components should not be neglected for the sake of cutting initial investment. Having said that it does not mean that the choice should always be for expensive options. It does not matter how expensive a component is; without ensuring its suitability and compatibility with the rest of the system it would not last long. Therefore the aim should be to implement the best possible option by considering all physical, chemical, environmental and economic factors affecting the components. In other words, existing water supplies should be surveyed for their technical and sanitary characteristics, before making decisions on the choice of equipment and materials to be made.

4.3.3 Simplicity vs. Complexity

The initial aims of interventions also play an important role in the process of decision making on the type of technology. The criticism made by ITDG (1978:1109) on Western engineers' general attitude towards the water supply implementations in low-income countries can also be of relevant to this discussion. It is explained that engineers from Western countries do not realize the importance of setting goals and objectives for their interventions, as the provision of a certain high-level of water services are taken for granted in their countries. It is claimed that "...they have not usually had any clearer objective in mind than to have 'safe' water flowing out of the end of a pipe". However, it has already been shown in Chapter Two that the post-war water supply interventions can have three stages of aims which cover issues more than just the four basic water supply issues: quantity, quality, availability and reliability. Therefore if the intervention aims at the self-reliance of a community in addition to the provision of water for improvement of public health, then the complexity and simplicity of technology choice should also be born in mind.

For example, the mixing of the alum with the water when it falls freely in a concrete weir can be an alternative method for the conventional flash mixing. It is a simple system, but it is reliable and it requires less complex operation and maintenance. The issues of skilled personnel, operation and maintenance are not only prerequisite for the decisions on simplicity and complexity of technologies, but also all other criteria identified in this section. This is unfortunately not a well understood concept in the current praxis. The training of local personnel for operation and maintenance is not usually considered as a high priority by the international agencies.

These issues will be further explained in the next chapter, but regarding the concept of simplicity and complexity it should be pointed out that it is not unusual to have the demand for advanced technologies coming from local authorities. Some of recent armed conflicts have affected many urban areas in middle income countries like the former Yugoslavia, the CIS Countries, Lebanon and Iraq where the local authorities tend to be interested in more complex technologies than simple ones, because using advanced technology is often considered as being 'modern' and 'better', and they are often used to it some extent due to the inevitable complexity of urban water supplies.

4.3.4 Efficiency and Maintainability

The preceding criteria are especially important for the long-term sustainability of reconstructed water supply components as they can have important impacts on their efficiency and maintenance. If there is not a compatibility for instance, between a new pump and other existing pumps at a water intake, this would have detrimental effects on the operation of system. On the other hand, there can be several options to deal with these kinds of challenges as was pointed out in the Phnom Penh Waterworks experience. For example, the first option can be carrying out only repairs on all pumps, and the second option can include repairing some and replacing others, and the third option can be replacing all of them with new ones. This is a decision which should consider first of all the preceding criteria and secondly, its economic aspect in terms of capital cost, operation and maintenance of the system.

There can be certain cost advantages by repairing, as new components can be quite expensive. However, the process of carrying out repairs is not a guarantee for a cost efficient intervention in certain circumstances. Besides, cost efficiency should not be the only criterion to consider, as time is often an important factor in order to satisfy water demands and to protect public health. In the case of Oxfam's (1994:42) involvement in Cambodia, it was pointed out that:

> "Only one pump could be sent away at a time; shipping both ways would take six months, and the rebuilding work would take two to three months. It would not be possible to send the next pump away for refurbishment until the previous one was back and commissioned. The supply system for the city would therefore be limping along for at least two years".

Besides, the option of refurbishing an existing pump would have cost half that of a new pump. Consequently, the preference was made for the option of buying three new pumps to avoid having three different type of pumps with different characteristics requiring different maintenance methods. The other aspect of efficiency is the operational cost of components such as power consumption, chemicals and manpower. In the process of making a choice for the method of rehabilitation and a component for the implementation, the parameters for operational power needs should also be considered for the long-term sustainability of systems. Maintenance costs, the availability of spares, the existence of

experience with using certain types of technologies and repairing skills should also be considered as important criteria in order to make sound choices.

4.4 Health Considerations

4.4.1 Water-related Infectious Diseases

The literature in public health studies and the health care for war-affected people usually gives the classification of water-related infectious diseases according to their transmission routes which were first categorized by White et al. (1972) and Bradley (1977) (Feachem, et al., 1977; Dangerfield, 1983; WEDC, 1991; Mears & Chowdhury, 1994; Kolsky, 1993; Thomson, 1995). The four categories are:

- Water-borne route: The infection occurs by drinking water containing pathogens.
- Water-washed route: The infection in this group caused by the lack of water for personal hygiene.
- Water-based route: Some pathogens spend a certain part of their life cycle in an aquatic animal such as a water snail and infection occurs by coming in contact with parasitic worms.
- Insect vector route: Water in this route acts as a breeding ground for insects which spread diseases.

The Table 4.1 shows these four water-related transmission routes with example diseases and some preventive strategies.

Transmission route	Example	Preventive Strategy
Water-borne	Diarrheas, dysenteries, cholera, typhoid.	Improve water quality Prevent use of uncontrolled sources Hygiene education
Water-washed	Infectious skin and eye diseases, louse-borne typhus.	Increase water quantity, accessibility, reliability Personal hygiene education
Water-based	Schistosomiasis, guinea worm infection.	Water quality & quantity Control snail population Excreta disposal control
Water-related insect vector	Sleeping sickness, malaria, yellow fewer.	Improve surface water management and surplus water drainage Destroy breeding sites of insects

Table 4.1: *Water-related infection routes with examples and control measures (Source: WEDC, 1991:70 and Dangerfield, 1983:27-28)*

The first two categories - water-borne and water-washed are of most relevance to the scope of this research as their control measures also tend to be the two main physical objectives of post-war reconstructed urban water supply programmes. Therefore, many infectious diseases such as diarrheas, dysentery and cholera can be prevented from causing the deaths of thousands of war-affected people each year by increasing and improving water quantity and quality. Although the framework of water quantity and quality considerations in emergencies and rehabilitation processes are mainly similar, some of the differences should be pointed out to draw appropriate preventive strategies.

According to Kolsky (1993), the preceding categorization of water-related infectious diseases was especially appreciated by engineers as it outlines a preventive strategy for each transmission route. For example in the Table 4.1, the improvement of water quality was given as an appropriate intervention for water-borne diseases and increasing the quantity for the water-washed. However, it is difficult to claim a single transmission route for diarrhoeal diseases as both water-borne and water-washed routes play a significant role in their infection. As a result of this, Bradley and Feachem proposed the following classification:

- faecal-oral diseases (water-borne and water-washed)
- strictly water-washed diseases (skin and eye infections)
- water-based
- water-related insect vector

In terms of recovery of water supplies, it might seem that it is extremely important to point out these different classifications. However, it should be borne in mind that it is very important to have a comprehensive understanding of water quality and quantity issues to choose appropriate technologies and approaches. Kolsky (1993:45) concludes that:

> "(i) The quantity of water used by people is at least as important, and often more important, for diarrhoeal disease control than the quality of that water. The general results in the epidemiological literature bear out the significance of water-washed diarrhoeal disease transmission. The importance of water quality is greatest in urban environments where concern about common-source outbreaks is legitimate; where diarrhoea is endemic and overall faecal contamination is high, it is reasonable to focus on quantity rather than quality. (ii) The impact of water and sanitation interventions upon diarrhoeal disease will vary greatly from place to place, for a variety of reasons. (iii) The study of hygiene behaviour offers much promise in the development and implementation of water and sanitation interventions" (emphasis added).

4.4.2 Water Quality and Quantity from Emergencies to Reconstruction

The amount of water required for human survival in emergencies varies according to the climate, the amount and type of food available and level of human activity. However, Davis and Lambert (1995) explain that drinking water requirements would lie in the range of 3-5 litres per person per day. In fact, the minimum quantity of water required is between 15 and 20 litres including the amount of water needed for cooking and washing. However, Chalinder (1994) points out that the water requirements of Rwandan refugees in 1993-1994, were less than expected - averaging out at 7.5-8 litres/day - as they came from a country where water has been scarce and difficult to access. Oxfam's experience in Rwanda which was pointed out Boyle (1994) also supports this view:

> "...even where an excess of water was supplied, the usage varied from 6 to 10 litres per person per day".

The Table 4.2 below is given by Davis and Lambert (1995) for the estimates of emergency water. The water requirements in health centres and feeding centres are given by UNHCR (1982) and WHO (Chalinder, 1994).

Type of Services	Water requirement
People	**litres/person/day**
Minimum for survival	3-5
Desirable quantity for basic needs	15-20
Health centres	
Out-patients	5
In-patients (excluding laundry)	40-60
Water-flushed toilets	
Pour-flush latrines 1-4 l/flush	2-8
Conventional flush 10-20 l/flush	20-50
Feeding centres	20-30

Table 4.2: *Emergency water requirements (Source: Davis and Lambert, 1995:199)*

The magnitude of some refugee crises can require a great volume of water utilization to satisfy even the minimum level of water requirements. For instance, 5 litres per person per day was taken as an immediate target during the Goma influx, and considering the total number of refugees was around 800,000, the amount of water needed for the influx was 4

million litres per day. Figure 4.6 shows the total treated water delivered to refugees in North Kivu between 14 July and 12 August 1994. The target of 15 litres per person per day in the Goma area was reached only in April 1995 (Millwood, 1996:70-77).[13]

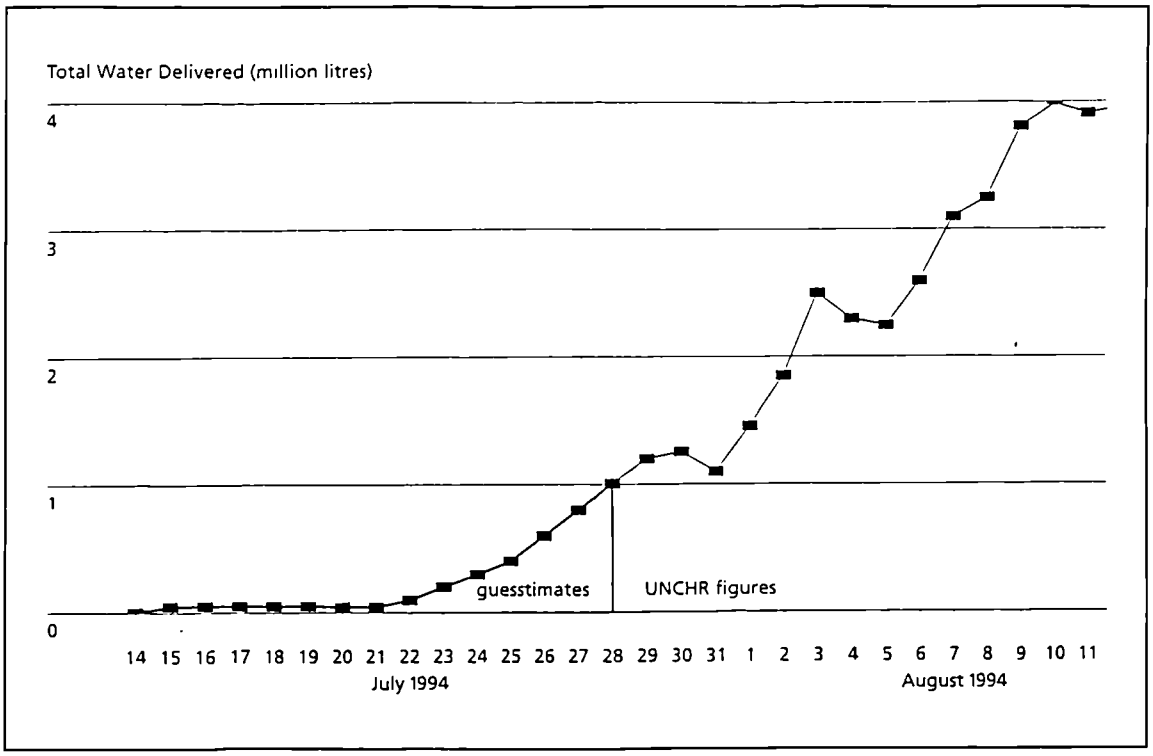

Figure 4.6: *Total treated water delivered to refugees in North Kivu between 14 July and 12 August 1994 (Source: Millwood, 1996:70)*

The provision of an adequate amount of water is especially significant for the health protection of refugees as the sufficiency of quantity does not only have decisive effects on water-washed diseases but also water-borne ones such as diarrheas and cholera. Consequently, improving the water quality would be secondary to supplying an adequate amount of water in emergencies. It is pointed out by UNHCR (1982:123) that:

> "Thus a large quantity of reasonably safe water is preferable to smaller amount of very pure water".

The amount of water provided in refugee camps should consider existing sanitation provisions as the used water will need to be discharged. Unless there is a sound drainage system in the camp, the discharged water would provide ideal breeding points for bacteria

13 Figures for the period up to 29 July are guesstimates as no data are available. From 30 July figures are taken from UNHCR Water Sanitation Coordinator's SitRep of 12 August 1994 (Millwood, 1996:70).

and mosquitos. Chalinder (1994:90) points out that :"The rule should be to bring the water as close as is feasible, affordable and practical" because he claims that there is a reverse relationship between the distance people have to walk to collect water and the amount they use. According to WHO, 100m maximum is the desirable distance to a water point. Therefore it can be summarized that the decision for the amount of water provided in refugee camps should not only be based on the availability of resources and their utilization possibilities, but also the provisions for discharging and accessibility to the water point. However, as was pointed out earlier war-affected people should be provided with sufficient amount of water for their personal hygiene as well as for drinking.

The other important factor in a refugee camp is the adequacy of the system on the basis of the number of taps provided for distribution. At the joint project of UN, MSF-France and Oxfam in the Maza Refugee Camp for Burundese refugees in Rwanda, the water was supplied by one tap for every 500 refugees.[14] It was claimed that: "...the aim was to provide sufficient access to water to avoid queuing and encourage an increase in water usage" (Boyle, 1995). However, the adequacy of this supply is questionable as there was no mention in this report about the level of satisfaction assessed. Although it might be possible to claim that the refugees required less water than could have been provided, it can never be known unless proved with assessments of satisfaction made on site. In fact, the relevance of this kind of satisfaction assessment can be argued in emergencies on the basis that there are always more important priorities, but it is of common knowledge that most of the refugee camps are used much longer than initially estimated that they would be. For example, Boyle (1995) explained that:

> "The design life of an emergency water supply is difficult to determine. The host country may not accept any permanency; however refugees often settle in the country of refuge. Emergency water supplies installed in Sudan in 1984 are still in use today. It is safest to assume that the refugees will be staying long term and design the scheme for at least five years use".

In fact, most of the camps for Rwandanese refugees in Zaire and Burundi are still in use after they were set up two years ago (UNHCR, 1995; ICRC, 1995).

On the other hand, water quality should be still kept under consideration to ensure that war-

14 MSF: Medicins sans Frontiers

affected people will not be infected by water-borne diseases. Stoullig (1995) reports from Sarajevo that after the destruction of the water system, there were bouts of dysentery and hepatises which had their origin in contaminated water. It was suggested that the most useful test for assessing the quality of water in emergencies is the detection of Escherichia coli (E.coli) as this bacteria indicates that there may be harmful pathogens and parasites present (Davis and Lambert, 1995:200).[15]

> "The WHO guidelines for a bacteriologically safe water supply have been set at 0 faecal coliform / 100 ml. However, although it may be a desirable target to reach eventually, this guideline is not practical in many untreated, or partially treated, supplies in developing countries. An acceptable and attainable microbiological water quality will depend on individual circumstances".

The relationship between faecal coliform levels and water quality are given in Table 4.3. According to the suggestion by the UNHCR (1982):

> "...the water is disinfected by chlorination, it is easier and more appropriate to test for the presence of free chlorine than for bacteria. The presence of free chlorine at around 0.2 mg/l at the distribution point indicates that the bacteria have almost certainly been killed and that the water cannot be heavily polluted with faecal or other organic matter".

Faecal coliform levels / 100 ml	Water quality
0 - 10	reasonable quality
10 -100	polluted
100 - 1,000	dangerous
over 1,000	very dangerous

Table 4.3: *The relationship between faecal coliform levels and water quality (Source: UNICEF, 1986:327)*

Meanwhile, Feachem (1977) gives an algorithm of the water treatment decision process according to E. Coli level in water in Figure 4.7, which can be used for clarifying the quality-quantity dilemma for low-income communities. This is also relevant for emergency and post-war situations where urgent water needs have to be satisfied by scarce funds.

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15 E.coli: Escherichia coli grows at 44-45 °C on complex media, ferments lactose and mannitol with the production of acid and gas, and produces indole from tryptophan. E.coli is abundant in human and animal faeces, where it may attain concentrations in fresh faeces of 10)9 per gram.. It is found in sewage, treated effluents, and all natural waters and soils that are subject to recent faecal contamination, whether from humans, agriculture, or wild animals and birds (WHO, 1993).

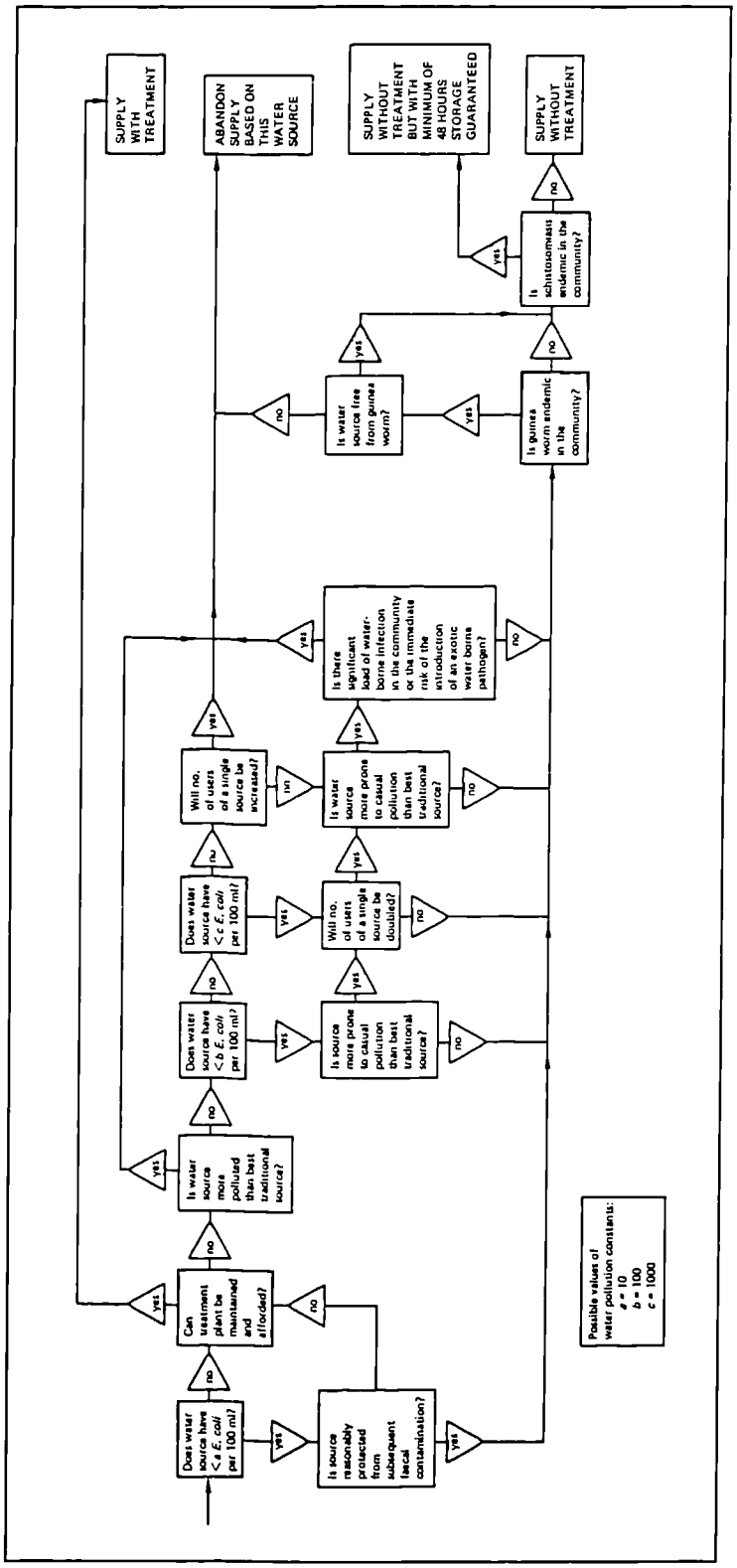

Figure 4.7: *An algorithm of the decision to treat, not to treat, or to abandon a particular water source*
Source: Feachem, et al. (1977:88)

The WHO's recommendations in the event of an emergency affecting an urban area, can be summarized as first of all, the decision to close the supply should be carried out unless an alternative safe supply is provided.

Secondly, consumers should be advised to boil water if the quality cannot be maintained by immediate corrective measures like superchlorination.

Thirdly, in the event of tankering water, a free residual concentration of at least 0,5 mg/litre chlorine should be obtained for a minimum of 30 minutes at the delivery point; and finally, other disinfectant measures like adding slow-release disinfectant tablets to water drawn from the tap should be considered as long as they are proven to give safe and reliable disinfection (WHO, 1993: 142-143).[16]

16 Free residual chlorine level required at the distribution point is given as 0.2 - 0.5 mg/litre by UNICEF (1986:325).

The precautions suggested by UNDRO (1982) in the framework of responding to disasters also emphasize similar actions such as:

- quick repairs to pipes using plastic patching and other **modern techniques** (emphasis added)
- increasing the chlorine concentration and arranging emergency chlorination in supplies if they are not normally chlorinated
- if the chlorination is impossible, advising the local population on the boiling and filtration of drinking water
- using water tankers when piped water supply is completely interrupted
- setting up emergency storage and treatment facilities in swimming pools or in industrial water tanks and reservoirs
- carrying out repairs to town water supplies

However, the successful implementation of the preceding recommendations in war-affected areas can only be achieved by adequate preparedness. For example, to enable the carrying out of repairs to town water supplies depends on the preparation and training of technicians. Additionally, the possibility of using modern techniques in conflict areas would be quite slim considering the absence of technical personnel, necessary equipment, chemicals and materials. After repairing water mains, the pipes should be cleaned with a 100 mg/litre chlorine solution for disinfection, and even more chlorine will be needed for the precautions mentioned above. This means obtaining a continuous supply of chlorine in conflict conditions when transport is highly dangerous and frequently impossible. Boiling water or using tablets for disinfection are the options if the contamination in water supplies cannot be solved by chlorination. Although, boiling water for ten minutes can be an effective disinfection method, the problems with availability of fuel in war-affected areas can pose serious obstacles. The availability and distribution of tablets again depends on successful preparedness plans in advance (DNHW[17]-Canada, 1981; UNDRO, 1982).

The preceding precautions to meet urgent water needs in emergencies affecting urban areas can only be short term solutions. Once the security situation allows people to carry out remedial works to increase and improve water quantity and quality, activities should be

17 DNHW-Canada: Department of National Health and Welfare, Government of Canada.

towards improving the efficiency and effectiveness of supplies. Otherwise, short term solutions cannot be sufficient to meet the water needs of an urban population in the long term. Although they can be varied from one country to another according to their economic development level and even in the same city from one income group to another, the urban population's expectations for quantity and quality for domestic consumption tend to be much higher than they are in rural areas.

It is difficult to make generalizations for water quality standards for every country as they are much more strict and higher in industrialised countries than they are in developing countries. For instance, the 1993 edition of WHO water quality guidelines which were set to be used as a basis for national standards, cannot be met in many developing countries in peace, never mind in emergencies, because of financial and organisational constraints. It is explained by WHO (1993:2) that: "...the adaptation of drinking water standards that are too stringent could limit the availability of water supplies that meet those standards - a significant consideration in regions of water shortage". The aim for proposing a set of guidelines for water quality is further explained as to draw up a framework for acceptable levels of risk. It is emphasized that: "...the guideline values have a degree of flexibility and enable a judgement to be made regarding the provision of drinking water of acceptable quality".

Water quality cannot be assessed easily by ordinary consumers who have neither knowledge nor equipment. People's basic judgement of the water quality is not more than checking the colour or smelling any unusual odours. For example, water with unusual colour or smell can be considered as suspicious, which can be perfectly harmless; while water with excellent physical parameters might contain a high level of infectious pathogens or harmful inorganic matter. Although there are no health-based guideline values for some parameters such as taste, colour, odour, hardness, iron and pH, it is very important to ensure that the standards of these constituents in water are appropriate to the local community's socio-economic and cultural. Otherwise, they can have discouraging effects on consumers who may obtain water from other unprotected sources. Therefore, acceptability standards also need to be considered in the provision of water in war-affected areas. Acceptability aspects are divided into four main groups by WHO (1993:122-130) which are:

- Physical parameters such as colour, taste, odour, temperature and turbidity.

- Inorganic constituents including aluminium, ammonia, chloride, copper, hardness, hydrogen sulfide, iron, manganese, dissolved oxygen, pH, sodium, sulfate, total dissolved solids, and zinc.
- Organic constituents - toluene, xylene, ethylbenzene, styrene, monochlorobenzene, dichlorobenzenes, trichlorobenzenes and synthetic detergents.
- Disinfectants and disinfectant by-products such as chlorine and chlorophenols.

In other words, the water supplied to consumers should not only be safe for drinking, but also it needs to be pleasing with its physical qualities. It is the result of these requirements that the complexity of the task in order to provide safe and acceptable quality of water should be once again, emphasized here. Therefore the discussion now needs to focus on urban water treatment processes and likely problems to be encountered in the context of war.

As pointed out in Section 4.2.3, a water treatment process is formed by 'the four lines of defence' which are pre-treatment, coagulation-flocculation-sedimentation, filtration and disinfection. However the existence of these treatment facilities would not be enough for the production of safe and acceptable quality, as the operation of each phase also depends on the provision of various chemicals and the availability of trained personnel. The existence of skilled personnel is very significant especially during flocculation as it requires gentle stirring in the range of 0.1-0.3 m/s with a detention time of 20-30 minutes. If the process is too slow or too quick, the whole process can be completely ineffective causing wastage of coagulant and later making the sedimentation process much more difficult. (Davis & Lambert, 1995:324). It is also pointed out by WHO (1993:134) that:

> "Coagulation and flocculation require a high level of supervisory skill. Before it is decided to use coagulation as part of the treatment process, careful consideration must be given to the likelihood of a regular supply of chemicals and the availability of qualified personnel".[18]

On the other hand, it should be borne in mind that chemicals and personnel are not easily obtained in war-affected areas as the examples in Chapter Three showed. This is particularly

18 Aluminium Sulphate - Al②(SO④)③ is most widely used coagulant which is particularly effective for waters with pH level between 6 and 8. If the pH level is lower than 6 or higher than 8, ferric chloride - FeCl③ or ferric sulphate - Fe②(SO④)③ can be used as coagulants (Davis & Lambert, 1995:321).

the case during emergencies, and the problem becomes more manageable in parallel with improving security conditions and logistics in general. However, the financial sustainability of interventions should be carefully considered in the planning phase, as the operation of these systems, including supplying chemicals and personnel would mean additional costs. The issues regarding operation and maintenance requirements will be discussed further in the next chapter.

4.4.3 Environmental Appropriateness

Biswas (1978, 283-297) discusses environmental implications of water development for developing countries through three categories of sub-systems: physical, biological and human. In terms of the physical sub-system, he investigates water quantity and quality issues, followed by water-related infectious diseases in the biological sub-system. He suggests that engineers and planners should always consider the implications of those programmes on human sub-systems such as production and socio-cultural systems. His arguments are concluded by emphasizing that: "Harmony can come only with integrated planning but discord is comparatively easy to produce" (emphasise added).

The concept of water sub-systems is further investigated in the 'Role of water in urban ecology' (Hengeveld & De Vocht, 1982:25-33) where three subsystems are categorized as natural, urban and human water sub-systems. The natural and urban water subsystems are identified as "...the water system outside the strict urban area" and the water system inside the urban area respectively. While the natural water subsystem has major components like waterbodies, wetlands, floodlands, coastal floodplains and groundwater system; the urban water subsystem can be in forms of artificial canals, balancing lakes, reservoirs, artificial lakes, river fronts and harbours. However, this research focuses on the human water subsystem which is "...the completely artificial part of the water system and provides for water supply, runoff and waste-water discharge". Figure 4.8 shows the human water sub-system in terms of water-handling aspects.

The diagram for the human water subsystem shows the interaction between water supply and waste-water discharge. Although this connection might seem to be obvious, it is often neglected or not included in the post-war water supply rehabilitation programmes at all.

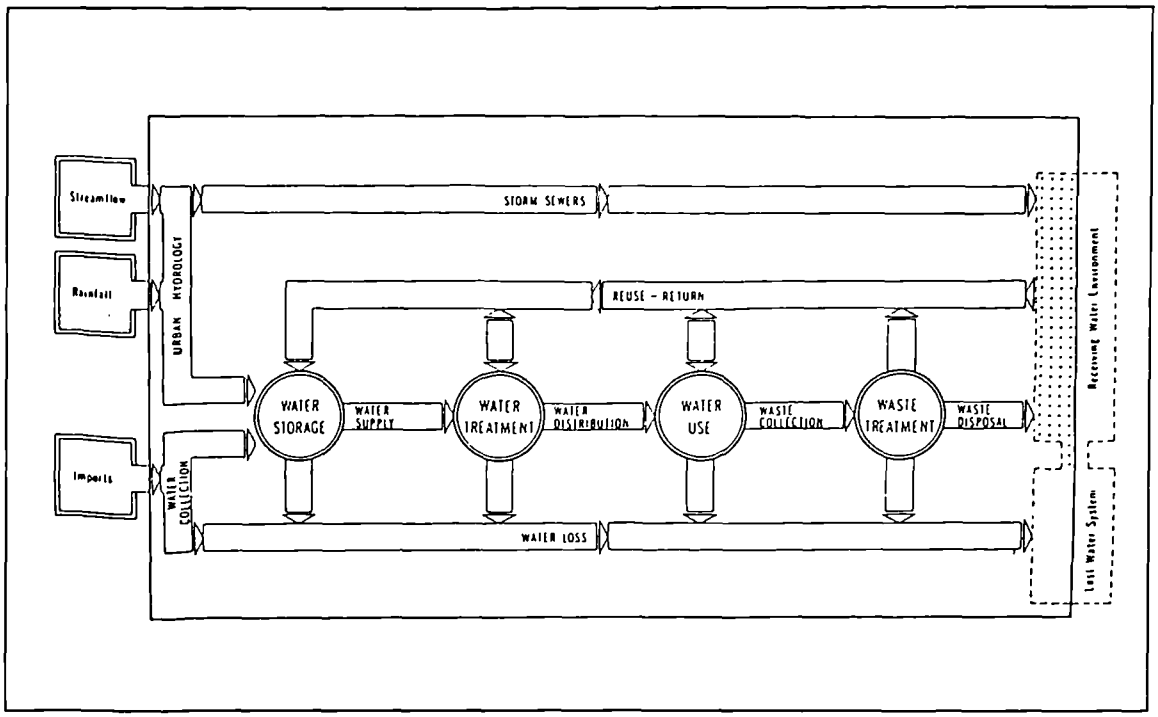

Figure 4.8: *Human sub-system (Source: Hengeveld and De Vocht, 1982:30)*

When financial resources are scarce, to invest money on sanitation is not considered as a viable option. However, this kind of approach can produce a further set of problems causing danger to public health. The experience shows that successful public health programmes require a close interaction among water supply, sanitation, nutrition, health education and primary health care programmes. The provision of water without considering the ways of discharging it, can have detrimental effects on the public health. Additionally, the lack of electricity, equipment, chemicals and personnel in war-torn areas do not only affect water supplies but also sewage systems.

In terms of the close relationship between water and sanitation services, and between disease and water supply projects implemented in emergencies, Nembrini and Etienne (1994) adapted Table 4.4 from Feachem which shows "the connection between the principal activities of the water and sanitation services and disease caused by insufficient or impure water or insanitary conditions".[19] It was explained that a shortage of water is bad for bodily and domestic hygiene, where there is no efficient system of waste disposal, sources of water can be contaminated and vectors of disease can breed causing water-related infections.

19 Feachem, R. G., "Environmental health engineering as human ecology: An example from New Guinea". In: Subsistence and survival, rural ecology in the Pacific.

Water/Sanitation Engineering Work	Interdependence with Environment	Effects on Health
Water Supply	Accessibility, Quantity Quality	Waterborne infections Infections of the skin and eyes
Evacuation of faecal matter and drainage	Contamination of the environment by faecal matter	Infections by faecal-oral transmission, Intestinal parasites
Waste disposal	Proliferating flies and rats	Infections transmitted by flies and rats
Vectors of disease	Profileration of vectors	Malaria, typhus, relapsing fever, etc

Table 4.4: *Relationship between water-sanitation work, the environment and some of their effects on health (Source: Nembrini and Etienne, 1994:2)*

4.5 Summary and Conclusions

This chapter looked at functional and environmental appropriateness issues which can be identified as basic concepts for the aim of alleviating suffering caused by inadequate and unsafe water supplies in war-affected urban areas. From this it can be claimed that the provision of water in a progression from emergency to reconstruction should include the following points:

- The post-war reconstruction of urban water supplies should be done in a framework that ensures the implementation of an holistic and integrated approach. All subsystems of a water supply from collection to distribution should be considered as a whole in rehabilitation works carried out to improve quantity and quality. For example, water quality cannot be ensured by a strict treatment process only, as the distribution subsystem also plays an important role for the level of water quality supplied to consumers. It can be claimed that the leakage problem can be as decisive as the treatment process on the quality of water. However it is important that the leakage should not only be seen as an indirect consequence of war because of reasons such as the lack of maintenance during the war. It is often inherited from pre-war era, as it is a common urban water supply problem even in peace. Therefore it is important that an holistic approach should analyse the water problems faced in a war-affected area with their root causes. For example, if there is a high level of leakage in the system, then the question should be why there is this problem and how can it be prevented

within available local resources. The concept of integration on the other hand, has a wider framework including all subsystems of a total water supply system such as power supplies, sewage systems, water treatment, etc. This is essential for two main reasons: firstly, the operation of water supplies depend on other lifelines such as power and sanitation; and secondly, the full protection of public health depends on the good working order of urban water cycle from water resources where collection is done, to the point where waste water is discharged.

- Water quantity and quality issues are not well understood in the current praxis of urban water supplies in war-affected areas. There is a tendency to relate the prevention of water-related infectious diseases purely to water quality improvements. However, water quantity is as important as quality for the protection of public health against many of these diseases. Without ensuring adequate amounts of water, the programmes aiming at supplying very pure water would be insufficient to enable high public health standards. Therefore decisions regarding water quantity and quality improvements should be made according to local public health needs. The preceding literature review also shows that the best approach would be to find a right balance between quantity and quality ensuring the best possible public health standards within local environmental and operational conditons.

- The rehabilitation of post-war water supplies is done by the three main technical methods: repairing, replacing broken components, and adding new ones. It is not possible to identify appropriate methods for each component of a water supply in all situations, as it is rather difficult to generalize the circumstances and possible impacts of the technologies employed. There are also many independent factors which can affect the same problem. Therefore it is clear that appropriate technical decisions can only be taken in the field according to existing physical, logistical, political and economic realities and structures. However this is not enough to ensure the sustainability of water supplies without considering long-term effects of these methods. Several criteria such as hydraulic suitability, pump compatibility, durability, simplicity, efficiency and maintainability were identified in this chapter; they are only a few of the examples which were derived for the concept of technological appropriateness. However similar criteria will be further analysed through the

investigation of the case study in the Tuzla Region of Bosnia -Herzegovina.

After highlighting these conclusions, the flow diagram of activities to improve immediate objectives of post-war urban water supplies, is given in Figure 4.9.

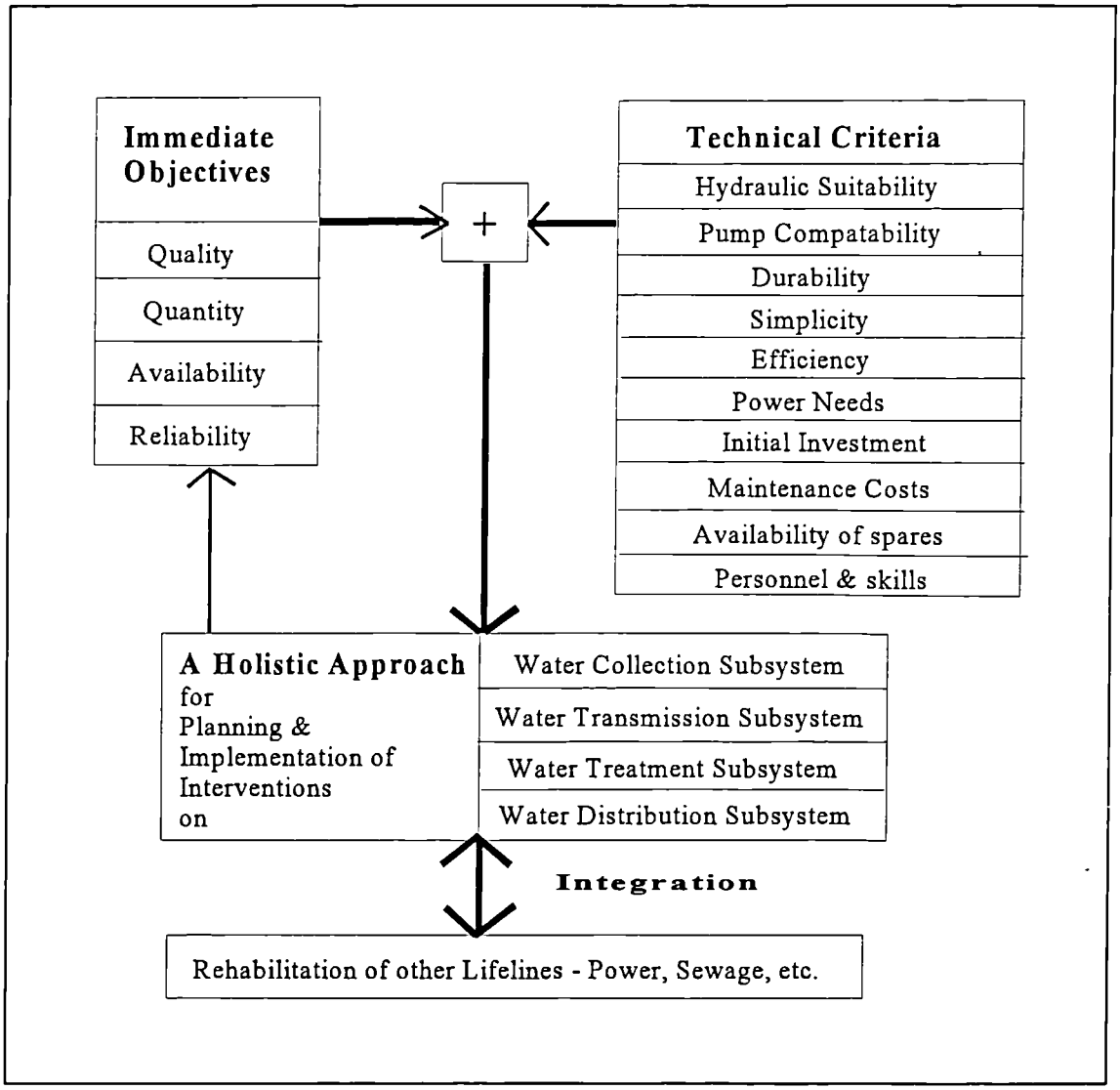

Figure 4.9: *The flow diagram of activities to improve immediate objectives of post-war urban water supplies (Source: Author)*

In the next Chapter, a further analytical review of knowledge will be presented in order to explore and articulate the context of targeted, applicable and maintainable interventions.

Chapter 5 : Targeted, Applicable and Maintainable Post-war Water Supply Reconstruction

5.1 Introduction

In the previous chapter the context of post-war water supply rehabilitation in terms of immediate objectives in Stage I was investigated. Apart from deriving a number of technical criteria for the reconstruction process, Chapter Four also investigated the concepts of water quality, quantity and environmental appropriateness. In this chapter this investigation will be taken one step further and include the contexts of goals in Stages II and III which are the consolidation of peace and the enablement of long-term sustainability. The chapter sets out three areas of concern for the reconstruction of urban water supplies:

1 being targeted socially, economically and politically

2 being applicable in a post-war environment

3 being maintainable after the completion of the reconstruction programme

Areas (1) and (2) will be investigated in order to highlight the objectives of Stage II, while the area (3) will be explained for the Stage III at the end of this Chapter.

5.2 Targeted Water Supply Reconstruction

It was already shown in Chapter Two that the reconstruction of urban water supplies can be used in order to consolidate the establishment of peace in a war-affected country. This relationship will be further investigated through social, economic and political dimensions. However, it is necessary to clarify the concept of peace before starting this investigation.

Galtung (1996:9) gives two definitions for peace, which are:

- Peace is the absence/reduction of violence of all kinds.
- Peace is nonviolent and creative conflict transformation.

He gives the main difference between these two definitions as the first one being 'violence oriented', while the second one is 'conflict oriented' emphasising the transformation process of conflicts. In the scope of this research, the second definition will be taken as a basis to explain the consolidation of peace through the post-war reconstruction of urban water supplies. The main reason behind this preference is that the second definition is more dynamic, advocating the possibility of establishing peace by means of nonviolent and creative conflict transformation. Following this, it can be claimed that the social, economic and political dimensions of post-war reconstruction can be used in order to enable this transformation.

It is explained in chapters One and Two that intrastate armed conflicts cause social and institutional disintegration by exploiting existing ethnic, religious, racial and cultural differences. Therefore the aim here is to investigate the contexts of 'partnerships' and 'institutional development' in order to derive issues, which can be utilised to eradicate the problems caused by these exploitations.

5.2.1 Local Participation and Partnerships

The concept of participation is one of the most frequently used notions of the 1990s in the fields of development and post-disaster recovery. It is not a new concept especially in rural development; community participation has been considered as an essential component of development programmes since the 1950s. Although reference to participation is often made in development programmes, it does not mean that is any more than an intention in some cases. Participation issues for urban development on the other hand, used to be overlooked, as beneficiaries of these programmes are seen as consumers, but not as producers as in rural development projects (White, 1981; UNICEF, 1982; Moser, 1987; IRC, 1991; Abbott, 1996) . Much has already been written about this concept by development theorists; the aim here is to give this research's understanding of it in the scope of recovery of urban water supplies.

Abbott (1996) categorizes approaches to participation as community development and empowerment. These two approaches are related to two main paradigms which are modernization theory and dependency theory respectively. The diagram in Figure 5.1 shows

the paradigm approach model of community participation. According to this diagram the dependency theory is superseded by the modernization theory leading to an emphasis on empowerment at the expense of community participation.

All these different components of this paradigm approach are investigated in detail in 'Sharing the City' by Abbott (1996:23) who points out that:

> "The issue is no longer whether a specific approach is now more universally appropriate in different situations. Instead, it is which factors make different approaches appropriate in different situations" (emphasis added).

In his attempt to suggest a model for partnership, Barakat (1993:382) states that:

> "Of course different States emerge from war with different needs and, similarly different communities will have different needs and abilities to contribute, thus it would not be realistic to suggest that participation is a 'good' and necessary thing in all post-war situations. What we are suggesting is that, there are different modes and levels of participation, and one has to consider what is best for a particular situation".

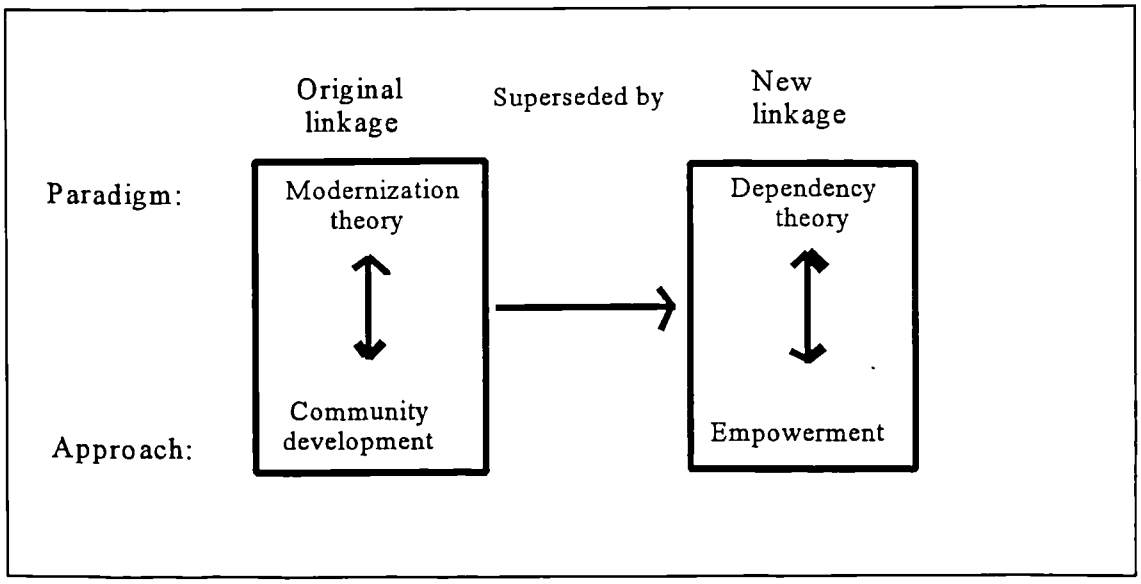

Figure 5.1: *The paradigm approach model of community participation (Source: Abbott, 1996:21)*

In other words, the success of different approaches depends on the social, political and institutional 'surround' of the arena where participation initiatives are taking place. The Figure 5.2 shows the categorisation of possibilities for participation in a relationship between the openness of government and the complexity of issues to be addressed. According to this relationship:

- Arena of exclusion: The government is hostile to community involvement in decision making. Community involvement is extremely difficult and can only be in simple projects rather than those which are complex.
- Arena of confrontation: Although the government is still closed to community involvement in general, there can be opportunities in some sectors and activities. As the level of system complexity is low to medium, empowerment can be used in this arena.
- Arena of inclusion: In this arena, the involvement of community in simple projects within a framework defined by the government is possible. The community development approach can be used.
- Arena of consensus: The government is open to community participation, but the problems to be faced are more complex than those in the arena of inclusion. Therefore it is not possible for either the government or the community to take complete control of the process. The negotiated development approach is not only possible but also necessary in this arena (Abbott, 1996: 123-125).

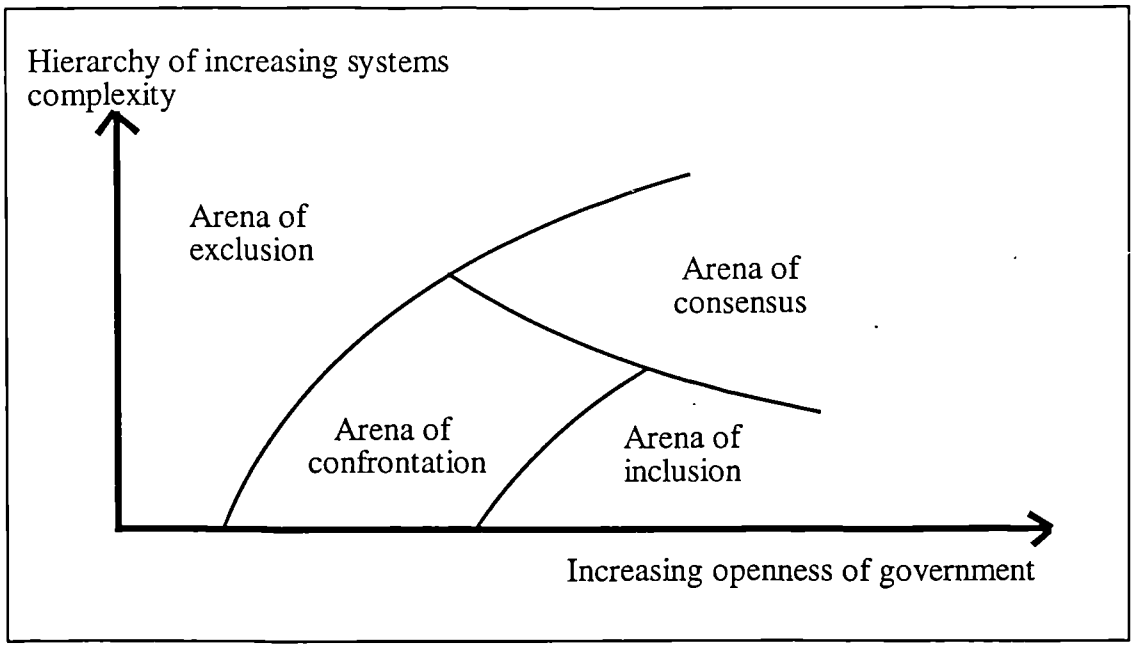

Figure 5.2: *Community participation surround and the different arenas of participation (Source: Abbott, 1996:124)*

Although the reality can be much more complex, the preceding conceptual model provides a useful framework in which participation initiatives can be located. On the other hand, the relevance of this model for the post-war reconstruction of urban water supplies can be

argued, as it is mainly about the relationship between the government and community. The main actors of the water supply reconstruction process, as is shown by examples in Chapter Three, can be categorized as international agencies and local authorities. The direct involvement of community in decision making is often not necessary as the planning and implementation of post-war urban water supplies take place at an institutional level more than a community one. In other words, it might seem that community participation is a more appropriate approach for rural water supplies. However it should not be forgotten that small scale programmes such as community piped water and handpump schemes are often used in the peripheries of many urban areas in developing countries. Besides, participation in infrastructure management is identified by the World Bank as (Schübeler, 1996:2):

> "...a process whereby people - as consumers and producers of infrastructure services, and as citizens - influence the flow and quality of infrastructure services available to them".

Therefore this conceptual model can be used in order to understand and respond to participation issues in war-affected urban areas. For example, community development seems a relevant approach to deal with post-war water issues in city peripheries or in urban areas where the population is supplied with water by simple methods.

In terms of local authorities' participation in the decision making process of complex projects which are funded by external donors and assisted by international NGOs, the arena of consensus seems to be the most appropriate. The negotiated development approach can be very productive for both sides in the implementation of schemes such as the rehabilitation of an entire water supply in an urban area. The scope of a task like this is clearly over the capacities of any international agency or a war-affected local water board with limited financial, institutional and personnel resources. Experience shows that when international agencies take on a reconstruction programme, their most important needs are communication, and knowledge and experience to work in that particular local environment. These can be provided by local authorities if they still exist. Meanwhile, international agencies can assist local authorities in forms of finance, institutional development and technical expertise if it is necessary. It is very important to ensure this partnership throughout the whole post-war reconstruction process in order to enable a good working order of operation and maintenance in the long-term. Therefore a clear working framework, a need for dialogue and consensus building between these international and local actors are

indispensable to tackle inevitable complex problems of urban water supplies successfully.

In support of this view, partnership in the shelter process is identified by UNCHS (1993:18) as a mechanism ensuring that the comparative advantages of different actors are exploited in a mutually-supportive way. In other words partnership is more than an interaction between actors, it is a process where the maximum utilisation of capabilities is ensured while the problems which might be caused by vulnerabilities are minimized. Schübeler (1996:48) supports this view by pointing out that:

> "As in any partnership, the basic purpose is to create mutually advantageous interactions and synergy in which the strengths of one partner balance the weaknesses of the others; together, partners should be able to achieve results that would not have been possible independently".

Therefore it can be claimed that the concept of partnership for the post-war reconstruction of urban water supplies should emphasize the harmonization of initiatives carried out by different actors in accordance with the needs of a particular situation.

Having identified the general concept of local participation and partnership, this section will conclude with the summarization of possible constraints and opportunities of a partnership initiative with local institutions. These opportunities and limitations are based on those identified by the participants of the 'Urban Rehabilitation in Kabul' Workshop in 1995 (Barakat, et al., 1996:39).

- Opportunities: To initiate a partnership with a local authority would provide several advantages to international agencies, as these institutions are often equipped with the technical knowledge of existing systems and can contribute to the process as an implementing agency through the utilization of their professional and labour force. However it should be borne in mind that as the experience shows, local water boards often lose their trained personnel due to death, displacement or the preference to work for international agencies for better financial prospects. Therefore these capacities need to be assessed diligently in order to establish the mode and level of partnership with local institutions. However, the participation of local authorities can also be significant for the reduction of implementation costs and ensuring the long-term maintenance of interventions.

- Limitations: While the preceding advantages can be obtained through the partnership with local authorities, international agencies should be aware of various limitations and take necessary precautions to eliminate them. First, it is often the case that international agencies and local institutions can have conflicting interests and priorities for the interventions to be taken. Although this can be a limitation for an international agency, it should not be forgotten that the initial setting up of project objectives and planning of programmes without a proper consultation of local authorities can result in other deficiencies in operation and maintenance phases. Second, the interest of the international community to improve water supplies can be manipulated by politicians and water board personnel's vested interests. Finally, international agencies can be reluctant to work with local authorities because not only they are governmental organisations, but also the partnership process can be time consuming and inefficient due to problems with local organisational structures.

5.2.2 Can Water Supply Recovery Be a Tool for Peacebuilding?

The post-war reconstruction of urban water supplies should also be targeted politically which can consolidate the establishment of peace. It is pointed out by Barakat (1993:75-80) that:

> "...war is waged and halted by politicians and reconstruction is bound to follow the political trend. In the same way, war and politics cannot be separated; reconstruction cannot be divorced from politics".

He further explains the political dimension of reconstruction by giving three main issues as follow:

- Wars might raise expectations because of promises given by politicians.
- The delays in taking political decisions because of economic and military structuring.
- The implementation of physical reconstruction in parallel to the ruling power's ideology.

As can be seen, these issues are more appropriate to interstate conflicts than to intrastate conflicts. The examples given in previous chapters show that intrastate conflicts can bring completely different political agendas in reconstruction process. For example, the exploitation of ethnic, cultural, religious and other social differences can create towns which are clearly divided as enemies. The agreement of peace deals between politicians

would not be sufficient to heal these differences. Therefore any opportunity should be taken in order to build up confidence and trust between the conflicting sides. It seems that the post-war recovery of urban water supplies can be one of these opportunities to unify divided communities.

The 1996 Jahorina-Brus Gravity Line Rehabilitation initiative taken by ICRC in Sarajevo example in Chapter Two showed that the unifying character of urban water supplies can be used as a tool for peace. However the secondary case study example of Mostar in Chapter Three indicated that to aim at the utilization of this opportunity sometimes cannot be more than naivety. On the other hand, although a post-war community in an urban area might be divided into sectors according to their common ethnicity, religion or another social characteristic, it is often the case that the whole population relies on the same water supply system. There can be different power balance structures and not always all sides would be in an equal position in terms of having access to water supplies. However it is shown in the previous chapter that without a holistic operation water production cannot be achieved. The partial ineffectiveness of a water supply can have serious operational impacts on the rest of system. Therefore at least theoretically, no matter how deep these exploited divisions are, it still seems that the unifying character of water supplies can be used to persuade the conflicting sides into a partnership initiative.

Strategies such as collaboration can be used to initiate a partnership within a divided community. However to persuade conflicting sides to work together can be a difficult task, as this would mean asking them to turn from being enemies to partners. In other words, this can easily be a time consuming process where a great deal of negotiations and trust-building initiatives may need to be taken. As a result of these needs that the utilization of unifying characteristic of water supplies as a peace tool requires a different set of skills that may not be readily available within the structure of the international agency. Therefore external agencies which aim at a politically targeted water supply implementation like this, should first assess their capacities to meet the needs of this kind of initiative, and would need to prepare themselves for the frustrating challenges of this task. On the other hand, for the reasons explained above regarding the unique characteristic of water supplies in urban areas these challenges can perhaps be overcome by following certain principles. The principles of a collaboration can be summarised as:

- All sides should be aware of the fact that without their full collaboration, the full improvement of their common water supply cannot be ensured.
- All sides make an input to the programme.
- The responsibility of each stakeholder is designated clearly.
- The interaction of responsibilities is clearly identified.
- The external agency as a facilitator remains neutral at all times.
- Intervention on water supplies should include adjustments which would prevent any of the sides being an advantageous position with the access to water.

After looking at the concepts of socially and politically targeted water supply reconstruction, the next section will concentrate on the economic aspect of reconstruction. It is already shown in Chapter Two that there are close links with the provision of safe and adequate water, and the level of economic development in urban areas. It is also clear that the interventions taken to improve water supplies would also contribute to the local economy in several ways. First of all, local people as both professionals and labour need to be employed to carry out the reconstruction, which would mean the injection of money into the local economy. Secondly, the local economy can benefit further from these implementations if the required equipment and materials are obtained from local suppliers. Finally; if the implementations are socially and politically targeted as explained above, then the local economy can benefit even further from these partnerships as they would create an environment of hope and trust.

On the other hand, the aim here is to focus on another important reconstruction issue which is the incorporation of private sector into post-war recovery process. It is very important that the partnership between local authorities and national/international commercial companies should be forged to ensure the involvement of commercial companies in rebuilding of war-torn communities. However, as is also pointed out by the Water under Fire Workshop, this must be done within a structure of control to avoid exploitation. In this workshop, the concept of commercial companies' participation in the post-war recovery is discussed in a paper entitled 'Humanitarian or commercial, the limits of NGO work' by Paul Sherlock from Oxfam.[1] Consequently, this section will borrow great deal of information from this paper.

1 This paper was presented at the Water under Fire Workshop on 21-22 November 1996.

5.2.3 Humanitarianism vs Commercialism

It is pointed out that it is often very difficult to differentiate humanitarian agencies from commercial contractors. It seems obvious that the main difference should be; the former provides its capabilities to war-affected people on humanitarian grounds while the latter aims for profit at the end of implementation. However, examples from the Northern Iraq and Somalia show that some of local NGOs were "...a little more than contractors with a humanitarian name". On the other hand, some of NGOs positions in their humanitarian work, 100 per cent funded by a donor, can also be considered as a 'contractor' because in this kind of circumstances, they are not more than a 'body' to carry out these implementations for their funders. Barakat et al. (1994:13) describe the rapid increase of local NGOs in Afghanistan as follow:

> "A few Afghan NGOs, mostly specialising in health, were active during the war and a handful more were formed between 1988 and 1990. Some of these offshoots of International NGOs, or branches of these, turned into National Afghan NGOs. In 1990 the UN decided to channel a larger part of its support through Afghan NGOs...Today more [than] 200 Afghan NGOs are registered. Many of them are without proper planning and implementation capacity".

Security and political considerations used to be one of the main obstacles stopping commercial companies entering in post-war recovery activities. However, there are now three main ways for commercial companies to become involved in relief and reconstruction at war-affected areas. First, an increasing number of specialised companies such as the ones from the armament and mine clearance industries are competing alongside the aid agencies. Second, some commercial companies supplying equipment and services to NGOs , which are sometimes called into the field to sort out problems with their products. For example: "...Oxfam called out a commercial company to the Goma camps in 1994 to try and solve a problem with mounting plates on a range of large pumps they were using". The other example is the involvement of the ex fire chief of San Francisco through the US Army in Goma. By their involvement, water was pumped from a lake and tankered to one of the refugee camps. According to Sherlock (1997):

> "After one month the US army pulled out, leaving the ex fire chief in charge of water pumping. After two months, this pumping system was handed over to Swed. Relief, leaving the San Francisco fire chief to sell his services to UNICEF in Southern Rwanda".

Finally, 'service packages' are the recent concept where more and more commercial companies become involved in post-war recovery work. It is pointed out by Sherlock (1997) that 'service packages' is the new type of approach to emergencies, where an increasing number of commercial companies sell their expertise into the 'emergency market place'. The concept of 'service packages' which started to occupy international aid circles with the Goma influx in 1994, has been presented as a better option to deal with large number of refugees. On 20 July 1994 the UNHCR issued an urgent request to donor governments to provide services in eight packages defined as:

- Airport services;
- Logistics base services;
- Road servicing and road security;
- Site preparation;
- Provision of domestic fuel;
- Sanitation facilities;
- Water management;
- Management of airspace.

The water management service package which the UNHCR requested donor countries included: "Organise and manage water tanker operation from water sources to sites; ensure water purification; set up water storage and distribution systems in sites; investigate ground source potential or other sources of supply to replace tanker operation"(Millwood,1996). According to the Joint Evaluation of Emergency Assistance to Rwanda:[2]

> "Whilst most of these were eventually met, the way in which they were met rarely corresponded to the intention of the request. For instance, most of the packages involved not just one government providing a team to undertake all the requirements within that package, but generally involved combinations of teams or military contingents from more than one government working in conjunction with several NGOs".

For example,

> "...the water management package was effectively undertaken by at least a dozen agencies with the US military/PWSS, Oxfam and THW playing a key role and several others such as UNICEF, MSF-Belgium, the US military and the UK ODA participating in the tankering operation...".[3]

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2 Millwood is the editor of the publication entitled "The international response to conflict and genocide: Lessons from the Rwandan experience" which is result of "Joint evaluation emergency assistance to Rwanda".

3 PWSS: Potable Water Supply System Co.Ltd. THW: Technishes Hilfswerk.
The THW came to the Goma area as part of the German government's service package, and produced treated water using mobile filtration units with a capacity of 750,000 litres/day which was almost equivalent of 20 per cent of the total demand (Millwood, 1996:71).

Consequently, there were several problems regarding the implementation of these service packages such as specification of requirements, deployment, and co-ordination of implementation. Therefore, the findings of the Joint Evaluation Team regarding the service packages in Rwanda can be summarised as:

- The concept did not work as planned because the lack of co-operation between different agencies working within the same service package reduced the effectiveness of the response.
- Although the performance of governments in these service packages was not assessed, the evaluation team examined the overall performance of Operation Support Hope which covered parts of four packages including the water management package. It is pointed out that:

  "...as with military contingents, cost-effectiveness issues are probably significant considerations in relation to self-contained teams that brought with them all their own equipment, living, sleeping and cooking facilities and food. As this was all brought by air, it must not only have been very costly, it will also have occupied a significant number of the scarce 'slots' at the airport".

According to Sherlock (1997) one of the factors which led the Western governments to the creation of new concepts like 'service packages' may be the result of finding 'employment' for their armies after the Cold War. Alastair Livingston (16 March 1996, Zagreb), the Chief General Services of UN Peace Force in Croatia also made a similar point regarding the NATO's willing and enthusiastic involvement in the Bosnian War. According to him:[4]

> "...after the Cold War NATO had to find something to do for its armies. Besides, there is a need to train the soldiers in an environment which should be as similar as possible to war. After all, soldiers would gain much better experience in a short while in Bosnia than training them back in the UK for three years, which is also a much more expensive option".

It is very clear that the main reason behind commercial companies' increasing interest in war is completely profit-driven as pointed out by Sherlock (1997):

> "Bosnia and Kuwait are good examples where the international community really did want to invest back in the area, and commercial companies saw a very lucrative market".

Supporting this view, according to Al-Bahar (1991:14-17), commercial companies have taken a substantial share of Kuwait's estimated US$ 25-30 billion reconstruction budget. For example, the US Army Corps of Engineers (USACE) was awarded one of the first contracts with a value of US$ 218 million to manage the emergency and recovery phases

4 Personal communication on 16 March 1996 in Zagreb, Croatia.

of reconstruction. He further explains:

> "Most of the contracting activity during the initial recovery phase has been with companies that service the emergency relief measures, identified in the planning stages prior to the liberation. These have included contracts for oil well fire fighting, clearance of mines, explosive dumps and other military debris, waste management, reparation of the water and sewerage networks, power transmission lines, roads and runways, and telecommunications, and the supply and shipping of imported goods such as motor vehicles, computers, and health and educational supplies. The US oil, construction and engineering giant Bechtel, has won one of the major contracts to manage and reconstruct the oil industry in Kuwait".

Therefore, it should be pointed out that the framework of commercial companies' involvement is mainly profit-driven, and consequently, tends to concentrate on countries with political and strategic importance, in which the international community has an interest. The example of Mostar in Chapter Three points out that international suppliers can sometimes be very keen on entering the market, even though this means offering very low prices. This might seem to contradict the idea that their main aim is to make a profit, but this interest in fact underlines their eagerness in cases where there are funds available to implement physical reconstruction programmes. Besides, the international suppliers in Mostar might have ended up selling underpriced water supply equipment, but at least it meant that they would also be the suppliers of spares for maintenance in the future. It can be concluded that the participation of private enterprise in the post-war recovery of urban water supplies should be encouraged, but a structure of control over this involvement is essential, as otherwise the suffering of war-affected people can easily be exploited for the sake of profit.

On the other hand it should be pointed out that, the discussions here do not aim at drawing up a completely negative view for the involvement of private companies. It is also likely that private companies' initiatives can sometimes be the most efficient way of recovering a war-affected water supply. At least theoretically it can be claimed that a private company specialising in water supply development can provide technically relevant quick responses to the recovery of water supplies because of their experience and know-how knowledge, and network of suppliers and consultants. However, working in a war-affected area poses its own set of challenges and dilemmas, as shown in the previous chapter, and whether working structures of private companies can be responsive to these constraints would be

another question to be answered. Therefore it can be concluded that the first main issue here seems to be the possibility of finding a right balance between obtaining efficiency and not losing the necessity of effectiveness for the sake of making profit. Secondly, the need for strategies and policies which can guide the international community for the involvement of private companies in the recovery process. This is an area of consideration that requires a detailed research which cannot be met by the scope of this thesis.

5.3 Applicable Water Supply Reconstruction

It is shown in Chapter Three that the main areas of concern regarding the implementation of post-war reconstruction of urban water supplies can be categorised as follow:

- Security and Logistics: The procurement and transportation of necessary equipment, materials and chemicals, and the forming of a work force including local professionals and labour during and in the aftermath of an armed conflict.
- NGO Coordination and Empowerment: The collaboration of NGO sectorial activities, and the empowerment of local authorities responsible for the operation and maintenance of supplies.
- Accountability: The responsibility of reporting what has been achieved to both donors and beneficiaries.
- Flexibility: The ability to adapt water supply reconstruction programmes to the changing socio-economic and political environment of war-affected areas.

Therefore the concept of applicability will focus on these four issues here.

5.3.1 Security and Logistics

The world's intrastate armed conflicts during the 1990s together with the trend of international response to them have formed serious security and risk challenges. Between the dates of 1 January 1992 and 1 March 1997, 131 UN staff - 24 internationally and 107 locally-recruited were killed in incidents such as gunshot wounds, bombing, ethnic violence and landmine accidents. There were also 35 cases of kidnapping and hostage taking between these dates. It is suggested that the four main components of a security enhancement package, security training, stress management, field security officers and communications should be implemented in order to reduce personnel losses in difficult environments of war-torn countries (UN Security Coordinator, 1997). On the other hand, the issues of security, health and safety are only some of the risks faced by NGOs and their operations. Bickley

(1997:74-75) categorises the types of risks as follow:

- Risks to personnel
- Risks to the programme
- Risks to the organisation
- Risks to local community

Bickley's categorisation claims that risks caused by poor design and performance, negligence and misappropriation can pose serious threats to the programme. Besides, the targeted damage which may be inflicted on the physical components of a project during the implementation should also be included in the list of risks to the programme. Programmes affected by these risks can have impacts on the organisation's reputation and image as well as causing financial losses. In a wider perspective, these risks to the programme can create further risks to local community such as the negative impacts on the peace process, social and economic structures, and environment. Therefore NGOs involved in the water supply improvements need to take necessary precautions to reduce risks to their personnel, programme, organisation and local community concerned. Security guidelines such as the UN Security Management System, focus only on the well-being and protection of personnel, but the preceding analysis shows that there should be a better integration of risk assessment into programme planning. According to Brabant (1997), "A common weakness of security plans and security guidelines is the absence of risk assessment".[5] Following this, it can be claimed that the context of logistics in addition to the technical criteria explained in the previous chapter, can play a very significant role in reducing possible risks to programmes, organisations and local communities.

The concept of logistics is identified as "...getting the right thing to the right place at the right time at the right cost". As can be seen from this description a logistics system is the combination of several elements which can be summarised as communications, transport, storage facilities, control systems and personnel (Davis & Lambert, 1995:106). Following this, we may say that the organisation of logistics in war-affected areas is a difficult challenge because of two main reasons; first, shortcomings caused by inadequate infrastructure and lack of personnel, and secondly, the instability of the political environment and fragile security conditions. Therefore the planning of logistics, both in emergencies and

5 From Koenraad van Brabant's lecture notes presented in the 'Security and Risk Management' Week of the MA in Post-war Recovery Studies on 18 February 1998.

reconstruction, should consider the possibility of facing problems caused by these factors.

The examples in Chapter Three and a literature review in logistics show that a logistics system in terms of post-war recovery of urban water supplies, needs to include the following operations (Fawcett, et al., 1992; Wood, et al., 1995; Davis & Lambert, 1995; Rushton & Oxley, 1996): procurement, transport and storage.

Procurement: The procurement of equipment, materials and chemicals needed to carry out the reconstruction works as well as the operation phase include the phases of specification and ordering. Davis & Lambert (1995:108) gives an useful checklist for these phases which can be summarised as:

- Order exactly what is needed.
- Reach a clear agreement with suppliers on three key elements: price, delivery time and international trade contract terms.
- The technical criteria like the ones given in the previous chapter should always be borne in mind.
- Be specific with each component to be ordered by giving suppliers stock codes, etc.
- Include details of intended use.
- Use the language of the person to carry out purchasing.
- If possible consider a visit to the supplier to check the goods to be purchased.
- Give necessary information to the supplier about possible hazards during the transportation in order to take necessary precautions with packaging.

Transport: The selection of transportation method should be made according to the following factors:

- Urgency of shipment.
- Availability of transportation routes and services from the supplier to the country concerned.
- In-country security conditions and environmental factors.
- Availability of transportation in the country concerned.

The Table 5.1 below gives the comparisons between the major characteristics and attributes of four main ways of transportation - sea, air, rail and road freights, in war-affected areas.

Storage: The major issues to be born in mind with the storage of water supply equipment can be summarised as (Davis & Lambert, 1995):

- A storage area should be prepared before the orders arrive. It should have enough space for bulky goods such as long pipes.
- Unloading process should be planned in advance, receiving as long-waited items can

cause enthusiasm which lead to accidents.

- Storage area should be secured against theft.
- All the goods received should be checked and issued. The record keeping should be made a specific responsibility to a member of staff.
- Chemicals and gases such as chlorine should be stored with a special care. The possibility of a direct attack on the storage area where chlorine-based substances are kept should be as low as possible.
- Generators can be damaged during manual handling as they are usually bulky and heavy. In the process of machine handled unloading, avoid any type of fall.

	Sea Freight	Air Freight	Rail Freight	Road Freight
FLEXIBILITY	Depends on the availability of ports	Depends on the availability of airports	Depends on the working conditions of railways	The most flexible way of transport
RELIABILITY	Long delays possible with shipment, unloading and customs	The most reliable option. Possible delays with customs	Operational delays possible	Operational delays as a result of poor weather, security conditions, blockages, etc.
SPEED	Slow	The fastest	Various	Various
ECONOMICS for	The cheapest way of transport.	The most expensive form of transport.	Inexpensive	Inexpensive but depends on the availability of fuel and spare parts.
TYPE OF GOODS	Large quantity, bulky and non-urgent	Low volume and weight, high value and very urgent	Large quantity and volume	Not important
	Special handling with the transportation of chemicals like chlorine.			
DISTANCE	Long	Long	Long	Various

Table 5.1: *The comparisons between methods of transport in war-affected countries (Source: Adapted from Davis and Lambert, 1995:111-114, and Rushton and Oxley, 1996:144-149)*

5.3.2 NGO Coordination and Empowerment

The main actors of the post-war water supply reconstruction can be listed as follow:

- UN agencies such as UNDP, UNICEF, UNHCR, DHA, UNCHS
- Funding agencies such as the World Bank, IMF
- Host Government - National or Regional, or de facto government structure (eg. ERA/REST in Ethiopia, SRRA in Sudan)
- Local authority responsible for water supplies.
- Red Cross / Red Crescent Movement
- External and local NGOs

- Community-based organisations (CBOs).
- Private sector actors
- Military

The various partnership strategies between these actors were already discussed in the previous section. Therefore the aim here is to focus on two important issues, which are the coordination of NGOs involved in the post-war recovery of water supplies in a town or region, and the initiatives that can be taken to enhance the capacities of the local water board during planning and implementation in order to ensure the long-term operation and maintenance of the reconstructed systems.

In parallel to the rebirth of development discourse during the 1980s, NGOs emerged as key players on the development scene. NGOs today are allocated US$ 9-10 billion annually to implement emergency and developmental programmes in many different sectors. The current trend of NGO activities to concentrate on emergencies where more funds are available at both international and local levels has been criticized. As the aim here is not to scrutinize the performance of NGOs in detail, only the main shortcomings of their activities will be summarised as follow (Bennett, 1994):

- lack of coordination,
- mutual competitiveness,
- lack of accountability,
- destabilization of local authority structures by offering better salaries and resources to local staff, and
- unwillingness to contribute to the process of transferring skills to their southern counterparts

Bennett (1994) gives a list of eight possible structures for NGO collaboration; however the focus here will be on the sectorial coordination. It is often the case that there are several NGOs working on water supply programmes in the same urban area or region. The competitiveness for more funds between them can easily cause duplications, waste of resources and long delays. As is explained in the security and logistics section, these kinds of factors can easily pose serious risks to programmes, organisations and most importantly, to the well-being of beneficiary community. To avoid these risks, umbrella organisations of NGOs can be formed to collaborate their programmes for the post-war recovery of water supplies.

NGO coordination is identified as a cooperation between participants, which would create an environment where experiences can be shared and useful ideas can be put forward. Furthermore it is claimed (Bennett, 1994:2-3) that:[6]

> "Coordination is not a bureaucratic imposition designed to stifle the independence and imagination of individual NGOs; it is a tool for increasing the effectiveness of a collective endeavour. The challenge is to design a structure conducive to strengthening cooperation without limiting the freedom of any one participant".

The preceding argument points out two important aspects of coordination. First, the possibility of NGOs' unwillingness to participate in a coordination since it might seem as giving up their independence; and secondly, the possible benefits to be gained by being a part of a coordination body. Therefore NGO coordination can be precented as a process of obtaining benefits while accepting the mandate of a collaborative body. The relationship between type of benefits and type of collaboration is given in Figure 5.3.[7]

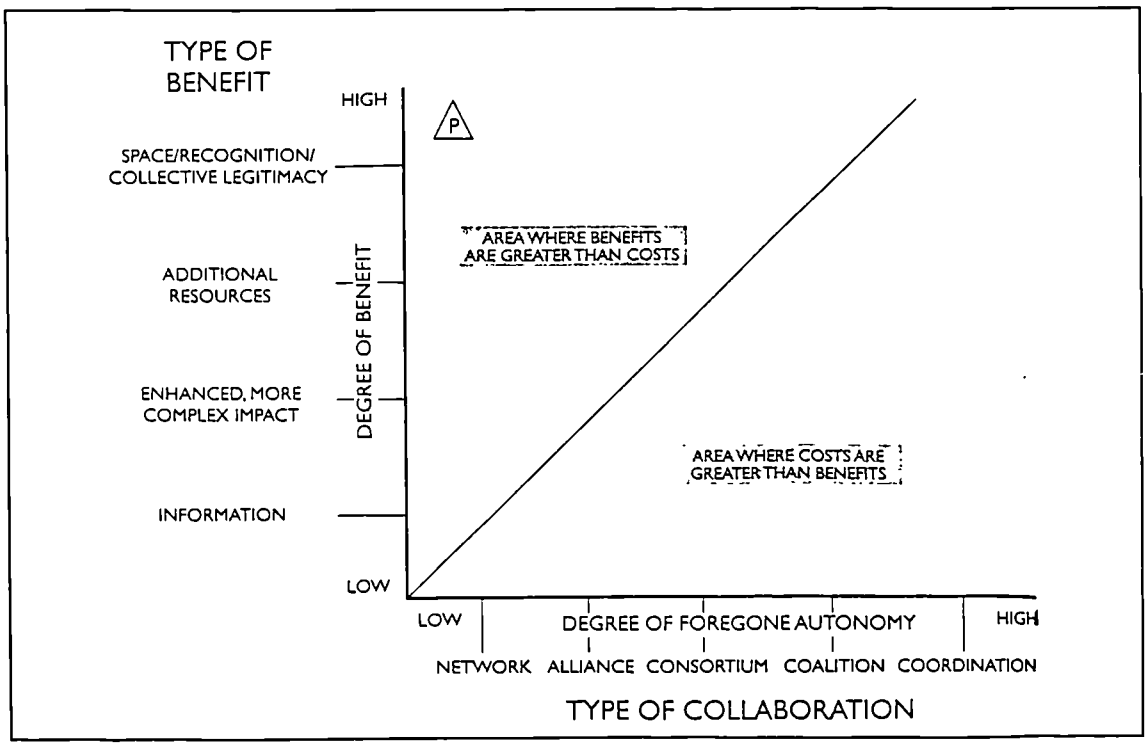


Figure 5.3: *Trade-offs in NGO collaboration (Source: Fowler and Bennett, 1997)*

6 Bennett's other publications on NGOs look at various aspects of coordination such as membership requirements, management structures, activities, funding, etc. (Bennett, 1994; Bennett, 1995; Bennett & Gibbs, 1996; Bennett & Kayetisi-Blewitt, 1996).

7 It is taken from Jon Bennett's tutorial notes at the 'Working under Fire' Week of the MA in Post-war Recovery Course on 4 November 1997. The diagram is originally from Fowler, A., Striking a Balance, 1997.

The preceding diagram claims that NGOs' benefits increase in parallel to the loss of their autonomy by developing their collaboration from networking to coordination. However, the main challenge would be to start this collaboration process as NGOs are often reluctant to share their experience, resources and information. It is pointed out that a coordination process would not start spontaneously, and often needs a "lead agency" to initiate it. The Table 5.2 gives comparisons between strengths and weaknesses of possible lead agencies such as UN, host government, multinational military force and Red Cross / Crescent movement. As can be seen, this presentation of NGO coordination is very much oriented to benefits gained by NGOs, but not beneficiaries. On the other hand, the ultimate aim of a water sector NGO coordination should be the sustainability of safe and adequate water supplies.

Strengths: *** Weaknesses: *	UN	Host Government	ICRC	Multinational Military Force
Legitimacy	***		***	
Attracting funds	***		***	
Logistics		*		***
Security Council sanction				***
Neutrality		*	***	
Ensuring Sustainability		***		
Mobilisation of international resources	***		***	
Quick response at short notice				***
Adaptation to humanitarian interventions	***		***	*
Availability of resources		*	***	***
Reduction of duplications by national planning		***		*
Strict mandate requirements			*	*
Possible biases in favour governments	*			*
Politicising of humanitarian relief	*	*		

Table 5.2: *The comparisons between strengths and weaknesses of possible lead agencies*

(Source: Adapted from Bennett's tutorial notes at the MA in Post-war Recovery Studies)

To ensure the sustainability, it is very important to form partnerships between NGOs and local authorities. However war-affected local authorities are often not in a position to be able

to take over the full responsibility of operation and maintenance because of their institutional constraints. Therefore, NGO coordination should not only be targeted at the possible benefits to be gained, but also the institutional development of local authorities by empowerment.

The common understanding of the concept of empowerment tends to be to encourage people to participate in decision making process to change the unjust and to take action for improving their life standards. These unjust situations can be varied from the lack of access to land, infrastructure and production tools to the legal protection of women against domestic violence and the right to unionise (Eade & Williams, 1995:12). On the other hand, this research considers empowerment as a process where the partnerships between external NGOs and local authorities create an environment of institutional development. The most important issues regarding institutional development are operation, maintenance, training and financial sustainability, which will all be looked at in the following section. Therefore the focus point here will be the issues of empowerment.

The relationship between the participation of local authorities in partnerships with external NGOs and the issue of empowerment can be looked through two main ways which are either as a means for achieving other objectives, or as an end in itself. If partnership strategies which were explained in the previous section, are considered as a means of achieving objectives such as efficiency, effectiveness and cost sharing of programmes, then the importance of empowerment becomes a secondary priority. However if the empowerment of local authorities by partnerships is considered as an end itself, then the physical improvements to be gained from these post-war recovery programmes become less important (Moser, 1983; Schubeler, 1996; Abbott, 1996). Although it might seem that these viewpoints contradict each other, it is suggested that these two processes can be tied together in order to ensure the sustainability of programmes.

According to Moser (1989), participation as a means can be developed into participation as an end through the planning and implementation of programmes. In other words, if necessary the empowerment of local authorities should be part of all post-war water supply implementations. The major issues to be considered in order to achieve this are:

- The partnerships in the first instance can be based on objectives such as efficiency, effectiveness and cost sharing.
- The empowerment of local authorities by external NGOs requires extra resources such

as time, money and skills.

- Considering local authorities as partners and involving their participation through the whole processes of decision making and implementation would have significant effects on their empowerment.
- The empowerment of local authorities is the most important guarantee for operation and maintenance of reconstructed water supplies.

5.3.3 Accountability

Accountability is defined by the Oxford Dictionary of Current English as being "...responsible; required to account for one's conduct (accountable for one's actions), and further as "...explicable, understandable", which outlines several important aspects of the concept. These aspects can be pointed out as responsibility of actions taken, financial accountability and transparency. However the prevailing understanding of accountability in the field of humanitarian aid tends to be limited to financial reporting. Financial accountability can only ensure the agencies' responsibility towards their donors. In other words, governments see their responsibility of being accountable only to their parliaments, UN agencies to member governments, NGOs to their donors, etc. Being accountable in terms of finance does not bring any guarantee that implementing agencies see their responsibility as also being to war-affected people who are supposed to gain the benefits out of these programmes implemented (Minear & Weiss, 1993).

Walker (1995:23-26) explains this one sidedness of accountability as a result of current 'contract culture'. According to him, NGOs see their obligation to be accountable only towards their donors; as donors but not beneficiaries, are considered to be 'the consumer' in the field of humanitarian aid. He claims that this 'contract culture' has created an environment which is described as 'marketplace' where agencies try to get more funds by keeping the donors' interest first. Ellis (1996:66) sees this current understanding of accountability as a great danger to the attempts towards making relief programmes more developmental. She points out that "This issue of accountability has huge cumulative effects on the types of projects [which] are implemented and the way in which they are valued and judged to be successful".

It is also advocated by the International Federation of Red Cross and Red Crescent Societies (1996:60) that "...they [agencies] should also practice accountability towards the disaster

survivors", and not only to their headquarters and donors. The responses from RedR Engineers to the questionnaire survey carried out by the author also show that accountability is very often seen as being responsible to programme donors. For example, only four out of 34 engineers said that the programme they worked for had a method of reporting to beneficiaries as well as to their agencies.

If accountability should not only be to donors, but also to beneficiaries, then the next question would be whether it would be possible to be accountable for all actions taken in every circumstances. Theoretically the answer should be 'yes', which is in fact a requisite of humanitarianism, but in practice to ensure transparency in all circumstances can create certain dilemmas. Minear and Weiss (1993) give examples of some organisations involvement with the cross-border humanitarian efforts into Southern Sudan and rural Liberia. If they had been completely transparent and their activities had been made known publicly, then the rest of humanitarian efforts from Khartoum and Monrovia respectively, could have been affected very badly. These authors claim that although some organisations would not accept the need for transparency in almost all circumstances, they should not at least attempt to justify the conditions on the ground for their general lack of transparency. Accountability to both beneficiaries and donors by implementing the ethic of transparency into programmes is very important to ensure that external NGOs see their responsibility for their actions taken on the ground.

In terms of post-war recovery programmes to improve water supplies, the partnership strategies explained in the previous sections can play significant roles for making accountability more than a theoretical principle or an ethic of humanitarianism. The involvement of local authorities and beneficiaries into partnerships with external NGOs can first of all, create an environment where locals participate in decision-making and implementation processes directly. Following this, it would not be whether accountability to local authorities is seen as a responsibility or not, but it could automatically become part of their partnership relation. This can be questioned for example, in circumstances in which local authorities are under serious operational and institutional constraints. This can be a well-reasoned argument, but then the strategy should be more empowerment-oriented to ensure that local authorities are really treated as partners. Whether this can be really viable or how much willingness from NGOs can be expected for this kind of process can again be

questioned. The response to this argument then would be by two major issues. First, the concept of 'contract culture' should be changed by adapting a more beneficiary-oriented approach. Donors should not expect to monitor the accountability of an NGO only for themselves, but also for beneficiaries in circumstances where local authorities are not in the position to do so. Secondly, the principles of the Code of Conduct for the International Red Cross and Red Crescent Movement and NGOs in Disaster Relief claim that they should build their responses on local capacities and "...hold ourselves accountable to both those we seek to assist and those from whom we accept resources" (Walker, 1995:26). In regard to donors' approach to accountability, evaluation is an useful tool in order to make sure that the cost-efficiency of programmes is achieved by implementing agencies. Furthermore; this approach can be improved not only in terms of its context, but also the responsibility of being accountable to beneficiaries by setting up monitoring and evaluation accordingly (Rubin, 1995). Therefore it can be claimed that to ensure implementing agencies' accountability to both donors and beneficiaries, the successful processes of monitoring and evaluation which will be investigated in the following section, are essential.

5.3.4 Flexibility

Flexibility expresses the ability to adapt in terms of programme planning and implementation to the changing demographic, economic and political environment of war-affected areas. War's impacts as explained in Chapter One, create an environment of instability in every aspect of life. Programmes which are planned according to existing factors at that particular time, should have the ability to adapt themselves according to changes in these factors. For example, the population of a war-affected urban area changes frequently , as there is likely to be the movement of internally displaced persons and refugees to or from that urban area. If the population to be served was considered as 'X' initially and this has changed to 'Y' now, then the likely impacts of this change should also be reflected in the planning and implementation of this programme.

We can also point out that even careful planning may not be able to eliminate all possible problems. This is explained as follows: "Every project and programme throws up its own challenges, and agencies and communities have to be prepared to deal with the unexpected and to adjust plans accordingly" (IRC, 1991:112). The preceding discussions in the section

of 'Security and Logistics' has already highlighted the possibility of unexpected problems arising in war-affected areas. It is often not possible to consider all these problems at the initial planning stage. For example; the assumptions made on the transportation of equipment may have changed completely because of security reasons. There can be financial pressures as a result of problems with the continuation of funds from donors. Some of the key personnel might not be there anymore to carry out their tasks as was initially planned. Therefore it is very important to adapt some principles at the beginning that can ensure a continuing flexibility during the implementation of programmes. However before listing these principles, it is important to highlight the relationship between accountability and flexibility.

In the preceding section, the context of accountability was discussed and several issues were put forward which can draw up the framework of a good level of transparency to both donors and beneficiaries. Considering these issues and putting them in the context of discussions in this section, it can be seen that the flexibility of programmes may also mean the risk of being unaccountable. This is a challenge that requires careful consideration of international agencies. In other words, the mechanisms that can avoid the manipulation of flexibility need to be ensured, which in return can provide a balance of flexibility while having a good level of accountability for the initiatives taken by the actors involved. After highlighting this interrelationship, now the principles of flexibility can be pointed out as follow:

- The need for flexibility should be recognised by all partners involved in a programme.
- Assumptions made for the realisation of a programme should all be clearly identified at the planning stage.
- Possible precautions in terms of personnel, finance, etc. should be taken according to these assumptions.
- The progress of implementation and the changing socio-economic and political environment should be closely monitored; and in the event of possible problems and changes arising, the initial precautions should be included into the implementation process.

The preceding principles for flexibility show that a built in monitoring system and a continuous evaluation process are prerequisites to achieve a successful adaptation to possible external changes in war-affected areas. The following section therefore will focus on the issues of monitoring and evaluation.

5.4 Maintainable Water Supply Reconstruction

After looking at the planning and implementation issues of water supply reconstruction, the main concern areas of this section will be the monitoring and evaluation of programmes, and the management of systems. The literature review and the analysis of secondary case study examples in the previous four chapters show that these issues play significant roles for the enabling of the long-term sustainability of water supplies.

5.4.1 Monitoring and Evaluation

Evaluation has been defined by the OECD's Development Assistance Committee (1984) as follow:

> "An evaluation is an assessment, as systematic and objective as possible, of an ongoing or completed project, programme or policy, its design, implementation and results. The aim is to determine the relevance and fulfilment of objectives, development efficiency, effectiveness, impact and sustainability. An evaluation should provide information that is credible and useful, enabling the incorporation of lessons learned into the decision making process of both recipients and donors".

The preceding definition points out almost all important aspects of an evaluation process. These aspects which will be looked at here, can be summarised as:

- The credibility of an evaluation relies on the objective analysis of collected data which can only be achieved by the monitoring of criteria decided according to the initial objectives of a programme.
- An evaluation is not only to determine the efficient use of resources invested in a programme, but also the programme's effectiveness, impact, relevance and sustainability.
- The need for certain research qualities and the dissemination of results for to both donors and beneficiaries.

While the evaluation is indispensable for checking if initial aims and objectives have been met, it cannot be achieved without a good working monitoring system. Monitoring should be a routine built-in mechanism to obtain regular information during the day-to-day implementation of a project for checking the performance against the initial assumptions and hypotheses. It is to clarify the project's progress, difficulties, and possible future challenges. However, to achieve the preceding framework, the indicators to be used for monitoring should be identified according to the project's aims and objectives. As can be seen from this

argument it might seem difficult to distinguish monitoring from evaluation. According to Cairncross, et al. (1981) and Rubin (1995), monitoring is the process of obtaining information in order to 'maintain' or 'improve' project performance if there are discrepancies between actual and planned progress. Therefore monitoring is done to check the progress of programmes in order to take timely precautions before it becomes too late. Meanwhile evaluation aims at providing 'feedback' for future planning and design by the implementation of a data gathering process and also using the information collected during the monitoring. These explanations show that both monitoring and evaluation should be part of the project cycle starting from the initial assessment of the situation. It is very important that the initial appraisal phase sets clear aims and objectives for the project, which can later be used to assess the level of progress and the result by monitoring and evaluation.

It can be claimed that the credibility and success of an evaluation will depend on the clear identification of objectives at the beginning, as the evaluation of water supply implementations can focus on different aspects of programmes. For example, it can concentrate upon the assessment of: project organisation process, resource utilisation, possible health benefits to be gained from the programme or participation of local authorities. Therefore an appropriate approach should be chosen for the evaluation.

Two main approaches known as 'goal evaluation' and 'process evaluation', can be useful for the process of objective identification (Samset, 1993:20-21).[8] According to the goal model, the possible consequences of a programme are formulated as hypotheses and then tested against the data collected by the evaluation. Although this approach has the advantage of choosing various data and interpretation possibilities, it poses the danger of overlooking some unexpected consequences of the project. On the other hand, the process model gives the chance of investigating the project in-depth through 'observation' and 'investigation'. It is a time-consuming approach as the investigators assess '...the project and the way it functions within a societal context'. It seems that an evaluation model which embraces both of these approaches can be an appropriate solution for the assessment of post-war water supply reconstruction because of the following four reasons:

- The need for assessing what has or has not been achieved by the project in terms of

8 Evaluation of Development Assistance is a book prepared by Knut Samset of Scanteam International A.S. in collaboration with the Evaluation Unit in the Norwegian Ministry of Foreign Affairs.

water availability, reliability, quantity and quality.

- The need for assessing how this has or has not been achieved in terms of technical implementations, resource utilisation, partnerships with local authorities, etc.
- The need for assessing the relevance of project , and its positive and negative impacts on beneficiaries.
- The need for assessing the degree of operation and maintenance services to find out whether the sustainability of positive impacts gained by the project can continue in the long-term.

The evaluation model by Samset (1993), which is shown in Figure 5.4 covers all these preceding reasons given for water supply reconstruction.

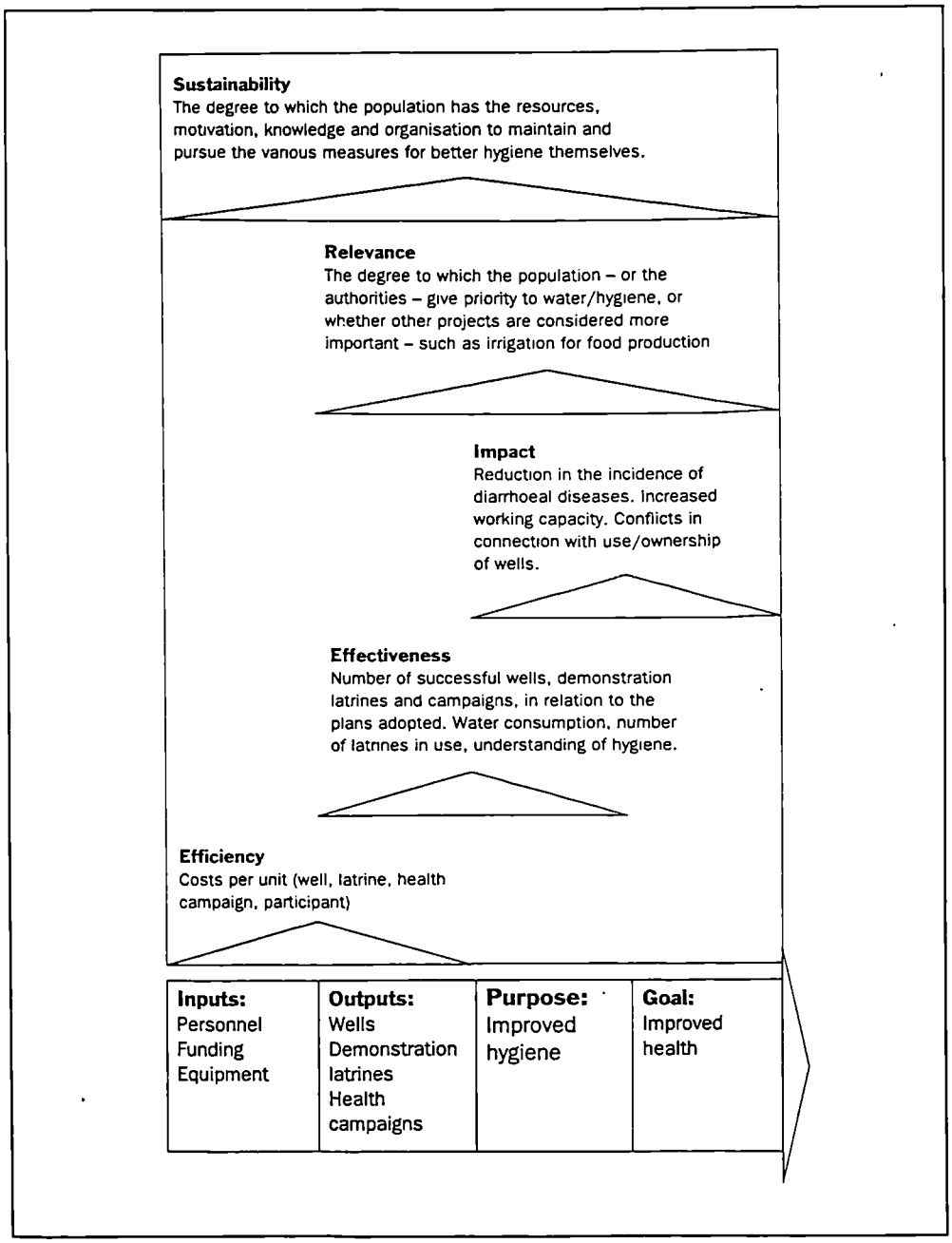


***Figure 5.4:** A model for evaluation of water supply reconstruction (Source: Samset, 1993:33)*

The dimensions of this model will be explained through a fictitious water supply project, the aim of which was to improve water quantity by the rehabilitation of the collection and distribution subsystems.

According to this fictitious project, the goal hierarchy would include:

- **Inputs:** Funding, personnel and equipment.
- **Outputs:** The rehabilitated collection and distribution subsystems and the improved water quantity.
- **Purpose:** Improved public hygiene by increasing the per person water consumption.
- **Goal:** Improved health and subsequent socio-economic benefits.

Following this, the evaluation components can be explained as:

- **Efficiency** is the assessment of expenditure for inputs and the analysis to find out whether the same results would not have been gained by the utilisation of a lesser expenditure.

- **Effectiveness** is the assessment to find out to what extent the purpose of this project was achieved by the outputs. For example, what extent the per person water consumption is increased and what extent the public hygiene is improved by increasing the quantity of water supplied.

- **Impact** component is the assessment of positive and negative effects of this project on the war-affected community. For example, did the project reduce the level of water-related infectious diseases? Did the implementation of this project create any further conflict within the community? Were the capacities of local authorities damaged?

- **Relevance** component is to find out whether this water reconstruction programme is still given the same priority by local authorities and beneficiaries as it was initially.

- **Sustainability** component of the evaluation focuses on the local community's capabilities to maintain the positive impacts of this project and to improve them by taking further measures, in the long-term. The successful operation and maintenance of this fictitious water supply project would play a significant role for the achievement of sustainability, which will be discussed in the following section.

On the other hand, an important fact regarding this evaluation model should be pointed out first. The model is structured for the evaluation of development projects in peace time, which inevitably, does not address itself to some special requirements and constraints created by war. These characteristics which can be truly decisive on the success of evaluation process, can be summarised as insecurity, limited time, and lack of skills and awareness to carry out them. Although it is very likely that not much can be done in regard to insecurity and lack of time directly, they underline the importance of monitoring and

evaluation once again. They show that these two constraints are likely to be very effective at the appraisal stage, which can have serious detrimental effects on the efficiency, effectiveness and relevance of these programmes. Therefore by ensuring that monitoring is part of the project cycle, these inadequacies can be detected and improved at the right time.

Other limitations regarding skills and awareness, can be dealt with by the implementing agencies like external NGOs. De Veer (1997) suggests some methods to improve these limitations:

- NGOs should train their staff in monitoring and evaluation.
- Most NGOs seem to lack evaluation tools, therefore they should be encouraged to produce their own evaluation guidelines.
- These guidelines should be simple, clear and comprehensive in order to ensure their successful implementation.
- The lack of dissemination of information within and between agencies should be overcome by improving reporting and communication systems in terms of information flow and storage.

The other important issues of putting an evaluation into practice such as what the appropriate qualities are to be possessed by an evaluator and how to overcome operational challenges on the site will be discussed in the following chapter as part of the author's field visit methodology for the case study of this thesis.[9]

5.4.2 Operation and Maintenance

Operation and maintenance are two inter-connected phases of water supply management, which are essential for the efficiency and effectiveness of supplies and very crucial for their long-term sustainability. These processes need to be inter-connected because their successful implementation compliment and improve each other's effects. This is perhaps why these processes are often referred together with their initial letters as 'O&M' in the related literature.

The outcomes and recommendations of the international summits on water and sanitation issues such as the 1981 - 1990 International Drinking Water Supply and Sanitation Decade

9 This information can be found in Cairncross, et al. (1981); Feurstein (1986); Marsden & Oakley (1990); IRC (1991); Rubin (1995).

(IDWSSD), which were investigated in Chapter One have highlighted that some of the most important inefficiency and ineffectiveness problems with urban water supplies are directly connected with O&M constraints. To understand this interaction, it is first necessary to look at general constraints faced during the implementation of O&M procedures, which can be summarised as follow (WHO, 1994; IRC, 1995):

- There is a lack of awareness on O&M issues and their importance for long-term sustainability.
- The shortsightedness of seeing a water supply project cycle only in terms of the planning and implementation procedures result in giving a low priority to the requirements of O&M by decision makers.
- The O&M requirements such as trained staff and the availability of spare parts and equipment are often not included in the planning and design phases of water supply programmes.
- Financial sustainability is a decisive factor to ensure the availability of personnel and materials for the O&M.
- External agencies tend to neglect the O&M requirements of the existing supplies for the sake of concentrating on the expansion of their activities.
- Inappropriate technological choices as explained in the previous chapter can have detrimental effects on the successful implementation of O&M procedures.
- The lack of local participation in the planning and implementation can mean inadequate access to necessary technical knowledge and experience for the O&M.

The preceding points clearly show why there is a close interaction with the efficiency and effectiveness problems of urban water supplies and the negligence of O&M procedures. It does not matter how properly a water supply reconstruction was carried out; if the requirements of these phases were not considered right from the beginning of a project cycle, the programme is bound to be unsustainable. These problems can vary from large quantities of unaccounted water to dangerous health hazards to public health. Therefore it is very important to consider these phases not only in technical terms but also managerial, economic, social and environmental. This can be explained by looking at the main requirements of the O&M, which can be grouped as trained staff, financial resources and management. The requirements under the first two group will be looked at in the following sections, but the focusing point here will be the management of O&M.

The WHO (1994:7) recommends a managerial approach for the O&M, which is called: "The systems approach to management". It is claimed that this approach provides an useful tool to urban water supply managers "...to describe and reorganize the service framework of a water supply and sanitation agency and to allocate resources so that targets can be achieved efficiently". It is clear that this approach cannot ensure the successful implementation of

O&M on its own, because it is only a framework to be used as a guide in the process of setting up or improving these procedures. Therefore it seems to be appropriate to look at the context of this approach in order to draw lessons for the O&M of reconstructed water supplies. This is especially significant in the context of partnership with local authorities and their empowerment as it has been explained in the preceding discussions. The systems approach as it is shown in Figure 5.5, identifies a 'human resources administration and development system' which is made up by the combination of organisational systems.

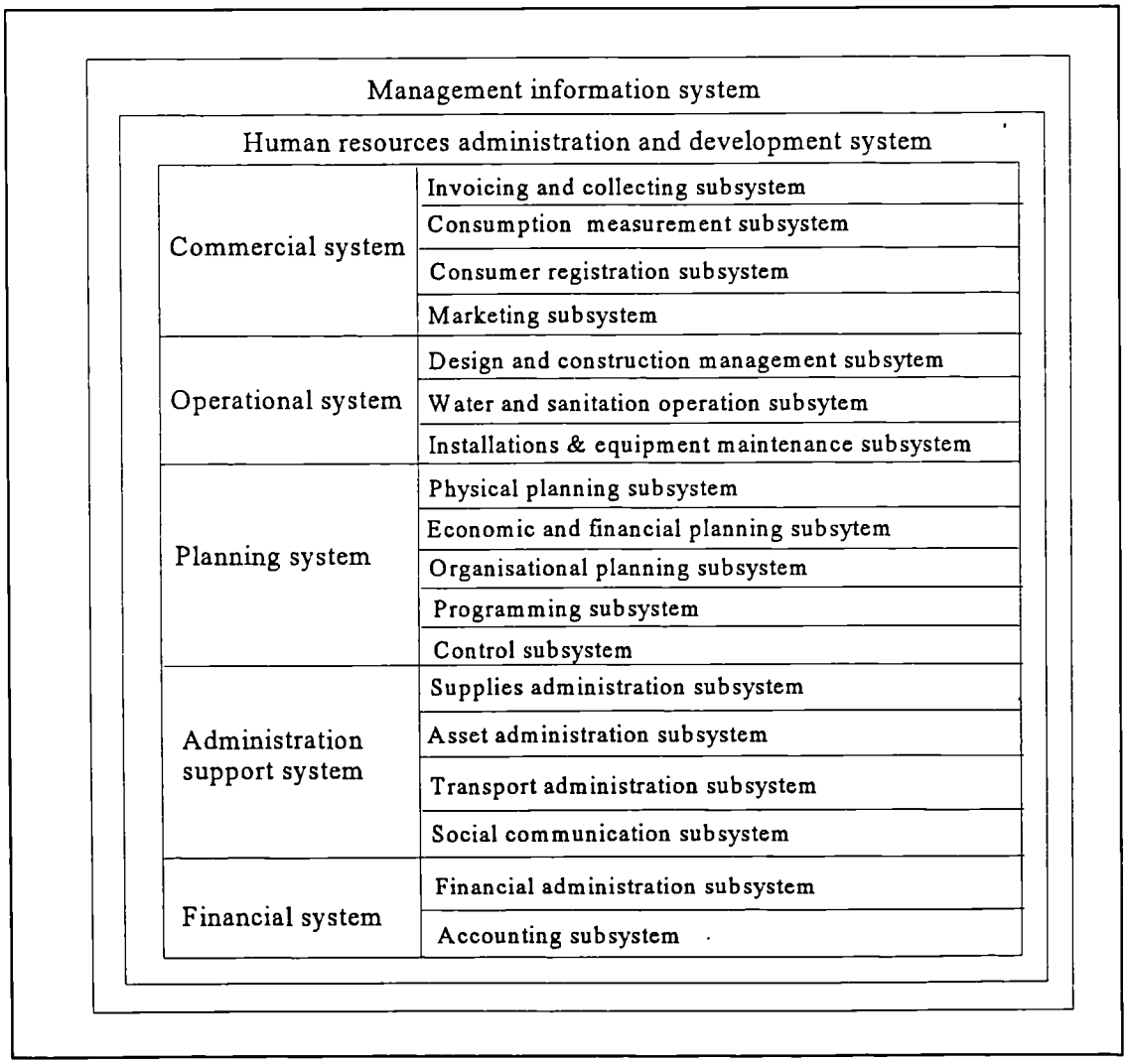


Figure 5.5: *Organisational systems (Source: WHO, 1994:8)*

These organisational systems which can be listed as commercial, operational, planning, administration support and financial are divided into subsystems according to their main functions. It is also very interesting that this approach puts these systems and subsystems into a framework of management information system. The main purpose of this interaction is

explained as to provide a link between these different subsystems in order to ensure a continuous monitoring and evaluation for management control.

The preceding figure also shows the complex character of this approach for the successful O&M of urban water supplies. The viability and practicality of this model for the post-war reconstructed water supplies can be questioned, as it is very likely that there would be several logistical, operational and institutional constraints which were already investigated in the earlier sections. Having said that, this model is only presented as a guide to highlight the major aspects of O&M in terms of technical, economic and managerial issues. Therefore the post-war water supply programmes regardless their complexity or sizes, should include the establishment of similar systems which would undertake the implementation of these O&M aspects.

These management systems can be varied according to the size and complexity of the water supply concerned, but the main issue is that there is a need for some kind of institutional structure which can carry out O&M successfully. For example, the objective of implementing an organisational structure is given as the enablement of successful O&M, and consequently to ensure that the system will function properly. To achieve this objective, the following points need to be considered during the implementation procedure of a functional organisational structure (WHO, 1994:91-92):

- **Step 1**- Assessment of the present organisational structure: Determine objectives for O&M, and criteria for financial and physical measurement. Describe activities to be carried out by each management level - i.e. senior, middle and operational, at each organisational system. Following these, determine how many staff will be needed to carry out these activities, and their possible needs such as training, finance and motivation. Also assess the effectiveness of the current organisational structure.

- **Step 2** - Adjustment of the current organisational structure: Define objectives, targets, quantitative indicators and organisational functions for O&M. Reformulate operational decision making and information structures in order to develop the new functional organisational structure. Determine resources in terms of human and economic, needed for the implementation.

- **Step 3** - Actual implementation: Ensure that the staff are involved, informed and trained. Carry out an evaluation of this implementation for further adjustments.

5.4.3 Financial Sustainability

The preceding discussions show that operation and maintenance are very significant processes for sustainable water supplies. It can also be seen that financial sustainability is a corner stone for the successful enablement of these processes. Local water authorities would need economic means to employ personnel and buy necessary spare parts, equipment and chemicals for the continuation of O&M. However they often do not have adequate financial capabilities to carry out these services especially those in many parts of developing countries. There are several reasons beyond these incapabilities such as the investment of scarce financial resources into subsidies instead of expansions, and the lack of financial management. This view is now strongly supported by institutions and researchers such as UNCHS (1987, 1993), Habitat (1996, 1996a), the World Bank (1995), Serageldin (1994, 1995). The author's observations at the 1996 WEDC Conference and the City Summit, and the recommendations of international conferences on water issues during the last two decades show a similar understanding of this view.[10] On the other hand, seeing water as a commodity might be considered as an act which would force the poor to use less water than their needs. This argument is quite significant for the scope of this research, as the similar opposition to water charges can be received for the post-war reconstructed water supplies. Therefore, there is a need to discuss how possible it is to introduce water charges in war-affected urban areas to cover O&M costs.

It is not viable to give a direct answer to the preceding dilemma as 'yes' or 'no'. Different characteristics of each situation would bring different opportunities and challenges for this task. However, some useful lessons can be derived regarding the willingness to pay for water from the field of development studies. Following this, it is also important to understand the 'war sub-culture' which can point out some important criteria to deal with the issues of water charges in war-affected areas.

The costs for O&M can be divided into two main groups as fixed costs and variable costs. While the former includes the repayment of initial capital borrowed and its interest rate, the

10 The WEDC Conference: Reaching the Unreached - Challenges for the 21st Century in New Delhi, India.
The City Summit: The Habitat II Conference on Human Settlements in Istanbul, Turkey.

latter group comprises costs for personnel, spares, equipment, chemicals and administration (Mehrotral & Kumar, 1996). In the context of a post-war reconstructed water supply, the fixed costs are likely to be covered by external agencies or local government. The variable costs on the other hand, still play a very significant role for financial sustainability.

Water supply services are often heavily subsidised by governments in order to ensure the usage of adequate amounts of water for the protection of public health. Besides, political-pressures also play a very important role in decisions on the level of subsidies. However, the examples given in Chapter One shows that these policies sometimes can have serious counter effects on the efficiency and effectiveness of the water provision services. The poor living in the peripheries of urban areas are worst affected, because they are often provided with inadequate water supplies. The subsidies therefore work for the benefit of the rich who live in town centres. Eberhand (1996:34) supports this view by pointing out that "...without an emphasis on appropriate levels of service, affordable charges and proper financial planning, service delivery fails and the poor are once again worst off". The diagram in Figure 5.6 is given to show that the idea of the poor benefiting from subsidised water supplies more than the rich is only a misconception.

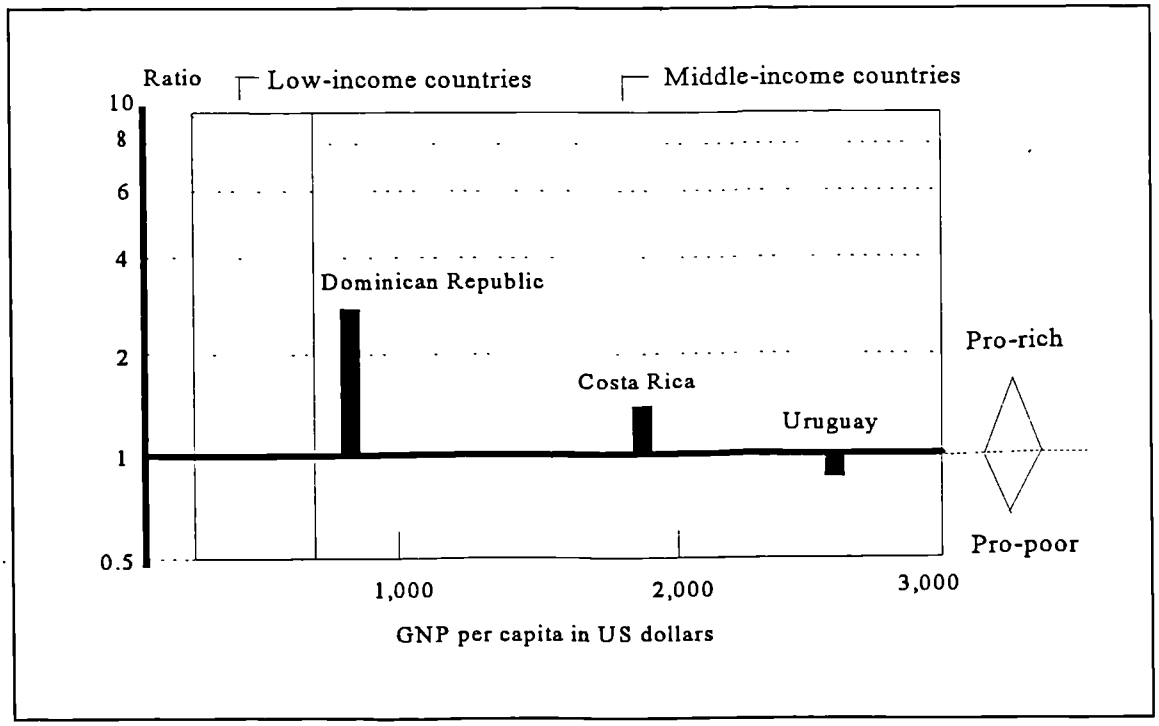


Figure 5.6: *Who benefits from subsidised water in Latin America (Source: Serageldin, 1994:27)*

Eberhand (1996:34-37) recommends a financial modelling to avoid this unfairness occurring. This financial modelling is claimed to provide useful tool for the assessment of financial viability and sustainability of investment in water services. The following steps should be taken for the process of this modelling:

- Having a clear understanding of the existing financial system in terms of capital and O&M costs.
- Setting the targets in terms of hypothetical service goals and time frames for three scenarios which can be called as "financially ambitious, safe and middle".
- Designing an investment programme for each scenario.
- Adding existing tariff structures into these programmes and adjusting them for financial viability.
- Assessing outputs by considering the existing socio-economic and political framework in terms of the willingness to pay the adjusted tariff levels, the affordability and the political acceptability.
- Selecting a scenario which is the most appropriate to existing structures.

As can be seen, the key issues of affordability, willingness to pay and political influence are the major criteria for the outcomes of this financial modelling. However, the Tirupur Area Development Project (TADP) in India suggests that these challenges can be overcome by innovative financing methods (Raghupathi, 1996:53-56). Tripur is the centre of the textile industry with a population of 250,000 in the Tamil Nadu state. The town used to be supplied with water only once a week. This has been improved to twice a week by the implementation of a water project in 1995. The TADP aims at supplying another 185,000 m^3 water per day with an approximate cost of $ 6 million.

However, the significance of this project is in terms of its cost recovery, as the industrial users will be charged four times more than domestic users. Similar innovative approaches can be also applied in war-affected areas in order to find the right balance between water charges and the consumers' willingness to pay for them. All of these preceding three key issues become even more significant in the aftermath of a war. Inevitable economic constraints and the "sub-culture of war" can create serious challenges. Wars destroy livelihoods and employment opportunities, and create households where the main breadwinner is disabled or dead. Consequently, it is very likely that war-affected people would be going through economic hardship. As a result of this, affordability becomes a very sensitive issue in terms of deciding on the willingness of the community to pay for the cost of O&M.

The sensitive assessment of affordability is essential, but this would not be really possible by carrying out questionnaire surveys and asking questions like 'How much can they afford to pay for water?'. Barakat (1993:50-51) suggests the need for ensuring war-affected people's trust first, and then talking to them about their needs, capabilities and aspirations. He explains that the 'war sub-culture' which is identified as "...an expression of the everyday life and activities of a society that is living at war", which plays a significant importance during the post-war recovery. For example, the people at war usually do not pay for water, electricity and other services. The efficiency and effectiveness of them are questionable, but they are free. Bearing in mind that some conflicts last for a long time, it might not be easy for people to accept that they need to pay for them. The task can be even more challenging in countries where the state provided all these provisions free of charge during the pre-war era. Therefore it is essential to consider all these different criteria in the decision making process of an affordable charge for water supplies which can cover at least the cost of O&M.

The preceding discussions show that financial sustainability is essential to ensure the successful implementation of O&M. It has been also pointed out that financial sustainability is essential for the availability of both technical and personnel requirements. However it is clear that without the training of staff, the efficiency and effectiveness of O&M cannot be guaranteed in the long-term. This is one of the areas that is often neglected by external agencies during their water supply implementations. It was already pointed out that the main reason behind this is the shortsightedness of external agencies, which result in not allocating necessary time and funds for training of local staff. The concept of 'contract culture' which was explained in the section of 'Accountability', also plays a significant role in this shortsightedness. Therefore the following section will focus on the concept of training in order to explain why it is very significant for the sustainability of water supplies.

5.4.4 Training

Training of local staff is very significant in order to ensure the long-term sustainability for the following reasons. First of all; if the intervention comprised the introduction of a new technology, or equipment and machinery that local staff are not accustomed to use, then by training the necessary knowledge and skills for their O&M should be passed to them.

Secondly; although there had not been any significant technology transfer during the projet cycle, the training would be still necessary in circumstances where the former local board staff are displaced, injured or killed by war. Thirdly; training can prevent war-affected people from becoming dependent on external technical knowledge and skills. The professional self-sufficiency would not only be significant for the O&M, but also improving the self esteem and motivation of the local water board personnel. Finally; training of technical, managerial and administrative staff would play a very significant role in the empowerment process of local water authorities.

The preceding reasons showing why training is essential for sustainability also point out that there are different types and levels of training. The different types of training can be identified as induction, on the job training, counterpart training, and formal training sessions, seminars and workshops (Davis & Lambert, 1995). Meanwhile, these different types of training can be implemented at different levels such as technical, managerial and administrative. Each of these levels can also be divided into various sublevels. For example, WHO (1994) gives three management levels as senior, middle and operational. Consequently the training requirements of each level and the type of training to be carried out varies according to their respective management activity. The diagram in Figure 5.7 shows different management levels and organisational systems with their areas of management activity.

As can be seen in the following diagram, training should be made an integral part of overall management system. A human resources development system can initially be started by training of trainers. This is especially significant in cases where large numbers of maintenance workers and administrative employees need to be trained for the long term management. The training of local managers and supervisors in how to train their personnel can be very effective and sustainable, as this would ensure the future human resource development. The training process of trainers can progress more smoothly by forming partnerships with local authorities through the whole project cycle from planning to implementation. In other words, the need for training of local staff at the end of project cycle can be reduced by ensuring their involvement during the project. This can be a very significant benefit, as training is often overlooked because of financial and time constraints. However, it seems that the most important constraint is often neither economic nor time, but

it is often the lack of agencies' own training skills.

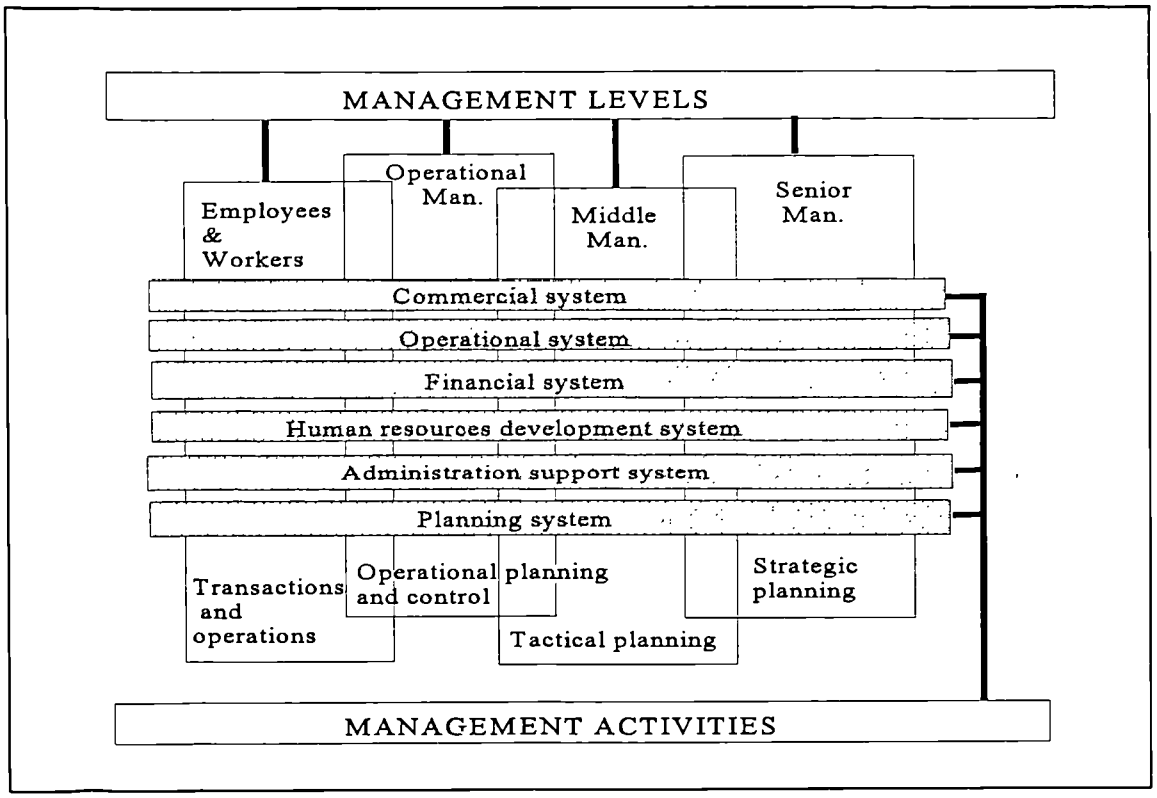


Figure 5.7: *Areas of management activity according to management levels and organisational systems (Source: WHO, 1994:34)*

This tends to be a problem at both organisational and personnel levels. It is a problem at the organisational level, because NGOs often are not aware of the fact that training is essential for the sustainability of their programmes. They also often neglect the assessment of their own training needs. It is assumed that to have knowledge and skills can also mean being able to pass them to other people. However it is unfortunately not as simple as that. Training skills can only be acquired by developing one's abilities to choose appropriate methods for getting the message across. As a result of this, it is very important for external agencies to ensure that they employ practitioners who can achieve this. Following this, practitioners to be employed need to be trained first, not only in the issues of working under conflict but also in the training of others. This is where the continuum of training starts.

After the preceding discussions, the areas of consideration in order to make the continuum of training appropriate, effective and relevant to trainees' needs can be summarised under five headings which are:

- Range of training

- Training process
- Type of training
- Design of training courses
- Training methods

It is pointed out by WaterAid (1993:57-65) that as training is necessary for personnel at each level and stage of operation and maintenance phases, it is important that training activities cover a wide range of needs from the improvement of technical skills to the conveying of managerial responsibilities. In order to be responsive to a wide range of needs, it is important to have a training process starting with the identification of training needs and ending with an evaluation for the impact of training. In addition to this, the type of training also plays a significant role to carry out responsive training programmes. WaterAid divided the type of training in four main groups which are:

I. In-service training such as on-the-job training and 'in-house' courses
II. Academic courses which can be in-country, in-country of an external donor and in a third country
III. Observation and study visits
IV. Adviser-Counterpart relationships

After choosing the type of training, the next step is to design the programme with a clear ultimate aim and immediate objectives which are responsive to the needs of trainees. It is suggested that the assessment of needs should be done by "...taking into account the job descriptions of the trainees, their direct experience of the work involved and their perception of their needs". Although the recommendations made WaterAid (1993) highlight the necessity of tailor-made training methods, the following list of characteristics are given as basic principles to be born in mind in setting up a training method:

- Trainees should take part
- Informality
- Methods should not be threatening
- Language should be simple
- Trainers should be supportive
- Training should be enjoyable
- Merit should be recognised
- Practical back-up
- Variety
- Built-in checks

Having briefly looked at several prerequisites of training programmes for the water supply

recovery process, the diagram in Figure 5.8 is given to show a proposed continuum of training. It starts from the assessment of NGO's own training needs and continues with the training of local personnel, and finally, it aims at sharing this accumulated knowledge of training with other local institutions. Some of the preceding principles on training are also incorporated in this continuum. However it should be pointed out that the concept of training and its importance for long-term sustainability is often overlooked by external agencies. Therefore it is not surprising to see post-war reconstructed water supplies not working efficiently and effectively in the long term.

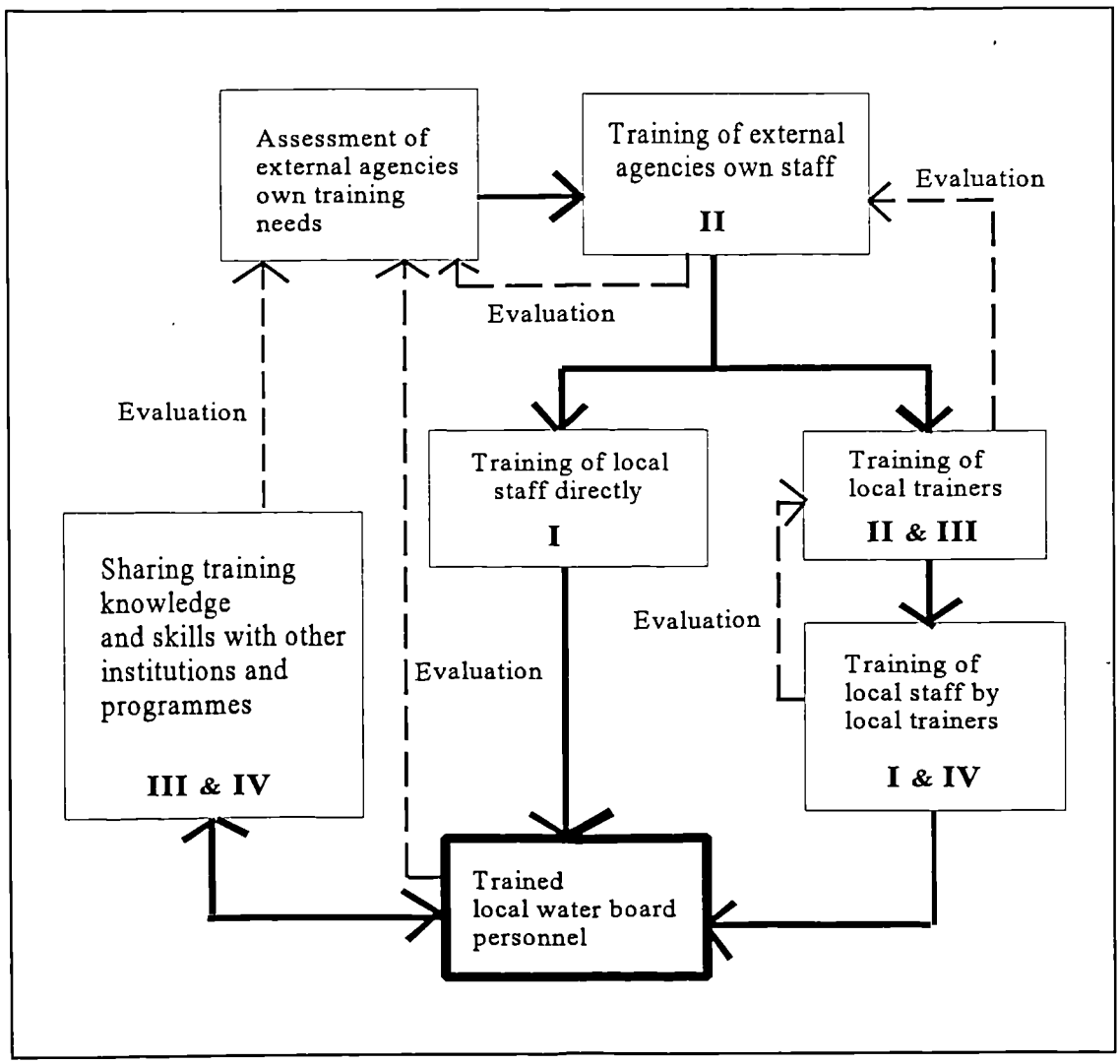


Figure 5.8: *The continuum of training from external agencies to local programmes (Source: Author)*

Note: *Roman numbers show the suggested training types as outlined in the preceding discussions.*

5.5 Summary and Conclusions

The discussions in this chapter focused on the issues which can enable the consolidation of peace, and the long term sustainability of reconstructed water supplies. Local participation and partnership strategies were first investigated to draw up the framework of socially targeted reconstruction programmes. It was shown that the concept of partnership in general is a process where the comparative advantages of all actors involved can be exploited in a mutually supportive way. In other words, partnership should be seen as the harmonisation of initiatives taken by different actors. Different types of partnership strategies were suggested according to the characteristics of actors involved and the complexity of reconstruction challenge.

The unifying characteristic of urban water supplies was explored in the section of politically targeted reconstruction. It was pointed out that the sharing of a water supply within the boundaries of a same urban area can be taken as an opportunity to build confidence and trust, and heal the differences exploited during the conflict. The discussions showed that this can be a very difficult challenge, and external agencies who would like to utilise this unique characteristic of water supplies, should prepare themselves for frustrating negotiations during their confidence building measures. Although the complexity of the challenge was acknowledged, it was pointed out that it can still succeed by considering certain principles of collaboration.

The dilemma of humanitarian or commercial provision was investigated in order to discuss the involvement of commercial companies in the post-war recovery process. It was felt that it is sometimes not possible to differentiate some NGOs from commercial contractors. It was pointed out that there has been an increasing trend for commercial companies to become involved in the post-war recovery processes of water supplies through various ways. The concept of service packages was explained as part of these. Service packages were criticised on the basis that they seem to be aimed more at finding employment for the Western armies than at alleviating the suffering of war-affected people. It was also claimed that commercial companies' interest tends to be much more in countries with economic and strategic advantages. Although the involvement of commercial companies can improve the

efficiency of post-war recovery programmes, there needs to be a structure of control over their involvement in order to ensure effectiveness and sustainability.

There is no doubt that actions taken during the implementation process can also have significant impacts on long term sustainability. This is why the second section in this chapter focused on the issues of applicability. The discussions in this section first looked at the concepts of security and logistics. It was seen that there is a need to consider security not only as the protection of personnel and their well-being, but also in terms of risks to the programme, organisation and community. It was also pointed out that risks to programmes can have subsequent effects on both the organisation and the community concerned. Therefore it was clear that logistics which are essential for a successful implementation, play significant roles in the process of reducing risks. Logistics for the water supply reconstruction were investigated under the headings of procurement, transport and storage. A set of important issues to be born in mind for these aspects of logistics are also given in this section.

Following this, the applicability section focused on the issues of NGO coordination and empowerment. It was pointed out that a sectorial NGO coordination for water supply improvements can reduce the likeliness of duplications, waste of resources and long delays. The discussions in this section also revealed two important issues regarding NGO coordination. While the first one explains the possible unwillingness of NGOs to be part of a coordinative system, the second issue can be used to overcome this unwillingness as the coordination can bring considerable benefits to NGOs. The starting of a coordination was seen to be the most crucial point, as experience shows that they do not start spontaneously. A lead agency such as local government or an UN agency may need to initiate this process. The comparisons between the advantages and disadvantages of some possible lead agencies are included in this section. On the other hand, it was explained that the ultimate benefit to be gained from a coordination process should be for the beneficiary community. Therefore the sectorial NGO coordination should also be targeted at institutional development by empowerment. The task of empowerment was considered through two major ways which are a means for achieving other objectives and as end in itself. The discussions concluded that empowerment as a means can be developed into a process which can be an end in itself by the implementation of some partnership principles.

The third important issue regarding the context of applicability which was discussed in this section, was accountability. It was pointed out that the prevailing understanding of accountability in the field of humanitarian aid tends to be only in terms of financial reporting. Following this, it was explained that the current concept of contract culture was one of the main reasons why accountability often works upwards towards donors. The criticism was made that NGOs which are competing for more funds, often consider donors' interest first. Furthermore, this discussion also considered the concept of transparency and the dilemmas related to this. It was seen that to ensure transparency for all actions taken in all circumstances for every NGO would not be really possible. However, it was pointed out that this should not be used to justify the lack of transparency for actions taking place on the ground to both donors and beneficiaries. The involvement of local authorities into the planning and decision making processes was proposed as an approach for the realisation of accountability to beneficiaries. It was suggested that donors should take the responsibility of ensuring NGOs' accountability to both themselves and beneficiaries by using the tools of monitoring and evaluation.

Monitoring and evaluation processes were also highlighted as essential management tools to allow adaptation to the changing socio-economic and political environment of war-affected areas. It was recommended that the concept of flexibility should be made an integral part of reconstruction programming by the realisation of principles given in this section. It was also urged that the flexibility of programmes can also mean unaccountable actions on the ground. The manipulation of flexibility by those decision-makers should be avoided by the incorporation of built-in checking mechanisms.

In the third section of this chapter, the focus points were the issues of long term sustainability, which were investigated under the heading of the maintainable water supply reconstruction. Monitoring and evaluation as two closely interactive processes, were claimed to play a significant role to provide a continuity from implementation to long term maintenance. It was explained that monitoring should be a built-in mechanism to collect regular information on the progress of water supply programmes. This is necessary for two main reasons which are first, to detect unexpected developments in time and take necessary precautions; and secondly, to provide information to be analysed during the evaluation. Following this, evaluation was identified as a process of data gathering and analysing in

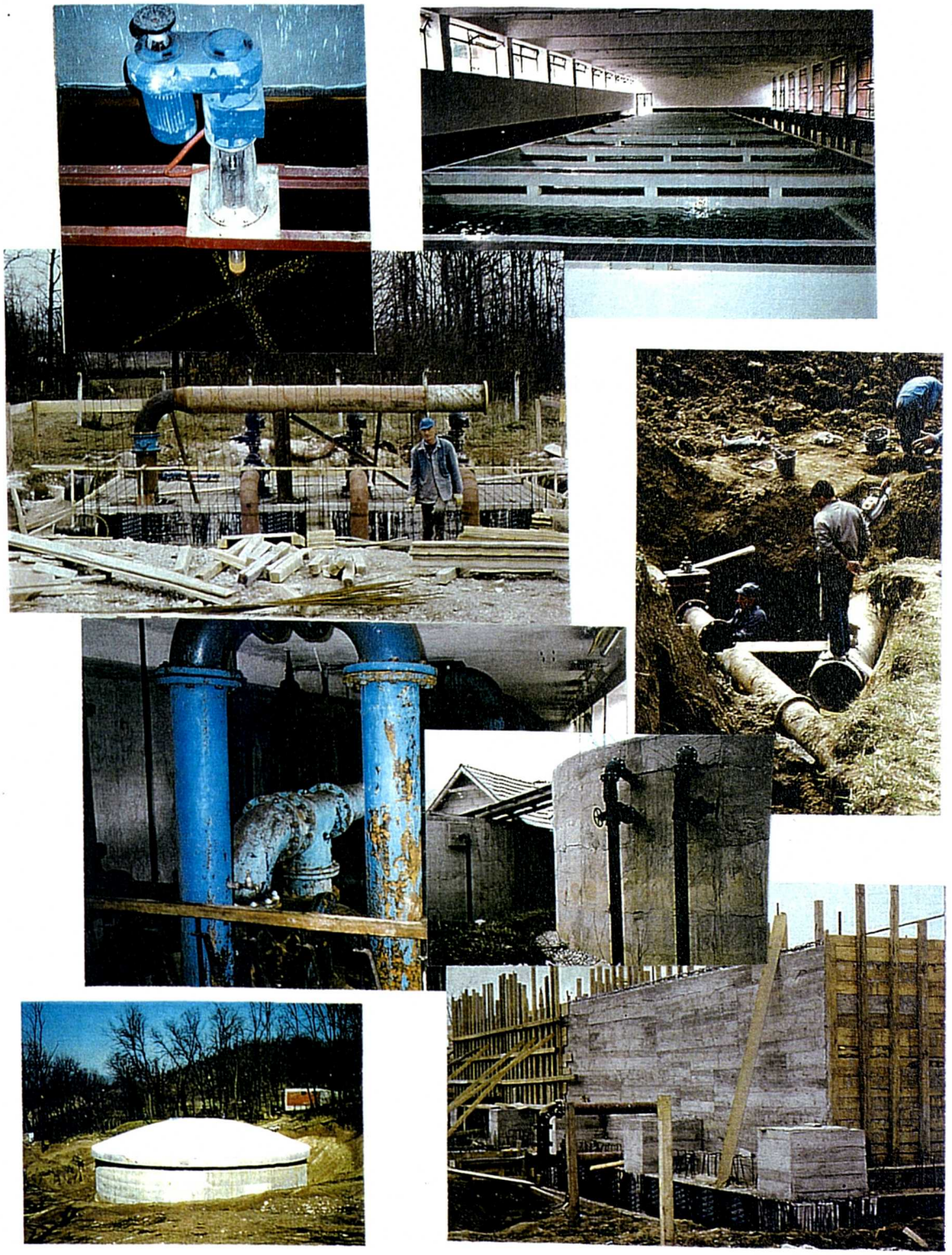
order to draw lessons for future programmes. Furthermore, this section also investigated the concept of an appropriate evaluation model for the reconstruction process of water supplies. The model recommended includes not only the issue of efficiency, but also effectiveness, relevance, impacts and sustainability. The limitations which may be caused to these processes by the characteristics of war-affected areas were highlighted, and some methods to improve them were also given in this section.

The other two inter-connected processes of water supply management were identified as operation and maintenance. After highlighting possible constraints to be faced during the implementation of these processes in war-affected areas, their main requirements were given as trained personnel, financial resources and management. The systems approach to management by WHO was proposed as an example in order to ensure the implementation of O&M. After discussing the viability and practicality of a system like this in war-affected areas, a set of steps were suggested to be taken in order to set up an organisational structure.

Following this, the other two major requirements for the successful implementation of O&M were discussed in the sections of financial sustainability and training. The concept of financial sustainability was investigated in order to clarify the methods of covering O&M costs in the long term. Different financial modelling experiences were given to discuss the issues of affordability, willingness to pay and political influence. It was explained that there are common misconceptions for these issues such as the negative impacts of water supply subsidises on the poor. This section also urged that the difficult challenges for financial sustainability should be dealt diligently, as it is a very important prerequisite for the long term sustainability.

The last issue regarding the long term sustainability to be investigated in this chapter was the training of local personnel. After pointing out why training is essential, its different types and levels were investigated in the framework of a management system. The training of trainers was suggested to initiate a human resources development system as part of a training continuum. The lack of funds and time constraints are often seen as the major training limitations. However, the discussions showed that the lack of awareness and agencies' their own training skills are the main constraints for this continuum.

After looking at all these issues regarding the consolidation of peace and long term sustainability in this chapter, the rest of this dissertation will focus on the investigation of the case study. The following chapter will give the methodology of this research with a specific reference to the field visit study in the Tuzla Region of Bosnia Herzegovina.



PART THREE:

Lessons from the Field

Chapter 6: Methodology and Research Design for Field Work

6.1 Introduction

After exploring the overall context of the research question (Chapters 1 to 3) and articulating (Chapters 4 & 5) the framework of an approach to sustainable recovery of urban water supplies in war-affected areas, this chapter explains the research strategy and research methods used to accomplish development of this thesis. In addition to the literature review, these methods include:

- Questionnaire survey of professionals operating in war zones
- Field work - war zone
- Further learning tools - workshops and conferences

The research's overall development was ensured by following a logical interaction of the above research methods, which will be summarized briefly here before presenting each of these phases in more detail later in this chapter.

After the initial literature review which was carried out to develop a theoretical understanding of issues and previous related work in the fields of humanitarianism, development studies and water engineering, a questionnaire survey was carried out with RedR engineers. Through this questionnaire, not only the context and the content of this study were supported and enriched, but also rewarding insights on the personnel dimension of recovery interventions were obtained. Following the questionnaire survey, the first phase of the field work was carried out in order to explore the context further by collecting data in the Tuzla Region. The findings from this field research were incorporated in the forming of the other important research tool which was the conveying of an international workshop. Through the recommendations of this workshop which were based on the invaluable insight

of the context from various professionals in this field and the process of a continuous literature review that the articulation of ATAM framework was achieved. The overall structure of the ATAM framework was utilized in the forming of a log book which proved to be a productive tool to examine SEA assisted water supply interventions in the case study area during the second phase of the field work. In addition to this overall strategy, the participation in various conferences and workshops throughout the development of this research was utilized as a further learning tool.

6.2 The Research Strategy

The paucity of research and literature in the field of post-war recovery of urban water supplies has brought the necessity of adopting a combined strategy, as it has not only involved a substantial review of the literature in the related fields in order to conceptualize a theoretical framework, but also two data collection exercises which were a questionnaire survey and a case study. It should be pointed out that the research question was an important factor on deciding the type of investigation used. A combined strategy with an emphasis on the case study was decided to be the best approach, as only an empirical investigation could respond to the context of this question for the following reasons. First; the type of the research question of this thesis is exploratory, attempting to find out what is happening in the current praxis; secondly, it is seeking new insights to find out the way of changing the current praxis; and finally, the need for employing a qualitative element.

Having pointed out three traditional research strategies as experiment, survey and case study, Robson (1993:168-169) also highlights the possibility of combining strategies which can serve the research question in the most appropriate way. He emphasizes the need for alternative strategies for real world studies because of the following two reasons:

- "relatively little is known about the problem area, in terms of either relevant previous work or what theoretical formulation would be appropriate;
- some form of intervention or change is proposed".

As it can clearly be seen, these two reasons also describe the contextual framework of this research which deals with an issue lacking previous research and information, and it proposes an approach which is different from current praxis in the field of post-war recovery

of urban water supplies. In order to explain these reasons a step further, some of the preceding key concepts will be clarified here.

Rubin and Babbie (1989:86-87) explain that exploration is necessary "...when a researcher is examining a new interest, when the subject of study is relatively new and unstudied...". They continue to point out the importance of exploratory research by claiming that "...they [exploratory studies] can almost always yield new insights into a topic for research". Exploration has been necessary in the framework of this research, because this thesis has sought an answer to a research question that attempts to modify the current praxis of urban water supply recovery. In parallel to the preceding understanding of exploration, Hakim (1987:26) suggests that qualitative methods are needed for exploratory studies. She draws the framework of the area concerned with qualitative methods as follows: "...individual's own accounts of their attitudes, motivations and behaviour". From this description, it may seem that qualitative research is about individuals. However, it is also pointed out that qualitative methods "...focus on the various patterns, or clusters, of attitudes and related behaviour that emerge from the interviews".

The analysis of the description given for qualitative methods by Hakim shows that they provide opportunities to understand people and their interaction with the surrounding environment better than can be done by quantitative methods. The methodology used by Ellis (1996:78-79) to research the question of shelter provision for internally displaced persons and refugees in Croatia, also recommends the use of qualitative methods. She advocates that:

> "Such qualitative techniques can enable the researcher to understand the changes that new shelter forms bring about in lifestyles, in a way that quantitative techniques fail to do".

In his doctoral thesis which was one of the first comprehensive studies carried out on the post-war recovery of built environment, Barakat (1993:162) employed research methods that were not "highly structured". In other words, he avoided "questionnaires or set strategies", and his primary approach to data collection in the field relied on "...observation and semi-structured interview". On the other hand; as pointed out earlier a questionnaire survey was used in the strategy framework of this research. It is therefore important to

explain now, 'how' and 'why' a questionnaire survey was considered to be an appropriate method in the context of the exploratory strategy of this research employing qualitative methods.

6.2.1 A Questionnaire Survey: The Reconstruction of Water Supply Systems in Post-Disaster Areas

The first attempt to overcome the paucity of written information about the experience of professionals working in this field was by reviewing technical assignment reports submitted to the RedR. These reports were structured to find out the engineers' organisational and technical experience during their missions. Although they played a significant role in understanding what are the general concern areas in the process of urban water supply recovery, these reports seemed to be limited, not covering important issues such as relationships between donors, NGOs and beneficiaries, and long-term sustainability of programmes. It was because of those reasons that the possibility of carrying out a questionnaire survey was explored after the encouragement received from David Ede, the then Director of RedR.

The literature in social research describes a questionnaire as a type of research strategy "comprised of a series of questions" which can be both in "open-ended" and "closed" forms that can be answered by self-completion, self-completion in a group setting, interview and interview by phone (Labovitz & Hagedom, 1971; Hakim, 1987; Robson, 1993; Hall & Hall, 1996). Remaining in the framework of this description, *the Reconstruction of Water Supply Systems in Post-Disaster Areas* Questionnaire Survey which was carried out with RedR[1]

1 Although it was briefly mentioned in earlier chapters, the following information about RedR will be given here in order to explain the context of the questionnaire survey more clearly: "Registered Engineers for Disaster Relief (RedR) aims to relieve suffering in disasters by selecting, training and providing competent and effective relief personnel to humanitarian relief organisations world-wide. People with the right qualifications and aptitudes are recruited to a register and then given high-quality training by RedR. On request, these members are then assigned to humanitarian relief agencies".
RedR has a total of more than 600 members on the register specializing in water supply, sanitation, roads and bridges, project management, camp planning, mechanical engineering, electrical power and telecommunications, infrastructure reconstruction, logistics and transport management. More than 100 RedR members are assigned to different humanitarian programmes every year. This information is acquired from RedR's mission statement.

members included questions in both forms and used the self-completion method. There were several reason behind these preferences.

The questionnaire contained both open-ended and closed questions because of its main purpose which was to concentrate on the process of recovery interventions. There were open-ended questions because the author wanted respondents to have the freedom of expressing their own ideas and experience as they liked. It was essential that as much experience and information as possible should be acquired through this survey. However, the author was also aware of the fact that the length of questionnaire would be an important factor affecting the response rate.

In addition to this, the questionnaire was specifically targeted at 60 engineers specialized in water and sanitation, and who were on an assignment in the last three years. Those engineers have had relevant experience on different types of programmes in various countries such as Afghanistan, Bosnia Herzegovina, Croatia, Iraq, Kenya, Rwanda, Sudan, Tanzania and Zaire. Therefore it was not possible to be very specific on the type of questions whether they are for those who worked in refugee camps, rural areas or urban areas. Furthermore, time constraints of the targeted group had also been taken into account, as they were a group of professionals who were working for NGOs as a RedR member in addition to being involved in regular work in this country. It was because of these reasons that the following note seemed to be appropriate in the first page of the questionnaire:

> "Please respond to the following questions. Appreciating your time constraints, I do not expect you to answer each question. Please focus your attention on those questions you think are most relevant to the project you have worked on. Of course, should you desire and have the time, I would be most grateful to have your comments on all of them".

A self-completion method was preferred, as the author would not be able to visit all those engineers to conduct this questionnaire in a face to face interview form. Although this method could have used open-ended questions in a more effective way, and received a better response rate, the questionnaire survey showed that practitioners had different understanding of terms such as 'participation' and 'sustainability'. It should also be pointed out that the response rate for this questionnaire was reasonably satisfactory as it was 55 per

cent. Supporting this view, Hall and Hall (1996:100) wrote that:

> "Although response rates for well-conducted mail questionnaires of between 60 and 75 per cent have been reported, it is not uncommon for response rates to fall below 50 per cent".

Although the response rate was just over 50 per cent, it was very encouraging to experience that some of the respondents showed a great deal of enthusiasm for this questionnaire, as they completed different forms for each experience. Furthermore, this survey was also used as an opportunity to enquire about key resources such as references, manuals and guidelines that respondents were aware of, in addition to asking them their ideas and comments on any other key issues they thought, that were not covered in the questionnaire. Most of the respondents suggested different publications, handbooks and manuals. The author also found the responses to 'Ideas, Comments' section useful and fascinating. One engineer wrote that: "Drilling wells - everybody wants to drill wells in the first place; [but] they take a long time to implement; [if] the ground water is not there or is insufficient, or not where it is required; [or] other reliable means of providing water are ignored, it can be catastrophic.. BEWARE OF PUTTING ALL YOUR EGGS IN ONE BASKET". In addition to this, some of the respondents enclosed some technical and evaluation reports with their responses, while some suggested that they would be happy to assist the author with his research if they could. These kind offers were utilized by inviting them to the Water under Fire Workshop where the author had chance to share their experiences further during a two-day forum.

Having explained the overall structure, the four main sections of the questionnaire survey will be summarized here, and the analysis of data acquired from the survey will be presented in the following section:[2]

- *The problem, the briefing, the needs assessment, monitoring and evaluation:* The seven questions in this section aimed at finding out the context of mission and the composition of team that the engineer worked with; the type and effectiveness of briefing given to the engineer before leaving UK and just after arriving in the destination; the goals of the programme, who set them and who funded the programme; the ways of monitoring the progress of implementations and the methods of reporting and to whom.

2 A blank copy of this questionnaire can be found in Appendix A.

- *The implementation:* The seven contingency questions in this section tried to identify the technical framework of the programme; the level of local participation utilized; the level of integration between those water supply projects implemented and other programmes such as health and sanitation in the area.[3]

- *Organizational aspects, NGOs:* The main concern areas which were explored through six questions in this section were NGOs' capabilities and weaknesses for those programmes they undertook, and the issue of coordination between NGOs and other agencies involved.

- *Sustainability:* The questionnaire in this section presented five questions enquiring the long-term impacts of those programmes implemented, through finding out the utilization of local human and natural resources, and the main temporary and long-term effects on beneficiaries.

6.2.2 The Analysis of Data Acquired from the Questionnaire Survey

As pointed out earlier, most of the questions were open-ended (see Appendix A). Although the literature in social research offers various methods such as categorization to analyse this type of questions, it seemed that this would cause "...losing some of the richness of the information" (Robson, 1987; Hall & Hall, 1996). In addition to this; bearing in mind that the aim of this survey was to learn from the respondents' experience in different circumstances, it was not therefore considered to be essential to put them in rigid categories. However the analysis was done on the following areas.

Agency and type of work: Fourteen different agencies were represented in the 33 responses, and one third of RedR members (32 %) were employed in rehabilitation programmes. It was a surprising finding bearing in mind that the period of interest covered the crisis in Rwanda, and the ongoing conflict in the Former Yugoslavia. The Table 6.1 shows that those 33 RedR members were assigned to programmes in 11 different countries, but 51% of respondents involved in the Rwanda operation, either in Rwanda, Burundi, Zaire

3 Contingency question format was used because of the assumption that not all questions would be relevant to all respondents. The reason for using contingency type of questions is explained by Rubin and Babbie (1989:165): "Frequently, this situation - realizing that the topic is relevant only to some respondents - will arise when you wish to ask a series of questions about a certain topic". In this section, the main concern area was the implementation process, and as the type and scale of programmes would not have been known in advance it was thought contingency question format would provide a more flexible approach.

or Tanzania. It was also interesting to see that 82% of the respondents had been on assignments of less than 8 months.

		Number	%
Type of Work	Emergency	23	68
	Rehabilitation	10	32
Profession	Civil Engineer	18	55
	Water & Sanitation Engineer	6	18
	Other	9	27
Agency	Oxfam	11	33
	ODA	4	12
	UNICEF	4	12
	SCF	3	9
	UNHCR	2	6
	Other	9	28
Country of Posting	Rwanda/Burundi/Zaire	10	31
	Tanzania	7	21
	Bosnia / Croatia	5	15
	Kenya / Sudan	5	15
	Iraq	4	12
	Other	2	6
Length of Service	Less than 1 month	6	18
	1 - 3 months	11	34
	4 - 7 months	10	30
	8 months and over	6	18

Table 6.1: *Agency and type of work*

The briefing, the needs assessment and reporting: According to Table 6.2, just less than two thirds of the respondents thought that they were supplied with sufficient briefing, and large proportion of them had some kind of back up during their assignments. Eleven agencies' names were given as donors among 33 respondents, and almost half of those assignments were funded by UNHCR. Half of the respondents also said that the goals for their programmes were set by the agency they worked for, while 21% of respondents reported that the goals were set by donors and it was the same percentage for the collective decision form between donors and NGOs. Only 55% of the respondents were sure that those goals which were set initially were met by their agencies. It was seemed that the measuring of the programme impacts was not a common practice, as the responses were divided quite evenly on different criteria. One of the respondents reported that he measured the success "...by the smiling faces of the children?", while another respondent astonishingly

claimed: "...no one gave me any idea as to whether I was successful or not". For many of the respondents, the main way of reporting was within their organizations. The method of reporting to beneficiaries was employed by a small number of respondents (9%) as part their reporting system to donor and agency.

		Number	%
Briefing received sufficient	Yes	23	70
	No	9	28
	Not applicable	1	2
"In country" or "International" back up available	Yes	27	82
	No	6	18
Who funded the project?	UNHCR	16	49
	ODA	4	12
	Oxfam	3	9
	Others	8	24
	No response	2	6
Who set the goals?	Donor	7	21
	NGO	16	49
	All agencies involved	7	21
	No response	3	9
Were those goals set by your agency met?	Yes	18	55
	Partly	9	27
	No	2	6
	Not applicable / no response	4	12
How was success measured?	Time	2	6
	Number of beneficiaries	4	12
	Litres of water provided	6	19
	No of local people employed	0	0
	Various combination of above	9	27
	All of above	2	6
	Other	9	27
	No response	1	3
Who were you reporting?	To donors	3	9
	Within organisation	18	55
	Both donor and organisation	9	27
	To beneficiaries	0	0
	Various combination of above	3	9

Table 6.2: *The briefing, the needs assessment and reporting*

Level of damage inflicted on water supplies and level of participation utilized: In the survey; more than two thirds of respondents (79%) worked in areas where a water supply existed before the disaster; those respondents highlighted that 70% of those water supplies were damaged by the disaster. The damage caused to water supplies were at moderate and

high levels, 56% and 44% respectively. In addition to this, 23% of respondents pointed out that those existing water supplies were also affected by war indirectly. Although it was not possible to reflect in the Table 6.3, it was observed through the responses that those respondents who worked in urban areas, emphasized the high level of damage inflicted on water supplies.

		Number	%
Were there any water supply systems present in the area?	Yes	26	79
	No	7	21
If YES, Did the disaster damage those systems?	Yes	18	70
	No	8	30
If YES, What was the extent of the damage	Low	0	0
	Moderate	10	56
	High	8	44
	Indirect	6	23
Was the water provision you provided primarily for?	Refugees & IDPs	15	46
	Local host	5	15
	community	13	39
	Both		
Did you receive any participation from the community during planning/implementation of the project?	Yes	25	76
	No	8	24
If YES, At what stage did this contribution happen?	Planning	2	8
	Implementation	1	4
	Maintenance	3	12
	Various stages	19	76
Were you satisfied with the level of the participation?	Yes	20	80
	No	5	20
If YES, What kind of participation it was?	Labour	8	32
	Professional	2	8
	Administrative	0	0
	Financial	0	0
	Various types	14	56
	No Response	1	4
Was the water project you worked for involved with any sanitation or health project in the area?	Yes	23	70
	No	10	30

Table 6.3: *Level of damage inflicted on water supplies, and level of participation utilized*

The refugee crisis in Rwanda showed its impact in this survey as almost half of the respondents (46%) were involved in programmes where the water provision was mainly for

refugees and internally displaced persons. According to Table 6.3, three quarters of the respondents (76%) experienced a local participation at various stages (76%). It was reported that 80% of the respondents were satisfied with the level of participation which was mainly in various forms (56%) as labour, professional and administrative. It was also interesting to see that 70% of the respondents reported a certain degree of integration of their water supply oriented programmes with sanitation and health projects.

Capacities & Weaknesses, and NGO Coordination: More than one fourth of the respondents (27%) thought that NGOs they worked for, were not aware of their capacities and weaknesses before taking on those projects. It was also pointed out by 27% respondents, their NGOs' capacities were not adequate to meet the needs of those programmes. The Table 6.4 strongly emphasized that NGOs do not work in isolation as it was confirmed by 90% of the respondents, that there were also other NGOs working in the same area. The respondents also thought that their efforts were coordinated well (84%) with those of other NGOs'.

		Number	%
Was your NGO aware of its capacities and weaknesses before taking on this project?	Yes No Not applicable	23 9 1	70 27 3
Were your NGO's capacities adequate enough to meet the needs?	Yes No Not applicable	22 9 2	67 27 6
Were there any other NGOs working in the same area? If YES, Were your efforts coordinated with those of other NGOs'?	Yes No Yes No	30 3 25 5	90 10 84 16

Table 6.4: *Capacities & Weaknesses, and NGO Coordination*

As pointed out earlier, the analysis of findings from this questionnaire played a significant role understanding the general context of NGOs' involvements in the provision of water during and after war. Building on these lessons and shared experiences the author was able to modify and re-structure the development of this thesis in its present form. The implementation of a small-scale survey strategy as part of an exploratory research was

found to be quite effective and productive. However, survey strategy on its own would not have been adequate for the needs of this research, but its findings were significant in terms of supporting and enriching the framework of the research argument and the development of the ATAM approach.

6.3 Water under Fire Workshop

The process of data collection and development of research were also supported by convening an international workshop entitled "Water under Fire: The Challenge of Post-war Reconstruction of Water Supplies" on 21-22 November 1996 in York. Organized jointly by the PRDU, RedR and SEA and convened by the author, the framework of discussions at the workshop were formed by the initial findings of the research and the six keynote papers. This international workshop aimed at exploring and identifying the main components of post-war reconstruction of water supplies, and thereby reaching conclusions that could form a basis for guidelines regarding future interventions. To reach this aim, the workshop had the following objectives:

- **To provide** a forum for practitioners, policy makers working in the field, commercial water and water equipment companies, NGO representatives and academics in order to share their experience of post-war water supply reconstruction.
- **To explore** the context of opportunities and challenges for the ways to implement structures and procedures for the sustainable recovery of post-war water supplies.
- **To discuss** the framework of possible approaches which would make the Donor-NGO-Beneficiary Triangle more pro-participation and beneficiary oriented.
- **To identify** strategies for monitoring and evaluation of water supply projects in war-affected areas.

To meet those workshop objectives, the topics for the workshop papers were selected so as to allow comprehensive discussions to be initiated in three working groups. The papers presented at the workshop can be summarized as follows:

Dr Giorgio Nembrini, ICRC Nairobi, emphasized the need for:

- a coherent approach among agencies to avoid duplication and to harmonize approaches and relationships, not only at the field level, but also at headquarter level.
- the use of soft mechanisms like consultation instead of coordination, which may be seen to reduce flexibility and ability for quick response.
- the dissemination of lessons learned in recent conflicts in order to achieve essential

cooperation among the different actors and cope with future humanitarian interventions.

Paul Sherlock, Oxfam, underlined the increasing involvement of commercial companies in emergency operations within two spheres of action. First, by providing services and equipment to NGOs and military; and second, by being part of the "service packages" which are increasingly used by western governments as a response to emergencies. It was emphasized that the framework of this involvement is mainly profit-driven and, therefore, tends to concentrate on countries with political and strategic importance, in which the international community has an interest.

Riccardo Conti, ICRC Geneva, presented a case-study from Sarajevo, requiring the collaboration of both Pale and Sarajevo Water Boards across the Dayton line, which showed how the provision of water supplies can be used as a "peace-building tool". Other issues raised were:

- no distinct division between relief and reconstruction in regard to urban water supplies.
- operational difficulties such as territories, security, time constraints, mines, etc.
- the need for comprehensive monitoring in order to achieve the adaptation of implementations according to changing environment.

Dr Robert Hodgson, The University of Exeter, presented post-war water supply reconstruction examples from Mostar and Grozny which dealt with top-down and bottom-up approaches, pointing out:

- the need to identify who are the victims and real beneficiaries, and who is responsible.
- the top-down approach seems to work best for temporary quick fix solutions, however, more bottom-up approaches should be the only way for long-term recovery.

The author's paper concentrated on the findings from the first phase of the field work regarding SEA assisted water supply implementations in the Tuzla Region. The analysis was presented under three main headings as opportunities created by war, beneficiaries, and monitoring and evaluation. The author used this presentation as an opportunity for the findings of the research to be discussed by the workshop participants.

Issues related to Monitoring and Evaluation also formed the framework of the paper by

Tom de Veer, RedR engineer from the Netherlands, which recommended:

- training of staff in monitoring and evaluation issues.
- introduction of better methodologies for programme planning.
- producing guidelines/expert systems on the subject and disseminating ready information.

The discussions during working groups and plenary sessions first identified several opportunities and challenges for post-war reconstruction of water supplies. Following this, the participants recommended some approaches which would build on the opportunities and overcome the challenges. The workshop recommendations can be summarized under five headings:[4]

- Opportunities for improving existing systems and building new water supplies:
- Social reconstruction
- Empowerment and capacity building
- Economic aspects of post-war water supply interventions
- Partnerships between Donors, NGOs and Beneficiaries.

Further information on the workshop papers and its recommendations can be found in The Water under Fire Workshop Report (Ozerdem & Barakat, 1997).

6.4 Field Work

Having explained the context of the questionnaire survey and the analysis of its findings, and the context of Water under Fire Workshop, the exploration of the research strategy will now focus on the field research methodology used in the case study. As pointed out earlier, the research strategy has comprised qualitative methods for the field work because of the context of the research question. However, it is also important to consider what Feldman (1981:8) rightly claims about choosing research methods:

> "We must remember that when we choose a problem, we choose one problem among many, and that when we choose a method to solve that problem, we choose one among many possible ways of solving the problem. These choices are value-laden; they carry with them biases and constraints, screening out some possibilities while maximizing others".

4 The full text of these recommendations can be found in Appendix B.

This realistic statement shows that research methods chosen for the collection of information can be easily questioned for their objectivity as researchers make those preferences according to their biases. It is not possible in the scope of this research to answer the question of whether those biases can be eliminated completely, but Barakat and Ellis have suggested several ways of avoiding them during the process of carrying out a field research in war-affected areas. Academic research in war areas is still in its infancy. In their leading article entitled "Research Under Fire", Barakat and Ellis (1996:149-150) explore the issues of data and information collection in war circumstances as they point out that:[5]

> "The researcher in war is governed by multitude of unpredictable parameters which tightly control appropriate and possible action. Personal safety, shifting battle lines and alliances and restrictions of movement are all concerns that have regulatory effects on the researcher in war".

Considering these challenges posed by war circumstances, they advocate the need for the researcher to be "reflexive, flexible and innovative". Although both phases of the field work for this thesis were carried out after the Dayton Peace Accord in 1995, the employment of these three concepts as stepping stones was found extremely useful during the research in the Tuzla Region.[6] Through the investigation of the concepts of reflexivity, flexibility and innovation, several issues are outlined by Barakat and Ellis (1996:149-156).[7] Building on these issues, the framework of the field work in the Tuzla Region is explained through the following framework:

- Pre-field preparation
- Research biases
- Gaining access and identifying gatekeepers
- Freedom of movement and time limits
- Limited information and range of techniques
- Self-presentation
- Background and culture
- Impartiality

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5 The full title of this article is: Researching Under Fire: Issues for Consideration When Collecting Data and Information in War Circumstances, with Specific Reference to Relief and Reconstruction Projects.

6 The peace agreement reached in Dayton, USA by the presidents of Bosnia-Herzegovina, Croatia and the Republic of Yugoslavia on 21st November 1995. The agreement which was signed in Paris in December 1995 has created two entities in Bosnia-Herzegovina known as the Federation of Bosnia and Herzegovina, and the Republica Sirpska.

7 These three concepts formed the framework of the research methodology used by Sue Ellis in her doctorate thesis (Ellis, 1996).

6.4.1 Pre-field Preparation

It was explained by Barakat and Ellis (1996:149-156) that by learning as much as possible about the situation both current and pre-war, the researcher can ensure a better understanding of the conflict and analysis of the data to be collected. Pre-field preparation was also considered to be essential for ensuring that the researcher would not become a burden to local population for his/her physical requirements. The author visited Scottish European Aid (SEA) Edinburgh Office to get as much information as possible on their involvement in the Tuzla Region, as well as having several meetings with their staff in Edinburgh. Learning from the literature available on the conflict in the Former Yugoslavia was also found extremely useful in giving a better understanding of the situation. In addition to this, the author benefited a great deal from his supervisor, Dr Sultan Barakat's extensive experience in Bosnia-Herzegovina to prepare himself for the field work.

6.4.2 Research Biases

Barakat and Ellis (1996) based their discussions in 'Programming and Seasons' on the six biases - spatial, project, person, season, diplomatic and professional - identified by Chambers.[8] To avoid these biases, the field work visits in the Tuzla Region made the following special efforts.

Spatial biases: The field work visits which took place between 15th March and 5th April 1996, and 7th March and 11th April 1998 attempted to cover as many and different size urban settlements as possible in order to avoid spatial bias. Although the author was based in Tuzla town during his field works, working with local water engineers at SEA gave him the opportunity to make several visits to various projects in different parts of the region.

Project bias: These visits also ensured that the research would not be distorted by project bias; as SEA has been assisting more than 70 different water supply projects since 1993. Those projects were varied in size from simple equipment provision to assisting the biggest

8 Chambers, R. 1983. Rural Development: Putting the Last First, Longman Scientific & Technical

water supply work in Bosnia-Herzegovina since the outbreak of the war.

Person biases: The person bias was not particularly an easy task to overcome, as the author was affiliated with SEA during the field research. The problem was not in terms of elite bias, male bias, user and adopter biases, and active, present and living biases, as the concept of person biases are explained by Chambers (1983), but it was in terms of affiliated organisation bias.

Affiliated organisation bias: It was especially observed during the first phase in 1996 that key people in municipalities and local water boards seemed to be extra careful at the interviews on the role of SEA during those implementations. It was therefore ensured during the second phase that the author conducted interviews without having a member of SEA staff present. The reasons for affiliated organisation bias can be seen more clearly in the next chapter where the working relationship between SEA and local municipalities will be explained.

Dry season biases: The author agrees that weather can have fundamental effects on the living conditions; for example for those living in tropical countries, life standards particularly deteriorate in the wet season as explained by Chambers (1983). Supporting this view, Ellis (1996:85) explains her experience with dry season bias during her field research on the provision of shelter in Croatia:

> "Conditions that may be perceived to be satisfactory in summer when families could extend their living environment beyond the confines of the shelter, might become unsatisfactory in winter when the family would be largely house-bound".

Following this, it can be argued that the decision to carry out both phases of the field work in March may have caused a season bias in their findings. For example, water sources are affected by changes in weather conditions, which would in return have some impacts for the amount of water to be supplied. This can be an important factor in the findings of supply efficiency assessment whether it is done in summer or winter. However it should be pointed out that the period around March for field works was a good time to research and get people's attention, and it enabled to avoid adding an extra burden to SEA's busy working

schedules in summer time. In addition to this, the author believes that this bias was successfully avoided by collecting information from a variety of sources such as statistics from local water boards, the WHO office in Tuzla, SEA, and through careful interviews. In regard to the bias of having site visits in easy weather conditions as explained by Chambers (1983), it can easily be claimed that March is a difficult month in the Tuzla Region.

Diplomatic biases - politeness and timidity: Although Chambers (1983:22) explains that these biases prevent "urban -based researchers" from "...approaching, meeting, and listening to and learning from the poorer people", Barakat and Ellis (1996:151) emphasize the issue of "...selectivity over which projects are shown to the researcher". With regard to both these concepts, the author managed to avoid diplomatic biases for the reasons explained in the sections of spatial, project and person biases.

Professional biases: The concept of "a tunnel vision" of professionals is used by Dudley (1993:57) to summarize this bias, as Chambers (1983:23) explains the way professionals carry out their research assignments as follows:

> "Knowing what they want to know, and short of time to find it out, professionals in rural areas become even more narrowly single-minded. They do their own thing and only their own thing. They look for and find what fits their ideas".

At the end of the Research Strategy Section, this bias was also highlighted by Feldman (1991) with his warning on the process of choosing research methods. This bias was avoided as suggested by Ellis (1996:86), by turning the research process back upon the researcher in order to check whether the perceptions had any effects on the type of data collected. She states that:

> "Only through the process of constantly questioning and evaluating the process while in the field and during analysis following the periods of field study, is it possible to expand the field of study beyond the constraints of professional bias".

6.4.3 Gaining Access and Identifying Gatekeepers

Carrying out field work in war circumstances can often mean difficult challenges with

gaining access to the field because of security check points, roadblocks, need for obtaining permissions, etc. This is further explained by Barakat and Ellis (1996:151):

> "...in civil conflicts there can often be rebel groups acting against the government and they can seriously impede the researcher's access to an area or setting".

Fortunately, gaining access to the Tuzla Region for the field work was not a major problem. As pointed out earlier, carrying out this research after the Dayton Peace Agreement was a significant reason for the easy access, as there was a certain level of stability in the country even during the first phase of the field work. However it should be pointed out that being affiliated with SEA in Tuzla and able to receive logistical assistance from them made everything much easier than it could have been otherwise. The author was provided with logistic assistance by SEA through three primary ways:

- **Transport:** As pointed out earlier, the scope of the field visits attempted to cover as many SEA assisted water supply projects as possible in order to gain clear and sufficient perspective of those implementations. Without SEA's transport support, the cost of travelling could not have been afforded within the field work budget limits as the author had to self-finance those visits.

- **Language:** SEA's local members of staff, both technical and administrative played a significant role in the process of the field research in terms of identifying the key people, making contacts and assisting the author as translators. As pointed out earlier, the assistance for translations from SEA was only required during the first phase, as the author decided to use an independent translator during the second phase of the field work to avoid affiliated organisation bias. In addition to this; considering the large number of special terms and notions in the field of post-war recovery; it was thought that the task of translation was far more specialized than SEA staff could have handled. Therefore during the second phase site visits and interviews, in addition to hiring a professional interpreter, the assistance of a Bosnian student from the MA Course in Post-war Recovery Studies, who was on her placement experience in Tuzla during the same period, was employed for some of translations as she was well aware of the terminology of post-war recovery.[9]

- **Affiliation:** The other main advantage of affiliation with SEA was the easiness it provided during making appointments with local authorities, other international NGOs and local water boards. It was mainly the result of SEA's good reputation and large number of contacts in their networking system.

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9 Masters in Post-war Recovery Studies is run by Post-war Reconstruction and Development Unit (PRDU) at the University of York. The course aims to train a multi-disciplinary body of professionals in the analytical, planning and management skills required to propose, design and execute recovery programmes and projects in societies torn apart by war.

6.4.4 Freedom of Movement and Time Limits

The need for being "flexible" and "adaptable" were identified by Barakat and Ellis (1996:152) as "...the realities of war often mean that well-planned schedules cannot be kept to". Barakat (1993:162) urges the need for flexibility also in the process of carrying out an exploratory research where there is a paucity of published information as it was for his case study in Fao City, Iraq. Considering the preceding issues, the author avoided tightly structured field visit programmes. They were not appropriate for the nature of the research because of the reasons explained earlier. Besides, there was a need for having an adaptable programme to fit with SEA's working schedule, as the author avoided being an extra burden to their staff by making them feel obliged to meet the needs of a rigid programme.

The constraints with a self-financed budget for the field work were the primary reasons of bringing certain time limits for the length of those visits. Nevertheless, it was made sure that the time spent in the field was not less than sufficient for the needs of carrying out comprehensive field research.

6.4.5 Limited Information and Range of Techniques

To carry out field research in an area which has been affected by war can mean a high level of limitations on obtaining information such as basic statistics, maps, plans, etc. For example, the author found it very difficult to get information on the region's history and socio-economic structures. Most of the published information acquired was written in Bosnian, which needed to be translated into English. To overcome this limitation as much as possible, the author tried to utilize all secondary sources of information such as local libraries, information published by local authorities and international agencies, the University of Tuzla, local newspapers, etc. The other ways of collecting information such as photography was not a problem, therefore the author had chance to document the progress of implementations and general changes in built environment in the region.

As explained earlier, the primary exploratory research methods in field work are observation and interviewing. Questionnaire surveys are not recommended as an appropriate method for

field work in war-affected areas (Barakat, 1993; Ellis, 1996). Therefore the author's research in the Tuzla Region employed those two methods primarily, but bearing in mind the importance of "chance learning" during the field research in war circumstances which was highlighted by Barakat and Ellis (1996:153). They explain this concept as one of data collection methods that researchers should have at "their fingertips". They further elaborate the reason for this:

> "The researcher in war cannot predict when, where or how they will learn something, a fact which runs contrary to established method in academic institutions".

This in fact is one of the advantages of carrying out field research through employing exploratory methods which bring the researcher the flexibility of being open to the unexpected. Supporting this view Hall and Hall (1996:88) state that "Things rarely go according to plan. So be prepared to regard the action plan as provisional and changeable". Carrying out the field research based on several methods also met the criterion of methodological triangulation which can be described as "...using different research methods or sources of data to examine the same problem" (Hall & Hall, 1996:44).[10] The importance and validity of methodological triangulation for field research in war-affected areas is also emphasized by Ellis (1996:81).

> "Thus, the author believes, in line with the interpretevist model of triangulation, that multiple techniques should be used in the environment of war to establish an holistic understanding of the subject under investigation".

Robson (1993) explains that there are various direct observation approaches such as two extremes: participant observation and structured observation. While the first one involves "...living in the community under study for a period of weeks or months", the second one is the use of "...structured forms for systematic recording of observable data" (Nichols, 1991:12). Whatever the approach may be, the main advantage of an observational technique is explained as its "directness". The reason for this is explained by Robson (1993:191) as follows: "You do not ask people their views, feelings or attitudes; you watch what they do and listen to what they say". In addition to this, he emphasizes that direct observation should

10 Rubin and Babbie (1989:277) explain that "Despite its connotation of a triangle, triangulation does not require using three options, only more than one). According to Hakim (1987:144), there are five types of triangulation identified by Denzin: methodological, data, investigator, theoretical and multiple.

not be considered "...an easy or trouble-free option". In order to provide appropriate data for the research, observation method needs to be equipped with various aids. For example, IRC (1987:60-61) in its training manual on the evaluation of water supply and sanitation projects, recommends that the following points may aid the reliability of the observation method:[11]

- **Decide carefully what to observe and why:** It is pointed out that although the limits of selection need to be broader in an exploratory research, at least some direction for direct observation is required.
- **Include a try-out:** The method, direction and items for observation may need to be adapted in the field.
- **Be systematic in your observations:** In order to provide a certain level of reliability with the data collected through observation, the researcher needs to be systematic in terms of observing an activity in all sections of a community or throughout the day.
- **Keep systematic records:** It is necessary to record observations in terms of what, when and where by writing them down during or just after the observation.

In addition to the employment of those aids, the author also developed a habit of keeping a diary for the field work which was found very useful to make the time spent in the field as beneficial as possible. The beneficial use of a check list during observations as explained by IRC, should also be pointed here. Barakat (1993:167) employed the check list method during his case study in Yemen in order to "...register and cross check some of the rather dubious remarks made by the various interviewees". Furthermore, Barakat and Ellis (1996:152) explain the use of a check list of observations with the following example:

> "...when trying to measure the degree of acceptance of a rebuilt housing settlement, a researcher can note the extent to which the settlement has been transformed. This is a category of investigation that can be broken down into observable, measurable indicators,..."

Feldman (1981:43) also recommends that the researcher needs to develop useful physical indicators of social processes such as the number of cars in front of homes to measure the wealth of a community. In addition to direct observation with a check list, the method of the focused interview was also employed in the Tuzla Region. Three types of interviews: free, focused and standardized can be distinguished, of which the first two types can be used to

11 IRC: International Reference Centre for Community Water Supply and Sanitation, The Hague. "IRC is an internationally operating, non-profit organization dealing with information and technology support for water and sanitation improvement....Support is provided by means of publications, training and education, evaluation and advice, and development and demonstration" (IRC, 1987).

collect mainly qualitative data while the last one is for mainly quantitative data. As was the case for observation method, focused (or semi-structured interviews as they are more commonly known in social research) interviews follow a check list of questions while keeping an open mind to what the respondent is saying, to provide further questions. In addition to this definition of focused interview, IRC (1987:68-69) also outlines the following points for effective interviewing:

- Preparation of a check list in the form of pre-worded questions.
- Proper self introduction which was particularly important to avoid affiliated organisation bias.
- Creating a relaxed atmosphere by "asking factual, non-threatening questions" to start the interview.
- Starting with general questions and moving to more specific questions as the interview develops.
- Employing further questions to clarify general answers.
- Using neutral questions to avoid influencing on the response.
- Listening carefully is very important not to miss important issues which can be probed by further questions.
- Taking notes is essential, and using a tape recorder (after asking the permission of the respondent) can also be very effective.

In addition to the above discussions on observation and interviewing techniques, the research also utilized another method of collecting information, which was the utilization of a log book. The primary need for structuring a log book was to ensure that the second phase of the field work was carried out through a checklist of questions derived from the research's proposed ATAM framework.

In addition to its main four sections with set of questions on each aspect of the ATAM framework, the log book also contained several other sections such as:

- Brief project description
- Summary of activity
- Objectives
- History of activities
- Inputs
- Other comments
- Diagrams

Subsequently, it was an extremely useful tool for the evaluation of SEA assisted water supply projects in the field. A copy of this log book can be seen in Appendix C. In parallel

to conducting the second phase of the field work, the structure of this log was also assessed by the author in order to improve its future use. The assessment of the log book was based on the author's marks from one to five which were given to each question during the use of the log book in the field. The marks ranged from '1' which was the lowest, to '5' which was the highest, showing the question's success as a tool to bring a better understanding to the project situation. The intention was to improve the context of the log book through the experience gained in the field.

6.4.6 Self-presentation

Several aspects of self presentation such as dress, body language, speech and travelling companions were highlighted as crucial issues for a researcher to consider in the process of a field work (Barakat & Ellis, 1996). The author's experience in the Tuzla Region also supports this view, especially in terms of type of clothes for different visits and occasions. For example, casual dress and boots were not only the most appropriate, but also necessary during the visits to project sites. However, the author felt after the first interview with a key person at the Tuzla Municipality that it could have been perhaps better to avoid heavy boots and jeans. Therefore as part of the pre-field preparation, researchers should consider the possibility of different dressing needs in terms of casual, smart casual and smart for different occasions.

Before going to Bosnia-Herzegovina in 1996, the author felt that it would have been more appropriate to have only casual clothes because it was a war-affected country. However, it was soon realized that it was a wrong assumption. Ironically, it was often expatriates who preferred very casual clothes not Bosnians. It should also be pointed out that researchers in a country like Bosnia-Herzegovina should not lead themselves into another wrong assumption which is the idea that wearing scruffy clothes could make them more acceptable to local community.

6.4.7 Background and Culture

The above misconception of preferring scruffy clothes was in fact considered as a rudeness

by the Bosnians the author worked with, because as far as they were concerned preferring scruffy clothes was a disrespect to other people around them. This way of thinking was quite easy to understand for the author, as he comes from a country with the same religion and similar social and cultural sensitivities. This was in fact a major advantage for the author to make contacts with local people, to gain their trust and to integrate with them more easily. Overall, the author received a sincere hospitality and warm welcome.

6.4.8 Impartiality

Although the author felt culturally close to the Muslims in Bosnia-Herzegovina and it seemed he received extra hospitality and attention from them because of this, he did not allow this to affect his impartiality during the collection of information. The author often checked the findings from observations, meetings and interviews in order to make sure that his cultural closeness towards the Muslims did not result in a partial interpretation. To remain impartial is a difficult task for all researchers in war-affected areas because of their own conceptions and understanding of the conflict. The point to maintain impartiality which was made by Barakat and Ellis (1996:155), was always borne in mind during the author's field work:

> "An open-minded and reflective approach should be maintained, allowing the researcher constantly to address and adjust their perspective. To travel into the field looking, listening and learning from all possible sides and sources, and constantly assessing the viewpoint, is the closest the researcher can come to impartiality".

In their analysis of researching in war areas, Barakat and Ellis (1996:155-156) also look at the issue of stress as putting the informants under stress by being persistent with questions that remind them of unwanted memories of war, and the stress that the researcher may be under. This issue was not particularly applicable in the scope of the field works, as they were not carried out while the war was ongoing and did not involve interviewing people on their experience of war.

6.5 Other Learning Tools

In addition to these methods explained above, the author also tried to overcome the paucity of published information in the field of post-war recovery of water supplies by utilizing opportunities of attending and participating in a number of national and international workshops and conferences which were important learning tools for keeping the research up-to-date and being enhanced continuously by other related disciplines. This section therefore, will summarize the context and findings of these events in a chronological order.

6.5.1 Towards Improved Shelter and Environment for Refugees and Displaced Persons within the Post-Yugoslav Countries, 9-11 October 1995, Luton, UK

Organized jointly by the University of Luton and PRDU this international workshop aimed at providing a forum for discussions on all aspects of shelter for refugees and displaced persons in order to make recommendations for improvement in the praxis of shelter provision. The workshop discussions focused on the following areas of shelter provision in war-affected areas:

- **Responding to Conflict:** It was highlighted that the involvement of some NGOs which did not have any previous experience of working in armed conflicts, had negated the peace building process in the Former Yugoslavia.
- **Relief to Development Continuum:** The need for initiating linkages between the provision of shelter in relief and reconstruction was emphasized in order to address the long-term shelter needs.
- **Types of Shelter Policies and Programmes Initiated:** It was explained that decisions of shelter programmes should be made according to beneficiaries' physical, social and economic needs, and possible impacts of those programmes should also be considered before the implementation process.

In addition to making the value of the research on water and the way it inter-relates to shelter apparent further, this workshop provided various lessons were for the development of the author's own doctoral research. The author also had chance to meet a number of experts such as Ian Davis from Oxford Centre for Disaster Studies.

This workshop also turned out to be very significant for the research as it provided the opportunity of meeting David Ede and Mike Cunningham, the then Directors of RedR and

SEA respectively. The exchanging of ideas with them continued after this workshop, and resulted in two important developments for this research, which were the questionnaire survey with RedR members and deciding on the Tuzla Region as a case study.

6.5.2 Habitat II Conference "The City Summit", 3-14 June 1996, Istanbul, Turkey

The City Summit in Istanbul was the culminating event in an unprecedented continuum of UN conferences held in the 1990s such as the Rio Earth Summit, the International Conference on Human Rights in Vienna, the Population and Development Conference in Cairo, the Copenhagen Summit on Social Development and the Fourth World Conference on Women and Development in Beijing. In May 1996; Wally N'Dow, the Secretary General of Habitat II stated the overall aim of the City Summit as follows:[12]

> "The overall objective of the Habitat II Conference is twofold: one is to increase the world's awareness of the deteriorating living environment, and the second one is to awaken the planet to the potentials of human settlements as catalysts for social progress and economic growth - and that can only happen if our cities, towns and villages are healthy, safe, just and sustainable".

However, the progress of the conference which was attended by more than 10,000 delegates showed that the aiming at an increased awareness to the problems faced by the world cities would not be enough to overcome them without substantial political commitments at a global level. For example, the significant divisions between developing and developed countries once again created a conflict of interests and ideologies which were tackled throughout the conference in various forums at different levels. The protection of environment was for example considered by developing countries as a factor undermining their development process, while western countries were anxious about a declaration that made housing a human right. Although those divisions were not encouraging in reaching a common agenda for the future of the world cities, the process of the conference itself was particularly significant. The conference achieved a broad participation of all relevant actors from local governments, unions and academics to professionals, NGOs and community-based organizations. This broad based participation of all those actors should be considered as a positive sign and commitment for tackling and solving the problems of cities.

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12 From Habitat II Newsletter published by UNCHS, No. 7, May 1996.

The most significant parts of this conference for the author were the participation in the Forum of National Academies of Science and Engineering which took place between 31 May and 1 June, Habitat Dialogues for the 21st Century from 4 to 10 June and the "Infrastructure Essential for Life" Special Events during the conference. The first forum where 72 of the World's Scientific Academies were represented was an interesting opportunity for the author to meet many scientists and academics from different disciplines. The discussions during this forum brought clear insights on several challenges and dilemmas faced by urban settlements, and the role of scientists, engineers and academics in this framework. The statement by the World's Scientific Academies pointed out that:[13]

> "Cities throughout the world, however, suffer from a host of problems, including congestion, pollution of air and water, inadequate water supplies, wasteful use of energy, problems of waste disposal, inadequate housing, the spread of communicable diseases, and the deterioration of social support systems...The problems of our cities must be addressed by effective economic and social policies and strategies. Science and technology also have a crucial role and responsibility in providing solutions and in ensuring the long-term sustainability of cities and the ecosystems on which they depend".

In addition to outlining a list of new discoveries that may be applicable to the amelioration of urban problems, the statement also included an urban research agenda, and local and national capacity building for sustainable cities. The Maintenance and Evolution of Infrastructure part of the capacity building section stated that:

> "The evolution, replacement, and modification of systems need to be integral elements of infrastructure concepts. The capability to plan for and mitigate natural and man-made disasters is a critical element in the functioning and survival of urban settlements".

As far as the author's main interest is concerned, it was encouraging to see that this statement from the World's Scientific Academies acknowledged the importance of preparedness for responding to natural and man-made disasters. However, it did not seem very clear whether war was really considered as one of those man-made disasters. At least there was no mentioning of war during the forum discussions, which made it obvious that the elite-experts of the national academies thought of the world as a peaceful planet. The author could only participate in this very formal forum as an observer which meant that his

13 From the Statement by the World's Scientific Academies, prepared for Habitat II, June 1996.

concerns and contributions could only be heard during the breaks, but were not necessarily noted in the plenary.[14]

On the other hand, at the "Water for Thirsty Cities" Forum which was one of the Habitat Dialogues covering various urban settlement issues such as land, energy, employment and finance, the author had a better chance of participating in the discussions. Wally N'Dow in his opening speech of this dialogue also drew the attention of participants to the increasing trend of armed conflicts in urban areas and their severe impacts on populations. In addition to this forum, four out of the eight "Infrastructure Essential for Life" Special Events were also allocated to the issues of water, sanitation and waste. It was a great experience to meet many participants at those forums, who are involved in water supply management and listen to experts such as Ismail Serageldin from the World Bank, Veysel Eroglu from Istanbul Technical University and Arcot Ramachandran who was the former Secretary-General of UNCHS.

6.5.3 Reaching the Unreached: Challenges for the 21st Century, 9-13 September 1996, New Delhi, India

This event was the 22nd WEDC conference which was organized to provide a forum for practitioners and academics to explore the context of water supply and sanitation provisions to the poorest in developing countries.[15] After the official inauguration of the conference by the prime minister of India, Deve Gowda, Professor John Pickford in his welcoming speech (WEDC, 1996) stated that to reach the unreached water supply and sanitation programmes should be "...simple, straightforward and well-accepted" and urged that the discussions during this five-day conference should focus on three primary issues:

"The first of the three is that technology should be appropriate; the second that

14 To become a member of a National Academy of Sciences, one needs to have an outstanding and long period of academic experience.

15 The Water, Engineering and Development Centre at the Loughborough University . The centre is concerned with education, training, research and consultancy for the planning, provision and management of physical infrastructure for development in low- and middle-income countries. As part of their mission, WEDC organizes a series of conferences on those issues related to water and sanitation, which take place every year in a different country.

> all our endeavours should be people-centred and the third that what we do must be properly managed. Three things, all important in themselves. It is specially important that our ideas about technology, people and management should be fully integrated".

The author participated in this conference with a paper entitled "Water under Fire" identifying the context of water provision in war-affected areas as well as outlining his ongoing research in the Tuzla Region with its findings at the time. Apart from the author's paper, there was only one other paper in the context of war and water. Sarah House and Bob Reed from WEDC presented their analysis on the rapid assessment of emergency water sources. It must have been the result of this that these two papers were grouped with some other papers under the heading of 'Miscellaneous', which probably could not be put in any of the following groups:

- Management
- Community Management
- People and Health
- Water Resources and Use
- Wastewater and its Treatment
- Water Quality and Supply
- Solid Waste and Sanitation

Ironically, on the contrary of its group title, the 'Miscellaneous Session' witnessed one of the most interesting discussions of the conference. It was the result of this that in his speech to summarize the findings from the group discussions and to close the conference, Professor Pickford stated the value of having papers on such an important issue as the water provision in a war context. He also urged his colleagues in WEDC to encourage the submission of papers on this context for the future WEDC conferences.

Furthermore, the various group discussions and other papers submitted to this conference drew the author's attention to several issues such as financing options for water supplies, sustainability through training, the importance of operation and maintenance for long-term sustainability, etc.

6.5.4 The 3rd International Conference on the Reconstruction of War-damaged Areas in Iran, 2-8 March 1997, Tehran, Iran

This conference was the third of its kind organized by the Central Council for the Reconstruction of War-damaged Areas and the University of Tehran - the first and second ones were in March 1986 and January 1991 respectively. The conference was inaugurated by the then President of the Islamic Republic of Iran, Ali Akbar Hashemi Rafsanjani. In his speech, the President outlined the extent to which Iran had been affected by the physical, social, economic and psychological impacts of the eight year Iran-Iraq war. The war, which started on 22 September 1980, caused massive destruction along the 1,200 km common border between the two countries. Only in Iran, it affected 87 cities and 2,676 villages within a depth of up to 80 km. The scope of direct and indirect damage to the Iranian economy was US $1,000 billion.

The 16 papers presented at the general assembly of the conference covered a wide range of issues such as demolition and waste management of war-damaged areas, indigenous recovery, evaluation of reconstruction, employment and revitalization of natural resources. The afternoon sessions of the second and third days were allocated for round tables on various specialized subjects including: Architecture and Urban Planning; Political, Social, Cultural and Psychological Aspects, Infrastructure, Research in Reconstruction, Economics. After the two and half days of conference participation, the author with a large group of other participants both Iranian and international had the opportunity of participating in a comprehensive study tour along the Iran-Iraq border including Abadan, Ahwaz, Dezhul, Dehloran, Mehran, Ilam, Quasr-e-Shireen and Kermanshah.[16]

The following observations were made during this study tour:[17]

- The massive scale of reconstruction programmes implemented by the Iranian

16 This visit was part of the 1996/97 MA Course in Post-war Recovery Studies. The group from the University of York was led by Dr Sultan Barakat and included eight MA students, Charles Cockburn, Priyaleen Singh and the author.

17 These observations are taken from a brief report on this study tour which was written by the author and Haneef Atmar and published in Revival, Issue 8, August 1997, p: 4.

government over the last few years was impressive.

- The government has provided all kinds of support including financial, administrative and organisational to alleviate the destruction and suffering caused by the war.
- Opportunities created by war in areas such as town planning and architectural integrity had not been properly utilized. Several towns were reconstructed almost identically even though each had different geographical, social and cultural qualities.
- Some opportunities created by war have been utilized, such as the provision of proper water supply and sewerage systems in places like Dehloran where they had not existed before the war.
- Participation was highlighted as an area neglected by the post-war reconstruction in Iran. The inevitable top-down approach allowed a minimum amount of local participation into decision making and implementation.
- Some of housing programmes, however, were limited to the provision of materials and funds, leaving planning and reconstruction to war-affected people.
- It was witnessed that Iran considered the self-help reconstruction programmes as a therapeutic way to alleviate psycho-social impacts of the war.
- Accountability in terms of funding mechanisms seemed very complex. Money was distributed among several beneficiaries, meaning funds came from a combination of charities, governmental allowances and other sources.
- The sincere efforts of ordinary citizens, community groups, the clergy and government to rebuild their country were often very visible.

6.5.5 14th Inter-Schools Conference on Development - Global and Local Development: New Agendas, New Partnerships, 24-25 March 1997, Edinburgh, UK

Organized by the Centre for Environment and Human Settlements (CEHS) at the Heriot-Watt University, the Inter-Schools conference in Edinburgh was the 14th of its kind which are held at a different school of Architecture and Planning in the UK each year. The papers at this conference were presented in two parallel workshop groups as Community-based Partnerships in Development, and New Directions and Agendas in Development. The author participated in the first group, as it included papers on issues such as the role of international NGOs in new partnerships, micro-credit systems for toilet schemes in India, partnership at the grass-roots, etc.

The discussions during the working group and the plenary sessions were extremely useful for the author in the process of building his understanding of concepts such as enablement, empowerment, participation and partnerships which were extensively used in Chapter Five. Although much has been written on these notions and concepts, participation in a conference like this gave the opportunity of meeting other researchers who were specifically

focusing on these issues in their respective on-going researches. It was found extremely useful talking to them about the research and its scope of understanding of those concepts in a framework of post-war urban water supply recovery. Exchanging ideas and opinions with colleagues from different disciplines proved to be very fruitful and enhancing.

6.5.6 A workshop on Indigenous Recovery and Peace Building, 11-12 December 1997, Peshawar, Pakistan

This workshop organized by the Norwegian Church Aid and the PRDU was part of the field visit for the 1997/98 MA Course in Post-war Recovery Studies. The aim of this workshop was to explore the concept of indigenous recovery and peace building in the context of Afghanistan by providing a forum for field practitioners, policy makers and academicians to exchange views and experience in order to:

- explore different aspects of recovery and peace building,
- highlight strategic issues for the role of aid in recovery and peace building in Afghanistan,
- inform the strategies of concerned actors - both local and international,
- document the experience of participants, through a workshop report, for the benefit of a wider audience in the Aid Community for Afghanistan.

Thirty representatives from local and international NGOs, and United Nations Agencies involved in programmes of relief and reconstruction in Afghanistan, plus fifteen MA students and members of staff from the PRDU, participated in what proved to be two days of very intensive discussions. Varied use was made of working groups, plenary sessions, and presentations.

The study tour in Afghanistan preceding this workshop was particularly useful for the research as it consisted of many visits to relief and reconstruction programmes both in Kabul and the Jalalabad Region. For example, one of the key things learnt was the existence of traditional local Afghan structures for the organization and implementation of physical and infrastructural programs, namely jergas and shuras comprising of representatives from the community. The Urban Rehabilitation Program, established by Habitat and drawing on lessons learnt from their Emergency Relief Shelter Program, relies on these local structures for identifying the needs of the community and its capacity to implement programs. In this

way, not only does the program assist in the physical reconstruction of housing and the provision of water but also contributes to the building up of trust between agencies, key authorities and the beneficiaries. Moreover, the involvement of the community offers a greater chance for self-sufficiency and, in the bringing together of people through physical activities, has initiated opportunities which pave the way for fighting factions to cooperate together in achieving common goals.

Some of the observations made during the field visit in Afghanistan can be summarized as follows. The level of post-war recovery assistance needs to be tailored to reflect the varying and changing needs throughout different areas in the country. It was pointed out that in some areas, there is already a level of stability. In such areas, humanitarian assistance could focus on developmental programs rather than emergency relief. The approach towards this development should be "how" rather than "what." Local and government participation, for example, can play a significant role in the peace building process and can play a part in building skills, avoiding dependency and reducing tensions. To this end, even during the implementation of relief programs, a progression towards development should be borne in mind.

Indigenous ownership of projects was identified as one of the key factors for supporting recovery. Such ownership could be achieved by using local workers and personnel on projects, supporting traditional institutions (Jergas and Shuras) and ensuring participation of people at every level. Illiteracy and lack of education, for example, should not be a barrier to participation. One practical measure would be to pilot test programmes in small areas before introducing them on a large scale, in order to gauge local reaction to programmes. In the process of formulation of assistance programs, the need to be sensitive to terminology and ideologies which people associate with those that caused conflict in Afghanistan - democratization, collective action, gender, literacy for women, communism, etc., should be recognized. Capacity building should be undertaken parallel to relief and rehabilitation projects. Technologically intense programmes such as the transfer of western technology for water treatment plants in Kabul, for example, require training of staff if long term operation and maintenance is to be ensured. Similarly, the need to invest in education at all levels: basic, secondary, higher, civic and professional is critical.

6.5 Summary and Conclusions

It is very difficult to point out a set of guidelines for a research strategy for the field of post-war water supply recovery that can be utilized by researchers in the future, as the factors which set the framework of this research could be completely different in a different environment. However it should be borne in mind that there is no need to discover the wheel again and again. As the author benefited extensively from the methods employed by researchers such as Barakat (1993) and Ellis (1996), it is hoped that the strategy employed for this research can guide the future researchers in this field. Therefore the following recommendations will be given to summarize the overall strategy of this research and the methods employed in its development:

- The paucity of literature and research can be overcome by the employment of a combined research strategy.
- Useful lessons can be derived through carrying out a questionnaire survey by targeting a group of specialists in the field explored.
- Targeted questions as pre-field preparation works can produce beneficial results to bring useful insights to the context of the research and areas of concern.
- Try to gain as much as possible from respondents to the questionnaire by using both open ended and closed contingency questions.
- Choosing research methods for the field work should consider the possibility of certain biases which need to be avoided in order to ensure the research findings' reliability and validity.
- Considering possible time limitations, the researcher should utilize all possible ways of preparing himself/herself for the field work through the literature review and talking to experts on the area concerned in order to gain the most from it.
- It is essential to cover as many areas and projects as possible both in terms of secondary case study examples and the field work.
- Affiliation with an organization in the field provides several opportunities and benefits for the research. However, the researcher should be aware of possible biases caused by this affiliation.

- The researcher should keep an open mind to the unexpected during the field work.
- Asking, listening and observing with the utilization of semi-structured checklists are the most beneficial research techniques for this type of field work.
- Data and information collected in the field should be kept systematically for the future analysis.
- The researcher should present himself/herself and the companions in an appropriate manner to the needs of that particular occasion in the field.
- Avoid certain assumptions regarding post-war areas and try to obtain advice from people who are currently working in that particular area.
- Use a built-in checking mechanism to control the impartiality of the research findings.
- Do not isolate yourself from local people during the field work. Socialising with them would not only help in easing the stress, but also may be beneficial for the field work in general.
- Try to enhance the research strategy by deriving lessons from other relevant disciplines. Participation in workshops and conferences can be extremely beneficial to exchange views and experiences, as well as creating a network of people who can assist the research in different ways.

Chapter 7: Post-war Recovery of Water Supplies in the Tuzla Region of Bosnia and Herzegovina

7.1 Introduction

This chapter sets out to introduce the general framework of the case study in the Tuzla Region of Bosnia and Herzegovina in two main sections. In the first one; the chapter provides necessary background information on the Bosnian conflict in terms of its causes and consequences. Thus the section first analyses the collapse of the former-Yugoslavia and investigates the Bosnian conflict in this context in order to understand the concepts of fragmentation and the post-Dayton structures in Bosnia and Herzegovina. This analysis is particularly important as the recovery of urban water supplies in the region has been carried out in this post-war environment, and their sustainability will partly depend on those constitutional, organisational and institutional structures that have been created by those changes. Although the analysis here does not attempt to be comprehensive, it presents certain key facts and concepts which will allow this chapter to focus on the Tuzla Region, with its immediate physical, political, economic and social environment.

The second section focuses on the recovery of water supplies in the Tuzla Region, with specific reference to the programmes assisted by Scottish European Aid (SEA). In order to provide a comprehensive analysis of those programmes in the next chapter, this section presents the quantitative data which outlines the main characteristics of those water supply projects and settlements to which the author applied the ATAM framework during the second phase of the field work.

7.2 The Bosnian Conflict: Causes and Consequences

The Bosnian conflict which broke out just after the March 1992 referendum on whether Bosnia and Herzegovina should declare its independence from Yugoslavia, and ceased with the Dayton Peace Accords in December 1995, went through three main phases. The Table 7.1 is given to outline these phases and their main characteristics.

Phases	Main Warring Parties & Alliances	Objectives & Gains and Losses
Phase I: March - May 1992	Muslims & Croats against Serbs	BiH Government: to get the Yugoslavian National Army (JNA) units out of BiH and to prevent BiH from staying in Yugoslavia
	*The bombardment of Mostar by JNA in April 1992 after the defection of two JNA pilots to Croat units. * Serb irregulars from BiH such as Arkan and his "tigers" and Duke Šešelj caused terror through looting, intimidation and massacre in the heavily Muslim populated territories bordering Serbia. * General Ratko Mladić known for his "fearless" and "ruthless" conduct in the Krajina region of Croatia, became the commanding officer of the Bosnian Serb army and started to conduct the siege of Sarajevo	
Phase II: June 1992 - Spring 1993	The Muslim - Croat alliance against Serbs continued.	The area controlled by Serbs increased from 55 per cent to 70 per cent.
	* The siege of "safe areas" which were created by the UN to protect the Muslims from Serbian offensives after the abandonment of enforcing Vance-Owen plan. Those "safe areas" were: Sarajevo, Srebrenica, Gorazde, Zepa, Bihac and Tuzla. * The formation of Serbian detention camps. Atrocities of rape, torture and ethnic cleansing of Muslims and Croats by Serbs were widespread all over the country. On the other hand, both Croats and Muslims were also engaged in similar atrocities against Serbs, but the international community singled out mainly Serbs as aggressors. * The Bosnian Serb leader Karadjić and General Mladić exploited the national feelings further with the theory of the West's conspiracy against Serbs. * The international community imposed sanctions on Serbia and Montenegro. Bosnian Serbs ignored many threats and ultimatums issued by UN.	
Phase III: Spring 1993 - December 1995	Fighting mainly between Croats and Muslims in central Bosnia	The area controlled by the Muslims was reduced to 10 per cent of the former BiH.
	* The strangulation of Mostar by Croats: killings, starvation, ethnic cleansing, deliberate destruction of cultural heritage, etc. * The siege and destruction of Sarajevo by Serbs continued, and Serb and Croat plans for partitioning BiH into two or three entities. *The conflict between Fikret Abdić's forces and the Bosnian army in Bihać from September 1993 to August 1994, and the formation of a Muslim-Croat Federation on 1 March 1994. *The Contact Group proposed its plans for dividing the country into two roughly equal halves, 51 per cent for the Federation and 49 per cent to the Serbs. *The " safe areas" of Sarajevo, Bihać, Tuzla, Žepa and Srebrenica were under intensified Serb assaults. The fall of Srebrenica in July 1995: 40,000 Muslims fled and thousands of men were "ethnically cleansed" and NATO air strikes against Serb military installations in September 1995.	

Table 7.1: *The three phases of the Bosnian Conflict and their main characteristics (Source: Information obtained from Crnobrnja, 1994; Malcolm, 1996; Davis , 1996; Gow, 1997)*

The preceding table on the phases of the Bosnian conflict highlights several important characteristics which need to be scrutinized in order to analyze and understand causes and consequences of the conflict. These characteristics can be categorized as:

- The interrelation of the Bosnian conflict with the collapse of Yugoslavia.
- The ethnic structure of pre-war Bosnia and Herzegovina and its exploitation during the conflict.
- The destruction of all pre-war social, ethnic and cultural reciprocal structures by an unprecedented level of atrocity.
- Continuous changes in alliance structures throughout the conflict and all over the country.
- The involvement of irregular warring units.
- The long siege of cities.

It can be clearly seen from the preceding characteristics that the collapse of Yugoslavia will need to be looked at first before looking at the Bosnian conflict itself. By doing this, the section will be able to put the Bosnian conflict in its main framework where a set of multi-causal factors prepared the ground for the end of the former-Yugoslavia. It should also be pointed out that the literature often refers to Bosnia and Herzegovina as "Yugoslavia in miniature" or "Yugoslavia in little" as it contained all social, demographic and cultural characteristics of the former-Yugoslavia. Only after this investigation can the path from fragmentation to destruction and the post-Dayton frameworks in Bosnia and Herzegovina be explained.

7.2.1 The Collapse of Yugoslavia

The literature on the former-Yugoslavia conflict identifies the end of Yugoslavia by various concepts such as "fragmentation", "disintegration", "death", "fall" and "collapse" (Zametica, 1992; Thompson, 1992; Glenny, 1993; Fyson, et al., 1993; Crnobrnja, 1994; Silber & Little, 1995; Dyker & Vejvoda, 1996; Davis, 1996; Malcolm, 1996; Hall, 1996; Gow 1997). Although all of these concepts are used to elaborate the ceasing of Yugoslavia after an existence of seventy years, they also show the authors' different points of view in regard to the way this existence came to an end. If these concepts are divided in two opposing groups, they can be gathered under the headings of "disintegration" and "collapse". It can be clearly seen in this categorization that while the former concept is emphasising a political separation in a peaceful way as it happened, for example, in the case of Czechoslovakia. The latter, on the other hand, is pointing out the destruction of reciprocal social, economic and political

structures. Radošević (1996:66) identifies two corollaries to make the distinction between disintegration and collapse. First, he states that "...a collapse has [its] own dynamics and goes through several qualitatively different phases" and supports his argument by pointing out that the conflict in Yugoslavia started "...at the top of the social structure" before turning into a full-blown civil war devastating all types of existing structures. Second, he claims that the reasons which prepared the environment for the collapse had a long history, but "...the social and psychological preconditions of conflict were created" in a short period of time. In other words, Vejvoda (1996) rightly claims that the sudden and violent cessation of Yugoslavia was a collapse which was caused by "...the intricacy and many sidedness of the political, social and economic dynamics of the situation". Therefore it is important that any attempt to explain why Yugoslavia collapsed but not disintegrated in a peaceful way should consider the context in a holistic manner in terms of historical, economic, social and political preconditions.

The current historical content of political debates tended to link the preconditions of the Yugoslav conflict with its ancient and medieval history. It is now even a national policy in Croatia, Serbia and other former- Yugoslavian republics to re-write history in order to differentiate their ethnic, religious and national distinctiveness and claim the right for land as original rulers for those disputed regions. However, this section here will confine itself to the period starting with the founding of the Kingdom of the Serbs, Croats and Slovenes in 1918 to the break up of the Socialist Federative Republic of Yugoslavia in 1990. In order to make it simpler to understand, this period of just over seventy years can be divided in two main distinctive parts as pre and post World War II (WWII).

Pre-WW II Era:

***1918 - 1929, The Kingdom of the Serbs, Croats and Slovenes*:** The Corfu Declaration in July 1917 heralded the formation of this kingdom recognizing the three national names with their own flags and religions, and the two alphabets - Cyrillic and Latin. Following this, the actual founding of the Kingdom took place on 1 December 1918 which was just after the end of the First World War. It is important to note that during the war, Serbia was part of the Entente powers (France, Britain, Italy and the United States) while Croatia and Slovenia fought against them next to other Central Allies such as Habsburg Empire, Germany and Ottoman Empire. It can be claimed that Serbia had a long term desire of creating a "Greater

Serbia" by uniting all Serbs in one state and this kingdom in a way served this purpose, but it should also be pointed out that this kingdom recognized the Croats and Slovenes as equal partners. Meanwhile, the Croats and Slovenes saw this kingdom as an opportunity which could improve their situation at the post-war peace conference. However, it is a fact that their aspirations were not realized completely as the peace conference rewarded Italy with a large part of Dalmatia and considerable number of Slovenes remained in Austria. The main shortcoming of the Kingdom was that it had a centralized constitution which concentrated the power in Belgrade. As a consequence of this, there were serious power struggles between the Croats and Serbs for a decade which resulted in the dissolving of the parliament by King Alexander I in 1929 (Zametica, 1992; Crnobrnja, 1994).

1929 - 1941, The land of the South Slavs: Yugoslavia: King Alexander I changed the name of the Kingdom to Yugoslavia in parallel to his other policies for uniting his subjects under the nationalism of Yugoslavia. He also banned all national parties, flags, symbols and insignia in addition to the introduction of nine geographic units called "banovina" instead of old national administrative borders. The map in Figure 7.1 shows these banovinas.

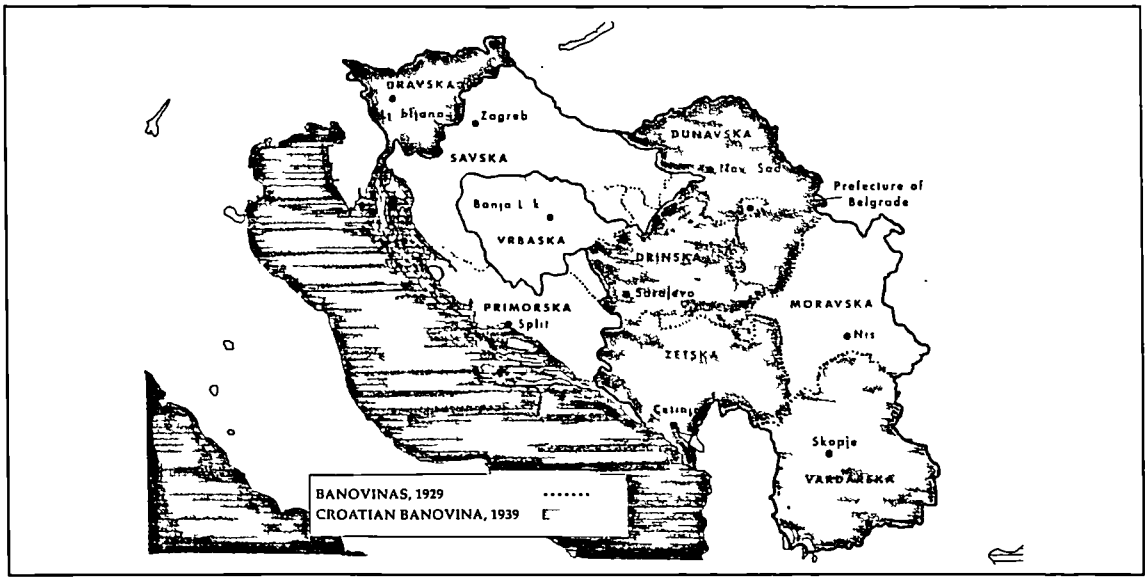

Figure 7.1: *The Banovinas created by King Alexander I in 1929 (Source: Malcolm, 1994)*

The authoritarian rule of King Alexander I resulted in flourishing of extremism in Croatia and Macedonia. For example, the "Ustashe" movement led by Ante Pavelić who later headed the so-called Independent State of Croatia under the protection of fascist Italy and Germany, started in this period. The events in this period continuously challenged the

unitary structures imposed by the monarchy, and in a way they highlighted an important fact which was "...the attempt to create a Yugoslavia without due respect for its nations and national diversities was impossible and would be counter-productive sooner and later" (Crnobrnja, 1994:61). The historical events which took place in the post-WWII era once again demonstrated this Yugoslavian reality, which will be explained in the following section. The formation of a Croatian Banovina in August 1939 was an attempt to solve the Croat question (See Figure 7.1). However, it was an attempt which came too late, because first, it satisfied neither the aspirations of the Ustashe in Croatia nor the centralists in Serbia, and second, the power structures in Europe were changing rapidly with the rise of Nazism in Europe and WWII was about to engulf the region once again (Zametica, 1992; Crnobrnja, 1994).

Before looking at the historical content of post-WWII Yugoslavia, it is necessary to highlight a few points about the period between 1941 and 1945. The invasion of Yugoslavia by Germany happened in a political environment where secessionist movements were getting stronger not only in Croatia, but also in Bosnia and Herzegovina and Slovenia. It can be claimed that if the German invasion had not happened, this process would have taken Yugoslavia into a transformation that could have formed completely different constitutional structures. However, the historical events of the day made the partisans led by Tito (who became the general secretary of the Communist Party of Yugoslavia in 1937), the only viable fighting force against the fascist invasion. It was because of his successful resistance with an army of 700,000 partisans against the fascist alliance, in addition to the Ustashe and the Serbian nationalist Chetniks during the war, that Tito emerged from the WWII as a very popular leader both in Yugoslavia and abroad. His popularity grew even more when he managed to keep his ground against Stalin in 1948, though this could have been a dangerous move considering the power of Soviet Russia in Eastern Europe at that time (Crnobrnja, 1994).

Post- WWII Era:

Tito's Yugoslavia consisted of six federal republics including Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Serbia and Slovenia. It was a country of diversity, with five nations, four languages, three religions and two scripts in an area of 256,000 km^2. The map of former-Yugoslavia with its seven neighbours is shown in Figure 7.2.

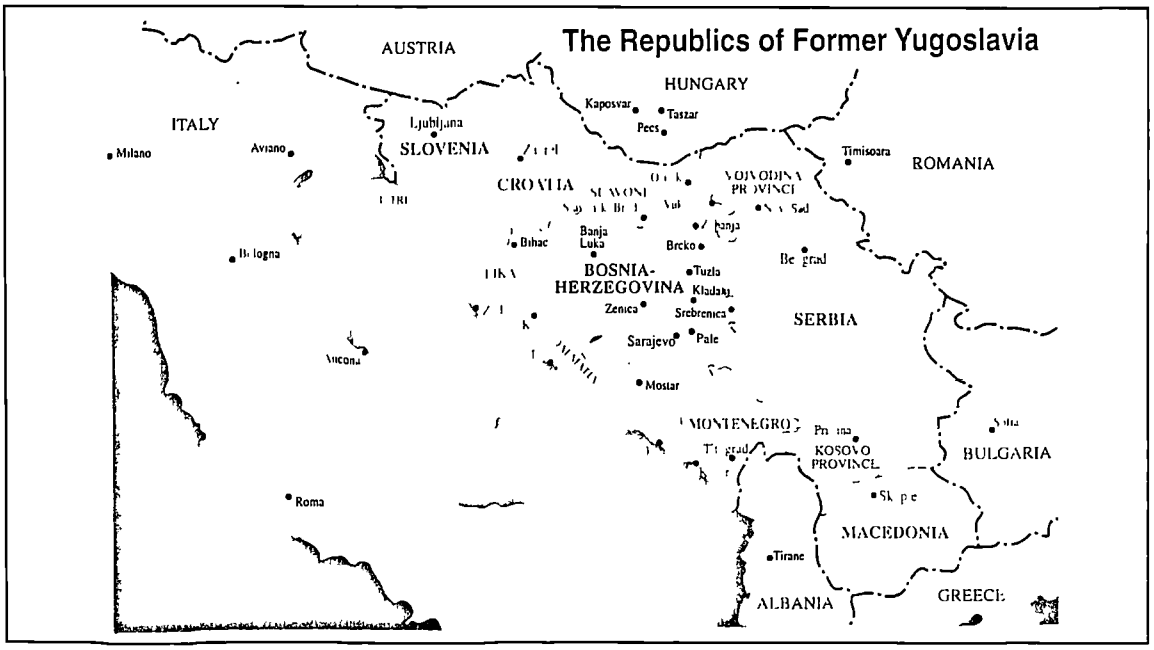

Figure 7.2: *The map of Post-WWII Yugoslavia*

The task of making a united country out of this diversity was not an easy challenge, and Tito had one goal: **to live in brotherhood and unity**. Therefore it is important to look at some of the policies implemented by Tito, which partly succeeded in realizing this goal until the 1990s. However, those policies also played a significant role in the creation of a fertile environment for the collapse of Yugoslavia. Because of this, the analysis here will focus on some of those policies which can enable this research to understand why and how the constitutional and institutional structures in Bosnia and Herzegovina today perceive, conceptualize and respond to the realities of the post-war environment.

The economic reforms implemented by Tito in the 1950s resulted in a massive growth in the Yugoslavian economy until 1974. Yugoslavia, mainly poor and agrarian, was turned into an industrialized country with a high standard of living in a record time. Several reasons are usually given for this rapid growth: the post-revolutionary fever, a low starting base and large financial injections from the West as Yugoslavia was seen as a buffer country between the East and West during the Cold War. The tendency for foreign debt however, increased considerably after the first oil shock in 1974. The cheap funds which were obtained easily from the international market were spent lavishly in order to secure the continuation of the system. Relying on the four main periods in terms of economic efficiency performance which were identified by Bojičić (1996:31-34), the constitutional and economic policies of Tito will be summarized as follows:

The period of self management between 1953 and 1964: Although this period was marked with high overall growth rates, the low performance of economic efficiency and rising inflation brought the 1965 political and economic measures.

The period of full-scale market socialism between 1965 and 1973: The practical socio-economic outcome of this period is described by Bojičić (1996:32) as "republican etatism". According to her, this period was "...in a way a logical stage in the process of the fragmentation of the economic and political system that had been going on virtually from the start of socialist development. Political determination was not enough to counter the autarkic tendencies that the economic system and development strategy bred".

The contractual economy period between 1974 and 1979: The economic reforms in 1965 together with the 1963 constitution, created an environment of federalization which resulted in some level of secessionist activity in Croatia. In addition to this, there was also a movement towards liberalization of socio-economic and political life in Serbia and Slovenia. In the light of these changes a new constitution was enforced in 1974. Some of the changes which took place with this constitution had a significant role in the way Yugoslavia came to its end. For example, the constitution brought confederative institutional arrangements between six republics and two autonomous provinces - Kosovo and Vojvodina - in Serbia. According to these arrangements, each unit had a right to veto decisions made by the federal government. This decision was destined to cause serious governmental problems in the future, as a consensus was necessary to make a decision. The Socialist Republic of Serbia's position was particularly worse off by these changes as its assembly could only change its own constitution by the acquiescence of the assemblies of Kosovo and Vojvodina, but these autonomous provinces did not need to have the concurrency of the Republic to change their own constitutions. The institution of the Federal Presidency, on the basis of one member from each republic and autonomous province, was also created by this 1974 constitution. However as far as Bosnia and Herzegovina was concerned, the most important change brought by this constitution was the recognition of the Muslims as a nation (Crnobrnja, 1994; Vejvoda, 1996). Until this date, Yugoslavia had five nations as Serbs, Croats, Macedonians, Slovenes and Montenegrins, and the recognition of Muslims as a nation was probably done to preserve the harmony of ethnic balance in Bosnia and Herzegovina. However, the experience in the 1990s has shown that this decision

has also had some unexpected outcomes.

The economic crisis between 1980 and 1989: The economic crisis of the 1980s also played a significant role in the collapse of Yugoslavia. The Federal Presidency, after the death of Tito in 1980, had to deal with not only the shortcomings of the federal structure, but also a huge foreign debt, a high level of inflation and unemployment, and an overall inefficiency of the economy. These economic problems first of all, prevented a social consensus from being realized by the Federal Presidency and they were also successfully utilized by the nationalist politicians for their "exploitation of one region by another" rhetoric. According to Radošević (1996:69-70), the main problem with the Yugoslavian economy was its inability to adapt itself to structural changes taking place in the world. For example, the economy was not competitive enough as it required some legal adjustments such as allowing the free forming and closing of enterprises of all types of ownerships. This type of urgent change that the country needed could not be achieved quickly because of the inabilities of the political elite, as it was in the case for the preceding amendments on ownership law which were only issued in 1989 - far too late to have any impact on the cycle of economic collapse. Because of the limited scope of this section; without going into any further details on this issue, the analysis of collapse will focus on the disfranchisement of the individual Yugoslav citizen and its effects on the collapse, before focusing on the Bosnian context.

Vejvoda (1996:21-22) explains that the rise of living standards on one hand and the limited, elitist and dictatorial structure of the Yugoslavian Communist Party on the other resulted in the creation of a society that defined its orientation "...in terms of personal and concrete societal needs". In other words, he claims that "...individuals were being demotivated and driven to expend their 'civic' energies either through the tightly defined mechanisms of Communist Party life or through private consumption and personal image enhancement". It is this kind of political environment that Radošević (1996) believes, gave the opportunity to populists like Milošević to utilize the vacuum created by the disintegration of an excessively bureaucratic, politicized and incompetent federal administration in the late 1980s. Supporting his view, Radošević (1996:76) gives the example of the 1990 multiparty elections and the maldefining and manifestation of social groups' socio-economic interests. He states that:

> "As a result, voting in multiparty elections tended not to be for defined interests of social groups as such - because interests could not be properly defined in that system. Where there are no differential individual, social and economic interests, politics is inevitably mainly about collectivist interests (previously class, now nation)".

After looking at the long term reasons which had some considerable effects on the collapse of Yugoslavia, the chapter will now start to concentrate on the short term dynamics of the collapse such as the ethnification of politics and violent destruction of all types of structures. However, this focusing will be more beneficial if it is done in the context of Bosnia and Herzegovina as it would enable the research to narrow down its wide framework. Before starting to look at the Bosnian context however, the overall causes of conflict in the former-Yugoslavia can be summarized once again as follows:

- The disintegration of the country as a result of decay and collapse of the communist federal structure
- Severe economic problems such huge foreign debt, high inflation and unemployment
- The lack of adaptability to changing needs for democratization of the system
- The increased manipulation of nationalist sentiment for political gains

7.2.2 The Bosnian Context: Fragmentation, Destruction and Post-Dayton Frameworks

At the beginning of his essay on the concepts of "State" and "Communitarianism" in Bosnia and Herzegovina, Bougarel (1996:87) describes Bosnia as follow:

> "Crossroads of civilisations, Bosnia is certainly a land of encounters, of coexistence and, occasionally, of symbiosis. On the periphery of more than one empire, it is also a land where, with extraordinary regularity, other people's wars have nourished and have been nourished by the internal conflicts of Bosnian society. Thus the words 'tolerance', 'hate', coexistence' and 'fear' are all equally applicable. In essence, they are complementary or consecutive rather than contradictory".

Bougarel (1996) in the preceding statement points out two important issues which will enable this section to analyse and understand the contexts of fragmentation and destruction in the Bosnian conflict. First, he highlights the interconnection between the conflicts in Bosnia and "other" people's wars, which was looked at in the preceding section. Second, the reality of Bosnia in terms of reciprocal relationships within the society because of its diverse ethnic and religious formations. In other words, there is a need to focus on the ethnic, national and religious concepts in Bosnia and Herzegovina and their contextual evolution during recent history to give some useful derivations for post-Dayton frameworks.

In order to initiate discussions here, the ethnic compositions of the former-Yugoslavian republics are given in Table 7.2. It can be clearly seen from these national compositions that Bosnia and Herzegovina had a fine balance between its three major national groups, while other republics enjoyed a majority of one national group.

Republic or Province	Composition	Population (millions)
Bosnia-Herzegovina	40% Muslim[1] 32% Serb 17% Croat	4.1
Croatia	75% Croat 12% Serb	4.6
Macedonia	67% Macedonian 19% Albanian 5% Turk	1.9
Montenegro	69% Montenegrin 14% Muslim 6% Albanian	0.6
Serbia	66% Serb (includes Kosovo and Vojvodina)	9.3
Kosovo	78% Albanian 13% Serb	1.6
Vojvodina	54% Serb 19% Hungarian	2.0
Slovenia	91% Slovene	1.9

Table 7.2: *The ethnic composition in the former-Yugoslavian republics and autonomous provinces according to 1981 census which was the last census to include figures for all regions (Source: Adapted from Fyson, et al., 1993:10)*

Bougarel's (1996:97) analysis on the manipulation of nationalism for political aims during

1 Francis Freidman (1996:29) in her well researched comprehensive book, "The Bosnian Muslims: Denial of a nation, explains that the arrival of the Ottoman Turks in Bosnia in the mid-fifteen century also meant the arrival of Islam which "...brought a profoundly institutionalized religion and a sociopolitical structure that relied on religious differentation. Islam offered social and economic advantages to many, particularly the persecuted "heretical" or schismatic Christians, as well as Orthodox and Catholic inhabitants who converted. Nevertheless, the process of Islamization only slowly produced an indigenous native Muslim community in Bosnia. The interactions between this Muslim community and its non-Muslim neighbours became a key element in the two groups' ability (or lack thereof) to cohabit peacefully". Furthermore, she also explains the term 'Bosniac' in conjunction with 'Muslim' as follows (p:43): "The Serbo-Croatian-speaking Muslims of Bosnia called themselves *Bošnjaci* (Bošnjaks) to emphasize their regional origins. Even the Turks in Istanbul called the Bosnian Muslims *Bošnjaci*, although in Constantinople the word *potur* appeared in certain documents to signify the Islamized Bosnian population, as opposed to those with Turkish origins. Bosnian Christians and even the Bosnian Muslims themselves often called the Serbo-Croatian-speaking Muslims *Turci* to disinguish them from Bosnian Christians. Bosnian Muslims, however, often applied the pejorative term *Turkuš* to Ottoman Turks to differentiate themselves from the Turks in the ethnic sense. The word *Turčin* was generally applied to Slavic Muslims in all regions of the Ottoman Empire".The preceding explanation of terms 'Muslim' and 'Bosniac' can easily show the complexity of the context in terms of an identity of a nation. According to Freidman's account on the other hand, the term 'Muslim' did not have a common usage until the 1910s which was the period just after the Habsburg annexation of Bosnia and Herzegovina on 7 October 1908. She stated that (p:74-75): "As was the case during the early stages of occupation, the Bosnian Muslims initially shared with the Serbs a violent opposition to annexation and were disillusioned by Austria's precipitous announcement of its intent to do so...The former closeness of Muslims of whatever class or place of origin on the basis of their shared religion now took on public overtones of separatism, because Bosnian Muslims felt the Ottoman Empire had betrayed their homeland. This was reflected in the way Bosnian Muslim intellectuals referred to themselves and their fellow Muslim citizens. Rather than continuing to use the term *Turčin*, they began to refer to themselves as *Muslimani* (Muslims)".

the last 70 years shows that the limited access to decision making in the communist era played an important role for taking ethnicity as an identity. As a result of this manipulation the fragmentation process ended with a sudden and violent destruction. Bougarel states the reasons for this as: first "...in the absence of political pluralism, the only chance the inhabitants of Yugoslavia had to express a free and individual choice was...in the census"; second, "...the results of the censuses served as a base for the distribution of top posts, according to the principle of the 'national key' (proportional representation of the various national communities)". Therefore it is not surprising to see that the history of Bosnia and Herzegovina continuously witnessed a political struggle between nationalist parties, each time trying to manipulate differences and setting up short-lived peculiar alliances in this process.

In the late 1980s, the manipulation of nationalist sentiment increased drastically which was mainly the result of incapabilities of the federal bureaucracy and inefficiency of the economy. The results from the multiparty elections on 18 November 1990 once again confirmed that politics in Bosnia and Herzegovina was based on not socio-economic groups' but national groups' collective interests. In this election, the three nationalist parties: Stranka Demokratske Akcije[2] (SDA), Srpska Demokratska Stranka[3] (SDS) and Hrvatska Demokratska Zajednica[4] (HDZ) obtained 30.4%, 25.2% and 15.5% of the votes respectively (Bougarel, 1996:96).

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2 SDA (Party of Democratic Action) was formed on 27 March 1990 as a "political alliance of the citizens of Yugoslavia belonging to the historical-cultural sphere of Islam". Although it was considered as a marginal party at the beginning, SDA has become one of the main actors of Bosnian politics in the 1990s. The party is still led by Alija Izetbegovic who is also the president of the Federation of Bosnia and Herzegovina (Bougarel, 1996:95).

3 SDS (Serbian Democratic Party) was formed by Radovan Karadžić on 12 July 1990. As mentioned earlier, both Karadžić and his party played the most active role in the partition of Bosnia and Herzegovina. For example, after the proclamation of six Serbian Autonomous Regions from September to November 1991 SDS controlled all key posts in these self-proclaimed regions and started to impose discriminatory policies on non-Serb Bosnians. It was not any later than 21 December 1991 that Serb Republic of Bosnia and Herzegovina was created by the initiatives of SDS (Bougarel, 1996:100).

4 HDZ (Croatian Democratic Union) was formed by Stjepan Klujić on 18 August 1990. Although both SDS and HDZ were part of the three party coalition after the 1990 elections, HDZ also started as was the case with SDS, the implementation of its plans for the dismantling of Bosnia and Herzegovina . In November 1991 only one year after the elections, two Croat autonomous regions as Herceg-Bosna (Western Hercegovina and Central Bosnia) and Posavina (Northern Bosnia) were proclaimed. Following this, HDZ under the leadership of Mate Boban who came to power on 5 February 1992 pursued the policy of dividing Bosnia and Herzegovina into cantons (Bougarel, 1996:101).

The period between November 1990 and March 1992 witnessed turbulent days when these three nationalist parties were manipulating existing ethnic and religious differences in various ways. They formed and dismantled several alliances between them and also with Croatia and Serbia according to their political agendas. However, it was not only these three political parties' agendas that decided the future of Bosnia and Herzegovina, but also the involvement of Milošević and Tudjman, the presidents of Serbia and Croatia respectively. It was during this period that the federal government of Yugoslavia was mainly under the control of Milošević who spent its budget generously on Serbia, and the assembly of Kosovo province was abolished in June 1991. Meanwhile, the conflict in Slovenia was very brief, only a matter of ten days. The international recognition of Croatia and Slovenia as independent states in mid-December 1991 also enabled the war in Croatia to come to an end. Izetbegovic's government in Bosnia and Herzegovina was trying to perform a fragile balancing act to avoid the outbreak of a war, and had to decide whether to remain in a rump Yugoslavia or also ask for the international recognition of its independence. However after the self-proclamation of Serbian autonomous areas and ethnic cleansing carried out by Serbian irregular military units such as "Arkan's tigers[5]" and Šešelj[6]'s forces, the prospect of keeping the peace was decreasing quickly (Malcolm, 1996).

Šešelj's view towards the Muslims (see footnote 5) also highlights another important aspect of the ethnic structure in Bosnia and Herzegovina. The position of the Muslims against the Croats and Serbs, though they were the biggest proportion of the population, was much weaker as the latter two ethnic groups had geographical connections with their motherlands, Croatia and Serbia respectively. On the other hand, the Muslims were always oriented to either Turkey or other Muslim countries and they did not have the same geographical opportunity to receive full assistance and protection from any of those countries. It was also one of the reasons why both Serbs and Croats could proclaim their own entities within

5 Željko Ražnjatović, better known as Arkan was a criminal wanted by Interpol because of his involvement in the assassinations of Yugoslav émigrés.

6 Vojislav Šešelj was also the leader of Serbian Radical Party whose election success was engineered by Milošević. He set up a Chetnik army which was actively used in the genocide of the Bosnian Muslims. In an interview, he claimed that the Muslims of Bosnia were Islamicized Serbs and the Croats were Catholic Serbs. His response to a question on what would happen if the Muslims do not accept his suppression was clear enough to show that the destruction of reciprocal ethnic relations in Bosnia and Herzegovina would be extremely violent. He said: "In that case, we will kick them out of Bosnia". "Where to?" "To Anatolia" (Malcolm, 1996:226-227).

Bosnia and Herzegovina quite easily without giving too much consideration to the international community's reaction.

The European Community invited applications for membership from other republics, but put a prior condition of a referendum for Bosnia and Herzegovina. The Serbs boycotted this 29 February - 1 March referendum and 63.7% of the electorate voted. As expected, 98.9% of votes cast said "yes" to the independence (Bougarel, 1996:101). Immediately after the announcement of this result that, the Serbs started to use their sniper positions around Sarajevo, which was just before the international community recognized Bosnia and Herzegovina's independence. From March 1992 to December 1995, Bosnia and Herzegovina was engulfed by a ruthless conflict. By only referring to the main phases of the Bosnian conflict which were highlighted in Table 7.1, this section will limit itself to the following description of the conflict made by Crnobrnja (1994:178) to explain why the level of destruction caused to social and physical structures of the country was so immense:

> "The war in BiH [Bosnia and Herzegovina] went through several distinctly recognizable stages. It was variously labelled a 'civil', 'tribal', and 'religious' war, and a 'war of aggression'. It was undoubtedly all of the above. Fundamentally, like all the conflicts in the former Yugoslavia, it was a result of aggressive and uncompromising political abuse of national feelings. But above all it was a dirty and gruesome affair of unspeakable brutality. The main strategy of the paramilitary formations of the three groups was mass expulsion, popularly known as 'ethnic cleansing', of the other two groups".

To elaborate the preceding statement further and to point out the direct toll of the war on Bosnia and Herzegovina's 4.3 million pre-war population, the following estimates are given. According to the World Bank (1997), approximately a quarter of million people have been killed, more than 200,000 wounded, and 13,000 permanently disabled. The strategies such as ethnic cleansing also uprooted millions from their homes and livelihoods. For example, the UNHCR's May 1992 estimates for the number of refugees and internally displaced persons from within Bosnia and Herzegovina were 752,000. However the massive population movements caused by the implementation of ethnic cleansing policies during 1993 and 1994 made ICRC's estimates in December 1996 as high as 2 million, half of whom are displaced in Bosnia and Herzegovina while the other half remain as refugees in third countries. In the spiral of ethnic cleansing, detentions, torture, rape and evictions, the ethnic structure of the country has also been changed drastically. The following two maps from

International Management Group (IMG) in Figures 7.3 and 7.4 show pre-war and present ethnic majority distributions of Bosnia and Herzegovina.

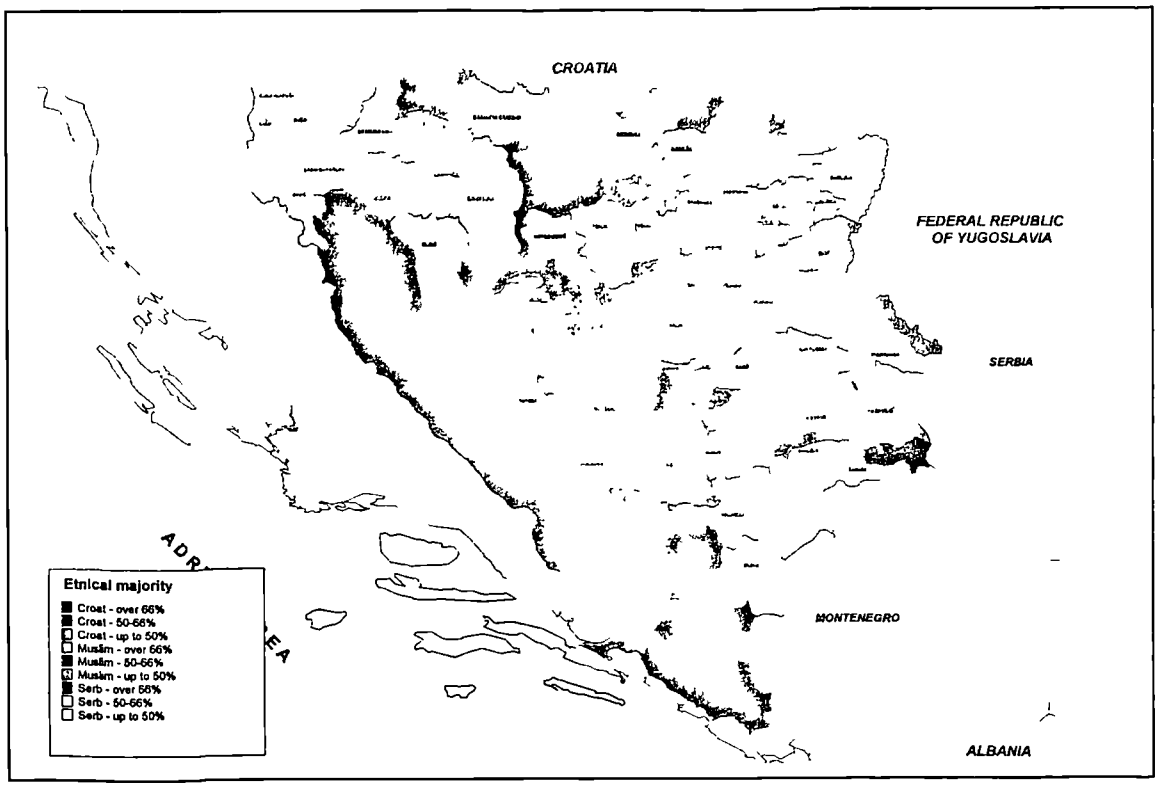

Figure 7.3: *The pre-war ethnic distribution in Bosnia and Herzegovina (Source: IMG, 1998)*

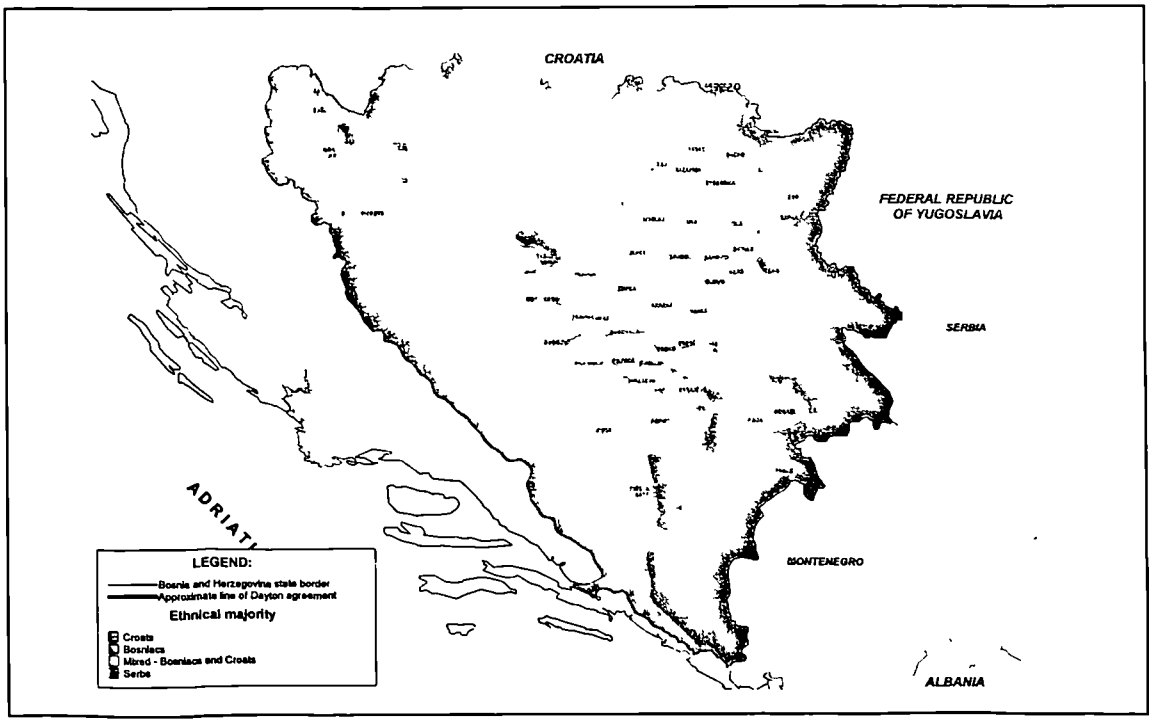

Figure 7.4: *The present ethnic majority in Bosnia and Herzegovina (Source: IMG,1997)*

According to the World Bank (1997), Bosnia and Herzegovina had a US$ 8.3 billion of gross domestic production (GDP) in 1991, which meant an annual per capita income of US$ 1,900. However, the impacts of the war reduced the country's GDP to US$ 2 billion with a per capita income of US$ 500 in 1995. The industrial production in 1996 was only 10 per cent of its pre-war level and the unemployment is as high as 80 per cent. Burke and Macdonald (1994) made an estimate of US$ 150 million to restore the railway network, while IMG (1998) put the figure for the rehabilitation of water and waste water services to their pre-war level as high as US$ 500 million.

After looking at the contexts of fragmentation and destruction in Bosnia and Herzegovina briefly, this section will now focus on the post-Dayton frameworks. However before that it should be pointed out that the foundation of the Dayton Accords was laid by the Contact Group's proposal for a peace settlement in May 1994.[7] This proposal was an initiative which could only be realized after the creation of a Muslim - Croat Federation on 1 March 1994.

The Contact Group's proposal divided Bosnia and Herzegovina into two halves, with 51% of the country for the Federation and 49% for the Serbs. The Dayton Accords which were agreed in Ohio, USA on 21 November 1995, and signed as a full peace agreement by the presidents of Bosnia and Herzegovina, Croatia and Serbia in Paris on 14 December 1995, also maintained the 51:49 per cent division between the two sides. The agreed basic principles number one and two state that (OHR[8], 1998): 1. "Bosnia and Herzegovina will continue its legal existence with its present borders and continuing international recognition 2. Bosnia and Herzegovina will consist of two entities, The Federation of Bosnia and Herzegovina as established by the Washington Agreements, and the Republica Sirpska (RS)". The map in Figure 7.5 shows Bosnia and Herzegovina with its two entities.

The general framework agreement for peace in Bosnia and Herzegovina consisted of ten articles which were supplemented by eleven annexes (though the first annex on military matters was divided into two separate parts). Apart from the first annex, the rest of the agreement is concerned with civilian aspects of the settlement.

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7 The Contact Group consisted of Britain, France, Germany, Russia and USA.

8 OHR stands for Office of the High Representative.

Figure 7.5: *Bosnia and Herzegovina - Cantons and Regions in its Two Entities (Source: IMG, 1997)*

According to Gow (1997:286), it was not the military aspects of the agreement that caused concerns for successful implementation, but the civilian aspects. The civilian implementations of the accords such as elections, constitution, arbitration, human rights, refugees and displaced persons, the future of public corporations, and the preservation of national monuments "...would define the peace and would delineate Bosnia's future". Gow (1997:288) further elaborates his point by stating that:

> "The longer term fate of those armed forces and the peace made in Dayton and Paris would rest with the civilian parts of the agreement and civilian implementation. Only if there was adequate implementation would there be a prosperous and viable state and the elimination of conditions for a return to armed hostilities in the years ahead".

The map in Figure 7.5 also shows cantons and regions designated in the Federation of Bosnia and Herzegovina, and Republica Sirpska respectively. The categorization of cantons is made as follows: Canton number: 1, 3, 4, 5 and 9 as Bosnian; 2, 8 and 10 as Croat; and,

6 and 7 as Mixed Bosnian and Croat. Meanwhile, the Serb entity is divided into 7 regions.[9] The Tuzla Region as it is called in this research, covers the area designated as Canton Number Three: Tuzlanski-podrinjski. From this point, the canton's official name and the Tuzla Region will be used interchangeably, and the explanation for this use can be found in the footnote number ten.

7.2.3 Why Study Canton Number 3: Tuzlanski-podrinjski

The Tuzlanski-podrinjski Canton was chosen as an ideal arena to explore and analyze the proposed framework of the ATAM approach for the following reasons:

- According to IMG's Project Information Monitoring System (PIMS) (1998), there have been 173 water supply projects implemented in the Tuzla Region since 1993. They have varied in their scale from simple equipment provision to highly complex projects and 130 of these projects have already been completed. The remaining 43 projects are in either in their proposal stage or ongoing. The total cost of these 173 water supply projects is approximately DM 20 million.

- Based on the information from the PIMS (IMG, 1998) Scottish European Aid alone (SEA) has provided assistance with a total budget of almost DM 10 million during the implementation of 39 water supply projects since 1993. The implementation of the Tuzla Water Supply Project with a cost of DM 3,5 million which was one of the biggest water supply projects in Bosnia and Herzegovina since the outbreak of the war, was also assisted by SEA.

- The time span of SEA's involvements in these projects from 1993 to present day has provided the opportunity of not only carrying out investigations during the implementation of these projects, but also sustainability assessments after their completion over the two phases of the field work in 1996 and 1998.

- According to UNHCR (1996), there were more than 240,000 internally displaced persons (IDPs) and refugees living in the Tuzla Region. In Tuzla town alone their numbers were as high as 50,000. UNHCR (1998) reported that 200,000 IDPs are still accommodated in various parts of the region. Although the number of IDPs who live in the collective centres has been decreasing over the last few years, most of them have settled down in the region - mainly in town centres - as the prospect of going back to their settlements of origin has been very slim. As a result of this, the water needs in urban settlements have increased drastically, putting extra

9 **Cantons:** 1: Unsko-sanski, 2: Posavski, 3: Tuzlanski-podrinjski, 4: Zeničko-dobojski, 5: Gornjedrinski, 6: Srednjebosanski, 7: Srednjehercegovački, 8: Zapadnohercegovački, 9: Sarajevo, 10: Zapadnobosanski.

Regions: 1: Banja Luka, 2: Doboj, 3: Bijeljina, 4: Vlasenica, 5: Sokolac, 6: Srbinje (Foča), 7: Trebinje

pressures on already inadequate water supply networks.

- The provision of water in the urban settlements of the Tuzla Region has always been an acute problem as a result of the financial constraints and inadequacy of institutions for the maintenance of existing water supplies and the development of new sources for the increasing needs of an industrial society. In addition to this, many water networks in the region could not receive any maintenance during the war, while some of them were damaged deliberately.

- As can be seen on the map in Figure 7.5, the war has not only created the problem of internally displaced persons, but also internally displaced municipalities as some of them became municipalities during or after the war. Doboj East, "the free territory of Brčko", Ćelič and Teočak are those municipalities that either did not exist before the war or were part of other municipalities such as Doboj, Brčko, Lopare and Ugljevik respectively. The operation and maintenance of water supplies within the resources of these newly created municipalities face serious challenges because of their inadequate institutional capacities. This unfortunate reality of the region has provided an opportunity to analyze and compare water supply recovery implementations in different municipalities with varying resources.

- Although the Tuzlanski-podrinjski Canton in general is dominantly Muslim, there are many settlements where the Croats and, less often, the Serbs form a substantial proportion of the population. Hence it has been possible to investigate the question of water provision in a multi-ethnic post-war environment, which have been quite difficult in other parts of the country. The Tuzla Municipality in particular is a rare example of a settlement which preserved its pre-war characteristic of multi-ethnicity.

- Considering the preceding issues conjoined with social, economic, political and physical characteristics of the Tuzla Region, the findings from the analysis of ATAM framework may be applicable to similarly affected countries as well as other parts of Bosnia and Herzegovina.

7.3 Scottish European Aid Assisted Water Supply Programmes in the Tuzla Region

7.3.1 The Tuzla Region Context

The Tuzla Region is located approximately 90 km north of Sarajevo, including the municipalities of Banovič, Brčko, Ćelič, Doboj East, Gračanica, Gradačac, Kalesija, Kladanj, Lukavac, Sapna, Srebrenik, Teočak, Tuzla and Živinice. The Dayton Line separates the Tuzla Region from the Serbian regions number 2, 3 and 4 all along its west, north and east sides, while in the south it borders with the Muslim Canton number 4, as can be seen in Figure 7.5. The map in Figure 7.6 on the other hand, shows the region in more detail.

The climate in the region is typically moderate continental. Summers are fairly warm with temperatures rising up to +35° C and winters are quite cold with temperatures hitting as low as -20° C with occasional and periodical anomalies. Springs and autumns are always followed by plentiful rainfall.

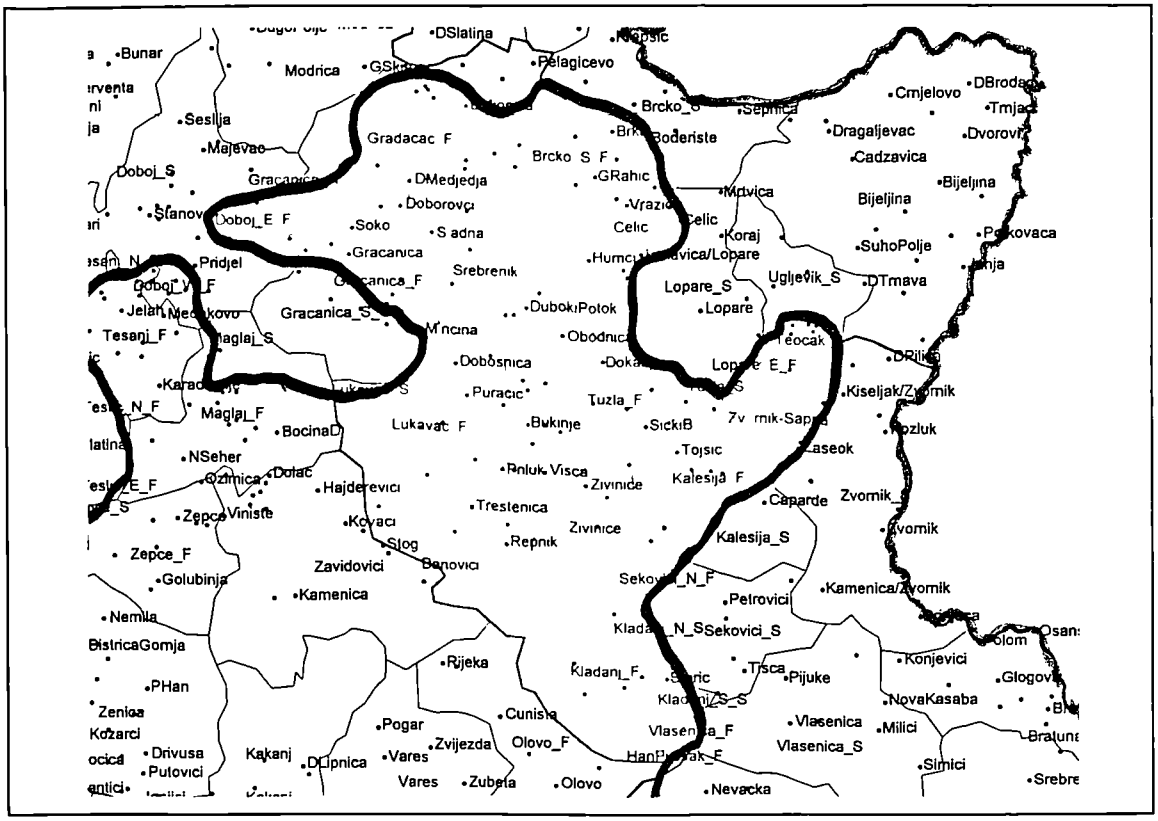

Figure 7.6: *The map of the Tuzlanski-podrinjski Canton*

Population: The Tuzla Region preserved its multi-cultural and multi-ethnic characteristics for centuries under the rules of different empires from the Ottomans to the Austria-Hungary Empire. Although it was mainly a Muslim region - 65% of the population in 1991-, the Croats and the Serbs formed a considerable proportion of the population in municipalities such as Brčko and Tuzla. Table 7.3 shows the distribution of population and ethnic groups in the municipalities according to the last census in 1991. There is no doubt that the war changed these demographic structures both in terms of population and ethnicity ratio through its severe impacts such as ethnic cleansing and mass population movements. According to UNHCR (1997a), there are 200,000 Muslim IDPs living in the Tuzla Region. However, apart from estimating some approximate numbers and percentages, it is not an easy task to give a similar breakdown for each municipality for the present day as is shown according to the pre-war era in Table 7.3.

Municipality	Population	Croats (%)	Muslims (%)	Serbs (%)	Other (%)
Banovič	26,507	2.1	72.4	16.8	8.7
Brčko	87,332	25.4	44.4	20.8	9.4
Doboj*	102,546	13	40.2	39	7.8
Gračanica	59,050	0.2	72.2	23	4.6
Gradačac	56,378	15.1	60.2	19.8	4.9
Kalesija	41,795	0.1	79.5	18.3	2.1
Kladanj	16,028	0.2	73.3	23.9	2.6
Lukavac	56,830	3.8	66.7	21.6	7.9
Srebrenik	40,769	6.8	75	13.1	5.1
Tuzla	131,861	15.6	47.6	15.5	21.3
Živinice	54,653	7.3	80.6	6.4	5.7
TOTAL	**673,749**	**8.1**	**64.7**	**19.8**	**7.3**

Table 7.3: *Population and ethnic distribution in the Tuzla Region before the war*
(Source: Historical maps of Croatia supplement, the Penguin Atlas of World History)
**The population figures shown are for the whole Doboj District before the war. The figures for Doboj East, Sapna, Ćelič and Teočak could not be obtained.*

If four different municipalities, Gradačac, Lopare (Ćelič has become a municipality after the partition of Lopare), Lukavac and Tuzla are taken in consideration, as shown in Table 7.4, the reality of the demographic changes which have taken place in the region can be seen easily (The boundaries of the first two muncipalities were changed by the war).

		Gradačac			Lopare			Lukavac			Tuzla		
Pre-war Population	(%)	56,581			32,537			57,070			131,618		
		60	15	20	37	4	57	66	3	21	47	15	15
Current Population	Fed	38,600			19,500			51,200			159,718		
	RS	6,900			20,200								
Refugees (From)	Fed	Min 250			---			Min 660			Min 2,300		
	RS	Min 4,000			900								
Displaced Persons (In	Fed	4,400			1,400			7,500			41,200		
	RS	2,000			4,800								
		B	C	S	B	C	S	B	C	S	B	C	S

Table 7.4: *The pre-war and post-war population and ethnicity in four sample municipalities*
(Source: UNHCR, 1997a) **B: Mainly Bosniacs, C: Mainly Croats, S: Mainly Bosnian Serbs**

Table 7.4 shows that the municipalities of Gradačac and Lopare experienced a considerable level of displacement in terms of receiving refugees and IDPs, and having people displaced from their boundaries, because of their geographic positions between the Federation of Bosnia and Herzegovina, and Republica Sirpska. On the other hand, the main displacement experience for Lukavac and Tuzla had been in terms of receiving mainly Muslim IDPs from other parts of Bosnia and Herzegovina.

For example, IDPs form 25 % of the current population in the Tuzla Municipality. However more importantly, it can be seen that, as a consequence of Muslim IDPs the proportion of ethnic groups has changed considerably. Even assuming that the population of Croats and Serbs remained the same, the ratio of the Muslims in the Tuzla Municipality increased from 48 % to 65 %. The map showing the distribution of the displaced persons in Bosnia and Herzegovina by canton and region of refuge in Figure 7.7 also confirms this estimation.

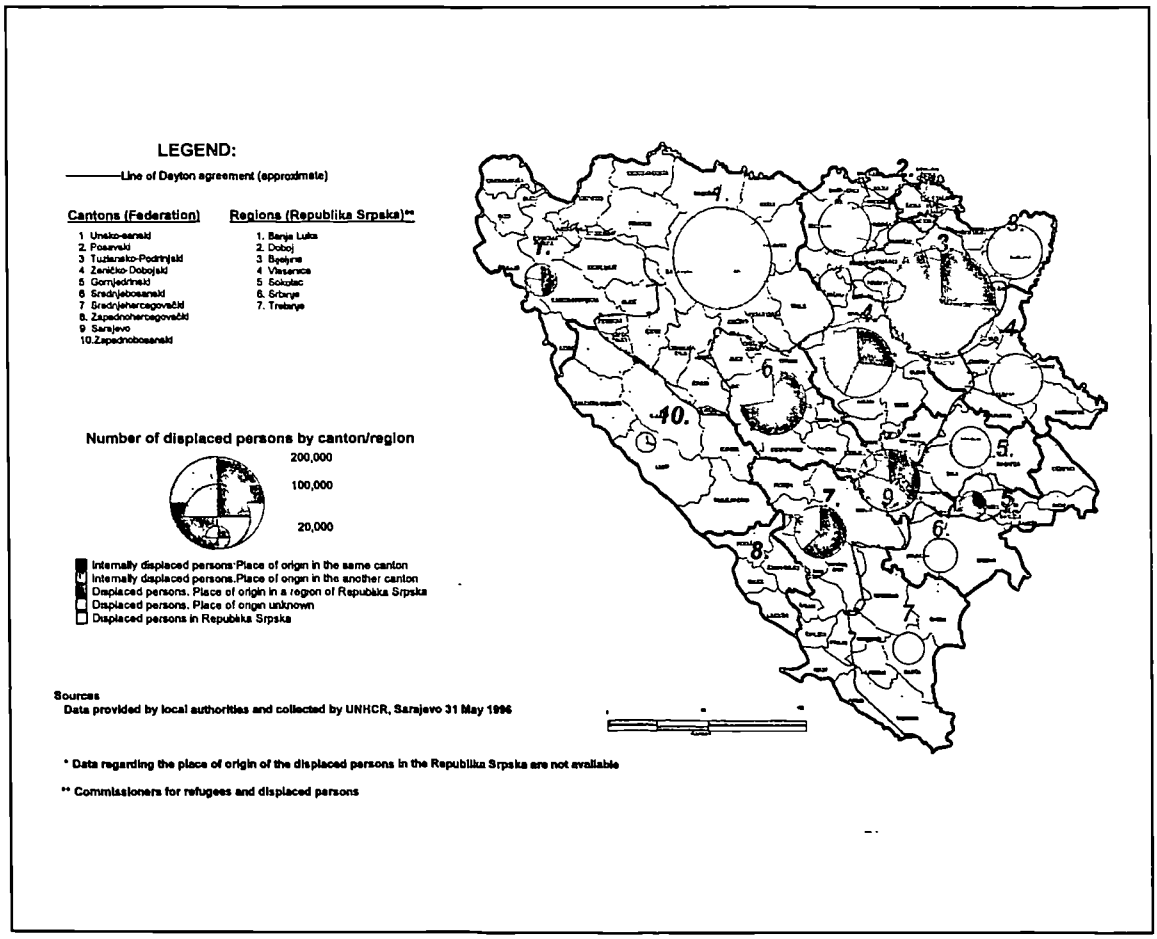

Figure 7.7: *Distribution of the displaced persons in Bosnia and Herzegovina by canton and region of refuge (Source: IMG, 1997)*

Economics: The pre-war economy of the Tuzla Region was mainly based on large state-owned industries such as chemical complex - SODASO and HAK, coal mines - KREKA, production commercial complex - PTK, construction industry company - Technograd and the thermoelectric power station - Termoelektrana. For example, the SODASO complex had an annual capacity of producing 230,000 tonnes of table salt, 20,000 tonnes of polyol, 15,000 tonnes of toluenediisocynate (TDI) and 50,000 tonnes of powder and liquid detergents. Meanwhile, the amount of coal mined in the region was around 12 million tonnes per year of which large quantities were used in the 780 MW power plant to produce electricity. The other industries in the region were the production and processing of beer, yeast, milk, meat and alcohol, and ready-to-wear clothing and footwear.

As can be seen from these industrial sectors, the exploitation of salt and its collateral productions had been a major source of income for the region. In fact, salt exploitation in the region has had a long history starting in the late Neolithic Age. Since then, the area of Tuzla's salt water springs has uninterruptedly been inhabited by different civilisations, and the way these cultures named the area was always related to salt. For example, before the Ottomans arrived in 1463 the region was called Zupa (parish) Soli (Slavic name for salt) during the medieval era. Even the name of the regional rivers "Jala" and "Solina" mean salty as they were the source of salt for settlers in this region for centuries. The present day name is derived from the Turkish word "tuz" which also means salt.

Salt Exploitation and its Impacts: The Ottoman rule was followed by the Austria-Hungary Empire which obtained a mandate to occupy and govern Bosnia and Herzegovina from the Congress of Berlin in 1878.[10] By the arrival of this new order, Tuzla - the administrative, economic, educational, health and cultural centre of the Tuzlanski-podrinjski Canton - started to experience a rapid socio-economic change. The late 19th Century was also the beginning of the industrial exploitation of salt. The Tuzla Region with its rich mineral sources such as salt and coal was an integral part of the Austria-Hungary economy.

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10 The 1878 Congress of Berlin was to rewrite the settlement and redraw the map made at San Stefano which took place after the defeat of the Ottoman Empire by the Russians. According to the treaty of San Stefano, Bulgaria was granted with huge areas and almost full autonomy while Bosnia remained as Ottoman territory. The great powers of Europe enforced a congress in Berlin to counter balance Russian's influence in the Balkans. As a result of this, not only the territory of Bulgaria was cut down, but also Austria-Hungary Empire was given rights to occupy Bosnia and Herzegovina, though it was still under Ottoman suzerainty in theory (Malcolm, 1996).

According to Djuric & Knezicek (1992), by the end of the Austria-Hungary Empire rule in 1914 the intensive salt exploitation which consists a process of injecting water through boreholes and pumping of brine from a considerable depth below ground, had already caused a reduction of the piezometric surface to around 20 m. The intensity of salt exploitation was increased even further over the next 70 years. As a consequence of this, the fall in piezometric surface reached 200 m.

This drastic reduction in piezometric surface and the formation of large zones of salt extraction created huge caverns deep underground beneath Tuzla, causing the ground to subside. The maximum ground subsidence has been more than 12 m over the past 100 years. In other words, 5,5 million m^3 land subsided during this period. Consequently, many historical buildings from the Ottoman and Austria-Hungary Empires and hundreds of residential buildings, where housing 15,000 people, were destroyed. Although some of those buildings were under the protection of the State as cultural monuments, the high rate of ground subsidence prevented them from being saved. For example, only four of 16 Ottoman mosques, the oldest of which is Turali Bey's Mosque from the 15th Century managed to survive to the present time. The map in Figure 7.8 show these areas where dwellings and many historic buildings were destroyed by the ground subsidence. The photographs in Figure 7.9 show some views of these subsidence-affected areas in Tuzla.

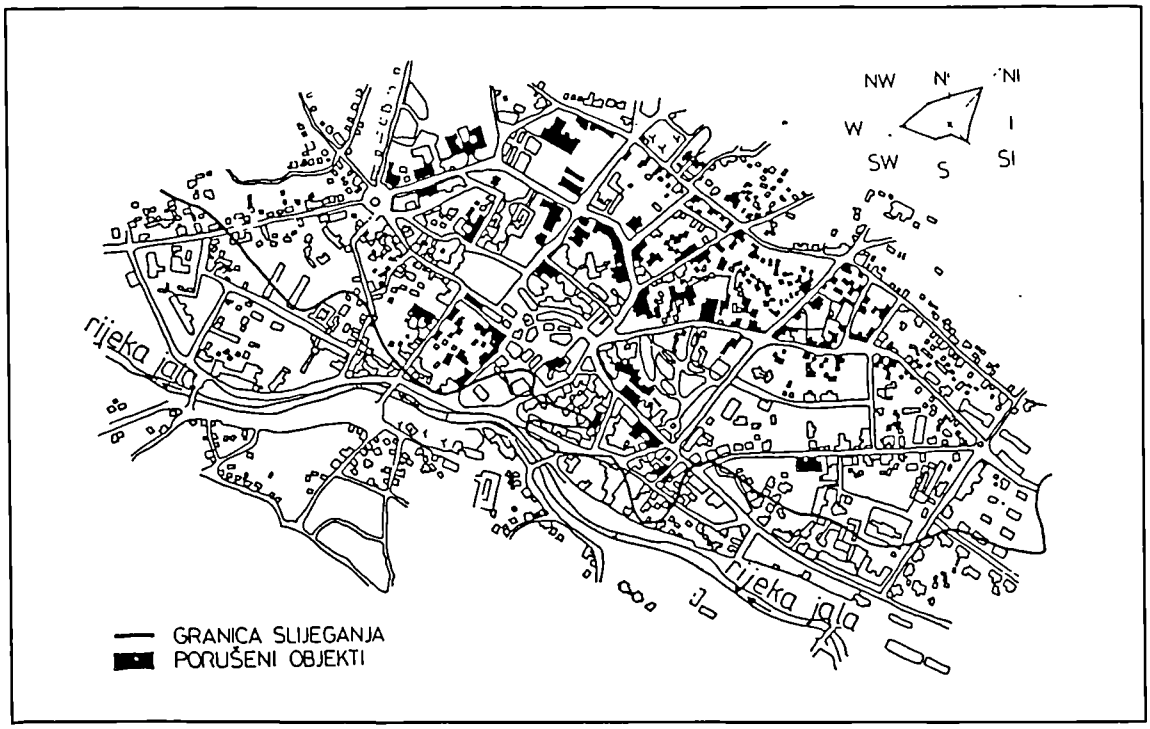


Figure 7.8: *The map of ground subsidence affected areas in Tuzla*
(Source: Fabrika Soli Tuzla, 1985:250)

Figure 7.9: *Some views from the subsidence-affected areas in Tuzla town centre (Source: Author)*

Overview of Water Supplies in the Tuzla Region: The ground subsidence has not only affected the buildings above the ground, but also the infrastructure underground such as the town's water and sewage systems. The damage caused by this phenomenon is one of the main reasons why there is a high level of leakage from the water distribution system in Tuzla. Apart from the irony of losing almost half of the water supplied to the system in a town suffering from serious water shortages, the leakage from the water and sewage systems may also pose great risks to health. The issues related to leakage from distribution systems were already highlighted in Chapter Four, and further examples and their analyses from the Tuzla Region will be given in the following chapter. However, the map in Figure 7.10 showing the level of water loss in network in Bosnia and Herzegovina can give a clear idea regarding the urgency and scale of the problem.

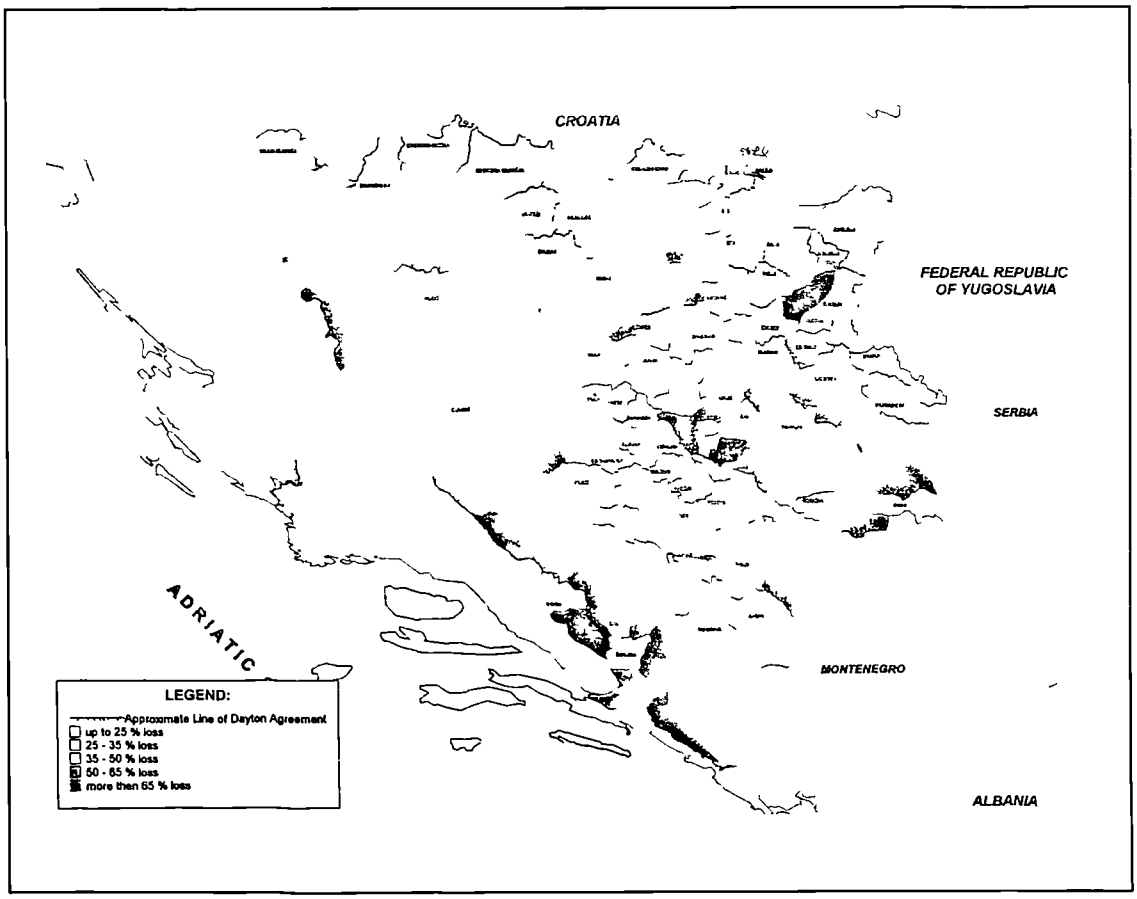


Figure 7.10: *The level of water loss from networks in Bosnia and Herzegovina (Source: IMG, 1997)*

It should be pointed out that there are other cantons and regions worse off than those in the Tuzla Region in terms of the level of water leakage. However, the Tuzla Region is one of the worst parts of Bosnia and Herzegovina as far as the length of time each day that water

is supplied to inhabitants. The water supply map of Bosnia and Herzegovina in Figure 7.11 indicates that water is supplied for a maximum eight hours a day in the municipalities of Ćelič, Gradačac and Tuzla, while Brčko, Doboj East and Teočak receive water on average between eight and 16 hours per day. The remaining eight other municipalities are supplied with water for longer periods.

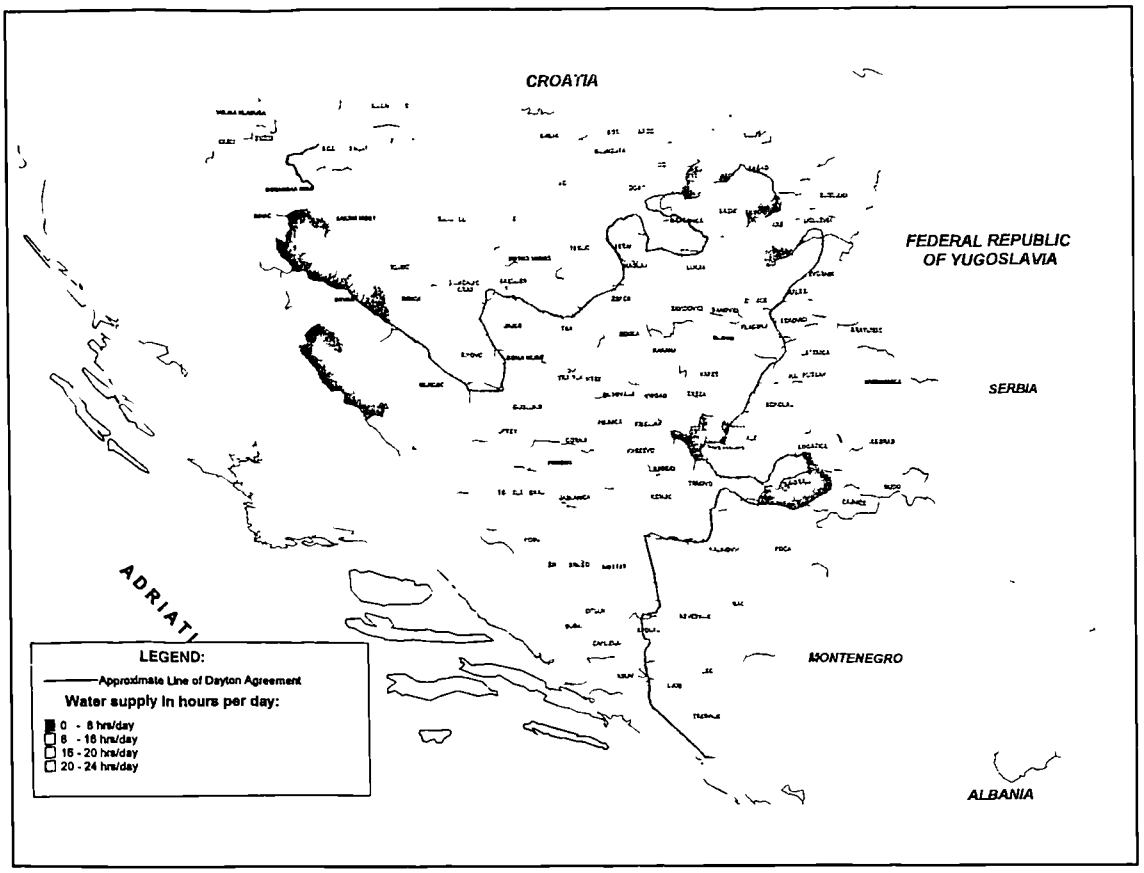


Figure 7.11: *Water supply in hours per day in Bosnia and Herzegovina (Source: IMG, 1997)*

On the other hand, the author's visits to some of these municipalities during his field work in March 1998 showed that the length of time that water is supplied can be varied within the same municipality. For example, Tuzla town rarely gets water more than four hours a day while Mramor enjoys a better quantity of water because of its new water supply. Therefore, these categories of time for water supplies given in Figure 7.11 can only be taken as indications highlighting the overall framework of the problem, but the possibility of regional diversities should also be borne in mind. In addition to this, the Tuzla Region is also much worse off in terms of population served with water. Before the war, according to the map in Figure 7.12, while most of the regions in Republica Sirpska had a high level of population served with water, the cantons within the Federation had around 60 per cent of coverage.

Focusing on the Tuzla Region it can be seen that Ćelič, Gračanica and Tuzla were the only municipalities where more than three quarters of the population were served with water before the war.

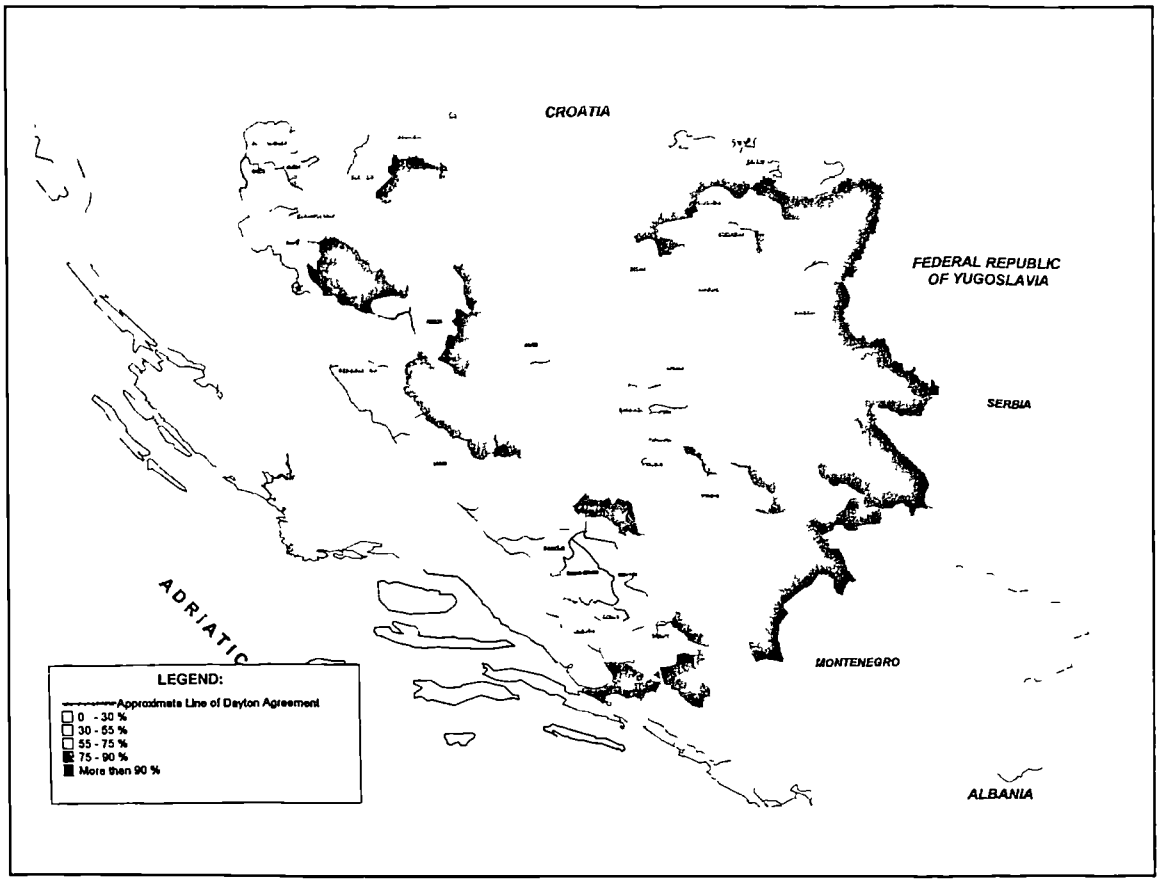


Figure 7.12: *Population served with water in Bosnia and Herzegovina before the war (Source: IMG, 1997)*

7.3.2 Scottish European Aid: From Water and Shelter to Civil Society Initiatives

Scottish European Aid, before its merger with Mercy Corps Europe in 1996, was working in the fields of water and shelter provision to war-affected people in the Tuzla Region. SEA initially started working as a non-profit making organisation in the orphanages of Romania before extending its activities to Bosnia and Herzegovina. The brothers Rupert and Magnus Wolfe Murray first set up the "Scottish Branch of Romania Projects UK" to expand their operations from orphanages to a Romanian hospital. The initial response to help children in Romania, which included the delivery of clothing, food, medicines and toys, was developed into a programme of enablement of local authorities working for children with severe disabilities as well as for an adult psychiatric institution.

Meanwhile, Magnus Wolfe Murray visited Bosnia on a reconnaissance trip in November 1992. He returned to Scotland to raise enough funds to go back to the Tuzla Region with a water engineer and a health specialist. Following this, the Soros Foundation accepted their funding proposal for some shelter and three water provision programmes. However to support these operations, the organisation needed to become an independent charity in its own right. Consequently, SEA was established in early 1993 (Cunningham, 1994).

Shelter Programmes:

SEA's initial strategy for the provision of shelter in the Tuzla Region included two main sections. First, the completion of those houses which were left half-constructed because of the outbreak of the war, for IDPs who were uprooted and had no prospect of going back to their homes in a foreseeable future. The repair of those semi-completed houses was done on the basis of a contract with the property owner letting a displaced family occupy it for a period of two and a half years. Second, the repair of houses for the IDPs from the Tuzla Region to return to their settlement of origin.

In addition to these two main ways of involvement in shelter provision, SEA has also carried out assistance programmes to collective centres in the region. The assistance included various activities such as repair, maintenance and monitoring of living standards in these centres, and the provision of other basic needs such as water and sanitation if necessary. In December 1995, there were 12,000 IDPs living in 54 collective centres in the region (SEA, 1995a). According to December 1997 figures, the SEA's assistance continued to 7,803 IDPs in 30 collective centres. Starting from 1995 SEA also began to provide long-term housing settlements for those IDPs whose home towns are now in Republica Sirpska. As part of this initiative, 11 settlements accommodating 6360 IDPs were built in the region (SEA, 1998).

Water Programmes:

Charles Pallant, who was SEA's chief engineer between 1993 and late 1995 in Tuzla, first carried out a needs assessment to "...identify whether the situation at the time and consequently their involvement, was an emergency or reconstruction". He pointed out that

he was aware of the fact that he was not working in Africa and the socio-economic environment in Bosnia was completely different. Therefore he stated that "...there was no point in doing Oxfam type projects to deal with problems of sophisticated water systems" (Pallant[11], 1998).

Having carried out the needs assessment, it became clear that a great deal of international assistance was necessary to provide water in many towns and villages where water supplies had suffered serious damages and become ineffective because of the influx of IDPs and refugees. This was despite the fact that the most frequent cause of water interruption during the war was the wilful and deliberate cutting off the water sources in order to bring pressure on the adversary. In many cases where a town was in the hands of one side and its water source in the hands of another, the water supply was used as a weapon of war, "...sometimes playing a role as important as the exchange of gunfire" (SEA, 1995).

SEA's main approach to the task of urban water supply recovery in the Tuzla Region was to play a catalyst role between donors and beneficiaries for the provision of necessary equipment and materials under difficult war conditions. SEA (1995) explains the main reasons behind the strategy of limiting its working framework to only the provision of materials and technical supervision while local authorities provided professional expertise and labour to implement water supply projects as follows:

> "If foreign agencies are responsible for every stage of emergency or development reconstruction work in this war-torn country, additionally confused by the collapse of the centrally planned economy, the very fabric of the local authorities could be undermined and a dependency on international intervention and funding inevitable".

As an approach to assist the enablement of local authorities and a working framework in physical, economic and political difficulties of a war-affected area, the preceding strategy played a significant role in the implementation of various projects. On the other hand, it should be pointed out that the process of enablement through a working framework like this is based on an assumption which is that the existing capacities of local authorities would be adequate to achieve the task as a partner. However as explained in the previous section, the war in Bosnia and Herzegovina has left its effects on the institutional structures to such an

11 From an interview carried out in Sarajevo on 30 March 1998.

extent that they are sometimes not more than a name on paper. In the case of working with a local authority without necessary resources the preceding delegation of responsibilities can no doubt be very ineffective. This is particularly important in terms of implementation of the programme and its long-term maintenance. The following chapter will respond to this shortcoming through the lessons learned in the field.

After pointing out the general water situation, the requirements to deal with those problems and SEA's overall approach, the overview of SEA's involvement in the reconstruction of water supplies over a period of five years can be summarized as follows. Following the first three projects in Gračanica, Srebrenik and Vrazici which were funded mainly by the Soros Foundation in 1993, SEA was involved in various projects such as those in Maoča, Gornji Tuzla, Gradačac and Živinice . SEA received a larger budget of DM 900,000 from UNHCR via IMG to assist the Tuzla Water Supply Project in 1994. It was also in this period that SEA initiated projects in settlements some of which were Klokotnica, Tojšići, Rahić, Mionica and Rasljani. The expansion, with various water supply projects all over the region in 1994, continued in 1995. Simin-Han, Čelić, Brka were some of those projects started in 1995. The Dutch Government, ODA, UNHCR and ECHO were the main funders of the projects during the 1994 - 95 period.

Apart from continuing with those programmes which had already been initiated, 1996 was a year which SEA started to go through some structural changes. The signing of the Dayton Peace Accords and consequently the changing emphasis of aid from emergency rehabilitation programmes to those to initiate the repatriation or settlement of IDPs and refugees made a distinctive impact on SEA's funding prospects. It was in this kind of environment that SEA merged with Mercy Corps Europe in late 1996. The mission statement of Mercy Corps reads as follow:

> "The mission of the Mercy Corps family is to build a world in which God's transforming love overcomes hate, violence, poverty and despair, a world where children experience a caring family, a nurturing community, a sacred environment, love, and the opportunity to fulfil their God-given potential. We do this through a distinctive twin strategy of Healing Broken Communities and Building Partnerships. An integral part of all our programmes is building Civil Society".

Mercy Corps claims that they reach the aim of their mission by implementing programmes "...Emergency Relief and Sustainable Development, such as Microcredit and Self-Help for

the Handicapped".

The involvement of SEA in water provision between 1996 and 1998 continued with only a few new projects such as Mramor, Puracic and Stjepan Polje. It seems that the merge in 1996 played a significant role in why there was a lesser involvement of SEA in water programmes, though this is not acknowledged by the country Director of MC/SEA, Louis Chong-Kwan.[12] According to him, the main reason behind this was the lack of funds available for water supply implementations. Although this could be a justified explanation in its own right, it cannot be the only reason. For example, International Rescue Committee (IRC) is currently involved in more than 12 ECHO funded water supply programmes with a total budget of almost DM 2 million. The analyses in the next chapter will bring some explanation to these question marks. However this section will limit itself to the overview of programmes assisted by SEA.

The Table 7.5 shows the breakdown of 39 water supply programmes in terms of place, donor, budget and project status. The full list of all water supply projects implemented in the Tuzlanski-podrinjski Canton can be found in Appendix D. The following section on the other hand, will present basic information on 14 SEA assisted projects on which the analyses will be focused in the next chapter. The projects highlighted in Table 7.5 are those which were taken as samples of SEA assisted programmes during the field work. As already explained, the main purpose of choosing them was to lead investigations in the field and put the analysis of this research in a focused framework. Besides, there were a few other reasons behind this selection.

Before that however, two important points should be highlighted here. First of all, although the analysis in the next chapter will be on these 14 SEA assisted projects, the involvement of other implementing agencies in these settlements will also be part of discussions. The main reason for this can be summarized as the overall nature of water supply programmes in the region.

12 From the interview that took place on 17 March 1998.

Municipality	Settlement	Donor	Budget (kDM)	Completed
Banovici	Trestenica		50.00	1996
Brčko (Federation South Fraction)	Brka	OFDA	160.00	1997
Brčko (Federation South Fraction)	Rasljani	ECHO	50.00	1995
Brčko (Federation South Fraction)	Stjepkovica	ECHO	160.00	1996
Brčko (Federation South)	**Maoča**	**ECHO**	**150.00**	**1995**
Brčko (Federation South Fraction)	Palanka	ECHO	150.00	1995
Brčko (Federation South Fraction)	Rahič	ECHO	120.00	1995
Doboj (Federation East Fraction)	Stanic Rijeka	OFDA	300.00	1997
Doboj (Federation East Fraction)	**Klokotnica**	**ECHO**	**130.00**	**1995**
Gračanica (Federation Fraction)	Doborovci	ECHO		1996
Gračanica (Federation Fraction)	**Gračanica**	**ECHO**	**100.00**	**1996**
Gračanica (Federation Fraction)	Stjepan Polje	OFDA	190.00	1996
Gradačac (Federation Fraction)	Sibovac	OFDA	65.00	1997
Gradačac (Federation Fraction)	**Gradačac**	**ECHO**	**200.00**	**1995**
Gradačac (Federation Fraction)	Mionica	OFDA	150.00	1995
Gradačac (Federation Fraction)	Gornje Ledenice	OFDA	90.00	1997
Kalesija (Federation Fraction)	**Tojšići**		**80.00**	**1995**
Kladanj (Federation Fraction)	Kladanj	ECHO	100.00	1995
Kladanj (Federation Fraction)	**Stupari**	**ECHO**	**170.00**	**1995**
Lopare (Federation West Fraction)	Humci	ECHO	25.00	1995
Lopare (Federation West)	**Čelić**	**OFDA**	**100.00**	**1996**
Lukavac (Federation Fraction)	Dobošnica	OFDA	175.00	1996
Lukavac (Federation Fraction)	Puracic		150.00	Ongoing
Lukavac (Federation Fraction)	Gornja Orahovica	USAID	100.00	1997
Lukavac (Federation Fraction)	Turija	OFDA	132.00	1997
Lukavac (Federation Fraction)	Babice	OFDA	25.00	1997
Srebrenik	Donji Moranjci	UNHCR		1995
Srebrenik	**Špionica**	**OFDA**	**180.00**	**1996**
Srebrenik	**Srebrenik**	**ECHO**	**200.00**	**1995**
Tuzla (Federation Fraction)	**Simin Han**	**Netherlands**	**500.00**	**1997**
Tuzla (Federation Fraction)	**Tuzla**	**Netherlands**	**3,500.00**	**1997**
Tuzla (Federation Fraction)	**Mramor**	**OFDA**	**470.00**	**1997**
Ugljevik (Federation Fraction)	Stari Teočak	ECHO	90.00	1997
Ugljevik (Federation Fraction)	**Teočak**	**ECHO**	**180.00**	**1997**
Živinice	Priluk	ECHO	100.00	1995
Živinice	Tupkovici	ECHO	120.00	1995
Živinice	Zelenika	ECHO	80.00	1997
Živinice	Stejepan Polje	OFDA	180.00	1997
Živinice	**Živinice**		**150.00**	**1995**

Table 7.5: *The full list of water supply projects assisted by SEA from 1994 to 1998 (Source: Adopted from PIMS, IMG, 1998)*

Some of programmes which have been assisted by SEA were only part of a bigger scheme planned by the local authorities, or they were only emergency rehabilitation schemes which needed to be improved by other interventions at a later stage, or the intervention assisted by SEA was not successful therefore a further intervention by a different agency was necessary. Therefore the reason for selecting 14 projects for the analysis was to set up the overall water situation in that particular settlement and derive lessons from the whole project cycle, current situation and the prospects of long-term sustainability for these implementations.

Secondly, the indication of project completion does not mean that the water situation was changed in a positive way in that particular settlement. There are some cases where the whole intervention assisted by SEA did not have any positive impacts to realize even basic objectives of water supply implementations. In other words, the completion date only indicates the end of SEA's involvement in these projects, but not ensuring that all objectives of the programmes have been met. The other important point regarding the date of completion for these projects is that IMG had started to collect this information on water supply projects in the Tuzla Region in 1995, therefore the earliest completion date is seen as 1995. However, some of those projects with the completion indication of 1995 may have been finished in either 1993 or 1994.

The selection process of 14 projects as samples for the overall involvement of SEA was initially started by preparing a list of 30 projects on the basis of two to three projects from each municipality. Bearing in mind certain constraints such as time, logistics and economics, and the overall scope of the field work, it was clear that the number of projects to be focused on should not be more than 20. Therefore the author approached Nedim Mesič and Kemal Bedič for their professional opinion as the former used to be the chief local water engineer of SEA between 1993 and 1997 and the latter is currently responsible for water supply programmes. After the objectives of the field work in relation to the ATAM framework had been explained to them, the selection of 17 projects was done through discussions with them. The possible biases of carrying out field work, which were explained in the previous chapter were also born in mind all the way through this process.

As a result of poor recording of projects assisted by SEA in the last five years, it was a

difficult task to get a list of contact names and telephone numbers to initiate interviews in the field. The reality of frequent changes at the local authorities was also another reason why it was difficult to find out who was the responsible person for the water sector in each settlement. For example in the case of Kladanj, the author's efforts to trace Sakib Hajdarevič who was the responsible local engineer during the implementation, did not give any results and there was not anybody at the Municipality in a position to talk about this project. It was also a similar case for Dobošnica and Brka, for the first of which SEA could supply the author with only a contact name, Mehmedalija Osmić without a contact number and for the second, with only a contact number. Although a telephone search could have had some results, the telephone connections with Dobosnića and Brka were out of order at the time.

Despite all these difficulties, the 14 projects which were focused on were in a position to give a good representation of the overall involvement of SEA in the Tuzla Region, because of several reasons:

- They are from very different parts of the region.
- They are not only in those municipalities which remained intact from the current cantonal structure, but also those which were divided by the Dayton Line.
- They are varied in size from the Tuzla Project with a budget of DM 3,5 million to smaller projects with a budget around DM 100,000.
- All types of local authorities from cantonal level to community groups were represented in this selection.
- The findings from discussions with other international agencies such as IMG, UNHCR, IRC and USAID, and the discussions with Mesić and Bedić managed to categorize some of SEA's involvements as very successful or unsuccessful implementations. The selected projects include representations from both sides.

The map of the Tuzlanski-podrinjski Canton in Figure 7.13 shows the location of these 14 projects. Following this, the basic quantitative information on each project can be found in Figures from 7.14 to 7.27 which will follow the summary and conclusions of this chapter.

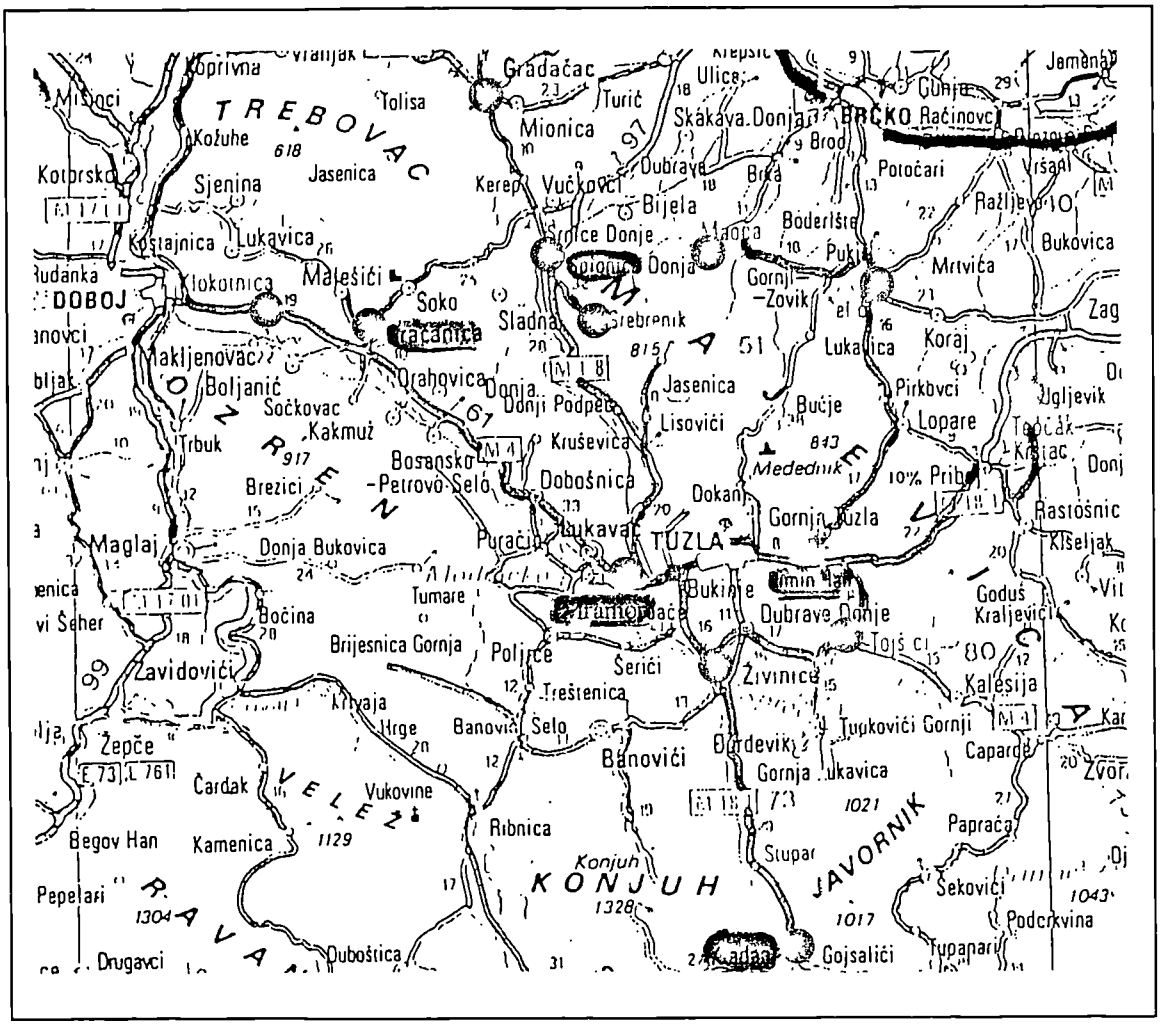


Figure 7.13: *The location of 14 projects in the map of Tuzlanski-podrinjski Canton*

7.4 Summary and Conclusions

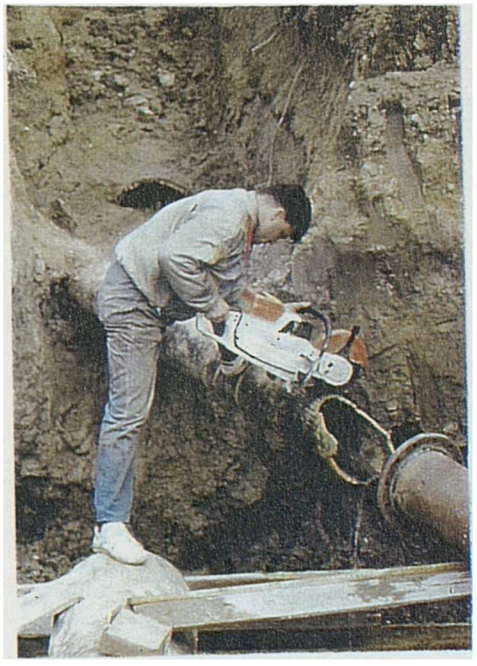
This chapter presented social, economic, physical and institutional frameworks of the case study in the Tuzla Region through the analysis of the Bosnian conflict from its causes in the context of Yugoslavian collapse to its post-Dayton frameworks. In addition to this, the investigation of the region itself provided necessary quantitative background information on SEA assisted water supply projects for the analysis to be carried out according to the ATAM framework in Chapter Eight.

Over the last four years, the situation in which the international community is responding to the water supply recovery in the Tuzla Region has changed considerably. The main emphasis from 1993 to 1996 was the emergency rehabilitation of water supplies in which international agencies such as SEA played a significant role to develop new supplies and

improve existing systems. Today, the international community tends to place its emphasis on more long-term initiatives such as institutional development as part of their partnership with local authorities. The type of aid to recover and improve urban water supplies has also changed, as the international community prefers to give credits with low interest rates than simply donating its contributions. Although this change can play a significant role to guide local authorities to focus on more feasible projects and the ways of making those implementations sustainable, it is also an unfortunate fact that the international community has already missed many opportunities to achieve this in the progression from emergency to development.

There are several reasons for this argument. First, the international community has been investing large amount of aid on the improvement of water supplies since 1993. Although some of these interventions were only in terms of emergency intervention to provide water for survival, the greater proportion of them were to develop new systems and add new components to the existing ones in order to alleviate protracted water shortages which have been exacerbated by the impacts of the war. In these implementations, the international community's concentration was only to provide technical assistance for their realization without aiming at the institutional development of local authorities. The second reason which is interconnected to the first one is that the international agencies such as USAID now require cost recovery plans in order to ensure their investments would be sustainable in the long term. However, this process could have been started much earlier by other agencies as large parts of the Tuzla Region has been enjoying a good level stability since 1995, and the requirements of local water boards for institutional development have not become an urgent necessity since 1997. Therefore the counter argument of changing the strategy according to improved socio-political and physical environment cannot be a satisfactory explanation for this delay. Thirdly, the appropriateness of this current strategy for those newly created municipalities such as Teočak, Doboj East and Čelič should be questioned as their needs and capacities are considerably different from those in Tuzla, Gračanica and Živinice. The preparation of cost recovery plans to qualify for cheap credits can be a viable and attractive option for the latter municipalities, but those in the former group first need to solve some very basic institutional problems such as qualified personnel and the establishment of organisational structures.

The discussions and analysis in the following chapter will attempt to find appropriate approaches to deal with these dilemmas faced by the international community and local authorities in the Tuzla Region. The analysis will be based on the appropriate, targeted, applicable and maintainable aspects of post-war recovery of urban water supplies, which were investigated in Chapters Four and Five.



Place (town / municipality): Tuzla / Tuzla Federation fraction **Completion Date:** 1997

Budget: DM 3,500,000 **Donor(s):** The Dutch Government, UNHCR, ODA

Population: 120,000 **Ethnic Groups:** Mainly Muslims, Croats and Serbs

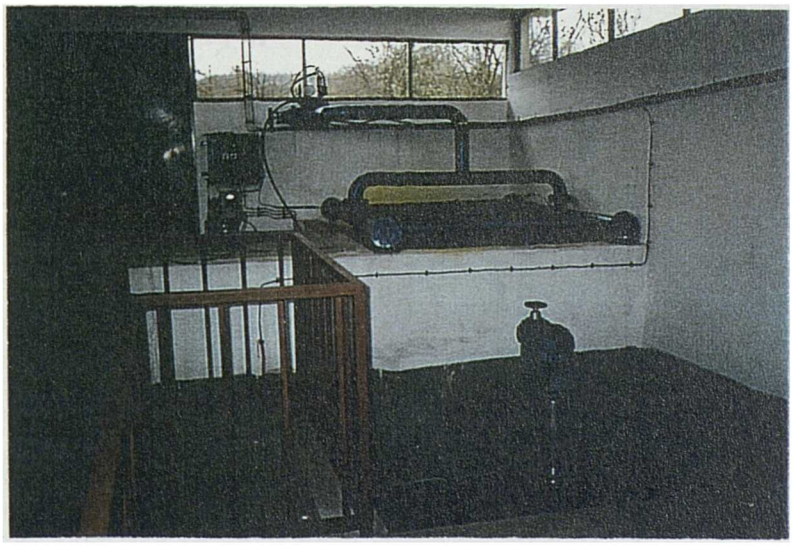
Works: The construction of a 9.8 km, 500 mm cast-iron pipeline, the drilling of a new borehole and refurbishment of six boreholes, the construction of pre-treatment and treatment plants for 200 l/s, new pumping facilities, connection to the town network.

Current Water Situation: **Quantity:** 4 hrs a day **Quality:** Safe **Leakage:** 40-60 %

Availability: All population **Reliability:** All the time

Figure 7.14: *Information on the Tuzla Water Supply Project, and images from the settlement and the implementation*

↕ A view of Mramor



➜ The water treatment facilities

Place (town /municipality): Mramor / Tuzla Federation fract.

Supplying water to Mramor, Dobranj, Caniči & Mramor Village

Budget: DM 470,000 from the donor, DM 600,000 from the Tuzla Municipality. **Donor:** OFDA

Completion Date: 1997 **Population:** 5,000

Ethnic Groups: Mramor: Mixture of Muslims & Croats

Caniči: Mainly Croats

Dobranj & Mramor Village: Mainly Muslims

Works: The drilling of a new borehole with a capacity of Q= 15 litres per second, the construction of a treatment plant and a pumping station, the construction of a water reservoir with a capacity of V= 100 m³.

Current Water Situation: Quantity: 16 -24 hrs a day **Quality:** Safe **Reliability:** All the time **Availability:** All population, but in Caniči only 10 out 200 houses are connected to the network

Figure 7.15: *Information on the Mramor Water Supply Project, and images from the settlement and the implementation*

↕ The pipe laying under way in 1996

↕ The water pressure tank under construction in 1996

Place (town/municipality): Simin Han / Tuzla Fed. fraction **Completion Date:** 1997

Budget: DM 500,000 **Donor:** The Dutch Government

Population: 8,000 **Ethnic Groups:** Mainly Muslims

Works: The construction of a water intake at the Kovacica River, 1.4 km pipeline, a treatment plant, pumping station and a water reservoir. The reconstruction of 1,5 km of PVC pipeline.

Current Water Situation: The new system is not functioning at all. **Quantity:** 1-2 hrs a day

Quality: Unsafe **Availability:** Only lower parts of the settlement **Reliability:** Unreliable

Figure 7.16: *Information on the Simin Han Water Supply Project, images from the implementation*

↕ A view from the Srebrenik town centre

↕ The water reservoir with a capacity of 2,500 m³

Place (town/municipality): Srebrenik / Srebrenik **Completion Date:** 1995

Budget: DM 200,000 **Donor:** ECHO

Population: 12,000 **Ethnic Groups:** Mainly Muslims

Works: The completion of a semi-finished project including the drilling of 3 boreholes, the construction of pipeline and a reservoir with a capacity of V=2,500 m³.

Current Water Situation: Quantity: Water supplied to the system increased from Q=17 litres/second to Q=35 litres/second . 16-24 hrs a day **Quality:** Safe **Leakage:** 40 -50 %

Availability: All population **Reliability:** All the time

Figure 7.17: *Information on the Srebrenik Water Supply, and images from the settlement and the implementation*

↕ A view of Teočak with the dam lake in the background which will supply water to the settlement

↕ The water reservoir which was funded by USAID

Place (town/municipality): Teočak / Ugljevik Fed. fraction **Completion Date:** 1997

Budget: DM 180,000 **Donor:** ECHO

Population: 6,000 **Ethnic Groups:** Mainly Muslims

Works: The construction of 1,5 and 2,5 km pipelines, pump station, water treatment plant and a reservoir with a capacity of V=300 m³.

Current Water Situation: The implementation of the project has only been partly completed as further funding is necessary. **Quantity:** 8-16 hrs a day **Quality:** Uncertain

Availability: Half of the population are connected to the network

Reliability: Various according to seasons

Figure 7.18: *Information on the Teočak Water Supply and some views from the settlement and the implementation*

↕ A view of the Orthodox church

↕ The capping of the water intake from the spring

Place (town/municipality): Špionica / Srebrenik **Completion Date:** 1996

Budget: DM 180,000 **Donor:** ECHO

Population: 2,500 **Ethnic Groups:** Muslims, Croats and Serbs

Works: The capping to the spring and the construction of 7 km of PVC pipelines with all necessary fittings. SIDA has also been involved in the implementation of the Špionica Water Supply.

Current Water Situation: Špionica consists of three small settlements which are Špionica Srednja, Špionica Donja and Cerik. The main ethnic groups in these villages are Muslims, Serbs and Croats respectively. In order to preserve the ethnic harmony between these settlements, the municipality has been waiting to get adequate funds to implement the project fully which would supply these three settlements with water. Meanwhile, the population in these settlements are using their own small supplies and wells which are inadequate for their needs.

Figure 7.19: *Information on the Špionica Water Supply and some views from the settlement and the implementation*

↕ A view of the historic castle which is the symbol of Gradačac

↕ The water pipe laying is in progress

Place (town/municipality): Gradačac / Gradačac Fed. fract.		**Completion Date:** 1994
Budget: DM 200,000	**Donor:** ECHO	
Population: 18,000	**Ethnic Groups:** Mainly Muslims & some Croats	

Works: Emergency intervention during the war: The installation of a filtration plant for water treatment, the connections to two water reservoirs. The further intervention by USAID since 1996.

Current Water Situation:	**Quantity:** 24 hrs a day	**Quality:** Safe but not satisfactory
Leakage: 40-50 %	**Availability:** All population	**Reliability:** All the time

Figure 7.20: *Information on the Emergency Rehabilitation of Gradačac Water Supply and some views from the settlement*

↕ A view of Živinice with its water tower in the background

↕ The pumping station in Toplića

Place (town/municipality): Živinice / Živinice **Completion Date:** 1995

Budget: DM 150,000 **Donor:** ECHO

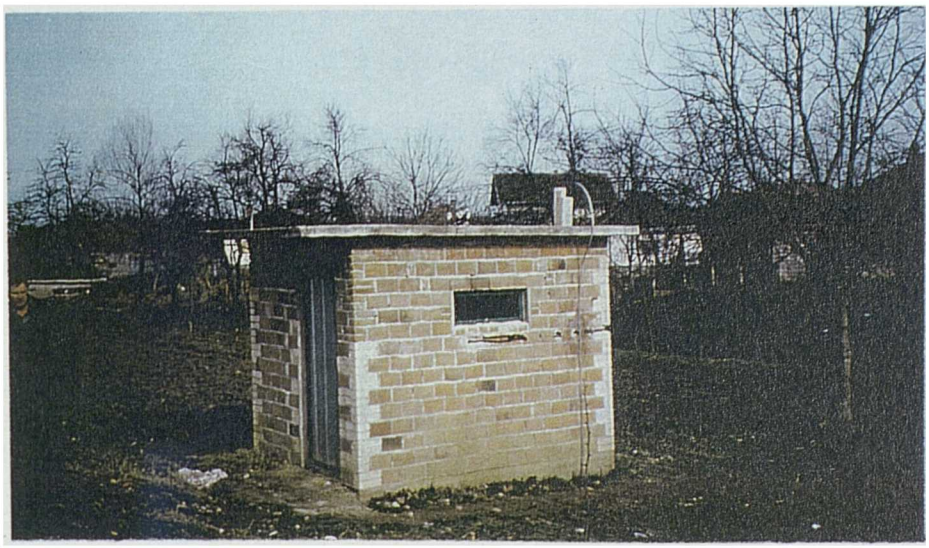
Population: 15,000 **Ethnic Groups:** Mainly Muslims

Works: The construction of a by-pass pipeline with a diameter of θ= 300 mm to reduce water pressure in the distribution system. Further involvement of ICRC in 1995.

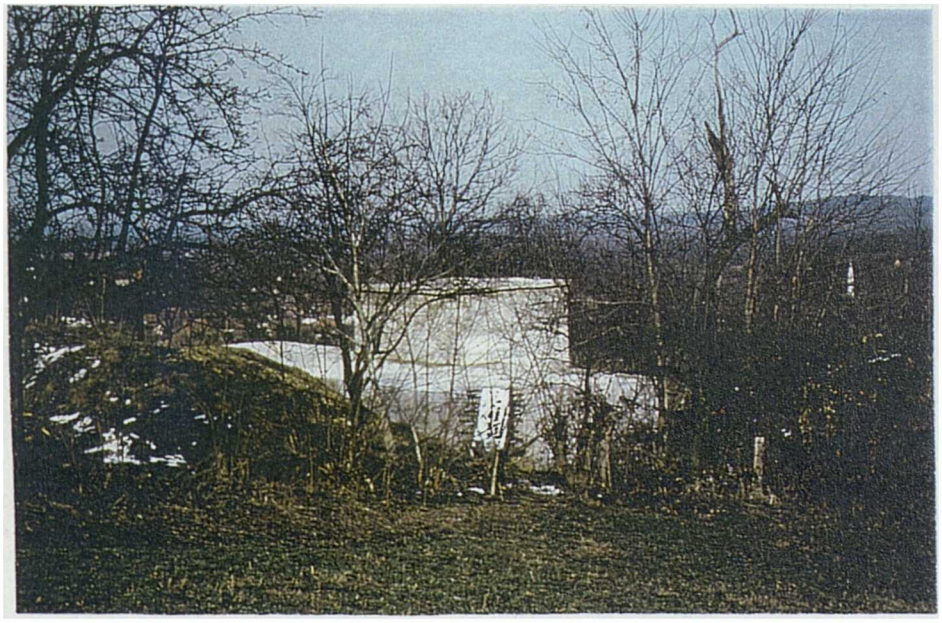
Current Water Situation: Quantity: 16 -24 hrs a day **Quality:** Safe

Availability: All population **Reliability:** All the time

Figure 7.21: *Emergency Rehabilitation of Živinice Water Supply and some views from the settlement and Toplića Pumping Station*



↕ The borehole with a capacity of 10 litres / second



↕ The water tank with a capacity of 300 m³

Place (town/municipality): Maoča / Brčko Fed. South fraction **Completion Date:** 1995

Budget: DM 150,000 **Donor:** ECHO

Population: 9,100 **Ethnic Groups:** Mainly Muslims

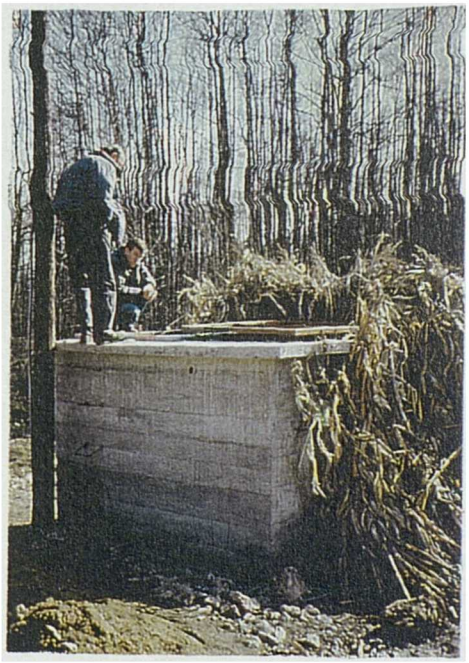
Works: The construction of a new reservoir with a capacity of Q= 300 m³ and the drilling of a 60 m borehole a capacity of Q= 10 litres/second.

Current Water Situation: Quantity: 16 -24 hrs a day **Quality:** Safe

Availability: All population **Reliability:** Frequent breakdowns

Figure 7.22: *Maoča Water Supply and some views from the implementation*

↕ A view from Klokotnica



↕ The trenches used by the Serbian forces during the war, and the borehole is being investigated by SEA engineers, Nedim Mesić and Kemal Bedić

Place (town/municipality): Klokotnica / Doboj Fed. East fract. **Completion Date:** 1995

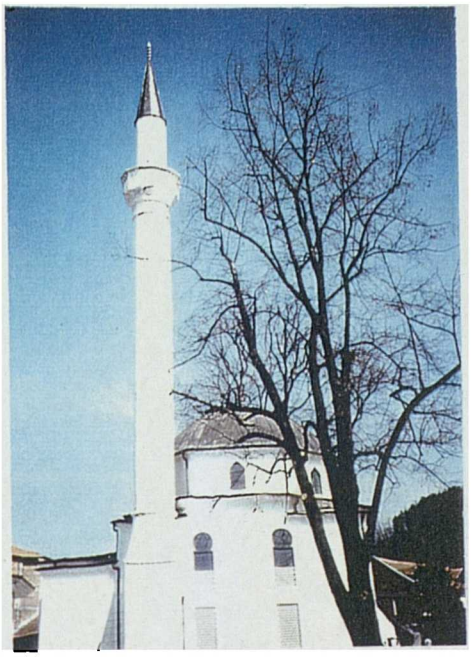
Budget: DM 130,000 **Donor:** ECHO

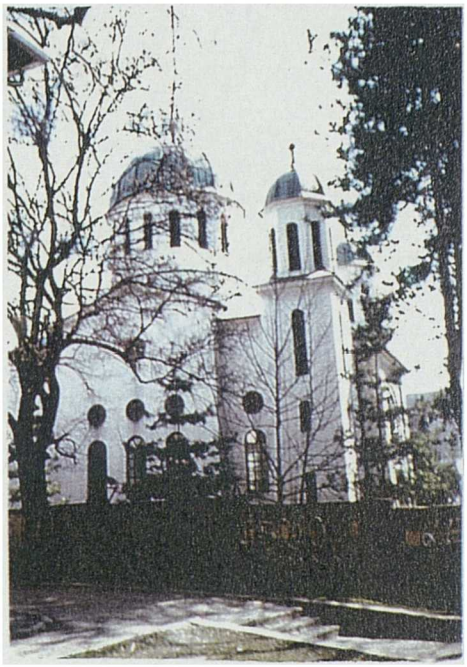
Population: 6,000 **Ethnic Groups:** Mainly Muslims

Works: The drilling of a borehole with a depth of 70 m, the construction a 5,8 km pipeline with a diameter of θ= 160 mm, and two reservoirs with a capacity of V=100 m³ and 50 m³ .

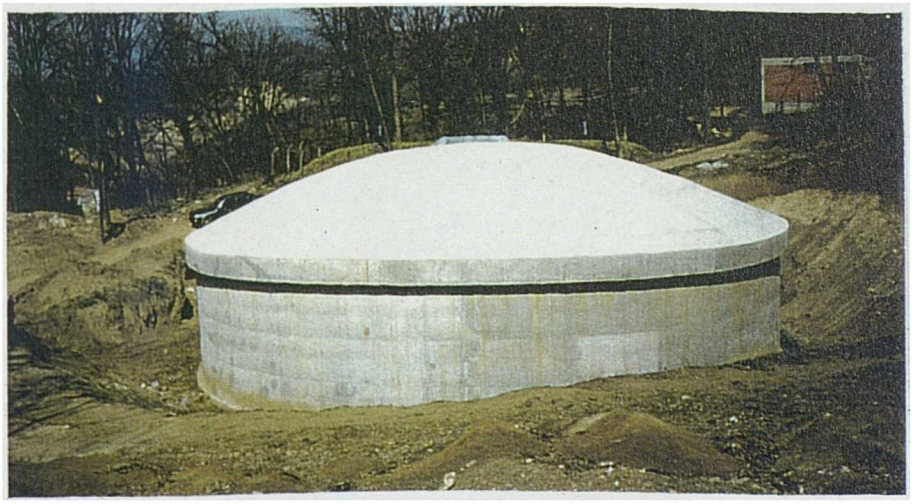
Current Water Situation: Klokotnica in addition to settlements Stanič Rijeka, Brijesnica and Lukavica Rijeka form the municipality Doboj East. All these four settlements apart from Lukavica Rijeka have their own supplies, but they are not sufficient for the current needs of the population.

Figure 7.23: *Emergency rehabilitation of Klokotnica Water Supply and some views from the settlement and the implementation*





↕ A reconstructed mosque and a Catholic church which are only 200 m away from each other



↕ The water tank with 1,400 m³ capacity is under construction

Place (town/municipality): Gračanica / Gračanica Fed. Fract. **Completion Date:** 1996

Budget: DM 100,000 **Donor:** ECHO

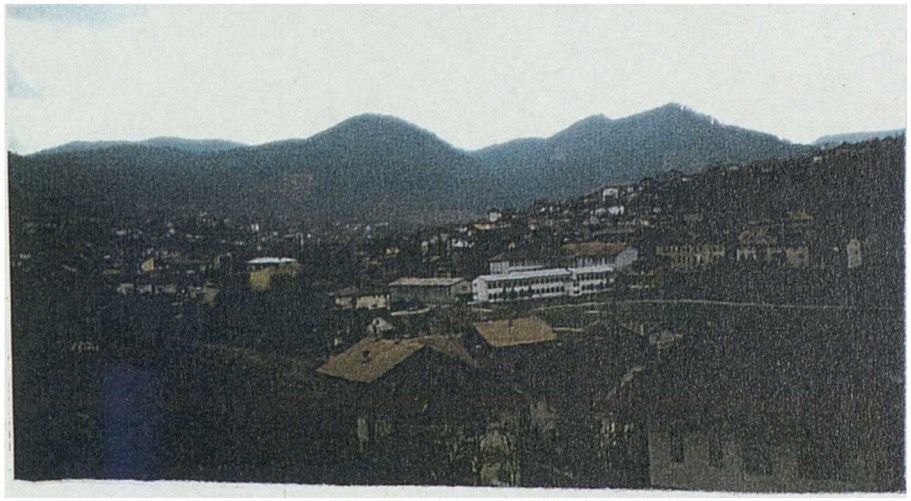
Population: 15,000 **Ethnic Groups:** Mainly Muslims & Croats

Works: The initial agreement between SEA and the Municipality of Gračanica planned the construction of a water reservoir with a capacity of V= 400 m³, but through the implementation process the municipality increased the capacity to V=1,400 m³. As a result of this, the construction of this reservoir has not been completed yet.

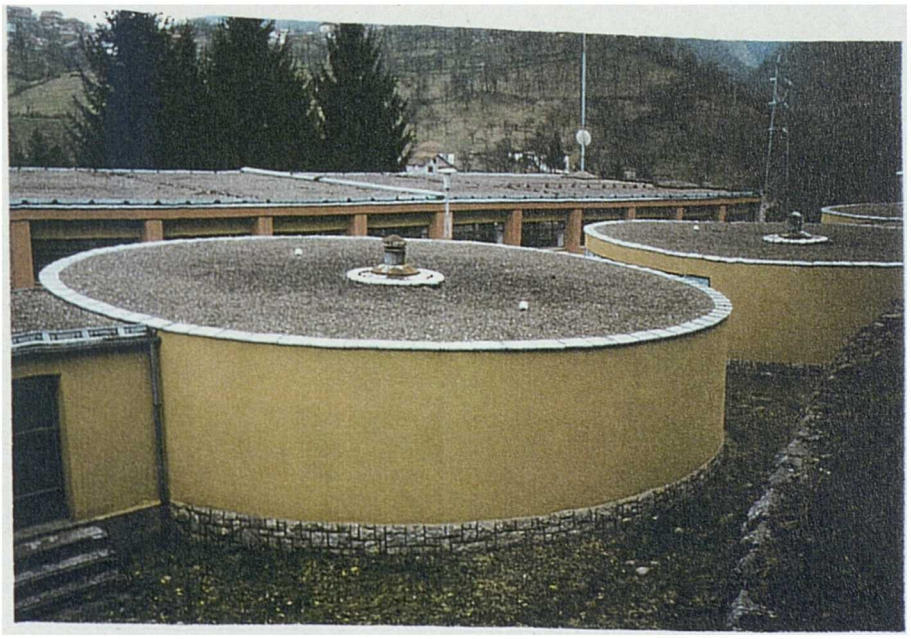
Current Water Situation: Quantity: 16 - 24 hrs a day **Quality:** Safe

Availability: All population **Reliability:** All the time

Figure 7.24: *Gračanica Water Supply and some views from the settlement and the implementation*



↕ A view of Kladanj



↕ A view of Stupari water treatment facilities

Place (town/municipality): Kladanj / Kladanj Fed. fraction **Completion Date:** 1995

Budget: DM 100,000 **Donor:** ECHO

Population: 13,000 **Ethnic Groups:** Mainly Muslims & Croats

Works: The construction of caps to springs and a 3,6 km of pipeline. The provision of fittings and repairs to town network.

Current Water Situation: Quantity: 16 - 24 hrs a day **Quality:** Safe

Availability: All population **Reliability:** All the time

Figure 7.25: *Kladanj Water Supply and some views from the settlement and Stupari Water Treatment Facilities*

Place (town/municipality): Čelić / Lopare Federation West **Completion Date:** 1996

Budget: DM 100,000 **Donor:** OFDA

Population: 3,000 **Ethnic Groups:** Mainly Muslims

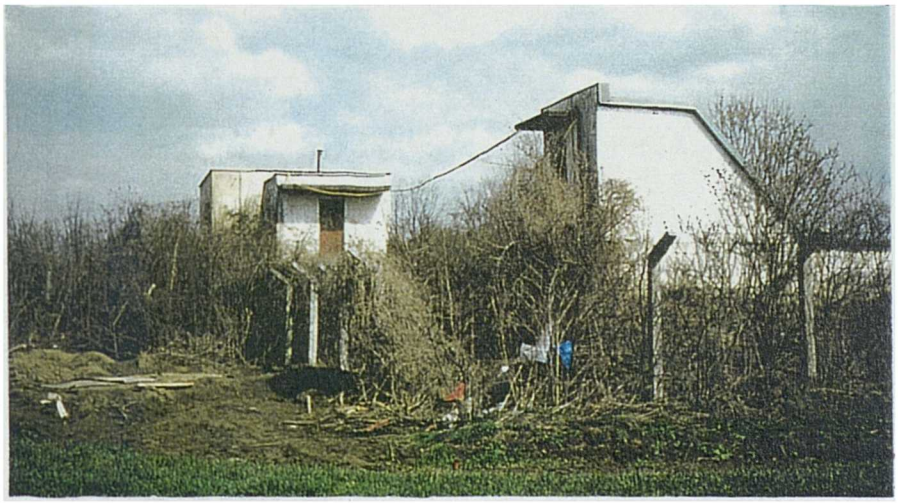
Works: SEA's initial plans included the installation of a water intake at the Sibonica River and transporting water by a 8 km pipeline to a new reservoir with a capacity of V= 250 m³. However these plans had been changed drastically in order to supply other settlements in the Municipality of Čelić with sufficient water. The project consisted of the following works: The drilling and rehabilitation of six boreholes, the construction of three reservoirs with a capacity of V= 100 m³ each. These works have cost DM 1,2 million and realized with funds made available by SIDA and ICRC in addition to those provided by SEA.

Current Water Situation: Quantity: 4 -8 hrs a day **Quality:** Uncertain **Leakage:** 60 %

Availability: All population **Reliability:** Various according to seasons

Figure 7.26: *Čelić Water Supply and some views from the settlement*

↕ Tojšići town centre



↕ Tojšići pumping station

Place (town/municipality): Tojšići / Kalesija Federation Fract. **Completion Date:** 1995

Budget: DM 80,000 **Donor:** ECHO

Population: 5,000 **Ethnic Groups:** Mainly Muslims

Works: The drilling of a 37 m deep borehole, which was carried out by Norwegian Refugee Council (NRC) with a cost of 30,000 DM. The construction of a water reservoir with a capacity of V= 200 m³, and a pipeline, 5 km of which with a diameter of θ= 110 mm and 1 km with θ= 90 mm.

Current Water Situation: Quantity: 15 min. - 2 hrs a day . The main source of water is garden wells **Quality:** Uncertain - High risk of pollution in garden wells

Availability: Small proportion of the population is connected **Reliability:** Not reliable at all

Figure 7.27: *Tojšići Water Supply and some views from the settlement and the implementation*

Chapter 8: Analysis of Field Research Findings

- Part I -

8.1 Introduction

The findings of the field investigations in the Tuzla Region, which was done through the proposed framework of appropriate, targeted, applicable and maintainable (ATAM) water supply reconstruction will be presented in this chapter. The utilization of the ATAM framework in the field research provided two important opportunities. The first one was to test this framework in terms of the research question and hypotheses, and the second was to test it as a method for the evaluation of post-war water supply interventions in order to improve its structure and content. In regard to the first aim, the findings presented in this chapter to support the proposed ATAM framework, are structured as follows:

i. Appropriateness Issues of Water Supply Reconstruction

- Water quantity, quality, reliability and availability
- Health aspects
- Technical criteria
- Integration with other rehabilitation programmes

Following this, Chapter Nine will present the findings on targeted, applicable and maintainable water supply reconstruction:

ii. Targeted Water Supply Reconstruction

- Socially targeted
- Politically targeted
- Economically targeted

iii. Applicable Water Supply Reconstruction

- Security and logistics
- Institutional development
- Accountability
- Flexibility

iv. Maintainable Water Supply Reconstruction

- Monitoring and evaluation
- Operation and maintenance
- Financial sustainability
- Training

In regard to the second aim on the other hand, an updated version of the log book can be found in the form of checklist of questions for implementing agencies in Chapter Ten.

8.2. Water *Quantity*, *Quality*, *Reliability* and *Availability*

In Chapter One, the improvement of improve water quantity, quality, reliability and availability for the alleviation of suffering caused by inadequate and unsafe water supplies was identified as immediate objectives of any water supply interventions in war-affected areas. Therefore it was an important initial step to assess whether the project implemented had any impacts to improve these four main characteristics. However several important points regarding this assessment process such as careful selection and measurement of indicators had to be borne in mind.

In regard to water quantity, the amount of water supplied from the system in terms of litres per second can only be an indicator for the capacity of the system, but not for the amount of water supplied to consumers. The main reason for this is the high level of leakage in distribution networks which can sometimes mean the loss of large proportions of the amount supplied. It was because of this that the research considered the length of time that consumers were supplied with water as a more reliable indicator for water quantity improvements.

The collection of data for the characteristic of water quality on the other hand, mainly relied on the information obtained from the local health authorities. However, apart from the municipalities which are well-established such as Tuzla, Gračanica and Živinice, the information which could be obtained from the authorities was limited. Therefore the task of analysis was often supported through water quality studies carried out by Bosnian experts working for local health authorities. In addition to this, as explained in Chapter Five, the

literature in the field of evaluation suggests the use of the initial objectives which were set for expected improvements as indicators, in order to compare them with the results gained by the implementation. However the investigation in the field showed that setting clear objectives was not a common practice for those projects implemented by SEA. Therefore it was important to establish the water situation before and during the war in order to compare it with the situation after the intervention, which has given the possibility of making at least some kind of comparison for the assessment of impacts.

8.2.1 Assessment of Needs and Capacities for Planning

The assessment of needs and capacities prior to the planning of projects is a vital stage in order to make implementations efficient, effective, relevant and sustainable, as explained in Section 5.4.1. The account of Pallant in Section 7.3.2 in regard to the SEA's needs assessment was an appropriate attempt to establish the agency's approach to deal with water problems in the region. Having assessed that the needs of water supply recovery in the region were protracted and complex, but at the same time, the utilization of local professional and institutional capacities was possible, SEA has limited its involvement to the provision of materials, equipment and technical supervision. On the other hand, carrying out a needs assessment in *1993* and relying on its results over the coming five years cannot be considered as appropriate.

As explained before, it was during this period that the region has gone through substantial social, organisational and political changes. The needs of the population for water supplies have also increased accordingly. The initial methods of rehabilitating water supplies for emergency needs have also become inadequate to deal with the problems of long-term water supply developments. Although the argument here is not claiming that SEA has not been successful with any developmental projects, it states the necessity of a consistency and up-dating for needs and capacity assessments. The main reason behind this claim is the differentiation of needs and capacities from one project to another, as can be seen in Figures from 7.15 to 7.27 where some of projects were given as examples.

The field investigation showed that SEA's involvements did not include a clear needs and capacity assessment before each intervention. First of all, the author could not locate any

documentation prepared by SEA, which identified the water supply status in terms of:

- population served
- technical characteristics and shortcomings of the existing system
- information on organizational structures for operation and maintenance

for the interventions carried out in the region. The reports prepared during 1994 and 1995 while Charles Pallant was working as a Chief Engineer, are the only documentation that gives some indication about SEA's involvements. For example, it was not possible to obtain a full list of SEA's water supply projects and written information about them from the SEA Tuzla Office. It was stated by Bedić (3 April 1998, Tuzla) that "SEA has not kept a regular record of projects". He explained further:

> "Our project proposals were often based on the information provided by local authorities, and as long as funding was possible SEA went ahead with procurement of equipment and materials needed. The control over the reliability of information which was obtained from the local authorities, were mainly depended on our [SEA's water engineers] knowledge on the region".

On the other hand it should be pointed out that the collection of information from local authorities to design projects could have been vulnerable to the misuse of demographic, technical and economic facts in order to obtain more funds and justify the relevance of proposed projects. Werner Labi (30 March 1998, Sarajevo), *the country Director of IMG* in Bosnia and Herzegovina, pointed out that the reliability of information collected from local authorities had to be double checked as IMG was often supplied with data exaggerating the scale and urgency of problems. He continued:

> "It is very important for IMG to obtain reliable information during our Damage and Needs Assessments as these data are provided to the international community for their involvements in the rehabilitation of infrastructure".

However, he asked "How can you be sure that you are provided with correct information?" which was highlighting once again the challenge of this task. Although the point here is not to urge the reader to be pedantically precise in the process of obtaining statistical and technical information, it is the need to be aware of this possibility and take necessary precautions. For example, the exaggeration of population can be used to justify the expenditure of a water supply project better. On the basis of a cost-benefit perspective, to state the population of Tuzla is 190,000 instead of 120,000 would increase the justifiableness of any water supply intervention. The important thing to note here is that the former figure is the population of the whole municipality , while the latter is the number of

people served by the Tuzla Water System. It should also be added here that, as explained in Section 7.3.1, the post-war environment brings serious limitations to the availability of statistics. Therefore the estimation of population can be the only solution. However, the interpretation of this information and its usage consistently within documentation should be ensured in order to provide the credibility of proposals and actions taken by implementing agencies.

On the other hand, the assessment of the implementing agency should not only be of the water situation concerned but also the agency's own strengths and vulnerabilities for the implementation of that particular project. This assessment should be in terms of funds, time, other work load and personnel. There is no doubt that working in the environment of war-affected areas poses its own pressures on the personnel, but the nature of programmes should not become an extra burden for them. Some external factors such as the type and conditions of funding can bring extra pressures that could not have been foreseen, which will be further looked at in the Section 8.2.4.

Nevertheless, it is the agency's responsibility that the personnel are not given duties that cannot be met by their primary skills and available time. For example, in SEA's water supply team there were four local engineers of whom only two were water engineers. One of these water engineers, Zihno Hurem was entirely responsible for the Tuzla Water Supply Project from 1994 to 1997, while Nedim Mesić was leading two other engineers in the implementation of other water supply projects in the region. There were times that SEA had to deal with more than 20 different projects' planning, procurement and monitoring at the same time. Most of the representatives from the local authorities, who were interviewed by the author, emphasized that diligent efforts made by those local engineers played an important role for the successful implementation of their water supply projects. However in some cases it was pointed out that the technical supervision and monitoring provided by SEA could have been better. It was also during the first phase of the field work in March 1996 that the SEA's local engineers were often complaining about their work load and limited time they had to visit their ongoing projects.

Having assessed both agency and local community's needs and capacities, the implementing agency should start setting objectives for projects. There are several issues in regard to

setting objectives, but two of them are particularly important for the long-term sustainability. The first one is to aim at viable and clear objectives which can be achievable within the existing resources. The second one is the prioritisation of needs, which requires a close consultation between the actors involved in the project.

8.2.2 Setting Objectives for Water Supply Interventions

SEA (1995, 1995a) states that the provision of "...a minimum quantity of 40 litre potable water per person per day to all members of the community within the overall project" is the aim of their water supply projects as far as the water quantity is concerned. As explained in Chapter Four, this is a minimum quantity recommended by UNHCR to satisfy basic water needs for drinking and personal hygiene in emergencies. There is no doubt that it was a well-justified target for those implementations which took place in 1993 and 1994, as they were mainly emergency rehabilitation interventions. However, most of SEA's involvements were more complex than carrying out simple repairs to water supplies.

In the case of Tuzla Water Supply Project for example, the main aim was to provide extra Q=200 l/s water, increasing the total amount of supply going into the town system by almost 50 %. Sead Džambić, Supervisor of Tuzla Vodovod explained that the quantity of water supplied to the system was Q=500 l/s before the implementation of this project, and consequently the quantity of water to be supplied after the project was supposed to be Q=700 l/s (25 March 1998, Tuzla).[1] However, the system's capacity has not been more than Q=650 l/s. Džambić pointed out that the reasons behind this shortage could not be found easily as the new system was not equipped with appropriate measurement apparatus. In March 1998, the Tuzla Vodovod was in the process of investigating the reasons for this loss by carrying out checks from one component to another. The issue of inappropriate technology will be focused on further in Section 8.3.

In order to achieve its aim, the project included various complex implementations as pointed out in Figure 7.13. Although reaching this aim did not mean an increase of 50 % in the length of time that water supplied to consumers, it increased the availability of water for

1 Vodovod: Public Utility Company for Water and Sewage

those who live in the Eastern Tuzla.[2] On the other hand it can be pointed out that this project was achieved, because of the determination given by both the Tuzla Municipality and SEA's personnel. For example, Džemal Murković (27 March 1998, Tuzla), Head of Tuzla Vodovod Investment Department, pointed out that he was paid DM 1,200 for his three year work during the implementation of this project. In terms of timing, the project's implementation experienced serious problems with logistics and security. See Section 9.3.1. Overall, it can be summarized that the Tuzla Water Supply Project was an ambitious initiative considering its scale and timing. It was initiated, because the Tuzla Municipality considered the interest of the international community as an opportunity to ease its protracted water shortage problem, and for SEA , it was a case of establishing their name as an NGO in the region.

On the other hand, it is difficult to claim that SEA set clear and viable objectives for all its involvements. For example, Teoćak Water Supply was initiated without any clear objectives either in terms of water quantity or a time framework for the completion. Rizvan Čalaković (1 April 1998, Teoćak), Secretary for Water Management at the Municipality of Teoćak was clearly surprised when he was asked questions regarding the objective for the quantity of water to be supplied (See questions in the Section 1.1 of the log book in Appendix C). He said that the project had aimed at supplying more water to the settlements in the municipality, but as the budget of the project was known to be inadequate for the completion, a clear objective had not been aimed at during the planning phase. He stated that:

> "SEA's proposal was to bring water from a dam lake which is approximately 4 km from the municipality. When we started the project in 1996 we planned to supply 140 litres per person per day to Teoćak, Snježnica, Bilaliči and Uzunoviči. The materials and equipment provided by SEA were used in the construction of pipeline and one of the reservoirs. I am not sure when we will complete this project, because more money is needed"

Čalaković's reply was a good example of showing the way some of SEA's implementations

2 This part of the town was growing fast as a residential district before the war, and it was also this part of the town that was worst affected by water shortages. The old water system's connection to the distribution subsystem was in central Tuzla and therefore water went from the centre to the surrounding districts. Having a high level of leakage from the central part of distribution system for the reasons explained in Section 7.3.1, the quantity of water supplied to the eastern part of town was inadequate. It was because of this that the new pipeline's connection to the distribution system was made directly at its eastern section to avoid this problem.

had been planned. From SEA's side on the other hand, the author could not be given a satisfactory answer about this project. Nedim Mesić who is not working for SEA any longer, did not think that this project would be ever completed. He considered this involvement as a total failure, but preferred not to make any further elaboration on his claim. Meanwhile, Kemal Bedić claimed that he was not the responsible person during the provision of materials to this project. Therefore he was not in a position to make any detailed comments or supply any written information on this implementation. However, he kindly supplied the author with a diagram of the project as far as he could remember it.

It is clear that SEA was lacking any sense of control for their involvement in Teoćak. This was particularly alarming from the point of accountability which will be explained in Section 9.3.3. There were no clear objectives established, and both sides were aware of the fact that the viability of this project would be very difficult. However SEA went ahead with the provision of materials, as agencies involved in the construction of other components of the project have done. For example according to PIMS (1998), USAID provided DM 56,000 for this project. Considering the figure given by Čalaković in order to complete this project, which was as high as DM 1,8 million, it can be clearly seen that it was an initiative started without any planning and consideration to its achievability.

In regard to the prioritisation of objectives, funding tends to be the main constraint. For example, Graćanica Water Supply provides water for 16 -18 hours a day without going through a treatment plant. Apart from disinfection made by chlorination of water in the water reservoir, the population in Graćanica consume water which is not treated for its chemical and bacteriological qualities. According to Fuad Alić (31 March 1998, Graćanica), the Director of Graćanica Vodovod, although the chemical characteristics of water supplied are satisfactory, the bacteriological ones need to be improved. Alić claimed that the main reason behind proposing the construction of a water reservoir instead of a water treatment plant was the fact that donors would not be interested in supporting an expensive project.

However, the most interesting part about the SEA's involvement in Graćanica was the way its initial objective had been changed by the Graćanica Vodovod. According to the initial planning, SEA agreed to provide materials for the construction of a reservoir with a capacity of V= 500 m^3. However, this capacity was increased to V= 1,400 m^3 by the

Vodovod. The construction of this reservoir has not been completed yet. Alić explained the reason why they had increased the capacity while they did not have adequate funding for the task as follows:

> "For the needs of 15,000 people, a reservoir with 500 m³ capacity would not have been sufficient. We need a capacity of 2,000 m³ to supply water 24 hours a day over the next five years. Anyway, I believe that it will not be a problem to find extra funding to complete this reservoir, because anything which was started to be built, would be completed sooner or later".

Following the preceding discussions, two main reasons can be highlighted for causing ad hoc approaches in the reconstruction process of water supplies. The first one is the way these projects were funded, while the second reason is more in terms of carrying out these implementations without having a holistic perspective.

8.2.3 Holistic Approach for Meeting Objectives

The concept of the holistic approach was explored in Section 4.2, and the investigation in the Tuzla Region showed that the lack of a holistic approach was one of the main reasons why these implementations were not meeting their initial objectives. It was particularly visible where the objectives were to improve water quantity and quality in the settlements concerned. For example as explained in Sections 4.4.2 and 8.2, the international agencies attempt to improve the quantity of water by developing new water sources, or the quality by only implementing a high level of technology for the treatment of water. However, what tends to be neglected very often is the rehabilitation of distribution networks. This is a deficiency particularly important for the Tuzla Region, as the results of interviews in 14 different settlements show that the level of leakage from their distribution networks is usually at least 50 per cent.

For example in Tuzla, assuming an average domestic water consumption of 200 litres per capita per day, the capacity of supply should be at least:[3]

= [120,000 (population) x 200 l/c/d] / [60 (seconds) x 60 (minutes) x 24 (hours)]

= 280 l/s

3 This estimation for the quantity per person per day for Tuzla was confirmed by Džambić (25 March 1998, Tuzla).

After making allowances for industry, commerce, institutions and fire fighting, the total water demand in Tuzla can be estimated to be around Q= 375 l/s. The present capacity which is Q= 650 l/s can therefore be adequate for almost two towns like Tuzla. However, including the factor of leakage into equation, which is around 50%, the demand increases to Q= 750 l/s. In other words, by reducing the leakage from its distribution network Tuzla can gain as much water as if a new source with a capacity as big as the existing supply had been developed.

There is no doubt that the result of preceding calculations should only be taken as approximate figures, as the calculations were based on several estimates such as the level of leakage and population. On the other hand, the preceding equation shows that to increase the quantity of water supplied from the treatment subsystem to the distribution subsystem cannot mean an one-to-one increase in the amount provided to consumers. This is the point where the importance of a holistic approach becomes indispensable for reaching project aims. If water quantity improvement is the aim of the project, the strategy should focus not only on new water source development works, but also on the ways of supplying as much of the existing quantity as possible to consumers. In other words, the reduction in the loss of water from the distribution system can mean an effective way of increasing the quantity of water supplied by the system. The rehabilitation of distribution networks no doubt is also essential for the prevention of water from being polluted. If water quality improvement is the aim of the project, this cannot be ensured by only treating water, no matter how complex technology is used in the process, unless it is ensured that the pollution of water is not caused by breakages in the distribution network.

For example according to Pallant (30 March 1998, Sarajevo), it is very unlikely that water in the Tuzla network does not get polluted through the distribution system, as it had been claimed by the Tuzla Vodovod. Džambic was very clear when he claimed in the interview that water is treated in the new water treatment facilities in Sprećko Polje and its high level of quality is kept until to the point of consumption without any danger of pollution in the distribution network. He (25 March 1998, Tuzla) explained:

> "It is true that we are facing the problems of leakage from the water supply and sewage systems, but the negative suction of polluted water getting back to the water supply is not the case for the network in Tuzla. This is ensured because the Vodovod always keeps the level of water pressure in the town centre low,

while the pressure in the higher ground is kept neutral".

When Pallant was reminded of Džambic's claim, he elaborated his stand as follows:

> "If there is a level of leakage between 40 and 80%, and water can only be supplied four out of 24 hours, then they [The Tuzla Vodovod] cannot ensure that water is really safe for drinking".

In order to bring a clarification to these contradicting claims on the quality of water in Tuzla, the author interviewed Atifa Zamović, Head of Tuzla Vodovod Laboratory for Water Quality Control on 31 March 1998. She confirmed the points made by Džambić in regard to the possibility of water pollution through the distribution network. She stated:

> "I am not sure about the technicalities of keeping pressures at right levels in order to avoid water pollution in the distribution system. However, I can confirm that water supplied in Tuzla is safe for drinking. The main problem we face, is the frequency of closings and openings in the supply. They sometimes cause problems with physical qualities of water, but not pose any danger to public health".

Zamović's explanations regarding their water quality procedure will be further looked at in Section 8.3 where the issue of health considerations will be discussed. However for the contradicting claims between Pallant and Džambić it can be pointed out that Zamović's confirmation is borne in mind in this analysis. The physical, chemical and bacteriological test results for water supplied in Tuzla can also be found in Appendix E. These test results show that water consumed by the population in Tuzla are safe for drinking. On the other hand, this cannot be a justification for the lack of a holistic approach for dealing with water supply problems. For example, the question of why a programme for the leakage detection and, consequently, maintenance work had not been carried out, instead of undertaking a major implementation like the Tuzla Water Supply Project can rightly be asked. This is in fact not only a question of a holistic approach, but also the prioritization of needs.

SEA (1995b) reports that Swedish International Development Agency (SIDA) supplied a leak detector to the Tuzla Vodovod at a cost of 32,000 DM after the request made by the Tuzla Municipality in February 1994. However, the first programme for leakage detection and remedy works was not started before late 1997. According to the SEA (1995c) report, the municipality claimed that there was not a suitable vehicle available for this work, and that they were lacking materials to remedy leaks once detected. There was, however, no

problem with supplying diesel and labour. The proposed budget for this programme, to be expected to take about a year, was reported as 160,000 DM, which is much less than the three million DM spent on the new supply project. In fact, for the sustainability of this project, the use of leak detection and remedy work is indispensable. Therefore, the result could have been more fruitful for the Municipality if they had first concentrated on a project like this.

When Džambić (25 March 1998, Tuzla) was asked to explain why a leak detection programme was not carried out until 1997, his response was not clear and in fact, he was reluctant to explain the Tuzla Vodovod's stand for this problem. Although he claimed that the maintenance works had been carried out even during the war as part of his detailed speech about the long history of the Tuzla Vodovod and its achievements since the Austria-Hungary Empire period, he could not quite explain why the level of leakage in Tuzla is between 50 to 80 per cent. Omer Bešlagić (24 March 1998, Tuzla) from USAID Tuzla explained that his organisation began to take substantial steps for the rehabilitation of the Tuzla water distribution network in 1997. The consultation between the Tuzla municipality and USAID resulted in the preparation of priorities such as some leakage repairs in some particular locations, repairs to bottlenecks and the extension of the system.

The preceding discussion shows that cooperation among local authorities, NGOs and donors is essential to address the problems according to the real needs and priorities of beneficiaries. If similar projects to those which were initiated by USAID in 1997, had begun any earlier, the beneficiaries would have fully enjoyed the benefits of the Tuzla Water Supply Project now. However, the rehabilitation of distribution networks tends to come at the bottom of the local Vodovod's priority lists. From one settlement to another, the author was given similar responses in regard to this issue. They all considered the leakage problem as urgent and the main cause of water shortages experienced, but none of those municipalities in the Tuzla Region that the author visited has initiated any programmes yet in order to reduce the level of leakage. The development of new water sources and the construction of pipelines, pump stations, treatment facilities and reservoirs were the main types of recovery projects implemented in the region. The main two reasons behind this approach can be pointed out as the eagerness of local authorities to utilize the availability of international funding for projects which are costly and will satisfy future water needs, and secondly, the

lack of funding for the rehabilitation of distribution networks.

8.2.4 Praxis of Funding for Water Supply Recovery

The discussions in the previous three sections concluded that the type and conditions of funding as reasons for the problems experienced which prevent water supply implementations from being targeted, holistic and sustainable. In order to elaborate this interaction, this section will look at the type and conditions of funding and the way it causes ad-hoc implementations.

Agencies such as SEA which were involved in the post-war recovery of urban water supplies in the Tuzla Region tend to define the framework of their works according to the availability of funds. It is the case that the objectives of projects are often set not for meeting the needs of beneficiaries fully, but satisfying them as much as possible within the funds available to these type of projects. The implementing agencies are aware of the fact that to carry out a project holistically they will need a much greater amount of money than those funds they can acquire from donors under emergency funds. In fact if the money is available, there are many local and international companies which are technically and organisationally equipped to do these implementations without any problem. However, the implementations of these large scale water supply projects by commercial companies require large budgets which cannot be obtained neither within NGOs nor through donors.

On the other hand, it can also be questioned whether the international community should be considered solely responsible for the recovery of water supplies. How far can the international community be involved in the water supply improvements, and from which point it is the responsibility of local authorities? Although this is an area which also requires some answers for the timing and scale of involvements for different types of donor agencies from ECHO and the UN agencies to the World Bank, the discussion here will focus on the problems caused by current funding policies during the rehabilitation period.

For example, the Tuzla Water Supply Project was funded by ECHO, UNHCR and the

Overseas Development Administration (ODA).[4] These donors, through IMG, provided more than 3,5 million DM for SEA to assist the Tuzla Municipality in the implementation of the project.[5]

According to the agreement between SEA and ECHO, the main procurement was supposed to take place over a six-month period, starting in May 1994. However, the first ECHO payment was not made before 31 October causing SEA a major cash flow problem. Other problems were as follows:

- The works were scheduled as a 15 month construction period, yet SEA had less than seven weeks to process order lists after the Tuzla Municipality and Spreća Company developed sufficient designs to compile them (SEA, 1995c).[6]
- Although SEA requested them to do otherwise, ECHO insisted upon paying through SEA's Edinburgh Office, which had severe time and cost implications. Figure 8.1 summarizes the cash flow from Brussels to Split.

ECHO's funding methods clearly do not fit with normal construction industry cash-flow. It is recommended by SEA (1995c) that: "ECHO would be expected to fund such projects in the same manner as UNHCR or they could adopt a method more similar to that within

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4 ODA has become a ministerial department within the British Government in May 1997, which is now called Department for International Development (DfID).

5 The breakdown of 3,596 million DM spent by the Tuzla Municipality for this project was given by Murković (27 March 1998, Tuzla) as follows:

- Manpower= 1,295 million DM
- Treatment plant= 489,711 DM
- Clearance of site= 36,010 DM
- Rehabilitation of wells= 262,164 DM
- Manpower for the rehabilitation of wells= 38,989 DM
- Other expenses such as documentation, repairing roads and fences, fuel, solving land right matters and transportation of pipes from Split to Tuzla= 676,990 DM

6 According to SEA, in peace time the sequence of events leading up to and covering such a project would probably be:

i. Feasibility study with report to point way forward and start raising finance: 3 months;
ii. Design / cost estimations. More work raising finance: 6 months;
iii. Tender period: Probably more than 1 month;
iv. Evaluate tenders: 2 weeks;
v. Re-evaluate finance: 1 week to 4 months;
vi. Agreement with contractor: 1 month;
vii. Mobilisation of contractor: 1 month;
viii. Construction period: 12 months;
ix. Demobilisation: 1 month;
x. Maintenance period: 1 year;

Total: 25 months to get water flowing.

the construction industry". The criticism made by SEA of ECHO's funding policies is also supported by the author for two main reasons. First, many NGOs like SEA depend on the availability of funds and without consistency of funding for agreed involvements, it is very difficult to survive by their own means. As they are not profit making organisations, they do not have mechanisms to spend money from their own funds when there are problems with the cash-flow from donors. Secondly, the implementation of major programmes such as the Tuzla Water Supply Project requires the continuous flow of large amounts of cash in order to carry out procurement of materials.

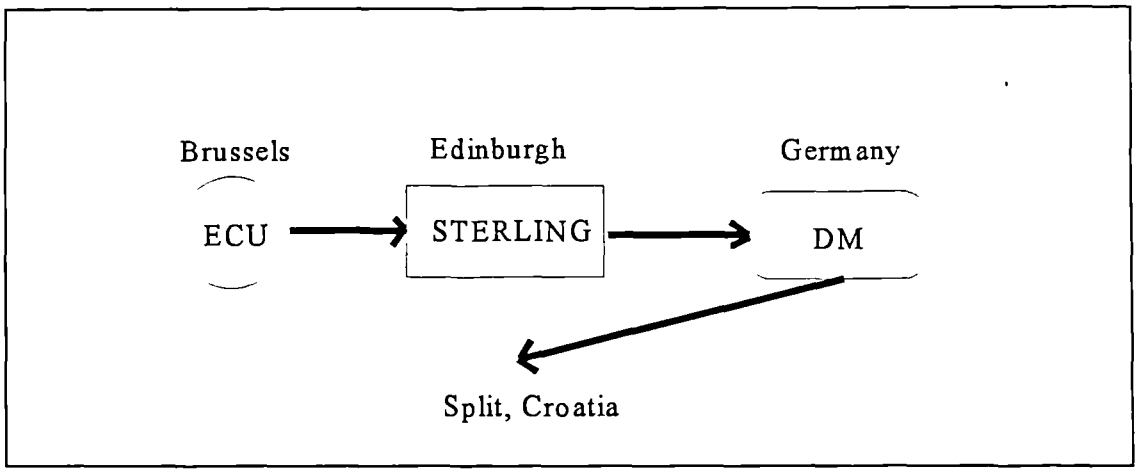

Figure 8.1: *The ECHO's cash-flow from Brussels to Split for the Tuzla Water Supply Project (Source: Author)*

In addition to this, the conditions for the liquidation of funds in short periods also mean extra pressure on the personnel working for NGOs and local authorities and hastily planned implementations. The preceding example in Tuzla, as pointed out in Section 8.2.2, caused great deal of problems with procurement, accounting and meeting deadlines. SEA (1995d) reported:

> "Liquidation of funding deadlines imposed, particularly by ECHO are quite unrealistic for Tuzla Water Supply where significant design is required to be carried out by the beneficiary (Tuzla municipality) who, it transpires, has little funding to commission such work on time. This has resulted in delays within the unrealistic time frame, and then in a sudden tidal wave of orders inundating our Split office which, quite properly, does not carry the staff to meet such a demand. It has not been possible to prioritise order packages or to exert normal [engineering] management controls as orders have gone through the SEA system of tender, leading to placing the order.
> Consequently orders have been processed (although in accord with UNHCR practice) in a haphazard manner, important things like Aeration Plant equipment have been left to last and items of little importance, like Coagulation Plant equipment have been ordered earlier".

In regard to ad-hoc approaches, the ceiling for funding was found to be one of the main reasons why NGOs and local authorities tend to propose different phases or parts of the same project to various donors. It is only this way that they can obtain adequate money for the completion of their interventions. For example, in the case of Tojšići where the population still faces severe water shortages after various assistance provided by different organisations, Enver Agić explained their problems with funding limitations. Agić (24 March 1998, Kalesija), as the responsible person for the Tojšići Water Supply from the Kalesija Municipality, has worked a number of NGOs since 1993. The aim of their project is to provide 5 litres per second of water or for 2 hours a day, to the population of 5,000 people. Apart from SEA's involvement, see Figure 7.26, ICRC and USAID also provided various materials and equipment for the same project with a cost of 150,000 DM and 70,000 DM respectively. Agić stated:

> "It has not been possible to obtain adequate funds to complete this project. The funds received from SEA, ICRC and USAID were always limited. The system in its present conditions is not working effectively because of two reasons; first the pressure that pipes can handle is smaller than the potential pressure in the case of utilizing the borehole fully. SEA asked us to use 10 bar PVC pipes instead of 12 bar in order to fit their proposal to the available funding. Secondly, the limited funding also prevented us from carrying out a project for house connections. To complete the project, we will need further 300,000 DM and the Municipality of Kalesija has not got financial means to carry out a project like this".

On the other hand, Agić's initiatives to get more funding from IMG brought the following response from Hans Ulens, Director of IMG Tuzla Office as follows: "I am not an economist, but a water engineer. Therefore I do not see my responsibility in terms of finding ways to provide more funding for your project". According to Agić (24 March 1998, Kalesija), this response was a big disappointment as the urgency of this project is great and the shortage of water poses a big danger to public health. Although he is fully aware of the fact that the interest of the international community has been a great opportunity to solve the water shortage problem with a history of more than 40 years in Tojšići, the limited funds provided by different organisations meant the implementation of the project on an ad-hoc basis.

Similar complaints about imposing a ceiling for funding were also made by IRC. After the failure of the SEA assisted Simin Han Water Supply Project in producing the expected

water quantity and quality, IMG requested IRC to make a project proposal to improve the system. However, the ceiling of funding at 300,000 DM for IMG Micro-projects allowed IRC to design a project which they can consider as only the first phase. They are aware of the fact that this project will not be able to solve the water problem in Simin Han completely. Juan Aranda (19 March 1998, Tuzla), Field Coordinator of IRC in Tuzla, emphasized that the funding constraints posed by IMG played a decisive role in the way they prepared their proposal for Simin Han. The IRC's view on the limitations of their proposal which was imposed by the IMG funding ceiling will be further looked at in Section 8.4.

8.3 Health Aspects

Health considerations regarding the provision of water in urban areas were presented in Section 4.4 which showed the interaction between water quality and quantity aspects, and water-related infectious diseases. It was pointed out that water quantity consumed for personal hygiene plays as decisive role as the quality standards of water, for the protection of health. For this reason it is necessary that water provided to consumers should be adequate for quantity needs and treated to improve its physical, chemical and bacteriological qualities. On the other hand, the treatment of water and drinking water quality control are complex and expensive procedures which can only be carried out by big and well-established municipalities. There are several reasons for this, but the main ones are the cost of building these facilities and their operation and maintenance, and the need for trained personnel, institutions and legal regulations for successful applications of treatment procedures and safety measures. Having summarized this background information, the first section here will present the current water quantity and quality situations in the Tuzla Region.

8.3.1 Control of Quality of Drinking-Water in the Tuzla Region

A survey carried out by Jusupović and Bešlagić (1998) from the Tuzlanski-podrinjski Cantonal Ministry of Health and the Cantonal Public Health Institute respectively, presented the current situation of water supply and drinking-water quality control in the Tuzla

Region.[7] The following data which are obtained from this survey are presented in Tables 8.1, 8.2 and 8.3. These tables show the service connections to city waterworks, the sanitary-technical state of city water supply networks, and the water treatment plants in the region respectively.

Municipality	Population of the municipality*	Population of the city	Number of inhabitants with connections to city water networks	Percentage of inhabitants with connections to city water networks	Water consumption (litres per inhabitant per day)
Banovići	30,578	6,672	3,000	9.81	50 - 230
Brčko	64,000				
Čelić	20,247	4,647			
Doboj East	11,544		4,500		30
Gračanica	53,848	15,000	17,000	31.57	150
Gradačac	41,311	8,937	8,937	21.63	150
Kalesija	20,234	4,500	5,000	24.71	20
Kladanj	18,229	8,300			
Lukavac	55,064	15,435	15,435	28.03	250
Sapna	9,000				
Srebrenik	42,708	4,700	6,000	14.04	140
Teočak	13,806	6,000**			
Tuzla	150,000	120,000	100,000	66.66	200***
Živinice	69,606	14,197	30,800	44.24	150

Table 8.1: *The number of service connections to city water networks in the Tuzla Region (Source: Jusupović and Bešlagić, 1998:116)*

* *Some of the population figures for municipalities and town centres are different than those were given in Chapter Seven. The reasons for this variations were explained in Section 8.2.1. The population data presented in this table were as on 30 June 1997.*

** *This population was obtained from the interview with Rizvan Čalaković (1 April 1998 Teočak).*

*** *This figure was confirmed by Sead Džambić (25 March 1998, Tuzla).*

The preceding data in Table 8.1 shows that the level of service connection to existing urban water supplies is very low in the Tuzla Region. The Tuzla Municipality has the highest proportion of its population, 67 per cent, connected with the water supply network, while this is as low as 10 per cent in the Municipality of Banovići. However it should be pointed out that the percentages given show the ratio for the number of inhabitants with connection to city water networks in municipalities . It is known from the result of the field work that

7 Fatima Jusupović (M.D., Msc) and Zijad Bešlagić (Prof., PhD) are working for the Tuzlanski-podrinjski Canton Ministry of Health and the Public Health Institute in Tuzla, respectively.

these percentages for the population living in town centres are much higher. For example in Gradačac, Gračanica, Tuzla and Živinice town centres, almost all populations are served with water by town water supply networks. The other important data in the preceding table is the variation of water consumption from one municipality to another. It is over 150 litres per capita per day in major municipalities, but it decreases to 30 litres in Kalesija and in fact it can be observed from the field experience that for those municipalities which are without any data the level of water consumption is also similar to Kalesija.

Municipality	Source	Faulty tapping	Faulty reservoirs	Length of deteriorated water supply network (m)	Percentage of deteriorated water supply network
Banovići	Ground water	Yes	No	10,000	25
Brčko					
Čelić					
Doboj East	Ground water	Yes	Yes	13,000	16
Gračanica	Ground water	Yes	Yes	10,000	57
Gradačac	Surface water			40,000	80
Kalesija	Ground water	Yes	Yes	4,000	
Kladanj	Ground water	Yes	Yes		
Lukavac	Surface and		Yes	5,000	20
Sapna					
Srebrenik	Ground water	Yes	Yes	18,000	51
Teočak	Ground water				
Tuzla	Ground water	No	No	no figures	
Živinice	Ground water			36,000	15

Table 8.2: *Sanitary-technical state of water supply systems in the Tuzla Region (Source: Jusupović and Bešlagić, 1998:116)*

The survey results in Table 8.2 shows that the technical state of water supplies in almost all municipalities is rather alarming. Apart from the Municipality of Tuzla, it seems that all other municipalities have various problems with their water supply systems as roughly pointed out in terms of faulty tapping and reservoirs. However, what is shown very strongly by these data in Table 8.2 is that the state of distribution networks in the region is very poor. The level of deterioration in Kalesija for example is as high as 80 per cent. Therefore it is not surprising to see that almost all water distribution networks in the region experience a leakage level at least 40 to 50 per cent.

Municipality	Sedimentation facilities	Filtration facilities	Disinfection facilities
Banovići			Hypochlorinators,
Brčko			
Čelić			
Doboj East			Chlorinator
Gračanica			Chlorinator
Gradačac	Yes	Yes	Chlorinator
Kalesija			
Kladanj			
Lukavac	System of sedimentation by	Sand filters	Chlorinator
Sapna			
Srebrenik			Chlorine
Teočak			
Tuzla	Treatment conducted	completely	
Živinice	Treatment conducted	completely	

Table 8.3: *The state of water treatment facilities in the Tuzla Region (Source: Jusupović and Bešlagić, 1998:117)*

The data in Table 8.3 for the presence of water treatment facilities in the region shows that apart from Tuzla and Živinice, the main type of treatment for other settlements is chlorination. However it should be noted that although it seems to be for the whole municipality, the information presented regarding treatment facilities is for the town centres in each municipality. Therefore the real state of treatment facilities for those who do not live in urban centres is much worse, as they are supplied with water directly from the source. The inhabitants who are not connected to a water supply obtain their water from local supply sources and private water facilities such as garden wells.

Having seen the general water situation in terms of the level of connection to supply networks, the technical state of systems and the existence of treatment facilities in the Tuzla Region, this section will now focus on the results of chemical and microbiological tests which were carried out by Jusupović and Bešlagić (1998) as part of their water quality survey. Chemical and microbiological tests were carried out in six different centres which are the Cantonal Public Health Institute, the Institute of Microbiology in Tuzla and Health Centres in Gradačac, Gračanica, Lukavac and Srebrenik. For the chemical control of water

quality, the survey includes 159 samples and the results were given according to municipalities in Table 8.4. Meanwhile the results of 879 microbiological tests can be found as divided according to the test centres in Table 8.5.

Municipality	No. of tested samples	No. of unacceptable results
Banovići	12	1
Brčko	2	2
Čelić	2	0
Doboj East	3	2
Gračanica	2	0
Gradačac	7	2
Kalesija	12	3
Kladanj	3	0
Lukavac	1	1
Sapna	1	1
Srebrenik	36	0
Teočak	0	0
Tuzla	51	18
Živinice	27	9
TOTAL	**159**	**39**

Table 8.4: *The results of chemical analysis for water quality which was carried out in the Tuzla Region in 1997 (Source: Jusupović and Bešlagić, 1998:117)*

Considering these 36 unacceptable samples out of 159, it can be seen that almost 25 per cent of samples analysed gave positive results. In other words, a quarter of samples were found chemically unacceptable for drinking purposes. The situation for bacteriological qualities of water in the Tuzla Region, on the other hand, was worse than chemical ones, as can be seen in the following Table 8.5. The results of microbiological tests showed that 37 per cent of samples checked were bacteriologically unacceptable for drinking.

Institution performed the analysis	Number of analysed samples	Number of positive results	Percentage of positive results (%)
Public Health Institute	97	44	45
Inst. for Microbiology	183	69	38
Gračanica Health Centre	65	23	35
Srebrenik Health Centre	196	4	2
Lukavac Health Centre	49	16	33
Gradačac Health Centre	289	165	57
TOTAL	**879**	**321**	**37**

Table 8.5: *The results of microbiological tests which were carried out in the Tuzla Region in 1997 (Source: Jusupović and Bešlagić, 1998:118)*

Having examined the results of chemical and microbiological tests of water quality control, it can be pointed out that the quality standards for drinking water in the Tuzla Region need to be improved urgently. The present state of most of water supplies in the region can be identified as hazardous to public health. Water treatment facilities, or at least chlorinators, are needed for all urban supplies in the region in order to improve chemical qualities and reduce the level of bacteriological pollution. However, the context of water quality improvements should not only be considered from a perspective which is limited to the provision of physical facilities and the establishment of a better quality control system. The context of this challenge, in fact, includes much wider areas such as the enhancement of legal regulations for water use and quality control measures, and the development of institutions in terms of better equipment and trained personnel. These preceding issues will be looked at further in appropriate sections in this and the following chapters. On the other hand, before moving to the next section, presenting the issue of water-related diseases in the Tuzla Region, Atifa Zaimović's experience regarding the control of free residual chlorine in the distribution network as a means of water quality control in Tuzla will be presented here.[8]

Zaimović (1998:114) explains that the testing of free residual chlorine which needs to be between 0.2 and 0.5 mg/l, should be done in all parts of the distribution network in order to produce reliable information regarding the quality of water. However, this tends to be a

8 The concept of free residual chlorine in water supplies was explained in Section 4.4.2.

difficult challenge for a big network like Tuzla's, as it has many branches and covers a large area. To ensure that there is enough free residual chlorine at the terminal points, it is sometimes necessary to use extra chlorine, in reservoirs for example. The other important issue is the need to carry out these analyses in situ instead of in a laboratory, as chlorine evaporates during the period from sampling to testing. If these tests are carried out in a laboratory, then this possibility should be borne in mind in the interpretation of results. In regard to the risk of secondary contamination through the Tuzla Distribution Network for the reasons explained in Sections 7.3.1 and 8.2.3, the following precautions are taken:

> "In order to lessen the risks, in the city centre, where the sinking ground phenomenon is most pronounced, we keep the waterworks network under lower pressure, continually monitoring the residual chlorine.
> Apart from that, as [a] preventive measure for securing the appropriate level of residual chlorine in the network, we keep in readiness in our city reservoirs the previously prepared quantities of chlorine ('kaporit') for additional or emergency dosing".

In discharging the responsibility for controlling water quality in the area covered only by the Tuzla Water Supply Network, Zaimović's (31 March 1998, Tuzla) laboratory carries out chemical and bacteriological tests on samples from the Stupari source once a week, in addition to testing 5 -10 samples everyday from the distribution network and 7 samples every month from public health services. The laboratory employs one chemical engineer, two chemical technicians, one sanitary technician and one laboratory technician. This structure should be viewed in the light of the fact that the Tuzla Vodovod is the most established local water board in this region. This is what can be achieved within their capacities, which are much better than other municipalities. Therefore two important points should be taken into account here. Firstly, the responsibility area of the Tuzla Vodovod Laboratory for Water Quality Control covers only the area served by the Tuzla Waterworks, which leaves out a large part of the municipality. Secondly, the laboratory still uses a portable Oxfam laboratory kit which was donated by UNICEF during the war in order to carry out the preceding tests. These portable laboratories were also donated to other municipalities in the region, and played an important role in the monitoring of water quality in these settlements.[9] The photograph in Figure 8.2 shows Rasima Novalić who is the

9 These municipalities which were donated with a portable Oxfam laboratory by UNICEF in the Tuzla Region are: Banovići, Brčko, Doboj East, Gradačac, Kalesija, Lukavac, Sapna, Tuzla, Živinice (Jusupović and Bešlagić, 1998:118).

engineer responsible for the operation of Gradačac Water Treatment Plant, carrying out water quality tests with the equipment donated by UNICEF.

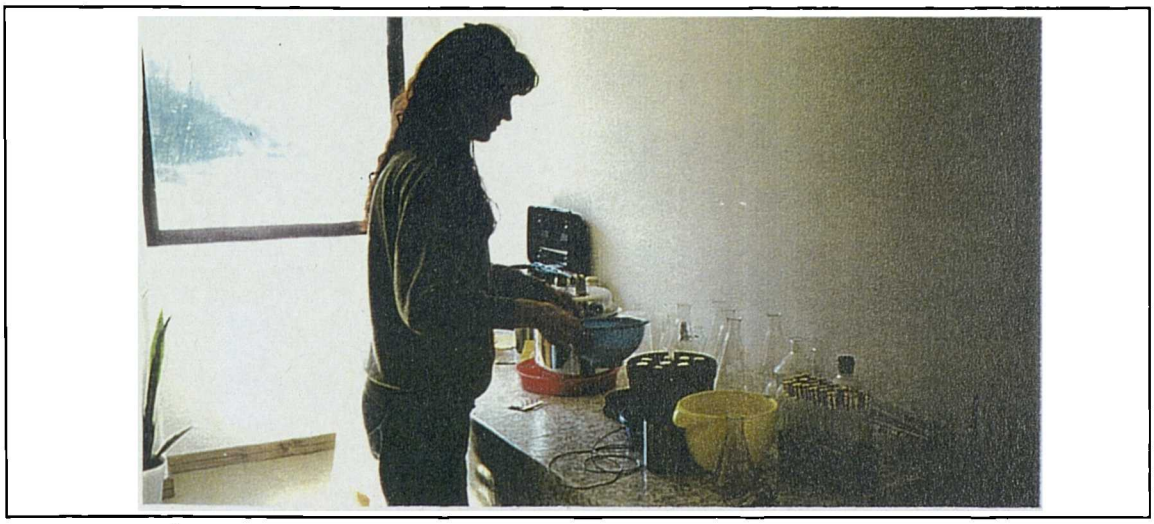

Figure 8.2: *Carrying out water quality tests in Gradačac. The equipment was donated by UNICEF (Source: Author)*

Therefore it is clear that the provisions for chemical and bacteriological controls for drinking water in the Tuzla Region are not satisfactory. Many settlements are excluded from the umbrella of water quality controls met by the major central municipalities. Considering that in most of these settlements the main sources of water are from private facilities such as garden wells, the scale and urgency of the water quality problem in the region can be realized clearly.

8.3.2 Water-related Infectious Diseases in the Tuzla Region

The war in Bosnia and Herzegovina had serious impacts on the health of the population because of deterioration of environmental and living conditions, malnutrition and destruction of health facilities. Communicable diseases, especially among refugees and internally displaced people, have shown a big increase all over the country. For example, the result of a medical survey upon the arrival of 4,200 displaced people from Srebrenica, in the Tuzla Region showed that 72 % of children had malnutrition, 42 % of them suffered from anaemia, 40 % had an upper respiratory tract infection, 31 % had a skin disease, 17 % suffered from diarrhoea and 17 % had bronchitis (Ministry of Health, 1996).[10]

10 This document was prepared by the Federation of Bosnia and Herzegovina Ministry of Health with assistance of WHO.

The Cantonal Public Health Institute in Tuzla (1995) prepared a report on the health situation in several municipalities in the region. The data provided in this report covers the period from 1991 to 1994, where 1991 and early 1992 figures represent the pre-war situation while 1993 and 1994 figures are for war time.[11] These data are presented in Tables 8.6 and 8.7, the first of which shows cases registered at the Cantonal Public Health Institute, while the second one is at the Tuzla Town Out-patient Clinic.

		Tuzla	Srebrenik	Lukavac	Živinice
Dysentery Bacilli.	1991	3	-	4	-
	1992	15	-	1	6
	1993	58	1	-	2
	1994	11	-	1	3
Enterocolitis Acute	1991	32	7	9	9
	1992	125	21	10	62
	1993	215	29	16	42
	1994	138	8	6	18
Hepatises A and B	1991	31	4	16	17
	1992	22	10	2	3
	1993	21	21	4	7
	1994	59	31	23	60
Salmonellosis	1991	43	6	16	15
	1992	29	1	2	4
	1993	1	-	-	-
	1994	5	-	1	-

Table 8.6: *Four major diseases registered at the Cantonal Public Health Institute in four municipalities of the Tuzla Region*
(Source: The Cantonal Public Health Institute, 1995)

Dysentery Bacilli.				Enterocolitis Acute				Hepatises A and B				Salmonellosis			
91	92	93	94	91	92	93	94	91	92	93	94	91	92	93	94
-	71	73	9	-	236	297	162	-	32	333	438	-	26	2	4

Table 8.7: *Four major diseases registered at the Tuzla Town Out-patient Clinic for the Municipality of Tuzla only (Source: The Cantonal Public Health Institute, 1995)*

It should be noted that those figures provided by the Cantonal Public Health Institute are

11 The war affected the Tuzla Region starting from April / May 1992.

much lower than those by the Out-patient Clinic in Tuzla. The reasons for this can be first, the difficulties of compiling information during the war, and second, the Institute had received its figures from the Tuzla General Hospital only, while those cases which are treated in the clinics may not have been sent to them. Therefore it can be claimed that the real state of these four major diseases had been in fact much worse in those four municipalities during the given period.

Having investigated the state of some major diseases registered in four municipalities of the region between 1991 and 1994, the section will now present the result of a survey on the bacteriological safety of waters in the territories of the Municipality of Tuzla which are not covered by the Tuzla Town Water Supply. The survey was carried out using the Oxfam's E-coli counting method by the Tuzla Health Centre in 1997 (See Section 4.4.2 for further information on E-Coli). This survey was particularly important to show the scale of the health problem for approximately 30 per cent of the population who are not connected to a town water supply in the Tuzla Municipality. As pointed out in the previous section, Mehinović (1998:95) stated:

> "The control of quality of water from water supply facilities which are outside of the city waterworks system is performed mostly by no one, except in epidemiologically indicated situations".

Some of the results from the Tuzla Health Centre Survey are presented in Tables 8.8, 8.9 and 8.10 as follow:

Type of Water Facility	No. of Samples	No. of Positive Results	Percentage of Positive Results (%)
City waterworks	9	1	11
Community local waterworks	4	2	50
Local waterworks	38	25	66
Tapped source	45	31	69
Public fountain	14	5	36
Well (above 5 households)	153	129	85
Artesian well	1	1	100
Cisterns	2	2	100
TOTAL:	**266**	**196**	**74**

Table 8.8: *Results of bacteriological survey of water according to type of facilities in the Municipality of Tuzla (Source: Mehinović, 1998:96)*

The preceding findings with a rate of 74 % for positive test results shows that the bacteriological contamination of water in the Municipality of Tuzla poses a high level of danger to public health for possible epidemics of infectious diseases.

Percentage of Positive Test Results	Number of Escherichia-coli Colonies in 100 ml of Water		
	1-50	51-200	Countless
	52 %	17 %	31 %

Table 8.9: *The percentage of positive test results according to the number of E-coli colonies (Source: Mehinović, 1998:96)*

Remembering UNICEF's thresholds in Table 4.3 which identify water with more than 10 E-coli colonies in 100 ml as polluted, it can be pointed out that the degree of contamination of water in these positive test results is far too dangerous and in excess of acceptable levels. Considering the high percentage of E-coli of faecal origin in water, it is not surprising to see that there were many incidences of intestinal infectious diseases registered in the Municipality of Tuzla during the period when this survey was carried out. The data in Table 8.10 shows these diseases according to settlements in the municipality.

Settlement	Enterocolitis	Hepatises	Dysentery	Salmonellosis	Intoxic. Alim.
Central part of the city	137	7	2	31	29
Solina	13	-	-	-	2
Simin Han	25	1	-	-	2
Gornja Tuzla	5	-	-	-	2
Kiseljak	4	-	-	5	2
Lipnice	3	1	-	2	-
Mramor	9	-	-	-	3
Pasci	5	-	-	1	-
Ljubače	1	-	-	1	1
Obodnice	2	-	-	2	1
Slavinovići	4	1	-	2	3
Mihatovići	4	-	-	-	1
Dokanj	1	-	-	-	-

Table 8.10: *Incidence of intestinal infectious diseases in the Municipality of Tuzla in the period of water control in 1997 (Source: Mehinović, 1998:96)*

The presence of the above mentioned faecal-oral diseases (water borne and water washed) in the territory of the Tuzla Municipality show that water in settlements which are not covered by the town water supply is exposed to a high risk of faecal contamination. Following this, it can be pointed out that water in these settlements is not safe for drinking purposes because of bacteriological contamination. On the other hand, the presence of these intestinal infectious diseases in the central part of Tuzla should not also be overlooked (Mehinović, 1998). Although it is claimed by Zaimović and Džambić that the bacteriological contamination of water in the Tuzla Water Supply does not occur, the result of this survey carried out by Mehinović shows that it may in fact be a possibility. It should be pointed out that the number of these water-related infectious diseases should be considered in the context of that particular settlement's population. For example, 28 incidences in Simin Han with a population of 8,000 means a ratio of 35 incidence per 10,000 people, while there are 17 incidences per 10,000 in Tuzla.[12] However these figures should not be overlooked by those who are responsible with the management of the Tuzla Water Supply and the control of water quality in Tuzla.

8.4 Technological Appropriateness

The context of technical criteria for post-war recovery of urban water supplies was investigated in Section 4.3, which identified several criteria in order to draw up the framework of this issue. Some of these criteria were regarding the compatibility and hydraulic suitability of pumps, while the others were on more general concepts such as durability, simplicity and maintenance requirements. Bearing in mind these criteria during the field work, some lessons were derived from the experience of SEA and other international agencies in the Tuzla Region. The questions in Sections 1.6 and 1.7 of the log book were utilized as tools to investigate experience in the region. However it should be pointed out that the context of technological appropriateness is very wide and it requires a comprehensive team work incorporating various specialists such as mechanical and urban water supply engineers. Therefore it was not possible in the scope of this research to carry out such a technical evaluation on each project. Nevertheless, the following lessons were

12 The calculation is based on 206 incidence of intestinal infectious diseases for a population of 120,000 in Tuzla.

identified in terms of technological appropriateness:

- Technology transfers need to be appropriate to local environment, and carried out by an approach which incorporates a good level of local participation.
- Choice of technology tends to be affected by the origin of funding and the conditions set by donors and investors.
- Local authorities consider the most advanced technology as the best option for their projects without adequate consideration to their long term maintenance.
- The capacity of local authorities in terms of personnel and skills needs to be assessed for a successful implementation of the project and its long term operation.
- In the event of a technology transfer, it is necessary to support local authorities with possible problems that they may encounter during the operation and maintenance.

In order to elaborate the preceding lessons, the analysis of the field work here will need to focus on some water supply implementations in the Tuzla Region. The first example is from Tojšići where the involvements of SEA, USAID and ICRC in the construction of a water supply have so far not produced any substantial improvements.[13]

The project included the drilling of a 38 m deep borehole and the construction of pipeline from the pump station to the water reservoir in the town. The borehole was located and drilled without any preliminary investigation into the quality of water, by Norwegian Refugee Council (NRC) with a cost of 30,000 DM at the beginning of 1996. It was later confirmed by JVP Spreča Tuzla Company during their investigation works for finding new water sources for Kalesija that water from this borehole was, luckily, acceptable in terms of its chemical and bacteriological qualities. However, the mistakes made during the down-the-hole (DTH) hammer drilling process have had really serious impacts on the efficiency of the borehole.[14] For example, the diameter of the borehole, θ= 200 mm, was not large enough to accommodate a submersible pump which could supply the necessary discharge. The anticipated discharge from this borehole was 9.5 l/s, though this could have been increased to 15 l/s. The photograph in Figure 8.3 shows the borehole and pumping station of Tojšići Water Supply.

Considering recommended diameters of boreholes for different pumping rates by Davis and

13 The information in this examples was obtained from the interview with Agić (Tojšići, 24 March 1998).

14 This drilling was chosen because of the site of the borehole which consisted of hard rock formations.

Lambert (1995:268), for an anticipated pumping rate between 5 l/s and 10 l/s the optimum internal diameter of borehole casing should be at least 200 mm. If, however, the anticipated pumping rate is between 10 l/s and 22 l/s the diameter of borehole casing needs to be at least 250 mm. In addition to this, as an analysis on the aquifer strata was not carried out the length, diameter and openings of borehole screens were chosen approximately.[15] As a result of this, screens used in this borehole were not appropriate for the hydraulic qualities of aquifer strata. It was because of these shortcomings that the productivity of this borehole was less than the anticipated quantity. They may cause quick wearing out of the borehole, and also its abandonment.

Figure 8.3: *The Tojšići Water Supply's borehole and pumping station (Enver Agić is standing on the borehole) (Source: Author)*

In regard to the pipeline, similar mistakes were repeated with the choice of equipment and materials. The pipeline which is 5,584 m long was constructed by using PVC pipes. For the first five kilometres the pipes had a diameter of 110 mm with 10 bar pressure capacity, while the rest of the pipeline had 90 mm pipes with the same pressure capacity. Considering the length of the pipeline, and the elevation difference of 92 m between the pumping station and the reservoir, the choice of diameter for pipes and their pressure capacity had a limiting factor for the selection of pump size. Consequently it is very likely that even at regular

15 These characteristics of screens play a significant role in the yield to be received from boreholes.

capacity of pumping the pipeline will be damaged.

These are the two main reasons why this supply for Tojšići cannot be put in function, while the population of 5,000 people obtain their water from private wells which are highly exposed to bacteriological contamination as explained in the previous section. Similar mistakes were also repeated during the implementation of Simin Han Water Supply Project which resulted in one of the worst failures of SEA in the Tuzla Region. The photograph in Figure 8.4 shows a local woman in Tojšići obtaining water from her garden well.

Figure 8.4: *A local woman in Tojšići is obtaining water from her garden well (Source: Author)*

Simin Han which is in the eastern part of the Municipality of Tuzla is an administrative area, covering the settlements of Simin Han, Gornji Čaklovići, Donji Čaklovići, Kovacevo Selo and Pozarnica. As it is only 5 km from Tuzla, it is considered as a suburb of Tuzla. Simin Han was connected to the Tuzla Water Network before the war, though the availability and reliability of water used to be varied because of water shortages in Tuzla itself. The war has not only changed ethnic mixture of these settlements, but also provided a possibility for Simin Han to construct its own system.

The pre-war mixed population in Simin Han and the Serb majority in Gornji Čaklovići,

Kovacevo Selo and Pozarnica were drastically changed after most Serbs fled and were replaced by those Muslims who were displaced from Eastern Bosnia. The events such as the fall of Srebrenica and the ineffectiveness of Dutch soldiers in the protection of these civilians played a significant role in the way Dutch Government has become involved in many projects for the benefit of these displaced persons from Srebrenica in the Tuzla Region. Therefore it would not be an exaggeration that the existence of a Dutch UNPROFOR battalion in Simin Han was an important reason for the Dutch Government's 500,000 DM donation for a water supply reconstruction programme there.

The design for the implementation was done by a local designing office and the implementation was carried out by SEA through local contractors after two agreements which were signed between SEA and Stichting Vluchteling (SV), and SEA and the Tuzla Municipality in mid-December 1995. The main reconstruction items can be seen in Figure 7.15, but the report prepared by the commission responsible for the technical survey and handling over shows that they could not issue the Permission of Use for the following reasons:[16]

- The water in-take at the Kovaciva stream is located down-stream in an area of high pollution and was poorly constructed.
- The water treatment plant is in an inappropriate location which is too close to the Pozarnicka Rijeka stream, and was not completed.
- The 100 m^3 water reservoir in Donji Čaklovići was not completed.
- The capacity of some new water pumps is not adequate.
- Two existing pump stations are damaged and not functioning.
- The Pozarnica and Vasici water reservoirs are damaged, and the hydromechanical equipment is missing or not functioning.
- The pipelines are damaged and some sections in Pozarnica and Donji Čaklovići are missing.

The photographs in Figure 8.5 and 8.6 show the uncompleted water in-take and pumping station facilities of Simin Han Water Supply respectively.

16 The report which is entitled "Izvještaj O Internon Tehničkom Pregledu Sistema Vodosnadjevanja U Naselju Simin Han, Čaklovići": Report of Internal Technical Inspection of Water Supply System in Settlements Simin Han, Čaklovići, was obtained from Sead Džambić, Tuzla Vodovod.

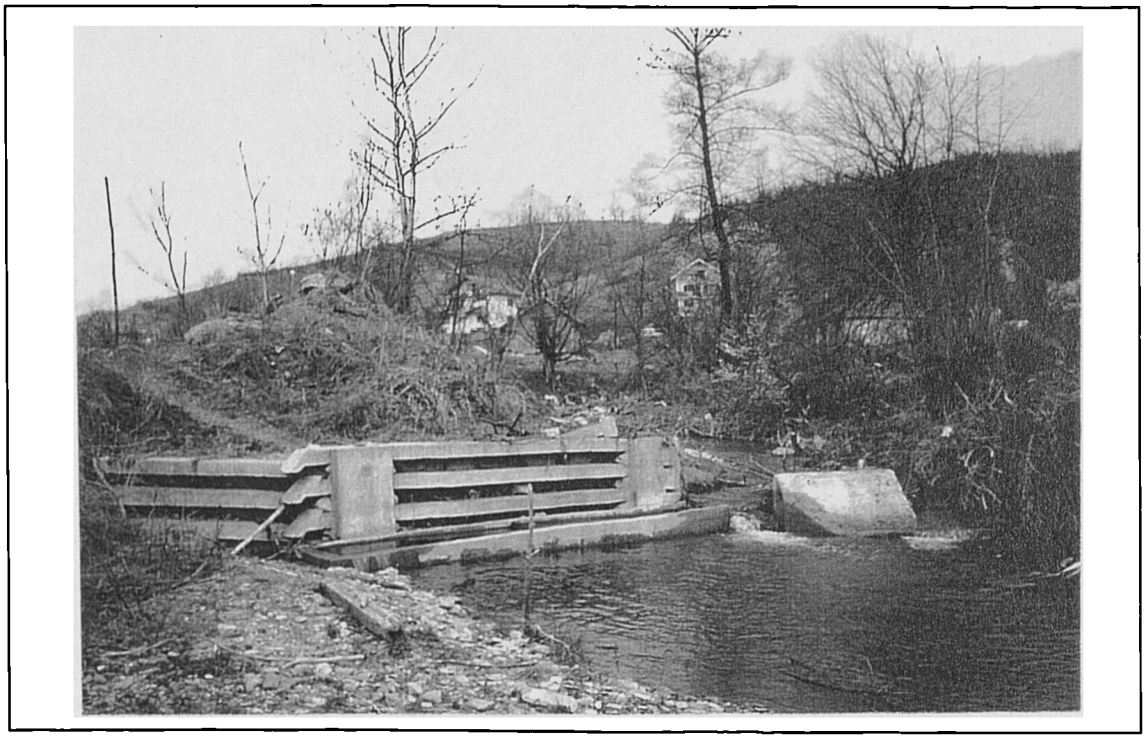

Figure 8.5: *The water-intake of Simin Han Water Supply (Source: Author)*

Figure 8.6: *The pumping station of Simin Han Water Supply (Source: Author)*

The author's field work tried to find out the main reason behind the failure of Simin Han project. The Tuzla Municipality and SEA had completely different explanations, but mainly emphasized the other side's incompetence and unwillingness to cooperate as a reason for

the failure. However, it seemed that the direct involvement of SEA with the local authority in Simin Han which did not possess adequate technical and organisational capacities for a project like this, was the main reason. The Tuzla Municipality's refusal to become involved in this project was a crucial point which it was hoped would shed some light on this issue. The interview with Safet Husanović (31 March 1998, Tuzla) put the whole blame on SEA's wrong policy for not involving the municipality in the implementation of this project. However, he was reluctant to explain why this happened in Simin Han, but not in Mramor for example, which was also connected to the Tuzla Water Network before the war.

Furthermore, an engineer from the Tuzla Vodovod, who asked to remain anonymous, explained that the Director of Vodovod in Tuzla wished the funding for Simin Han to be provided to his organisation directly without any involvement of SEA. When this request was rejected by the funder of the project, the Tuzla Vodovod refused to provide technical assistance to the local authority in Simin Han during the implementation.

Pallant (30 March 1998, Sarajevo) also explained that the Simin Han project was one of the main items of the 1995 budget, and after the refusal of the Municipality SEA made everything possible for a successful implementation. He criticized the attitude of the Municipality for naming SEA as the only reason for the failure in Simin Han. He pointed out that the design of the project was done according to conditions existing at that time. For example according to Bedić (3 April 1998, Tuzla), it was not possible to locate the water in-take 1,000 m upstream as pointed out by the Tuzla Vodovod's Permission of Use Report, because the heavily mined frontline would have been too close to the intake in that case. It is also interesting that this explanation was not given by Muhamed Kajlajović, Community Leader in Simin Han (3 April 1998, Simin Han). He seemed to find himself in a rather difficult position, because the direct involvement of his local authority in this project resulted in a failure, and now he needs the cooperation of the Tuzla Vodovod for the completion of this project. Therefore this could have been one of the reasons why he was trying to be seen as siding with the Municipality in Tuzla.

After the technical assessment of the system by the same designing company which was appointed by the Tuzla Municipality, various improvements such as the completion of the recently constructed water supply facilities and further repairs were proposed in order to

complete the project to produce a safe and adequate quantity of water for Simin Han.[17] However, because of the funding constraints as explained in Section 8.2.4, IRC's proposal was limited to improvements from 1 to 8 (See Footnote 15). The water supply improvements in Pozarnica and Vasici were not included in the IRC's proposal (1997), because of two reasons:

> "Firstly, these locations are still mined and since there are no original residents to provide necessary information about the water system...Secondly, the proposed budget would exceed the 300,000 DM limit on IMG Micro-projects if improvements to these locations are included".

The IRC's estimated budget for this proposal is 296,443 DM and aims at providing "...adequate water to the majority [of] residents...", and protecting "...these facilities from further deterioration to create pre-conditions for future improvements to the water system" (IRC, 1997). The interpretation of the IRC is an attempt to overcome the technical shortcomings of the project in Simin Han. However, the benefits of this project will still not be fully enjoyed by the local community because of the preceding constraints. In short, the SEA's involvement with a weak local authority and not being able to compensate this by a strict monitoring (See Section 9.4.1) resulted in a failure, but the alleviation of this by a new intervention unfortunately does not promise a full recovery of the system. On the other hand, technology transfer is not only a problem in cases like Simin Han where the local authority does not have strong technical and administrative institutions, but also in places like Tuzla, though it may appear in a completely different way. The collapse of the previous socialist regime, and the war, started the process of social, economic and political change. Consequently, this is likely to make some administrative and technical professionals in the

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17 The improvements proposed can be listed as follow (IRC Simin Han Water Supply System Project Proposal, 1997):

1. The relocating the water in-take to a higher location and out of the area of pollution.
2. The installation of feeding pipeline from the in-take to the existing water treatment facility.
3. The completion of the recently constructed water treatment plant.
4. The installation of pressure pipeline from the water treatment plant to the existing distribution pipeline for Pozarnica and Simin Han.
5. The fortification of the Pozarnicka Rijeka River bed section next to the water treatment plant.
6. The completion of the 100 m^3 water reservoir in Donji Čaklovići.
7. The renovation of the two existing pump stations in Simin Han.
8. The completion of the recently constructed break tanks.
9. The repair of some water pumps and installations of new ones.
10. The repair of the water reservoirs in Pozarnica and Vasici.
11. The repair of the pump stations in Pozarnica and Vasici.
12. The repair of the existing distribution network and house hook-ups in Pozarnica and Gornji Čaklovići.

region prone to choosing inappropriate technologies. The idea of the 'more advanced the technology, the better it is for the future' was observed quite frequently at the interviews with the authorities and SEA's engineers in Tuzla. The tendency for setting up equipment and using methods which are technologically the most advanced, can cause:

- Wastage of valuable financial resources;
- Operational problems, because of inadequate power supplies;
- Maintenance problems, because of the lack of spares and funds.

For example, the treatment of cascade aeration was recommended after tests were carried out by the Institute of Hydro-engineering of the Civil Engineering Department of Sarajevo University in 1992.[18] This view was also supported by SEA; however, 'the Tuzla Municipality preferred the treatment of sprinkler aeration as it is more advanced - but relevantly more expensive.[19] According to SEA, the Municipality insisted on going ahead with their preference of sprinkler aeration and there was little SEA could do about it but to monitor the design. The photograph in Figure 8.7 shows the Tuzla Water Supply's sprinkler aeration facility.

The author's attempts to find out the reasons behind the Municipality's preference resulted in the following findings. Džambić (25 March 1998, Tuzla) claimed that the preference for sprinkler aeration did not cause any disagreements between them and SEA as far as he could remember. According to Husanović (31 March 1998, Tuzla), the reason why the municipality insisted on the preference of sprinkler aeration method was to ensure the long-term maintenance of the system. He thought that as the Tuzla Vodovod was the responsible institution for the sustainability of the system, then it was quite natural that their choice of technology was implemented.

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18 **Cascade Aerators:** The simplest type of free-fall aerators, which are widely used because of the following reasons: they take large quantities of water at low head, are easy to keep clean, and they can be made of robust and durable materials giving a long life. Reduction of CO content is usually in the range of 50 % to 60 % (Tworth, et al., 1994).

19 **Spray Aerators:** These work on the principle of dividing the water flow into fine streams and small droplets which come into intimate contact with the air in their trajectory. They require up to 10 m head of water and a large water collection area. Although 70 % removal CO content can be obtained with the best type of spray nozzles, the sprays require protection from wind and freezing (Tworth, et al., 1994).

Figure 8.7: *The Tuzla Water Supply's sprinkler aeration plant (Source: Author)*

On the other hand Pallant's (30 March 1998, Sarajevo) account for the choice of technology was quite different. He explained that the original design was based on the laboratory tests, and the recommendation made by the University of Sarajevo was the design of a cascade aeration plant. However according to him, the experts at the university had changed their mind after receiving pressure from Tuzla. Pallant insisted that a cascade aeration could have been a better choice for Tuzla because it requires less maintenance than sprinkler aeration plants do. There were huge disagreements over the choice of technology at that time, and it severely damaged the working relationship between SEA and the municipality. During a visit to the treatment facilities in Sprečko Polje, Tomić (22 March 1998, Sprečko Polje) was questioned regarding maintenance problems with their aeration plant. He confirmed that they have not had any problems with maintenance, and the high level of iron in the water has not been a problem by blocking aeration nozzles as was feared initially by SEA.

The other major disagreement over the choice of technology during the implementation of Tuzla Water Supply Project was experienced with the choice of filters. Pallant (30 March 1998, Sarajevo) indicated that he found the Tuzla Vodovod's insistence on choosing filters supplied by a certain company in Tuzla instead of obtaining them from a Slovenian company, using Dutch technology, a little bit suspicious. He did not wish to elaborate this

in detail, but he was claiming that there could be some kind of mutual beneficial agreement between this particular company and the Tuzla Vodovod. Murković's (27 March 1998, Tuzla) account claimed the contrary. He stated that SEA was not quick enough to come up with a suggestion for the decision on building some parts of filters in Tuzla. The crucial point with these filters was the extent of the pressure which was known to be very high as water head was 280 m and the planned capacity was 200 l/s. According to Murković, the Tuzla Vodovod finally went ahead with the production of these filtration equipment in Tuzla; they have been in good order so far.

The main technological shortcoming of the Tuzla Water Supply implementation was identified by Džambić (25 March 1998, Tuzla) and Tomić (2 April 1998, Tuzla) as the lack of flow measurement apparatus which was not installed at each phase of water collection and treatment phases because of financial constraints in the budget. It was as a result of this that the Tuzla Vodovod was not able to identify the reason why there is a shortage of 50 l/s as explained in Section 8.2.1. Džambić explained that the process of finding out where this shortage occurs would require inspecting had to go through the whole system from one component to another and implementing individual measurement of flows in order to find the faulty section. It was pointed out that the initial saving from the budget by not installing these pieces of apparatus resulted in more expensive operation and maintenance problems.

The choice of technology was also made according to the origin of funding, which is a particularly relevant issue for those projects funded by low interest rate credits. For example, the Tuzla Municipality's current proposal to ease the water shortage problem is a project taking water from the Lake Modrać and supplying it after its treatment by using facilities at the Tuzla Thermoelectric Plant. The Tuzla Municipality has in fact got two versions of the same project. The first version aims at the construction of a treatment plant near to the Modrać Dam and transporting water after its treatment, not only to Tuzla, but also to other municipalities such as Lukavac, Živinice and Kalesija. However the funding is the main obstacle for the implementation of this project, as it is estimated to be around 40 million DM. The second option includes the use of existing pipeline for the Thermoelectric Plant and the treatment of water by some of the existing facilities at the Plant to produce a quantity of 250 l/s for Tuzla. After the treatment, water will be transported to the town by a 4 km new pipeline. This option is more achievable as it is estimated to cost

around 13 million DM. The diagram in Figure 8.8 shows the plan of this proposed project.

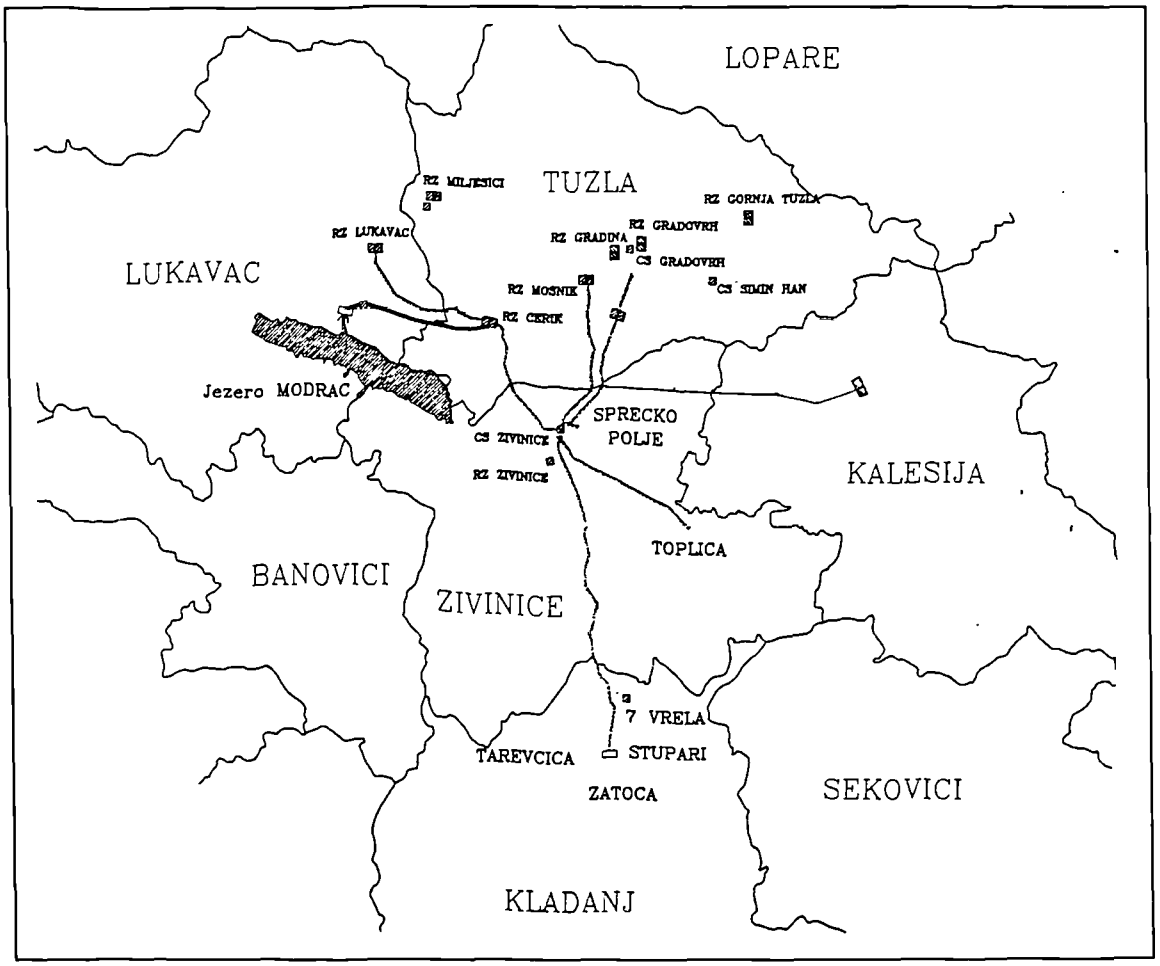

Figure 8.8: *The plan of the proposed Modrac Lake Water Supply Project in the overall scheme of water supplies in the surrounding municipalities*
(Source: The Tuzla Municapility, 1997)

Husanović (31 March 1998, Tuzla) identified the second version of this project as an immediate solution, considering the constraints with funding. However, he did not accept concerns stated by some professionals such as Džambić and Bešlagić for the location of the proposed treatment process at the Thermoelectric Plant. According to Džambić (25 March 1998, Tuzla), the plans made by the Ministry of Agriculture, Forestry and Water Management at the Municipality are unrealistic as the location of thermic plant would not be suitable for water treatment. Although he was reluctant to make further comments about this project, obviously because of internal politics between institutions, he made his disbelief clear with the following question: "Have you ever heard of any town treating its water in a thermoelectric plant?".

Bešlagić's concerns which he revealed to the author during the field visit to the Modrać Dam on 21 March 1998, were more in terms of rivalry between institutions. He claimed that the Bosnian Electricity Company which is particularly strong in the country and owns the Thermoelectric Plant, might refuse the use of this proposed water treatment facility in the future when their water needs increase in time. Husanović, as might be expected, rejected these views. He supported his argument by pointing out that the feasibility of this project was confirmed by Thyssen Aqua Engineering from Salzburg. He also explained that the location of the treatment plant is their only short-term solution and they need to choose this option regardless of the possibility of future problems with the ownership of the plant. However what is even more interesting is the relationship between the origin of funding and its effect on the choice of technology.

It was explained by Husanović (31 March 1998, Tuzla) that after the EU and the Dutch Government agreed to contribute 1,5 million DM each towards this project, SIDA's involvement for the provision of the remaining amount of money for the project has become quite likely. In the event of this, it was stated that the Swedish companies would be the main suppliers of equipment and materials. Husanović considered this as a normal practice because he supposed that their agreement with SIDA would be bound to include certain rules and requirements for the origin of equipment. The possibility of choosing technology according to the requirements of the funder was also confirmed by Tomić (2 April 1998, Tuzla).

These examples regarding the challenges faced with the choice of technology in the Tuzla Region can easily be multiplied. For example, the filtration equipment of the water supply in Gornji Tuzla has not been in function for more than four years because of technical problems. According to Remzja Begomivić (3 April 1998, Gornji Tuzla) from the local authority in Gornji Tuzla, the 1993 SEA assisted intervention included the construction of a water in-take and the self-wash filtration using active carbon for water treatment. This was a simple technology with minimum maintenance requirements, which was provided by a local company called Hidrotehnika from Kladanj. However, the filtration system had some operational problems soon after its installation.

The supply of new carbon for the filtration was not possible because of financial constraints.

As a result of this, water has been supplied to a population of 4,500 directly from the natural spring without any treatment or chlorination. The other water source which was a secondary supply from Tuzla and provided water 2-3 times a week for 1-2 hours a day, was also cut off because of the war.

Sakib Hajdarević, Director of Hidrotehnika (2 April 1998, Kladanj) pointed out that the reason behind why the filtration plant in Gornji Tuzla with a 5-10 l/s capacity did not give any satisfactory results was the lack of pre-treatment facilities. This point was also identified as a problem area by Begomivić, and it was claimed that SEA did not agree with the suggestion from Hidrotehnika regarding the need for pre-treatment facilities as the project would require a much bigger budget for its implementation.

The local community in Gornji Tuzla has been trying to solve their water problem since 1994 with their own means. The company from Kladanj was contacted as well as the Municipality of Tuzla in order to repair the filtration equipment. The water analysis in 1994 showed that although water supplied from the spring is acceptable for its physical and chemical aspects, it requires bacteriological treatment. The main reason this problem has taken such a long time to solve is said to be that although their settlement is within the boundaries of Tuzla, it is far enough from the centre for the authorities to neglect it. The required technical expertise in order to solve this maintenance problem in Gornji Tuzla can be provided by the Tuzla Vodovod, but it was pointed out that the financial constraints prevented them from being able to do this. On the other hand, Husanović (31 March 1998, Tuzla) once again claimed that the failure of the project in Gornji Tuzla was result of the SEA's approach not involving the authorities in Tuzla during the planning of this project.

The overall impression from the interview with Husanović regarding those SEA assisted implementations in the Municipality of Tuzla, which were unsuccessful was as follows. Whenever SEA tried to implement projects jointly with local communities without including the involvement of the municipality, they have had technical and operational problems. It was stated that the Tuzla municipality and its institutions have got all kind of capabilities to implement any kind of reconstruction projects. Their main problem is to find such funding as donations or credits with low interest rates. However, the author's investigations in regard to the organisational capabilities of the Tuzla Municipality did not confirm this. The

capabilities of the municipality often did not meet the creditors' requirements in regard to fund-raising or cost-recovery for these projects. The analysis of the issues of institutional development and financial sustainability will be presented in next Chapter.

On the other hand, returning to the preceding point made by Husanović it should be pointed out that the involvement of local authorities in the planning and implementation process of water supplies is crucial for their long term sustainability. It is especially indispensable in cases of technology transfers. Working with the local community cannot always be an appropriate approach if the community does not have technical expertise to deal with operational and maintenance problems. This is perhaps a more crucial issue than deciding on the simplicity or complexity of projects. For example, although the treatment facility in Gornji Tuzla was a simple technology, the local community has not been in a position to deal with its maintenance problems. According to Mesić (20 March 1998, Tuzla), the reason why the local authority in Simin Han wanted to have such an advanced treatment facility as UV (ultraviolet) purification system was the bad experience with a simple technology in Gornji Tuzla. However, this advanced technology has not been able to produce safe water on its own for the reasons explained earlier. Besides, the appropriateness of this technology for the state of water supply in Simin Han is in fact, questionable. Considering that the UV purification method does not provide free residual of chlorine for further protection of water and remembering also the possible leakages from the distribution network in Simin Han, the inappropriateness of UV purification method can be better realized. Therefore it is not the matter of considering one criterion instead of another, but it is more the ability of an holistic perspective to respond to all the challenges faced in the field and the possible ways of responding to them.

8.5 Summary and Conclusions

In this chapter a number of issues on the appropriateness of water supply projects assisted by SEA were highlighted and analysed in the context of the Tuzla Region. These issues were found to play a significant role for the successful planning and implementation of projects, and subsequently the provision of maximum health and economic benefits to local communities. In addition to this, they also emerged as stepping stones for at least ensuring the four basic objectives of post-war water supply implementation, which are: the

improvement of quantity, quality, availability and reliability. Therefore if the international humanitarian community is to improve the current praxis of urban water supply implementations in war affected areas, the following issues need to be addressed as prerequisites.

A. Assessment of needs and capacities for planning

The analysis of the current praxis in the Tuzla Region showed that the design of water supply programmes are often done without a proper needs assessment and the survey of existing supplies. Although this research acknowledges possible difficulties with the collection of reliable data in war-affected areas, it was pointed out that agencies need to monitor the changing socio-economic and organisational environment and carry out needs assessments consistently.

B. Setting objectives for interventions

The analysis showed that the initiation of projects without setting up clear objectives and provision of assistance on an ad-hoc basis resulted in waste of scarce resources and project failures. It was pointed out that the setting of clear objectives in terms of water quantity, quality, availability and reliability in a proper consultancy with local authorities, is a prerequisite to make implementations more transparent and achievable and to ensure their long-term sustainability.

C. Holistic approach for meeting objectives

The case study showed that the lack of a holistic approach was one of the main reasons for not being able to meet the initial water quantity and quality objectives. For example, water quality improvements cannot be achieved only by the implementation of water treatment facilities, as the rehabilitation of distribution networks also plays a significant role in the water quality improvement process. In conjunction with this, the rehabilitation of distribution networks was also highlighted as an important factor for improving water quantity.

D. Improvement of funding praxis for water supply recovery

The shortcomings and problems with funding procedures such as the conditions for the liquidization of funds and the discontinuity of cash flows from donors to implementing agencies were identified as the causes of problems with the procurement process and haphazardly planned implementations.

E. The provision of water and public health

The case study showed that the provision of safe water and the control of water quality cannot be ensured by the implementation of treatment facilities, and the establishment of laboratories alone, but they also require the existence of financial sustainability, training of personnel and institutional development. Consequently, the inhabitants in small size settlements with weak local institutions, such as those 'displaced' by war tend to be exposed to greater health dangers.

F. Basic technological criteria for planning

The analysis showed that the technical design of recovery programmes is often made according to the origin of funding and the conditions set by donors and investors, and without carrying out necessary surveys and investigations, which result in the selection of inappropriate technical criteria for the choice of technology.

After the presentation of the analysis for targeted, applicable and maintainable post-war water supply recovery in the following chapter, the recommendations for all of these issues and observations will be listed together in Chapter Ten.

Chapter 9: Analysis of Field Research Findings
- Part II -

9.1 Introduction

The second part of the analysis of field research findings in this chapter will focus on the aspects of targeted, applicable and maintainable post-war recovery of urban water supplies in the context of the Tuzla Region. The first section of this chapter will present the research analysis on the issue of targetting in terms of strategies to encourage local participation, the utilization of the recovery process as a peace tool and the use of local resources. Following this, the issues of security and logistics, institutional development, accountability and flexibility will be analysed in the section under applicability of water supply reconstruction. In the final part of the field research analysis, the main focus is the maintainability aspect which will be presented by the analysis of monitoring and evaluation, operation and maintenance, financial sustainability and training issues.

9.2 Socially, Politically and Economically Targeted Reconstruction

9.2.1 Strategies to Encourage Local Participation

The issues and examples presented in the previous chapter were given in the context of working partnership between SEA and local authorities. It was through these analyses that SEA's approach for local participation was analysed with its various aspects. As a result of this, some of the conclusions from the previous chapter can also be referred to for the purpose of this section. However it is still necessary to analyse the socially targeted reconstruction issue in terms of SEA's strategy to encourage the partnership of local authorities. On the other hand, it is rather difficult to draw the framework of a clear strategy used by SEA for this purpose. The interviews with SEA staff members show that what happened as an approach to deal with the challenge of productive partnership with local authorities was in fact a necessity to address the needs for satisfactory water provision in the region. Pallant as the first expatriate chief engineer of SEA, played a significant role in the formation of this agency's strategy for working with local authorities. During the

interview with him, the main aim of SEA's approach was identified as to avoid the danger of creating a dependency culture.

Pallant (30 March 1998, Sarajevo) stated that the approach of "Oh sunshine, you go and sit down and we will solve all your problems" would have created a culture of dependency. However according to Pallant, there were different levels of enthusiasm from local authorities and donors for their strategy. He stated that he was not sure whether there would have been many donors who could have approved an approach of cooperation with local bodies. Nevertheless, he argued that he would use a similar method, if he worked for SEA in the Tuzla Region again. The main reason behind Pallant's argument was the limited options of choice for the implementation process. If local authorities had not been chosen as partners to implement these water supply projects, then SEA would have had to use contractors. However, Pallant's experience of three years in the Tuzla Region have taught him that the construction companies were open to corruption in the vacuum of a rapidly changing political and institutional environment.

On the other hand, the main shortcoming of SEA's approach was observed as being in the borders of over-simplification and over-generalization of different needs and facts for each individual project. It was accepted that by encouraging the local authorities to participate in the projects, SEA helped to reduce the creation of a culture of dependency. However, this was an approach better suited in circumstances where the local authority was capable of carrying out its responsibilities within its own technical and organisational resources. For example, the projects in Tuzla, Srebrenik, Živinice and Gračanica were achieved by using the resources existing in the local vodovod as part of that particular municipality. On the other hand, neither Simin Han, Tojšići, Gornji Tuzla and Klokotnica nor Maoća and Čelić had similar resources to utilize in the implementation of their projects.

It is worth noting at this stage that hiring a construction contractor by NGOs and local authorities is a common practice in the region; especially after the signing of the Dayton Accords. This has become much easier by 1996 - 97 due to the increase in the number of private sector enterprises. However considering the warning made by Pallant in regard to the possibility of corruption risk in the involvement of local contractor companies, the need for monitoring and recording can easily be seen. On the other hand, these are procedures

which also require the existence of settled institutional structures. Therefore if hiring contractors and monitoring their work are the responsibilities of municipalities which are either inadequately equipped in terms of capacities or being re-structured because of the war, then SEA's approach cannot be accepted as realistic to expect that these municipalities would have been able to carry out their duties as required by agreements.

In other words, SEA's approach of giving the main responsibility of implementation to local authorities created a long chain of working relationships from the agency to local authorities and then to contractors. Therefore in the case of ensuring a proper implementation there was an environment of unclarity with the division of responsibilities and the process of decision-making in return causing the construction of dysfunctional systems. In the light of this analysis, the criticism made by some members of the Tuzla Municipality regarding the low success rate of implementations in the event of SEA's direct involvement with local communities, (already discussed in the previous chapter) can be better understood. This point will be further analysed in terms of revitalisation of economy in Section 9.2.4.

9.2.2 Water Supply Recovery in a Highly Politicised Environment

The preceding point in regard to the limited capacities of some of the municipalities also needs to be looked at from the perspective of a highly politicised working environment such as the current situation in the Tuzla Region. This was observed to be particularly decisive for the success of recovery implementations in the region. The post-Dayton administrative structure in the Federation of Bosnia and Herzegovina, as pointed out in Section 7.2.2, consists of several cantons which are responsible to a federal government in Sarajevo. The hierarchical order after a cantonal government is followed by a municipal structure which consists of various institutions. After municipalities there are local community organisations which are responsible for various aspects of public utility services' management. In other words, from the Federal Government in Sarajevo to a beneficiary in a village in the Tuzla Region decisions needs to go through at least four or five hierarchical levels. Considering that there is the possibility of different political representation at various levels, then the degree of risk that the decision-making process will be affected by this highly politicised environment can easily be estimated. Although the inefficient and ineffective bureaucratic

hierarchy of the socialist era just before the war was an obstacle for responsive and targeted decision-making, as explained in Chapter Seven, the proliferation of different political views and the conflict between them have exacerbated this shortcoming even further.

According to Agić (24 March 1998, Kalesija), the municipality of Kalesija has not got the political will to ensure the implementation of a project like the one in Tojšići. As far as he was concerned, "Everything in Bosnia has got a political dimension and political changes may affect any kind of initiatives to be taken by the municipality". It was claimed by Agić that the main reason for example, why the Municipality of Tuzla has not allowed the Municipality of Kalesija to utilize water sources from the territory of Tuzla, which could have been a better option to solve the water problem in Tojšići, was the different political orientations of these two municipalities. Labi (30 March 1998, Sarajevo) also highlighted this point to explain the intense political environment of Bosnia and Herzegovina. According to Labi, the tensions between cantons and municipalities when they are governed by different political parties can sometimes reach such an extent that it makes the necessary cooperation between local authorities very difficult, hindering the progress of recovery programmes initiated by the international community.

It was also observed that the provision of water was often used as a tool to gain votes by political parties, because of water's indispensability for life. Fuad Alić as Director of Gračanica Vodovod (31 March 1998, Gračanica) expressed his complaints which were in similar terms to the point made by Agić in Kalesija:

> "There is always the involvement of politics in every aspect of public services provisions in Bosnia. The political gains can be ensured by supplying better quantity and quality of water to consumers. For example, the mayor of Gračanica wants to complete the construction of the water tank as soon as possible with the hope of similar political gains".

Furthermore, Agić explained that the political power struggle within the Municipality of Kalesija causes delays in the decision-making process and consequently in carrying out necessary infrastructural projects. Not supporting the right party which holds the majority in the central municipality can mean, for example, the sudden ending of professionals' contracts and the discontinuity of projects. He also gave the example of pressure for using companies and firms which are owned by politicians in the municipality. For further discussion on this issue, see Section 9.2.4.

In addition to this, Alić (31 March 1998, Gračanica) also highlighted the relationship between the risk of corruption and the public services provision in a politicised environment. He thought that the way aid was provided by the international community needed to bear its own share of the blame for carrying out this process in such a politicised manner. Alić stated that:

> "Giving money to politicians could mean a 50 % loss, because of the high degree of corruption at every level of the system. The filtration of resources from top to bottom is very difficult, slow and expensive. Therefore I believe that it is more beneficial if the aid had been provided to local Vodovod structures in terms of materials and equipment".

The previous examples from Kalesija and Gračanica show that the post-war recovery of urban water supplies in the Tuzla Region is operated in a highly politicised environment where decisions to be taken for the benefits of war-affected people are set back because of different political views. The involvement of politicians in the process of public service provisions were found to be for various aims such as political gains, power struggles and profit making out of the aid provided for water supply improvements. This is a working dilemma for the international community that needs to be assessed carefully and addressed in order to avoid waste of resources, delays in implementations and infunctional systems.

9.2.3 Ethnic Diversification and Targeted Approaches for Water Supply Recovery

As pointed out in Chapter Seven, the Tuzla Region enjoys a special ethnical characteristic different from the rest of the country. It is a canton where the differences between ethnic groups were exploited to a much lesser degree than in the other cantons of the Federation. For example, considering those other cantons where the policies of ethnic cleansing were deeply experienced, the harmony between the three main ethnic groups were preserved in most parts of the Tuzla Region. This was especially the case in the Municipalities of Tuzla, Srebrenik, Lukavac and Živinice which are all in the central part of the canton.

The important role played by individual politicians, decision makers and planners in the preservation of ethnic harmony in this region while the rest of the country was engulfed in an ethnic struggle was often pointed out by the interviewees. For example, Mr Bešlagić, the Mayor of Tuzla was one of these politicians who managed to keep a fine balance between different ethnicities in his municipality. The successful policies for approaching ethnical

issues in this municipality were further consolidated by the collaboration with the international community in the provision of water supplies. For example, the implementation of the water supply project in Mramor, which is in the territory of the Tuzla Municipality, aimed at supplying water to four different settlements with different ethnic mixtures.[1] Therefore it was an important achievement not only for implementing a project with a total budget of more than 1 million DM in a period of 18 months, but also for the successful utilization of a water supply implementation in the preservation of ethnic harmony. Dzambić from the Tuzla Vodovod, and Niko Tomić who is responsible for the operation of the system in Mramor (25 March 1998, Mramor), confirmed that the implementation of the project did not experience any problems caused by the different ethnic structures of these four settlements. Tomić explained that it was unique case, and it was very important that the project design was made to cover all of these settlements by a common water supply at the same time. However in order to avoid possible biases during the collection of data which were explained in Chapter Six, it was still important to check this information in Canići, which is populated mainly by Croats who live in a dominantly Muslim region.

Niko Tadić (25 March 1998, Canići) who is the representative of the local community in Canići, also emphasized that the approach by the Tuzla Municipality and SEA for dealing with the problem of water shortage in his village as part of the Mramor Project, played a significant role in the consolidation of existing ethnical reciprocal relations in the area. He particularly pointed out that the Croat community in Canići held a great deal of trust for the policies of the Mayor Bešlagić. In addition to this, the way this project improved ethnic relations through cooperation during the implementation was also emphasized. The meaning of this project for the day-to-day life in Canići was expressed by Niko Tadić's wife, Maria Tadić as follows:

> "To have a continuous water supply in my kitchen feels like being over the moon. The water supply improved my life to such an extent that I think it is now completely different".

The preceding approach in Mramor, for providing water in ethnically sensitive war-affected areas was also used in Špionića where the three main ethnic groups still live together. The ethnic distribution for a total population of 2,500 is approximately 55 % Croats, 30 %

1 The basic information on this project was provided in Figure 7.14.

Muslims, and 15 % Serbs who live in the settlements of Cerik, Špionića Srednja and Špionića Donja respectively. The assistance provided by SEA in 1996 as explained in Figure 7.18, and by the Swedish Red Cross for the financing of a 1000 m pipeline were only adequate for the partial completion of the project. In order to supply water to the whole population in these three settlements, the project requires the installation of one pump station and a distribution reservoir in Špionića Srednja and another pumping station in Cerik. However, adequate funding has still not been obtained to complete the project, as pointed out by Muhamed Hasić (26 March 1998, Srebrenik).

Hasić (26 March 1998, Srebrenik) explained the local authority's attempt to avoid doing any harm to ethnic relations while trying to alleviate water shortages in Špionića as follows:

> "The Municipality of Srebrenik is decisive that we would either manage to provide water to the whole population of Muslims, Croats and Serbs at the same time, or not at all. I believe that this is a very important and also a necessity to show that all ethnic groups are treated on an equal basis. Our main expectation now is that the international community would realize the importance and sensitivity of this project and provide us with the necessary assistance for its completion soon".

The preceding approach used by the Municipality of Srebrenik in the case of water provision in Špionića highlights three main characteristics which are consultation, impartiality and being prepared to say no, if necessary. This targeted approach seemed to be responsive to the ethnic realities of the settlement, as the implementation would not only ensure the target of "do no harm", but also enable the improvement of existing ethnic relationships. Similar approach may also be needed in the improvement of the water situation in Gradačac where the town's pre-war water resources are now in the territory of Republica Sirpska.

Before the war, Gradačac obtained its water needs from three boreholes with a total capacity of 110 l/s. According to Husein Mejremić (27 March 1998, Gradačac), Director of Gradačac Water Utility Company, the water quantity and quality from these boreholes were so good that it did not require any treatment apart from disinfection. It was during the war that SEA provided its assistance for an emergency rehabilitation programme to get water from an unused borehole in the town centre, as the town's water source from the boreholes was cut off by the Serbs. However this emergency implementation was not in a position to meet the water needs of the population, and just after the war another programme taking water from a surface reservoir was implemented. The main shortcoming

of water from the reservoir at Vidara was its poor quality, which required a proper treatment facility. It was because of this that USAID assisted a project for the construction of a water treatment plant in 1996, which was initiated and completed in 1997. However, this treatment plant was used fully to supply water to the population for only a short period as the local Vodovod soon ran out of chemicals to be used in the coagulation and flocculation phases. This issue will be further examined in Section 9.4.4, but the point to be made here is regarding the possible utilization of water as a peace tool.

Considering the volatility of the period when SEA undertook the emergency intervention in Gradačac, it was almost impossible to initiate any programme which can incorporate the cooperation of the Serbian side for the re-use of the boreholes in their territory. The Serbs were holding off the water source as a weapon against the Muslims, and SEA would not possibly be in a position to consider this option. However what it seems that the project which was undertaken with the assistance of USAID for the treatment of water from the Reservoir Vidara could have been targeted in a more effective way. There are several reasons for this argument. First, the armed conflict between the Serbs and the Muslims was already over in 1996. In conjunction with this, there would have been stronger possibilities to initiate a programme jointly between the two sides. Second, the investment made by USAID for the treatment plant could have produced more sustainable results, as the supply from the boreholes did not require any treatment. Finally, the trust and level of confidence between the two ethnic communities in the region of Gradačac should urgently be improved through the utilization of any possibilities such as joint water supply initiatives. This is a prerequisite for example, in order to gain positive results from the negotiations on disputed territories such as Brćko which is still a contentious issue between the Serbs and the Muslims.

After looking at the analysis of socially and politically targeted implementations, this section will now focus on the issues related to economics of programmes. In terms of economically targeted water supply recovery, Section 5.2.3 investigated the context of commercial companies' involvement in the reconstruction process. Subsequently, the analysis of this issue will be made through the findings based on three main areas which are: the issue of providing employment for the local community; the use of local products for materials and equipment; finally, the involvement of commercial companies in the recovery.

9.2.4 Enabling an Economic Revitalisation Through Water Supply Recovery

The recovery process of urban water supplies in the Tuzla Region, which was started as small scale emergency rehabilitation programmes, has definitely been pivotal for providing employment to local communities. Remembering the figures given by IMG in Section 7.2.3, for the financial cost of 173 water supply projects to the international community, which was more than 20 million DM, it can be claimed that the injection of this money was crucial for the economy of the region. On the other hand, it can be argued that the main proportion of this money was spent on materials and equipment, and therefore its impact for creating employment in the region was limited. However as pointed out earlier in Section 8.2.4, the local authorities also invested large sums of money during the implementation process. The cost of the Tuzla and Mramor Water Supply Projects to the Municipality of Tuzla for example, were 3,596 million DM and 600,000 DM respectively. In addition to this, Murković (27 March 1998, Tuzla) also pointed out that the breakdown of the project in Tuzla included the amount of 1,295 million DM for manpower.

From the preceding figures, the following estimate for the cost of manpower for these 173 projects can roughly be made on two main assumptions. First: for the investment of 20 million DM made by the international community on materials and equipment, the local authorities in the region may have spent a similar amount of money to carry out their implementation responsibilities. Secondly; at least one third of the cost met by the local authorities was for manpower. Therefore, on the basis of these two assumptions, the recovery of water supplies in the Tuzla Region for a period of five years meant the creation of employment with a value of at least 7 - 8 million DM.[2] Although this figure can only be considered as an approximate estimate, it still gives some indication for the scope of employment created through water supply recovery programmes and money spent for manpower in terms of local professional and labour input.

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2 From the 1995 dated SEA's report entitled "Proposal for Water Supply to Several Townsand Villages in North Bosnia", the ratio of money spent for local SEA staff was calculated as 7 % of the whole budget, and this ratio was assumed for the all water supply implementations assisted by the international community in the region for the given period. Therefore the calculation of the value given for the local manpower was as follows:
International Community: 20 million DM x 0.07 = 1,400,000 DM
Local Authorities: 20 million DM x 0.30 = 6,666,666 DM
Total: 8,066,666 DM

The estimated figure of 7 - 8 million DM for the creation of employment is also important to show the value of giving priority to the implementation of water supply recovery projects which are labour intensive. The construction process also has a kick off effect on other sectors such as the production of construction materials, distribution and transportation. The creation of employment for war-affected people and its positive impacts in the social reconstruction in terms of hope, healing and reconciliation as explained in Section 2.3.2, is as important as the financial value entering into the local economy.

Different examples in the previous chapter showed that in various SEA assisted implementations local products, such as filtration tanks from the Hidrotehnika company in Kladanj, were used. However, the use of local products tend to be limited because of constraints with being able to obtain equipment like pumps, valves and pipes in Bosnia and Herzegovina. Before the war, most of these types of equipment were produced nationally. However the reasons most frequently given for preferring to buy this kind of equipment from abroad were the unavailability of them in the country, and the dated technology of the socialist era. Local products were not available, because if the factories were not in the Serbian entity, then most of them were still out of production. However it was also observed that those engineers who design projects and make procurement for implementations tend to consider the use of equipment and materials from the Western countries as a much better option for the long term. It seemed that to use a pump from Germany, Italy or Austria was considered as an important guarantee for the implementations to be in a good order and to meet the objectives. In other words, the tendency to use foreign products is not only because they are not locally available, but also the general mentality of engineers considering this as some kind of attempt at 'modernization'.

The concept of 'the more advanced the technology, the better it is' which was explained in Section 8.4, can also be identified with this context of quick 'reformation' or 'modernization' after the war. The argument here is not that the foreign products should not be preferred at all, but it is more in terms of the underlying reasons for the choice. Thus, the possibility is that preferring foreign products may become misconceptional decision-making habits which result in not only a culture of dependency, but also a continuous dependency for the future water supply developments and maintenance works. In connection with this matter, as pointed out for the underlying criteria for the choice of technology in Section 8.4,

the following observation was also highlighted. The conditions which are enforced as part of low interest rate credit agreements on the origin of equipment and materials to be used, were also exacerbating this wrong modernization mentality.

In regard to the involvement of commercial companies in the recovery process on the other hand, two main opposite arguments were identified through the field findings. First of all, this involvement as designing projects or implementing as contractors has been the case since the early days of these recovery programmes. For example, most of the designs for SEA assisted projects were made by Spreća Company in Tuzla. Furthermore, it is often the case that the local authorities contract construction companies to carry out the implementation on their behalf. This is an inevitable process which in fact needs to be encouraged to empower private enterprises in the region. Considering the overall intentions for a quick change from the socialist era's ownership and financial powers to a free market economy, strong entrepreneurships and private initiatives in construction related sectors can play a pivotal role in the revitalisation of the economy.

This is one side of the coin which considers the issue from a positive perspective, but there is also the other side of the coin. As explained in Section 9.2.2, the encouragement of private sector involvement can also mean the risk of corruption as the working environment is highly politicised. However the crucial point here is the ability to separate politics from the context of private sector involvement in the recovery process. How that would be possible and what kind of organisational structures and measures would be necessary to ensure the minimum level of corruption risk can definitely not be addressed in the scope of this research. The main point to stress here is that the private companies and contractors as main implementing actors should not be seen as causes of fraud solely. It is only the case when the decision makers such as politicians start to prefer certain companies instead of others because of their personal interests. Therefore it is in this context that it is the responsibility of international community to encourage local authorities to make necessary institutional changes in order to avoid the mismanagement of funds.

9.3 Applicability of Water Supply Recovery

9.3.1 Overcoming the Challenge of Security and Logistics

Before starting the analysis on the challenge of security and logistics, it is worth noting at that Section 5.3.1 highlighted three main operations for logistics as procurement, transport and storage. However, the analysis on logistics here will mainly focus on the issue of transportation, as the issue of procurement has already been analysed from different perspectives in the previous sections, and the issue of storage has not been a significant factor, affecting the overall success of SEA assisted implementations. The main reason behind this was the transportation of equipment and materials directly to the storage areas allocated by local authorities for their respective projects. Therefore SEA did not experience any blockages with the storage of equipment for those projects ongoing at the same time.

The problems related to the overall security situation and logistics constituted main part of the challenges that SEA had to overcome in order to implement their rehabilitation programmes in the Tuzla Region. These challenges were particularly serious at the height of the conflict during the period from 1993 to 1995. The implementation of the Tuzla Water Supply Project which was initiated in 1994 had therefore, to deal with a wide scope of security and logistics problems not only because of the ongoing war, but also because of the scale of the project.

According to the initial agreement between the Tuzla Municipality and SEA, the municipality was legally bound to undertake the transportation of 1,643 pipes with a diameter of θ= 500 mm. However, it subsequently became obvious that the municipality had neither the funds nor the transport capacity to complete this task. The transportation of the pipes from the port of Ploce in Croatia to Tuzla was faced by the following conditions:

- Bad roads;
- The Herzeg Bosnian customs and their restrictions on anything that has the potential to be used for war purposes by Bosnian Muslims;
- Fuel costs;
- Each pipe was 1 tonne in weight, therefore 200 truck loads were needed to complete the task.

The preceding reasons were highlighted by Magnus Wolfe Murray (Personal communication, 1996). In addition to this, Pallant's (30 March 1998, Sarajevo) following account, explaining how they were overcome will be given below to clarify several issues, as Murković (27 March 1998, Tuzla) claimed that the main part of transportation of these pipes were in fact carried out by the Municipality of Tuzla, but not SEA. According to him, SEA carried out its responsibility only from the port of Polce to Zenica, as they could not pass security check-points in Herzeg Bosnia, and subsequently had to leave the pipes in Zenica. For the remaining part of the journey, it was stated by Murković that:

> "SEA did not have enough money for the transportation of these pipes, therefore the Municipality of Tuzla had to take this responsibility. We brought them from Zenica to Tuzla".

When Pallant (30 March 1998, Sarajevo) was asked about this claim made by Murković, he explained his account of events as follows: First of all, the transportation of these pipes was an enormous challenge, considering that it was during the war and carried out under winter conditions. It was during this time that Pallant was trying to solve the shortage of fuel for transportation. In a coordination meeting, he was questioned by a Swedish Officer working for UNPROFOR. The officer did not think that claims of the shortage of fuel could be correct, as around 10 - 20 tonnes of diesel were being delivered to Tuzla each week at the time.[3] However, he was not obviously aware of the fact that there was a need to produce a continuous supply of electricity to avoid a tragic disaster caused by the ground subsidence phenomenon in Tuzla. This phenomenon was explained in Section 7.3.1, and the connection between electricity, ground subsidence and lack of fuel was that a large proportion of the fuel delivered to Tuzla had to be used for coal mining, which was essential for the continuation of electricity production at the power plant. Pallant explained that "If this had not been done, the dry salt mines underneath the town would have been flooded and this would have created large holes in the town centre".

It was also at this coordination meeting that a Captain from UNPROFOR offered the transportation of the pipes on behalf of the municipality. However, they could only transport 77 pipes as the personnel changes at the UNPROFOR would discontinue this commitment.

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3 In 1993 and 1994, the black-market price of 1 litre fuel in the Tuzla Region was around 40 DM. This figure was given by Hasić (26 March 1998, Srebrenik) to explain SEA's achievement in completing the emergency rehabilitation of the Srebrenik under very difficult war conditions.

To solve the transportation problem, UNHCR gave seven trucks to SEA as well as fuel.[4] The decision for transporting pipes from Polce to Zenica instead of Tuzla as a first step was in order to avoid paying any further duties at the Croatian port. According to Pallant (30 March 1998, Sarajevo), the whole task of transportation was very difficult because of the bad physical environment and poor security. The heavy bureaucracy of UNPROFOR made this task even worse. For example, after the task of transportation was completed, they were still deemed as never cleared from the Croatian customs, because UNPROFOR had not submitted the necessary documents to SEA. It was confirmed by Pallant that SEA not the Municipality of Tuzla transported 90 % of pipes from Ploce to Tuzla.

If the contradicting accounts of Pallant and Murković for the transportation of pipes can be put to one side, it can still be seen very clearly that the task of overcoming difficult logistical challenges for both SEA and the municipality was enormous. The problems with the transportation caused not only delays in the implementation process, but also partnership constraints and tensions between these actors. In the context of the timing of appropriate interventions, these kinds of possible logistical problems caused by the environment of war need to be acknowledged and precautions to be taken in order to address them. It may be perceived as speculating, but how Pallant explained the underlying reason for initiating this project causes concern. Therefore the preceding analysis should be considered as seeking answers for the relationship between the right time for intervention, and the project requirements in terms of logistics and security. Pallant stated:

> "In May 1994, IMG wanted a large water supply project in Tuzla. It was a prestigious project for SEA, and it was also a good opportunity to re-allocate some money from UNHCR".

It was not only with the Tuzla Supply Project that SEA had this type of problems, but because of the scale of the project the challenges to be overcome were more difficult. In Klokotnica for example, the drilling of the borehole was done during the conflict. The actual drilling point was very near to the front line. SEA managed to get a drilling ring and other equipment in position overnight to avoid being seen by the Serbian warring groups. The well was drilled secretly and the forested character of the area also helped this work to be carried out during the day. However being shot at was still an immediate danger throughout the

4 From 1995 onwards, SEA had a fleet of 19 cargo vehicles varying from four to 16 tonnes and 13 Land Rovers (SEA, 1995a).

works. The implementation of the project in Gornji Tuzla was similar. This time it was on the eastern frontline of the region, and the construction of the project was completed in a short period of about three weeks. However it was already explained in Section 8.4 that this system now is not functioning. The requirements for a quick implementation because of the low security must have played a significant role in the haphazard way this project was carried out. However, it should be pointed out that these two last examples were emergency rehabilitation projects and played a very important role for the protection of public health during the war.

9.3.2 Legal Aspects of the Institutional Strengthening of Vodovods

In Section 5.3.2, the issues of NGO coordination and empowerment were explained. It was concluded that the institutional strengthening of local authorities through these processes would play the most important role for long-term sustainability. It was the result of this relationship that the field analysis attempted to clarify: whether the partnership between SEA and local authorities played an empowering effect on the institutional strengthening. It was clear that SEA did not allocate additional resources such as time, money and skills for the strengthening of local authority capacities. However, as explained in the previous sections, the involvement of local authorities was no doubt encouraged as part of SEA's approach for the recovery implementations.

It is important to recognise at this point that it would not have been fair to consider SEA as responsible for the challenge of institutional strengthening as part of their rehabilitation involvements. There are several reasons for this, but the most important of them can be summarized as follow. Firstly, SEA was carrying out its activities in the framework of funds made available by donors, and as explained in the previous chapter, project budgets were often inadequate even for carrying out technical implementations they should have met. Secondly, the scope of needs to be addressed for the institutional strengthening of local water boards in the Tuzla Region are much bigger than SEA's organisational and technical capacities could ever have met as an NGO. Therefore the analysis here will focus on the concept of institutional strengthening in a more general perspective. A new initiative for institutional development for the water sector in the Federation of Bosnia and Herzegovina was in fact started in Spring 1997 by a working group, consisting of both national and

international agencies.[5] A similar initiative was also started in the Republica Sirpska in Autumn 1997.[6] The two working groups carried out their assessment of the situation and identified five main aspects of institutional strengthening as the areas to be improved to ensure long term sustainability of water supplies. These issues are as follow:

1. Water Quality
2. Organisational Aspects
3. Financing and Cost Recovery
4. Human Resource Development
5. Legal Aspects

The water quality aspect was already analyzed in the previous chapter, and the issues number two, three and four will be analyzed in Sections 9.4.2, 9.4.3 and 9.4.4 respectively. Therefore the main focus here will be on number five, the legal aspects of institutional strengthening.

Sparavalo (1998) classifies the regulations, by-laws, enactments and statutory provisions pertaining to water resources and management in the Federation of Bosnia and Herzegovina into three main groups: First, those brought in before the war and still applicable today; second, those brought in during the war and still applicable today; and finally, those brought in or being about to be brought in by the Constitution of the BiH Federation and Cantonal Constitutions. The whole concept of legal aspects of the water sector is very complex, therefore the analysis here will not attempt the full presentation of these classified laws. However it is also a fact that they have a decisive impact on the management of these public utilities. On the other hand, Labi (1998) rightly claims that the most important issue is not the provision of these laws and regulations, but their interpretation and execution. In addition to this, he lists the issues and items that need to be included and defined in water

5 The working group initially consisted of the Ministry of Agriculture, Water Management and Forestry, Vodoprivreda BIH (Public Water Management Enterprise), USAID (US Agency for International Development), SDC (Swiss Agency for Development and Co-operation), International Management Group (IMG), OHR (Office of the High Representative). The group was later expanded by the inclusion of the European Commission, CIMIC (Civil Military Corporation), Spanish Institute for Foreign Trade (ICEX) and Corporazione Italiana.

6 The working group for this initiative in the Republica Sirpska includes the Ministry of Agriculture, Forestry and Water Management, Zavod za Vodoprivredu, USAID, CIMIC, IMG, OHR, The World Bank, SDC, Cooperazione Italiana and the Finnish Ministry of Foreign Affairs.

sector laws.[7] Returning to the point regarding the framework of laws regulating the issues of municipal water management in the Tuzla Region, Glumčević (1998:41) explains:

> "Tuzla-Podrinje [Tuzlanski-podrinjski] canton has not as yet brought a special law on public utility services. Thus therefore, at the level of the canton there are as yet still no regulations governing the work and business operations of public utility companies".

It was explained that since there were also no regulations at Federation level, governing this sector the regulations used are mainly from the pre-war period, such as the 1990 Law on Public Utility Services.[8] This law in its present state is considered by Sparavalo (1998:36) "...as a good starting basis for the preparation of the cantonal laws on public utility services", though some of its regulations such as Article 11 which "...prescribes as a rule that the users cannot be denied public utility services" prevents the rational pricing of water and the collection of water charges. This article in terms of taking decisions and their enforcement for ensuring the financial sustainability of water supplies is particularly significant, as it prevents municipalities from cutting off supplies to consumers who do not pay their bills. However, this rule is exempted "...(1) if the user did not pay for the services for two consecutive months and (2) if the technical conditions allow the possibility to refuse delivery of public services, without prejudice to the rights of other users of public utility services who are regularly paying for municipal services". This is only one of the examples to point out the present shortcomings of the law. The various governmental bodies of the Federation and cantons are currently working on regulations and enactments regarding water resources and supply management. Without attempting any detail of these activities and their analysis, it should be pointed out that the regulations for the operation and maintenance of water utility systems are mainly brought by the municipalities themselves.

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7 The main items to be included and clearly defined in water sector laws were given by Labi (1998:14) as follow: "Water rights, use of water, approvals, legal ownership, standards, operationresponsibility, water supply to others, water resource area, securing of documents, decision on objections, decision on cost (subsidiary), calculations, legal approvals, planning and building regulations, forestry law, water protection law, water quality, criminal, general administrative work, control, etc.".

8 According to the 1990 Law, public utility services in the Municipality of Tuzla are carried out by four main public utility companies which are (Glumčević, 1998:42):

- VODOVOD I KANALIZACIJA (Waterworks and Sanitation) for the production and distribution of water, maintenance of water supply facilities, drainage and treatment of waste water.
- CENTRALNO GRIJANJE (Central Heating) for the production and delivery of thermal power from individual sources and its distribution, and maintenance of the plants.
- KOMUNALAC for removal and disposition of waste from households and cleaning of public traffic surfaces, maintenance of parks, etc.
- POGREBNE USLUGE (Burial Services) for burial and funeral services.

For example the by-laws of the Municipality of Tuzla defines the structure and working areas of the Tuzla "Vodovod I Kanalizacija" Company. In addition to this, the "Rule Book" of the municipality defines criteria and measurement for the performance of operational activities to be taken in the process of supplying water to consumers. There are also various regulations for drinking water quality and security measures for the protection of water supply facilities. However the most significant part of this process can be seen in Glumčević's (1998:43) concluding remarks:

> "...this document [the Rule Book] in a more concrete way regulates the matters which are regulated by the municipality decision on waterworks and sewerage in the territory of the municipality".

In other words, each municipality in the Tuzla Region should equip itself with a set of rules, regulations and measures for operation and maintenance of water supplies. It is at this point that the international community's efforts for institutional strengthening in terms of the improvements of legal aspects should be concentrated. Many weak municipalities in the region did not seem to have capacities such as professional personnel and finance to carry out these necessary activities. The unequal capacities between various municipalities should therefore, be taken into account in the planning of institutional strengthening.

The other important issues which may set back this process were explained by David Hardman, who is EU Representative in BiH for the Institutional Strengthening of Public Utility Enterprises Initiative. According to Hardman (Personal communication, 22 March 1998), the municipalities and institutions in Bosnia and Herzegovina are in the habit of talking about their problems without taking necessary decisions for implementation. That is why he believes that the main problem with the institutional development of water sector, more than anything else, is the mentality of decision-makers and planners coming from the socialist era. He also pointed out the existence of conflict of interest between the capital, Sarajevo, and other municipalities such as Tuzla and between the central and other municipalities in each canton, on the utilization of national resources and international support for the post-war recovery. In the light of Hardman's explanation, it can be concluded that the success of institutional strengthening initiatives will no doubt rely on the efficiency and effectiveness of the post-Dayton organisational structures.

9.3.3 Accountability

The analysis in Sections 8.2.1, 8.2.2 and 8.4 presented various examples where the context of accountability was also explored partly. In addition to this, the questions in the log book for accountability were also targeted to find out: to whom SEA reported during its interventions, whether SEA had any reporting system to local authorities, and in which ways SEA's approach ensured the aim of accountability to them. The result of this analysis was that SEA did not ensure a full accountability, as explained in Section 5.3.3, during its assistance to various projects in the Tuzla Region. There were several reasons behind this such as the ways that projects were initiated and the constraints brought by the funding praxis. However, whatever the reasons were for this it clearly seems that it created dangerous loopholes for the mismanagement of funds.

As already mentioned, the lack of accountability for Teoćak for example could not be justified in terms of any preceding reasons. It was very clear that the local municipality was not in a position to explain what was the total amount of funding received from international donors and local community, and how these funds for the water supply were utilized. The author put the following note in the field work diary just after the interview with Rizvan Čalaković, Secretary for Water Economy at the Municipality of Teoćak:

> "The overall impression gained from Čalaković was very negative. He seemed to be very unclear about the involvement of the municipality and also about the financial accountability. He was unwilling to disclose how much money had been collected and spent for this project".

The author's uneasiness with the impression gained from this interview was later confirmed by the communal leader, Mr Hasanović (1 April 1998, Teoćak) who took the author to some of the implementations carried out as part of the Teoćak Water Supply. He seemed uncomfortable about answering questions regarding the municipality's financial accountability directly. Having realized this, the author instructed his interpreter to ask this question in private, while he kept himself busy with taking photographs. It was later explained by the interpreter that Hasanović had explained his concerns about the corruption in the Municipality of Teoćak, which he claimed were rife. He had also pointed out that as long as the same politicians remain in power, he had not expected this project to be completed in the near future. It is very difficult to carry out a judgement unless a thorough

investigation of the municipality's accounts is carried out, and in fact the aim of this field work was far from that. However the preceding example shows the existence of distrust among the different levels of municipal hierarchy, which obviously has been caused by the lack of accountability.

The relationship between the lack of transparency at the Teoćak Municipality and SEA's involvement in the improvement of water supplies cannot perhaps be very clear at first sight. However this problem needs to be considered from a perspective that also includes SEA's accountability. It seems that SEA's practice which lacked a proper monitoring and reporting system, had an important role in not placing the municipality in a framework, and thus avoiding the possibilities of fraud. The other side of the coin of course, was the SEA's lack of accountability towards local authorities for the amount of money spent for the necessary equipment and materials. The author was, often told by the representatives of the local water boards that they did not know exact amount of money spent by SEA for the procurement of materials used in their projects. Hasić (26 March 1998), Director of Srebrenik Vodovod, explained that SEA could have been more transparent about the details of how much money was spent on the projects in Srebrenik and Špionića. The reason for his uncertainty was the result of not being able to receive any report from SEA, outlining how much money was spent on which item, etc.

In one of the project proposals prepared by SEA (1995a), the process of accountability was explained as follows:[9]

> "SEA Budget Holders will be responsible to the Financial Manager, the latter being responsible to the Country Director for the financial management of the overall project. Quarterly evaluation reports will be submitted to MCI [Mercy Corps International]. These will include details of project progress, SEA and other related inputs and resources to date, financial details and social/political situation. The Country Director will be responsible for the overall project and report to the Country Director MCI".

The preceding proposed commitment for accountability made by SEA shows the framework of SEA's understanding of accountability which is not more than allocation of

9 Although MCI's involvement was not started until 1996, the proposal was made by incorporating the involvement of MCI as the project proposal was planned to take place between September 1995 and September 1996.

responsibilities for management. If this is considered as a presentation mistake, the following quote from the same report also shows the limitedness of their accountability process:

> "The money is spent within the strict framework of the specific agreement between SEA and the donor. Monthly, quarterly and final reports are forwarded to donors on the actual project work and financial situation".

On the other hand, the lack of reporting practice to local authorities is not peculiar only to SEA, but many other NGOs in the region report only to donors. For example as explained by Juan Aranda, Field Coordinator of IRC in Tuzla, they also only report to IMG on a monthly basis as stipulated in the contracts. The IRC also submits a financial report to their donors in addition to a narrative of what happened in terms of implementations. The reporting to local authorities directly tends to be on an informal basis. The IRC's Head Office in Sarajevo also reports to relevant authorities in the government, and it is hoped that this information filters down to the municipality level. There is no need to say how time consuming and difficult this process might be, considering the hierarchial structures explained in the previous section.

9.3.4 The Manipulation of Flexibility Provided by SEA's Approach

It was urged in Section 5.3.4 that the planning of recovery implementations should incorporate a certain level of flexibility in programmes for the changing environment of war-affected areas in terms of population, finance, politics, etc. In conjunction with this, SEA's approach for working with local authorities in fact provided a suitable framework to ensure a good level of flexibility. This was outlined by SEA (1995a) as follows:

> "SEA policy is kept loose enough to enable rapid response to changing circumstances. However (*sic.*) SEA whenever reasonably possible make the beneficiaries, whether a Municipality or a local community, perform some part of the task".

The way SEA explained its practice for flexibility by pointing out a "loose"approach was in fact its understanding of finding the right balance for the catalyst role between local authorities and donors. However what seems missing from this logical approach, which caused the manipulation of it by local authorities, is the structure of a control mechanism. A proper monitoring system which will also be analysed in this chapter, should have formed an important part of this mechanism. In addition, the stipulation of objectives,

responsibilities and control measurements in agreements signed with local authorities should have also been followed during the implementation, and adjusted for well-justified reasons. As actually happened, in Gračanica for example with drastic changes to the capacity of the water reservoir, some local water boards went ahead with changes without recognizing the need for being accountable to SEA.

The main cause of this was SEA's intervention strategy which often included only the period from the design stage to the delivery of materials to the construction site, though SEA claims their involvement to be continuous until the end of construction. For example in the "Proposal for water supply to several towns and villages in North Bosnia" Report, SEA describes its "planned phase out" as follows:

> "Direct SEA participation will phase out on 31 Dec 96. Prior to this SEA will satisfy itself on behalf of MCI that all sub projects are completed, tested and working as planned".

The practice of involvement until the end of construction for this proposal was made to seem as if it was SEA's general practice. However, the experience gained through the field work shows that most of projects were not completed until well after the date of completion indicated to IMG for their PIMS records. This was sometimes partly because of the nature of projects and SEA's involvements in them. However the result of the field analysis shows a certain degree of manipulation of SEA's flexibility by the local authorities, and it would not be too much to claim that this was partly caused by the absence of SEA's control mechanisms. On the other hand, as pointed out several times before, it is important to consider the result of this analysis in the context of the realities of the working environment that SEA has been operating in. It must be emphasized that the most crucial point here is to be able to learn lessons from SEA's experience and not to repeat them in similar circumstances.

9.4 Maintainability of Reconstructed Water Supplies

9.4.1 Monitoring and Evaluation

The field analysis up to this section has repeatedly emphasized one issue in relation to various aspects of water supply recovery, which is the importance of having a built-in

monitoring system in these programmes. The importance of a monitoring system and its conjunction with programme evaluation was already explained in Section 5.4.1, and the findings from the field have underlined this necessity once again. First of all, it should be pointed out that the understanding of monitoring for SEA did not seem to be more than the provision of technical supervision. On the other hand, the discussions in Chapter Five explained that a proper monitoring system is based on initial objectives set for programmes, and the criteria used for data collection as part of monitoring are also decided according to these objectives. As explained in Section 8.2.2, the practice of setting clear objectives for all SEA involvements could not be claimed as some of examples showed completely the contrary. Following the haphazard planning stage, monitoring of interventions in the Tuzla Region were seen to be done in an ad-hoc manner. Therefore it was not surprising to find out that the failure of some of the implementations such as Simin Han could not be detected until the completion of the project.

The reason behind this shortcoming can be seen in what was claimed by SEA (1995a) for monitoring and evaluation of some of their proposed interventions. The report outlines three main items for monitoring and evaluation, which are "Monitoring project impact", "Evaluation criteria" and "End of project indicators". These items were explained in this report as follows. The monitoring project impact was proposed to be done by measuring three criteria which were health, water quantity and migration from rural to urban areas. The report explains the ways of obtaining measurements for these three criteria:

> "(1) Health: By liaising with the various Tuzla based medical NGOs recording the decline in water related illnesses.
> (2) Water Quantity: The aim is to provide a minimum quantity of 40 l/s of potable water per person per day to all members of the community within the overall project. SEA will undertake this physical measurement.
> (3) Migration from Rural to Urban Areas: As SEA are (*sic.*) already, under a separate project, responsible for the maintenance and management of 48 Collective Centres in the Tuzla Region, they (*sic.*) will be in a position by weekly monitoring the Collective Centres to determine the degree of migration from these areas into Collective Centres (*sic.*)[urban areas]".

Following this, the evaluation criterion was given as "To determine the pressure and quantity of water entering the systems". Finally, the end of project indicators were stated as follows:

> "Quarterly evaluation reports and a final evaluation report at the end of the project review criteria and give a final assessment of the success of the project.

> Assumptions used in determining the programme success will be based on the assumption on health, quantity of water produced, and impact on migration from the project areas to the urban areas".

What can be seen from these proposed monitoring and evaluation activities made by SEA is a set of lessons for some NGOs' understanding of these two important control mechanisms. First of all, these activities were planned in a proposal; SEA has either not carried out any of these activities, or they did, but most of their members of staff were not aware of them and the records for these processes were not kept at all. This could be the only explanation for the contradiction between the reality and the proposal. In the case of going through the above mentioned criteria and indicators for monitoring and evaluation, it can in fact easily be seen that these mechanisms can hardly be realized in reality.

There are various reasons for this, but some of them are as basic as the way SEA was involved in many programmes, which was only towards the construction of a certain component of systems. In addition to this, not all of their interventions could achieve the full functioning of projects as the constraints of funding prevented them from implementing the full scale of necessary implementations. Besides, the measurement of indicator number three regarding the migration from rural to urban areas could have never been realized effectively and used satisfactorily as there would have been many other factors that affected the degree of this migration. After discussing the context of evaluation in Section 5.4.1, it seems rather pointless to analyse SEA's concept of evaluation for these proposed water supplies. Therefore it can be claimed that what SEA did by including the section of monitoring and evaluation in their proposal was not any more than claiming to do these activities which are considered as necessity by many donors today, and may have increased SEA chances of obtaining the funding. This preceding view was also supported by Mike Cunningham (9 July 1998, Personal communication).[10]

During the implementation of large scale projects, such as the Tuzla Water Supply Project, the mechanisms of monitoring and supervision were served better by setting up specific committees for these tasks. For example, the committee for the project in Tuzla consisted of two engineers from SEA and three engineers from the local water board. It was the result

10 Mike Cunningham was involved in SEA as a fund raiser, trustee and Managing Director between 1993 and 1996.

of establishing a committee like this that ensured a good level of monitoring of the project. According to Murković (27 March 1998, Tuzla), these types of committees can be given the overall responsibility of controlling the whole implementation and take initiatives to solve possible unforeseen problems. In the case of creating an executive committee, the need for including representatives from the local authorities was also highlighted. For example, an executive committee like this for the project in Dobrnja, which included two representatives from the local municipality in addition to engineers from SEA and the Tuzla Vodovod, solved problems pertaining to land passes and legal issues. However it is very interesting to see that the monitoring committee for the Tuzla Water Supply Project could not act promptly to solve the problems with the ownership of land for the pipeline route from Sprećko Polje to Si-Selo in Tuzla. According to Pallant (30 March 1998, Sarajevo), the municipality did not finalize the land ownership issues before the contractors started the implementation. As a result of this inefficiency a Bosnian Croatian land owner did not let SEA have access to his land, causing considerable delays for the completion of the project. Pallant stated:

> "The municipality did not really have their heart in this project. Politicians make lots of talking, but not enough action".

Overall, it can be summarized that the main reasons and constraints which prevented SEA from carrying out necessary monitoring and evaluation processes in the Tuzla Region seemed to be: first of all, the personnel's unawareness of the necessity of these mechanisms for successful implementations; secondly, the lack of training provided by SEA to its local and international personnel; thirdly, the lack of organisational structures which would incorporate these processes; finally, the limited funding and time constraints.

9.4.2 Organisational Improvement for Successful Operation and Maintenance

It was also mentioned in the preceding sections that the public utility companies working on water and wastewater systems in the Tuzla Region varied according to their size, scope of activities, human and technical resources and organisational structures. Therefore it is not possible to reach conclusions that allow recommendations which can be applicable to all of these utility companies. However, the analysis here will aim at finding out basic principles which can promote institutional strengthening in order to ensure successful operation and

maintenance of reconstructed water supplies.

No matter how well the functionality of systems were ensured by following strict high reconstruction standards, without appropriate structures for operation and maintenance they cannot successfully function. This is why it was so crucial that the initiative of institutional strengthening of water utility enterprises in Bosnia and Herzegovina, which was explained in Section 9.3.2, also aimed at the improvements of organisational aspects.

The main towns in the region such as Tuzla, Živinićе, Gradačac and Srebrenik have public utility companies which carry out the specific tasks of water provision, water drainage and wastewater treatment services. However, the other smaller size municipalities have public utility companies that are responsible for all kinds of services from water provision and solid waste collection to maintenance of parks and burial services. The main argument behind having a united public utility company is to save administrative costs and to have the advantage of shared use of vehicles, equipment and materials. However, the main shortcoming is that these small municipalities do not possess the financial and human capacities to run even one utility services company. Remembering the discussions in Section 5.4.2, these two issues are particularly important for operation and maintenance because of the primary considerations for the successful management of water supplies, which are the type of system managed, the degree of organisational development, the level of trained human resources and financial sustainability.

It must have been this wide range of different considerations for the organisational improvements in small municipalities which operate within serious financial constraints, that led to the Municipality of Čelić initiating an unusual way of operation and maintenance of public services. The private management of public utility services is not practised in Bosnia and Herzegovina which is emerging from the war and the structures inherited from the socialist era. According to Labi (30 march 1998, Sarajevo), the current law in the Federation forbids the privatisation of public services. He believes that the private sector's involvement will play a pivotal role for ensuring the sustainability of the international community's efforts. However in Čelić, this process has somehow already been initiated by an agreement signed on 1 March 1998, between a private company and the municipality. The ex-Deputy Mayor of Čelić, Mehmed Alija Yunusavić (28 March 1998, Čelić) manages this company

which is called "Trgotranšped", and it is entitled to carry out operation and maintenance duties of the following services:

- Water supplies,
- Septic tanks,
- Garbage collection,
- Market places,
- Local roads,
- Green areas
- Graveyards and funerals.

The preceding list of services in Čelić town, with a population of 4,600, adds up to a considerable workload. It could have been a manageable challenge for this first trial privatisation of public services in Bosnia, if the company had had the necessary financial resources. However it is one of the ironic realities of this region that this company was established on the basis of being able to survive by personal funds provided by Yunusavić. It was pointed out by him and his two members of staff that this was an experimental initiative as they did not know whether it would be successful. The photograph in Figure 9.1 shows Yunusavić and his two member of staff in their office. In order to be successful, they will need to collect charges for the services they provide. This is a particularly big challenge in a town where the population is exhausted by the war and mostly unemployed. The cost of operation and maintenance for just water supplies was given as 15,000 DM per month, including the expenses of electricity, manpower, materials and chemicals.

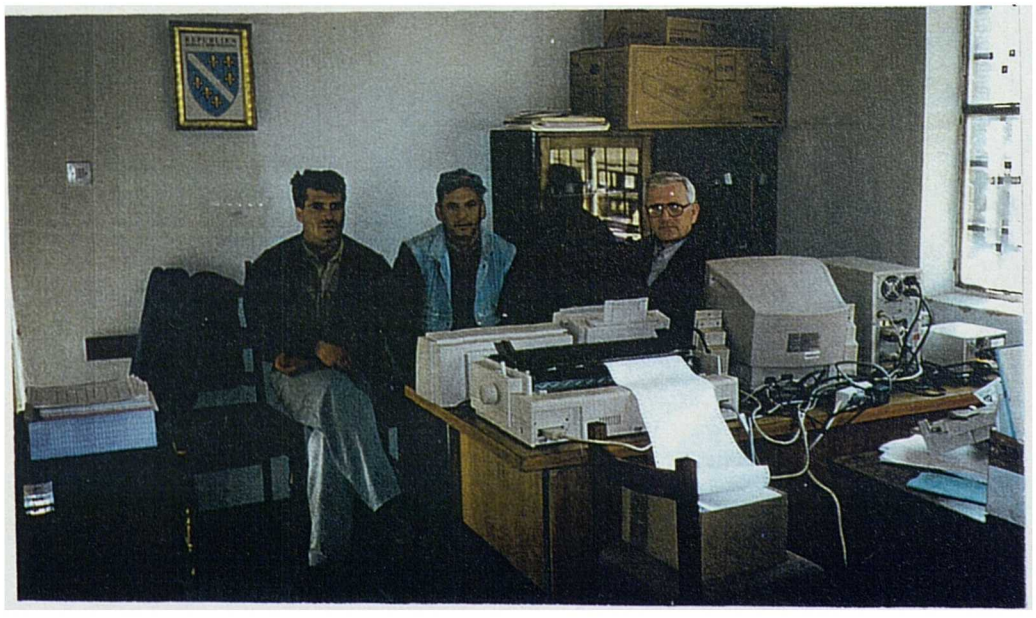

Figure 9.1: *Mehmed Alija Yunusavić, Director of Čelić Public Utilit Company with his two members of staff in their office (Source: Author)*

Yunusavić (28 March 1998, Čelić) explained one of the main reasons for taking this initiative, while the financial viability that can support the cost of operation and maintenance is very small, as follows:

> "The decision of European Union for putting the condition of financial viability of public utility services in order to get their support played a significant role for the initiation of this company. Because as a result of this condition that the number of employees at the municipality had to be reduced from 75 to 37. Subsequently, I wanted to provide employment to some of those people who have recently become unemployed".

In other words, the first trial of privatized public utility services in Bosnia and Herzegovina had been started on a rather ad-hoc basis, and the financial realities of this involvement show that Yunusavić and his team would need a miracle to make it a success. Čelić of course is not the only town in the Tuzla Region that faces these types of challenges. Many other small municipalities, visited as part of the field work, were in similar circumstances. For example, in Klokotnica Rasim Sofić (31 March 1998, Klokotnica) explained similar difficulties which were mainly the result of becoming a municipality after the war. He stated:

> "The public corporation for water and wastewater treatment which I work for, lacks of all kind of necessary organisational resources for the management of these services. We cannot expect any help from the Federal Government and our only hope is the international community...The resources of my corporation would not be even adequate to deal with problems which may be faced in the case of a simple breakdown...By now some international agencies such as ICRC helped us with solving the problems of breakdowns...The cost of the operation and maintenance of water supplies in Klokotnica is 3,000 DM per month, the cost of electricity on its own is about 2,500 DM per month...I do not know how to overcome these problems. I am feeling completely helpless and seeing myself in a total dilemma...I am the only member of staff responsible for water supplies in my corporation and I am a mechanical engineer".

The preceding discussion and examples identify several important issues in regard to operation and maintenance problems faced by the public utility organisations in the region. It is also clear that the interrelationship between successful operation and maintenance processes, and financial sustainability and human resources development initiatives, plays a significant role for the sustainability of those systems rehabilitated through the assistance provided by the international community. It is on this basis that some other examples and further analysis on operation and maintenance issues will be presented in the following two sections on financial sustainability and training of personnel.

9.4.3 The Challenge of Financially Sustainable Water Supply Management

The successful implementation of operation and maintenance phases of water supplies, as explained in Section 5.4.3, depends on the availability of funds for expenses such as the cost of employing personnel, electricity, and buying necessary equipment, materials and chemicals. It was also identified that in addition to running and maintenance costs, the water charge needs to cover the costs of depreciation and development of further resources for increasing needs. On the other hand the analysis in the previous section pointed out that many municipalities in the Tuzla Region, especially those that are small and affected by the war to the greatest extent experienced serious problems with meeting the costs of operation and maintenance. The two main reasons behind this shortcoming can be identified as the ineffectiveness of organisational structures inherited from the pre-war era, and the overall financial constraints experienced by the war-affected population.

In regard to the pre-war financing of water supply systems, the field work highlighted that the low collectability level of water charges in the Tuzla Region is partly caused by the ineffectiveness of organisational structures and the legal framework for public utility companies. Čavar et al. (1998) explained the process of water charges in the post-war environment of the Federation as follows:

> "...it is the managing board of the municipal company that brings decisions on water and sanitation pricing, and the chief executive (e.g. Mayor) of the municipality in his resolution gives approval and makes eventual corrections. There are even some public utility companies which do not collect charges for municipal services from the consumers, or if they do, then the amounts collected are negligible. These companies are neither (*sic.*) [not] receiving the funds out of budget to cover their expenses, and thus it is by engaging in additional activities that they provide resources to cover the minimum of their costs. This is, of course, to the detriment of their activity they had been set up and registered for".

For example, water charges in Tuzla for various type of consumers were given by Džambić (25 March 1998, Tuzla) as follow: 0.20 DM per m^3 for domestic consumption while it is 0.90 DM, 1 DM and 1,5 DM per m^3 for public institutions, general industry and water intensive industries respectively. It was pointed out that these charges were not high enough even to cover the costs of operation and maintenance, let alone to build up financial resources for further development. However what was the most important shortcoming was

that the Municipality of Tuzla could collect money for only 16 % of domestic and 37 % of industrial consumptions. The municipalities tend to keep water charges as low as possible for various reasons such as the attitude that sees water as a right and not a commodity, and the affordability of charges for the war-affected population. For example, the current water charge in Živinice is 40 DM per home per year, and according to Zlothić (2 April 1998, Živinice) because of this low charge 1 m^3 of water is cheaper than 1 litre of bottled mineral water. It is the result of this that only 40-45 % of operation and maintenance costs were met by water charges. He further explained that the attitude of seeing "water as gift from God" needs to be changed and the population should realize that they need to pay for the water that they consume.

Hasić's view in regard to water charges was in parallel to Zlothić's preceding explanation. According to Hasić (26 March 1998, Srebrenik), the possibility of a public service being cut off easily plays an important role in the way some people prioritize the payment of their bills. In other words, the population acts in a more diligent way to pay their telephone and electricity bills than water charges. He believes that the local authorities need to change the methods of dealing with consumers who do not pay their bills. The politicians tend to be very unwilling to be seen to be cutting off their voters' water. It is important that the production of water should be considered as other service provisions. Hasić explained that if a consumer insists on not paying for his/her water consumption, then the supply should be cut off. He pointed out that the idea of protecting the poor by not enforcing strict rules for water charges is in fact a myth. He stated that:

> "The people who are the most willing to pay their water bills are in fact not the richest section of the population in Srebrenik. This is something more to do with some people losing their sense of citizenship during the war. The mentality of war prevents them from getting adapted to the life in peace and its requirements".

Sevlet Mujkonović (28 March 1998, Maoća) was also concerned with the collectability of the 0.30 DM per m^3 water charge in Maoća, as more than 30 % of consumers do not pay their water bills. It was explained that this was partly caused because of financial difficulties faced by a large proportion of the population. However Mujkonović explained that although some people in Maoća cannot afford to pay for water, this should not be generalized for the whole population. He also highlighted an important aspect of water charge collectability and the level of water metering in Maoća. It was interesting to see that

Protuča which is a suburb of Maoća, has been the most problematic area in terms of collecting water charges. According to Mujkonović, there are two main reasons behind this. First, the Protuča area has only one general water meter and the charge to the population is done by the division of this overall charge to the number of houses. Secondly, the unwillingness of internally displaced persons who form the main population in this suburb to pay their water bills. It was explained that there was a real tension between the host community and internally displaced persons who were mainly from the Municipality of Brćko. Mujkonović stated:

> "The internally displaced persons from Brćko do not consider themselves as part of the local community; therefore they are reluctant to participate in any kind of developmental projects in Maoća. They do not have the feeling of ownership for their living environment and the tensions reached such an extent that some of displaced people say to us: 'When we go back to Brćko one day, we will put check points on the road to stop the people of Maoća entering Brćko'".

It was because of these tensions, which in fact always existed between these two municipalities even before the war, that Mujkonović, as the leader of the local community who is responsible for the operation and maintenance of water supplies, finds it rather difficult to collect water charges from internally displaced persons. Over the last two years, the Protuča settlement has built up a debt of 50,000 DM for water consumption. The amount paid up to the date of the interview with Mujkonović was only 1,800 DM.

It is clear from the above analysis that the public utility companies are restricted in deciding the price of water and the ways of making sure that charges can be collected from consumers. It is for this reason that the legal framework for these companies will need to be reviewed in order to make sure that the water is priced realistically according to its operation and maintenance costs. In addition to changes in regulatory framework, the local authorities will need to develop strategies that can realistically ensure the proper collection of water charges by taking the realities of the region's economic environment into consideration. The financial sustainability for operation and maintenance and further development of new water sources is a prerequisite that should always be born in mind in the process of drawing up strategies for water supply management.

9.4.4 Human Resources Development as a Prerequisite for Sustainability

The lack of trained personnel working for public utility companies for the operation and maintenance of water supplies was frequently observed during the field work. Although the big municipalities were affected by this shortcoming to a lesser extent, it was one of the main problems faced by smaller size municipalities. The war no doubt, played an important role in creating this shortage of professionals who can work in the water supply management sector. Many experienced professionals had left the country with the outbreak of the war. In addition to this, the international agencies also attract better qualified and experienced engineers and other professionals with their more attractive financial prospects. Subsequently, a large proportion of municipalities in the Tuzla Region now employ personnel who are not trained to work in the management of water supplies.

USAID has already taken some initiatives for the training of local water board managers by organizing a training course entitled 'Potable Water Management' at the College of Continuing Education of the University of Oklahoma, USA. Hasić (26 March 1998, Srebrenik) was one of the managers who attended this course. He explained that the training programme provided a good environment for managers from various municipalities to share their experience, in addition to providing a theoretical background on water supply management. It seems that this training course in USA was designed to give a different perspective to water supply managers. Those who attended this course, such as Hasić from Srebrenik, Džambić from Tuzla, Alić from Gračanića and Zlothić from Živinice, seemed to have clearer and stronger ideas on the need for privatization of urban water supplies, water charges and the methods of collection. For example, participants on this course had been asked to prepare an action plan to improve the effectiveness and efficiency of their water boards. Hasić's plans for the first six months were concentrated on the training of technical and managerial personnel, while Alić focused on ways of increasing the productivity of staff. He stated that

> "The overall productivity level of staff is very low and the main reason for this is the working habits coming from the socialist system. It is almost a matter of mentality. Payment for work instead of working hours was found to be an encouraging initiative".

In addition to this, Alić (31 March 1998, Gračanica) also prepared a comprehensive cost

recovery plan after his training course in Oklahoma. According to this plan, the total income from water charges by the year 2000 will cover basic costs such as electricity and overheads; from 2000 onwards, adequate funds will be collected for the development of future programmes. It was explained that starting from the year 2000, water will be charged with its full production costs, and meanwhile, the Gračanica Vodovod aims at decreasing the level of leakage to 20-25 % by changing asbestos pipes. In other words, the percentage of population paying for their water consumption, currently 22 %, will be increased to 85 % in the coming two years. It was clear that the training course provided by USAID played a significant role in the way these managers prepared strategies for the planning of the future water needs and provisions. Alić was optimistic that the population in Gračanica will be willing to pay for water as it has been planned by the Vodovod's strategy. In order to ensure this, a public awareness campaign through the distribution of small leaflets explaining the water production process and its subsequent reasons for charging was already initiated.

The international agencies can initiate similar programmes to increase the cooperation between municipalities for the training of their personnel in the region itself. As explained earlier, the capacities of municipalities in the Tuzla Region are varied and those in a better position can be given leading positions to enable smaller municipalities' empowerment through the training of personnel. In Gradačac for example, USAID assisted the local authority in the construction of a complex water treatment plant including the phases of aeration, coagulation, flocculation , filtration and disinfection with a capacity of 75 l/s. The photograph in Figure 9.2 shows the water treatment plant in Gradačac. Although the implementation of this treatment plant was done at a cost of 2,15 million DM, it was not fully utilized due to financial constraints, preventing purchase of necessary chemicals and also preventing the training of personnel.

Husein Mejremić (27 March 1998, Gradačac) responded to the question of how he thought that the problem with obtaining necessary chemicals for the treatment process could be solved:

> "I believe an international organisation should help us with buying those chemicals in the short term, and I hope that Bosnia and Herzegovina will grow financially that be able to afford them in the long-term".

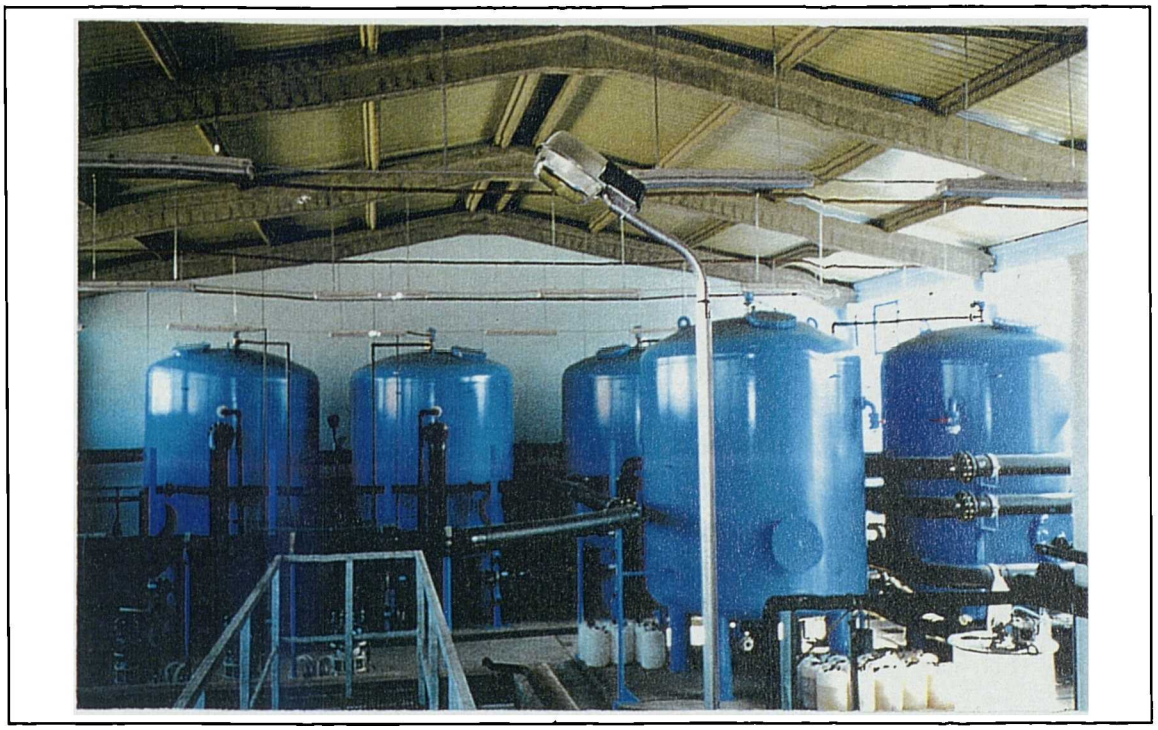

Figure 9.2: *The water treatment plant in Gradačac (Source: Author)*

The above response from Mejremić was similar to the "mentality" of the socialist era pointed out by water supply managers trained by the USAID Course in Oklahoma. It was very much in line with the mentality of 'dependency' rather than taking 'action' to solve the problems. It was because of this that the training course provided by USAID was thought to be positive in the way it changed some of managers' working attitude and their mentality when approaching problems. This argument becomes even more striking when the ineffectiveness of water charges in Gradačac is considered. According to Mejremić, only 30% of consumers in Gradačac pay their water bills which are 6 DM per m^3 per house per month. This price is in fact three times less than the water charge taken in 1988. Therefore it would have been more worthwhile for the local Vodovod to draw strategies to improve the ways of collecting more money for water charges instead of relying on external aid in the short term and governmental subsidies in the long.

Rasima Novalić (27 March 1998, Gradačac), who is a water engineer responsible for the operation of the treatment plant in Gradačac, explained that although water is provided 24 hours a day, it is not consumed for drinking purposes by the population because of its low quality and lack of treatment. However, it did not seem that Novalić was fully aware of the importance of coagulation and flocculation phases for reducing the turbidity and pH levels

which both play a significant role in the realization of successful chlorination. It was the result of these discussions that Novalić was asked whether she was given any training before being given her responsibility at the treatment plant. She explained:

> "The treatment plant was designed by a German company and all equipment were bought from Germany too. Therefore we were given a training session via an interpreter by this company. However I do not think that I gained so much out of this training as the translation process was a big obstacle to understand everything".

Following this, she was asked whether it would not be possible for a Bosnian to carry out this training session. First, she was not aware of any Bosnians who were qualified in the technology of the treatment plant, though the author knew that a similar technology was used for the Tuzla Water Supply Project. Therefore as a response to this point, Novalić stated:

> "I have requested several times to be sent to Tuzla in order to learn from my colleagues' experience there, but by now it has always been postponed to another time. I believe, I can gain so much from a visit to the facilities in Tuzla, and exchange ideas with the engineers at the Tuzla Vodovod".

It can be realized from the above response that the training needs of personnel working for public utility services can partly be met by the utilization of resources available in the region. It is important that the institutional development initiative taken by the international community should acknowledge the availability of these resources, and structure their approach towards a 'training of trainers' strategy rather than organizing expensive training sessions outside the country. However it can sometimes be necessary to take those who are considered as potential trainers to learn from the experience of their counterparts in other countries, or provide them with opportunities of attending courses that can give them a better understanding of post-war recovery issues. Therefore the approaches for training should be considered from a wider perspective with a view to providing a continuity in the long-term through the positive impacts of initial training provided by the international community.

9.5 Summary and Conclusions

Through the analysis of targeted, applicable and maintainable aspects of the proposed ATAM framework in the context of the Tuzla Region, the issues related to general

objectives for Stage II and Stage III, as defined in Table 1.5, for water supply improvements in war-affected areas were highlighted in this chapter. These issues are considered in an interwoven relationship with the immediate objectives of water supply improvements, which were analysed in the previous chapter. It was clearly seen that the overall approach for ensuring the long-term sustainability of reconstructed water supplies needs to incorporate all of these aspects of the proposed framework. The need for interdependency and interconnectivity of each issue with the others was observed as a prerequisite in order to make the interventions effective, efficient, relevant and sustainable for the benefit of war-affected communities.

The other important overall observation, for long-term sustainability, was the necessity of considering the challenge of post-war water supply recovery in a framework consisting of the context which is war, the content which is water supply improvement initiative, and actors which are donors, NGOs, implementing agencies, local authorities, private companies and war-affected communities. The Figure 9.3 is given to show this framework in a diagrammatic style.

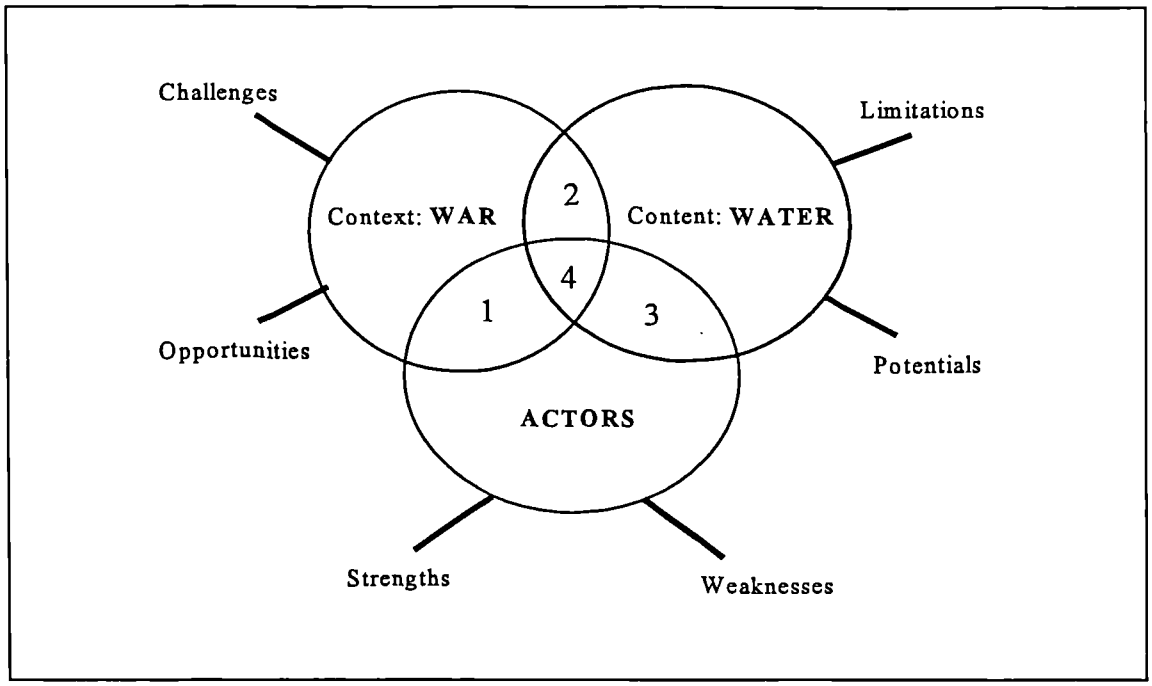

Figure 9.3: *The framework for tackling with the challenge of post-war recovery of urban water supplies in diagrammatic style (Source: Author)*

In other words, the challenge of water supply recovery which is indispensable for health,

well-being and development of communities can only be ensured when the interventions taken are realized in the humanitarian space where these three components of the above mentioned framework overlap each other. Areas number one, two and three in Figure 9.3 symbolize the interaction between actors, the context of war and the content of water supply recovery interventions, which were investigated in terms of dilemmas of political and strategic, operational and technical, and personnel and moral in Chapter Three. On the other hand, the area number four can be identified as the conceptual humanitarian space where the ATAM framework draws the context of interaction, interdependence and interconnectivity of these three components.

On the basis of this explanation the recommendations for the following issues which were derived from the analysis of targeted, applicable and maintainable post-war water supply recovery in this chapter, will be presented in the following chapter.

A. Strategies to encourage local participation

The analysis emphasized that the creation of a partnership environment between international and local agencies is a prerequisite for functional systems as end products. It is in this process that international organisations need to overcome the dilemma of choosing an appropriate partner between local authorities and private contractors, and establish responsive strategies to encourage local participation.

B. Water supply recovery in a highly politicised environment

The politicised environment of post-war areas can hinder the progress of recovery programmes, and create a fertile ground for the possibility of mismanagement of funds as politicians and bureaucrats often attempt to gain financial and political benefits out of aid provided by the international community.

C. Ethnic diversification and targeted approaches for water supply recovery

The analysis showed that the recovery of water supplies can be an important tool to preserve and improve the existing ethnic reciprocal relations. It was pointed out that the

utilization of water supply recovery as a peace-building tool requires different organisational capacities such as knowledge, time and financial means for carrying out long negotiations, mediation and peace-making.

D. Enabling an economic revitalisation through water supply recovery

The case study showed that the recovery of water supply programmes can play a significant role in the creation of employment to war-affected people. In addition to this, they are also important for their knock-on regeneration effects in related sectors and the enablement of social reconstruction. However it was observed that the process of an economic revitalisation through recovery programmes requires the implementation of certain strategies for the encouragement of private sector initiatives and the utilization of local resources.

E. Overcoming the challenge of security and logistics

The experience in this case study showed that the scale and complexity of projects and the timing for initiating recovery programmes can have decisive effects on the extent of logistical problems experienced during the implementation. The timing factor is particularly important as logistical problems seemed to become much easier with the improvement of security.

F. Legal aspects of the institutional strengthening of Vodovods

The analysis showed that the public utility companies in the Tuzla Region did not have the necessary technical and organisational rule books or manuals for operation and maintenance of individual components of their water supply systems. However it was also pointed out that the interpretation and execution of legal frameworks are more important than initiating a process for possible improvements in the legal aspects of water supply management. It was the result of this argument that the institutional strengthening of local water boards in the region was urged to be municipality-specific and responsive to real needs of these institutions.

H. Accountability

The analysis showed that international agencies tend to be lacking mechanisms and methods for making their interventions accountable to beneficiaries. The way some projects were initiated as well as the funding praxis of donors, were observed as the main reasons for these ineffective accountability mechanisms. The lack of accountability was also found to have detrimental impacts on the way local authorities were encouraged towards sustainable partnerships.

I. The manipulation of flexibility provided by international organisations

The case study emphasized that the component of flexibility needs to be an essential part of programmes in order to adapt them to changing factors of post-war environment. However, it was also observed that without necessary checking mechanisms and implementation strategies, the flexibility provided by international agencies can be manipulated by some local authorities for various political and institutional reasons.

J. Monitoring and Evaluation

It was observed that the inclusion of monitoring and evaluation sections in project proposals tend to be done to increase the possibility of obtaining funds without having a clear understanding of these processes and the requirements to carry out them. It was the result of lacking these processes in project cycles that the problems during the implementation are often not detected before recovery programmes become complete failures.

K. Organisational improvement for successful operation and maintenance

The case study emphasized the importance of organisational improvement in order to ensure successful operation and maintenance of reconstructed water supplies. It was observed that no matter how diligently these recovery programmes are carried out, if international agencies do not address the organisational problems of local institutions it is not possible to ensure long-term sustainability of these systems.

L. The challenge of financially sustainable water supply development

In addition to the need for the organisational improvements, the financial sustainability was also found as a decisive factor, affecting the sustainability of reconstructed systems. It was observed that the local water utility companies were not in a position to decide on the price of water in a cost-effective way and the methods to be used during the collection, because of legal obligations. The misconception of affordability also seemed to be an important factor for setting up inappropriate water price strategies.

M. Human resources development as a prerequisite for sustainability

The analysis showed that the lack of trained personnel is a serious challenge for most of the local authorities, especially for those in small size and weak municipalities. In addition to the war's direct impacts on local water board personnel such as killing, disablement and displacement, the brain-drain to overseas and the attraction of better qualified professionals to international humanitarian organisations were observed as the main reasons for the shortage of trained personnel working at the local authorities.

Having summarized the main findings from the analysis in this chapter, the recommendations for these issues as well as those from the previous chapter will be presented in Chapter Ten.

Chapter 10: Conclusions and Recommendations

10.1 Introduction

At the beginning of this thesis, three main areas of considerations on the issue of reconstruction of urban water supplies in war-affected areas were identified as the reasons for carrying out this study. These considerations were:

1- Recent experiences of civil conflicts showed an alarming tendency for urban water supplies around the world to be damaged by war either directly or indirectly.

2- Current praxis in the field of post-war reconstruction of urban water supplies is often carried out by NGOs on an ad-hoc basis and purely from a technical perspective resulting in detrimental effects on the long-term sustainability of water systems and hence on the overall development of war-affected communities.

3- There is a paucity of research on the context of post-war reconstruction of urban water supplies.

Through the review of the literature, the utilization of various learning tools, and the investigation and analysis of the case study in Bosnia and Herzegovina, it became apparent that if the recovery of urban water supplies in war-affected areas is to be, in any way, improved in order to contribute to the realization of positive and sustainable socio-economic recovery of war-affected communities, then the recovery of urban water supplies, needs to be Appropriate, Targeted, Applicable and Maintainable (ATAM) through a progression from relief to reconstruction.

The knowledge acquired and discourses presented within this thesis have shown that the international community's approach to urban water supply recovery, ad-hoc in character and solely concerned with technical matters, undermines the sustainability of these rehabilitated systems and impose detrimental effects on the overall development of war-affected communities. Thus, the findings illustrated that the international community needs to address

a set of issues as part of water supplies interventions, in order to ensure the implementation's long-term sustainability. For this purpose the findings from the research will be presented in this chapter in the form of a list of recommendations which can be utilized by those agencies involved in the post-war recovery process of urban water supplies.

To achieve this aim, this chapter is divided into six sections. Following the introduction, the next section summarises the previous nine chapters, highlighting general areas and the essential points from discourses explored and utilized in this thesis. The third section presents a set of recommendations addressing the issues derived from the analysis of the ATAM framework in the context of the Tuzla Region. These recommendations will be presented in four sub-sections in accordance with the structure of the proposed framework. In Section Four, an improved version of the evaluation log book which was used during the second phase of the field work will be presented in the form of a checklist of questions which can be used by the implementing agencies in the field to initiate programmes and evaluate their performance. Following this, Section Five will highlight further issues in regard to the applicability of working recommendations and the use of the log book as an evaluation tool. A set of recommendations on the personal profile of evaluators will also be presented in this section. The final section of this chapter will identify a list of future research suggestions which can build upon the findings of this thesis.

10.2 General Summary and Conclusions

The close woven relationship between water and war was investigated in two categories: 'water as a cause of war' and 'water as a weapon of war' in **Chapter One**. For the former aspect of this relationship, the chapter explored the context of water provision in 'peace' time through the investigation of the outcomes of UN Conferences during a period of two decades starting from 1976. The main emphasis was the challenge of providing 'safe' and 'adequate' amounts of water to everybody in the world where water resources are finite and the population increase is rapid. It was because of this dilemma that water scarcity was identified as a likely cause of wars in the near future, particularly in the Middle East, Central Asia, and the Nile Valley. The investigations in this chapter also showed that the heavy pollution and irresponsible exploitation of both surface and underground water resources

were other major reasons for the exacerbation of the water scarcity problem. In addition to this, it was argued that the challenge of water scarcity in urban areas should be considered not only in terms of the lack of water resources, but also the ineffective and inefficient management of water supplies.

The second part of Chapter One considered the context of intrastate conflicts in the framework of water scarcity and its relationship to urban areas, exploring the context of 'water as a weapon of war'. Basing its main argument on the vital necessity of water for the survival and development of humankind, this section identified various direct and indirect ways of utilizing water as a weapon during armed conflicts. These direct and indirect effects of war on water supplies result in potential dangers to the survival and well-being of war-affected people. As a response to these dangers the international community and local agencies take various interventions to improve water quantity and quality in war-affected areas. However the framework of interventions are often defined by dilemmas imposed by war. Furthermore, the dilemmas facing those responding to the challenge were categorized in three main groups, varying from strategic to operational and moral ones. It was also pointed out that the effects of these dilemmas on interventions varied according to the stages of post-war recovery which were identified as immediate, short and long-term. The other important component of this conceptualization was given as the three stages of hypothetical objectives for the post-war recovery of urban water supplies, which were (1) to alleviate suffering caused by inadequate and unsafe water; (2) to consolidate the establishment of peace, and; (3) to ensure a sustainable development. Following this identification of the framework upon which the research question underlying this thesis was based, Chapter One ended by proposing a matrix of relationships between objectives and the stages of post-war recovery for urban water supplies.

Having explored the context of the relationship between war and water, and identified a set of water supply intervention objectives for the different stages of post-war recovery, **Chapter Two** investigated the context of these three main aims. It was demonstrated that as an approach, the progression from relief to reconstruction can be the most beneficial in providing an understanding of how benefits gained by each intervention without any regard to its scope and magnitude can be transferred to the next. It was in this context that the framework of taking preventive interventions instead of emergency ones (which cannot by

themselves alleviate the ultimate deterioration of water supplies) was strongly recommended in the first section of this chapter. Following this, the chapter focused on the second stage of objectives which target the enablement of social reconstruction and the consolidation of peace by utilizing the process of water supply interventions as a tool. Finally, Chapter Two reviewed the concept of sustainable development through two main perspectives. The understanding of sustainable development was first clarified for the purpose of this research, which was followed by the exploration of the interaction between development and the sustainability of water supplies. At the end of the chapter, it was clearly stated that sustainable development for war-affected people is affected by various external factors, and the sustainability of water supplies is one of them. Therefore the need for considering not only technical, but also social, economic and political aspects of the task during water supply improvements was emphasized in the context of this discourse.

The experiences gathered through the secondary case study examples of emergency and post-conflict response to water supply recovery from Bosnia and Herzegovina, Cambodia, Northern Iraq, Rwanda and Yemen in **Chapter Three** identified a number of issues, lessons and dilemmas which were categorized under the headings of the earlier concluded three sets of dilemmas of post-war recovery of urban water supplies: (a) political and strategic, (b) operational and technical, and (c) personnel and moral. In conjunction with the conclusions obtained from the exploration of various discourses in the previous two chapters and based on the key points identified through the analysis of secondary case study examples, the third chapter concluded with the proposition of a framework for sustainable recovery of urban water supplies. The framework advocated that if the post-war reconstruction of water supplies were appropriate, targeted, applicable and maintainable (ATAM), then it could contribute to the realization of sustainable recovery of war-affected communities which was in line with the hypothesis of the research.

Chapters Four and Five which formed the second part of this thesis, was therefore, allocated for the exploration of these four main aspects of the proposed ATAM framework. In Chapter Four, firstly, several technical criteria to bear in mind during the interventions taken to alleviate suffering caused by inadequate and unsafe water supplies were identified. Secondly, the interrelationship between water quantity and quality in terms of their impacts

for the protection of public health were explored and it was concluded that the best approach would be to find a right balance between quantity and quality within the operational realities of working environment. Finally, in the last part of Chapter Four, the exploration resulted in drawing the conclusion that the interventions should ensure a holistic and integrated approach. The consideration of all sub-systems of a water supply as part of a whole system during recovery implementations was identified as holistic approach, while the concept of integration included a wider framework. Thus, the framework in addition to water supplies, consisted of all other sub-systems of a total water supply system such as power supplies, sewage systems and waste-water treatment facilities.

After the investigation of the appropriateness aspect in Chapter Four, the remaining three aspects of the ATAM framework were explored in Chapter Five. First, different types of partnership strategies were highlighted according to the characteristics of actors involved and the scope of the recovery challenge undertaken. Following this, the challenge of utilizing water supply recovery as an opportunity to build trust and confidence between warring sides was analysed and it was concluded that agencies which would like to utilise this unique characteristic should prepare themselves for a frustrating and long, but at the same time extremely rewarding, process. In the last part, for targeted water supply recovery, it was concluded that the involvement of commercial companies in the recovery process was inevitable and could in fact improve the overall efficiency. However the need for a control mechanism was also urged in order to ensure the effectiveness and sustainability of their involvement.

In the following section on coordination between international and local agencies, it was first pointed out that NGO coordination and institutional strengthening of local authorities could reduce the possibility of duplications, waste of resources and long delays. This first section concluded that institutional strengthening of local authorities as a 'means' can be developed into a process which can be an 'end' in itself by ensuring the incorporation of some of the partnership principles identified at the beginning of Chapter Five. Furthermore, this section on the applicability of interventions identified that the concept of contract culture was one of the major reasons why accountability often worked only 'upwards' towards donors, and not 'downward' towards beneficiaries. In addition to this, the need for transparency to both donors and beneficiaries for actions taken on the ground was also

urged. It was in this context that the importance of encouraging the involvement of local authorities into the planning and decision making processes was recommended as an approach for the realisation of accountability to beneficiaries.

Considering the issues in regard to the long-term sustainability of water supply implementations, the third and final section of Chapter Five first focused on the mechanisms of monitoring and evaluation. It was pointed out that, because of the need for flexibility in a project cycle, monitoring should be a built-in mechanism to collect regular, reliable and viable information on the progress of water supply programmes. Having looked at the concept of monitoring, the section not only identified an appropriate evaluation model for reconstructed water supplies, but also some recommendations to improve the limitations caused by the characteristics of war-affected areas. After looking at the concepts of operation and maintenance in terms of their needs such as trained personnel, financial resources and management structures, a list of actions to be taken were highlighted. Following this exploration, the last two issues to be investigated at the end of Chapter Five were financial sustainability and training of personnel. It was argued that several misconceptions such as affordability for the poor and subsidisation of costs needed to be overcome and looked at in a more realistic perspective in order to ensure structures providing long-term financial sustainability. Finally, the concept of 'training of trainers' in a progression from the training capacities of external agencies to sharing of resources between various local actors was explored and suggested to initiate a human resource development system.

The methodology of field research in addition to other research methods adopted throughout the development of this work was presented in **Chapter Six**. It first explained the research's combined strategy, incorporating a quantitative method such as a questionnaire survey with the overall exploratory framework employing qualitative methods. Following this, the data collection methods during the field research were explained, highlighting some crucial points that had to be borne in mind during the collection of reliable, sufficient and bias-free information. The chapter also discussed a number of workshops and conferences that played the role of 'learning tools' for the author. A list of recommendations were given as the conclusions of Chapter Six, summarizing the overall strategy of this research and the methods employed in its development.

Chapter Seven presented the general framework of the case study in the Tuzla Region of Bosnia and Herzegovina. Having analysed the conflict in Bosnia from its causes in the context of Yugoslavian collapse to its post-Dayton hierarchical structures, the chapter explored the social, economic and physical characteristics of the region. In addition to this, necessary quantitative background information on SEA assisted water supply projects was presented at the end of the chapter. It was concluded that the international community's response to the recovery of water supplies in the Tuzla Region has changed considerably. While it was focused on mainly emergency rehabilitation programmes from 1993 to 1996, it began to place more emphasis on more long-term needs such as institutional strengthening. It was in this context that the international community was criticised for missing the opportunities of achieving similar long-term aims in the progression from emergency to reconstruction.

Having presented the background information on the region, **Chapters Eight and Nine** consisted of the analysis of field research findings. These two chapters used the same structure as the fourth and fifth chapters respectively, as the collection of data from the field was made by the utilization of an evaluation log book, consisting of the four main areas of the ATAM framework. Therefore the analysis in Chapter Eight was on the issues related to appropriateness of SEA assisted water supply recovery programmes, while Chapter Nine included the analysis on the remaining three aspects. The conclusions derived from these chapters will be utilized for the presentation of recommendations in the following section.

10.3 Recommendations for an Approach to Sustainable Recovery of Water Supplies in War-affected Areas

Lessons and conclusions which were highlighted, derived and identified in the previous two chapters were regarding the international community's response to post-war water supply requirements in the Tuzla Region, with specific reference to the projects assisted by SEA. Although these recommendations do not attempt to be universally applicable, they are meant to provide accessible, comprehensive and achievable frameworks to the post-war recovery of urban water supplies in other similar situations.

10.3.A Appropriateness Issues of Water Supply Reconstruction

A1. Assessment of needs and capacities for planning

The international community should plan and design water supply projects only after a thorough assessment of their own needs and capacities and their local partners, and the physical, economic, logistic and political situation existing in the field.

- A proper water needs assessment and the survey of existing supplies in terms of technical and sanitary conditions should be established prior to the review of technical options for the task.
- In order to avoid the manipulation of 'facts' and statistics for the purpose of increasing the justifiableness of water supply recovery proposals, the difficult challenge of collecting reliable information in the field should be recognised and necessary checking mechanisms for the data collected should be incorporated in the field operation structures.
- Due to the special characteristics of war-affected areas it is always not possible to obtain reliable factual information for planning of projects; therefore where estimates are used instead for the justification of expenditure, agencies should use them with consistency and highlight them properly.
- The characteristics of local authorities, even those in the same region, may vary greatly, therefore after the assessment of needs and capacities, international agencies should establish a situation-specific approach for working with local authorities.
- International agencies should carry out self-assessments for their own vulnerabilities and capacities on a regular basis as the characteristics of their involvements need to be different according to changes taking place in a post-war environment.
- After the assessment of needs and capacities for the involvement in a water supply project, agencies should review their personnel's primary skills, and the time allocated to carry out their responsibilities as part of their self-assessment process.
- Agencies should make sure that their personnel to be involved in the planning and implementation of interventions should have appropriate knowledge, skills and experience for the tasks to be undertaken.
- International agencies should note that their expatriate personnel who are involved in long-term reconstruction programmes should be on contracts which are not less than two to three years in order to enable a successful continuity in the project cycle.

A2. Setting objectives for interventions

International agencies and organisations should set up clear objectives in terms of water quantity, quality, availability and reliability in order to make their implementations more transparent and achievable, and easier to monitor and evaluate.

- The implementations should be decided according to their viability and prospect of long-term sustainability, instead of having the availability of funds as the sole reason.
- The objectives of a project should be achievable and consistent with the capacities of agencies involved and resources which can be provided.
- In line with the objectives which are initially set up for the intervention, agencies should ensure the establishment of clear job descriptions and areas of responsibilities between agencies involved and also for their own personnel.
- Setting up clear objectives is particularly important to avoid carrying out implementations on an ad-hoc basis, wasting of scarce resources and having project failures.
- The prioritization of objectives for implementations should be done following proper consultation with local authorities.
- International agencies should be aware of the possibility that they may find themselves in an awkward situation as a result of initial objectives being altered by local authorities. This is particularly the case if the international agency's practical involvement in the project cycle ends after the delivery of materials and equipment to the construction site.

A3. Holistic approach for meeting objectives

International agencies and organisations should ensure that their approach to improve water quantity and quality in war-affected areas is structured on the basis of a holistic approach in order to meet their initial objectives successfully.

- The implementation of water treatment facilities should not be considered as the best and only remedy to improve water quality, as the rehabilitation of distribution networks also plays a significant role in the water quality improvements.
- It should be noted that the rehabilitation of distribution networks is also important for improving water quantity, as the development of new water sources cannot be enough to improve the quantity on its own.
- The efforts to reduce the level of leakage from distribution networks should be

considered as an integral part of international organisations' interventions to improve water quantity and quality.

- Local authorities should be encouraged to review and adjust their priorities on the overall improvement of their settlements' water situation for the benefit of strategies which would result in the rehabilitation of distribution networks.
- International agencies should take into account that the main reason for the inappropriate prioritisation of projects is often the unwillingness of donors to support complex and long-term projects.
- It should be noted that the main constraint for the implementation of holistic projects tends to be the lack of funding.

A4. Improvement of funding praxis for water supply recovery

Donors should change their current methods of funding which tend to consider water supply projects from a pure cost-benefit perspective. Consequently, donors should adopt funding policies and methods that are more responsive and appropriate to the real needs, sensitivities, vulnerabilities and capacities of the situation.

- The type of funding and conditions which are employed as part of donors' methods of funding should be formulated in the most appropriate way to the situation to avoid the possibility of leading implementing agencies and local authorities to ad-hoc programmes.
- The conditions for the liquidization of funds and the continuity of cash flows from donors to implementing agencies should be responsive to the realities of the construction industry in the field.
- Donors should be aware of the fact that shortcomings and problems with funding procedures tend to be the main causes of problems with the procurement process and haphazardly planned implementations.
- It should be noted by donors that imposing a ceiling of funding for various aims can also result in ad-hoc and unsustainable implementations as the project design needs to remain within limited budget frameworks.

A5. The provision of water and public health

The provision of water in war-affected areas is indispensable for the protection of public health. However it is crucial to recognise the following issues in the planning process of

water supply improvement strategies:

- A holistic approach in terms of ensuring not only adequate quantity and safe quality, but also the overall availability and reliability to all layers of the population should be incorporated in the strategy.
- It should be noted that the problems with water provision in terms of four basic requirements of quantity, quality, availability and reliability tend to be much more serious in small size settlements with weak local institutions such as those 'displaced' by war than central settlements of well-equipped municipalities.
- International agencies and organisations should be aware of the fact that the population who obtain their water from sources outside the umbrella of town water networks tend to be exposed to greater health dangers, as the physical, chemical and bacteriological characteristics of waters from these sources are not improved to make them 'safe' for drinking.
- It should be noted that the lack of regular water quality checks in semi-urban areas makes it more difficult to become aware of these water-related health problems.
- Agencies should not consider that the implementation of treatment facilities and the establishment of laboratories are sufficient to ensure the provision of safe water and the regular control of water quality, as these processes also require the existence of financial sustainability, training of personnel and institutional development.
- The rehabilitation of water supplies as a whole should be considered as the only way of ensuring the water quality standards.

A6. Basic technological criteria for planning

Agencies should consider various technical criteria in the process of reviewing the possibility of different technical options which can be utilized to improve the provision of water in war-affected areas. These technical criteria to be borne in mind are essential with regard to ensuring the implementations' long-term sustainability. However it should be noted that it is not matter of considering one criterion instead of another, but it is more an issue of having a holistic perspective in the process of responding to technological challenges faced as part of water supply interventions.

- Agencies should recognise that haphazard planning for quick fix solutions without carrying out the necessary technical surveys and investigations can result in the decision to apply inappropriate technology.

- The long-term operational failures of rehabilitated water supplies are often the result of the implementation of a technology transfer which is not appropriate to the local physical, organisational and economic environment, and which has been carried out without incorporating a good level of local participation.
- At the least, several basic technological criteria such as pump compatibility, hydraulic suitability, appropriate simplicity and power needs should be considered in the process of choosing equipment and materials for water supply implementations.
- International agencies should not supply equipment and materials which are left over from previous interventions for the sake of 'cutting costs', if they are not specifically designated as appropriate to these particular projects.
- It should be noted that the mentality of 'cutting costs' often results in implementations which never become operational.
- In the process of implementing complex water supply projects, international agencies should ensure the partnership of local authorities which are technically and organisationally equipped to carry out their responsibilities.
- International agencies should consider the capacity of local authorities in terms of personnel and skills as an indispensable requisite for a successful implementation of projects, and their operation and maintenance.
- International agencies and organisations should be aware of the fact that local authorities tend to consider the most advanced technology as the best option for their projects, which can cause serious problems with operation and maintenance of supplies.
- International agencies should consider the utilization of an external consultant with appropriate technical and organisational experience to provide advice on planning and implementation of complex water supply projects.
- In the event of a large scale technology transfer, international agencies should provide a coordinator who can supervise the overall process as well as technical personnel.
- The practice of making the choice of technology according to the origin of funding and the conditions set by donors and investors should be handled with care. In the case of any probability that they can result in inappropriate implementations, then a committee including members from donors, implementing agencies and local authorities should be able to make the final decision on the choice of technology.
- If a water supply rehabilitation project includes the implementation of a technology

transfer, international agencies should be in a position to provide long-term expert assistance for possible problems that local authorities may encounter during the operation and maintenance.

10.3.B Targeted Water Supply Reconstruction

B1. Strategies to encourage local participation

International agencies and organisations should establish strategies that can enable operational approaches, encouraging the participation of local authorities in the project cycle from the planning and design to the implementation.

- It should be noted that international agencies often face the dilemma of choosing an appropriate partner between local authorities and private contractors as an implementing actor.
- International agencies should be aware of the fact that the full participation of local authorities in the planning and implementation stages of water supply interventions can be the most beneficial, only when they are equipped well in terms of organisational and technical capacities.
- Agencies should carry out strict control mechanisms to avoid the possibility of mismanagement of funds if the possibility of hiring a private contractor as an implementing agency is preferred.
- The need for clear division of responsibilities in terms of decision-making, planning and implementation should be recognised by international agencies. This provides an environment of partnership which is a prerequisite if the final product is to be a functioning system.

B2. Water supply recovery in a highly politicised environment

International agencies and organisations should recognise the fact that they often operate in a highly politicised environment which can hinder their recovery programmes in various ways.

- It should be noted that international agencies often need to deal with tensions created by different political opinions at different levels of hierarchy in order to achieve their goals for the benefit of war-affected people. The issue of impartiality plays a

significant role in gaining trust from all different levels of the hierarchy and political powers.

- The utilization of water supply recovery programmes by politicians as a tool to gain votes should be avoided by setting up objectives on the basis of the real needs of beneficiaries and the resources to be provided for the implementation.
- It should be recognised that a highly politicised environment in war-affected areas also provides a fertile ground for the possibility of corruption as politicians and bureaucrats may attempt to gain financial benefits out of aid provided by the international community. This should be avoided by the implementation of built-in control mechanisms and ensuring the involvement of international agencies until the project cycle is totally completed.

B3. Ethnic diversification and targeted approaches for water supply recovery

International agencies should be aware of the fact that their initiatives for the implementation of water supplies in war-affected areas can be utilized in the preservation and improvement of existing ethnic reciprocal relationships.

- The positive impact of some individual politicians and decision-makers in the protection of ethnic harmony should be recognized and international agencies' efforts in this process should be targeted at the incorporation of these decision-makers' involvement in the overall process of recovery programmes.
- It should be noted that the provision of water to different ethnic communities by a common water supply can be utilized for strengthening relationships between them, if this approach is carried out in a culturally sensitive way, ensuring that all stakeholders are treated equally.
- Agencies should note that the use of water supply recovery as a peace building tool tends to be a long and frustrating process which requires additional organisational capacities such as extra time and financial means, and mediation and peace-making skills.

B4. Enabling economic revitalisation through water supply recovery

It should be recognised that water supply rehabilitation programmes can play a pivotal role in the revitalisation of post-war economy through the utilization of local and human resources and the encouragement of private sector initiatives.

- As the construction of water supplies is a labour intensive process, their implementation in war-affected areas should be recognised as an essential tool for the creation of employment.
- It should be noted that the creation of employment is not only significant for direct financial reasons, but also for creating knock-on regeneration effects in related sectors and the enablement of social reconstruction.
- International agencies should be aware of the fact that the choice of equipment and materials from the West does not always mean that comparable equipment or materials are not available locally.
- The encouragement of private sector initiatives in the post-war recovery process should be considered as essential for the revitalisation of the economy.
- International agencies should be aware of the fact that the misconception of 'modernization' often leads local engineers and planners to prefer products from countries which are considered as developed and 'modern'.
- It should be noted that the misunderstanding of quick 'reformation' through the utilization of the western technology can easily result in a culture of dependency.

10.3.C Applicability of Water Supply Reconstruction

C1. Overcoming the challenge of security and logistics

International agencies and organisations should assess the logistical and security requirements of water supply projects, which is particularly important for large scale and complex interventions in order to make an achievable decision for the timing to initiate them.

- It should be noted that the scale and complexity of projects can be an important factor affecting the extent of logistical problems experienced during the implementation process.
- Agencies should be aware of the fact that logistics and security conditions, and efforts to overcome them, can impose serious tensions on the working partnership between the actors concerned.
- Agencies should carry out comprehensive situation assessments in order to have a better understanding of the existing logistical realities.

- International agencies should make sure that commitments made by other actors in the field for overcoming logistical and security challenges are in the form of formal agreements, which otherwise can result in discontinuities as a result of personnel changes.
- The proper timing of any intervention, to avoid problems which are caused by logistical and security difficulties, should not be neglected for the sake of other intentions such as liquidization of funds and gaining prestige among other international agencies.
- Agencies should find a right balance between waiting for the proper timing for the intervention and taking risks by intervening for the survival of war-affected people while the war is ongoing.

C2. Legal aspects of institutional strengthening in the context of the Tuzla Region

Although the requirements of the institutional strengthening of local water boards is far more complex and wider than an NGO like SEA could have ever met, it should be noted that SEA's approach for working with local authorities has definitely had some substantial positive impacts on this process.

- It should be recognised that SEA was not in a position to take the responsibility of enabling the institutional development of local water boards due to financial and time constraints.
- Agencies should be aware of the fact that the interpretation and execution of legal frameworks are more important than initiating a process for possible improvements in the legal aspects of water supply management.
- It should be noted that most of the public utility companies in the region do not have the necessary technical and organisational rule books and manuals for operation and maintenance of individual components of their water supply systems.
- The institutional strengthening process initiated by the international community should note that there is a need to prepare rule books for each specific local water board because of the varying characteristics of municipalities.
- The institutional strengthening process should also acknowledge that some of the municipalities in the region do not possess the necessary financial and professional capacities for the establishment of their own rule books and manuals.
- The participation of local water boards in the process of preparing regulations dealing

with public utility companies should be recognised as necessary for ensuring their appropriateness to the requirements of each municipality.

- Legal frameworks should encourage cooperation between public utility companies from different municipalities in order to provide opportunities of sharing staff and equipment for similar operations.
- New legal adjustments for the institutional strengthening process should ensure that water metering for every flat in buildings with more than two flats, is made a legal obligation.

C3. Accountability

International agencies and organisations should ensure a full accountability to both the donors of funds and local authorities as beneficiaries in order to avoid the waste of scarce financial resources and to encourage the participation of local partners.

- It should be noted that the main reasons for ineffective accountability mechanisms utilized by agencies tend to be the funding praxis imposed by donors and the way water supply projects are initiated, which often lack achievable and consistent objectives, and are carried out on ad-hoc basis.
- Agencies should be aware of the fact that the lack of accountability to their partners often results in the creation of opportunities for the mismanagement of funds.
- International agencies should require a full accountability from their local partners in terms of funds being collected and their spending on the achievement of interventions.
- International agencies' lack of accountability should be considered as one of the main reasons why local authorities can become completely unaccountable for their involvements.
- International agencies should note that their restricted interpretation of accountability, which is mainly to donors of the funding, produces detrimental consequences on the way local authorities are encouraged towards sustainable partnerships.
- Agencies should have a built-in practice of a thorough collection of information and keeping records for the purposes of accountability.

C4. The manipulation of flexibility

Agencies should be aware of the fact that the good intention of flexibility as part of water supply interventions to respond to the changing characteristics of a post-war environment,

can sometimes be manipulated by local authorities.

- The monitoring and supervision mechanisms should be clearly set down in order to avoid the possibility of the manipulation of flexibility, which is often done by altering the objectives and plans of projects for the benefit of politicians and other local water board personnel.
- The involvement of international agencies in water supply project cycles should not be limited to the delivery of equipment and materials to the construction site, as otherwise the manipulation of flexibility by local authorities becomes easier.

10.3.D Maintainability of Reconstructed Water Supplies

D1. Monitoring and Evaluation

Agencies should recognise that the lack of monitoring and evaluation prevents the detection of problems with the progress of water supply implementations before they become complete failures, and does not enable agencies to learn from their previous experience; this may result in the repetition of similar mistakes from one involvement to another.

- The process of monitoring should be recognized as essential for a successful assessment of the changing environment and the progress of interventions.
- The lack of monitoring should be recognised as one of the main reasons for corruption which may take place at the local authority level.
- A proper monitoring system should be able to detect the negative progress of water supply implementations before it becomes too late to deal with them.
- A proper monitoring process should be considered as the collection of information in terms of efficiency, effectiveness, impact, relevance and sustainability of water supply interventions.
- Agencies should be aware of the fact that the main reasons that monitoring is carried out haphazardly are the way initial objectives are set up on an ad-hoc basis, and the international agencies' lack of awareness and understanding on this issue.
- The possibility of creating committees including members both from local authorities and international agencies to deal with monitoring requirements should be recognised as an appropriate approach, not only providing a good level of monitoring, but also supporting the process of international agencies' accountability to beneficiaries.

- Agencies should avoid including monitoring and evaluation sections in their proposals mainly for the sake of increasing the possibility of obtaining funds. They should be included as an essential part of the project. Consequently, donors should have a better understanding of these processes in order to question and adjust the proposals of monitoring and evaluation made by implementing agencies.
- Agencies should evaluate their programmes in terms of the efficiency and effectiveness of interventions, their relevance to the target group, their impacts on the population and local authorities, and the overall sustainability of rehabilitated systems.

D2. Organisational improvements for successful operation and maintenance

Institutional strengthening initiatives taken by the international community should make sure that the organisational structures of public utility companies are designed to be appropriate to the physical and economic facts of the local environment.

- The organisational strengthening process should first assess the present organisational structure, determine objectives for operation and maintenance and describe activities carried out by each management level. Following this, it should determine how many staff will be required to carry out these necessary activities. Second, it should carry out a similar exercise for an adjusted version of the current organisational structure in terms of the reformulation of the decision making process and the determination of human and economic resources for the intervention. Finally, it should carry out the actual implementation by ensuring that the staff are informed, involved and trained in this process.
- Financial difficulties should be recognised as the main problem for successful operation and maintenance of water supply services; this tends to be a more serious problem for small size municipalities with limited capacities.
- Agencies should have a clear understanding of the existing financial system in terms of capital, and operation and maintenance costs.
- It should be noted that the cost of operation and maintenance of water supplies is often much higher than local authorities can collect as water charges from the local community.
- The other main constraint with the operation and maintenance of water supplies in war-affected areas is the availability of trained personnel.

D3. The challenge of financially sustainable water supply management

Agencies should note that the low level of collectability of water charges is mainly caused by the ineffectiveness of organisational structures which are often inherited from the pre-war era.

- Local water utility companies should be allowed to be in a position where they can decide on the price of water in a cost-effective way and on the methods to be used during the collection.
- Agencies should be aware of the fact that the ability of war-affected people to pay is often given as an excuse for the low level of collectability without determining the real financial situation in the field, and the overall attitude of beneficiaries on the issue of water as a commodity needs to be considered.
- It should be noted that the population in war-affected areas tend to be prepared to pay their telephone and electricity bills more readily than water bills as a result of the small chance of the water supply being cut off in the event of not paying the bills.
- Reasons such as lack of sense of ownership, or the sub-culture of war should also be recognised as reasons for the low collectability of water charges, which is more likely to be experienced in settlements with large internally displaced populations.

D4. Human resources development as a prerequisite for sustainability

International agencies should recognise the importance of 'training of trainers' to initiate a human resources development system as part of a training continuum in order to ensure the long-term sustainability of rehabilitated water supplies.

- It should be noted that the phenomenon of 'brain-drain' to overseas and the attraction of better qualified professionals to international humanitarian organisations are two of the main reasons for the shortage of trained personnel working at the local authorities.
- Agencies should be aware of the fact that small size municipalities are affected by the lack of trained human resources to a greater extent than larger municipalities.
- International agencies should initiate training programmes for medium and senior level managers from water utility companies, which can introduce different approaches for water supply management.
- By creating an environment of collaboration between the municipalities of a region or a country, the human resources available locally should be utilized in the training of

personnel from small and weaker municipalities.

- The provision of technical training to personnel at the operational level in their own country by expatriates or abroad, via interpreters, should not be considered as methods of training, because they tend to be inefficient and ineffective.

10.4 Operational Checklist for Initial Programming and Eventual Evaluation

After presenting a set of recommendations derived from the research carried out in the Tuzla Region, this section aims at presenting a checklist of questions which can be utilized in the process of initiating new water supply programmes and evaluating their performance.

This operational checlist is based on the questions which formed the content of the log book utilized during the field work. Having reviewed the preceding recommendations and taken the experience of the author with the use of the log book in the field into consideration, the context of the log book has been improved in order to provide an operational checklist. The questions provided in this checklist can be adjusted by implementing agencies according to the needs of the particular situation faced in the field. Therefore this checklist of questions should only be considered as a tool for drawing up the framework of some of the issues and dilemmas that implementing agencies may experience in their interventions. However it is hoped that the checklist will provide a comprehensive framework for the formation of new perspectives in brain-storming sessions prior to initiating recovery programmes, and the evaluation of overall sustainability of reconstructed water supplies. It should also be pointed out that the checklist also has the potential of being adopted by other disciplines such as sanitation, shelter, etc.

As pointed out earlier, it is not possible to cover all the issues that may be encountered in the recovery of war-affected water supplies, because of the different characteristics of each working environment and the requirements of that specific situation. Consequently, the intention here is not to provide a final definite document, but to present a set of recommendations which can be utilized as stepping stones in the process of improving current praxis of water supply recovery in war-affected areas.

1. Appropriateness Issues of Post-war Water Supply Reconstruction

1.1 Assessment of needs and capacities for planning

The international community should plan and design water supply projects only after a through assessment of the needs and capacities of their own organizations, their local partners, and the physical, economic, logistic and political situation existing in the field.

1.1.1 What are the methods and mechanisms utilized for collecting and checking the reliability of information collected in the field in order to initiate the programme?

1.1.2 Is the estimated factual information which is used for the justification of expenditure used consistently and highlighted properly?

1.1.3 Has the implementing agency carried out a water needs assessment and the survey of existing supplies in terms of technical and sanitary conditions prior to the processes of planning and project design?

1.1.4 Is the approach for working with local authorities decided specifically for that particular programme?

1.1.5 When was the last time the implementing agency carried out a self-assessment of its own vulnerabilities and capacities for working in that particular area?

1.1.6 Did the implementing agency review its personnel's primary skills, and the time allocated to carry out their responsibilities for that particular programme?

1.2 Setting objectives for interventions

International agencies and organisations should set up clear objectives in terms of water quantity, quality, availability and reliability in order to make their implementations more transparent and achievable, and easier to monitor and evaluate.

1.2.1 What is/was the project's objective for the quantity of water to be supplied, and will/did the implementation of this project result in meeting this objective?

1.2.2 If not, what were the main reasons for this?

1.2.3 Is /Was the water supplied before the project's implementation safe for drinking and how does/did the local authority control whether it is/was safe?

1.2.4 What is/was the extent of water shortages before the implementation of the project and how much will/did the project improve this shortcoming?

1.2.5 What is/was the extent of population provided with water by the town water supply and will/did the project improve the extent of water availability in the settlement?

1.2.6 Is/Was the project decided according to its viability and prospect of long-term sustainability or is/was the sole reason having available funds?

1.2.7 Are/Were the objectives of the project achievable and consistent with the capacities of the actors involved and resources which can/could be provided

by them?

1.2.8 Are/Were clear job descriptions and areas of responsibilities between agencies established prior to the implementation?

1.2.9 Are/Were the objectives prioritized in consultation with local authorities?

1.3 Holistic and integrated approach for meeting objectives

International agencies and organisations should ensure that their approach to improve water quantity and quality in war-affected areas is structured on the basis of a holistic approach in order to meet their project's initial objectives successfully.

1.3.1 How will/did the implementing agency ensure that the project will have/had a holistic approach between different sub-systems of the water supply for the improvement of water quantity and quality?

1.3.2 Will/Were the efforts for reducing the level of leakage from the distribution network an integral part of the intervention taken by the international agency?

1.3.3 Will the local authority be (or was it) encouraged to rehabilitate the distribution network?

1.3.4 Will the importance of implementing that particular project in a holistic manner be explained (or was it) to the donor to ensure proper awareness?

1.3.5 Are/Were there any problems with the sewage system that resulting in the pollution of water through the distribution network?

1.3.6 Is/Was the settlement supplied with a regular electricity supply?

1.3.7 To what extent are/were the shortcomings of the electricity supply affecting the operation of the water supply?

1.4 Improvement of funding praxis for water supply recovery

Donors should change their current methods of funding which tend to consider water supply projects from a pure cost-benefit perspective. Subsequently, donors should adopt funding policies and methods that are more responsive and appropriate to the real needs, sensitivities, vulnerabilities and capacities of the situation.

1.4.1 Will the type of funding and conditions which are/were set out as part of donors' method of funding be/were they formulated in the most appropriate way to the situation?

1.4.2 Are/were the liquidization of funds and the continuity of cash flows from donors to implementing agencies responsive to the realities of the construction industry in the field?

1.4.3 Is/Was there adequate funding to implement the project according to the real needs of the situation?

1.5 The provision of water and public health

The provision of water in war-affected areas is indispensable for the protection of public health. However it is crucial to recognise the following issues in the process of planning water supply improvement strategies:

1.5.1 Is/Was there a holistic approach in terms of ensuring not only adequate quantity and safe quality, but also the overall availability and reliability to all layers of the population?

1.5.2 Will/Did the implementing agency give particular attention to the water provision problems in small size settlements with weak local institutions such as those 'displaced' by war?

1.5.3 Is/Was the international agency aware of the fact that the population who obtain their water from sources outside the umbrella of town water networks tend to be exposed to greater health dangers?

1.5.4 Will/Did the implementing agency pay any attention to the enablement of local authorities in terms of financial sustainability, training of personnel and institutional development as part of the implementation of treatment facilities and the establishment of laboratories?

1.6 Basic technological criteria for planning

Agencies should consider various technical criteria in the process of reviewing the possibility that different technical options can be utilized to improve the provision of water in war-affected areas. It is essential to bear these technical criteria in mind if the long-term sustainability of any implementation is to be ensured. However it should be noted that it is not matter of considering one criterion instead of another, but it is more an issue of having a holistic perspective in the process of responding to technological challenges faced as part of water supply interventions.

1.6.1 To what are/were the main technical shortcomings of the water supply before the implementation of the project?

1.6.2 What extent has the project improved those technical shortcomings?

1.6.3 Will/did the implementing agency use any design criteria to decide the technical aspects of the project?

1.6.4 Will/Did the implementing agency carry out the necessary technical surveys and investigations to avoid the selection of inappropriate technology for the project?

1.6.5 Is/Was the technology transfer appropriate to the local physical, organisational and economic environment, and incorporating a good level of local participation?

1.6.6 Does/Did this reconstruction project bring any unexpected constraints to the operation and maintenance of the system?

1.6.7 Is/Was the cost of equipment a criterion on technological choices to be made in the planning of this project?

1.6.8 What kind of criteria will/did the implementing agency use in order to decide whether to repair a component or to replace it with a new one?

1.6.9 Will/Did the implementing agency ensure the partnership of the local authority and is/was the local authority technically and organisationally equipped to carry out its responsibilities?

1.6.10 How will/did the implementing agency decide on the level of complexity of technology implemented?

1.6.11 May/Did the local authority consider the most advanced technology as the best option for the project?

1.6.12 If necessary, will/did the implementing agency consider the utilization of an external consultant to provide advice on the planning and implementation of the project?

1.6.13 If a large scale technology transfer is/was necessary, will/did the implementing agency provide a coordinator position to supervise the overall process?

1.6.14 If the choice of technology will be/was made according to the origin of funding and the conditions set by donors and investors, how will/did the agency reduce the probability of inappropriate implementations?

1.6.15 If a technology transfer is/was necessary, will/did the implementing agency provide long-term expert assistance for possible problems during the operation and maintenance phases?

2. Targeted Water Supply Reconstruction

2.1 Strategies to encourage local participation

International agencies and organisations should establish strategies that can enable operational approaches, encouraging the participation of local authorities in the project cycle from the planning and design to the implementation of water supply interventions.

2.1.1 How will/did the implementing agency encourage the participation of local authorities?

2.1.2 How will/did the implementing agency ensure that its partnership with the local authority would be beneficial for the both sides?

2.1.3 Will/Did the implementing agency consider the local authority's organisational and technical capacities in the process of deciding on the type of partnership with the local authority?

2.1.4 If the possibility of hiring a private contractor as an implementing agency is preferred, how will/did the international agency avoid the possibility of corruption?

2.1.5 To what extent and in which phases is/was the local authority to be involved in decision-making with respect to allocation of responsibilities, selection of technology, design and construction, and organisation of operation and

maintenance?

2.2 Water supply recovery in a highly politicised environment

International agencies and organisations should recognise the fact that they often operate in a highly politicised environment which can hinder their recovery programmes in various ways.

2.2.1 Is/Was the international agency aware of the fact that tensions created by different political opinions at different levels of hierarchy can have detrimental impacts on the achievement of the project objectives?

2.2.2 How will/did the implementing agency avoid the manipulation of water supply recovery programmes by politicians as a tool to gain votes?

2.2.3 How will/did the implementing agency avoid the possibility of corruption as politicians and bureaucrats may attempt to gain financial benefits out of aid provided by the international community?

2.3 Ethnic diversification and targeted approaches for water supply recovery

International agencies should be aware of the fact that their initiatives for the implementation of water supplies in war-affected areas can be utilized in the preservation and improvement of existing ethnic reciprocal relationships.

2.3.1 Does/Did the implementing agency recognise the importance of some individual politicians and decision-makers in the protection of the ethnic harmony?

2.3.2 If it does/did, how will/did the implementing agency utilize this opportunity?

2.3.3 How will/did the implementing agency ensure the participation of different ethnic groups for a partnership initiative to improve the water situation?

2.3.4 Will/Did the implementing agency establish a strategy for the implementation of the project in a culturally sensitive way and ensuring a fair treatment of all stakeholders?

2.4 Enabling an economic revitalisation through water supply recovery

It should be recognised that water supply rehabilitation programmes can play a pivotal role in the revitalisation of the post-war economy through the utilization of natural and human resources and the encouragement of private sector initiatives.

2.4.1 Does/Did the implementing agency recognise that the construction of water supplies can be an important tool for the creation of employment and a knock-

on regeneration impact in related sectors as well as assisting the enablement of social reconstruction?

2.4.2 Where does/did the implementing agency purchase necessary equipment and materials for the implementation?

2.4.3 If they will be/were obtained from abroad, are/were they not available locally?

2.4.4 How will/did the implementing agency encourage the participation of private sector initiatives in the project cycle?

2.4.5 How will/did the implementing agency ensure that the utilization of western technology will/did not create a long-term dependency?

3. Applicable Water Supply Reconstruction

3.1 Overcoming the challenges of security and logistics

International agencies and organisations should assess the logistical and security requirements of water supply projects, which is particularly important for large scale and complex interventions in order to make a practicable decision on timing the start of projects.

3.1.1 Is/Was the implementing agency aware of the fact that the scale and complexity of projects can/could be an important factor affecting the extent of logistical problems experienced during the implementation process?

3.1.2 Is/Was the implementing agency prepared for overcoming the problems caused by the overall requirements of logistics and security conditions?

3.1.3 Will/Did the implementing agency carry out a comprehensive situation assessment in order to have a better understanding of the logistical realities?

3.1.4 What kind of arrangements will/did the implementing agency make to ensure a working order of logistics for the project?

3.1.5 Is/Was the implementing agency clear about the right timing of intervention to avoid problems caused by logistical and security problems?

3.1.6 What will be /was the implementing agency's strategy to find a right balance between waiting for the best time for the intervention and taking risks by intervening while the war is/was ongoing?

3.2 Institutional development

Although the requirements of the institutional strengthening of local water boards are far more complex and wider than many NGOs can ever meet, it should be noted that an approach for working with local authorities can definitely have substantial positive impacts on this process.

3.2.1 Will/Did the partnership between the implementing agency and the local authority have any empowering effects on the process of institutional development?

3.2.2 To what extent will/did the implementing agency incorporate the issues of additional resource allocation such as time, money and skills, and the participation of the local authority, throughout the project cycle?

3.3 Accountability for preventing waste of scarce resources

International agencies and organisations should ensure a full accountability to both the donors of funds and local authorities as beneficiaries in order to avoid the waste of scarce financial resources and to encourage the participation of local partners.

3.3.1 How will/did the implementing agency ensure that it is/was fully accountable to the donor of funds and the local authority as beneficiary?

3.3.2 How will/did the implementing agency ensure its local partner's full accountability in terms of funds being collected and their spending for the implementation?

3.3.3 Does the implementing agency have a built-in practice of a thorough collection of information and keeping records of them for the purposes of accountability?

3.3.4 Will the implementing agency's accounts and plans be or were they open for scrutiny by donors and beneficiaries?

3.3.5 What will be/was the main reporting system of the implementing agency to the local beneficiary?

3.4 The manipulation of flexibility

Agencies should be aware of the fact that the good intention of acting with flexibility as part of water supply interventions in order to respond to changing characteristics of post-war environment can sometimes be manipulated by local authorities.

3.4.1 To what extent will there be/was flexibility to change the programme according to changing characteristics of the post-war environment?

3.4.2 How will/did the implementing agency ensure that the possibility of the manipulation of flexibility, by altering and changing the objectives and plans for the benefit of politicians and local water board personnel, will be/was avoided?

4. Maintainability of Reconstructed Water Supplies

4.1 Monitoring and Evaluation

Agencies should recognise that the lack of monitoring and evaluation prevents the detection of problems with the progress of water supply implementations before they become complete failures, and does not enable agencies to learn from their previous experience, which may result in the repetition of similar mistakes from one involvement to another.

4.1.1 Will the monitoring of the project be/was it done in terms of efficiency, effectiveness, impact, relevance and sustainability throughout the implementation?

4.1.2 What will be/were the main indicators for the monitoring of the project?

4.1.3 Will the indicators be/were they derived from the programme objectives?

4.1.4 Will the flexibility of implementation be/was it able to incorporate the necessary adjustments according to the findings of monitoring process?

4.1.5 Will the project be/was it evaluated in terms of efficiency and effectiveness of the intervention, its relevance to the target group, its impacts on the population and local authorities, and the overall sustainability of the rehabilitated system?

4.1.6 What will be/were the indicators and criteria utilized for the evaluation process?

4.1.7 What kind of methods will be/were used to gather information for the evaluation, and who is/was responsible for carrying out the process?

4.2 Organisational strengthening for successful operation and maintenance

Institutional strengthening initiatives taken by the international community should make sure that the organisational structures of public utility companies are designed to be appropriate to the physical and economic realities of the local environment.

4.2.1 Is/Was the organisational structure of the water utility company suitable for an efficient and effective operation and maintenance?

4.2.2 If it is/was not, how can/could an appropriate organisational structure be developed?

4.2.3 How will/did the implementing agency ensure that there will/would be a working order of operation and maintenance?

4.2.4 Is/Was there a clear understanding for the existing system's financial cost of operation and maintenance?

4.2.5 Will the local authority be/was it in a position to provide necessary financial means and trained personnel for operation and maintenance?

4.3 The challenge of financially sustainable water supply management

Agencies should note that the low level of collectability of water charges is mainly caused by the ineffectiveness of organisational structures which are often inherited from the pre-war era.

4.3.1 Will/Was the local authority be/was it in a position to decide on the price of water in a cost-effective way and on the methods to be used during the collection?

4.3.2 Will the limited ability of war-affected people to pay be/was it assessed as a reason for the low level of collectability of water charges?

4.3.3 Was there any water charge before the implementation of the project?

4.3.4 Is there any charge for water now?

4.3.5 What are the financial resources to cover operation and maintenance costs of the system?

4.3.6 What strategies can be/were developed to improve the financial sustainability of the system?

4.4 Human resources development as a prerequisite for sustainability

International agencies should recognise the importance of 'training of trainers' to initiate a human resources development system as part of a training continuum in order to ensure the long-term sustainability of rehabilitated water supplies.

4.4.1 Will there be/Were any initiatives taken for the identification of training needs and the development of training programmes?

4.4.2 How many people will be/were trained and at what levels of the water management system?

4.4.3 Does the implementing agency have any policies or plans for training of its expatriate and local members of staff?

4.4.4 Does the implementing agency have the financial resources and time to be able to focus on the training of local personnel?

4.4.5 What are the methods of training and for which levels will they be/were carried out?

4.4.6 What are the possibilities and needs of using local staff, trained as instructers, to train other locals?

10.5 Final Remarks Regarding the Use of the Operational Checklist as an Evaluation Tool

As pointed out earlier, the preceding recommendations, which can be utilized by implementing agencies during the initiation and evaluation of water supply projects, are not the answers for all challenges and opportunities to be experienced in the field. However, they provide the outline of an approach which can contribute to the realization of sustainable recovery of war-affected communities. If these recommendations are used as an evaluation tool, it is necessary to emphasise several issues which are derived from the author's field work experience. Some of these issues such as evaluation methods, determination of indicators, carrying out research in war-affected areas, were already discussed in Sections 5.4.1 and 6.3. Therefore the aim here is to present some further issues in regard to initiating an evaluation process through the use of preceding recommendations.

Five important areas of consideration for the initiation of an evaluation can be categorized as follows:

- The request for conducting the evaluation
- Allocation of responsibilities for the evaluation
- Personal profile of evaluators
- Representation of recipients in the evaluation
- Resources necessary for conducting the evaluation

Each of the above issues play a significant role in the way an evaluation exercise is structured and carried out, and its findings presented. For example, an evaluation based on a request from donors who tend to be more interested in the efficiency of programmes, would be completely different from an evaluation initiated by an implementing agency itself, attempting to find out the success of its overall approach for the rehabilitation of water supplies. Related to this, the allocation of responsibilities in terms of commissioning, financing and conducting would also play a significant role in the way evaluation is realized. However, the main emphasis here will be put on the selection of evaluators to explain the overall applicability of the evaluation.

In parallel with the recommendations made by IRC (1991:18-19) on the selection of evaluators, the following issues can be highlighted. First of all, it is crucial to decide whether the evaluation will be carried out by internal or external evaluators. The main advantage of using internal evaluators is that they are likely to have a comprehensive knowledge of the project, and would make a more efficient utilization of the log book. In addition to this, it may also increase the chance of incorporating the recommendations of the evaluation in their future programmes. However the main drawback of using internal evaluators is that they are more likely to be biased because of their involvements in the project. Considering the structure of the log book and areas of consideration incorporated, it seems that the use of external evaluators is more likely to produce objective findings. For example during the use of the log book in the field, the author often needed to interview representatives from local authorities, institutions and communities. As pointed out with the notion of affiliated organisation bias in Chapter Six, it is advisable that the evaluators are chosen from an external organisation such as an academic institute or a consultancy organisation. It should also be borne in mind that if the evaluation is commissioned or financed by a donor for example, local authorities and international implementing agencies are likely to be unwilling to be completely open with their responses. Obviously, the main reason behind this is the possibility of endangering the chances of funding for future programmes. It was because of this that the author's reassurances to SEA and local authorities regarding the purpose of his evaluation works had to be presented first before obtaining access to written information and conducting interviews.

Secondly, the other important issue regarding the selection of evaluators is their area of expertise. It is essential that the recommendations are used by an evaluator who is equipped with not only expert knowledge, but also has been trained in the issues of post-war recovery. It is clear that the evaluator needs to have some expert knowledge in many different disciplines such as technical, organisational and financial in order to interpret the findings obtained by the log book. However as it is not always possible that one evaluator possesses all these different areas of expertise, the choice of setting up an evaluation team in order to cover all areas of necessary expertise can be made. The author's experience in the field showed that the log book can be used efficiently and effectively by somebody who is aware of the requirements of various research techniques and trained to work in war-affected areas. If this evaluator is not equipped with the necessary technical expertise in

water supply management, then the best option would be to employ an additional expatriate or local consultant who can provide necessary technical expertise for the analysis of findings on the technical aspects of the implementation.

Finally, just as certain reassurances needed to be given to local authorities and international agencies for the purpose of the evaluation exercise, it was also discovered that the personal profile of the evaluator also plays a significant role in the process of information collection. The main issue regarding the personal profile can be highlighted as the necessity of being respected and trusted. This is perhaps the most difficult aspect of being an evaluator, which requires the combination of various characteristics. Most of these were explained in Chapter Six such as the ability of using an appropriate range of research techniques, qualifications, credentials, overall communication skills, self-presentation and impartiality. It is crucial that those who provide information through various ways for the purpose of the evaluation should be able to trust the evaluator. Unless they are assured and their trust is obtained, the productive use of the log book can be rather limited, as most of the questions are targeted on issues that can easily be either manipulated or unfairly interpreted.

For approving and implementing the recommendations of the evaluation, it is also important to conduct the whole process in collaboration with the representatives from the implementing agency, local authorities and community. The formation of a committee including these representatives may be necessary to assist the establishment of evalution indicators according to project objectives and the purpose of the evaluation, and the formulation and implementation of recommendations from the evaluation. A steering committee for this purpose can act as a useful mechanism where recipients can represent their views on the processes of evaluation and implementation of findings. In addition to this, the other important area of consideration for initiating an evaluation process should be emphasized here. It is the determination of resources necessary for conducting the evaluation process such as money, time and manpower. It is therefore crucial that implementing agencies which have included the decision to conduct an evaluation in the planning of a water supply project should also budget these necessary resources in their proposals.

10.6 Future Research Suggestions

Having presented the operational checklist and the sugestions for their utilization as an evaluation tool, it can clearly be seen that further research in this field will need to be pursued in order to sustain the improvement process of current praxis.

Post-war institutional strengthening of water utility companies

This research showed that no matter how diligently the post-war recovery programmes are carried out, if the institutional structure of water utility companies is not equipped with the necessary capacities, policies and procedures, the long-term sustainability of implementations cannot be viable and achievable. As a result of this fact the requirements of institutional strengthening of water utility companies need to be taken as urgent priorities as part of recovery programmes. However this is an area of consideration that has only recently come to the attention of the international community. The experience from initiative for the institutional strengthening of public utility companies in Bosnia and Herzegovina which has been taking place since 1997, is still to be seen. On the basis of its importance for the long-term sustainability of water supplies, and the lack of strategies and experience in this area of consideration, there is a prime need for research which can review the experience in Bosnia in order to derive lessons for future initiatives.

Private Sector Initiatives in the Recovery of Water Supplies

As this research progressed, it became clear that the involvement of private sector initiatives in the recovery of urban water supplies is often a common practice due to the characteristics of water supply projects. However the dilemma of choosing an appropriate partner between local authorities and private contractors as an implementing agency is still faced by international agencies working in the field. Consequently, there is a prime need for research to explore and articulate the policies and strategies for the involvement of the private sector, which can be used by the international community in the process of initiating projects and setting mechanisms of control for these involvements.

Water Supply Recovery as a Peace Building Tool

The utilization of water supply recovery as a tool for social reconstruction through encouraging different ethnic groups to work together towards the improvement of their common water supplies presented itself quite strongly as this research progressed. From Kabul and Mostar to some examples in the Tuzla Region, the concept was raised in different perspectives and presented contrary findings. However at least theoretically, it is an area of consideration that if applied sensitively, can provide the possibility of positive contributions towards the establishment of peace as well as recovery of water supplies. It is the result of this hypothesis that there is a need for research in order to explore the context of this challenge further by collecting up-to-date and reliable information on this topic, and defining appropriate and inappropriate approaches for the task.

Training of Professionals in Post-war Water Supply Recovery

This research in the Tuzla Region showed that the gap between technical knowledge, and skills and methods necessary to work in war-affected areas, needs to be overcome by the training of professionals. A continuum of training can be initiated by the training of humanitarian aid personnel at some continuing education and research centres such as the PRDU. However further research is still essential to designate training manuals based on the findings of this research that can be utilized in the establishment of courses for the training of professionals such as public utility managers and engineers who work in water supply reconstruction, development and management in war-affected areas.

Testing the Recommendations

Having explored the research question in the context of the Tuzla Region and established an operational checklist based on the findings from this case study, there is now a need to test the applicability of the above recommendations in the field and in a variety of countries. Consequently, this presents a prime need for research which can review and validate the context more extensively, and rectify and build upon it further.

Appendix A

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Questionnaire

The Reconstruction of Water Supply Systems in Post-Disaster Areas

This research aims to understand the context of exploring human resources and the challenge of reconstructing water supplies. The research is concerned with the different aspects of disaster recovery from disaster preparedness to reconstruction. It must be borne in mind that the provision of water is part of post-disaster recovery which can contribute to the regenaration of social, cultural and political structures of the community directly or indirectly which is imperative for the sustainability of the community.

Name: .....
Address: (optional) .....
.....
.....
Phone: (optional). ..... Fax: ..... e-mail: .....
Discipline: .....
.....
The project- .....
.....
.....
.....
Location: .....
.....
.....
Name of employing NGO: .....
.....
Starting date: .....
Length of the programme: .....
.....
Targeted population: .....

Please respond to the following questions. Appreciating your time constraints, I do not expect you to answer each question. Please focus your attention on those questions you think are most relevant to the project you have worked on. Of course, should you desire and have the time , I would be most grateful to have your comments on all of them.

A. THE PROBLEM, THE BRIEFING, THE NEEDS ASSESSMENT, MONITORING AND EVALUATION

What was the nature of the disaster?

What were the causes of the disaster?

1)What kind of briefing did you receive from the agency employing you before starting to work on the project?

- Was this briefing sufficient enough to prepare you for the work? Yes ( ) No ( )

- Do you think your work could have been more successful if you had more detailed briefing? Yes ( ) No ( )

2)What was the work your team carried out?

- What expertise was represented in your team?

- Did you have "In Country" or "International" technical back up?

3)What were your tasks in this project?

4)What were the goals of the project?

- Who set the goals?

- Were there additional goals set by your agency ?.....

5)Who funded the project?.....

- Were there restrictions placed by funders?.....

6)Were those goals set by your agency met? Yes ( ) No ( )

- How was success measured?

( ) Time
( ) Number of beneficiaries
( ) litre(s) of water provided
( ) number of local people employed
( ) other, please specify

7)Who were you reporting? How?

( ) To Donors
( ) To Beneficiaries
( ) Within Organisation

B. THE IMPLEMENTATION

1) Were there enough fresh water resources available to satisfy disaster affected people's water needs in terms of: a)Ground water? , b)Surface water?

2) Were there any water supply systems present in the area? Yes ( ) No ( )
If YES
Did the disaster damage those systems? Yes ( ) No ( )
If YES
What was the extent of the damage? Low ( ) Moderate ( ) High ( )

3) What were the technical solutions, innovations and adaptations used on the project?

4) Was the water provision you provided primarily for:
( ) refugees
( ) displaced persons
( ) local host community

If only for refugees/displaced persons
Please evaluate relationship between refugees/displaced persons and local host community?

- Did this inform the way you tackled the issues surrounding water provision Yes( ) No( )

5) Did you receive any participation from the community during planning/implementation of the project? Yes ( ) No ( )
If YES
At what stage did this contribution happen and how?
( ) Planning
( ) Implementation
( ) Maintenance

6) Were you satisfied with the level of the participation? Yes ( ) No ( )
If you WERE
What kind of participation it was?
( ) Labour
( ) Professional
( ) Administrative
( ) Financial

If you were NOT

What were the main obstacles to the achievement of a good level of participation? .....

- What could have been done to improve participation? .....

7) Was the water project you worked for involved with any sanitation or health project in the area?
Yes ( ) No ( )

If YES please specify

- Were there advantages of this involvement at an early stage? If so what were they?.....

- What is your personal opinion about the involvement of water projects with sanitation or health projects in post-disaster areas

C. ORGANIZATIONAL ASPECTS, NGOs

1) Were there any management/coordination problems on the ground?

2) Were there any governmental organisations involved in the area? .....

3) Do you think your NGO was aware of its capacities and weaknesses before taking on this project?
Yes ( ) No ( )

- How did your NGO come to be involved in this project? .....

4) Were your NGO's capacities adequate enough to meet the needs? Yes ( ) No ( )

5) Were there any other NGOs working in the same area? Yes ( ) No ( )
If YES
Were your efforts coordinated with those of other NGOs'? Yes ( ) No ( )

6) What would you suggest to improve cooperation among NGOs or between NGOs and governmental organisations?

D. SUSTAINABILITY

1) Did this project contribute to the development of the area in anyway? Yes ( ) No ( )
If YES how? .....

2) During the implementation of the project how many people were directly employed and for how long? .....

- Do you think there were some positive effects of this employment creation?
e.g. For easing tensions among people? For economic spin-off?
If YES were these effects
( )Short term
( )Long term
( )Both

3) Did you use local human and natural resources for the implementation of this project?
Yes ( ) No ( )
If YES
What were these resources?

- Were there any problems with the provision of these resources? Yes ( ) No ( )

- What did you do to overcome these obstacles?

4)
a-Can you identify the main effects of your project on the client community?

- Are these effects: ( ) temporary or ( ) long term?

b-Can you identify the main effects of your project on the host community?

- Are these effects: ( ) temporary or ( ) long term?

- In general terms has the project had a beneficial or a detrimental effect on:
a-The client community: ( ) beneficial or ( ) detrimental

b-The host community: ( ) beneficial or ( ) detrimental

5) What do you think about using local human and natural resources for the implementation of projects during the RECONSTRUCTION period?
Please comment on the relative importance of using indigenous human and natural resources rather than imported resources during the following periods of the disaster.

E. IDEAS, COMMENTS

Please identify any other key issues regarding the provision of water supplies in post-disaster areas which you think have not been covered in this questionnaire.

F. KEY RESOURCES

Can you suggest any resources such as references, guidelines, checklist, manuals, computer programs, individuals and agencies with expertise in the provision of water supply systems in post-disaster areas which you think would be significantly useful for the development of this research.

Would you object to part of the text of your answers being quoted and referenced in my PhD thesis-
( ) YES ( ) NO

Appendix B

Appendix B:

Recommendations of the Water under Fire Workshop: The Challenge of Post-war Reconstruction of Water Supplies, 21-22 November 1996, York

The recommendations of the Water under Fire Workshop, which were derived from the discussions took place in working groups and plenary sessions, were summarised under the following headings:

- Opportunities for improving existing systems and building new water supplies
- Social reconstruction
- Empowerment and capacity building
- Economic aspects of post-war water supply interventions
- Partnerships between Donors, NGOs and Beneficiaries

A. Opportunities for Improving Existing Systems and Building New Water Supplies

There is no doubt that war has devastating effects on physical, social, economic and political structures of a community, but it should be noted that war cannot be blamed for all shortcomings faced in a post-war situation. Experiences in many post-war countries show that the problems with water quantity, quality, availability and reliability in urban areas tend to have existed even before the war, but their magnitude and scope are exacerbated by the influx of refugees and internally displaced persons, and the lack of operation and maintenance during the conflict.

Ironically, the post-war reconstruction of urban water supplies can provide opportunities to improve existing supplies either by carrying out thorough remedy works or by implementing new systems. However, in order to be able to utilise these, certain issues should be borne in mind. Firstly, the complexity of urban water systems and their dependence on power supplies require an integrated and holistic intervention which should consider all aspects of the problem and take necessary precautions for their long-term sustainability. Secondly, activities to be carried from emergency to reconstruction should

be achieved in a progression from relief to reconstruction. In other words, agencies involved should ensure that the positive impacts gained from water supply interventions in each phase can be carried to the following.

B. Social Reconstruction

The post-war recovery does not only embrace the physical rebuilding of war-affected communities, but also its social, political and cultural aspects. The main differences between physical and social reconstructions are that the former is easier to achieve and measure than the latter, though their respective long-term sustainabilities depend on each other's successful implementation as part of the post-war recovery. Without building up a post-war society that could live in harmony with all the existing ethnic, religious and cultural differences, the continuity of positive impacts gained by post-war reconstruction programmes cannot be long lasting. Consequently, the post-war recovery programmes such as reconstruction of urban water systems should aim at reconciliation between those different groups.

For example, a Habitat-led water supply intervention provided several opportunities for people from different ethnic groups to work together and to rebuild the confidence and trust which were damaged by the exploitation of those differences during the 18 years of civil conflict. The possibility of using water as a peace tool has also similar effects on the reconciliation. The examples from Bosnia show that it would be possible to bring warring factions together to work for the improvement of common water systems - Divided communities / Unifying water systems.

C. Empowerment and Capacity Building

Empowerment of local authorities is one of the most important guarantees for the long-term sustainability of improved water systems, as their operation and maintenance will be carried out by those local agencies. This can be done in several ways, but perhaps the provision of training of local staff in organisational, technical and managerial aspects of day-to-day operation and maintenance of systems could be the most appropriate as war can have serious set-backs on existing institutional and personnel structures.

In post-war situations, local authorities tend to be more open to changes which could be used as an opportunity to carry out institutional enablements. This is especially a prerequisite in circumstances where the intervention involved is in a technology transfer. On the other hand, those working with local authorities should also bear in mind other important issues such as culturally sensitive implementation, using indigenous knowledge, and consultation. However, the successful repatriation of returnees is also an important aspect of post-war social reconstruction and an over-emphasis of empowerment of local authorities can have detrimental effects on the future of those returnees as they are often seen as the opposition faction during the conflict.

D. Economic Aspects of Post-war Water Supply Interventions

The close interaction between water and economic development means that sustainable water supplies can be an important part in the stabilization of the economy, by both creating employment and being an indispensable component in the development of industry and commercial activities. In addition, as a result of the media interest in war affected countries, it is likely to attract external financial support to improve water supplies, which would not otherwise be possible. On the other hand, the international community tends to have more interest for this kind of investment where a war-affected country has certain economic, political and strategic importance for them. It should also be pointed out that this type of developmental aid given by donors is likely to have some hidden agendas such as using certain suppliers by chosen agencies from certain countries. This approach can have serious detrimental effects on the sustainability of the systems if the technology implemented is not compatible and appropriate to the existing systems.

The water system reconstruction projects should aim at the full utilization of local resources which in return would create necessary economic spin-offs. The other important issue to ensure the sustainability of interventions is their commercial viability in terms of operation and maintenance. The pricing of water should be dealt with carefully as an initial step, the industry can be approached first to pay for their consumption as this might be difficult for household users in the aftermath of a war.

E. Partnerships between Donors, NGOs and Beneficiaries

The long-term sustainability of programmes implemented in post-war countries depends on the successful cooperation and coordination of agencies involved in this process. This approach would reduce duplication preventing resources from being wasted and ensuring that they will be well operated and maintained once external agencies pull out from the country. In other words, NGOs should play a catalyst role between donors and beneficiaries considering war-affected people as partners but not victims. The scope of this catalyst role can be varied from the provision of materials, equipment and funds to technical supervision, but NGOs should bear in mind that their interventions should strengthen local institutions and their capabilities.

The type of partnership should be flexible according to the evaluation of the situation. For example, while a coordinative approach can be more appropriate in emergencies for a quick response, a consultative or cooperative approach in post-war recovery could ensure a more broad-based participation of beneficiaries in decision making and implementation. Expatriate personnel should, for instance, avoid certain types of attitudes such as 'I am in charge here' or 'I am here to coordinate'. Consequently, this can ensure a 'better level of liability, accountability and sense of ownership by beneficiaries.

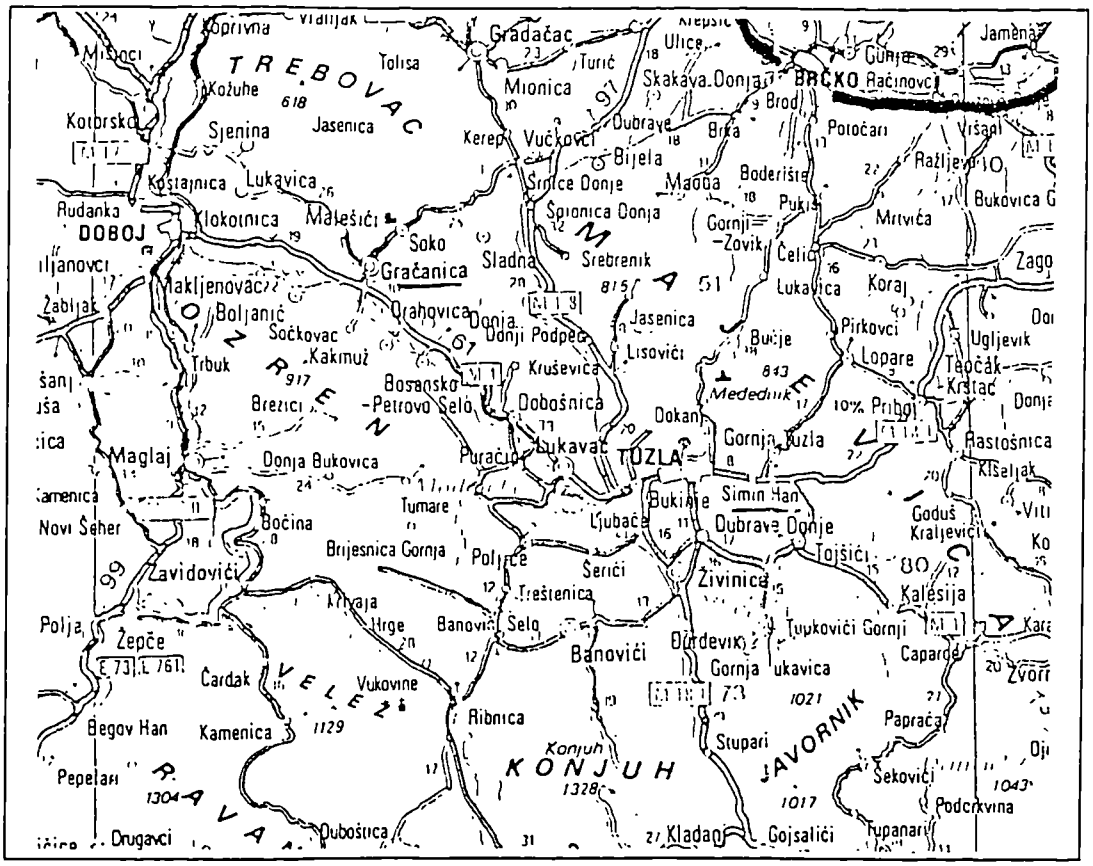
Appendix C

Log Book
for the Evaluation of SEA Assisted Water Supply Projects in the Tuzla Region of Bosnia Herzegovina

Carried out by: ..... Date:.....

Translation by: ..... Starting&Finishing Time:.....

Name of Interviewee: .... Profession:.....



Brief Project Description	
Project Activity	
Place	
Executing Authority	
Duration	
Budget	

Population	
Ethnic Groups	
Household Composition	
Sources of Income	

Summary of Activity

Justification of the Project

Objectives

History of Activities

Inputs	
SEA	
Local Authority	
Others	

1. Appropriateness Issues of Post-war Water Supply Reconstruction

1.1 Water Quantity:		Assessment of the question: 1-5
Q 1.1.1: What was the project's objective for the quantity of water to be supplied?		
Q 1.1.2: What was the amount of water per person per day supplied before the implementation of this project?		
Q 1.1.3: What is the amount of water per person per day supplied after the completion of this project?		
Q 1.1.4 If the initial objective for the quantity of water to be supplied has not been met by the implementation of this project, what are the main reasons for this?		

1.2 Water Quality:		Assessment of the question: 1-5
Q 1.2.1: Was the water supplied before the implementation of the project safe for domestic uses? How did you control whether it was safe?		
Q 1.2.2: How do you measure the quality of water? What are the criteria used for this measurement?		
Q 1.2.3: What is the E.Coli level in treated water entering the distribution system? What is the E.Coli level in treated water in the distribution system? What is the E.Coli level in treated water at various consumer points in the town?		
Q 1.2.4: What is the method of disinfection used in the treatment system?		
Q 1.2.5: Do you measure the presence of free chlorine in treated water?		
Q 1.2.6: Do you measure inorganic and organic chemicals? Do you keep a record of those tests?		
Q 1.2.7: Do you measure substances and parameters in drinking-water that may give rise to complaints from consumers such as physical parameters, inorganic constituents, organic constituents and disinfectant and disinfectant by-products? Do you keep a record of those tests?		

1.3 Water Reliability:		Assessment of the question: 1-5
Q 1.3.1: Was the water supply working continuously before the implementation of this project?		
Q 1.3.2: What was the extent of water shortages?		
Q 1.3.3. Is the supply now providing water 24 hrs a day?		
Q 1.3.4: Are there still any water shortages?		

1.4 Water Availability:		Assessment of the question: 1-5
Q 1.4.1: Was the water supply reached to the whole population before the implementation of this project? What was the extent of population provided with the town water supply?		
Q 1.4.2: Were there any particular areas in the town that were not connected to the town water supply?		
Q 1.4 3: Is the water supply now available to the whole population in the town?		

1.5 Health Aspects:		Assessment of the question: 1-5
Q 1.5.1: What were the extent of water-washed and water-borne diseases before the implementation of this project?		
Q 1.5.2: Did the implementation of this project result in the level of water-related diseases in the area?		

1.6 Technical Criteria:		Assessment of the question: 1-5
Q 1.6.1: What were the main technical shortcomings of the supply before the implementation of this project?		
Q 1.6.2: What extent has this project improved those technical shortcomings?		
Q 1.6.3: How did you decide the technical aspects of the project? Have you used any design criteria during the planning of this project?		

Q 1.6.4: If there was a pump replacement as part of the project, did you consider the hydraulic suitability characteristics of the new pump and its compatability with the other existing pumps?		
Q 1.6.5: What extent did the hydraulic suitability and pump compatability characteristics affect to your choice of pumps?		
Q 1.6 6: What kind of standards did you use or consider in order to ensure durability of equipment used in the project?		
Q 1 6.7: How did you decide on the level of complexity of this project? Was there any special requirement posed by any partner involved in this programme?		
Q 1.6.8: Did this reconstruction project bring any unexpected constraint to the operation of the system?		
Q 1.6.9: Was the cost of equipment a criteria on technological choices you made in this project?		
Q 1 6.10: What kind of criteria did you use to decide whether to repair a component or to replace it with a new one?		
Q 1.6.11: What is the level of water leakage from the distribution system?		
Q 1.6.12. Did you carry out any remedy programme to decrease the level of leakage? If you did not, what were the main constraints for this?		

1.7 Integration with other rehabilitation programmes: A. of the question: 1-5		
Q 1.7.1: What kind of sewage system is used in this settlement?		
Q 1.7.2: Are you aware of any pollution problems that affecting the water table or treated water in the supply as a result of shortcomings of the sewage system?		
Q 1.7.3: Are you aware of any problems with the town sewage system?		
Q 1.7.4: If there is any leakage from the sewerage system, is this affecting the quality of water supplied to the population?		
Q 1.7.5: Were there any programmes carried out to improve the sewage system?		
Q 1.7.6: What are the main constraints that prevented you from carrying out a sewage improvement programme?		

Q 1.7.7: Is the settlement supplied with a regular electricity supply?		
Q 1.7.8: What extent are the shortcomings of the electricity supply affecting the operation of the water supply?		
Q 1.7.9: Since the implementation of the reconstruction project, have you had any operational problems with the systems, caused by the problems at the power supply?		
Q 1.7.10: Did you consider the availability of power supply in your decision making of choosing the type of technology or technical components used in the implementation of this project?		

2. Targeted Water Supply Reconstruction

2.1 Socially Targeted:	Assessment of the question: 1-5	
Q 2.1.1: What strategy has been used to encourage local participation?		
Q 2.1.2: How did you ensure that the partnership between SEA and the local authority during this project work in a beneficial way for the both sides?		
Q 2.1.3. To what extent and in which phases was the local authority involved in decision-making with respect to: * selection of technologies that appropriate and sustainable * accepting varying needs and capacities as a starting point * formal division of responsibilities and rights * selection of source (s) * level of service * design and construction * timing * organization of operation and maintenance * costs and contributions * training of manpower development		

2.2 Politically Targeted:	Assessment of the question: 1-5	
Q 2.2.1: How did SEA persuade the ethnic groups for a partnership initiative to improve their existing water supplies?		
Q 2.2.2: What were the main problems in this process and how were they overcome?		

Q 2.2.3: To what extent and in which phases did the participation of those ethnic groups rely on the following principles: * all sides were made aware of the fact that without their full collaboration, the full improvement of their common water supply cannot be ensured. * all sides made an input to the programme. * the responsibility of each stakeholder was designated clearly. * the interaction of responsibilities was clearly identified. * SEA as facilitator remained neutral at all times. * the intervention included adjustments that will prevent any of the sides being an advantageous position with the access to water		
Q 2.2.4: Are you aware of any improvements in the overall relationship between those ethnic groups after the implementation of this reconstruction project?		

2.3 Economically Targeted:	Assessment of the question: 1-5	
Q 2.3.1: Did the reconstruction programme provide jobs for the local community?		
Q 2.3.2: Where did you get your supplies of equipment? If they were obtained from abroad, were they not available locally?		

3. Applicable Water Supply Reconstruction

3.1 Security & Logistics:	Assessment of the question: 1-5	
Q 3.1.1: What kind of arrangements did you make to ensure a working order of logistics for this project?		
Q 3.1.2: What were the main logistical and security problems during the implementation of this project?		

3.2 Institutional Development:		Assessment of the question: 1-5
Q 3.2.1: Did the partnership between SEA and the local authority have any empowering effects which resulted in an institutional development of the local authority?		
Q 3.2.2: To what extent did SEA incorporate the following issues in order to ensure the institutional development of local authority through empowerment: * SEA allocated additional resources such as time, money and skills. * local authorities involved in the whole process of decision-making and implementation.		

3.3 Accountability:		Assessment of the question: 1-5
Q 3 3.1: Who did SEA report to during the implementation of this project?		
Q 3 3.2: Did SEA have any system of reporting to the local authority?		
Q 3 3.3. Did the involvement of local authorities into decision making process ensure accountability to the local authority?		

3.4 Flexibility:		Assessment of the question: 1-5
Q 3.4.1: To what extent was there a flexibility to change during the implementation of the programme according to changing environment in terms of the increasing trend of population, finance, politics, etc.		

4. Maintainable Water Supply Reconstruction

4.1 Monitoring and Evaluation:		Assessment of the question: 1-5
Q 4.1.1: What were the main methods of monitoring employed by SEA and the local authority?		
Q 4.1.2: Has SEA evaluated any of the reconstruction programmes, if it did, what were the criteria for this evaluation?		

Q 4 1.3 Considering the importance of ensuring a clear identification of objectives at the beginning to enable the credibility of evaluation, who set up the initial objectives of the project?		
Q 4.1.4: What were the main constraints that prevented SEA from carrying out evaluation of their projects in the Tuzla Region?		

4.2 Operation and Maintenance:	Assessment of the question: 1-5	
Q 4 2.1 Can the maintenance of the system be done within the resources of the local water board?		
Q 4 2.2. Has an organizational structure for operation and maintenance been developed?		
Q 4.2.3 How did you ensure that there would a working order of operation and maintenance?		

4.3 Financial Sustainability:	Assessment of the question: 1-5	
Q 4.3.1: Was there any charge for water before the implementation of this project?		
Q 4.3.2: Is there any charge for water now?		
Q 4.3.3: What are the financial resources to cover operation and maintenance costs of the system?		
Q 4.3.4: What system has been developed for resource generation?		

4.4 Training:		Assessment of the question: 1-5
Q 4.4.1: Were there any training needs identified and training programmes developed, adapted and/or executed?		
Q 4.4.2: Which ministries, departments or agencies were involved in those training programmes?		
Q 4 4.3. How many people were trained and what levels?		
Q 4 4 4: How did you assess what have gained from those training programmes?		
Q 4.4 5: Does SEA have any guidelines for training of local staff?		

Other Comments

Diagrams

Assessment of the question: 1 Poor - 5 Excellent

Appendix D

Appendix D:

The Full List of Water Supply Programmes Implemented in the Tuzla Region of Bosnia and Herzegovina between 1993 and 1998

The information in the following table was obtained from International Management Group's Project Information Monitoring System (PIMS). The monitoring system was established in 1995 in order to provide up-to-date information on the progress of infrastructural projects implemented in Bosnia and Herzegovina. The overall system contains several sectors such transport; energy; water, sanitation and solid wastes; education and health; housing; and telecommunications. The information on these sectors from the whole country are collected and entered in the monitoring system at various 'entry points', one of which is the Tuzla Field Office. When a project affects more than one Canton/Region as a result of the boundaries introduced by the Dayton Accords, the following codes are used:

- "Federation" ...Whole Federation
- "Serb Republic" ...Whole Serb Republic
- "B&H" ...Whole Bosnia and Herzegovina
- "MC" ...More than one Canton - Federation
- "MR" ...More than one Region - Serb Republic
- "MCR" ...One or more Canton(s) and one or more Region(s)

There are also suffixes in the following table, which are used to indicate fractions created by the Dayton Line and other post-war political separations on pre-war municipalities:

- <pre-war name>_F ...Federation fraction
- <pre-war name>_S ...Serb Republic fraction
- <pre-war name>_N_F ...Federation-North fraction
- <pre-war name>_S_F ...Federation-South fraction
- <pre-war name>_E_F ...Federation-East fraction
- <pre-war name>_W_F ...Federation-West fraction
- <pre-war name>_N_S ...Serb Republic-North fraction
- <pre-war name>_S_S ...Serb Republic-South fraction
- <pre-war name>_E_S ...Serb Republic-East fraction
- <pre-war name>_W_S ...Serb Republic-West fraction

Meanwhile, the project status was indicated as follows:

- Project completed in 1995 or before ...C95
- Project completed in 1996 ...C96
- Project completed in 1997 ...C97

The other indicator shows the degree of IMG's involvement in the project:

- No IMG involvement ...N
- Identified with the participation of IMG ...I
- Appraisal done by IMG ...A
- Monitored by IMG ...M
- Financed through and managed by IMG ...F
- Implemented by IMG ...P

As the author required the list of only water supply projects which have been implemented in the Tuzlanski-Podrinjski Canton between 1993 and 1998, the entries in the following table provide information on these projects. Therefore 'sector' and 'entry point' columns show water supply projects in the Tuzla Region, which are indicated as 'WT' and 'U' respectively.

PIMS … Monitoring System

Entry Date	Sector	Level	No.	Description of Project	Canton									Comment
20 6 97	WT	U	00218	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Srebrenik	Srebrenik	ECHO	200 00	C95	SEA	N	20.6 97	
30.5.96	WT	U	00049	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Srebrenik	Donji Moranjci	UNHCR	0 00	C95	SEA	N	20 6.97	
30.5.96	WT	U	00057	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gradacac_F	Gornji Lukavac		0 00	C95	SEA	N	20 6 97	
30.5.96	WT	U	00073	Emergency rehab pipeline of existing water supply system after a natural disaster- flood..	Tuzlansko-Podrinjski	Zivinice	Djurdjevik	OFDA, RRF	11 00	C95	IRC	M	7 5.97	Population of 8 900. Village resuplied with some amount of water.
30.5.96	WT	U	00082	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Zivinice	Zivinice		150 00	C95	SEA	N	20 6 97	SEA propose to find funds 1 500 000 DM.
20.6.97	WT	U	00224	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Zivinice	Priluk	ECHO	100 00	C95	SEA	N	20 6 97	
30.5.96	WT	U	00148	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lopare_W_F	Humci	ECHO	25.00	C95	SEA	I	26.1.98	
30.5 96	WT	U	00039	New linking pipeline between the main pipeline and village Babunovici.	Tuzlansko-Podrinjski	Srebrenik	Babunovici	UNHCR	75 00	C95	IRC	N	7.5.97	Population of 6 000. Village supplied with enough amounts of water.
20.6.97	WT	U	00219	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Palanka	ECHO	150 00	C95	SEA	N	20 6.97	
20 6.97	WT	U	00222	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Rahic	ECHO	120 00	C95	SEA	N	20 6 97	
20.6.97	WT	U	00217	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gradacac_F	Mionica	OFDA	150 00	C95	SEA	N	20.6 97	
20.6.97	WT	U	00216	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gradacac_F	Gradacac	ECHO	200 00	C95	SEA	N	20 6 97	
20.6.97	WT	U	00214	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Kladanj_F	Kladanj	ECHO	100 00	C95	SEA	N	20 6.97	
20 6.97	WT	U	00212	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Zivinice	Tupkovici	ECHO	120 00	C95	SEA	N	20.6.97	
20.6.97	WT	U	00211	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Kladanj_F	Stupari	ECHO	170 00	C95	SEA	N	20 6.97	
30 5.96	WT	U	00097	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Doboj_E_F	Klokotnica	ECHO	130 00	C95	SEA	F	20.6 97	
30.5.96	WT	U	00111	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Sljepkovica	Norway	15.00	C95	NRC	N	30 6 97	
20.6.97	WT	U	00221	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Rasljani	ECHO	50 00	C95	SEA	N	20.6.97	
20.6.97	WT	U	00220	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Maoca	ECHO	150.00	C95	SEA	N	20 6.97	

PIMS

... Monitoring System

Entry Date	Sector subsector	Entry Point	Seq Number	Description of the Project	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30.5.96	WT	U	00014	New water supply system with capture basin, pump station, main pipeline, reservoir and supply pipeline to the centre of village.	Tuzlansko-Podrinjski	Kalesija_F	Cive	UNHCR	35 00	C95	IRC	N	7 5 97	Population of 800. Long-term supply needs are covered.
30.5.96	WT	U	00016	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Kalesija_F	Tojsici	Norway	30.00	C95	NRC	N	19 12 97	
30.5.96	WT	U	00017	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Kalesija_F	Tojsici		80 00	C95	SEA	N	20 6 97	
30.5.96	WT	U	00089	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Banovici	Treslenica		50 00	C96	SEA	N	20 6 97	
16.12.96	WT	U	00191	Rehabilitation of filter station.	Tuzlansko-Podrinjski	Lukavac_F	Priluk	ICRC	0 00	C96	ICRC	N	16.12.96	
20.6.97	WT	U	00223	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gracanica_F	Gracanica	ECHO	100 00	C96	SEA	N	20 6 97	
30.5.96	WT	U	00177	New connecting pipeline between the coal mine Mramor and Mramor primary school.	Tuzlansko-Podrinjski	Tuzla_F	Mramor	BPRM	17 00	C96	IRC	M	7.5.97	Population of 800. The school c/c supplied with technical water from the coal mine.
5.11.96	WT	U	00003	Install Potable water to hospital.	Tuzlansko-Podrinjski	Gradacac_F	Gradacac	USAID	20 00	C96	IFOR, Parsons	N	24 4 97	
30.5.96	WT	U	00179	Repair of the distribution network and house hookups.	Tuzlansko-Podrinjski	Doboj_E_F	Stanic Rijeka	OFDA, RRF	13 00	C96	IRC	M	7.5.97	Population of 40 returnee families resupplied.
10.12.96	WT	U	00180	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lopare_W_F	Sitari	OFDA	7 00	C96	WVI	N	21 3 97	Connection of source to reservoir. Supply of materials
10.12.96	WT	U	00181	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lopare_W_F	Bucije	OFDA	10.00	C96	WVI	N	21 3 97	Connection of reservoir to village. Supply of materials.
10.12.96	WT	U	00182	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lopare_W_F	Lucici	OFDA	10 00	C96	WVI	N	21 3.97	Connection of reservoir to village. Supply of materials.
30.5.96	WT	U	00134	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lukavac_F	Dobosnica	OFDA	175 00	C96	SEA	N	20 6 97	
19 9.96	WT	U	00094	Replacement of hand pumps.	Tuzlansko-Podrinjski	Doboj_E_F	Stanic Rijeka	ICRC	0.00	C96	ICRC	N	6.12.96	
30.5.96	WT	U	00088	Construction of water supply the village.	Tuzlansko-Podrinjski	Banovici	Aljkovici	Sweden	10 00	C96	SRSA	N	3.2.97	
30 5.96	WT	U	00118	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Satorovici	Norway	90 00	C96	NRC	N	30 6 97	
4.11.96	WT	U	00205	Rehab local water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Brka	USAID	46.00	C96	IFOR, Parsons	N	26 5 97	Parsons No of codification 1BCT-033.
11.12.96	WT	U	00186	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lukavac_F	Lukavac	USAID	77.00	C96	IFOR, Parsons	N	22 8.97	Restore village water and electrical works.

PIMS

Monitoring System

Entry Date	Sector	Entry Point	Seq Number	Description of the Project	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12.12.96	WT	U	00188	Emergency rehab 600 m of water line.	Tuzlansko-Podrinjski	Zivinice	Zivinice	USAID	5 00	C96	IFOR, Parsons	N	12.3.97	
18 2.97	WT	U	00200	New sanitary block.	Tuzlansko-Podrinjski	Banovici	Oskova	Germany	0 00	C96	GTZ	N	18.2.97	
30.5 96	WT	U	00110	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Stjepkovica	ECHO	160 00	C96	SEA	M	30.6 97	
16.12.96	WT	U	00195	Rehab of network.	Tuzlansko-Podrinjski	Lopare_W_F	Humci	ICRC	0 00	C96	ICRC	N	16.12.96	
30.5 96	WT	U	00112	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Gornji Rahic	Norway	0 00	C96	NRC	N	30 6 97	
16.12.96	WT	U	00193	Material for network.	Tuzlansko-Podrinjski	Gracanica_F	Vranovici	ICRC	0 00	C96	ICRC	N	16 12 96	
16.12.96	WT	U	00192	Construction material for reservoir.	Tuzlansko-Podrinjski	Kladanj_F	Stupari	ICRC	0 00	C96	ICRC	N	16 12.96	
10.12.96	WT	U	00183	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lopare_W_F	Toljaci	OFDA	10.00	C96	WVI	N	21 3 97	Connection of reservoir to village. Supply of materials.
30.5.96	WT	U	00015	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Kalesija_F	Jajici	ICRC	0 00	C96	ICRC	N	6 12 96	
30.5 96	WT	U	00023	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Kalesija_F	Brda	USAID	49 00	C96	IFOR, Parsons	N	26 5 97	
30.5.96	WT	U	00160	Emergency rehab of water system. Cleaning of the local area wells.	Tuzlansko-Podrinjski	Brcko_S_F	Omerbegovaca	USAID	44.00	C96	IFOR, Parsons	N	12 3 97	Include villages, Dizdarusa and Brod as well Parsons codification No 1BCT-034.
5 8.96	WT	U	00161	Construction of borehole for water supply. Phase I.	Tuzlansko-Podrinjski	Gradacac_F	Donji Hrgovi	Norway	0 00	C96	NRC	N	19 9 96	NRC have drilled successful well 12 l/sec.
30.5.96	WT	U	00031	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gracanica_F	Doborovci	ECHO	0.00	C96	SEA	I	18 9 96	
30.5.96	WT	U	00034	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gracanica_F	Stjepan Polje	OFDA	190 00	C96	SEA	N	23.8 97	Funding required 190 000 DM.
21.1.97	WW	U	00309	Cleanup Tinja river/tributaries.	Tuzlansko-Podrinjski	Srebrenik	Tinja	USAID	69 00	C96	IFOR, Parsons	N	12.3.97	
30.5.96	WT	U	00040	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Srebrenik	Spionica	OFDA	180 00	C96	SEA	N	20.6.97	
4.11.96	WW	U	00302	Cleanup of Tinja river and tributaries.	Tuzlansko-Podrinjski	Srebrenik	Tinja valley	USAID	69 00 -	C96	IFOR, Parsons	N	22.8 97	Wells supply over 20 000 citizens. Improvement of water quality.
4.11.96	WW	U	00301	Clean up of the open sewage channel.	Tuzlansko-Podrinjski	Lukavac_F	Lukavac	USAID	44 00	C96	IFOR, Parsons	N	14.1.97	

PIMS

Project Information Monitoring System

Entry Date	Sector subsector	Entry Point	Seq Number	Description of the Project	Canton Region	Municipality	Town Village	Donor	Budget (USD)	Project Status	Implement Agency	VAT Exc	Date Last Update	Notes Comments
30.5.96	WT	U	00012	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Kalesija_F	Brod	OFDA, DART	11.00	C96	IRC	N	7.5.97	OFDA/DART Housing Projects. 120 returnee families resupplied, include villages Jelovo B.and Makalici.
30.5.96	WT	U	00165	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gradacac_F	Rajska	ICRC	0.00	C96	ICRC	N	6.12.96	
11.12.96	WW	U	00602	Canal cleaning in local villages.	Doboj	BosanskiBrod_S	Ivanjsko	USAID	73.00	C96	IFOR, Parsons	N	14.1.97	Numerous farms in the area will benefit from the irrigation water. It helps flood control.
20.6.97	WT	U	00455	Emergency water supply to Srebrenica.	Vlasenica	Srebrenica_N_S	Srebrenica	UK	105.00	C96	ODA	N	20.6.97	
30.5.96	WT	U	00138	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lopare_W_F	Celic	OFDA	100.00	C96	SEA	N	20.6.97	
10.12.96	WT	U	00452	Rehab of Water reservoir.	Doboj	Derventa	Derventa	OFDA	35.00	C96	WVI	N	21.3.97	
10.12.96	WT	U	00451	Rehab of Water reservoir.	Doboj	Modrica	Modrica	OFDA	40.00	C96	WVI	N	21.3.97	
30.5.96	WT	U	00056	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gradacac_F	Jelovce Selo	ECHO	240.00	C96	IMG	P	23.8.97	
21.1.97	WW	U	00404	Reconstruction of water drainage.	Posavski	Odzak_F	Odzak	USAID	69.00	C96	IFOR, Parsons	N	12.3.97	
30.5.96	WT	U	00076	New pressure pipeline.	Tuzlansko-Podrinjski	Zivinice	Gornje Zivinice	BPRM	54.00	C96	IRC	M	7.5.97	Population of 7 000. With this improvement the village will have improved water supply.
30.5.96	WT	U	00140	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lopare_W_F	Drijenca	OFDA	10.00	C96	WVI	N	21.3.97	Connection of source to reservoir. Supply of materials.
30.5.96	WT	U	00066	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gradacac_F	Mionica	ICRC	0.00	C96	ICRC	N	6.12.96	
27.9.96	WT	U	00163	Construction of borehole for water supply, phase I.	Tuzlansko-Podrinjski	Brcko_S_F	Ulovic	Norway	0.00	C96	NRC	N	27.9.96	NRC have drilled successful well, 7 l/sec.
20.11.97	WT	U	00238	Pipes for main pipe line.	Tuzlansko-Podrinjski	Gradacac_F	Vida	ICRC	0.00	C97	ICRC	N	10.12.97	
30.5.96	WT	U	00093	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Doboj_E_F	Stanic Rijeka	OFDA	300.00	C97	SEA	N	20.6.97	
30.5.96	WT	U	00137	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lopare_W_F	Celic	SIDA	0.00	C97	SRC	N	26.6.97	
30.5.96	WT	U	00113	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Gornji Rahic	SIDA	80.00	C97	SRC	N	9.12.97	

PIMS

Project Implementation Monitoring System

Entry Date	Sector subsector	Entry Point	Seq. Number	Description of the Project	Canton Region	Municipality	Town Village	Donor	Budget (KM)	Project Status	Implement Agency	VAT Tax	Date Last Update	Notes Comments
30.5.96	WT	U	00142	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lopare_W_F	Vrazici	SIDA	0.00	C97	SRC	N	26.6.97	
30.5.96	WT	U	00129	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lukavac_F	Babice	OFDA	25.00	C97	SEA	N	20.6.97	
30.5.96	WT	U	00127	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lukavac_F	Turija	OFDA	132.00	C97	SEA	N	20.6.97	
30.5.96	WT	U	00126	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lukavac_F	Gornja Orahovica	USAID	100.00	C97	SEA	N	20.6.97	
30.5.96	WT	U	00123	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lukavac_F	Krtova	ICRC	0.00	C97	ICRC	N	26.6.97	
30.5.96	WT	U	00114	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Brka	OFDA	160.00	C97	SEA	N	26.1.98	
5.11.96	WT	U	00004	Clean of water supply source.	Tuzlansko-Podrinjski	Gradacac_F	Gradacac	USAID	72.00	C97	IFOR, Parsons	N	28.5.97	
30.5.96	WT	U	00021	Rehab of water system and network..	Tuzlansko-Podrinjski	Kalesija_F	Hemlijasi	ICRC	0.00	C97	ICRC	N	10.12.97	
30.5.96	WT	U	00026	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gracanica_F	Gracanica	SRC	0.00	C97	SRC	N	26.6.97	
30.5.96	WT	U	00027	Provision of water supply pipes.	Tuzlansko-Podrinjski	Gracanica_F	Gracanica	ICRC	0.00	C97	ICRC	N	10.12.97	
30.5.96	WT	U	00033	New water pump.	Tuzlansko-Podrinjski	Doboj_E_F	Mala Brijesnica	ICRC	0.00	C97	ICRC	N	26.6.97	
30.5.96	WT	U	00042	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Srebrenik	Spionica	SRC	0.00	C97	SRC	N	26.6.97	
30.5.96	WT	U	00044	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Srebrenik	Srebrenik	SIDA	0.00	C97	SRC	N	17.9.97	IRC propose to do rehab of the pipe line(50 000 DM).
30.5.96	WT	U	00054	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gradacac_F	Jasenica	ICRC	0.00	C97	ICRC	N	10.12.97	
30.5.96	WT	U	00063	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gradacac_F	Sibovac	OFDA	65.00	C97	SEA	N	20.6.97	
30.5.96	WT	U	00064	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gradacac_F	Gornja Ledenice	OFDA	90.00	C97	SEA	N	20.6.97	
30.5.96	WT	U	00086	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Banovici	Banovici	SRC	0.00	C97		N	26.6.97	
30.5.96	WT	U	00010	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Kalesija_F	Seljublja	ICRC	0.00	C97	ICRC	N	10.12.97	Funding required for 2 nd source, (mined).
20.11.97	WT	U	00242	Providing pipes and fittings.	Tuzlansko-Podrinjski	Lopare_W_F	Brnjik	ICRC	0.00	C97	ICRC	N	10.12.97	
30.5.96	WT	U	00156	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Zvornik_F	Godus	ICRC	0.00	C97	ICRC	N	26.6.97	

PIMS

Project Implementation Monitoring System

Entry Date	Sector subsector	Entry Point	Seq. Number	Description of the Project	Canton Region	Municipality	Town Village	Donor	Budget (KM)	Project Status	Implementing Agency	VAT In	Date Last Update	Notes Comments
20.11.97	WT	U	00239	Rehabilitation of water system.	Tuzlansko-Podrinjski	Gracanica_F	Lukavica	ICRC	0.00	C97	ICRC	N	10.12.97	
20.11.97	WT	U	00002	Rehab local water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Brka	USAID	15.00	C97	SFOR, Parsons	N	20.11.97	Parsons No of codification 1BCT-033A2.
6.11.96	WT	U	00001	Rehab of local water supply.	Tuzlansko-Podrinjski	Ugljevik_F	Teocak	USAID	56.00	C97	IFOR, Parsons	N	28.5.97	10 000 residents will benefit from this project.
30.5.96	WT	U	00092	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Tuzla_F	Mramor	OFDA	470.00	C97	SEA	N	20.6.97	Also villages Dobrnja and Canici.
24.11.97	W0	U	00002	Provision of 1.5 [t] drilling rig and & various accessories to Vodovod Tuzla.	Tuzlansko-Podrinjski	Tuzla_F	Tuzla	UK	100.00	C97	DFID	N	8.12.97	DFID means, Department for International Development, UK.
20.11.97	WT	U	00243	Rehabilitation of water system.	Tuzlansko-Podrinjski	Kladanj_F	Gojakovici	ICRC	0.00	C97	ICRC	N	10.12.97	
30.5.96	WT	U	00095	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Doboj_E_F	Lukavica Rijeka	Norway	25.00	C97	NRC	N	26.6.97	High priority.
20.11.97	WT	U	00241	Providing alcatene pipes and fittings.	Tuzlansko-Podrinjski	Zvornik_F	Brdjani	ICRC	0.00	C97	ICRC	N	10.12.97	
30.5.96	WT	U	00098	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Doboj_E_F	Velika Brijesnica	SIDA	0.00	C97	SRC	N	26.6.97	
30.5.96	WT	U	00099	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Doboj_E_F	Mala Brijesnica	SIDA	0.00	C97	SRC	N	17.9.97	Material delivered, april - 97.
30.5.96	WT	U	00101	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Ugljevik_F	Stari Teocak	ECHO	90.00	C97	SEA	F	26.1.98	
30.5.96	WT	U	00103	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Ugljevik_F	Teocak	ECHO	180.00	C97	SEA	F	19.11.97	
20.11.97	WT	U	00005	Rehab local water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Brka	USAID	23.00	C97	SFOR, Parsons	N	20.11.97	Parsons No of codification 1BCT-033A3.
24.4.97	WT	U	00206	Rehab of water supply, phase I.	Tuzlansko-Podrinjski	Brcko_S_F	Brka	USAID	36.00	C97	IFOR, Parsons	N	27.5.97	Parsons No of codification 1BCT-033A1.
11.12.96	WT	U	00185	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Lopare_W_F	Celic	USAID	77.00	C97	IFOR, Parsons	N	22.8.97	Provision of the potable water for 700 inhabitants.
11.12.96	WW	U	00401	Reinforce of damaged dike system.	Posavski	Orasje_F	Orasje	USAID	69.00	C97	IFOR, Parsons	N	28.5.97	Project will ensure the protection prom flooding for 1000 people. Construction End Date 04/11.
12.12.96	WT	U	00190	Upgrade of water supply.	Tuzlansko-Podrinjski	Zivinice	Zivinice	USAID	75.00	C97	IFOR, Parsons	N	22.11.97	15000 residential and 2000 refuges will benefit with this proj.
26.6.97	WT	U	00456	Provision of pipes and fittings.	Visesnica	Kalesija_S	Osmaci	ICRC	0.00	C97	ICRC	N	26.6.97	

PIMS *Project Implementation Monitoring System*

Entry Date	Sector subsector	Entry Point	Seq. Number	Description of the Project	Canton Region	Municipality	Town Village	Donor	Budget (DM)	Project Status	Implement Agency	[illegible]	Date Last Update	Notes Comments
22.1.97	WT	U	00199	Rehab of local water system.	Tuzlansko-Podrinjski	Lopare_W_F	Gornj Humci	USAID	72.00	C97	IFOR, Parsons	N	28.5.97	
15.2.97	WT	U	00201	Rehab of pump + electrical panel.	Tuzlansko-Podrinjski	Brcko_S_F	Maoca	ICRC	15.00	C97	ICRC	N	9.12.97	
11.12.96	WW	U	00601	Rehab of water drainage structures.	Doboj	Odzak_S	Odzak	USAID	71.00	C97	IFOR, Parsons	N	22.8.97	Reduction of waterborne health hazards, provides flood control.
15.2.97	WT	U	00203	Repair of the pump.	Tuzlansko-Podrinjski	Lopare_W_F	Celic	ICRC	0.00	C97	ICRC	N	26.6.97	
12.12.96	WT	U	00189	Repair local water system.	Tuzlansko-Podrinjski	Zivinice	Zivinice	USAID	71.00	C97	IFOR, Parsons	N	28.5.97	Water for 17000 inhabitant.
20.6.97	WT	U	00209	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Tuzla_F	Tuzla	Netherlands	3,500.00	C97	SEA	N	26.1.98	
20.6.97	WT	U	00210	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Tuzla_F	Simin Han	Netherlands	500.00	C97	SEA	N	20.6.97	
20.6.97	WT	U	00213	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Zivinice	Zelenika	ECHO	80.00	C97	SEA	N	20.6.97	
20.6.97	WT	U	00215	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Gracanica_F	Stjepan Polje	OFDA	180.00	C97	SEA	N	20.6.97	
26.6.97	WT	U	00225	Provision of Hydrophor.	Tuzlansko-Podrinjski	Gradacac_F	Kerep	ICRC	0.00	C97	ICRC	N	26.6.97	
26.6.97	WT	U	00227	Provision of plumbing material.	Tuzlansko-Podrinjski	Lopare_W_F	Celic	ICRC	0.00	C97	ICRC	N	23.8.97	
30.5.96	WT	U	00341	Rehab of local wells for water supply.	Posavski	BosanskiSamac_F	Domaljevac	USAID	42.00	C97	IFOR, Parsons	N	25.6.97	Include Grebnice village also.
15.2.97	WT	U	00202	Rehab of network.	Tuzlansko-Podrinjski	Zivinice	Gornja Lukavica	ICRC	0.00	C97	ICRC	N	26.6.97	
18.11.96	WT	U	00168	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Srebrenik	Straza	ICRC	0.00	C97	ICRC	N	26.6.97	
18.11.96	WT	U	00167	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Zivinice	Zelenika	ICRC	0.00	C97	ICRC	N	10.12.97	
20.11.97	WT	U	00159	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Srebrenik	Tinja	ICRC	0.00	C97	ICRC	N	10.12.97	
23.5.97	WT	U	00171	Emergency rehab of water supply.	Tuzlansko-Podrinjski	Brcko_S_F	Prutace	ECHO	15.00	C97	IRC	M	21.1.98	Project will include village Maoca to.
16.12.96	WT	U	00194	Emergency rehab of pump and electrical panel.	Tuzlansko-Podrinjski	Srebrenik	Cekanici	ICRC	0.00	C97	ICRC	N	23.8.97	
30.5.96	WT	U	00077	Repair of the existing water system, pipe line, pumps.	Tuzlansko-Podrinjski	Zivinice	Basigovci	ECHO	87.00	C98	IRC	M	16.3.98	Population of 4 500. Include village Donja Lukavica to.

Appendix E

Appendix E:
The Physical and Chemical, and Bacteriological Test Results for Water Samples Taken from the Dobrnja Settlement on 19 March 1998

The following physical and chemical, and bacteriological tests were carried out by the Tuzla Water and Sewage Utility Company's Water Quality Laboratory, and they were approved by Atifa Zaimović, Head of the Laboratory.

The test results show that water supplied in Dobrnja has 'acceptable' physical qualities and it is suitable to the requirements made by the Article 3 in the Tuzla Municipality's Rule Book. The water sample also gave negative results for the bacteriological testing, which means that water is suitable for drinking.

Although most of the terms in these test results are self-explanatory, there will be an translation page after the presentation of each test result.

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KOMUNALNO KOMUNALNO PREDUZEĆE
OOUR VODOVOD TUZLA
- Laboratorija -
Br. labor.protokola 59/88

FIZIČKO-HEMIJSKI NALAZ

LOKALNOST DOBRNJA
NAMIJENJENO

Datum uzimanja uzorka	19.3.88	Slobodni amonijak mg NH4/l	0
Meteorološke prilike	vedro	Rezid. hlor mg Cl/l	0,20
Temp. vode °C	17°C	Hloridi mg Cl/l	9,00
Temp. vazduha °C	—	Nitrati mg N/l	0
Boja:	bez boje	Nitriti mg N/l	0,005
Miris:	nema	Željezo mg Fe/l	0,01
Mutnoća: NTU	0,15	Mangan mg Mn/l	0
Reakcija pH	7,8	Isp. ostatak mg/l	—
Utrošak KMnO4 mg/l	1,84	Elektroprovodljivost	213
Ukupna tvr. mg/l	4,80	Alkalitet mg/l	4,20
Ca^{2+} mg/l	35,00		

S hemijskog stanovišta pregledani uzorak ~~ne~~ - odgovara zahtjevima člana 3. Pravilnika o higijenskoj ispravnosti vode za piće (Sl. list SFRJ 33/87).

Analizu uradila
Nečua

[illegible]

Rukovodilac Laboratorije
ZAIMOVIĆ ATIFA, dip. ing.

Public Communal Corporation

Local Water and Sewage Utility Company, Tuzla

-laboratory-

According to the laboratory procedure number 99/98

Physical - Chemical Analysis

Location: Dobrnja

Date of Sampling: 19. 3. 98	Free Ammonia NH4 mg/l: 0
Weather Report: Clear day	Chlorine Residual: Cl mg/l: 0,20
Temperature of water in lab. ºC: 17 ºC	Chlorine Cl mg/l: 9.00
Temperature of air: -	Nitrate N mg/l: 0
Colour: No Colour	Nitrite N mg/l: 0.005
Smell: No Smell	Iron Fe mg/l: 0.01
Turbidity NTU: 0.15	Manganese Mn mg/l: 0
pH Reaction: 7.8	Washed away elements mg/l: 0
Kmn04 Consumption mg/l: 1,84	Electro transmission: 213
Total hardness: 4,80	Alkaline: 4.2
Calcium mg/l: 35.00	

The chemical characteristics of the sample is suitable to requirements of the Article 3 of the Rule Book's Drinking Water Qualities (Official List of SFRJ 33/87)

JKP "VODOVOD I KANALIZACIJA"
TUZLA
LABORATORIJA
L a b o r a t o r i j a
Br.lab.prot. 253/19/3

Dana 19 03 1948 godine izvršili smo bakteriološku analizu poslatnog - uzetog uzorka vode, dezinfikovali i isprali vodovodne instalacije na vašem objektu: Naselje Dardanija veze vaš akt br.: _____ od _____ 19____ godine.

BAKTERIOLOŠKI NALAZ VODE

Coli titar negativan
Na agaru u ___ ml. zasijane vode poraslo je 0 klica
Najvjerovatniji broj koliformnih klica u 100 ml. vode 0
Streptococus fecalis negativan
Proteus vrste negativan
Clostridium perfigens negativan

Pregledani uzorak vode bakteriološk ~~ne~~ odgovara čl. 33/37 Pravilnika o higijenskoj ispravnosti vode (Sl. list SFRJ broj 9/80).

JAVNO KOMUNALNO PREDUZEĆE
VODOVOD I KANALIZACIJA
TUZLA
LABORATORIJA

Rukovodilac laboratorij
ZAIMOVIĆ ATIFA, dip. ing.
Zaimović Atifa, dipl. ing.

Public Communal Corporation
Local Water and Sewage Utility Company, Tuzla
Laboratory
Number of Laboratory Analysis: 253/19/3

On 19 March 1998, the water sample was taken from the point where treated water entering the distribution network of the Dobrnja Water Supply and tested for its bacteriological qualities.

Bacteriological Analysis of the Water Sample

Coli Organisms: Negative
Streptococcus Faecalis: Negative
Proetus: Negative
Clostridium perfigens: Negative

The tested bacteriological characteristic of the sample is suitable to requirements of the Article 33/97 of the Rule Book's Drinking Water Qualities (Official List of SFRJ 9/80)

Acronyms and Abbreviations

APRO	The Association of Pioneer Rescue Officers
ATAM	Appropriate, Targeted, Applicable and Maintainable
AWWA	American Water Works Association
CIS	Commonwealth of Independent States
DfID	Department for International Development
ECHO	European Community Humanitarian Office
EU	European Union
HABITAT II	The City Summit in Istanbul in June 1996
HDZ	Croatian Democratic Union
ICRC	International Committee of the Red Cross
IFRC	International Federation of the Red Cross and Red Crescent
IDP	Internally Displaced Person
IDWSSD	International Drinking Water Supply and Sanitation Decade
IMG	International Management Group
IRC	International Reference Centre for Community Water Supply and Sanitation
IRC	International Rescue Committee
ITDG	The Intermediate Technology Development Group
MCE	Mercy Corps Europe
MSF	Médecins Sans Frontières
NGO	Non-governmental Organisation

ODA	British Overseas Development Association
ODI	Overseas Development Institute
OECD	Organisation for Economic Co-operation and Development
OFDA	Office of Foreign Disaster Assistance
OHR	Office of the High Representative
O&M	Operation and Maintenance
PRDU	Post-war Reconstruction & Development Unit
RedR	Registered Engineers for Disaster Relief
SDA	Party of Democratic Action
SDS	Serbian Democratic Party
SEA	Scottish European Aid
THW	Technishes Hilfswerk
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCHS (Habitat)	United Nations Centre for Human Settlements
UNDP	United Nations Development Programme
UNDRO	United Nations Disaster Relief Co-ordinator
UNEP	United Nations Environment Programme
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNPROFOR	United Nations Protection Force
UNRISD	United Nations Research Institute for Social Development
USAID	United States Agency for International Development
USCR	United States Committee for Refugees

WatSan	Water and Sanitation
WEDC	Water, Engineering and Development Centre
WHO	World Health Organisation

Note on Pronunciation

In this thesis, indigenous spelling of certain terms and proper names are utilized as they are used in Bosnian language. For those who are not familiar with the complexities of the Bosnian alphabet, the following pronunciation examples are given:

c is pronounced as **ts** as in fi**ts**
ć is pronounced as **ch** (soft) as in mu**ch**
č is pronounced as **ch** (hard) as in **ch**urch
dj is pronounced as **j** as in **j**udge
g is pronounced as **g** as in **g**oat
j is pronounced as **j** as in **y**ell
lj is pronounced as **ll** as in mi**ll**ion
nj is pronounced as **ni** as in o**ni**on
š is pronounced as **sh** as in **sh**oe
ž is pronounced as **s** as in pleasure

Bibliography

Abbott, J. 1996. *Sharing the City: Community Participation in Urban Management*, Earthscan (London)

Adams, M. and Bradbury, M. 1994. Organisational Adaptation in Conflict Situations, paper presented at the *Development in Conflict Workshop*, 1-2 November 1994, Birmingham

Al-Bahar, H. 1991. 'Kuwait's Post-war Reconstruction', *Mimar*, No. 40: 14-17

Amirahmadi, H. 1986. Comprehensive Self-reliant Territorial Planning Strategy for Reconstruction of the War-damaged Areas, *International Conference on Reconstruction of War-damaged Areas*, 6-16 March 1986, University of Tehran, I.R. Iran

Anderson, M. and Woodrow, P., J. 1989. *Rising from Ashes: Development Strategies in Times of Disaster*, UNESCO (Paris)

Anderson, M. 1993. Development and the Prevention of Humanitarian Emergencies, in T. Weiss & L. Minerar (eds.), *Humanitarianism Accross Borders - Sustaining Civilians in times of War*, Lynne Rienner (Boulder, Colorado)

Aviguatero, V., O. 1986. Infrastructure Development Framework: An Approach to Post-war Urban Reconstruction, *International Conference on Reconstruction of War-damaged Areas*, 6-16 March 1986, University of Tehran (I.R. Iran)

AWWA, 1984. Emergency Planning for Water Utility Management, Second Edition, AWWA Manual M19 (Denver, Colorado)

Baechler, M. 1995. War a Threat to Sustainable Water Supply, *Sustainability of Water and Sanitation Systems - 21st WEDC Conference*, Kampala, Uganda, WEDC, Loughborough University (UK):256

Barakat, S. 1993. 'Reviving War-damaged Settlements Towards an International Charter for Reconstruction after War', unpublished DPhil thesis, IoAAS, University of York (UK)

Barakat, S. and Hoffman, B. 1995. Post-conflict Reconstruction: Key Concepts, Principal Components and Capabilities, *Post-conflict Reconstruction Strategies - An International Colloquim*, UNDMSMS & UNIDO, 23-24 June 1995, Vienna, Austria.

Barakat, S., Ehsan, M., Leslie, J. and Strand, A. 1996. Urban Rehabilitation in Kabul: Bridging Between Communities and Institutions Workshop Report, 5-6 September 1995, Pakistan, PRDU, University of York (UK)

Barakat, S. and Davis, I. 1995 *Disaster Preparedness in Urban and Rural Reconstruction of Palestine*, World Bank (New York)

Barakat, S. and Ellis, S. 1996 'Researching Under Fire: Issues for Consideration When Collecting Data and Information in War Circumstances, with Specific Reference to Relief and Reconstruction Projects', *Disasters*, Overseas Development Institute, Volume 20, 2:149-156

Barlow, P. 1991. RedR Debriefing Report for an Assignement in Northern Iraq, RedR (UK)

Bays, L. 1992. Urbanistaion and Birth-rate Thwart Global Water Progress, in M. Monro (ed.), *Water Technology - International 1992*, Century Press (London): 11-13

Bellamy, C. 1997. British Lion Claws a King-sized Stake in the World's Arms Bazaar, *The Independent*, Wednesday 26 February 1997: 11

Bennett, J. 1994. *NGO Coordination at Field Level: A Handbook*, International Council of Voluntary Agencies (ICVA) (Oxford)

Bennett, J. 1995. *Meeting Needs: NGO Coordination in Practice*, Earthscan (London)

Bennett, J. and Gibbs, S. 1996. *NGO Funding Strategies: An Introduction for Southern and Eastern NGOs*, ICVA (Oxford)

Bennett, J. and Kayetisi-Blewitt, M. 1996. Beyond 'Working in Conflict': Understanding Conflict and Building Peace, Report of a Three-day Workshop Organized by CODEP and ODI, London

Bickley, S. 1997 'Risk Management for NGOs Operating in Complex Emergencies', unpublished MA thesis, PRDU, University of York

Biswas, A., K. 1978. 'Environmental Implications of Water Development for Developing Countries', *Water Supply and Management*, Volume 2:283-297

Blaikie, P., Cannon, T., Davis, I. and Wisner, B. 1994. *At Risk: Natural Hazards, People's Vulnerability and Disasters*, Routledge (London)

Bojičić, V. 1996. 'The Disintegration of Yugoslavia: Causes and Consequences of Dynamic Inefficiency in Semi-command Economies', in D., A., Dyker and I. Vejvoda (eds.), *Yugoslavia and After: A Study in Fragmentation, Despair and Rebirth*, Longman (London)

Bougarel, X. 1996. 'Bosnia and Hercegovina - State and Communitarianism', in D., A., Dyker and I. Vejvoda (eds.), *Yugoslavia and After: A Study in Fragmentation, Despair and Rebirth*, Longman (London)

Boutros, B., G. 1995. *An Agenda for Development 1995*, UN (New York)

Boyle, F. 1995. RedR Assignment Report: Emergency Water Supplies in Rwanda, RedR (London)

Bulloch, J. and Darwish, A. 1993. *Coming Conflicts - Water Wars in the Middle East*, First Edition, Victor Gollancz (UK)

Burke, A. and Macdonald, G. 1994. 'The Former Yugoslavia Conflict (1991-)', *The True Cost of Conflict: Seven Recent Wars and Their Effects on Society*, in M. Cranna (ed.), The New Press (New York)

Cairncross, S., Carruthers, I., Curtis, D., Feachem, R., Bradley, D. and Baldwin, G. 1980. *Evaluation for Village Water Supply Planning*, John Wiley & Sons (London)

Čavar, B., Husaković, F., Vejzović, I., Panđa, B., Huseinović, M. and Hasić, M. 1998. 'Financing and Cost Recoveery in Water Management Municipal Systems', *Institutional Strengthening of Public Utility Enterprises Workshop Report*, 21-23 March 1998, Organized by Vodoprivreda BiH (Tuzla, Bosnia and Herzegovina):51-61

Chaguill, C., Franceys, R. and Cotton, A. 1993. 'Building Community Infrastructure in the 1990s', *Habitat International*, Volume 17, 4:1-11

Chalinder, A. 1994. *Water and Sanitation in Emergencies*, ODA (London)

Chambers, R. 1983. *Rural Development: Putting the Last First*, Longman Scientific and Technical (UK)

Conti, R., Witek, K., Spang, S., Dubas, A. and Nembrini, P. 1997. 'Emergency Repair and Reconstruction of the Jahorina - Brus Gravity Line Supplying Sarajevo from 1994 to 1996', *Water under Fire Workshop Report*, 21-22 November 1996, PRDU (York, UK):23-29

Crnobrnja, M. 1994. *The Yugoslav Drama*, I. B. Tauris Publishers (London)

Cunningham, M. 1994. 'Aid in Bosnia: Construction in Conflict', unpublished MA thesis, PRDU, University of York

Cuny, F., C. 1983. *Disasters and Development*, Oxford University Press (Oxford)

Cuny, F., C. and Tanner, V. 1995. 'Working with Communities to Reduce Levels of Conflict: Spot Reconstruction', *Disaster Prevention and Management*, MCB University Press, Volume 4, 1:12-20

Dangerfield, B., J. (ed.) 1983. *Water Practice Manuals 3 - Water Supply and Sanitation in Developing Countries*, The Institute of Water Engineers and Scientists (London)

Davis, I. 1978. *Shelter After Disaster*, Oxford Polytechnic Press (Oxford)

Davis, I. 1986. Lessons from Reconstruction after Natural Disasters for Cities Recovering from Bombing and Civil Strife, *Proceedings of an International Conference on Reconstruction of the War-deamaged Areas*, 6-16 March 1986, University of Tehran (I. R. Iran):44-51

Davis, G., S. (ed.) 1996. *Religion and Justice in the War over Bosnia*, Routledge (London)

Davis, J. and Lambert, R. 1995. *Engineering in Emergencies: A Practical Guide for Relief Workers*, IT Publications on behalf of RedR (London)

De Veer, T. 1997. 'The Challenge of Forming the Basis for a Set of Guidelines which Could Assist in Monitoring and Evaluating Post-war Reconstruction of Water Supply Projects', *Water under Fire Workshop Report*, 21-22 November 1996, PRDU, (York, UK):41-45

Djuric, N. and Knezicek, T. 1992. 'Protection of the Environment from the Effects of the Exploitation of Salt Deposit', *A Conference on Environmental Issues and Waste Management in Energy and Minerals Production*, unpublished paper (Rotterdam, The Netherlands)

DNHW-Canada, 1981. Emergency Health Services: Environmental Health in Disaster, unpublished report (Ottowa, Canada):4-16

Dudley, E. 1993. *The Critical Villager: Beyond Community Participation*, Routledge (London)

Duffield, M. 1994. 'Complex Political Emergencies - With Reference to Angola and Bosnia: An Explorator Report for UNICEF', unpublished paper, School of Public Policy, University of Birmingham, UK

Dyker, D. I. and Vejvoda, A. (eds.) 1996. *Yugoslavia and After: A Study in Fragmentation, Despair and Rebirth*, Longman (London)

Eade, D. and Williams, S. 1995. *The Oxfam Handbook of Development and Relief*, Vol. 1-2-3, Oxfam (Oxford)

Eastmond, M., Ralphsson, L. and Alinder, B. 1994. 'The Psychosocial Impact of Violence and War - Bosnian Refugee Families and Coping Strategies', *Refugee Participation Network*, Refugee Studies Programme (Oxford): 7-9

Eberhand, R. 1996. 'Tools to Promote Financial Sustainability', *Reaching the Unreached: Challenges for the 21st Century, Proceedings of the 22nd WEDC Conference*, 9-13 September 1996, New Delhi, Loughborough University (UK):34-38

El Bushra, J. and Piza-Lopez, E. 1993. 'Genger-related Violence: Its Scope and Relevance', in H. O'Connell (ed.), *Women and Conflict*, Oxfam Focus on Gender (Oxford)

Eliasson, J. 1993. 'The World Response to Humanitarian Emergencies', *A Framework for Survival: Health, Human Rights and Humanitarian Assistance in Conflicts and Disasters*, in K. Cahill, (ed.), Basic Books and The Council of Foreign Relations (New York)

Ellis, S., J. 1996. 'An Evaluation of Shelter Projects and Policies for Refugees and Displaced Persons Within the Republic of Croatia', unpublished DPhil thesis, University of Luton

Engelman, R. and Leroy, P. 1993. *Sustaining Water: Population and the Future of Renewable Water Supplies*, Population Action International (UK)

Etienne, Y. and Nembrini, G. 1995. 'Establishing Water and Sanitation Programmes in Conflict Situations: The Case of Iraq During the Gulf War', *Social and Preventive Medicine*, ICRC, Volume 40, 1:18-26

Fabrika Soli Tuzla, 1985. *100 Godina Fabrike Soli Tuzla*, (Tuzla, Bosnia and Herzegovina)

Falkenmark, M. 1995 'The Dangerous Spiral: Near-future Risks for Water-related Eco-conflicts', *Water and War - Symposium on Water in Armed Conflicts*, 21-23 November 1994, ICRC (Montreux, Switzerland):10-28

Farah, A., A. 1993. 'Responding to Emergencies: A View from Within', *A Framework for Survival: Health, Human Rights and Humanitarian Assistance in Conflicts and Disasters*, in K. Cahill, (ed.), Basic Books and The Council of Foreign Relations (New York)

Fawcett, P., McLeish, R. and Ogden, I. 1992. *Logistics Management*, The M&E Handbook Series, Pitman Publishing (London)

Feachem, R., McGarry, M., Mara, D. 1977. *Water, Wastes and Health in Hot Climates*, John Wiley & Sons (Chichester)

Federation of BiH Ministry of Health, 1996. 'Federation Health Programme: Health Reform and Reconstruction Programme of the Federation of Bosnia and Herzegovina', an unpublished report prepared with assistance of the World Health Organization

Feldman, E., J. 1981. *A Practical Guide to the Conduct of Field Research in the Social Sciences*, Westview Press (Boulder, Colorado)

Feuerstein, M.-T. 1986. *Partners in Evaluation: Evaluating Development and Community Programs With Participants*, MacMillan Education Ltd. (London)

Fischer, G. 1995. 'Rebuilding of Post-conflict Countries', *Post-conflict Reconstruction Strategies - An International Colloquim*, 23-24 June 1995, UNDMSMS & UNIDO (Vienna, Austria)

Freidman, F. 1996. *The Bosnian Muslims: Denial of a Nation*, Westview Press (Oxford)

Fyson, G., Malapanis, A. and Silberman, J. 1993. *The Truth About Yugoslavia: Why Working People Should Oppose Intervention*, Pathfinder (London)

Galtung, J. 1996. *Peace by Peaceful Means: Peace and Conflict, Development and Civilization*, International Peace Research Institute, SAGE Publications (London)

Gibbons, D., C. 1986. *The Economic Value of Water,* Resources for the Future (Washington D. C.)

Glenny, M. 1993. *The Fall of Yugoslavia: The Third Balkan War*, New Edition, Penguin Books (London)

Glumčević, M. 1998. 'Regulations and Enactments Regulating the Issues of Municipal Water Management Systems in the Municipality of Tuzla', *Institutional Strengthening of Public Utility Enterprises Workshop Report*, 21-23 March 1998, Organized by Vodoprivreda BiH (Tuzla, Bosnia and Herzegovina): 41-45.

Gow, J. 1997. *Triumph of the Lack of Will: International Diplomacy and the Yugoslav War*, Hurst & Company (London)

Grigg, N., S. 1986. *Urban Water Infrastructure: Planning, Management and Operations*, John Wiley & Sons (New York)

Habitat, 1996. *An Urbanizing World: Global Report on Human Settlements*, Oxford University Press for Habitat (Oxford)

Habitat, 1996a. *Managing Water Resources for Large Cities and Towns: Report on the Habitat II International Conference*, 18-21 March 1996, Beijing, UNCHS (Nairobi, Kenya)

Habitat II, 1996. *World Resources - A Guide to the Global Environment: The Urban Environment*, Oxford University Press (Oxford)

Hakim, C. 1987. *Research Design: Strategies and Choices in the design of social Research*, Contemporary Social Research Series No. 13, Allen & Unwin (London)

Hall, B. 1996. *The Impossible Country: A Journey Through the Last Days of Yugoslavia*, Minerva Publishing (London)

Hall, D., Hall, I. 1996. *Practical Social Research: Project Work in the Community*, Macmillan (London)

Hammer, M., J. 1977. *Water and Waste-Water Technology*, John Wiley & Sons (New York)

Hardoy, E. J. and Satterthwaite, D. (eds.) 1986. *Small and Intermediate Urban Centres - Their Role in National and Regional Development in the Thirld World*, Hoddor and Stoughton (London)

Harper, M. 1995 'Conflict Today and Its Demands on International Society', *Disaster Prevention and Management*, MCB University Press, Volume 4, 1: 6-11

Hayes, A. 1994. RedR Assignment Report: To Assess Roads for Rwandan Refugee Crisis, RedR (London)

Hengeveld, H. and De Vocht, C. (eds.) 1982. *Role of Water in Urban Ecology: Developments in Landscape Management and Urban Planning 5*, Elsevier Scientific Publishing Company (Amsterdam)

Hobbs, T. 1981. *Practical Supplements*, International Disaster Institute (UK)

Hodgson, R. 1997. 'Appropriate Approaches: Top-down or Bottom-up? The Agenda of Chaos-seeking Consensus', 21-22 November 1996, Water under Fire Workshop Report, PRDU (York, UK):33-41

ICRC, 1994. *Water in War: The Human Consequences*, a brochure prepared by ICRC (Geneva)

ICRC, 1995. *Water and War: Symposium on Water in Armed Conlicts Report*, 21-23 November 1994, ICRC (Montreux)

ICRC, 1996. 'Rwanda - Annual Report 1995', http://193.247.225.45/icrcnews/4c52.htm. Page consulted 4 May 1997.

ICRC, 1996a. 'Somalia: Mogadishu - Water for a War-torn City, Water and War News', http://gvasrweb.crc.org/icrcnews/water/htm. Page consulted 11 June 1997

Ilič ić, A. 1997. 'Management in Water Resource and Public Utility System in Rama', *Workshop on Municipal Systems Management: Water Supply and Sanitation*, 21-23 March 1997, Organized by Vodoprivreda BiH (Cazin, Bosnia and Herzegovina): 91-94

IMG, 1998. *Task Force Meeting: Water, Waste Water, Solid Waste, Flood Protection, Irrigation*, IMG (Bosnia and Herzegovina)

Institute of Civil Engineers, 1995. *Megacities: Reducing Vulnerability to Natural Disasters*, Thomas Telford (London)

IRC, 1987. *Evaluating Water Supply and Sanatation Projects: Training Course Modules*, Training Series No. 2, UNICEF/IRC (The Hague, The Netherlands)

IRC, 1991. *Partners for Progress: An Approach to Sustainable Piped Water Supplies*, Technical Paper Series, IRC (The Hague, The Netherlands)

IRC, 1995. *Water Newsletter - Developments in Water, Sanitation and Environment*, No.236-237 , October 1995 (The Hague, The Netherlands)

IRC, 1997. *Repair of Simin Han Water Supply System Project Proposal*, IRC Tuzla Office (Bosnia and Herzegovina)

ITDG, 1978. Water for the Thousand Million, *The Proceedings of the United Nations Water Conference* (London): 1105-1167

ITDG, 1980. Guidelines on Planning and Management of Rural Water Supplies in Developing Countries, *Appropriate Technology*, Volume 7, 3: 17-20

Jordan Media Group, 1994. *The Jordan - Israel Peace Treaty: What is it?* , 26 October 1994, Publication No. 18 (Amman, Jordan)

Jusupović, F. and Bešlagić , Z. 1998. 'Hygiene and Sanitary Situation in regard to Water Supply and Drinking-Water Safety Control', *Institutional Strengthening of Public Utility Enterprises Workshop Report*. 21-23 March 1998, Organized by Vodoprivreda BiH (Tuzla, Bosnia and Herzegovina):115-123

Karakaya, B. 1996. 'The Controversy over Water in the Middle East and the World', Water Conflicts in the Middle East, Publishing of Entellectuals Association (Istanbul)

Khan, M., Y. 1990. 'Boundary Water Conflict Between India and Pakistan', *Water International*, Volume 15, 4

Kirmani, S., S. 1990 'Water, Peace and Conflict Management: The Experience of the Indus and Mekong River Basins', *Water International*, Volume 15, 4

Klotzli, S. 1994. 'The Water and Soil Crisis in Central Asia - A Source for Future Conflicts', Center for Security Policy and Conflict Research, http://www.fsk.ethz.ch/fsk/encop/11/en11-con.htm. Page consulted 16 November 1996.

Kolsky, P., J. 1993. 'Water, Sanitation and Diarrhoea: The Limits of Understanding', *Diarrhoeal Disease: Current Concepts & Future Challenges*, Transactions of the Royal Society of Tropical Medicine and Hygiene, Volume 87, 3

Labi, W. 1998 'Water Sector - Institutional Building and Institutional Strengthening in Bosnia and Herzegovina', *Institutional Strengthening of Public Utility Enterprises Workshop Report*, 21-23 March 1998, Organized by Vodoprivreda BiH (Tuzla, Bosnia and Herzegovina): 11-19

Labovits, S. and Hagedom, R. 1971. *Introduction to Social Research*, Second Edition, McGraw-Hill Book Company (London)

Lee, T., R. 1969. *Residential Water Demand and Economic Development*, Department of Geography Research Publications, University of Toronto (Canada)

Lee, T., R. and Jouravlev, A. 1997. *Private Participation in the Provision of Water Services: Alternative Means for Private Participation in the Provision of Water Services*, UN Economic Commission for Latin America and the Caribbean (Santiago, Chile)

Leslie, J. 1995. 'Towards Rehabilitation: Building Trust in Afghanistan', *Disaster Prevention and Management*, MCB University Press, Volume 4, 1:27-31

Lundqvist, J. 1993. 'General Introduction to the Concept of Water Resources Management and Water', *Workshop on Gender and Water Resources Management: Lessons Learned and Strategies for the Future*, 1-3 December 1993, Volume II (Stockholm, Sweden)

Madeley, J. 1991. *When Aid is No Help - How Projects Fail and How They Could Succeed*, IT Publication (UK)

Malcolm, N. 1996. *Bosnia: A Short History*, Updated Edition, Papermac (London)

Manzo, K. 1995. 'Black Consciousness and the Quest for a Counter-modernist Development', *Power of Development*, in J. Crush (ed.), Routledge (London)

Marsden, D. and Oakley, P. (eds.) 1990. *Evaluating Social Development Projects*, Development Guidelines No. 5, Oxfam (Oxford)

McDonald, A. and Kay, D. 1988. *Water Resources: Issues and Strategies, Themes in Resource Management*, Longman Scientific and Technical (UK)

McGrath, R. 1994. 'Anti-personal Mines: Children as Victims', *Refugee Participation Network*, Refugee Studies Program (Oxford): 4-6

McRobie, G. 1982. *Small is Possible*, Abacus (London)

Mears, C. and Chowdhury, S. 1994. *Health Care for Refugees and Displaced People*, Oxfam Practical Health Guide No. 9, Oxfam (Oxford)

Mehinović, N. 1998 'Control of Bacteriological Safety of Waters from Water Supply Facilities in the Territory of Tuzla Municipality which are not Covered by the City Water Supply System', *Institutional Strengthening of Public Utility Enterprises Workshop Report*, 21-23 March 1998, Organized by Vodoprivreda BiH (Tuzla, Bosnia and Herzegovina): 95-101

Mehrotra, R. and Kumar, N. 1996. 'Pricing of Water: Mechanisms and Policy', *Reaching the Unreached: Challenges for the 21st Century, Proceedings of the 22nd WEDC Conference*, 9-13 September 1996, New Delhi, Loughborough University (UK):41-44

Mehta, J. 1988 'The Indus Water Treaty: A Case Study in the Resolution of an International River Basin Conflict', *Natural Resources Forum*, Volume 12, 1

Millwood, D. (ed.) 1996. *The International Response to Conflict and Genocide: Lessons from the Rwanda Experience, Study 3*, Humanitarian Aid and Effects Steering Committee of the Joint Evaluation of Emergency Assistance to Rwanda (Odense, Denmark)

Minear, L. and Weiss, T., G. 1993. *Humanitarian Action in Times of War - A Handbook for Practitioners*, Lynne Rienner Publishers (London)

Mokhber, M. 1986. 'Reconstruction and Renovation of War-damaged Areas: Problems of Today and the Promising Future', *International Conference on Reconstruction of War-damaged Areas*, 6-16 March 1986, University of Tehran (I.R. Iran)

Moser, C., N. 1983. 'The Problem of Evaluating Community Participation in Urban Development', *Evaluating Community Participation in Urban Development Projects*, C. Moser (ed.), Working Paper No. 14, Development Planning Unit (London)

Moser, C., N. 1987. 'Approaches to Community Participation in Urban Development Programs in Third World Countries', *Readings in Community Participation*, Bamberder (ed.), The World Bank (Washington D.C.)

Moser, C., N. 1989. 'Community Participation in Urban Projects in the Third World', *Progress in Planning*, Volume 32, Part 2:84

Murakami, M. 1995 *Managing Water for Peace in the Middle East - Alternative Strategies*, UN University Press (New York)

Nazifović, M. 1997. 'Some Our Experiences in Municipal Systems Management', *Workshop on Municipal Systems Management: Water Supply and Sanitation*, 21-23 March 1997, Organized by Vodoprivreda BiH (Cazin, Bosnia and Herzegovina): 37-43

Neale, G. 1996. Running on Empty - Focus: World Water Crisis, *The Sunday Telegraph*, February 25:22

Nembrini, P., G. 1995. 'Water Supply in Rwanda: From War to Sustainability', *Sustainability of Water and Sanitation Systems - 21st WEDC Conference*, Kampala, Uganda, WEDC, Loughborough University (UK):272-274

Nembrini, P., G. and Etienne, Y. 1994. 'Water, Sanitation and the Environment in Conflict Situations', an unpublished paper, ICRC (Geneva)

Nembrini, P., G. 1997 'Emergency Reconstruction: When, What, with Whom', *Water under Fire Workshop Report*, 21-22 November 1996, PRDU (York, UK):17-23

Nichols, P. 1991. *Social Survey Methods: A Fieldguide for Development Workers*, Development Guidelines No. 6, Oxfam (Oxford)

Ockelford, J., Rosenboom, J., Fawcett, B. and Neefjes, K. 1995. *Cambodia: Programmes in Transition, An Oxfam Workshop*, 23 May 1995, Oxfam (Oxford)

O'Coill, C. 1997. 'Locating Development Agendas in a Global Context: International NGOs and the Price of 'New Partnerships' in Nairobi', *14th Inter-Schools Conference on Development: Global and Local Development - New Agendas, New Partnerships*, 24-25 March 1997, Heriot-Watt University (Edinburgh)

ODA, 1995. 'An Overview of Britain Aid for Water in Developing Countries', an unpublished report, ODA (London)

OECD, 1984. *Report of the Expert Group on Aid Evaluation on Lessons of Experience Emerging from Aid Evaluation* (Paris)

OHR, 1998. *Bosnia and Herzegovina Essential Texts*, 2nd Revised and Updated Edition

Oxfam 1994. 'Evaluation of the Phnom Penh Waterworks (KAM 041)', an unpublished report, Oxfam (Oxford)

Özerdem, A. 1997 'Workshop Review: Water under Fire', *Crosslines*, May/June 1997, Volume 5, Issue 29, 3:59-60

Özerdem, A. and Barakat, S. 1997. (eds.) *Water under Fire - The Challenge of Post-war Reconstruction of Water Supplies Workshop Report*, PRDU, University of York (UK)

Özerdem, A. and Atmar, H. 1997. 'Post-war Reconstruction in Iran', *York Magazine*, July 1997, University of York (UK):11

Pearce, D., Barbier, E. and Markandya, A. 1990. *Sustainable Development - Economics and Environment in the Thirld World*, Earthscan Publications (London)

Plant, G. 1995. 'Water as a Weapon in War', *Water and War - Symposium on Water in Armed Conflicts*, 21-23 November 1994, Montreux, ICRC (Geneva):81-89

Pilavdžić, F. 1997. 'Sarajevo Municipal Systems Management', *Workshop on Municipal Systems Management: Water Supply and Sanitation*, 21-23 March 1997, Organized by Vodoprivreda BiH (Cazin, Bosnia and Herzegovina): 95-98

Ponting, C. 1990. 'Historical Perspectives on Sustainable Development', *Environment*, November: 4-9 & 31-33

Pope, N. and Pope, H. 1997. *Turkey Unveiled - Ataturk and After*, John Murray (London)

Postel, S. 1992. *The Last Oasis - Facing Water Scarcity, Worldwatch Environmental Alert Series*, Earthscan (UK)

Pots, E. 1993 'The Mobile Support Team in Northern Iraq', *Technical Support for Refugees - Lessons from Recent Experiences*, in R. A. Reed (ed.), The Proceedings of the 1991 International Conference, WEDC, Loughborough University (UK)

Radošević, S. 1996. 'The Collapse of Yugoslavia - Between Chance and Necessity', *Yugoslavia and After: A Study in Fragmentation, Despair and Rebirth*, Longman (London)

Raghupathi, U., P. 1996. 'Financing Options for Water Supply', *Reaching the Unreached: Challenges for the 21st Century, Proceedings of the 22nd WEDC Conference*, 9-13 September 1996, New Delhi, Loughborough University (UK):53-57

Reid, D. 1996. *Sustainable Development - An Introductory Guide*, Earthscan Publications (London)

Revival, 1996. Issue 6, PRDU, University of York (York)

Roberts, G. 1984. *Questioning Development*, Second Edition, RVA Publication (UK)

Robson, C. 1993. *Real World Research: A Resource for Social Scientists and Practitioner-Researchers*, Blackwell (Oxford)

Rubin, F. 1995. *A Basic Guide to Evaluation for Development Workers*, Oxfam (Oxford)

Rubin, A. and Babbie, E. 1989. *Research Methods for Social Work*, Wadsworth Publishing Company (Belmont, California)

Rushton, A. and Oxley, J. 1996. *Handbook of Logistics and Distribution Management*, Kogon Page Ltd. (London)

Ryan, D. 1994. RedR Assignment Report: Kigali Town Water Supply, Rwanda, RedR (London)

SAFE, 1996. *Annual Report 1996*, SAFE (Dublin)

Samset, K. 1993. *Evaluation of Development Assistance Handbook for Evaluators and Managers*, Norwegian Royal Ministry of Foreign Affairs (Oslo, Norway)

Samson, P. 1995. 'The Concept of Sustainable Development', *Green Cross International*:1-6

Sarić, M., Mustafić, S. and Comor, V. 1998. 'Wells for Water Supply to the Municipality "Stari Grad" - Mostar, Pumping Costs and Water Quality', *Institutional Strengthening of Public Utility Enterprises Workshop Report*, 21-23 March 1998, Organized by Vodoprivreda BiH (Tuzla, Bosnia and Herzegovina): 113-115

Schumacher, E., F. 1973 *Small is Beautiful: A Study of Economics as if People Mattered*, Blond & Briggs (London)

Schübeler, P. 1996. *Participation and Partnership in Urban Infrastructure Management*, No. 19, The World Bank (Washington D.C.)

SEA, 1995. Final Report on UNHCR Funded Operations 1994/95, unpublished report, Scottish European Aid Tuzla Office (Bosnia and Herzegovina)

SEA, 1995a. Proposal For Water Supply To Several Towns and Villages in North Bosnia, unpublished report, Mercy Corps / Scottish European Aid Tuzla Office (Bosnia and Herzegovina)

SEA, 1995b. Leak Detection and Tuzla Municipality Report, unpublished report, Scottish European Aid Tuzla Office (Bosnia and Herzegovina)

SEA, 1995c. The 1995 Tuzla Region Water Supply: IMG / ECHO Report, unpublished report, Scottish European Aid Tuzla Office (Bosnia and Herzegovina)

SEA, 1995d. Water Supply / Sanitation: Internal Report for January 1995, unpublished report, Scottish European Aid Tuzla Office (Bosnia and Herzegovina)

SEA, 1998. Monthly Project Narrative Report for the Period Ending 31/12/1997, unpublished report, Mercy Corps / Scottish European Aid Tuzla Office (Bosnia and Herzegovina)

Serageldin, I. 1994. *Water Supply, Sanitation and Environmental Sustainability: The Financing Challenge*, The World Bank (Washington D.C.)

Serageldin, I., (1995) Towards Sustainable Management of Water Resources, The World Bank, Washington D.C.

Sherlock, P. 1997. 'Humanitarian or Commercial, the Limits of NGO Work: Where Humanitarian Work Ends and Commercial Engineering Starts', *Water under Fire Workshop Report*, 21-22 November 1996, PRDU (York, UK):29-33

Silber, L. and Little, A. 1995. *The Death of Yugoslavia*, Penguin Books / BBC Books (London)

Sirleaf, E., J. 1993. 'From Disaster to Development', *A Framework for Survival: Health, Human Rights and Humanitarian Assistance in Conflicts and Disasters*, in K. Cahill (ed.), Basic Books and The Council of Foreign Relations (New York)

Slim, H. and Penrose, A. 1994. 'UN Reform in a Changing World - Responding Complex Emergencies', *War and Hunger - Rethinking International Responses to Complex Emergencies*, in T. Macrae and A. Zwi (eds.), Save the Children (London)

Smethurst, G. 1983. 'Water Quality and Treatment', *Water Practice Manuals 3 - Water Supply and Sanitation in Developing Countries*, in B. Dangerfield (ed.), The Institute of Water Engineers and Scientists (London)

Smith, N. 1976. *Man and Water: A History of Hydro-technology*, Peter Davies (London)

Smout, I. 1991. 'Intakes from Rivers', *The Worth of Water*, WEDC, IT Publications (UK): 89-93.

Sparavalo, Z. 1998. 'Legal Aspects of Organization and Work of Municipal Water Management Systems', *Institutional Strengthening of Public Utility Enterprises Workshop Report*, 21-23 March 1998, Organized by Vodoprivreda BiH (Tuzla, Bosnia and Herzegovina): 35-41

Stanton, P. 1991. 'Intervention Following War (A Case History): A Promise to a Kurdish Child', paper presented at *the 3rd International Workshop on Post-war Settlement Reconstruction*, 22-24 July 1991, IoAAS, (York, UK)

Starr, J. and Stoll, D. 1988. *The Legal Regime of the Nile River Basin, The Politics of Scarcity: Water in the Middle East*, Westview Press (Boulder)

Stoulling, J., M. 1995. 'Water and War: UNICEF Instrumental in Keeping Sarajevo Afloat', *DHA Retrospective*:39-40

Swenson, R. H. and Rahe, T. M. 1991. 'Water and Sanitation Efforts Among Displaced Kurdish Civilians', Task No. 246, unpublished report prepared for the Foreign Disaster Assistance under WASH (Washington D.C.)

Tebbutt, T., H. 1973. *Water Science and Technology*, John Murray Publishers Ltd. (London)

The Cantonal Public Health Institute, 1995. 'State of the Health in several Municipalities', unpublished report (Tuzla, Bosnia and Herzegovina)

The Federation of the Red Cross and Red Crescent Societies, 1996. *Twenty-six International Conference of the Red Cross and Red Crescent: Resolutions* (Geneva)

The John's Hopkins University, 1992. *Population Reports - The Environment and Population Growth: Decade for Action*, Series M, No. 10 (Baltimore, USA)

The Tuzla Municipality, 1997. 'Emergency Drinking Water Supply of Tuzla Municipality (The Elaborate Applying for Funding Provision)', a project proposal (Tuzla, Bosnia and Herzegovina)

The Washington Post, 1996. *After Bosnia's Vote*, 17 September 1996:14

The World Bank, 1995. *Better Urban Services: Finding the Right Incentives* (Washington D.C.)

The World Bank, 1997. 'Bosnia and Herzegovina', http://www/worldbank.org/html/extdr/offrep/eca/bshcbco.htm. Page consulted February 1998.

Thomson, M., C. 1995. *Disease Prevention Through Vector Control: Guidelines for Relief Organisations*, Oxfam Practical Health Guide No. 10, Oxfam (Oxford)

Thompson, M. 1992. *A Paper House: The Ending of Yugoslavia*, Vintage (London)

Todaro, P., M. 1989. *Economic Development in the Thirld World*, Fourth Edition, Longman (New York & London)

Twort, A., Law, F., Crowley, F. and Ratnayaka, D. 1994. *Water Supply*, Fourth Edition, Edward Arnold (UK)

UGI, 1992. *Water and Health: Cholera's Grim Warning*, No. 7/92, 'European Schoolbooks Publishing Ltd. (UK)

UGI, 1994. *World Population*, No. 94/7, European Schoolbooks Publishing Ltd. (UK)

UGI, 1994a. The Kurds: Caught between Nations, No. 94/3, European Schoolbooks Publishing Ltd. (UK)

UNCED, 1992. *United Nations Conference on Enviorenment and Development*, UNCED (Rio de Janeiro)

UNCHS, 1987. *Shelter, Infrastructure and Services for the Poor in Developing Countries: Some Policy Options,* UNCHS (Nairobi, Kenya)

UNCHS, 1993. *Public / Private Partnerships in Enabling Strategies*, UNCHS (Nairobi, Kenya)

UNDP - DHA, 1994. *Disasters and Development*, prepared by Stephenson R. S., Disaster Management Training Programme, Second Edition, UNDP

UNDRO, 1982. *Disaster Prevention and Mitigation: A Compendium of Current Knowledge - Sanitation Aspects*, Volume 8, UNDRO (New York)

UNDRO, 1992. *An Overview of Disaster Management, 2nd Edition, Disaster Management Training Programme*, UNDRO

UNHCR, 1995. *Refugees - Focus: The High Cost of Caring*, No. 102, IV - 1995, UNHCR (Switzerland)

UNHCR, 1995a. 'Post-conflict Recovery: UNHCR's Capacities and Perspectives', *Post-conflict Reconstruction Strategies - An International Colloquim*, 23-24 June 1995, UNDMSMS & UNIDO (Vienna)

UNHCR, 1997. 'The World - Afghanistan', http://www.unhcr.ch/world/mide/afghan.htm. Page consulted March 1998.

UNHCR, 1997a. *UNHCR Repatriation Team Reports*, UNHCR (Bosnia and Herzegovina)

UNICEF, 1982. *Community Participation: Current Issues and Lessons Learned*, 59 / 60, UNICEF (Geneva)

UNICEF, 1986. *Assisting in Emergencies: A Resource Handbook for UNICEF Field Staff*, Prepared for UNICEF by Ron Ockwell

UNICEF, 1988. *Aqua Plus Guidlist: Appropriate Technology for Water Supply and Sanitation in the Developing Countries*, UNICEF (Copenhagen, Denmark)

UNRISD, 1995. *States of Disarray - The Social Effect of Globalization*, UNRISD (Geneva)

UN Security Coordinator, 1997. *The United Nations Security Management System: Presentation to the Humanitarian Liaison Working Group*

Vassall-Adams, G. 1994. *Rwanda - An Agenda for International Action*, An Oxfam Publication (Oxford)

Vejvoda, I. 1996. 'Yugoslavia 1945-1991 - from Decentralisation Without Democracy to Dissolution', *Yugoslavia and After: A Study in Fragmentation, Despair and Rebirth*, Longman (London)

Wakeling, R., C. 1991. RedR Debriefing Report for an Assignment in Northern Iraq, RedR (London)

Walker, P. 1995. 'Conflicts, Contract Culture and Codes of Conduct', *DHA News*, May-June 1995, DHA: 23-26

Wallensteen, P. and Sollenberg, M. 1996. 'The End of International War? Armed Conflict 1989-95', Department of Peace and Conflict Research, Uppsala University, Volume 33, 3:353 - 370

Waller, D. 1996. *Rwanda - Which Way Now?*, An Oxfam Country Profile (Oxford)

WaterAid, 1993. 'People and Water: Social Aspects of Community Water Supply and Sanitation Programmes', unpublished report, WaterAid (London)

Waterhouse, R. 1996. *Mozambique: Rising from the Ashes*, An Oxfam Country Profile (Oxford)

WCED, 1987. *Our Common Future*, Oxford University Press (Oxford)

WEDC, 1991. *The Worth of Water: Technical Briefs on Health, Water & Sanitation with an Introduction by John Pickford*, IT Publications (London)

WEDC, 1993. 'Technical Support for Refugees - Lessons from Recent Experiences', *The Proceedings of the 1991 International Conference*, in R. A. Reed (ed.), WEDC, Loughborough University, UK.

WEDC, 1996. *Reaching the Unreached: Challenges for the 21st Century, Proceedings of the 22nd WEDC Conference*, 9-13 September 1996, New Delhi, Loughborough University (UK)

White, A. 1981. *Community Participation in Water and Sanitation: Concepts, Strategies and Methods*, Technical Paper Series No. 17 for the WHO (The Netherlands)

Wirasinha, R. 1996. *Water Supply and Sanitation Collaborative Council*, Habitat II (Geneva)

WHO, 1993. *Guidelines for Drinking-water Quality - Recommendations*, Volume 1, Second Edition, WHO (France)

WHO, 1994. *Operation and Maintenance of Urban Water Supply and Sanitation Systems: A Guide for Managers,* WHO (Geneva)

Wood, D., F., Barone, A., Murphy, P. and Wardlow, D., L. 1995. *International Logistics*, Chapman & Hall (London)

Zaimović, A. 1998. 'Disinfection of Water and Control of Residual Chlorine in the Distribution Network', *Institutional Strengthening of Public Utility Enterprises Workshop Report*, 21-23 March 1998, Organized by Vodoprivreda BiH (Tuzla, Bosnia and Herzegovina): 113-115

Zametica, J. 1992. *The Yugoslav Conflict*, Adelphi Paper 270, Brassey for the International Institute for strategic Studies (London)

Zargar, H., E. 1989. 'Reconstruction of War-damaged Rural Areas of Khuzestan - Iran', Vol. I - II, unpublished DPhil thesis, IoAAS, University of York (York)

Zemmali, A. 1994. 'Water and Armed Conflicts', an unpublished paper, ICRC (Geneva)

Zemmali, A. 1995. 'International Humanitarian Law and the Protection of Water', *Water and War - Symposium on Water in Armed Conflicts*, 21-23 November 1994, Montreux, ICRC (Geneva):71-80