URBAN GROWTH THEORIES AND THE URBAN GROWTH PATTERN FOR THE UPPER EUPHRATES REGION OF IRAQ

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METHODOLOGY AND TECHNIQUES OF ANALYSIS

INTRODUCTION

The main aim of this chapter is to suggest the methodology and technique of analysis for the distribution of the expected urban growth in the study area. It will be utilised as a bridge which connects the theoretical background of the study and the basic elements of spatial development of Iraq and the U.E.R. on the one hand and the urban growth strategies drawn for the U.E.R. on the other hand. Before suggesting what is thought to be an appropriate technique of analysis, the applicability of urban growth and city size distribution theories and models to the U.E.R. will be re-examined. Some basic techniques for the analysis of urban growth patterns, such as cost-benefit, threshold analysis and goals-achievement analysis techniques will be examined with emphasis on their validity and applicability to the case of the U.E.R. Finally, the chapter will elaborate on the field survey carried on by the writer. This elaboration will extend to include the scope, the methodology of conducting the survey, its limitations and the approach to be used in analysing the data.

7.1. The Applicability of Urban Growth Theories and Models to the U.E.R.

Many lessons have been learned from the first part of this study. In addition to the general understanding of the urban growth problem in developed and developing countries and the change in such understanding over time, the theoretical review suggested, among other things that, first, although many of the examined city size distribution models found to be satisfactory in the sense they generate size distribution of cities that are consistent with those found in the real world, they are far from being a general urban growth theories and models. Furthermore, the discussions suggested that a multi-disciplinary approach of the urban growth and city size distribution problems, is not merely desirable but it may be essential to deeper understanding of urban growth simply because it will rest on a more realistic basis. Second, having a well spaced hierarchical urban system serves better the economy and population of the nation or region compared, for instance, to having optimal city sizes. Third, the theoretical discussion also suggested that the rank-size regularities could be a useful analytical device for the analysis of the efficiency of urban hierarchy and economies of scale could be achieved with increasing urban size to a certain limits, depending on the items under investigations.

However, although city size distribution models and theories have already been evaluated and criticised in Chapter Three and Four, it seems appropriate here, after examining the socio-economic and physical charactaristics of Iraq and the U.E.R., in Part Two, to re-examine their relevance to the case of the urban growth of the U.E.R., where as it has been found in Chapter Six the main theme of this study will concentrate on the distribution of the expected urban growth in the region up to 1985. Almost all the discussed models in Part One do not deal with such problems. However, to avoid the arbitrary dismissing of any model or group of models from the forthcoming analysis a number of criteria will be set up. The model or group of models which meet all or most of the following criteria is the one and/or ones which could be adopted for the purpose of the analysis of the urban growth pattern of the U.E.R. These criteria are given as follows:-

1. The model should depend on realistic assumptions. This criterion implies that the model which is based on certain theoretical assumptions to expedite analysis and reach some general conclusions are most probably inapplicable to an empirical study which deals with real problems and aims at solving them. Hence, the sought model in this particular case

will be the one which depends on realistic assumptions which could have empirical implications.

2. The model should incorporate into analysis a set of different socio-economic and physical factors that are thought to affect the urban growth pattern and city size distributions, i.e., it should provide a comprehensive explanation for the occurances of the provided urban size distribution. Models which do not meet this criterion, i.e., depend on one or very few factors in their analysis of the city size distributions, represent partial models of city size distribution. This partial analysis overlooks certain aspects of this problem and subsequently reduces again the possibility of grasping the implications for planning policy applications. Hence, according to this criterion, the model which is generated by a wide range of socio-economic and physical factors is the preferred one.

3. The model should be dynamic and not a static one. This criterion implies that the model, based on the prevailing socio-economic and physical constraints should be able to predict the future urban size distribution, taking into consideration the expected future changes in these variables. This criterion also implies that models which take the future dimension into consideration will provide a more realistic results since urbanisation plans are going to affect, at least the life of the next generation.

4. The model should take into consideration the city size distribution, as well as the space separating urban centres. It should also deal with the whole urban system and not a single urban centre by itself. As it has been seen in Chapter Three, the distribution of cities in space, in particular the distances between all cities and their closest neighbours as well as their distances from the biggest centres of economic activity, influence the degree of economic integration of

cities within the regional and national economy and hence the level of external economies (and diseconomies) that the economic units in a particular city enjoy. This means that, spacing of urban centres is as important an element in urban theory as the more traditional question of urban size hierarchy.[1] Hence, the preferred model according to this criterion is not the one which ignores space and treat the city as an isolated unit misjudging the fact that the city may be one element in a multinuclear region and is certainly one unit in a complex national and/or regional urban hierarchy, but rather the model which takes both the hierarchy and spacing of urban centres into consideration. This coincides with the aim of the present study which will look on both the hierarchy and spacing of urban centres of the U.E.R.

5. There should be some evidence on the application of the model in developing countries. The importance of this criterion stems from the fact that if the models are built to deal with the problem of urban growth and city size distribution in developed countries which have a completely different set of socio-economic and political environments this could imply that much of the evidence on the applications of such models is from developed countries and that policy conclusions may or may not be applicable to the case of a developing region, such as the one in question in this thesis. Hence, the model needed in this particular case is either one which originally was developed to deal with urban growth problems in developing countries which have similar socio-economic charactaristics of that of the study area or was built for conditions in developed countries but was found to have applications in developing countries as well.

6. The model should provide the opportunity to differentiate the priorities assigned to different factors and assumptions incorporated

(1) For more detailed discussion on this aspect see section (3.5).

in the analysis of the urban growth problem. This criterion implies that the factors affecting city size distribution and urban growth problem are not the same throughout time and in all countries. They differ throughout time and according to the socio-economic charactaristics of the areas under investigation. The relative importance of the factors incorporated in the analysis also differs according to the local constraints and the socio-economic stages of development. Hence, according to this criterion the preferred model is the one which allows room for such variations.

To test the applicability of the urban growth theories and models presented in Chapters Three and Four, to the case of the U.E.R., a matrix will be established in which the models will be presented vertically and the criteria to be met will be presented horizontally. Three degrees of meeting each criterion will be distinguished. These degrees are:-

(a) The sign (✓) will be given if the model completely meets specific criterion.

(b) the sign (✗) will be given if the model partially meets the stated criterion.

(c) The sign (X) will be given if the model does not meet the stated criterion.

The overall outcome of the application of the above criteria to different urban growth theories and models is given in table (7.1). This table clearly indicates that no single model of those considered could be adopted for the purpose of the analysis of the urban growth pattern in the U.E.R. where first, only in one case (Friedmann's Core-Periphery Model) two of the defined criteria seem to be fully met. The first one represented by the inclusion of mutiple factors in the analysis. These factors are represented by social, political, geographical and economic ones. The second criterion which seems to be fully met by Friedmann's model is the dynamism of the model. As it has been seen, the model assumes that each of its four stages is transitional. Friedmann regards even the last stage as subject to transition to still unknown pattern when he stated that whether further pattern lie beyond the functionally interdependent system of cities stage, must in the absence of historical experience, remain an open question. Second, two of the examined models, i.e.,"Christaller Central Place Model" and "Losch Market Areas Model" are shown to have met one of the stated criteria i.e., the inclusion of the hierarchy of city sizes, as well as the space separating them. Third, four of the examined models are shown to partially meet two of the stated criteria. These models are the "Rank-Size Distribution", "Friedmann's Core-Periphery Model", "Price Individual Preferences and Optimal City Size Model" and "Tisdell's Model of Optimal City Sizes". The criteria partially met in this case are represented either by the consideration of the hierarchy of city size distribution, or the applicability of some models to the developing countries, or the involvement of some sort of dynamism in the model or the multifactoral explanation of the city size distribution problem, see table (7.1). Fourth, twelfth of the twenty two examined models are shown to meet partially only one criterion. The factor met partially in this special case is the one concerning the inclusion of the hierarchy of urban centres in the analysis without considerating the space separating them. Finally, four out of the twenty two models did not show any sign of meeting any of the adopted criteria for the purpose of measuring the applicability of these theoretical models to the case of the U.E.R. These models are "Beckmann Model", "Myrdal Cumulative Causation Model", "Hirschmann Growth Points Model" and "Richardson Optimal City Size Model".

To give a more comprehensive picture of the critical appraisal of the examined models the approach of the analysis of this section will be extended to evaluate each group of the city size distribution models

Table (7.1)

Applicability of Urban Growth Theories and Models of the U.S.R.

The Model	Criteria 1	2	3	4	5	6	Total Achievement ✓	✓✗	x
Statistical Models of City Size Distribution:-									
1. Lognormal Distribution	X	X	X	✓✗	X	X	-	1	5
2. Pareto Distribution	X	X	X	✓✗	X	X	-	1	5
3. Rank-Size Distribution	X	X	X	✓✗	✓✗	X	-	2	4
Hierarchical Models of City Size Distributions:-									
4. Christaller's Central Place Model	X	X	X	✓	X	X	1	-	5
5. Losch's Market Areas Model	X	X	X	✓	X	X	1	-	5
6. Beckmann's Model	X	X	X	X	X	X	-	-	6
7. Tinbergen's Model	X	X	X	✓✗	X	X	-	1	5
Polarised Growth Models:-									
8. Myrdal's Cumulative Causation Model	X	X	X	X	X	X	-	-	6
9. Hirschmann's Growth Points Model	X	X	X	X	X	X	-	-	6
10. Friedmann's Core-Periphery Model	X	✓	✓	✓✗	✓✗	X	2	2	2
Stochastic Models:-									
11. Simon's Law of Proportionate Effect	X	X	X	✓✗	X	X	-	1	5
12. Ward's Market Opportunities Model	X	X	X	✓✗	X	X	-	1	5
13. Entropy Maximisation Model	X	X	X	✓✗	X	X	-	1	5
Economic and Quasi-Economic Models:-									
14. Rashevsky's Equilibrium Model	X	X	X	✓✗	X	X	-	1	5
15. Zipf's Model of City Size Distribution	X	X	X	✓✗	X	X	-	1	5
16. Swanson's Differential Growth of Labour Forces Model	X	X	X	✓✗	X	X	-	1	5
Optimality in City Size and Distribution:-									
(a) Production Function Models:-									
17. Richardson's Model of Optimality in City Size	X	X	X	X	X	X	-	-	6
18. Schaefer's Model of the Urban Hierarchy and Urban Area Production Function	X	X	X	✓✗	X	X	-	1	5
(b) Individual Preferences and Optimal City Size Models:-									
19. Laird and Mazek Model of City Size Preferences and Migration	X	X	X	✓✗	X	X	-	1	5
20. Price's Model of Individual Preferences and Optimal City Size	X	X	✓✗	✓✗	X	X	-	2	4
(c) Cost of Inputs and Provision of Services and Optimal City Size:-									
21. Evan's Optimal City Size Model in an Industrial Economy	X	X	X	✓✗	X	X	-	1	5
(d) Optimality in City Size Distribution:-									
22. Tisdell's Model of Optimal City Sizes	X	✓✗	X	✓✗	X	X	-	2	4

Where:
1 means that the model should depend on realistic assumptions.
2 means that the model should incorporate a multifactoral analysis.
3 means that the model should be a dynamic one and should take the expected future variations in socio-economic aspects into consideration.
4 means that the model should take into consideration the city size distribution as well as the space separating urban centres.
5 means that the model should have some application in developing countries.
6 means that the model should provide the opportunity to differentiate the priorities assigned to different factors involved in the analysis.

separately with emphasising any specific charactaristics of the individual models.

(i) The Statistical Models of the City Size Distribution:-

The statistical models of city size distribution (Lognormal, Pareto and the Rank-Size distributions) assume that the rate of change in the size of any city is uncorrelated with its size. This assumption seems to be wrong for as it has been seen in both Chapters Three and Four that recent work (stochastic models and some optimisation models) has shown the rate of growth to be correlated with city size. Hence, these models rest on insecure foundation.

Furthermore, statistical models are descriptive models. The only thing they can reveal is the existence of an urban hierarchy. They deal with existing pattern of urban sizes without being able to predict the future urban size distribution. Each of them depends on one or two factors in generating the city size distribution. The Lognormal distribution used cumulative percentage of cities and city size. Pareto distribution uses cumulative percentage of cities above the threshold level and the Rank-Size distribution uses the rank of city. Although the statistical models deal with the whole urban system, they do not consider the spatial distribution of cities, hence in this respect they have been considered to meet criterion number (4), the necessity to consider the city size distribution as well as the space separating cities, of table (7.1) partially. Also they failed to provide an economic and social explanation for the occurences of the prevailing distribution of urban sizes. However, it should be noted that the statistical models particularly the rank-size rule is found to be valid throughout many parts of the world, particularly in countries with high degree of urbanisation, in large countries and in developing countries such as India and China which are not only large but have a long history of urbanisation.

The above drawbacks reduce the possibility of grasping the implications for planning policy applications not only in the case of the U.E.R. but equally elsewhere. They also are incapable of predicting the consequences of the committed economic development on the spatial distribution of the expected urban growth in the U.E.R.

(ii) Hierarchical Models of City Size Distributions:-

In general table (7.1) indicates that the models of urban hierarchy which were developed in an attempt to explain the laws which determine the number, size and distribution of urban centres were based on many unrealistic assumptions and on one or a very few factors. They were found to be static models, representing part of the urban functions and without any significant application in the developing regions of the world.

Both Christaller's and Losch's hierarchical models were based on almost the same key assumptions represented by the existence of featureless plain over which resources are uniformly distributed. Such assumptions do not correspond to the reality of the case of the U.E.R. where first, the region is part of a centrally planned socialist country and the development decisions are taken centrally and second, it is mainly a desert area with a very narrow fertile strip of land along the Euphrates River over which resources are not uniformally distributed. The Beckmann model which shows that a very simple economic mechanism can generate a distribution of urban centres that is similar to Pareto distribution was also based on unproven assumptions where it assumes a simple production functions in which cost curves are L shaped,[(1)] labour is the only input and input/output ratios are constant above the minimum output. Tinbergen's model of city size distribution which was

(1) Richardson, in his model of optimal city size, among others, found that the cost curves are U shaped.

originally constructed to apply to manufacturing industry depends also on an unrealistic assumptions of a closed economy (without any foreign trade) of regular form evenly covered with agricultural production units except in centres, the existence of arbitrary number of industries each producing finished products with having only one firm in the highest rank industry and the assumption of all income is spent.

The theory of urban hierarchy is a partial representation of the urban functions. Christaller's model focused on tertiary activities whilst those of Losch and Tinbergen concentrated on industrial functions. The partial representation of urban functions in these models makes them far from being a generalised formulations. The omission of industrial role in Christaller's and Beckmann's models contradicts the expected major role that is going to be played by industrial activities in the development and consequently urban growth of the U.E.R. (See Chapter Six).

Furthermore, the hierarchical models do not take into consideration the fact that central functions which affect the urban hierarchy do not necessarily exist in the central places but could be located in their hinterlands and this is particularly the case with the U.E.R. where most major development projects that are found mainly to affect the urban growth pattern of the study area are located either in the fringe of the urban centres or in their hinterlands.

The hierarchical models of city size distribution are also inapplicable to the case of the U.E.R. because they are static models. They do not explain development phenomenon and they neglect almost all important macro-economic interrelationships. They only aim at explaining the existence of certain pattern of centres and not explain how this pattern has come into being or what the pattern would undergo in future. However, although Christaller in his model presented in addition to marketing principle two other fundamental principles, that is, the transport and the socio-political principles the model continued to be a partial representation of urban functions and the latter two concepts were not fully developed. Hence, what is required for the case of the U.E.R. is a theory capable of predicting the consequences of the committed economic development on the spatial distribution of the expected urban growth.

Finally, the hierarchical models which were built and tested in the developed countries have not yet been quantitatively tested in case of developing countries.

However, it should be noted that both Christaller and Losch models consider the hierarchy of city sizes as well as the space separating these city sizes. Both of them dealt with spacing of central places and evolved a hierarchy of central places on the basis of threshold level of central goods and services.

To sum up, according to the evaluation criteria stated earlier in this section the hierarchical models of city size distribution are far from being applicable to the case of the urban growth of the U.E.R.

(iii) Polarised Growth Models:-

Myrdal's and Hirschman's models were shown to be least applicable to the case of the U.E.R., where table (7.1) indicates that both of the models do not meet any of the defined criteria set earlier in this section. In their models, Myrdal and Hirschman discuss the dual tendency of growth to concentrate in one location and to spill over down as a result of "backwash" and "spread" effects in case of Myrdal and "Polarisation" and "trickling down" effects in case of Hirschman. Both scholars emphasised that not all urban centres at a point of space grow at the same time and/or at the same rate but rather, at the first stage of development, one or very few urban centres, with a strong economic potentialities, can grow, thereafter other lagging and/or smaller urban centres can grow as a result of the benefits gained through the process of growing the first, or very few first urban centres. Such a logic of analysis could not apply to the case of urban growth in the U.E.R. where the expected urban growth is not entirely on the basis of free competition among urban centres, but rather on the basis of a strategic decisions taken by the central planning authorities. Furthermore, both models built to deal originally with spatial transmission of growth have very little to do with urban growth theory, where they do not give a considerable attention to the problem of distribution of urban population or changing the urban pattern. They rather regard the problem as a consequence of spatial transmission of development without answering some vital questions as how, when and exactly where the urban growth would take place.

Furthermore, Myrdal's rather grim prognosis for the developing countries has been challenged by Williamson (see section 3.4) who found that rising regional inequality is typical of the early stages while in the more mature stages there tends to be a convergence of regional incomes and a disappearance of disparities. More recently, concern has been expressed over the apparent lack of spread effects observed in the developing countries. Hence, it is suspected that the model have any significant application in most developing countries.

Both Myrdal and Hirschman's models are partial models. They depend in their analysis on economic factors without incorporating the social, physical, environmental and so forth of the factors that affect urban growth pattern. Even Friedmann's "Core-Periphery Model" which makes an explicit attempt to explain polarisation, which has been formulated specifically to deal with the problems of urban hierarchy and national development in developing countries and which goes beyond economic factors to take into account the social, political and geographical factors and addressed the spatial ramification of growth cannot be appropriate in the case of the U.E.R. For the following reasons:-

First, the model failed to explain why some centres develop while others do not, except to suggest that some become administrative centres and that eventually, individual investment is concentrated within these areas.

Second, the model was derived from the historical development of Venezula which although it is one of the developing countries and have had a few similar economic charactaristics with Iraq of being in the past an agricultural country and now predominant by oil sector,[1] nevertheless the socio-economic and political aspects are quite different. For instance, while in Venezula, economic development is influenced by market mechanism, in Iraq it is centrally planned and directed.

Third, the model based on four unrealistic assumptions compared to the U.E.R. circumstances. The model assumes the total population to remain constant, a perfectly even distribution of population, resources and income over a perfectly even plain and constant technology.

Finally, although Friedmann's model gives us a dynamic framework within which to consider the evolution of urban hierarchies in developing countries, his findings are supported theoretically by Hirschmann's earlier thesis and empirically by Williamson's study of regional income of disparities (see section 3.4) and many developing countries seem to be at the stage of "incipient industrialisation" in which primacy prevails and a few countries are progressing beyond it, however, some doubt is cast upon the capacity of many developing countries to transit through the progressive stages of the model by the

(1) See J. Friedmann, "Regional Development Policy, A Case Study..." op.cit., Chapter 6.

pessimistic perspective of Myrdal's "backwash" and circular causation thesis, propositions which in turn are supported by the Adelmen and Morris findings (section 3.4) that internal income disparities tend to increase with development in developing countries.

Hence, although Friedmann's model is believed to be highly generalised and appears to be useful as a general frame of reference in the study of spatial polarisation it cannot be applied to the local socio-economic circumstances of Iraq. Furthermore, the model does not cope with the problem at question where the committed economic development in the U.E.R. will generate an incrment in urban population which need to be accommodated in a most efficient way, i.e., with least socio-economic costs. Another problem which preclude the possibility of applying Friedmann's model to the case of the U.E.R. is that the model deals with national urban problem and not a regional urban problem which excludes Baghdad the capital from the analysis.

(iv) Stochastic Models:-

Stochastic models treat urban growth determinants as proportional to city size or the city size distribution as the probabilistically derived steady state equilibrium. These sort of models are inappropriate to explain the urban growth pattern in the U.E.R. because they are explanatory models. They explain what is happening but say nothing about what might happen in the future. They also depend on one or very few factors in explaining the urban pattern and neglect the role of systematic forces which definitely effect the city size distribution. Simon (1955) for instance suggested the demographic forces as a possible explanation of why the law of proportionate effect might apply and Ward (1963) built his city size distribution model on market-expansion opportunities which in turn is assumed to be proportionate to city size. In total, table (7.1) summarises the reasons behind the inapplicability of these models to the case of the U.E.R.

(v) Economic and Quasi-Economic Models:-

The economic and quasi-economic models which are represented by Rashevsky, Zipf and Davis and Swanson models are also inapplicable to the U.E.R. situation since they in turn depend in predicting the city size distribution on one or very few economic factors. The first model assumes that urban productivity is expressed as a function of city size and population distribution charactaristics of the system as a whole and equilibrium is reached when productivity per head is equalised among cities. Zipf's model, assumes that the city size distribution resulted from the operation of three forces - the force of unification, the force of innovation and the force of diversification - and the actual city size distribution is the net outcome between these opposing forces. Davis and Swanson model, assumes that city size changes as a result of the differential growth of labour force migrating from a rural hinterland.

Such forshort-sited explanation of city size distribution which neglect the very well known systematic factors affecting the city size distribution and which ignore spacing of cities cannot provide an accurate answer to the question of the urban growth pattern in the U.E.R.

(vi) Optimality in City Size and Distribution Models:-

The main theme of the optimal city size models is to examine how costs and benefits (quantitative and qualitative costs and benefits) vary with city size, and hopefully to derive an optimal size where marginal benefits equal marginal costs. Again table (7.1) indicates that such models seem inappropriate and inapplicable to the U.E.R. for the following reasons:-

First, in general, as it has been seen in Chapter Four, there is an agreement among scholars that the search for an optimal size is almost as idle as the quest for the philospher's stone. Even from theoretical point of view the search for the optimal city size is encountered with many problems. Most optimal size models are static. They depend in searching for optimality on one or very few factors. For instance, while the production function models depend mainly on productivity as a decisive factor, the individual preferences models argue that desirability of city size can only be judged in relation to the preference of individuals for production and consumption economies and diseconomies, and a third group of analysts believe that optimality in city size could be defined on the basis of economising in the cost of services and public utilities provision. Such approaches of determining the optimal city size which overlooks certain factors sound unpractical since the factors which affect the evoluation and growth of cities are enormous and consequently optimality differs according to the factors in question. This means that for the same city the optimal size differs according to the factors involved in the analysis. Add to that the U.E.R. is charactarised by having certain socio-economic and physical constraints which are expected to affect highly the size, growth and distribution of its urban centres.

Second, all the optimal city size models are theoretically based on many unrealistic assumptions. Richardson in his model of optimality in city size assumes homogeneous tastes and preferences. Schaefer model regard the transport costs and demand intensities equivalent for all products and production cost is the sole determinant of the hierarchy. Schaefer himself believes that many other real factors effects market areas and consequently the urban hierarchy, such as the variation in the terrain of the area and local variation in the taste. But for the sake of avoiding more complications, the model depends only on the above variables. Laird and Mazek in their model of city size preferences and migration assumed two types of individuals, large city type and small city type. This assumption is unreal and does not give an exact answer to the question of a preferred or optimal city size. Price model of individual preferences and optimal city size assumes the state of perfect competition, mobility in labour market and production economies of agglomeration peculiar to a city size. Evan's model also relies on many unrealistic assumptions. The model for instance assumes that the firm and/or individual will be able to find the city which minimises its costs. This assumption neglects the importance of individual preferences of city size. The assumption that all employment is located at the centre of the city is a considerable simplication but it obviously conflicts with the facts. The model also neglects, among other things, the fact that firms in the small town can use the business services of a nearby city which is larger. Finally, Tisdell in his model of optimal city sizes despite recognising the fact that the optimal city size cannot be determined in isolation and the attempt to discover the settlement patterns which maximises overall social welfare in the economy taking into account the preferences of individuals and the nature of production possibilities at all possible locations, the model again based on some unrealistic assumptions such as the assumption that the opportunities available in the city are shared equally between its inhabitants, the existence of a given number of sites for settlement in the country and the ignorance of trade between areas.

Hence, almost all the above models are based on abstract assumptions to expedite analysis and generate city size models based on the principles of free market mechanism to deal with the problem of city size distribution in developed countries. Such assumptions and mechanism, as it has been seen earlier in this section, is far from being applicable to the case of the U.E.R. where development and growth is centrally planned and directed. Furthermore, there is no evidence of such models having any significant application in the developing regions of the world.

Third, as in almost all reviewed models, optimal city size models, ignore space and treat the city as an isolated unit misjudging the fact that the city may be one element in a multinuclear region and is certainly one unit in a complex national urban hierarchy and that the space separating cities is as important as the city size hierarchy. Hence, incorporating the spatial distribution of urban centres in the analysis of urban growth patterns, which has been neglected by most optimal city size models is a very important aspect in the urbanisation process of the U.E.R., whereas it has been seen (Chapter Six) that the existing urban system is charactarised by an unbalanced spatial distribution of urban centres.

Hence it could be concluded that extensive reading in urban theory and examination of many theoretical studies does not provide any ready made answers to the problem of urban growth pattern in the U.E.R. Each of the models reviewed may be useful in its own context, but none is able to satisfy the objectives of the urbanisation strategy for the case study.

Since so many factors are going to be involved in the analysis of urban growth pattern of the U.E.R. and since their relationships are extremely complex, it is impossible to derive any definite results on this matter in a theoretical model and to make any satisfactory predictions for the future, therefore for the purpose of this thesis, an entirely alternative approach must be found to deal with the problem and satisfy the objectives.

The planning techniques, represented mainly by the planning application of the cost-benefit analysis, the threshold analysis and the goals-achievement analysis are initially believed to meet the objectives of this study. Unlike most of the city size distribution models and theories presented in Part One of this study, this group of techniques although developed originally in developed countries could be utilised to meet the aims, objectives and the constraints of this study. This group of techniques could incorporate into analysis a wide range number of factors that are thought to be important in the decision making process. The priorities assigned to different factors and the assumptions of the analysis could easily be derived from the local constraints and aims and objectives of the particular study. Hence, the application of one of the above mentioned techniques to the problem in question provide the basis for a more realistic solution compared to the use of the theoretical model which base on a very few factors in the analysis, even if that model is originally built to deal with this particular problem.

However, it should be noted that the inapplicability of the urban growth models and theories to the case of the U.E.R. do not, as it has been seen earlier in Part One, preclude the possibility of benefiting from many of their principles, such as the principle of hierarchy of urban settlement and its advantages, principles of polarisation and spread effects, economies of scale and urban size, rank size rule and so forth. All these and many other principles discussed in Part One will be fully utilised, wherever possible, in developing the urban growth strategies for the U.E.R. Furthermore, the changes in the understanding of the urban growth problem over time and according to different socio-economic and geographical environments (mainly developed as against developing countries) would in turn help in drawing implications for the analysis of the problem in question.

7.2. Urban Growth Distribution Techniques

The urban planning problems, in general, are of the sort of complicated and subjective one. Because they are so subjective it is difficult to be rational in the process, that is, to move by reason towards the optimum in the attainment of goals. To assist in this it is necessary to analyse the implications of the alternative plans, policies or actions. Such analysis would seek to test proposals for their likely effects on community welfare, to make what is termed by Lichfield a "Welfare Test".[1] The test "...could usually be made at various stages in the planning process. The planner could use it to compare alternatives during the design stage or on a completed plan or suggested variations from it and so have a means of demonstrating the quality of proposals. The analysis could aid decision-makers in their consideration of a plan, policy or action, or of alternatives and in their understanding of the implications of decisions."[2]

There is as yet no accepted method of analysis for welfare tests in town and regional planning, hence the applicability of the most familiar techniques, such as the cost-benefit analysis, threshold analysis and goals-achievement analysis will be critically examined.[3] This examination aims at suggesting the appropriate methodology of dealing with the problem of urban growth distribution in the U.E.R. To reach such a conclusion the evolution, basic notions, advantages and disadvantages and the applicability of each of the above stated techniques would be examined here.

(1) N. Lichfield, "Cost-Benefit Analysis in City Planning", Journal of American Institute of Planners, Vol. 26, 1960, P.273.
(2) Ibid, P.273.
(3) For the fuller account of these and other techniques see for instance, N. Lichfield, "Evaluation Methodology of Urban and Regional Plans"; A Review, Regional Studies, Vol. 4, 1970, PP.151-165; H. B. Fisher, Evaluation of Alternative Plans for New Communities: Toward Application of the Competition - for - Benefit Model, PhD. thesis, thesis series, Centre for Urban and Regional Studies, Chapil Hill,North Carolina,1971; P.W.J.Batey and M.J.Breheny, "Methods in Strategic Planning; Part I: A Descriptive Review, Town Planning Review, Vol. 49, 1978, PP.259-273; and "Methods in Strategic Planning; Part II: A Prespective Review, Town Planning Review, Vol. 49, 1978, PP. 502-518.

7.2.1. Cost-Benefit Analysis Technique

The cost-benefit analysis technique which has its foundation in theoretical welfare economics, was originally developed in late 1930's as a method of appraising projects in water resources field, particularly projects relating to dams, flood control, irrigation and hydro-electricity.(1) Its application extended to highways, urbanisation of agricultural land, municipal services, education, health and defence.(2) In the early 1960's Lichfield viewed that the analysis can be extended to aid decisions on town and regional planning.(3) He argued that, "Although the planning agency is not producing a direct service for consumption or production, just because the plan is a supra-investment framework, cost-benefit analysis is, in my view, an appropriate and relevant methodology, if suitably adapted. While it is essentially an economic tool, it seems to fit the planners requirements of aiding rational decisions on alternative plans."(4)

Cost-benefit analysis, state, the Royal Commission of the Third London Airport (The Roskill Commission)"...seeks as far as it can to assist in bringing all problems into their proper perspective. It provides a logical framework within which to assess all the effects flowing from a particular investment or planning decision. It tries to ensure that decisions are taken on the basis of people's individual values and choices as revealed by their behaviour rather than on the basis of the decision maker's own preferences or standards or of those

(1) C.Choguill,"Methods for Airport Location Analysis:Benefit-Cost Analysis," Airport International,No.34, 1974, P.24.
(2) A.R.Prest and R.Turvey,"Cost-Benefit Analysis: A Survey, Economics Journal, Vol. 75, 1965, P.683.
(3) For details of Lichfield's views on the applications of cost-benefit analysis on town and regional planning,See N.Lichfield, "Cost-Benefit Analysis in City Planning",op.cit.,PP.273-279; "Cost-Benefit Analysis in Plan Evaluation" Town Planning Review,Vol.35,1964,PP.160-196; "Cost-Benefit Analysis in Town Planning; A Case Study: Swanley", Urban Studies, Vol.3, 1966, PP.215-249; and "Cost-Benefit Analysis in Urban Expansion, A Case Study: Peterborough; Regional Studies,Vol.3, 1969, PP.123-155.
(4) N.Lichfield, "Cost-Benefit Analysis in Town Planning,...", op.cit., P.216.

of...politically powerful groups."(1)

Cost-benefit analysis is often employed in order to determine whether a country would be better off with a projected investment than without it. This type of cost-benefit study attempts to measure all the costs and all the benefits which flow from a project in order to see whether the benefits exceed the costs.(2) To ask this question the Roskill commission, stated that it is important to include the totality of all costs and all benefits.(3)

The cost-benefit analysis is also used to assist choice between alternative decisions. "It does so by comparing the costs and benefits that will flow from the alternatives as a guide to which choice will bring the greater margin of benefits over costs or the greater net return in benefits for the resources invested."(4)

Although it is believed that cost-benefit analysis provides a more comprehensive and less suspect framework for all the items which are relevant to the decision,(5) its application to the complicated problems is accompanied with many difficulties. To shed some light on such difficulties a well known example of British experience, i.e., the cost-benefit analysis study of the third London airport, will be presented here.

In 1968 Roskill Commission was established to select a site of London's third airport.(6) The Commission used cost-benefit analysis for choosing the airport location. The analysis for selection of the site was applied in some details to four sites that received primary

(1) Roskill-Commission on the third London Airport, The Report, H.M.S.O., London, 1971, P.12.
(2) Ibid, P.118.
(3) Ibid, P.118.
(4) N.Lickfhield, "Cost-Benefit Analysis in Town Planning,...."op.cit., P.215.
(5) See for instance, N. Lichfield, "Cost-Benefit Analysis in Planning; A Critique of the Roskill Commission", Regional Studies, Vol. 5, 1971, PP.157-183.
(6) Roskill Commission on the third London Airport, op.cit., P.1.

consideration: Cublington, Nuthampstead, Foulness (later re-named Maplin) and Thurleigh. Although at first glance the Roskill Commission experience of adopting cost-benefit analysis is an excellent guide to the use of this technique, an excellent justification of its adoption and it seems to be an answer to many urban and regional planners problems, there are certain weeknesses in using the technique. A reading of Roskill Commission Report, argues Lichfield, raises strong doubts on the way in which the Commission has used cost-benefit analysis in reaching its decisions, and in the Commission's decision-making framework itself.(1) In his critical paper of the commission's work, Lichfield tried to show that there are weaknesses in the following aspects:(2)

First, while the cost-benefit analysis provided the framework for the items measured in monetary terms, it was not extended to provide a framework for non-measured items. Items such as loss of wild life, or churches which would have to be demolished; Journey to work by airport employees; value of preserving the countryside; loss of landscape and rural amenity by people other than those residing in the effected areas; and so on, which were not measured (either because of the lack of data or because they were inherently non-measurable at that time) could have been included within the cost-benefit analysis, and so could provide the Commission with a means of doing what it stated it wished to do, of providing "a framework within which these different elements can be brought together and weighted."(3)

Second, the major emphasis of the recommendation lay with the aggregate of net costs (efficiency criterion), ie., the choice of site

(1) N.Lichfield, "Cost-Benefit Analysis in Planning: A Critique...," op.cit., P.157.
(2) Ibid, PP.157-183.
(3) Ibid, P.168.

which produced the lowest total net costs on the community, and the Commission did not follow up sufficiently to explore the incidence and equity aspects of their analysis, i.e., to consider the incidence of the costs and benefits on the various sectors of the community and accordingly lack of conviction in dealing with these issues in their recommendations.

The importance of taking the equity criterion into consideration in the analysis arises, since the planning decision to develop an area or not would involve a redistribution of income and wealth from that which would occur without development taking place or that development occured in another place.

The Essex group of County Councils, goes beyond the consideration of efficiency and equity criteria and suggested that weighting for posterity should also be included in the analysis. By weighting for posterity the group meant that "...we should consider the interest of posterity by placing special weight upon those things which the airport would destroy but which posterity might have treasured more highly."[1]

Third, the Commission failed to bring clearly into the perspective of their analysis the significance of the airport for regional planning and development and vice versa, i.e., the Commission did not treat the regional planning problem. The Commission itself admitted its failure to cover regional planning adequately, despite including many regional aspects in the analysis, such as access routes and urbanisation, to the fact that "...the task of quantifying this factor would have presented formidable difficulties. Quite apart from the difficulty of predicting what the regional planning consequences would be...there would have been problems of data collection and methodology which might have proved insurmountable."[2]

(1) Roskill Commission on the Third London Airport, op.cit., P.128.
(2) Ibid, P.124.

In addition to the above weaknesses in the approach of analysis of the Commission, there was the difficulty of finding reliable methods for evaluating the various categories of costs and benefits, such as the cost of noise and displacing residents from an airport site and second the users - costs and travel time cost.[1] The use of money as a common measuring rod itself introduced a distortion. The analysis for instance wrongly gave the same weight to a poor man's loss of one pound as to the rich man's loss of the same sum.[2] Furthermore, "The Roskill Commission identified only the more important costs. Rather than computing benefits separately, so that the return on capital could be calculated, certain benefits were included in the cost columns as "dis-benefits". Hence the result could more accurately be described as a "Cost-effectiveness" study than a comprehensive cost-benefit analysis."[3]

However, in failing to cope with the above stated difficulties, the Commission "...failed to recognise the cost-benefit analysis is a tool which has to be adapted and adjusted for the problem at hand, and that what they were faced with was the need of adaptation for the problems of urban and regional planning."[4]

The weaknesses of cost-benefit analysis application could also be recognised if the technique is applied to less complicated problems. A reading in the "Scuth Atcham scheme study",[5] which was intended both to examine the social costs and benefits of the proposed South Atcham Water Supply Scheme (The scheme aimed at providing mains water supply to remote rural areas to the South of Shrewsbury) as a pilot study to explore the usefulness of cost-benefit analysis as a routine method of appraising

(1) For examination of such weaknesses see for instance, C.Choguill, op.cit., PP.24-25.
(2) Roskill Commission on the Third London Airport, op.cit., P.124.
(3) C.Choguill, op.cit., P.25.
(4) N.Lichfield, "Cost-Benefit Analysis in Planning: A Critique...," op.cit., P.174.
(5) J.J.Warford, The South Atcham Scheme, an Economic Appraisal, H.M.S.O., London, 1969.

future proposals of this kind, has faced most of the technical difficulties(1) associated with the cost-benefit analysis study of the third London airport. However, what distinguished the Atcham Scheme from that of the third London airport is that it incorporated the annual running costs in the analysis making the study more realistic since the running costs are very important element of cost analysis and can effect to a large extent in achieving more optimisation in the decision making process.

The above analysis would suggest that the cost-benefit analysis in this sense would never include everything relevant to decision making, despite the fact that the cost-benefit analysis provides a framework within which different elements can be brought together and weighed.(2) This fact led some scholars to distinguish between two types of cost-benefit analysis, the economic cost-benefit analysis and non-economic cost-benefit analysis, each with different theoretical base and justification.(3) The economic type is firmly grounded in accepted economic theory, and has a well established use for the partial evaluation of projects since it emphasises only economic efficiency in resource use.(4) Lichfield in his critique of the Roskill Commission goes on the same line and argues that cost-benefit analysis taking into account the economic factors and efficiency criteria are short of being planning analysis.(5) Planning analysis believes Lichfield, "...starts with wide ranging concept of needing to take account of all the costs and benefits that are likely to flow from the decision at hand (subject to the necessary cut offs from

(1) For details of such difficulties see, Ibid, PP.170-175.
(2) Roskill Commission on the Third London Airport, op.cit., P.128.
(3) See for instance, Barrie Needham, "The Cost-Benefit Fallacy", Journal for the Built Environment, Vol. 34, 1971, P.47.
(4) For a detailed explanation of the economic type of cost-benefit analysis See, for example, A.R.Prest and R.Turvey, op.cit., PP.683-731.
(5) N. Lichfield, "Cost-Benefit Analysis in Planning: A Critique..., op.cit., P.174.

the view point of the decision maker and the problem at hand) and also the need to consider the incidence of the repercussions."[1] But even so the cost-benefit analysis could fall short of planning analysis if it were concerned only with the efficiency criterion for the choice and not also with the incidence of the costs and benefits of different sectors of the community and the need to consider equity and distribution considerations.[2]

To carry out such complete analysis and in an attempt to illuminate problems associated with economic cost-benefit approach, Lichfield has been devising a methodology of cost-benefit analysis for city and regional planning since 1960 which has come to be called 'The Planning Balance Sheet".[3] The creation of Planning Balance Sheet argues Lichfield, demonstrates how cost-benefit analysis could be used for a complex problems within a planning context.[4] The main principles, procedures and constraints of the technique have been developed by case study.[5]

The value of the technique ..."lies in exposing the implications of each set of proposals to the whole community and to the various groups within that community, and also in indicating how the alternatives might be improved or amalgamated to produce a better result. The purpose of the approach is the selection of a plan which, on the information available, is likely to best serve the total interest of the community."[6]

The Planning Balance Sheet, like the typical cost-benefit technique,

(1) Ibid, P.174.
(2) Ibid, P.174.
(3) N. Lichfield, "Cost-Benefit Analysis in Town Planning,...," op.cit., PP.210-249.
(4) N. Lichfield, "Cost-Benefit Analysis in Planning: A Critique...", op.cit., P.174.
(5) For the details of the procedure see for instance, N.Lichfield, "Cost-Benefit Analysis in Town Planning..." op.cit., PP.210-249; and "Cost-Benefit Analysis in City Planning...",op.cit., PP.273-279.
(6) N. Lichfield,"Cost-Benefit Analysis in Urban Expansion....",op.cit., P.128; and "Evaluation Methodology ---, op.cit., P.156.

presumes that, in forecasting, time must be allowed for in various ways. Development cannot be carried out quickly so that interest on locked up capital must be added. Assets, whether existing or proposed, have a limited life and must therefore be amortised. Revenue streams must be discounted back to values at a particular time, normally that time when the analysis is made. For all this discount rates must be adopted. The aim is that each transaction should be in terms at present worth of cost and benefit.

It should be noted that the analysis according to this approach would enable the decision maker to pick out elements of the projects which are high in cost or low in benefit, or those sections of the community which would bear the costs and receive the benefits.

Lichfield applied the planning balance sheet in the case of evaluating the alternative pattern of the growth of Swanley Town,[1] Peterborough New Town[2] and in his Critique of Roskill Commission.[3] However, despite all the advancements that Lichfield introduced on the typical cost-benefit analysis, to cope with the complicated urban and regional planning problems, the technique is still experimental and relatively undeveloped. The problems of application are many, comprising some of those common to typical cost-benefit analysis and others particularly acute ones which arise when applying the approach to town and regional planning. Lichfield gives an example of the complexity of the analysis when concerned with town and regional planning. He stated that,"...since the plan is for the community all, and not a limited range, of costs and

(1) N.Lichfield, "Cost-Benefit Analysis in Town Planning,..."op.cit., PP.215-249.
(2) N.Lichfield, "Cost-Benefit Analysis in Urban Expansion,..."op.cit., PP.123-155.
(3) N.Lichfield, "Cost-Benefit Analysis in Planning, A Critique,..." op.cit., PP.157-183.

benefits must be brought into analysis. From this it follows that very many benefits are non-measurable. Furthermore the decision makers need to weigh up costs and benefits to a wide range of sectors in the community, often with conflicting objectives, and in so doing must have regard to considerations of equity as between the sectors, and not only overall efficiency."(1)

The Roskill Commission stressed that there are formidable technical difficulties in selection of a plan, which on the information available, is likely to best serve the total interest of the community when applying the cost-benefit analysis. The Commission emphasised that "Quite apart from the difficulty of quantifying certain important matters..., it is rarely easy to observe and draw correct inferences from people's behaviour. In addition there is the problem, shared by other methods of analysis, of finding the correct basis of predicting the repercussions of the alternatives being used."(2)

It remains to emphasise that simply because the analysis must, by definition, concern itself with costs and benefits which cannot be measured, it must therefore involve a great deal of value judgement. However, subjective judgements is unavoidable in any decision-making process(3) and decisions which are made without such analysis involve mighty value judgements.

7.2.2. Threshold Analysis Technique

Threshold theory was developed by Malisz in Poland in 1963. Since then it has become an important element in Polish town planning where the theory was first applied and tested in practice for about six hundred towns in Poland and it has recently become an important

(1) N. Lichfield, "Cost-Benefit Analysis in Town Planning,..."op.cit., P.216.
(2) Roskill Commission on the Third London Airport, op.cit., P.12.
(3) Ibid, P.11.

tool in planning work and a feature of the modern school of Polish planning. It has been applied in the Moscow region and in Italy and a growing interest can be noticed elsewhere.(1) In Britain the technique was first applied by the planning research unit of Edinburgh University in the preparation of the sub-regional plan for the "Grangemouth-Falkirk Growth Area".(2) It has also been applied by the Scottish Development Department in the preparation of a plan for urban expansion in the Central Borders Sub-Region.(3)

The theory's founder emphasised that, it originated as a response of three notorious problems which accompanied physical planning at the time of its formulation.(4) These problems were first, the problem of facilitating inter-disciplinary co-operation, particularly between physical planners and economic planners, where the theory is an attempt to translate urban design into quantitative categories with which the economist deals. The second problem concerns the communication between planners at different levels, since threshold analysis tries to introduce an effective feedback into the overall planning process which facilitates such communication. The third problem relates to the period of time that the plan should cover. The theory is based on the supposition that short-term planning does not allow room for the operation of long-range investment process while too long a stride into the future may mean that one is caught out by shifts in development trends. So planning locking twenty or thirty years ahead has become the accepted compromise.

The threshold notion is already a well developed concept in the physical sciences (notably in physics and biology). Generally, it denotes a limitation within which a variable does not change under the influence

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(1) J. Kozlowski and J.T.Hughes, "Urban Threshold Theory and Analysis", Journal of Town Planning Institute, Vol.53, 1967, P.55; and B.Malisz, "Implications of Threshold Theory for Urban and Regional Planning", Journal of Town Planning Institute, Vol.55, 1969, P.108.

(2) Planning Research Unit of Edinburgh University, Grangemouth-Falkirk Regional Survey and Plan, H.M.S.O., Edinburgh, 1968.

(3) Scottish Development Department, The Central Borders; A Plan for Expansion, Vol. 1, H.M.S.O., Edinburgh, 1968.

(4) B.Malisz, op.cit., P.108.

of a gradually increasing factor (stimulus). In economics, thresholds are known in the form of indivisible investment objects.[1] In town planning, a threshold is not any limitation faced by the expansion of a town: "by its definition it is a major one which poses a serious problem and which has a marked effect on the cost per head of population."[2] Hence, in town and regional planning the main generator of threshold theory was the simple observation that towns encounter some physical limitations to their spatial growth. The conventional procedures of feasibility studies, argues Malisz, do not make sufficient use of these limitations in their methodology. Hence, the theory assumes that settlements during their course of growth will be confronted from time to time with limitations that have the character of thresholds. These limitations are basically of three types, physical, technological and structural thresholds.[3] They have been called the thresholds of urban development.

The physical threshold implies that a settlement on an island can expand only within the confines of its shores; Tracts of marshland or steep valley sides will stand in the way of development in certain directions. These limitations are not absolute. They can be overcome. Land can be reclaimed and artificial land created. But crossing these thresholds demand high inputs of economic resources. Physical limitations are visible even in less intractable sites. Technical thresholds appear when the extension of an existing system (i.e., water supply or transportation) is no longer possible and a new system has to be introduced. Finally, the structural thresholds, which affect the internal form of the city and necessitate its reshaping, particularly as far as its central area is concerned. For example an increased population may necessitate the radical expansion of a main shopping centre so restricted by existing built-up areas that any solution will require investment cost of a threshold character.

(1) Ibid, P.108.
(2) J.T.Hughes and J.Kozlowski, "Threshold Analysis - An Economic Tool for Town and Regional Planning", Urban Studies, Vol.5, 1968, P.138.
(3) B.Malisz, op.cit., P.108.

All these forms of threshold-limitations can be overcome either by creating a new system of facilities or by a radical act of reconstruction. "To cross a threshold one requires an input of capital that would not be necessary if the growth of the city were to be stopped in its tracks. In most cases this input is needed to accommodate an increase in population, though it must be noted that even with stable population figures thresholds may have to be crossed, for example owing to a rise in rate of motorisation".[1]

Accordingly, as Richardson[2] and Kozlowski and Hughes[3] put it, the notion of threshold costs can be formalised by dividing the per capita investment costs[4] necessary to locate a new inhabitant in a city into two components-normal costs and development (or threshold) costs. Normal costs are those not associated with the given location of investments necessary to accommodate new inhabitants. These types of costs remain constant or are a linear function of city size. On the contrary, threshold costs are the fixed costs required to overcome the thresholds limiting development. Hence they are heavily tied down to existing conditions and charactaristics of given land. They rise sharply with the onset of the threshold but decline once the threshold has been passed. Thus the thresholds can be presented by peaks or inflexion points on the cost curve. The overstepping of the thresholds i.e., completion of all investment necessary to open new land for town expansion, results in the decline in the threshold costs.

(1) Ibid, P.108.
(2) H.Richardson, Location Theory, Urban Structure....,op.cit., P.179.
(3) J.Kozlowski and J.T.Hughes, op.cit., P.55.
(4) The ratio of input to output of urban expansion can be established only if this measurement (the per capita investment costs) is used, i.e.,the cost of developing new urban land per one new inhabitant. (B.Malisz, op.cit., P.109). However, this single index of efficiency, argues Malisz, "may sometimes mislead,especially when the present population of a city is inadequately accommodated(with excessively high densities)or serviced (with badly stained transportation or water supply facilities). In such situations the threshold costs per one new inhabitant will be "loaded" with investments that are already needed. For this purpose an appropriate correction of the index is necessary for the purpose of comparing different towns." (Ibid,P.109).
Nevertheless,although Malisz does not wish to suggest that threshold cost indices are in themselves measures of economic efficiency he believes that"...they are useful assets for the regional planner, enabling him to choose the optimal location for the programmed development of economic activities. This is not to say that difficult thresholds must always be avoided;but in terms of economics it seems reasonable to cross thresholds at the point where maximum efficiency is derived". (Ibid. P.110).

The overall threshold cost is obtained through the integration of all partial results of the three groups of limitations (physical, technological and structural) which can be graphically shown on a map and considered within the successive threshold lines, from which can be deduced the most suitable areas for the further spatial expansion of a town.[1] "By estimating the threshold costs, indispensable for opening new land for urban growth and by calculating the capacity of threshold areas (in terms of the number of new inhabitants), we can obtain all data relevant to determining the most viable solutions to the various possibilities for town expansion."[2] Hence, threshold analysis, based on detailed economic assessment by cost indices, enables comparison of the various alternatives in the final stage of the planning process, and thus helps to determine the choice of the most desirable direction for growth. By emphasising the desirability of quantification, it enables the application of "Optimisation Procedures."[3]

The advantages of threshold analysis over other planning techniques is that it is a technique for generating the proposals. Simpson stressed this point and argued that, "Threshold analysis hardly has a serious rival for carrying out similar purposes as a vigorous economic planning technique at an early stage of planning process."[4] Cost-benefit analysis and Hill's "Goals Achievement Matrix"[5], for instance are very much a techniques for evaluation of plan proposals and comparison of alternatives rather than generation of proposals. Therefore,

(1) J.Kozlowski and J.T.Hughes, op.cit., P.55.
(2) Ibid, P.55.
(3) J.T.Hughes and J.Kozlowski, op.cit., P.133.
(4) B.Simpson "Some Theoretical Development on Threshold Analysis and Testing", Urban Studies, Vol.14, 1977, P.80.
(5) For the basic notions of the technique, See, M.Hill, "A Goals - Achievement Matrix in Evaluation Alternative Plans", Journal of American Institute of Planners, Vol. 34, 1968, PP.19-29.

threshold analysis filled an important cap in translating objectives and survey information into alternative proposals for development, especially at structure plan and more local plans than over the larger areas of the region and sub-region.(1) Furthermore, by using money as a measurement medium, threshold analysis also offers advantages over techniques which rely on a points system, such as the goals-achievement procedures, the subject of discussion in the next sub-section. This is because money is more firmly based on reality than the various points systems that have been used in other techniques.(2)

Threshold analysis also attempts to avoid the difficulty of non-quantifiable elements. Hughes and Kozlowski stressed this point and argued that, cost-benefit analysis and other economic appraisal approaches are severly handicapped by the non-quantifiable elements which in many cases are the essence of the decision. Threshold analysis attempts to avoid this difficulty.(3)

However, it should be noted that, "Threshold analysis is very much accurate when applied to only one type of development at a time. It is especially suitable where there are a number of computing factors influencing location without any single one being dominant, and where the form of building is relatively independent of location."(4)

Hence, by using threshold analysis, it is possible to overcome some drawbacks of other techniques. However, the technique, as developed to date, incorporates many technical difficulties. First of all, the technique does not include all the criteria affecting the decision-making in the process of analysis and evaluation. Simpson for instance elaborated on this point and pointed out that "...,although the factors

(1) B.Simpson, op.cit., P.79.
(2) Ibid, P.79.
(3) J.T.Hughes and J.Kozlowski, op.cit., P.136.
(4) B.Simpson, op.cit., P.79.

included can be accurately described, they often do not adequately represent the criteria for making locational decisions. Thresholds have been counted as obstacles to building which would cause abnormally high construction costs. And yet not all the locational factors influencing development are either obstacles nor do they refer to construction costs."(1) Social costs, travelling time cost, environmental costs, the loss of agricultural land, landscape damage resulting from development and other aesthetic considerations are examples of considerations appear in the objectives of many planning studies and affect the decision making but are not included in threshold analysis or, at least, not fully considered. These factors are not included in threshold analysis because of the difficulty of measuring them. This of course contradicts the view of Hughes and Kozlowski who argued that the technique attempted to avoid the difficulty of non-quantifiable criteria. Even in the case of quantifiable factors, the technique is primarily concerned with the initial investment cost where it stresses development costs to the neglect of operating costs.(2) This implies that the alternative which would seem to be most efficient, if the capital cost only is included, may well increase the operating costs, and being in the long run more costly compared to other alternatives. This is true especially the operating costs of several services, over-time, are as high as the initial capital costs and in some cases even higher. However this problem could be easily avoided through a modification in thetechnique. By the same concentration on initial costs, the analysis fails to take account of benefits of alternative patterns of development.

(1) Ibid, P.80.
(2) H.Richardson, Location Theory, Urban Structure,... op.cit.,P.179; and J.T.Hughes and J.Kozlowski, op.cit., P.143.

The small size of threshold costs resulting from the application of threshold analysis in some case studies confirms these doubts. Simpson stressed this point and argued that, "The size of threshold costs encountered support these doubts about them being only very partial as an aid to decision making. The...threshold costs encountered in the Central Borders was £47.98 per capita and in the Dundee study only £10.87 per capita ."[1] In a modified form of application of threshold analysis,[2] factors other than those included in traditional threshold analysis were incorporated in the analysis. These factors which extend to include the value of landscape, price of land acquisition, travelling cost, annoyance and residential environment gave more realistic results and show that the size and variation of size of threshold cost to be larger than previously encountered as a result of application of the conventional threshold definition (physical, technological and structural costs). However, even in the latter case factors such as social consideration of development, the future expected growth and the personal preferences are not incorporated in the analysis due to the unreality of assessing such factors in monetary terms and/or finding an appropriate valuation methodology. The latter reason applies to the factors included in the modified form of threshold analysis such as the effect on landscape and residential environment among others.

Further practical difficulties of applying threshold analysis must be admitted, "...there is the problem of calculating the cost indices necessary to cross successive threshold lines. Estimates are difficult to obtain and are subject to a considerable margin of error."[3]

(1) B.Simpson, op.cit., P.80.
(2) See for instance, B.Simpson, "Low Cost Housing Sites in Brighton", Surveyor and Public Authority Technology, Vol.CXLVII, 1976, PP. 26-28; and "The Costs of Expanding Lewes" Surveyor and Public Authority Technology, Vol. CXLV, 1975, PP.26-32.
(3) J.T.Hughes and J.Kozlowski, op.cit., P.142.

Furthermore, "The importance (and thus costs) of certain threshold may vary through time and some limitations of technical character today could be almost meaningless in fifteen years time with a change in technology."(1) Defining the successive thresholds, especially technical and structural thresholds is also a complicated problem, where in many cases the limitations upon expansion set by technical thresholds is not capable of precise definition and there is a considerable scope for personal judgement in determining the capacity of a road or of the different public utilities. The structural thresholds are probably the most difficult to define. The problem is more complicated in the case of developing countries where experience in this respect is very limited and no sufficient and accurate data is available to carry out such a complex analysis.

Finally, the conventional concept of threshold analysis does not consider the site of the committed projects (the main cause of urban population growth in this special case) as a factor in urban growth distribution. In general, it concentrates on the major land use, which is residential, and ignored the location of development projects sites or a principle source of employment that will exert strong influence on the possible distribution of population. The central borders study recognised the importance of this factor in the distribution of additional number of population among the towns of the sub-region.(2)

7.2.3. Goals-Achievement Analysis Technique

Goals-achievement methods have been originated in the United States in the field of transport engineering and land-use transportation in mid 1960's. Transport proposals form a very important element of many studies on which such methods have been developed. In Britain this method have been used in late 1960's and in 1970's by land-use planners to determine

(1) Ibid, P.142.
(2) Scottish Development Department, op.cit., PP.14-15.

the best sites of residential as well as the industrial development.

Goals-achievement methods have been developed by many scholars, such as Kreditor in his "Policy Evaluation Matrix",(1) Hill in his "Goals-Achievement Matrix",(2) Schlager in his "Objective Fulfilment Analysis"(3) and Holmes in his "Disaggregated Matrix".(4)

The methods have in common a basic approach of attempting to determine the extent to which alternative plans will achieve a pre-determined set of goals or objectives. The terms goals and objectives are used somewhat differently by those advocating this approach, but they are both used to denote the aims which it is thought the plan should achieve. The progress towards and retrogession from the specified goals or objectives represent respectively the advantages and disadvantages associated with alternative plans.

Lichfield and others in their publication the "Evaluation in Planning Process" distinguished four main charactaristics of the goals-achievement approach. These charactaristics are summarised as follows:-(5)

First, "goals or objectives are always formulated (in a preliminary fashion at least) in advance of both the design of alternative plans and the analysis of their consequences".

Second, "the objectives are said to be "multi-dimensional", that is, to include those of an "aesthetic", "environmental", and "political" nature, as well as those which the advocates of the approach charactarise as "economic"".

Third, "all goals-achievement methods have been designed to compare mutually exclusive plans only; that is, the considered plans represent alternative ways of tackling a particular problem (e.g. producing a particular output, locating given amounts of population and employment

(1) A. Kreditor, <u>The Provisional Plan, Industrial Development and the Development Plan</u>, An Foras Forbatha, Dublin, 1967, Chapter 8.
(2) M. Hill, <u>op.cit.</u>, PP.19 - 29.
(3) See, E. Boyce and N.D.Day, <u>Metropolitan Plan Evaluation Methodology</u>, Institute for Environmental Studies, University of Pennsylvania, 1969, PP.45-47.
(4) J.C.Holmes, "An Ordinal Method of Evaluation", <u>Urban Studies</u>, Vol.9, 1972, PP. 179-191.
(5) N. Lichfield, et.al., <u>Evaluation in the Planning Process</u>, Pergamon Press, Exford, 1975, PP. 52 -53.

within an area, relieving traffic congestion)".

Finally, "the objectives used for evaluation are generally either assigned a "weight" to reflect their relative importance, or are ranked in order of presumed importance, prior to the comparative analysis of plan consequences". In the same line Nash et.al.,[1] pointed out that most goals achievement techniques can reasonably be outlined by the five-step "rational" evaluation procedure described by Jessiman et.al.,[2] which are:-

1. Itemise the objectives,
2. Define the best measure of each objective,
3. Weigh the objectives,
4. Evaluate the way each alternative meets each objective,
5. Select the best alternative.

For the better understanding of the basic charactaristics of the goals-achievement methods a variety of these methods will be considered. The most important of these methods, Hill's goals-achievement matrix and the development potential analysis as developed in U.K. will be discussed in some details.[3]

In Kreditor policy evaluation matrix (1967), all alternative plan proposals are ranked against a series of objectives to show whether each is affected directly, marginally, negatively or not at all, by each hypothesis. The result is a visual ranking of these terms from which the preferred solution is selected for study. Lichfield argues that "This approach is useful in linking objective and end product but is not comprehensive as to objectives, would not for example show the distinction

(1) Christopher Nash, et.al.,"Criteria for Evaluating Project Evaluation Techniques", Journal of American Institute of Planners,Vol.41, 1971,P.85.
(2) W. Jessiman,et .al.,"A Rational Decision-Making Technique for Transportation Planning",Highway Research Record No.180,Washington,D.C., 1967.
(3) For more details of these and other goals-achievement techniques, see, for instance, H.B.Fisher, op.cit., PP.18-85; P.W.J.Batey and M.J. Breheny op.cit., Part 1, PP.259-273 and Part 2, PP.502-518; and David M. Nowlan, "The Use of Criteria Weights in Rank Ordering Techniques of Project Evaluation", Urban Studies, Vol.12, 1975, PP.169-176.

between costs (inputs) and benefits (output) nor indicate the marginal differences in such costs and benefits which are necessary to show the best scheme, and there is no attention to incidence".[1] Furthermore, Kreditor does not suggest the rule to be used in making the choice. With the methods developed by Schlager and Holmes, however, the objectives themselves are ranked in order of the considered importance of their achievement, with the objectives being ranked in advance of analysing the repercussions of proposals. In case of Schlager for instance, "..., the objectives already defined were grouped into three major categories. These categories of objectives were ranked in order of their increasing importance. Then the three alternative plans were ranked on each category of objective in order of their increasing ability to meet each category...These weighted scores were summed for each alternative achieving an overall score for each plan. Finally, this score was weighted by a "probability of implementation" subjectively reflecting the difficulty of implementing the plan. The alternative with the highest weighted score was considered to be the preferred alternative".[2] Holmes model makes a distinction between the goals to be achieved or "purchased" and the resources that have to be expended in order to achieve them. However, in his model, the comparison of plans in terms of goals-achievement is undertaken separately from their comparison in terms of resource costs.[3]

The most sophisticated and well-known goals-achievement method is the goals-achievement matrix which has been developed by Hill in 1966.[4] Hill's developed his procedure as a response to what he calls the unsatisfactory state of the single-objective cost-benefit analysis and the

(1) N. Lichfield, "Evaluation Methodology....", op.cit., P.159.
(2) See, E. Boyce and N. D. Day, op.cit., PP.45-47.
(3) J. C. Holmes, op.cit., PP.179-191.
(4) M. Hill, op.cit., PP.19-29.

development balance sheet for the purpose of the evaluation of the alternative courses of action. According to this procedure a set of ideals and objectives for the plan are formulated at the outset, in advance of the design of alternatives. The objectives are defined operationally so that either the existence or non-existence of a desired state or the degree of achievement of this state can be established. The model distinguishes between two types of objectives, a qualitatively-defined objective which is the one that following the execution of a course of action, is either obtained or not in terms of intuitive observation. On the contrary, a quantitatively-defined objective is the one that is obtained in varying degree. Furthermore, the model presumes that goals should, as far as possible, be defined operationally, that is they should be expressed as objectives. This allows that the degree of achievement of the various objectives can be measured directly from the costs and benefits that have been identified.

Hence, according to the goals-achievement matrix "..., costs and benefits are always defined in terms of goals-achievement. Thus benefits represent progress toward the desired objectives whilst costs represent retrogression from desired objectives. Where the goals can be and is defined in terms of quantitative units, the costs and benefits are defined in terms of the same units. Where no quantitative units are applicable, benefits indicate progress toward the qualitative state that the objective describes, while costs indicate retrogression from these objectives. For the same objective, costs and benefits are always defined in terms of the same units if the objective can be expressed in quantitative terms".[1]

After defining the goals and objectives in advance and operationally, the relative value to be attached to each goal is

(1) Ibid, P.23.

established, this usually being denoted by a set of numerical values. The consequences of each alternative course of action are determined for each objective. The incidence of the benefits and costs of each alternative course of action measured in terms of the achievement of the goal is established for each goal. The relative weight to be attached to each group is also established. The weighted achievement levels of the goals are then summed to give an overall index of achievement for each plan. This index value would then be adjusted to take account of the equity of the resulting distribution of gains and losses. This completes the comparison of the plans and the product of the analysis being presented in a matrix.[1]

The simplist approach, and one that is subject to least criticism, argues Hill, is to treat all objectives as if they have been measured on the least demanding of measurement scale, an ordinal scale.[2]

The main question that Hill faces in his method of evaluation is the one which concerns the fact how are the objectives that are expressed in qualitative terms to be compared with objectives expressed in quantitative terms? The analysis presume that, "to some extent , the distinction between quantitatively defined objectives and qualitatively defined objectives is artificial. Any property that can be quantified can also be expressed in qualitative terms. Similarly a qualitative description may involve implicit quantification".[3] However, Hill's recognised that it is obvious that the achievement of quantitatively defined objectives can be more easily measured than the achievement of qualititavely defined objectives. Nevertheless, Hill presumes that, at least the simplist two measurement scales in the hierarchy,[4] the

(1) An Example of the form and contents of the matrix is shown in M. Hill, Ibid, PP.23-24.
(2) Ibid, P.25.
(3) Ibid, P.24.
(4) There are four major classes of measurement scales,they are: the nominal scale, which classifies and numbers entities; the ordinal scale, which ranks entities; the interval scale, which provides equal intervals between entities and indicates the differences or distances of entities from some arbitrary origin; and, the ratio scale, which provides equal intervals between entities and indicates the differences or distances of entities from some non arbitrary origin. (Ibid, P.24).

nominal scale and the ordinal scale, can be employed for the measurement of the achievement of qualitatively defined objectives. In the final analysis the analysis presumes that "the validity of a measure depends on the extent to which it measures what it purports to measure. The measure of goals-achievement that are proposed should thus be judged by this criterion and, where deficient, should be improved so that they might better satisfy this criterion".[1]

Lichfield, et.al., argued that two main features distinguish Hill's evaluation method: The attention given to equity consideration and the use of hierarchy of goals.[2] The first feature argues Lichfield and his colleagues implies that "individuals in community are grouped according to some criterion viewed relevant to an assessment of the justice and fairness of the proposals, such as, income levels. A set of "incidence weights" are assigned to these groups in order to represent the preference "of the community" with respect to alternative distribution of gains and losses which are to be applied to the totals of net gain. The formulation of the incidence weights is considered to be the responsibility of the decision-taker. But planners must obtain evidence as to those weights from whatever sources they can if decision-takers cannot or will not state their own preferences on issues of equity". The second feature of the method is that "...the objectives employed...are not valued in themselves but for their achievement of certain higher level goals ("ideals") which denote very general policy aims, concerned with areas such as "social justice" and "choice and opportunity". Conceptually, the objectives are said to be derived from a consideration of the postulated ideals".

Despite the extremely complex, time-consuming and expensive task

(1) _Ibid_, P.24.
(2) N. Lichfield, et.al., _op.cit_., P.55.

which the goals-achievement matrix calls for, its conceptual framework is recommended as a basis for rational decision-making. It is assumed that knowing the effects of alternative courses of action with regard to all valued objectives, and knowledge of the incidence of these effects with respect to various aggregates of people should enable the decision-maker to arrive at more rational decisions.

The goals-achievement matrix can determine the extent to which certain specified standards are being met. This task could be undertaken by determining how various objectives will be affected by proposed plans. Furthermore, Hill's argues that the matrix "...can also determine the costs of meeting specified standards in terms of the degree of achievement of other "open-ended" objectives that would have to be forfeited. Different plans have different trade-offs between the achievement of objectives and standards, and these can also be compared."(1)

Finally, Hill argues that "The key to decision-making by means of the goals-achievement matrix is the weighting of objectives, activities, locations, groups, or sectors in urban areas. By the application of relative weights, it is possible to arrive at a unique conclusion. The goals-achievement matrix is not very useful if weights cannot be objectively determined or assumed. The development of methods for the determination of weights is thus of first priority for the successful application of the goals-achievement matrix".(2)

The goals-achievement matrix has limitation of application as a tool for plan evaluation. Hill himself recognised that, like cost-benefit analysis and the balance sheet of development, the goals-achievement matrix cannot determine whether a project should be executed or not. In all cases, the need for the project that is

(1) M. Hill, op.cit., P.27.
(2) Ibid, PP.27-28.

proposed is treated as a given. All of these methods of evaluation are designed primarily for the comparison and ranking of alternative projects rather than for testing their absolute desirability. Furthermore, the goals-achievement matrix has been devised for the evaluation of plans for development in a single functional sector (such as water resources or transport), where the activities and associated land uses are planned and managed as distinct operations. Hill suggested that this procedure could not be used for comparing alternatives involving multi-sectoral projects, because it does not register the interaction and interdependence of objectives relevant to different sectors. However, Lichfield and his colleagues commenting on this problem argued that "..., it would seem that unless the analyst is faced with having to identify the optimal alternative, application of goals-achievement matrix does not require an understanding of the way in which the achievement of one objective affects the level of achievement of others. Planning teams have applied the method to proposals embracing a variety of types of urban development".(1) The experience now gained from its use on the Coventry-Solihull-Warwickshire sub-regional study, Brighton urban structure plan and the West-Central Scotland plan has shown that in practice this particular difficulty feared by Hill is not a real one.

However, Lichfield and his colleagues has directed many criticisms to the goals-achievement matrix. Among the most important of these criticisms are:(2)

(a) The model did not elaborate on some important questions regarding the formulation of objectives, i.e., the model did not answer exactly whose interest or preferences are to be taken into account and who should formulate objectives and by what procedures?

(1) N. Lichfield, et.al., op.cit., P.83.
(2) For the details of these criticisms, see, Ibid, PP.78-97.

By deliberately leaving the nature of the public interest unspecified, it will vary as between application. In Hill's model the objectives are said to be derived from an explicit consideration of higher level goals or "ideal" which are specified in advance of the analysis of plans. These ideals are formulated by planners, elected representatives, and other participants in the planning process. Likewise in formulating objectives the planning team should in Hill's view, seek guidance from elected representatives. He does not discuss what he considers would constitute good evidence in support of any particular objective which might be suggested, nor how to verify any evidence which might be produced. The attempt is made to specify these objectives before the analysis of plans is begun. Lichfield and his colleagues believes that the objective incorporated in the evaluation process should represent the preferences of those within the relevant community whose well-being is potentially affected by the consequences of proposals.(1)

However, it should be noted that the above problem is associated with most evaluation-techniques. Nash et.al., who supports the view that decision-rule should be derived from individual preferences argued that a number of problems exist in achieving this aim. These problems extend to include whose preferences should count? What preferences should count? How should individual preferences count? and how should individual preferences be aggregated?(2)

(b) There are no goals-achievement matrix principles of measurement. They are whatever the particular study team want them to be. Not only does a team have discretion over principles, they have to construct their own rationale for evaluation. This argues Lichfield and his colleagues "...seem to ...constitute a critical weakness in the goals-

(1) Ibid, P.95.
(2) Christopher Nash et.al., op.cit., PP.86-87.

achievement matrix approach, given that the measurement of advantages and disadvantages (or of objective achievement) is central to the whole evaluation exercise".(1)

Hill in his schema argued that the employed relative values reflects the community's valuation of the objective achievements. When the objectives are those held by individual members of the community whose well-being would be affected, the meaning is clear: the weights would be intended to reflect their own valuations of the consequences of the alternatives. However, Lichfield and his colleagues argued that "..., it is not at all clear what Hill has in mind when objectives are held by the "state" or "society" as an entity".(2)

Furthermore, Hill prefers to use notional units of relative value, proposing numerical "points" for the purpose. This is especially so whenever it is considered that market prices are an inadequate measure of real costs and benefits and shadow prices cannot be reliably determined. In these circumstances he says that money units are not credible. This reflects his concern that the assignment of monetary values to the consequences of certain courses of action is often arbitrary and may serve to confuse rather than clarify. However, Lichfield and his colleagues who favour the use of money units wherever practicable argues that money is the most convenient units available. Not only is money familiar to people, but many items for inclusion in the valuation of any set of urban and regional planning proposals are already expressed in money terms by virtue of market prices. Furthermore, they argued that "..., the units serve only to express relative values. The use of points as the units of relative value is no different in this respect from the use of money. The units, in this sense, are unimportant. If relative

(1) N. Lichfield et.al., op.cit., P.92.
(2) Ibid, P.91.

values cannot reliably be determined using money, then the use of notional units cannot overcome the problem of credibility".[1]

In addition to the problem of the measurement unit, there is the difficulty of assigning the relative values of the objective achievements. According to goals-achievement matrix objectives are valued for their contributions to the attainment of higher level goals (the ideals) rather than for themselves. The relative values placed on objective achievements should reflect the relative values of the achievement of their associated ideals. Hence, according to Hill's scheme the relative values applied to the objectives can in principle only be determined if one can also determine the relative values of the ideals. He suggests that this presents a logical difficulty: the ideals describe desired states which, by their very nature, are not subject to precise and unambiguous description. The abstract and general nature of ideals also fosters many differentinterpretations of their meaning, thereby compounding the difficulty. Furthermore, Lichfield and his colleagues argued that "... it is meaningless to assign relative importance to objectives a priori without reference to either differences in levels of objective achievements (which cannot be specified in advance of design) or to the units in which those achievements are to be measured".[2] This difficulty has also been recognised later on by Nash and his colleagues.[3]

(c) Although equity has been given a considerable importance in choosing between planning proposals in Hill's schema, Lichfield and his colleagues argue that "There are two additional tasks that have to be accomplished in order to take full account of equity...It is necessary both to decide on the criterion for grouping individuals and to determine what adjustments should be made to the estimates of gains and losses of

(1) Ibid, P.91.
(2) Ibid, PP.52-53.
(3) Christopher Nash et.al., op.cit., P.86.

the various groups so as to reflect their relative significance for the welfare of society as a whole".[(1)] They added, the basis for grouping individuals should be conditioned by the scope and nature of the factors to be taken into account whilst Hill, in his schema, restricted the notion of equity to the community's view of what constitutes the best distribution of costs and benefits resulting from the proposals. However, like other principles used in his procedure, Hills deliberately leaves the criterion open. He writes "It is necessary to identify those sections of the public, considered by income group, occupation,location, or any other preferred criterion, who are affected by the consequences of a course of action since inevitably the consequences are unlikely to affect all sections of the public served uniformly".[(2)] Lichfield and his colleagues argue that the analyst should consult the decision-takers about the nature of the criterion to be used.[(3)]

Furthermore, it is recommended that "An appropriate set of equity weights has to be established by which to adjust upwards or downwards, the magnitudes of gain and loss. It is only after such weights have been applied that a summation of all items provides a true indication of the social worth of the project. If unadjusted magnitudes are summed, the total figure only indicates whether the gainers from a proposal could profitably compensate those who would suffer to the extent of their loss (assuming that the cost of administering transfer payments are smaller than the sum of aggregate net benefit)".[(4)]

Despite the methodological weaknesses of the goals-achievement procedures, they have been applied in practical situations. The procedures adopted and further developed in Britain during the late 1960's and 1970's to solve planning problems on a regional and sub-regional levels.

(1) N. Lichfield, et.al., op.cit., P.92.
(2) M. Hill, op.cit., P.22.
(3) N. Lichfield, et.al., op.cit., P.93.
(4) Ibid, P.94.

This application led to what is commonly known in Britain the development potential analysis technique. The Nottinghamshire/Derbyshire sub-regional planning study in 1969[1] represent a first attempt in developing the technique where it introduced a systematic analysis of potential for economic development to assist the progressive refinement of the strategic alternatives for the sub-region. It has been developed in the Coventry/Solihull/Warwickshire sub-regional study in 1971.[2] The technique has been employed in the Staffordshire County Structure plan in 1972[3] and the West Central Scotland plan in 1974.[4]

The main reason behind developing such a technique, argues Wannop, the team leader of the Coventry/Solihull/Warwickshire Sub-Regional Planning Study was the improving of the balance between the initial survey and forecasting stage of the study and the subsequent process of the choosing the best strategy which have been nearly neglected by the previous sub-regional studies in Britain.[5] The technique implies that "...the process of shaping alternatives for the region or a sub-region is not a preliminary to evaluation, but a major part of evaluation, and the testing of the final short-list of alternatives concluded a long process in which increasingly intensive evaluation produced diminishing returns in the sense of refinements to the evolving strategy".[6]

Before drawing the main principles of the technique and for their better visualisation, it is necessary to mention here the definitions of the terms used in describing the use of the development potential analysis.

(1) Notts-Derby Sub-Regional Planning Unit, Notts-Derby Sub-Regional Plan, Nottingham, 1969.
(2) Coventry City Council, et.al., Coventry-Solihull-Warwickshire:A Strategy for the Sub-Region, Supplementary Report - 3 - Alternatives, 1971.
(3) Staffordshire County Council, Staffordshire County Structure Plan, Policies and Proposals, 1972.
(4) West Central Scotland Plan, Glasgow, 1974.
(5) Urlan A. Wannop, "An Objective Strategy: The Coventry-Solihull-Warwickshire Sub-Regional Study", Journal of the Royal Town Planning Institute, Vol. 58, 1972, P.159.
(6) Ibid, P.160.

The definition of these terms or references are quoted from the West Central Scotland plan.(1)

(a) Development Factors which influence locational decisions receive Factor Scores which are calculated to represent the quality or quantity of the factors present in each kilometre square.

(b) These factor scores are given an Internal Weight which reflects the importance of a particular factor relative to the others in the same Factor Groups.

(c) To the factor groups are attached Policy Weights which are intended to reflect the importance of each group relative to the others.

(d) The product of the internal weight to a factor and the policy weight for the factor group to which it belongs is the Factor Weight.

(e) The accumulation of the products of factor weights and factor scores gives the Development Potential Score of each kilometre square.

(f) The distribution of these scores across the region produces a Development Potential Surface, indicating areas with relatively high or low potential.

(g) The assortment of weights allotted to the range of factors used to produce one development potential surface is called a Weighting Set, and alternative weighting sets reflect differing opinions about the importance of each factor, that is, alternative definitions of what constitutes a good location for development.

The main principles of the technique that could be drawn from the above mentioned studies is that it takes into account the physical, economic and social considerations directly related to the aims and objectives of the plan in generating alternative strategies and consequently provides a basis for evaluation. The method employed to crystallize the alternatives relied on identifying the relative

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(1) West Central Scotland Plan, Supplementary Report 2, Strategy for Urban Expansion and Change, Glasgow, 1974, P.37.

attractiveness of different parts of the studied areas for new development in terms of factors related to particular planning policies. This technique of development potential analysis argued Wannop "...was essentially a systematic and comprehensive development of traditional sieve map procedures, similar to that used in the Notts-Derby study but with much wider base of physical as well as social and economic factors representative of the overall range of objectives for the strategy, and use as a tool for generating the alternative strategies and for their subsequent detailing rather than as a means of evaluating previously defined alternatives as in the Notts-Derbys study".(1) Its basis lies in applying and measuring certain factors which contribute to the achievement of the objectives of the plan. The technique, therefore, involves a systematic and region-wide analysis of planning factors to determine the location and degree of development potential of any area. In addition the technique presume that the evaluation of alternatives is to be comprehensive in that the strategy objectives are intended to relate to all those consequences of the strategies which the study team considers significant in arriving at their recommendation. The main purpose of the Coventry-Solihull-Warwickshire study, for instance, was "...to demonstrate how alternative strategies might perform in relation to each of the objectives, and how the recommended strategy would best resolve any conflict between objectives and was the most satisfactory framework for change".(2)

In this context, the technique has a number of advantages over more conventional methods. First, it forms an important link in the conventional planning process by providing a systematic means of progressing from survey material, analysis, aims and objectives to the generation of alternative strategies, their evaluation and the development

(1) Urlan A. Wannop, op.cit., P.160.
(2) Coventry City Council, et.al., op.cit., Report, Para 2.16.

of a preferred strategy. Hence, the development potential analysis provides the procedure where no realistic strategy would be precluded, nor would be potential of any part of the study area be neglected. Wannop stressed that the best strategy can only be as good as the best of alternatives considered.[1] However, it should be noted that the generation of alternative strategies by using development potential procedure does not preclude the possibility of considering other alternatives which cannot be generated through using this procedure. The Coventry-Solihull-Warwickshire study, for instance involved a trend strategy[2] in addition to the three systematically generated alternative. A new town strategy could also be considered.[3]

Second, it helps separate policy decision-making from the more mechanical aspects of plan making. It enables specific decision areas to be isolated so that an explicit weight can be given to each. This means that specific policies can be formulated and plans produced from them.

Furthermore, the development potential technique argues Wannop represent an advance over the conventional sieve map in three specific ways, they are[4]; First, it does not rely on using arbitrary thresholds to identify the "best" and "worst" areas, but enables every factor to be valued or graded, throughout the sub-region as a whole. In this way, local variations in the value of each factor are incorporated in full, and not just for those areas where the factor was most or least important; Secondly, the use of weighting system enables certain selected factors to

(1) Urlan A. Wannop, op.cit., P.159.
(2) The trend strategy was based on an extrapolation of past changes in the amount and location of urban developments within the sub-region, and was an attempt to show the implications of a continuation of past policies for future residential development.
(3) See West Central Scotland Plan, Strategy for Urban Expansion, op.cit., P.45.
(4) Urlan A. Wannop, op.cit., PP.160-161.

be given greater emphasis; and Finally, by varying the weights given, it enables the emphasis to be shifted between the factors to measure how the potential for development changes when policy assumptions are varied.

To develop alternative strategies the technique assumes that the first stage involves separate analysis and testing of a wide range of factors to produce an indication of development potential. To expediate analysis and to enable the factors involved in this analysis to be combined into one index, the technique assumes that the scale of measurement had to be comparable and the measurement unit had to be the same. The scale of measurement could differ, it could be expressed in terms of a numerical scale, such as, 1-3, 1-10, 1-100 or any other scale depending on the research team and the availability of data for testing the related factors. The more detailed the available data, the wider the scale range could be. On the contrary, the more limited and generalised the available data, the narrower the scale is expected to be. In both Coventry-Solihull-Warwickshire sub-regional study and Staffordshire County Structure plan the ranges were standardised and converted to "normal scores" from 1-100. In this way lowest potentials were recorded as (1) and the highest as (100).[1] For instance, the best landscape would score (1) for it is to be preserved and therefore has the lowest potential for development. On the contrary, the poorest landscape would score (100) since its development would be loss. However, it should be noted that the Coventry-Solihull-Warwickshire sub-regional study emphasised that the use of a very narrow range of scores raises two fundamental points: first, a very narrow range would only give marginal differences between alternatives, whereas a wide one might range from conditions which were

(1) Coventry City Council, et.al., op.cit., P.15 and 25 and Staffordshire County Council, op.cit., Para 2.26.

ideal to those that were intolerable; and second, a narrow range might occur at the bottom of a scale, where even the best represented unacceptable conditions, or it might occur at the top of a scale, where the worst was still acceptable.[1]

The second stage involves grouping of factors representing different policies. Several basic policy groups of factors could be established. These groups could be environmental, social, economic, structural and so on. The list is expected to differ according to the nature and purpose of the study. This stage involves also combining factor scores with varying priorities so that varying emphasis could be imposed before the scores were added to produce combined potentials. Again the degree of priority for factors in each group as well as for different policy groups differs according to the research team. It could range between 1 and 3, 1 and 5, 1 and 10 or any other range. The Staffordshire County Structure plan for instance gives the values between 1 and 7 as a priority for objectives in each group where (1) represents the lowest priority, and (7) represents the highest priority.[2]

To derive the preferred strategy, the last stage involves the combination of the results of the above two stages. In comparing between alternatives and choice of a preferred strategy the plan should be shown to be realistic and an assessment should be made of how far it meets the aims and objectives of the plan. In the evaluation process, Hill's goals-achievement matrix is adopted in the studies employed the development potential analysis, which implies that the strategy which best meets all objectives is the preferred one. However, partial evaluation of the performance of specific policies or group of objectives

(1) Coventry City Council, et.al., op.cit., P.25.
(2) Stafford County Council, op.cit., Para 2.27. A full explanation of derivation of weights for strategy generation and valuation is given in the Supplementary Report - 4 - (Evaluation of the Coventry-Solihull-Warwickshire Sub-Regional Study, op.cit.

could be undertaken according to this methodology. The West Central Scotland Plan suggests that in evaluating the alternative strategies the local circumstances of the study area have to be taken into full consideration.

The study stress that because evaluation process is but a continuation of the generation process "The factors which were taken into account in determining the potential of different areas of West Central Scotland for industrial and residential development in themselves evaluated between different parts of the region. However, because the factors were based on the physical charactaristics of individual kilometre squares, they are unable to represent concepts such as the advantages of concentration of activity at sub-regional scale (into labour markets of different sizes for example)".[1] Furthermore, the study demonstrated that "because evaluation is only one part of a continuous process of strategy choice, there is an obvious need to concentrate on certain aspects which can be least well accommodated elsewhere in the process".[2] Finally, the study suggests that evaluation must inevitably cover a wide range of questions and the use of goals-achievement tests in the evaluation did not rule out the need to give qualitative reasoned statements on the advantages and disadvantages of the alternatives.[3]

In selecting the preferred strategy in the Coventry-Solihull-Warwickshire sub-region"...,the relative importance of each objective was represented by a different weighting applied to each measure of objective achievement, i.e. perform level. The performance levels were measured on the range of 0-100 regardless of the units of quantity involved in the test...."[4]

(1) West Central Scotland Plan, Strategy for Urban Expansion....,op.cit., P.50.
(2) Ibid, PP.50-51.
(3) Ibid, P.51.
(4) Urlan A. Wannop, op.cit., P.164.

To sum up, to choose the preferred strategy according to development potential analysis: first, the objective achievement tests give priority to the relative importance of each objective (factor); second, each of the generated alternative strategies is compared with the other strategies in terms of its advantages and disadvantages; third, comparison is made of the effect of alternative weighting systems for each group of objectives and for all groups; and finally, the results of these separate approaches are then brought about together to determine the final evaluation of the alternative strategies and to choose the recommended preferred strategy.

The application of the development potential analysis to practical problems indicate that the technique had some very good features. The most notable was the effort made to achieve a high degree of consistency between the activities of design and evaluation by employing the strategy objectives and their proposed measures directly in the strategy generation process. Design and evaluation in both Coventry-Solihull-Warwickshire study and West Central Plan were regarded as part of a single exercise to narrow down the area of doubts as to the optimum strategy. The teams of both studies fully appreciated that design activity itself involves judgements about the relative merits of possibilities which are rejected or deliberately ignored. Accordingly, they sought to ensure that only inferior alternatives were excluded from those put forward for evaluation.

The use of the development potential analysis enabled the studies teams to consider an enormous number of possible strategies and within a short period of time to produce a few that appeared to be relatively good in terms of their evaluation criteria and which could be compared in depth, given the time and resources available. In addition, attempts were made to assess quantitatively the differential capacity of alternative strategies to adjust to unforeseen circumstances. This argues Lichfield and his colleagues "...was an advance upon the conventional practice of, at best, an informal and discursive treatment of plan flexibility".[1]

Despite the advantages of the technique, it does have limitations which need to be understood. Lichfield, Kettle and Whitbread in their extensive evaluation of the Coventry-Solihull-Warwickshire Sub-Regional Planning Study criticised the technique in several areas. The most important of these criticisms are:-[2]

First, Evaluation Methodology

In adopting Hill's goals-achievement matrix for the purpose of the evaluation of the alternative strategies no attempt was made to divide the community into incidence groups and to determine the gains and losses which would accrue to each group from the adoptation of alternative proposals. Thus it was not possible to deal with equity considerations in the evaluations (except by way of an objective to help areas of declining industry. The ignorance of equity consideration was not because the approach do not allow room for such an exercise but rather because of financial requirement of carrying out such an exercise. The evaluation teams (Lichfield and his colleagues) emphasised this point when they stated in a footnote of their criteque, that a personal communication from Wannop clearly indicate that "In the initial phase of the study, however, the team envisaged that they would determine the gains and losses for specific incidence groups. This intention was dropped when it was found that the work involved would have added about 40 percent to the study budget".[3]

By adopting Hill's goals-achievement matrix which gives little guidance on the critical question of evaluation: from whose point of view

(1) N. Lichfield, et.al., op.cit., P.225.
(2) For the fuller argument of these criticisms see, Ibid, PP.189-225.
(3) Ibid, footnote, P.192.

and according to what principles of assessment? the study team therefore had no established principle to guide them in their evaluation work. Furthermore, "The principle they chose to adopt are regrettably not clearly stated in their published report and are very difficult to discern from a reading of those reports alone".

Like the case of the goals-achievement matrix, the evaluation team criticised the Coventry-Solihull-Warwickshire study for using numerical points instead of monetary units on objectives achievement. However, they did not base their criticsm on a concrete basis for they believe that "both systems...serve to express disparate items in common terms to facilitate choice between alternative proposals, and both rely on the ability of the analyst to determine the relative values of these items. Therefore, the weighting of a tangible item (either by the use of the points or money units) in order to make it comparable with an intangible item involves an identical operation to weighting the intangible item to make it comparable with the tangible". It appears that the only reason for their preference to monetary values is their believe that "...it should be fairly easy for the layman to understand what the monetary values in a social cost-benefit analysis mean. A difference of say, £1000 between two alternative schemes can be understood in relation to combinations of goods or items of value which are equivalent in worth to that sum of money. We consider it much more difficult for the layman to understand what is meant by a difference of, say, 1000 numerical points. The points only relate to the particular objectives adopted for the plan; they preclude comparisons with other items of value, such as those goods secured through market transaction".

Second, Formulation of Objectives

The second area of weaknesses in the Coventry-Solihull-Warwickshire study believes the evaluation team is the one concerning the formulation of objectives. They stressed that "it is very difficult when reading the published reports to determine whether the objectives are consistent with the attainment of goals. Terms such as "social and economic balance", "social welfare", and "environment" have no universally agreed meanings, and are used in a variety of ways by planners. The general notions behind goals such as to achieve "the greatest choice of opportunities" or to achieve "the greatest social welfare" may be fairly well understood. But without knowing the precise meaning to be attached to them one cannot with any confidence derive or deduce more specific and detailed aims from them. Unfortunately, there is virtually no discussion in the reports about what meaning the team themselves attached to the goals".

Moreover, the evaluation team saw that "these goals appear to overlap considerably. For instance, under the heading "social and economic" is the goal to achieve "balance and prosperity in the sub-regional economy and the greatest social welfare"; and under the heading "environmental" is found the goal of achieving "the best living and working environment throughout the sub-region". However, as the evaluation team stated, it could be argued that the living and working environment was not thought of as an economic or a social factors.

The evaluation team furthermore, regards not stating whose interests were taken into account when setting objectives and thus whose interests the objectives are intended to represent as a serious weakness. It makes it difficult for the decision-takers to tell whether the evaluation was comprehensive in relation to the community affected. By not stating whose interest was taken into consideration when setting the objectives, the team probably thought that this would be obvious. However, the evaluation team think that "...these particular principles of evaluation are too important to be left unstated, no matter how obvious they may seem to those undertaking the study".

Despite some of the collected empirical evidence to support their choice of objectives, the evidence argued the evaluation team was of limited usefulness since the only groups surveyed were those then existing within the sub-region. Furthermore, later on the leader of the study considered that "...more attention should have been given to the formulation of strategy objectives. Specifically, he would recommend that the public should be much more directly involved in the process".(1)

Third, Evaluation and the Measurement of Physical Effects

Under this title, the evaluation team discusses the suitability of the indices of performance which were used in measuring the objective achievement in the study, and whether they were checked against empirical evidence of how the individuals effected perceive the phenomena in question. The evaluation team argues with the study team that it is necessary to convert the different physical measurements to a common scale since the relative values of objective achievements had been established without reference to the units of measure.

In devising their indices of effectiveness, the study team first determined some of the items of preference comprising each objective. Separate measures were devised for each aspect identified and the measures were then combined into a composite index. For instance, landscape quality was sub-divided into various types of land use (farmland, woodland, heathland, built-up land, etc.) and allowance was made for the visibility of different areas from surrounding parts. However, the evaluation team argues that "...it was generally the case that no evidence was presented to support the particular form of the indices employed. In this aspect there was a significant lack of justification".(2) Furthermore, the evaluation team stressed that

(1) Ibid, P.204.
(2) For examples in support of this conclusion see, Ibid, PP.205-207.

"..., the evidence should be clearly set down so that the decision-takers and others can judge the reliability of the measures and thus the quality of analysis. It is normal to use evidence so that debate can be facilitated. In general the team only set down their views as to the indices that should be employed. We cannot debate these; we can only agree or disagree with them".

The evaluation team also criticised the way the study estimated the level of achievement of the objectives. Instead of expressing the extent of achievement of each objective on a percentage scale and without reference to the various units of measurements to be employed the team argued that "the difficulties in establishing hypothetical best and worst levels of objective achievement can be avoided if the valuation process is undertaken after the strategies have been prepared and estimates made of their physical effects. This obviates the need to convert measures of achievement into a standard scale before assigning relative values. The measures can be transformed directly into units of common value". Hence, the evaluation team believes that "...it is far better to establish the physical differences between plans first and then to assign relative values to those differences than to get embroiled in vague and hypothetical notions about maximum and minimum possible achievement levels and the value of the best possible level of item A compared with that of item B".

Discussing the approach of the study to assessing the flexibility put forward for evaluation the evaluation team concluded that the study did not discuss this aspect completely. For instance, the measures devised by the study took no account of switching between alternative strategies and accordingly no attempt to measure the relative costs of switching to different alternatives, irrespective of the degrees of similarity, have been made. They argued that "Future events may make the chosen plan undesirable compared with other possibilities, so that the ability to switch to some other course of action is desirable". Accordingly, the evaluation team suggested that "..., we should determine for each strategy the ease of switching to other courses. But little advantage is gained if one can only switch to a plan which is very similar in content. Switching will be easiest between two virtually identical plans, yet the advantage will be minimal.

Fourth, Evaluation and Relative Values

Four aspects of the relative values used in the comparison of strategies were investigated by the evaluation team. These aspects were:-(1)

(a) the principles that governed the way the values were determined;

(b) the nature of the evidence collected in support of the values;

(c) the problem of allowing for diminishing marginal utility of increments in the level of achievement of a given objective; and,

(d) the use of notional units of value.

Regarding the first aspect, the principle that governed the way the values were determined, the evaluation team argues that the approach determining the relative values of objectives in the study which depend mainly on the members of the team professional judgement is not very illuminating. The evaluation team believes that "as with the case of strategy objectives, the report do not explicitly state whose preferences were deemed to be relevant. It is possible to argue from scattered statements in the reports that the team tried to indicate how they thought potentially affected members of the community would value the achievement of the objectives. But the absence of any explicit statement of the principles of valuation is a significant draw back to the teams published material".

Furthermore, the evaluation team criticised the approach and way in

(1) See Ibid, PP.210-219.

which the questionnaire survey opinion was undertaken. The findings of the questionnaire survey opinion were intended to provide a rough check of the teams subjective assessments and a direct evidence as to the value held by different groups in the community. The questionnaire survey of opinions was questioned from three points of view:

(i) Opinion and attitude survey are not in general a reliable method of obtaining information about people's values. The evaluation team suggest that evidence as to people's values is usually better obtained by observing behaviour in making choices, either in real life or in some kind of experimental situation.

(ii) It was quite unreasonable to expect the public to be capable of answering accurately a number of questions. The evaluation team argues that they would not have had enough information to be able to say, for instance, what a loss of a given amount of good quality farmland was worth relative to, say, a specific improvement in their residential amenities.

(iii) The size of the sample was small; only 160 households were interviewed. Any conclusions drawn about the values of the community at large will therefore have been subject to considerable margins of error.

Regarding the third aspect, the problem of allowing for diminishing marginal utility of increments in the level of achievement of a given objective, the evaluation team argues that the study "...made no allowance for likely reductions in the amount of satisfaction, or utility, associated with successive increments of achievement of a given objective. One value only was assigned to each objective. This was intended to reflect the relative importance of a maximum level of achievement attainable in the circumstances". Instead, the team argued that the study should have specified a number of different weights for each objective, each weight to represent the relative value given to increments at different levels of achievements. Furthermore, the study assumed that the marginal rate of substitution between increments associated with different objectives were also assumed to be constant.

It seems that the study assumed constant marginal utilities as away of simplifying their analysis[1], and thus side-stepped the arduous task of having to specify values for all pausible levels of achievement for all strategy objectives. The evaluation team argues that "although it would not have been possible to obtain sufficient empirical evidence about the values of such a range of achievement level, this particular difficulty would not have arisen since the team were willing to guess community values. Nevertheless, the task would have been very time-consuming".

The problem of placing values on a number of small as well as large changes in levels of objective achievement, argues Lichfield and his colleagues is, of course, common to all evaluation methods. In practice this problem is rarely tackled, either in urban and regional planning. They added "in social cost-benefit studies, for instance, the assumption is conventionally made that changes in outputs are insufficiently large to affect prices in the various "markets" considered. However, if the team had waited until the strategies had been prepared and their physical consequences assessed, the task of allowing for changes in marginal utility would have been less severe".

Finally, the evaluation team argues that a points-weighting procedure as a measurement for the changes in individual utilities suffers from the fact that values are determined with respect to a restricted set of choices. They believe that both the points-weighting and money-weighting procedures employ a willingness to pay criterion; that

(1) Christopher Nash etc.al., argued that this possibility is very limited, See Christopher Nash etc.al., op.cit., P.86.

is, the value of an item is indicated by the alternatives which an individual would willingly sacrifice in order to obtain that item. However, the evaluation teams argument for the superiority of a money-weighting procedure rests on "the proposition that the greater the number of other items of value with which a given item is to be compared for evaluation purposes, the more accurate will be the indication obtained of the amount of satisfaction yielded by it". Hence, they suggested that "...the willingness to pay criterion is most useful when the greatest possible number of items of value are used to establish the values of those items associated with the planning proposals. Given a certain number of items to be valued, we are saying that their values should be established with reference not only to each other but also to a range of other items which are not associated with the planning proposals. This is so with a money weighting procedure, but not with points-weighting one". However, the evaluation team believes that this weakness could be overcome by including in the list of planning items a commonly encountered item, such as food staff or a car. The knowledge of the value of such items in relation to many other items can therefore be used by respondents as an information to express the values of the planning items in terms which relate to other items.

Basing on the above discussion it could be argued that many of the criticisms directed to the application of the development potential analysis to a practical problem are not as a result of weaknesses in the technique or that the technique does not allow enough room to consider such important issues but rather because of either time, financial and/or data limitations. Problems such as those related to the inclusion of equity consideration into analysis or obtaining direct empirical evidences to support the study team choice of objectives and their relative importance could easily be coped with if the time and money resources were made available.

7.2.4. Critical Appraisal of the Alternative Evaluation and Generation Techniques

After discussing what is thought to be the most appropriate techniques of alternative plans evaluation and generation in the field of urban and regional planning, that is, cost-benefit analysis and its refinement the planning balance sheet, the threshold analysis and the goals-achievement procedures, it is necessary, now, to develop a critical appraisal of these alternative procedures. The purpose of this critical analysis is to clarify the relative strengths and weaknesses of these alternative methods as a guide to their use in solving the problem of the urban growth pattern of the U.E.R.

Many conclusions can be drawn from the discussions of the last three sub-sections. First of all, there are many similar charactaristics between all the discussed techniques. All of them are designed primarily for the comparison and ranking of alternative plans or projects rather than for testing their absolute desirability. None are intended as a substitute for the decisions themselves. All of them depend on multi-factoral analysis approach. They usually take different sets of socio-economic and physical factors in the analysis of the planning problems. However, in this particular case there is a considerable difference in the number of factors that could be considered. For instance, threshold analysis does not include all the criteria affecting the decision making in the process of analysis and evaluation. Discussions in section (7.2.2) showed that factors such as social costs and individual preferences, travel time cost, environmental costs, the loss of agricultural land, landscape damage resulting from development and other aesthetic considerations are examples of considerations appear in the objectives of many planning studies and effect the decision making but are not included in threshold analysis or, at least, not fully considered, basically because of the difficulty of measuring them in money terms. This limitation applies in the same degree to the case of the conventional cost-benefit analysis procedure, see section (7.2.1.).[1]

All the discussed techniques have practical application to a real planning problems. The cost-benefit analysis, for instance, has been adopted in the third London airport study. Its refinement the planning balance sheet has been originally developed by case studies (urban expansion of Peterborough and Swanley towns among others). Threshold analysis has been applied in the preparation of the sub-regional plan for the Grangemouth-Falkirk growth area and in the preparation of a plan for urban expansion in the Central borders sub-region. The goals-achievement procedure has been applied in Coventry-Solihull-Warwickshire sub-regional planning and the West Central Scotland plan among others. Furthermore, most of the above applications were concerned with urban expansion and urban growth pattern, the same as in the problem under investigation in this research.

Despite the above similarities which could lead to reaching more rational decisions and the choice of the best alternative plans, the previous three sub-sections showed that each of the discussed techniques involves a considerable technical difficulties. Some of these difficulties are common to all the techniques, such as the problem of units of measurement and the involvement of a considerable value judgements in the whole planning process, whilst others are confined to a particular technique. The latter group of difficulties extend to include; the discarding of non-measured items and the equity criteria in case of the conventional cost-benefit analysis; the difficulty of finding reliable method of evaluating the various categories of costs and benefits, the difficulty of drawing correct inferences from people's behaviour and the

(1) Also see David M. Nowlan, op.cit., P.170.

difficulty of aggregating the overall result of all items in case of the planning balance sheet; not including all the criteria affecting the decision making in the process of analysis and evaluation, ignoring running costs, ignoring the benefit side of the process and the problem of calculating the cost indices necessary to cross successive threshold lines in case of the threshold analysis; and, leaving some important questions regarding the formulation of objectives opened to the analysts desire, the absence of principle of measurement, the difficulty of assigning the relative values of the objective achievements and the failure to consider equity considerations in a full scale in case of the goals-achievement procedures.

The above accute difficiences of the evaluation techniques in the planning field which have been discussed in some detail in the previous three sub-sections ruled out the possibility of having one most acceptable evaluation procuedre for solving planning problems. Instead different scholars prefer different techniques for this purpose. Lichfield, for instance, argues in favour of the social cost-benefit analysis or what he usually terms the planning balance sheet analysis. In his paper, "Evaluation Methodology of Urban and Regional Plans: A Review",[1] Lichfield, stressed his preference when he chose ten different criteria to measure their degree of meeting the needs of planning decision makers for evaluating plans in terms of what the community is asked to give up and what it would achieve. The criteria chosen extends to include aspects such as regarding the stated or implied objectives of the decision makers, covering all systems of urban and regional facilities which are encompassed in the plan, covering all sectors of the community which are affected, sub-dividing the sectors into producers/operators of the plan output and its consumers so that

(1) N. Lichfield, "Evaluation Methodology....", op.cit., PP.151-165.

all the transactions implicit in the plan are considered, taking all costs and benefits to all sectors including externalities into consideration, measuring all the costs and benefits in money terms and so forth.(1) The application of these and other criteria to eight group of evaluation techniques, among them were the planning balance sheet, cost-benefit analysis, threshold analysis and the goals-achievement procedures showed that the planning balance sheet, which is built in practice, best meets these criteria. It fully meets seven of the stated criteria and meets the remaining three partially. The criteria which are met partially are, measuring all the costs and benefits in money terms, facilitating the adoption of a satisfactory criterion for choice and its usefulness as an optimising tool with a view to ensuring the best solution.(2) On the contrary, the best of the goals-achievement procedures to meet the chosen criteria was found to be Hill's goals-achievement matrix. It meets fully five of the chosen criteria. They are: regarding the stated or implied objectives of the decision-maker, covering all systems of urban and regional planning facilities which are encompassed in the plan, covering all sectors of the community which are affected, showing the incidence of the costs and benefits on all sectors of the community and being usable as an optimising tool with a view of ensuring the best solution. The only criterion which have not been met in any degree is that concerning the sub-dividing the sectors into producers/operators of plan output and its consumers. The remaining four factors are met partially. Finally, threshold analysis does not meet any of the criteria fully. One of the criteria, taking the benefits of all sectors into account is usually not considered in threshold analysis, whilst the remaining factors are met partially. Lichfield further emphasised his preference

(1) Ibid, P.154.
(2) Ibid, P.155.

of the planning balance sheet as an evaluation procedure compared to Hill's goals-achievement matrix in his book with Kettle and Whitbread.(1) In this publication Lichfield and his colleagues argued that the planning balance sheet unlike the goals-achievement matrix, see section (7.2.3), provides a clearer answer to some basic questions regarding the nature of public interest, the choice of objectives and their relative values, principles of measurement and the fuller consideration of the equity considerations. In Lichfield and his colleagues view these short-sighted aspects in the goals-achievement matrix are due to its procedure. The "goals-achievement matrix proceeds from the identification of goals, the focus throughout being on levels of goals-achievement for the community as a whole and for groups within it. Objectives are derived from a set of higher goals (or ideals) whose formulation is the ultimate responsibility of the decision-takers. The objectives provide the basis for determining the relevant items of advantage and disadvantage. In contrast, the planning balance sheet starts from the identification of welfare effects and the preference of those groups who are affected, the objectives being formulated on the basis of their preferences".(2)

In contrast to the preference of Lichfield and his colleagues to the planning balance sheet analysis, Hill is in favour of using the goals-achievement procedure. In his formulation of the goals-achievement matrix Hill argued that "not only does the "balance sheet of development" omit the explicit identification of some of the objectives served by the proposed course of action, but there is no means of knowing whether the costs and benefits listed are relevant for inclusion in the balance sheet of development".(3) Furthermore, Hill argues that it fails to recognise that costs and benefits can be

(1) N. Lichfield, et.al., op.cit., PP.78-97.
(2) Ibid, P.96.
(3) M. Hill, op.cit., P.21.

compared only if they can be related to a common objective. "...,If the objective is of little or no value both for an entire community and for any sections within it, then the benefits and costs referring to the objectives are irrelevant for the community in question".[1] The Coventry-Solihull-Warwickshire sub-regional study also emphasised that the planning balance sheet method offer no advantage over objective achievement evaluation. The latter procedure, could also deal with the merits and demerits of alternative plans to separate groups in the community that distinguishes planning balance sheet from most other techniques.[2] The latter conditions depend on the details of data available, the time allocated for the study and the aim of the study, i.e., whether it looks on the overall interest of the community or the separate interests of different groups within the community. In the same line, Wannop, the team leader of the Coventry-Solihull-Warwickshire study emphasised that "we did consider using a planning balance sheet or cost-benefit technique to evaluate the alternative strategies, but could see no conceptual advantage in putting a price on the intangible to compare it with the tangible, rather than weighting the tangible to compare it with the intangible".[3] He adds, "The technical difficulties in cost-benefit analysis would have been as great as in objective-achievement evaluation, and we did not think that by overcoming them the qualities of the alternatives would have been more convincingly expressed".[4]

Furthermore, Fisher, evaluating the planning models and techniques in his PhD. thesis, "Evaluation of Alternative Plans for New Communities: Toward Application of the competition - For - Benefit Model", found that the goals-achievement procedure meets better the

(1) Ibid, P.21.
(2) Coventry City Council, et.al., op.cit., P.61.
(3) Urlan A. Wannop, op.cit., P.164.
(4) Ibid, P.164.

sixteen criteria he designed for evaluation.[1] He found that the goals-achievement procedure meets completely ten out of the sixteen criteria whilst the planning balance sheet meets eight criteria and the threshold analysis does not meet completely any of the stated criteria.[2]

The above analysis about which is the best evaluation technique in the field of urban and regional planning suggest that no such technique is yet in existence. This conclusion coincides with the

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(1) The criteria used for evaluation of alternative methods according to Fishers' study are:-

1. Whether or not the model is developed theoretically.
2. Whether or not the model is developed in a practical application.
3. Whether or not the model is developed in terms suitable for planning in the private sector.
4. Whether or not the model is developed in terms suitable for planning in the public sector.
5. The extent to which the model might be used to design alternative plans as well as evaluate them.
6. The extent to which the model is flexible enough to be of use in comprehensive planning of new communities (i.e., in evaluating different kinds of alternative plans).
7. The extent to which the model encourages identification of fundamental objectives.
8. The extent to which the model encourages identification of aggregative decision criteria.
9. The extent to which the model encourages identification of distributional decision criteria.
10. The extent to which the model encourages identification of costs.
11. The extent to which the model encourages identification of benefits.
12. The extent to which the model encourages confrontation with measurement problems.
13. The extent to which the model encourages elimination of redundant and trivial considerations.
14. The extent to which the model encourages commensurability of cost and/or benefits measures without transformation to interval or lower-order scales.
15. The extent to which the model encourages transformation of cost and/or benefits to real utility values.
16. The extent to which the model encourages transformation of costs and/or benefits to terms meaningful in political reality.

(2) For the full account of the evaluation and the definitions of the used criteria see H. B. Fisher, <u>op.cit</u>., PP.73-85.

findings of Nash et .al., who tried to choose criteria for evaluating projects evaluation techniques and came to a conclusion that "there is no logically unique way of carrying out project evaluation".[1] Each of them claim to embrace all those prospective consequences of proposals which should be taken into account in making decisions in the field of urban and regional planning. Each of them is designed to provide information to assist those responsible for decision-making and to facilitate general debate on alternatives. On the contrary, each of them embodied many technical difficulties in application. Hence, the choice of what is thought to be the preferred technique depends on the nature of the study, the time and data limitations, the amount of the resources allocated for the study and the ability of the researcher or work team to cope with the encountered technical problems. Again this conclusion coincides with the argument of Patey and Breheny who believes that "The current diversity of approaches to the use of methods is a reflection of the fact that planners are more prepared to select methods appropriate to local circumstances, taking account of organisational constraints, data availability, time constraints and local planning problems".[2] Accordingly, any of the discussed techniques could be useful for the analysis of the urban growth pattern of the U.E.R. However, the best suitable of the alternative approaches should be chosen for the case of this particular study. Again the choice will be based on considering the above factors, i.e., the nature of the study, the time and data limitations and the problem of coping with the encountered technical problems.

(1) Christopher Nash et.al., op.cit., P.88.
(2) P. W. J. Patey and M. J. Breheny, op.cit., Part two, P.263.

This study is a research project carried on by a single person with an economic and urban and regional planning background for a limited period of time of around 3 - 4 years. These limitations restrain the possibility of applying the cost-benefit analysis and threshold analysis from the following aspects: First, both of the techniques require a very detailed quantitative and qualitative data about different aspects of the region and its urban centres in particular. The cost-benefit analysis, for instance, requires a detailed data on the costs and benefits of the expected urban growth. These costs and benefits extend to include the cost of providing public services and utilities to accommodate the expected urban growth, the cost of regional infrastructure facilities of the alternative proposed strategies, the cost of losing the agricultural and/or good quality landscape, the benefits of preserving the historical and archaeological sites and so forth. Threshold analysis also require a detailed data on the cost of accommodating the additional people in the urban areas of the region. As it will be shown later on, these sorts of data are not only unavailable in the region but obtaining them is a time consuming process and needs a multi-disciplinary work team to undertake such a task which the nature of the study do not allow. To extract the physical threshold for instance needs structural or civil engineer. To extract the technical thresholds needs qualified people in different types of public services and utilities and to extract the structural thresholds needs architects, quantity surveyors and so forth. On the contrary, although goals-achievement approach needs a detailed qualitative and quantitative data for more accurate results, nevertheless, it is possible to depend on less detailed data in the analysis. This advantage is recognised by Simpson in his paper "The Penalty Point

Muddle",[1] when he argued that the goals-achievement procedures have the advantage of ease of application and small demand on staff and information resources.[2] As it will be seen later, in this research, this case applies to the areas of analysis concerning the availability of land for urban growth and the preservation of good quality landscape from urbanisation. If either the cost-benefit analysis or threshold analysis are to be adopted a further detailed data concerning the grade of agricultural land, the type of production and agricultural utilisation and the value of annual output and so forth would be needed which again are neither available nor easy to be collected within a reasonable period of time.

Second, by using the goals-achievement analysis some indirect procedures could be used to prove certain objectives. An example of this particular case in this study concerns the analysis of costs of provision of services and public utilities. By employing goals-achievement procedure it is possible, as it will be shown later on, to reach certain conclusions about the behaviour of these costs with urban size from the examination of the existing situation and then generalise from these conclusions the expected pattern in the future. In case of both the cost-benefit and threshold procedures, the analysis of such factors (costs factors) needs at least a tentative figure of the expected costs of accommodating the additional urban population in certain urban areas which as it has been mentioned above are neither available nor easy to be obtained within a reasonable time in this particular case.

Third, apart from the problem of providing adequate data for the purpose of the application of cost-benefit and threshold analysis,

(1) B. Simpson, "The Penalty Point Muddle", Town and Country Planning, Vol. 43, 1975, PP.305-308.
(2) Ibid, P.308.

there would be a problem of measurement of intangible items in monetary units. The problem of valuation, for instance, of the loss of one acre of good quality landscape compared to a saving in the cost of provision of services would be unsolvable problem. The assignment of monetary values to the consequences of certain courses of action would be arbitrary and may serve to confuse rather than clarify the process of valuation. This is particularly true in case of most developing countries where no valuation experience are gained or no suitable valuation approaches of the intangible items are developed. Hence, despite the benefits of the monetary valuation that is used in both cost-benefit and threshold procedures and the ambiguity of using the point system in case of the goals-achievement procedures, nevertheless, such procedures are more realistic to be applied to the case of the U.E.R. of Iraq.

Fourth, as a result of the above limitations, it is expected that using goals-achievement procedures would allow for considering a wider range of factors that are believed to affect the decision-making process and consequently leads to a more rational solution. In contrast, using either of the cost-benefit or threshold procedures would reduce this possibility. For instance, if cost-benefit analysis is employed, this will not allow enough room to consider factors such as social aspects, the preservation of good quality landscape and areas of historical and archaeological sites and consequently transfer the analysis from what is termed social cost-benefit analysis to just a cost-effectiveness analysis and face the same problem as that of the third London airport study. The same thing would happen if threshold analysis is applied, where no developed approaches to deal with aspects such as social consideration, individual preferences and preservation of the good quality landscape and other environmental aspects are yet established.

It could be concluded that the goals-achievement procedures could best serve the purpose of this study and accordingly a goals-achievement procedure would be developed, in the following two chapters, for the purpose of the analysis of the urban growth pattern of the U.E.R. In developing the approach the local circumstances of the study area, the aims and objectives of the national development plans and the data and time limitations of the study would highly be considered and consequently effect the procedure and details of the analysis. Furthermore, the principles of the alternative techniques, the cost-benefit analysis and the threshold analysis will be utilised wherever possible in the forthcoming analysis if that utilisation would lead to a better understanding or ease the analysis of certain factors.

7.3. The Survey

In many cases, the lack of data is the main constraint on research in the planning field, especially if detailed data on a small scale problem is required. This largelyinfluences the methodology used in the analysis. The discussions in the previous section and this section clearly indicate that the lack of detailed data and the problems of collecting them for cost benefit analysis and threshold analysis from the U.E.R. compared to the feasibility of a single person working for a limited period of time were among the main reasons for not applying these techniques for the purpose of the analysis of this study. Hence, to facilitate the necessary data for the purpose of the study a special field survey was conducted. The author visited the country (Iraq) for a period of about four months extending from mid February to mid May 1980 for this purpose. The survey was designed to obtain data on different aspects of the spatial development of the

U.E.R., in general, and development potentials of its existing and proposed urban centres, in particular. General data on the spatial development strategy on the Muhafadahs and National levels was also collected, in order to obtain a better under-standing of the overall spatial development strategies of the country.

7.3.1. Data Sources and Collection

Data were obtained from two basic sources: the published and unpublished governmental studies, reports and statistical abstracts, and the field survey carried out in the U.E.R.

Regarding the first source of data, general as well as particular information on population growth and distribution, urbanisation and spatial development on both national and regional levels were compiled directly from reports, studies and statistical abstracts of the Central Statistical Organisation and Physical Planning Commission of the Ministry of Planning. Data on the criteria used in the analysis of urban growth distribution were in many cases also obtained from such sources. In a very few cases, these data were the main source for analysis. This case applies to factors such as the future potentialities of economic and urban growth, the social aspects of analysis and the historical and archaeological sites analysis. In many other cases, the data obtained from such sources were used with that obtained from the field survey. The latter case applies in particular to factors such as the effect of urban expansion or the effect of the creation of new towns upon the agricultural land, availability of land for expansion, effect on the landscape and rural amenities among others. In total, the references and sources of data used are named in appropriate places in the study.

The second and the most important part of the survey was the field survey which dealt mainly with examining the development potential of different existing urban centres of the U.E.R. and those which have been proposed by the Ministry of Industry and the State Organisation of Resorts and Tourism. The importance of this source of information stems from the fact that little or no information of the type sought on urban centres of the region can be found in print. The study has therefore relied heavily on individual municipalities and the services departments in those municipalities for its information. To obtain the necessary information, interviews were conducted using questionnaire schedules. The questionnaire was designed to obtain information on the development potential of existing urban centres and the proposed sites of the new towns. The questionnaire includes, among other things (see appendix 1)):

1. The availability and level of provision of different types of services and public utilities (municipal services, water supply, electricity, telephones, mail, educational services at different levels, health and public libraries services).

2. The capital and annual running costs of these services.

3. The committed service schemes in each existing urban centre and their capacities.

4. Physical aspects of urban growth of the existing urban centres and the proposed sites of the new towns.

5. Agricultural value of the land and land ownership.

6. Type and value of establishments already in existence in the areas required for expansion.

7. Accessibility of the existing urban centres and the proposed sites of new towns to the main infrastructure in the region.

8. The prevailing and intended planning standards, whether with regard to the land use or the standard of provision of services and public utilities.

As many questions as possible were designed to give definite answers, but particular emphasis was placed on open ended questions.

Although the cost of this type of research design is a lesser ability to interpret results in terms of percentages and other simple measures, the benefit is the added information that can be obtained, especially if the questions involve value judgement as it is the case in this study.

All the existing urban centres and the proposed ones were included in the survey, i.e., sixteen existing urban centres and four proposed sites for the new towns. The questionnaire was administered on actual visits to the urban centres for whatever period of time was needed to cover all the aspects of the survey. To complete each questionnaire different government bodies were included. The municipalities, for instance, answered the parts concerned with the municipal services provision and costs, physical limitations of urban growth, effect on agricultural land and man made obstacles of urban growth. The water supply department in each urban centre answered the part concerning water supply provision and costs and so forth. Hence, the questionnaire which surveyed a wide range of matters effecting the urban growth potentialities covered information from a number of government departments in each urban centre.

In each urban centre the principle personnel were interviewed i.e., the heads of the municipalities and directors of different service projects. When detailed and technical information were needed other principle personnel were invited to participate. Those mainly included, accountants, municipal engineers, service engineers, foremen, surveyors and personal affairs officers. In most cases the response was highly successful and the objectives of the study were appreciated at different levels of managerial as well as technical personnel. Table (7.2), which summarises the response to the variables incorporated in the analysis confirms this argument. In total, the number of observations that will be fed into regressions ranged between 6-14, with more than 50% over ten observations. The decline of some cases to less than ten observations do not due to the unavailability of data or the inadequacy of responses but rather to the number of applicable cases in each service. In case of water supply, for instance, only six water schemes exist. They serve twelve urban centres and are administered through nine urban centres. This situation also explains why there are differences in the number of observations between the capital cost and the annual running costs and the other related variables. The same analysis applies to electricity services, kindergarten services, public libraries services and so forth, see table (7.2). The above table also indicates that out of the 56 variables incorporated in the analysis, some 48 variables (i.e. 85.7%) have received a complete response. Only eight variables did not receive a complete response for all the applicable cases. These cases apply to the capital cost of electricity supply, where no such data were available concerning the electricity scheme in Baghdadi town. Also no data were available on electricity consumption in the same town. Hence, it will not be possible to include both the per capita capital cost and per capita electricity consumption in Baghdadi town in the forthcoming regression analysis. The other six occasions where the responses were also not complete apply to educational services. The capital cost of provision of kindergarten services in Ana town and the capital cost of provision of a secondary school in Ubaidi town were not applicable due to the fact that the building of the kindergarten in Ana and the building of the existing secondary school in Ubaidi towns were rented. The remaining capital cost item in educational services is the furniture, which as it will be shown later was not available, as well for all levels of the educational services in the region. The least number of responses apply

Table (7.2)

Summary of the Survey Account

Variables	Number of Existing Urban Centres	Number of Applicable Cases	Number of Obtained Responses
Municipal Services:			
Per Capita Capital Cost.	16	14	14
Per Capita Annual Running Cost.	16	14	14
Actual Municipal Staff Ratio.	16	14	14
Needed Municipal Staff Ratio.	16	15	15
Actual Municipal Mechanical Equipment Ratio.	16	10	10
Needed Municipal Mechanical Equipment Ratio.	16	16	16
Number of Mechanical Equipment Used in 1976 and After.	16	10	10
Per Capita Area of Paved Roads.	16	14	14
Per Capita Park Space Area.	16	13	13
Water Supply Services:			
Per Capita Capital Cost.	16	9	9
Per Capita Annual Running Cost.	16	6	6
Per Capita Water Consumption.	16	9	9
Condition of Treatment Plants.	16	9	9
Percentage of Water Distribution Network in a Good Condition.	16	9	9
Electricity Supply Services:			
Per Capita Capital Cost.	16	7	6
Per Capita Annual Running Cost.	16	7	7
Per Capita Electricity Consumption.	16	7	6
Sub-Stations and Local Diesel Generators Conditions.	16	7	7
Percentage of Distribution Net-Work in a Good Condition.	16	7	7
Telephone Services:			
Per Capita Capital Cost.	16	14	14
Per Capita Annual Running Cost.	16	14	14
Actual Telephone Ratio.	16	15	15
Telephone Ratio if Full Capacity of Exchanges are Utilised.	16	14	14
Exchanges Conditions.	16	14	14
Percentage of Telephone Network in a Good Condition.	16	14	14
Mail Services:			
Per Capita Capital Cost.	16	14	14
Per Capita Annual Running Cost.	16	14	14
Educational Services:			
Kindergarten Services:			
Per Capita Capital Cost.	16	7	6
Per Capita Annual Running Cost.	16	7	7
Attendance Ratio of Children at Age 4-5 Years.	16	7	7
Pupils Per Teacher.	16	7	7
Pupils Per Class.	16	7	7
Percentage of Buildings Built in 1975 and After.	16	7	7
Primary Schools:			
Per Capita Capital Cost.	16	16	16
Per Capita Annual Running Cost.	16	16	13
Attendance Ratio of Children at Age 6-11 Years.	16	16	13
Pupils Per Teacher.	16	16	13
Pupils Per Class.	16	16	13
Percentage of Buildings Built in 1975 and After.	16	14	14
Percentage of School Buildings Used in a Shift System.	16	13	13
Secondary Schools:			
Per Capita Capital Cost.	16	13	12
Per Capita Annual Running Cost.	16	13	13
Attendance Ratio of Children at Age 12-17 Years.	16	13	13
Pupils Per Teacher.	16	13	13
Pupils Per Class.	16	13	13
Percentage of Buildings Built in 1975 and After.	16	12	12
Percentage of School Buildings Used in a Shift System.	16	12	12
Health Services:			
Per Capita Capital Cost.	16	16	16
Per Capita Annual Running Cost.	16	16	16
Ratio of Physicians Per 10000 Persons.	16	15	15
Ratio of Dentists Per 10000 Persons.	16	11	11
Ratio of Para-Medical Per 10000 Persons.	16	16	16
Ratio of Beds in Hospitals Per 10000 Persons.	16	8	8
Public Libraries Services:			
Per Capita Capital Cost.	16	8	8
Per Capita Annual Running Cost.	16	8	8
Designed Capacity (seats per 10000 persons).	16	8	8
Number of Complete Responses		48	
Number of Incomplete Responses		8	
Total Number of Responses		56	
Percentage of Complete Responses to the Total		85.7%	

to the cases of primary schools where thirteen out of the sixteen applicable cases have been obtained in case of variables concerning the annual running cost, attendence ratio of children at age 6-11 years, pupils per teacher and pupils per class. The data related to these variables were not available in case of Al-Furat, Muhamadi and Rummana towns. The unavailability of such data in these small urban centres were due to the fact that they were newly created as urban centres and information about them were within the rural statistics which were beyond the scope of this study.

However, despite the very high response in the field survey, there were a number of areas where data were either unavailable or incomplete. Among the most important areas where data were not available; the expected capital and annual running costs of accommodating the expected urban growth in the region, the costs of crossing different thresholds levels and the costs of creating and providing services in the suggested new towns.(1) Furthermore, no detailed data exists regarding the agricultural land, its ability, types of utilisation and number of farmers utilising it, grades of the good quality landscape and the value of the establishments, located within the expected urban growth directions, and their importance to the economy and people of the area. The unavailability of such data and the inability of the researcher to obtain them by himself in a reasonable period of time, forced the research, among other reasons, to neglect the possibility of adopting evaluation techniques, such as the cost-benefit analysis and threshold analysis in favour of utilising alternative techniques which require relatively limited range of data and information. Also the possibility of utilising the development potential analysis in generating the alternative strategies have been diminished due to the lack of a very

(1) There was originally many questions in the field survey questionnaire about these cost aspects which have been discarded later on due to their inapplicability.

detailed and comprehensive data on different parts of the study area. The latter aspect will be elaborated further in the next Chapter.

In addition to the above limitations which will highly affect the approach of the analysis, there are another number of areas where data are either inadequate or even not very accurate. The most important of these areas are:-

(a) No complete data of the capital costs of some services were obtained. This applies in particular to the educational services at different levels (kindergartens, primary and secondary schools), where the obtained capital costs do not include cost of furniture which is an important element in this case. This is due to the unavailability of data on this item. However, it is argued in appendix (3) that the total costs of land and buildings are sufficient to make the comparison, since it is reasonable to assume that the cost of furniture is almost the same for schools of the same size and educational stage in different urban centres because the supplier of the furniture is the same (a special government department) and there are no differences in the quality of furniture of schools in cities of differing size. The only expected difference is the time when the furniture was obtained which would, of course, affect its current value.

Cost of medical equipment which is again a very important element of the cost of health services was also not included because data on such items on Muhafadah levels were not available. The supplier of this item is, again, a special government department, which centrally distributes the needs of different health establishments all over the country. It is argued in appendix (3) that to know the share of different urban centres from this source would have been time consuming process and unrealistic since part of the equipments supplied are either at the time of the survey unusable or are no more within the existing assets of that urban area. However, again, the cost of land, buildings and furniture are sufficient for the purpose of capital cost analysis of the health services since the type and consequently the cost of medical equipments for each urban size group are expected to be almost the same.

Finally, the electricity services capital costs include distribution cost only. The generation and transformation costs of electricity were not included because no access to data of this type was possible. However, as it is shown in appendix (3), the exclusion of the generation and transformation costs from the analysis, provided the basis for more realistic analysis through comparing alike with alike.

Apart from the above minor omissions in the calculation of the capital costs, the capital costs of other services included all the related items, i.e., cost of land, buildings, vehicles, mechanical equipment, furniture, water treatment plants, distribution network (of water supply, electricity and telephone services), telephone exchanges and so forth, as shown in appendix (3). To be precise and to get reliable data in this respect, the actual capital costs were obtained for the end of 1979. The estimated capital costs were taken as valued by the end of 1979, according to different departments book-keeping documents.

In general, the principles governed the computation of different items of capital costs could be summarised as follows:-

(i) cost of land is usually valued at the prevailed market prices, if the land belongs to the private sector. If it belongs to the state, a common subsidised prices are prevailed. These prices differ among different sizes of the urban centres and the location of the land within the boundaries of the master plan. The latter approach of the valuation do not give a real picture of land cost. However, since almost all the public projects are built on a governmental land, it could be acceptable for the purpose of the comparison of the alternative strategies.

(ii) cost of buildings is valued by subtracting the depreciation cost which is 2.5% annually from the original construction cost of buildings and then adding the annual inflation rate. The latter rates were considered as 15% in the 1950's, 20% in 1960's and 32% in 1970's.[1] In cases where the original costs were unknown the governmental department valued the costs of buildings belonging to them as its worth at the year of valuation which is in this particular case, 1979 (i.e. the 1979 prevailed market prices).

(iii) costs of paved roads, parks and parking within the municipal boundaries were valued as in the current prices of constructing similar activities in 1979.

(iv) other capital costs which include, costs of vehicles and mechanical equipment, furniture, water supply treatment plants, distribution network (of water supply, electricity and telephone services), telephone exchanges and so forth were valued by subtracting the annual depreciation costs from the original buying costs. The depreciation rates of different capital assets are unified for the same item among all governmental departments for a uniform accountancy system is applied in the country. The depreciation rates are given in table (7.3). However, it should be noted that in case of the public libraries services, the value of books and periodicals were valued at the time of their purchase since it was impossible to incorporate depreciation rates and their current values into the methodology of valuating such items. To complete the picture of the capital costs of such items, the inflation rates were added to the outcome of the above process. It should be noted here that no detail data about the inflation rates of different items were available hence they have not been mentioned here.

(1) T. F. Hasoon, <u>Causes of Monetary Inflation in Iraq "1960-1975"</u>, published Msc.Thesis, Ministry of Culture and Arts, Dar Al-Taleya, Beirut, 1978.

Table (7.3)

The Annual Depreciation Rates of Different Items of the Capital Assets

Item	Annual Depreciation Rate (%)	Notes
Buildings	2.5	
Vehicles and Other Transport Facilities	25.0	
Furniture and Offices Equipments	7.5	
Water Supply Treatment Plants	6.67	
Elevated Storage Tanks	3.33	
Water Supply Distribution Network	6.67	
Electricity Distribution Network	4.00	includes mainly cables, underground and overhead lines and transformers
Street Lighting	10.00	
Telephone Exchanges	6.67	except for Ramadi automatic exchange which is regarded as 5%.
Telephone Services Distribution Network	6.67	
Miscellaneous Tools and Equipments	12.5	

(b) The unavailability of data on education services furniture cost and health services medical equipment cost prevent the possibility of including the depreciation cost of such items when calculating the annual running cost of the educational and health services. Hence, the annual running costs of these two services does not include the depreciation costs of the above items. However, it could be argued that the other items of the running costs could highly represent the overall behaviour of the running costs with urban size.

As in the case of capital costs, the annual running costs (wages and salaries, maintenance, depreciation, fuel and so on) were also taken from different departments book-keeping documents for the twelve months of 1979. For all other aspects of the field survey, information was obtained as it was at the time of the interview.

The computation of the annual running costs is far more easier job than that of the capital costs. It does not need, for instance, the discounting back of the prices of its different elements. All what the different governmental department do, is the inclusion of every detailed item of expenditure spend to run the service for the twelve months of the particular year. The outcome of such process is reliable and very accurate. In general the annual running costs consist of four parts. They are;wages, salaries and incentives for all the labour force engaged in providing the particular service; maintenance cost of all capital assets which belong to the particular service; the annual depreciation costs of the capital assets, as given in table (7.3); and other running costs which include all other expenses necessary to continue the provision of the service (see appendix 3).

(c) No access has been made to the committed schemes in the electricity and telephone services. This, as it will be shown in section (8.4.1), precluded the possibility of calculating the spare capacities of such services after implementing such schemes. The absence of the standards for provision of the municipal and mail services also prevented their inclusion in the calculation of the expected spare capacities in the provision of services in the region, if there could be any.

In addition to the lack of the above items of data, it was found during the interviews that subjective factor is a considerable element particularily with reference to the factors related to the evaluation of the conditions of the capital assets of different services, the opinions of the officials on the existing level of provision of services and the future needs from these services and the remaining length of life of the capital assets. This phenomenon which was more apparent in case of small urban centres and the newly created ones, often led to the problems of bias and exaggeration of which the researcher was aware. The estimation of the conditions of the capital assets, for instance, depended highly on personal opinions of the persons encharged. The satisfaction of the existing levels of services and the needed ones also was highly affected by the opinions of such personnel and so forth. However, an attempt was made to solve such a problem through; first, depending on one or very few persons in judging on such matters. For instance, when evaluating the conditions of the water schemes assets, the water engineer at the Muhafadah level which supervise all the water schemes in the Muhafadah was consulted and his opinion was considered highly important. This applies to all other services schemes and for all the items which involve considerable value judgements. Second, checking the information obtained at different urban centres with that available at the central offices of the Muhafadah, where each municipality or service department at Nahiya and Qadha levels is connected to its counterparts, the central office at the Muhafadah level. At the latter level, the principle directives, level of provision of different services and planning standards for different municipal and administrative ranks are formulated in co-ordination with the relevant central departments in Baghdad. Third, checking the information given at the urban centres of the same level also helped in avoiding the possible bias and exaggeration. Fourth and the most important factor is the adoptation of the central planning standards, where applicable, which obtained from the Physical Planning Commission of the Ministry of Planning and other Service departments, in the analysis process of the collected data. It could be concluded, that the above survey account suggests that the number of sufficient responses and the reliability of the data collected substantiate their inclusion in the forthcoming analysis.

It should be noted that there remains a problem which could not be solved in the survey and data analysis processes, that is the problem of providing higher order services by higher order centres in the hierarchy of settlements to smaller urban centres and their rural hinterlands. This problem, which is a well known principle of service hierarchy theory, implies that the larger urban centres are bearing unknown parts of the costs of provision of higher order services serving the smaller settlements in the hierarchy, which in turn leads to the rise of both per capita capital and annual running costs of provision of such kinds of services (health, education and so on) and consequently gives false impressions of the correlation between city size and cost of provision of such services. The administrative hierarchy of urban settlements and the administrative structure of service departments in Iraq in general (the U.E.R. is included) in turn could play a considerable role in giving such a false impression. To illustrate this problem an example could be given from the case study. The Directorate of Municipalities of Al-Anbar Muhafadah is in Ramadi City (the regional capital). This directorate provides a part of its services, mainly the administrative services to all the municipalities of the Muhafadah (at Qadha and Nahiya levels). Municipalities at Qadha level, in turn provide some of their administrative services to that at Nahiya level. Hence, higher order municipalities are providing part of their services to all relevant lower order municipalities. The same principles applies to the other service departments. This implies that part of the administrative costs in larger urban centres are spent to facilitate the administrative functions in smaller urban centres. The problem is even more apparent when the services are provided and/or administered from the larger order centres to the lower order centres, such as in the case of electricity and telephones among others, where these services in some cases are either provided from Qadah centres to Nahiya centres or only administered and maintained from there. However, such unavoidable problems are mentioned wherever is appropriate in the forthcoming analysis and a tentative evaluation of their effects will be reported.

Finally, it should be noted that the researcher's observations cover not only the period of carrying out this field work, but rather a longer time period, since 1976 when he was a planner in the Regional Planning Department of the Ministry of Planning and participated in most of the studies concerned with the development of the U.E.R. and resettlement of Haditha reservoir population. This was an important element in the survey and added a lot to the analysis of data and visualising the possible bias and exaggerated judgements.

7.3.2. Data Analysis

After completion of the survey, the data was transcribed into analysis data sheets especially prepared for the purpose. The data sheets were of different types. One concerning the per capita capital and annual running costs of different services and public utilities by urban size. Others contained information on each of the following services and for all urban centres of the study area.

The Services included are:-

1. Municipal Services which include mainly, road paving, parks, parking and refuse collection.
2. Water Supply.
3. Electricity.
4. Telephones.
5. Mail.
6. Educational Services at, Kindergarten, Primary, Secondary, Vocational and High Schools Level.
7. Health.
8. Public Libraries.

However, some of the information in the survey was not transcribed into analysis data sheets due to the nature of the information (qualitative information) which cannot be transcribed into such sheets. The latter case applies particularly to information concerning the physical aspects of urban growth and effect on agricultural land. It was from the prepared data sheets that responses were coded and put on punch cards for computer analysis at the University of Sheffield Computing Service. The Statistical Package for Social Sciences was used for analytical purposes wherever that was applicable. To enhance easy reading, variable names are given in the text in the appropriate places. However, any information not transcribed into punch cards from the data sheets were left therefore for separate analysis by adopting appropriate methodologies.

7.4. Summary

The main concern of this chapter was to find out the best appropriate methodology of analysis for the purpose of the distribution of the expected urban growth in the U.E.R. To achieve this aim the applicability of the city size distribution theories and models examined in Part One were re-examined here. It is found that despite the importance of many principles of these theoretical formulations for the forthcoming analysis, neither of them could be applicable to this special case study. This was due among other things, first to the differences in the aims of these theoretical formulations and the empirical study in question and second to the differences of the socio-economic, political and geographical environments among the places where these theoretical formulations were originally developed and the U.E.R. Hence, an alternative approach of analysis was looked at. This approach is represented by the applicability of evaluation techniques. Among the most well known evaluation techniques in the field of urban and regional planning, the applicability of three of these techniques, namely the cost-benefit analysis, threshold analysis and the goals-achievement analysis, to the case of the U.E.R. were examined in some details. It is found that despite the attractiveness of the alternative techniques, the goals-achievement analysis is the most appropriate one to this special case, especially if the data, time limitations and the nature of the study are taken into consideration. Problems of collecting data for cost-benefit analysis and threshold analysis from the U.E.R. compared to the feasibility of a single person working for a limited period of time were found to be among the main reasons for rejecting the application of these techniques for the purpose of the analysis of this study. On the contrary, the ease of application and the relatively small demand on information resources were among many other factors for recommending the application of the goals-achievement analysis technique for the purpose of the distribution of the expected urban growth in the U.E.R. until 1985. In developing the goals-achievement procedure in the following two chapters, the local circumstances of the study area, the aims and objectives of the national development plans and the data and time limitations of the study will highly be considered and consequently effect the procedure and details of the analysis.

Finally, the chapter summarises the methodology, scope and limitations of the field survey carried out for the purpose of the study, and outlined the data analysis approach.

CHAPTER EIGHT

TOWARD AN ALTERNATIVE URBAN GROWTH STRATEGY FOR THE U.E.R.

One: AIMS AND OBJECTIVES OF THE ANALYSIS AND THE TESTING OF THE FIRST PRIORITY FACTORS

CHAPTER EIGHT

TOWARD AN ALTERNATIVE URBAN GROWTH STRATEGY FOR THE U.E.R. ONE: AIMS AND OBJECTIVES OF THE ANALYSIS AND THE TESTING OF THE FIRST PRIORITY FACTORS

INTRODUCTION

The analysis to this point has suggested that an alternative urban growth strategy for the U.E.R. should be drawn through adopting an analytical and systematic evaluation approach. Furthermore the analysis has suggested that the goals-achievement technique is an appropriate one for the purpose of this case study.

The search for an alternative urban growth strategy will try to explore the best possible distribution pattern of the expected urban growth until 1985. In doing so, the proposals for urban growth pattern in the study area follow logically from the examination of the existing factors of the problem, whether they are socio-economic, physical, environmental and/or structural.

The analysis of urban growth strategy will be divided into two chapters (chapter eight and chapter nine). Chapter eight will suggest alternative urban growth strategies, cite the aims and objectives of the proposed strategies, outline the main constraints of the analysis, define the factors that are expected to affect the urban growth pattern of the region and finally test the first priority factors. Chapter nine will examine the second and third priority urban growth factors and suggest what is thought to be the preferred or best urban growth strategy.

8.1. The Proposed Alternative Strategies

Before stating the alternative proposed strategies and the methodology of defining them, it is necessary to elaborate briefly on some theoretical as well as practical principles governing the generation of alternatives. In general, the planners responsible for generating solutions cannot always assume that the particular set of alternatives submitted for decision will contain one which is satisfactory to the decision-taker. This dilemma argues Lichfield and his colleagues "...is only likely to be resolved in practice by the submission of a number of alternatives, with significant differences in magnitude of comparative advantages and disadvantages of differences in incidence effects for the groups which will gain or lose. In practice, some alternatives ought to be prepared to the necessary degree of detail even though they do not appear to be at all favoured by the results of the evaluation".(1)

In practice, several approaches exist to define the alternative strategies. These approaches extend to include the traditional methods, such as those based on pre-determined geometric concepts of urban form and growth or those depending on previous trends of growth and/or the more developed ones such as the development potential analysis which have been used in latter years in Britain in several planning studies (see section 7.2.3). The West Central Scotland Plan, among other studies, clearly indicated that several methods exist to define the alternatives. It employed three different procedures to produce the alternative regional strategies. These procedures are:(2)

(i) "by a consideration of the sites already identified as suitable by the planning agencies".

(ii) "by identifying sites according to conceptual design-governed principles".

(iii) "and by an analysis of the criteria influencing developers, and the local needs for employment and housing".

The first procedure which is termed by the study the "Control Strategy" "attempts to show the implications of the continuation of existing policies in terms of the future pattern of urban development in

(1) N. Lichfield, et.al., op.cit., P.41.
(2) West Central Scotland Plan, Strategy for Urban Growth..., op.cit., P.43.

the region; in other words to visualise the pattern of development that might occur if there were no regional strategy".[1] The main difference between the generation of the control strategy and the other strategies generated by development potential technique "is in the method used to allocate demand for industrial and residential land. In the former, activities were allocated to the kilometre squares with the highest potential in the region subject to locational restraints, whereas in the control strategy activities were allocated to undeveloped land zoned for that activity on current development plans".[2]

The second procedure which is termed the "conceptual design-governed procedure" represents "...a future situation in which major efforts will have been made to launch new trends and impose new forms of development. It is a radical, rather than a marginal intervention in the economic and social life of the region".[3] A new towns emphasis strategy is within this category.

The third group of procedures which is termed the "development potential analysis" is based, as it has been seen in section (7.2.3), upon a comprehensive analysis of opportunities and needs for development within the region or sub-region. It enables the work team to narrow down fairly rapidly the whole range of possibilities to a few which could be assessed in a comprehensive manner during the evaluation process. This procedure allows the selection of a range of alternatives which are good in relation to other possibilities and, most probably, include the best of all possibilities.

From the above definitions and basic principles of the alternative procedures of defining the alternative strategies, it is clear that the

(1) Ibid, P.44.
(2) Ibid, PP.44-45.
(3) Ibid, P.44.

development potential analysis leads to a more rational decision and reduces the possibility of dismissing realistic solutions. This fact encouraged the planning team of the Coventry-Solihull-Warwickshire study to employ the development potential analysis in generating the alternative strategies while discarding the other possible approaches. In this respect Wannop, the team leader of the above mentioned study, emphasised that "we were particularly dissatisfied with the logic of producing alternatives from a pattern-book i.e., linear cities, grid cities, polynucleated cities, star cities etc. Although satisfied to expect such a form if it eventually emerged, we leaned to a refinement of the more sensitive and systematic methods developed recently and preferred to build up alternatives from individual components and our understanding of economic, social and physical relationships, rather than to force these into a predetermined conceptual envelope".[(1)] The reasons for not considering the conceptual procedures in many recent planning studies due to their weaknesses in proceeding without reference to the criteria to be used in evaluation.[(2)] Furthermore, the West Central Scotland Plan emphasised that "whilst this approach has an instinctive appeal, there is no evidence that it materially benefits the peoples needs by any better than a more systematic approach based on objectives".[(3)] Also it is suspected that such approaches could pay scant regard to local needs and conditions. The control strategy also is encountered with many weaknesses. It takes into consideration the previous developmental trends which are not necessarily realistic or the best and/or their continuation are not insured. The changes in the pattern of investment or the priorities assigned to different sectors and areas of the regional economy would preclude the possibility of

(1) Urlan A. Wannop, op.cit., P.160.
(2) N. Lichfield, et.al., op.cit., P.195.
(3) West Central Scotland Plan, Strategy for Urban Growth...,op.cit., P.43.

adopting such procedure for defining the alternative solutions. Furthermore, the aims and objectives of the region as a whole are neglected in favour of considering what represents the separate policies of the various planning authorities.(1)

However, it should be noted that despite the comprehensiveness and reality of the development potential analysis, there are limitations to its use in generating the alternative strategies. In this particular study, although it is expected that adopting such approach would produce the most realistic alternatives and those which represent the best options, nevertheless, the time and data limitation problems would be unavoidable. As it has been seen in section (7.2.3), the application of such technique requires a wide range of data, on all parts of the region and on the basis of square kilometre which are neither available nor can be collected by the researcher for a reasonable period of time which the whole time of the study allows.

The adoption of the conceptually defined alternatives are not helpful. This is due to the spatial pattern of the committed economic development in the region which have been discussed in some detail in Chapter Six. It is not, for instance, possible to create a linear and dispersed development along the Euphrates River because of the committed pattern of economic development which implies that the basic employment should be within a reasonable daily journey to work. Such option would have a negative effects on the agricultural and good quality landscape which are confined to a narrow strip along the river. The possibility of establishing a large new town or expanding only one or two of the existing urban centres in any part of the region to accommodate the expected urban growth are also not applicable due to the same limitation of the pattern of the distribution of the committed economic development

(1) Ibid, P.45.

despite the advantages of such patterns of growth which imply that a relatively large urban centre could be created in the region which would provide the opportunity of providing higher urban functions and may be reducing the cost of providing of such functions.

Instead, the adoption of a control strategy in defining the alternative strategies could be helpful where, as it has been seen, this sort of procedure implies the continuation of existing urban growth pattern and policies which is, to large extent, the case in this particular study. Most of the urban growth in Iraq is directed to the existing urban centres, especially the large ones and expanding these centres are within the traditional interest of the planning departments in the country. Furthermore, the pattern of the committed economic development and the distribution of the major developmental projects coincides with the adoptation of such option, where, as it will be shown later, the sites of the committed development projects are within an easy access to most of the existing urban centres. Hence, the possibility of accommodating the generated urban growth by these activities would be examined. To be more rational in the process, the existing urban centres will be divided into two parts, that is, the expansion of the largest urban centre in each urban node and the expansion of the other urban centres in each urban node, to see their merits and demerits against each other and against the other possible options which is in this particular case the new towns option.

The new town option as a radical option will be adopted here because it is within the concern of the Ministry of Industry and the central planning departments. In the last fifteen years or so, and wherever, a large industrial projects are created, especially if these projects are located outside the existing urban centres, a new towns are suggested to accommodate the population that would be generated by their activities. Hence, the validity of such issue (new towns issue) should be considered when dealing with the urban growth problem in any part of the country to see its merits and demerits in comparison to other possible alternatives.

It is necessary to stress here that no definite definition of the new town concept exist in the country yet. Unlike in Britain where the new towns concept implies having a new settlement of a size of around 100000 inhabitants, self contained and built on a virgin site, in Iraq the term new town is given to any residential development built on a virgin site outside the municipal boundaries of the existing urban centres. Its size could be 2000 inhabitants and over. The idea of the new residential quarters started with establishing large industrial projects. To minimise the daily journey to work, among other things, a residential quarters have been built as near as possible to these industrial projects. Examples of such industrial quarters of a size 2000-3000 inhabitants could be found in many parts of the country, the paper plant, fertiliser plant and oil refinery in Basrah Muhafadah, glass industry in Ramadi and so forth. Such new residential quarters depend heavily on the nearby large urban centres in demanding most activities, shopping, high education, entertainment and so forth. Accordingly, in this particular study, the term new town means any new residential development on a virgin site outside the municipal boundaries of the existing urban centres.

Although it could be argued that the creation of a new town of a size of around 32000 inhabitants in case of Qaim urban node to be completed by 1985 seems to be unrealistic, the last decade experiences of the country in this respect are promising. Several new towns of that size in Al-Mushrack (Ninevah) and Al-Majar-Al-kabeer (Maysan) have been built in such a period of time. Furthermore, a large new town of a size 50C00 inhabitants have been built in Al-Iskandariya (Babylon) during the last decade and there is a new town in Basrah Muhafadah (Al-Baker New Industrial Town) to accommodate some 100000 inhabitants under construction with a high rate of implementation. Most of these projects are contracted to foreign specialised companies to execute the whole projects with their services within a definite period of time with providing them with the right to import all the necessary construction materials which either are in shortage supply and/or unavailable locally. Also these companies have the right to bring their own personnel with them.

To sum up, three alternative options would be adopted for the purpose of the analysis of this particular study and an evaluation process showing in some detail the merits and demerits of each alternative option would be undertaken in the remaining parts of it. These three alternatives are:-

(a) Expansion of the major urban centre in each urban node;

(b) Expansion of one or more of the other urban centres in each urban node; and

(c) Establishment of a new town in each urban node.

The principle variations not only involve a significant differences in magnitude of comparative advantages and disadvantages of different urban groups in the region and its whole well being but rather they are of great concern within different governmental departments. Furthermore, these alternative variations coincide with the spatial patterns of the committed economic development, the physical charactaristics of the study area and the aims and objectives of the study (see section 8.2).

All of these alternatives are financially feasible, where the central planning departments are responsible for financing all the economic functions and housing is no exception. Since, the committed development projects in the region are approved and financed by the national development plans, hence, the housing projects necessary to accommodate the population generated by them are equally supported by these plans. Furthermore, these alternatives seems to be feasible in relation to the constraints governing this particular study, where as it will be shown later all of these alternatives meets most of the stated constraints, however, in different degrees.

However, the adoption of the above stated three alternatives, does not mean that these variations are the only possible ones, but rather other alternatives which even might show to be very realistic could be found. It might be argued, for instance, that considering of a fourth option of expanding both small and large urban centres at once, in each urban node, would be a reasonable one. This possibility has been precluded from the following systematic evaluation procedure due to the fact that in two out of the four urban centres, the expected urban growth is relatively small. It is 3428 inhabitants in case of Haditha urban node and 5764 inhabitants in case of Hit urban node. The distribution of such small figures to two different sites could imply that a small size services schemes should be provided to serve the expected growth which would most probably be less economical than if the expected urban growth is directed to one site. Furthermore, the aim from this exercise is to design alternative options with significant differences in magnitude of comparative advantages and disadvantages to different urban groups in the study area. However, as it will be shown later, the possibility of expanding more than one site at once would be considered later on in the study if the analysis of the urban growth potentials in each urban node shows that there are a decisive limitations in absorbing all the expected urban growth in one site.

Finally, it should be noted that the problem of defining the alternative possible strategies is faced by most of the studies of this sort. Lichfield and his colleagues, for instance, emphasised this fact and argued that "only by investigating the merits of every possible alternative may we be confident of not having overlooked the preferred of all plans. However, we are never able to assess all the possibilities formally and comprehensively, norto design all of them in a detail required for implementation within the limitations of time and other resources made possible".(1) Nevertheless, because of limitations on the generation of the alternative strategies in a comprehensive and systematic way, represented by the lack of the detailed data on every square kilometre and the time limitations, this study recommends the development potential analysis as an area for further research in planning activities in Iraq.

8.2. Aims and Objectives of the Proposed Alternative Strategies

To achieve a best distribution of the urban growth, the proposed strategies should fulfil a set of aims and objectives. The expected aims and objectives are, either derived from the analysis of physical, economic and social charactaristics of the study area (representing potential constraints), or designed to preserve certain valuable inheritances. Analysis and interpretation of regional studies suggest that certain aims and objectives can be stated as guide lines to the proposals. These aims and objectives could be summarised as follows:-

(1) N. Lichfield, et.al., op.cit., P.41.

(a) The distribution of 70940 inhabitants must do more than continue the present urban pattern. It should establish conditions that will encourage self sustaining growth after 1985, reinforce the existing urban centres and reduce the dominance of the regional capital city, Ramadi.

(b) The limited agricultural potentials should be preserved and any further urban growth should avoid areas of agricultural value wherever is possible.

(c) The most economical approach might in the first instance place greatest emphasis on minimising the cost of the services and utilities. New development could be sited primarily where there is or expected to be, by 1985, a spare capacity in the provision of services and priorities could be decided either on the basis of cost or difficulty in extending provision.

(d) The very limited existing good landscape should be preserved and the sites on river fronts should be utilised for further urban development, unless these areas have significant agricultural and landscape value.

(e) The existing urban centres have a social independence and individual vitality which should be exploited so that their assets and community facilities are fully available to the expanded population. However, the relatively strong tribal relationships in the urban centres of the study area should be weakened.

(f) Daily journey to work should be minimised.

(g) Negative environmental effects of the development projects on the expanding population should be eliminated.

(h) The proposed urban growth pattern should cope with the overall regional development objectives.(1)

(i) Alternative strategies should be flexible, i.e., it should be possible for each phase to function efficiently and not to be dependent on further growth to take place.

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(1) Among the most relevant objectives stated in the regional development plan of the U.E.R. were:-

1. Raw material oriented industries should be developed in the region to utilise the abundant natural resources to meet the regional and national needs of Iraq and the Arab countries from the products of such industries and to diversify the Iraqi economy.
2. The optimum utilisation of the very low agricultural potentialities.
3. Raising the proportion of the women in the labour force of the region.
4. Reducing the income gap between different parts of the region and between its rural and urban areas.
5. Improving the services and public utilities and raising the level of their provision to the national average committed in the Long-Range National Development Plan (1981- 1990).
6. Reinforcing the pattern of the settlement hierarchy to increase the efficiency of provision of services in the region.
7. The utilisation of the committed transport network in the region to strengthen the interlinkages between it and the other parts of the country from the one hand and the Arab countries, especially Syria and Jordon from the other hand.
8. The better utilisation of the good landscape and the historical sites in tourism.

(See Planar, op.cit., Final Report, PP.76-78).

It is necessary to note from the beginning that the above stated aims and objectives are not fully compatible with each other, but rather conflict may be found between one or more of them. Such contradictions are expected and this alone does not rule out the vitality of the alternative proposed strategies. It reinforces this vitality, especially if a method like the goals-achievement technique is adopted which, first, considers a set of possible ranges of factors in the analysis of any problem; second, gives different weights for different factors and alternatives in question; and third, depends on the final accumulated scores in the evaluation of the preferable solution.

8.3. Constraints in the Analysis

Due to the natural features of the study area and the spatial distribution pattern of economic development taking place there (both of these two aspects have been discussed in some details in chapter six), several constraints impose some limitations on the analysis of the distribution of the expected urban growth. Among the most important constraints that should be taken into full consideration are:-

1. Although the forthcoming analysis could suggest that the 70940 additional residents or at least part of them could be accommodated within existing urban centres, further substantial growth may be inhibited either because of physical limitations or public utilities and services thresholds. Hence, expected growth beyond 1985 has also to be anticipated and the year 2000 has therefore been adopted as the approximate target date for long range planning purposes.

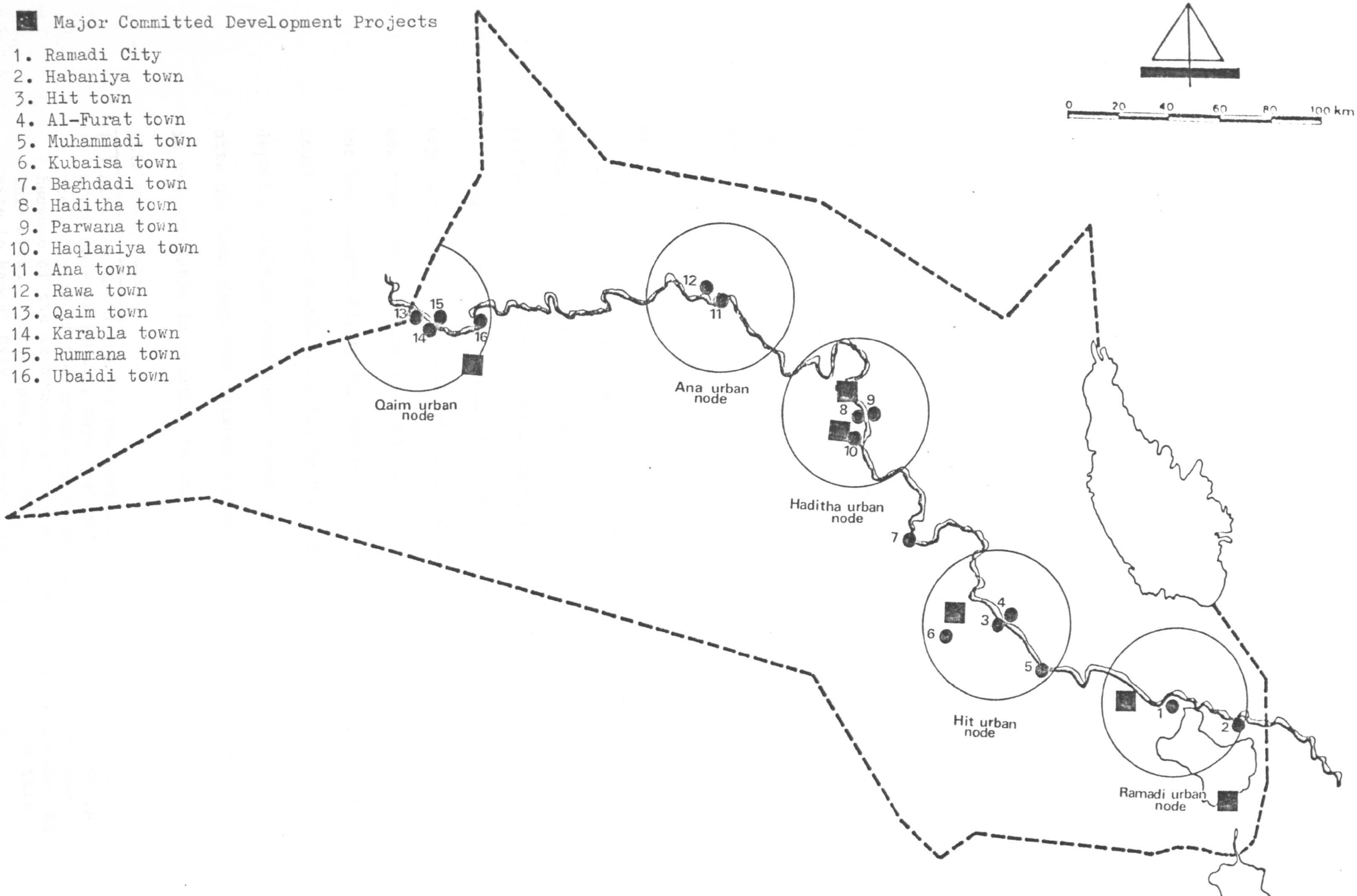
2. Location of basic employment will exert a strong influence on the possible distribution pattern of urban population. In addition, the location of the basic employment has a very powerful influence on most other issues e.g. on indirect and induced employment and indeed almost every other factor. Hence, to minimise the travel time, travel time cost and cost of transportation of employees, the study area has been, for the purpose of urban growth distribution, sub-divided into five urban nodes, they are: First, Ramadi urban node to include Ramadi City and Habaniya town. Second, Hit urban node to include Hit, Kubaisa, Al-Furat and Muhamadi towns. Third, Haditha urban node to include Haditha, Haqlaniya and Parwana towns. Fourth, Ana urban node to include Ana and Rawa towns. Fifth, Qaim urban node to include Qaim, Karabla, Rummana and Ubaidi towns.

The urban nodes are defined on the basis to include all the existing urban centres which are within a diameter not more than one hour travel time, with Qadha centres as a focal point of these urban nodes. (See map (8.1)). However, since there is no major committed development projects in Ana urban node, the urban growth analysis will be extended to include all the above stated urban nodes except Ana.

3. The severe natural conditions in the study area favour the distribution of most urban growth to be accommodated either in existing towns already situated along Euphrates River or in a new site along it. This fact will eliminate the possibility of urban development in areas distant from the river, except in one case, where there is the possibility of expanding Kubaisa town and/or the creation of new town nearby Hit Cement factory to accommodate the urban population increase expected to result from the establishment of the cement factory.

Map (8.1)

Urban Nodes of the U.E.R.



The expansion of existing urban centres already along the river and the possibility of creating new ones along it not only avoids the severe natural conditions but also coincides with minimising the cost of providing services and public utilities. In particular it reduces the difficulties and costs of providing water, drainage and other infrastructure facilities.

4. No urban development could be undertaken in areas liable to flooding as a result of the establishment of Haditha dam.

5. As with agricultural production, the safeguarding of mineral deposits for possible future production should be treated as of considerable regional importance. This should form a constraint factor on urban growth taking place, at least on a major scale on the land affected.

6. Urban development in areas within factories pollution sphere of influence will also be avoided.

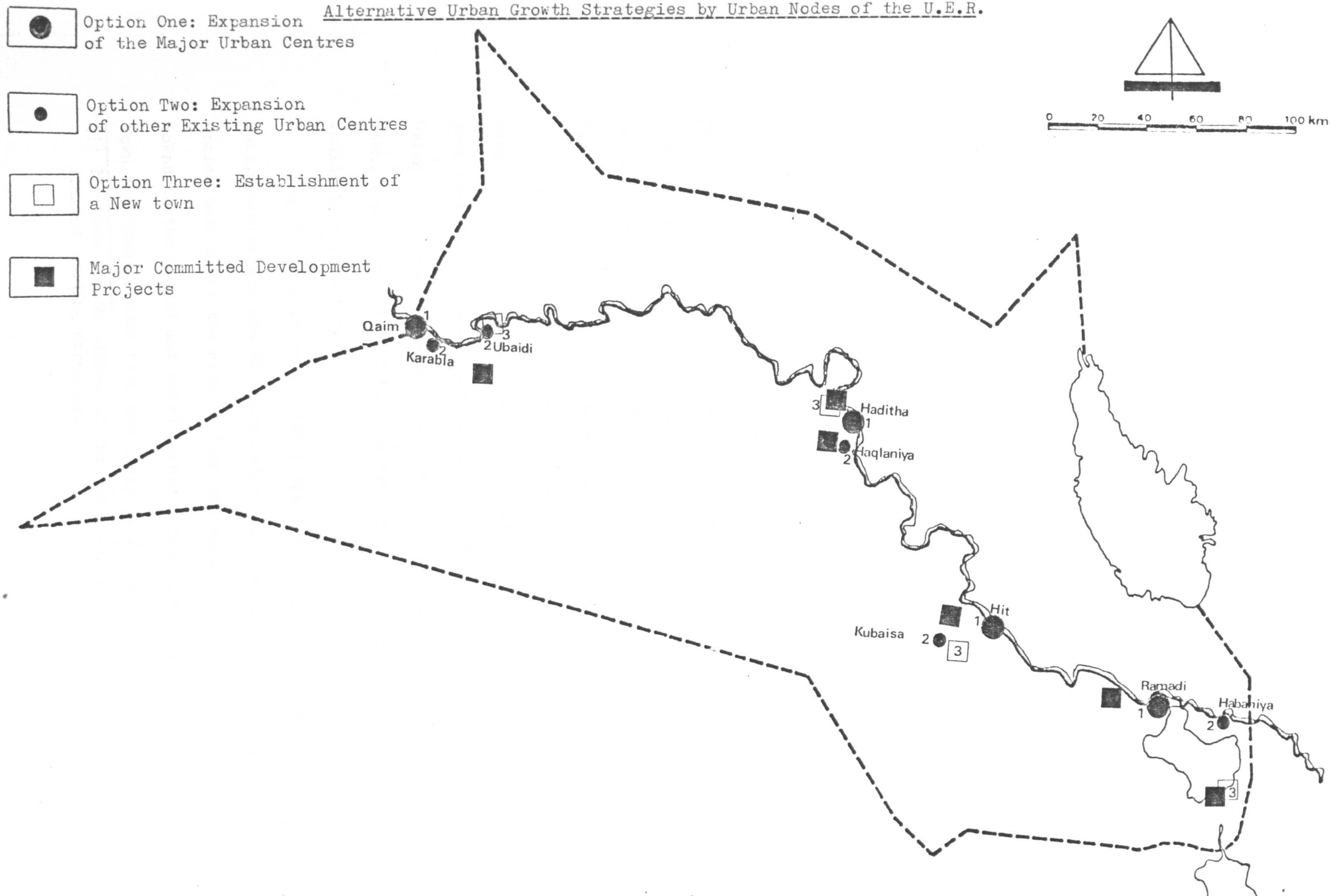
The above constraints suggest that the possible urban growth pattern in each urban node and according to the stated alternative proposed strategies could be summarised as follows (Map (8.2)):

First, In Ramadi urban node there are the possibilities of expanding Ramadi City and Habaniya town and/or the creation of a new town near Habaniya tourist village.(1) No site for a new town has been suggested, by any government department, to the west and south west of Ramadi City due to the richness of the area with mineral deposits: calcium carbonate, gypsum and phosphates. Also no new town site has been suggested between Ramadi City and Habaniya town, for it is unjustifiable in relation to the location of basic employment in this urban node.

(1) Although the suggested new town site is outside the delineated urban node of Ramadi, nevertheless it will be incorporated in the analysis of the urban growth pattern of this urban node because of the importance of the basic employment generated in this area. Furthermore, the daily journey to work from this site to Ramadi City is just over one hour travel time.

Map (8.2)

Alternative Urban Growth Strategies by Urban Nodes of the U.E.R.



Second, In Hit urban node there are the possibilities of expanding Hit and Kubaisa towns and/or the establishment of a new town about 10 km. south east of Hit Cement Factory, that is, outside the pollution zone of the factory. The possibility of expanding other urban centres in this urban node have been excluded due to;(a) the additional travel time and cost of transportation associated with that, where Baghdadi and Muhamadi towns are about 38 and 20 km's respectively from Hit, and if they have to be connected directly to the factory new roads should be required which are relatively costly. More than that Baghdadi town is outside the delinated range of the urban node. Al-Furat town has been excluded being on the other side of the river which means that if this possibility has to be considered, then a permanent modern bridge(1) should connect it with Hit which will be very costly unless justified by other development objectives which at this stage have not been delineated; and (b) the committed urban growth in this urban node is relatively small (about 5764 inhabitants) which does not appear to justify the possibility of considering more than three alternatives.

Third, In Haditha urban node there are the possibilities of expanding Haditha and Haqlaniya towns and/or the establishment of new town near Haditha dam. Parwana town has been excluded from analysis being on the other side of the river which, as in the case of Al-Furat town, connecting it with Haditha town through permanent modern bridge would be very costly.

Fourth, In Qaim urban node there are the possibilities of expanding Qaim, Karabla and Ubaidi towns and/or the creation of new town east of Ubaidi town along the river. Like the case of Al-Furat and Parwana towns in the second and third points above, the expansion of Rummana town has been excluded from the analysis for the same reason.

(1) The town is now connected through movable bridge with very limited loading capacity.

8.4. Analysis of Factors Affecting Urban Growth Distribution in the U.E.R. (One: First Priority Factors)

To achieve the realistic approach in the analysis and to cover all the possible aspects that could affect the urban growth pattern in the study area, ten different factors which seem to affect such growth have been chosen for more detailed analysis (table (8.1)). They include socio-economic, physical, environmental and structural elements.

Since the goals-achievement technique will be adopted in the analysis of urban growth and the evaluation of the alternative suggested strategies, it is necessary from this point to derive a set of weights suggesting the relative importance of each of these factors. It should be noted that, as it has been seen earlier in chapter seven, the derivation and assignment of such weights is a subjective decision. Even the range of weights is subjective, as they could extend from 1 to 100 or from 1 to 10, each of these ranges providing differing results. However, for the purpose of this study and because of data limitations, three types of factors have been distinguished. Those elements of greatest importance were given the highest weight (3 points), elements of second importance were given second highest weight (2 points) and elements of the lowest importance were given lowest weight (1 point).

In assigning weights to different factors, aspects such as; the relative importance of the factor in achieving the stated aims and objectives of the proposed strategies; the time dimension of the influence of the factor, whether it is of immediate or foreseeable in the future; and the nature of the influence of the factor, whether it is of direct or indirect effects, have been taken into consideration.

Table (8.1)

Factors Effecting the Urban Growth Distribution
and their Assigned Weights

Code	Weight	Factors
1	3	Availability and spare capactity of services and public utilities in the existing urban centres.
2	3	Cost of providing services and public utilities.
3	3	Daily Journey to work: travel time, travel time cost and cost of transportation.
4	3	Availability of land for urban growth.
5	2	Preserving good quality landscape.
6	2	Social considerations: social relationships and personal preferences of location and city size.
7	2	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.
8	1	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.
9	1	Future potentials of economic development and urban growth.
10	1	Improving the urban structure of existing urban centres.

Accordingly, factors such as the availability of spare capacity of services in existing urban centres, the cost of provision of services, the daily journey to work and availability of land for urban growth have been given the highest priority, for they are of vital importance in any urban growth policies, they are expected to contribute highly in achieving the stated aims and objectives of the proposed strategies and they immediately and directly affect these strategies. On the contrary, factors such as the accessibility to regional and/or national infrastructure facilities, future potentials of economic development and urban growth and improving the urban structure of existing urban centres, have been regarded as of least importance for the purpose of the analysis of this particular study. They have been given a weight of (1). This is due mainly to their limited expected role in achieving the aims and objectives of the proposed strategies. It is not expected that such factors will contribute highly in reducing, for instance, the problem of unbalanced existing urban system of the region, or minimising the cost of urban growth or contributing highly in preserving the very scarce agricultural land and good quality landscape and so forth of the main aims of the urban growth strategies stated earlier. Their role is mostly of indirect character. The remaining factors included in the analysis are in between the two above groups in affecting the urban growth pattern of the study area, hence they have been regarded of second priority and given a weight of (2) (see table (8.1)).

It is important to note that the factors stated above and the weights assigned to them are not absolute ones. Instead, they are probably variable over time depending on the prevailing circumstances, the problem and/or problems under investigation, and more importantly the urban growth objectives. The weights are influenced by the regional and national development aims and objectives. Finally, as it has already been mentioned, the personal judgement and preferences of the planner and/or planning team also play an important role in the assignment of alternative weights to these various elements.

However, it should be noted that later on, in choosing of the preferred strategy, a test of the importance of the adopted weighting system will be done through using a sensitivity analysis and relaxation of assumptions.

In general, the analysis and testing of each factor will be given in some detail and according to each urban node. However, due to the nature of some factors, such as the availability and spare capacity of services and public utilities in existing urban centres and the cost of providing services and publuc utilities, their analysis will include all the urban centres within the study area, regardless of whether they are suggested for further urban growth or not. For the first factor the analysis, in part, will include all the urban centres due to the fact that some of the services and public utilities are supplied from the main urban centre of each urban node to serve all the other urban centres of that urban node. For the second factor all the urban centres will be included to raise the significance of the findings.

Based on the results of the analysis of each factor, weights will be given on a points basis to each proposed strategy for each urban node. For the purpose of this study, three grades have been distinguished; first priority alternative will be assigned 3 points; second priority alternative will be given 2 points;and third priority alternative will be given 1 point. The highest weight will be given to the alternative which best achieves or maximises the aims of the factor under investigation. The lowest priority will be given to the alternative which least corresponds or achieves the aims of that factor, or achieves it to a very limited extent. The justification of assigning weights to different factors is given at the end of the analysis of each factor.

8.4.1. Availability and Spare Capacity of Services and Public Utilities in the Existing Urban Centres

The provision of many services such as water supply, electricity, telephones, health, education, municipal services and so on, not only contributes greatly to the quality of life but may also be important factor in decisions affecting the location and extent of future development in general and urban growth, in particular. On the other hand, spare capacity in existing services could also be an important factor in stimulating new urban growth.

To examine the effect of this factor on the distribution of urban growth in the U.E.R. a detailed survey of the types and level of provision of a group of services and public utilities has been carried out in the course of this research. Eight different types of services have been investigated. They are, municipal services (including refuse collection, road paving, parks and parking services), water supply, electricity, telephones, mail, educational (including, kindergarten, primary schools, secondary schools and other educational services), health and public libraries services. This section will be divided into two main sub-sections, the first one will elaborate on the availability and level of provision of the investigated services and public utilities and the second sub-section will be devoted to an analysis of the spare capacity, if any, of these services and public utilities in the existing urban centres.

(A) Types and level of provision of services and public utilities

Most urban centres of the study area are provided with most of the essential services. If the municipal and educational sub services are regarded, for the purpose of the analysis as a separate and independent services then table (8.2) would show that 13 urban centres out of 16 are provided with 10 or more of the services. However, although the simple correlation co-efficient between urban size and number of the services provided shows is low (+ 0.391)[1], it is clear that this correlation is a positive one and indicates that the larger the population size of the urban centre, slightly the higher the number of services provided. Hence, not surprisingly Ramadi City, the regional capital with Hit (the third

(1) This correlation co-efficient is extracted from the data given in table (8.2).

Table (8.2)

Selected Types of Services Provided in the Study Area by Urban Centres

Urban Centre	Population	Type of Service														
		Municipal Services				Water Supply	Elect-tricity	Telephones	Mail	Education				Health	Public Libraries	Total Number of Services
		Road Paving	Refuse Collection	Parks	Parking					Kinder-garten	Primary schools	Second-ary Schools	Others *			
Ramadi	101553	X	X	X	X	X	X	X	X	X	X	X	X	X	X	14
Habaniya	21378	X	X	X	X	X	X	X	X	X	X	X		X	X	13
Hit	15750	X	X	X	X	X	X	X	X	X	X	X	X	X	X	14
Baghdadi	1450	X	X	X	X		X	X	X		X	X		X		10
Kubaisa	4500	X	X	X	X	X	X	X	X		X	X		X		11
Al-Furat	950						X							X		2
Muhamadi	1250	X	X	X	X	X	X	X	X					X		9
Haditha	13150	X	X	X	X	X	X	X	X	X	X	X		X	X	13
Haqlaniya	4850	X	X	X	X	X	X	X	X		X	X		X	X	12
Parwana	2500	X	X	X	X	X	X	X	X		X	X		X		11
Ana	6850	X	X		X	X	X	X	X	X	X	X	X	X	X	13
Rawa	5250	X	X	X	X	X	X	X	X	X	X	X		X	X	13
Qaim	12850	X	X	X	X	X	X	X	X	X	X	X		X	X	13
Karabla	3150	X	X	X	X	X	X	X	X		X	X		X		11
Rummana	850						X	X						X		3
Ubaidi	550	X	X	X	X		X	X	X		X	X		X		10

* Instude vocational schools, technological institute and teachers training institutes.

largest urban centre in the region) came in the first place, each provided with all the services that were examined. Habaniya town, despite being the second largest urban centre came in the second place with 13 types of services. This could be attributed mainly to; first and the most important factor, its proximity to Ramadi City. It is about 20 km. south east of Ramadi, accordingly it can easily benefit from all higher order services provided there; second, the service which was not available (other educational services which include either vocational schools, technological institutes and teachers training institutes) is of the type that could be provided in very few towns of the whole urban system in the region without affecting the performance of a town like Habaniya and; third, Habaniya is of a third administrative order. It is a Nahiya centre compared to Hit which is a Qadha centre.

With Habaniya, 4 other towns were each provided with 13 types of services. All of these urban centres are within second and third order groups of urban centres and are of second administrative order, except Rawa which is a Nahiya Centre, but it had been created before about 40 years ago and represents the most important settlement to the north of Euphrates River. Its importance will even increase more with the flooding of Ana town and resettling the latter's population some 30 km. south east of the present site.

At the other extreme, the very low provision of services in both Al-Furat and Rummana towns is exceptional and could be attributed to the recent creation of both urban centres which means that the municipal framework responsible for the provision of municipal services was not completed at the time of carrying out the field survey. However the field visits to these towns showed that schools at primary and secondary levels were provided but they are not included in table (8.2) due to the lack of detailed data that could be used in further analysis of spare capacity and cost of provision of services.

The committed services schemes in the study area will raise the equity and level of the services provision throughout the study area. Details of table (8.3.1) shows that after implementing the committed services schemes, every urban centre in the study area will be provided with most of the investigated services. The lowest number of services provided will be in Muhamadi town (eleven services). This will decrease the gap between the highest and lowest order of urban centres from 12 to only 3 services. No urban centre in the study area will stand without provision of the most basic services which are water supply, education at primary and secondary stages, health, electricity, municipal, telephones and mail services.

Details of table (8.3.2) which shows the type, capacity and date of completion or the expected date of completion of some services schemes where access to the data was possible, indicate that a considerable additional capacities are added and will be added to the level of provision of the services which were provided when the field survey was carried out. This is particularly true in case of the educational services at different levels, water supply services, municipal services and health services in the capital city of the region (Ramadi City). The additional capacities generated or that will be generated by these schemes will be considered when analysing the spare capacity of provision of services and public utilities in the next sub-section, where the field survey showed that almost all the services schemes under construction will be completed by the end of 1982. Furthermore, most of the educational services schemes were completed when the field survey was carried out and the remaining

Table (8.3)

The Committed Services Schemes in the Urban Areas of the U.E.R.

1. Types of the Committed Services Schemes

Urban Centre	Municipal Services				Water Supply	Electricity	Telephones	Mail	Educational				Health	Public Libraries	Total Number of Services*
	Road Paving	Refuse Collection	Parks	Parking					Kinder-garten	Primary Schools	Secondary Schools	Others			
Ramadi															14
Habaniya															13
Hit															14
Baghdadi					X				X					X	13
Kubaisa									X					X	13
Al-Furat	X	X	X	X	X			X	X	X	X			X	12
Muhamadi										X	X				11
Haditha												X			14
Haqlaniya									X						13
Parwana									X					X	13
Ana															14
Rawa															13
Qaim												X			14
Karabla									X						12
Rummana	X	X	X	X	X			X	X	X	X			X	13
Ubaidi					X				X					X	13

* The total scores here represent the total number of services provided after the completion of service schemes under implementation. It represents the total scores of this table and table (8.2).

Table (8.3)

The Committed Services Schemes in the Urban Areas of the U.E.R.

2. The Services Schemes Under Construction and the Date of Completion or the Expected Date of Completion

Urban Area	Water Supply		Kindergartens		Primary Schools		Secondary Schools		Health Services		Road Paving Services		Parks Service		Parking Services	
	Capacity G/D	Date of completion or expected date of completion	Number of Class-rooms	Date of completion or expected date of completion	Number of Class-rooms	Date of completion or expected date of completion	Number of Class-rooms	Date of completion or expected date of completion	Number of Beds	Date of completion or expected date of completion	Area (m^2)	Date of completion or expected date of completion	Area (m^2)	Date of completion or expected date of completion	Area (m^2)	Date of completion or expected date of completion
Ramadi Urban Node:																
Ramadi	31651200	1983	8	1980	72- 48 24	1979 1980	104	1979	600	1983	80000	1980	35000	1980	16000	1981
Habaniya	1582560	1982	4	1980	84- 63 21	1979 1980	40	1979	-	-	75000	1980	-	-	-	-
Hit Urban Node:																
Hit	1846320	1981	-	-	12	1980	40	1979	-	-	100000	1980	9034	1980	-	-
Kubaisa	-	-	4	1980	-	-	20	1979	-	-	37500	1980	-	-	-	-
Haditha Urban Node:																
Haditha	1318800	1981	-	-	54	1979	40- 20 20	1979 1980	50	1982	75000	1980	-	-	-	-
Haqlaniya	-	-	4	1980	12	1979	20	1979	-	-	50000	1980	2000	1980	-	-
Qaim Urban Node:																
Qaim	-	-	-	-	64- 16 48	1979 1980	20	1979	-	-	125000	1980	13200	1981	-	-
Karabla	316512	1980	4	1980	-	-	16	1980	-	-	20000	1980	2300	1980	-	-
Ubaidi	316512	1981	4	1980	-	-	20	1979	-	-	35000	1980	-	-	-	-

schemes were expected to be completed later in 1980. The municipal services schemes were also expected to be completed mainly in 1980. Water supply schemes were expected to be completed mainly in 1981. The only committed services schemes which were expected to be completed after 1982 are the water supply and hospitals schemes in Ramadi City.

Taking the rate of the implementation of the development projects, in Iraq, in recent years which is found in chapter five to be around 80% of the allocated investment one could expect that all the services schemes expected to be implemented by 1980-1981 are now completed.[1] Furthermore, since this study is dealing with the urban growth problem in the region up to the year 1985, all the services schemes under construction are expected to be completed by that time and the study, for the purpose of the analysis will assume that these schemes are actually implemented.

Provision of specific services is not the only aspect which should be given a special consideration. What is at least of equal importance, the standard and range of provision of these services. The percentage coverage of the total population of the urban centres, standard of provision and complementarity of provision are of crucial importance in analysing the provision of different services.

In an attempt to analyse the standard of provision of services in the urban centres of the region, correlation co-efficients appear as the most obvious technique to use. For each investigated service, a set of criteria have been included in the analysis. The selected criteria differs according to the type of the service and in each case the criteria chosen are thought to be a suitable measurement of the level or standard of provision of that service.

(1) An interview with the local leadership of Al-Anbar Muhafadah in Atha-Thawra daily newspaper in January 1982 confirmed that all these projects were completed by the end of 1981. (See Atha-Thawra Daily Newspaper (1982)) (In Arabic), Baghdad, No. 4260, 15th January, P.7.

The Correlation Matrices,[1] tables (8.4) to (8.13) which indicate the linear association between the variables reveal some interesting relationships. Although not all the details of these tables will be utilised in this section, especially the factors concerning the per capita capital and annual running costs, i.e., factors number 2 and 3, nevertheless, they have been presented here to avoid repetition elsewhere. The following analysis summarises the most important relationships according to individual services.

(a) Municipal Services

Municipal services in the urban areas of the region, like any other urban areas in the country are provided by the municipality, which exist in every urban centre (except Baghdad metropolis where a special body called Amanat Al-Asima is responsible for providing the municipal services). Municipal services provided include road paving, refuse collection, parking, parks and other administrative and supervisory services. These services are provided within the boundaries of each municipality.[2]

Eight different criteria have been considered. They cover in one way or another, all the investigated municipal services, (Table 8.4). The actual and needed ratios of municipal staff and mechanical equipment[3] relate to every municipal services since both the staff and mechanical equipment are utilised in providing these services and consequently can be used as a measure of the standard of provision of the service. Per capita area of paved roads

(1) Data used in deriving the correlation Matrices were obtained from the field survey.

(2) Provision of municipal services outside municipal boundaries are the responsibility of local government administration. The local government administration exists in every Muhafadha and provides such services centrally (from the central city of the Muhafadha) to all areas outside the municipal boundaries of urban centres.

(3) The actual and needed municipal staff and mechanical equipment ratio represent the number of the actual and/or needed municipal staff and mechanical equipment per each 1000 inhabitants of the urban centres of the study area.

and park space reflects, in part, the level of both road paving and park space services. Per capita capital and annual running costs have not been used as a measure of the standard of provision of the services. The level of costs may differ even if the level of provision is the same as a result of either economies of scale gained in larger urban areas or differences in the date of provision of the services, especially in the case of services utilising a higher ratio of capital assets.

The resulting correlation matrix (table 8.4) indicates that there is a low and negative association between most of the selected criteria and the size of population. The low and negative association between the needed municipal staff and mechanical equipment, on the one hand, and population size, on the other hand, which took the values of (-0.350) and (-0.306) respectively, indicating that the larger the urban centre is, the lower the need from both items is and consequently the more efficient the municipal services in larger urban areas are. The moderate and negative correlation between actual municipal equipment and population size (-0.411), means together with second point above, that enlarging the size of urban areas minimises the ratio of mechanical equipment to population as a result of the economies of scale and more rational utilisation of this equipment. This genralisation is applied to some extent to municipal staff, where the actual ratio shows almost no association with the size of the urban areas while the needed municipal staff ratio shows a low and negative association (-0.350). The more rational utilisation of both manpower and mechanical equipment would rather be apparent if the proportions of the municipal staff and mechanical equipment provided by the Central City (Ramadi) and Qadhas Centres to serve the smaller urban centres are measurable.

Table (8.4)

Correlation Matrix (Municipal Services)

Variable	1	2	3	4	5	6	7	8	9	10
1	1.000									
2	0.230	1.000								
3	-0.208	0.713	1.000							
4	0.031	0.460	0.212	1.000						
5	-0.350	0.723	0.935	0.345	1.000					
6	-0.411	0.111	0.637	0.499	0.778	1.000				
7	-0.306	0.678	0.947	0.272	0.960	0.627	1.000			
8	-0.393	0.369	0.493	-0.133	0.420	0.310	0.094	1.000		
9	-0.272	0.843	0.874	0.433	0.930	0.445	0.899	0.769	1.000	
10	0.172	0.812	0.605	0.425	0.731	0.292	0.648	-0.017	0.707	1.000

Where variable 1 = Population size,
2 = Per capita capital cost of municipal services,
3 = Per capita annual running cost of municipal services,
4 = Actual municipal staff ratio,
5 = Needed municipal staff ratio,
6 = Actual municipal mechanical equipment ratio,
7 = Needed municipal mechanical equipment ratio,
8 = Number of mechanical equipment used in 1976 and after,
9 = Per capita area of paved roads and,
10 = Per capita park space area.

The level of provision of road paving services seems to be higher in smaller urban areas where it is found that low and negative associations (-0.272) exist between the per capita area of paved roads and the population size. Park services are found to be slightly higher in larger cities, where a low and positive association (0.172) is found between per capita park space area and population size.

To sum up, municipal services in the urban areas of the region seem to be slightly higher in the larger ones with achieving more rational utilisation of both municipal staff and mechanical equipment.

(b) Water Supply

The source of potable water in the study area is the Euphrates River. It is a very safe source. The field survey showed that by 1980, nine water supply schemes were supplying 12 urban centres, which means that, first, three urban centres were provided with drinking water from water schemes in other urban areas. These urban areas are namely, Haqlaniya, Rawa and Karabla served from Haditha, Ana and Qaim towns respectively. In addition, Kubaisa town is found to be served from a special water scheme located in Hit town. The location of Kubaisa scheme in Hit (to secure the continuity and safety of the water source) contributed to the high capital cost of the project compared to other water schemes in the region. It is found, in the field survey, that the per capita capital cost of water supply in Kubaisa was about 46 I.D. compared to only 8 I.D. in both Hit and Habaniya towns and 10 I.D. in Ramadi City. Second, three out of the four remaining urban centres in the region were not supplied with drinking water and they were using the river's water directly. These towns were Baghdadi, Rummana and Ubaidi. The fourth urban centre, Al-Furat is provided with drinking water from Hit by tankers. This method of supply is not efficient. It depends on the spare capacity of the Hit scheme and it hardly covers all the residents of Al-Furat town. However, this method of supply is a very temporary one and with the completion of water supply schemes under construction all the urban centres will be provided with drinking water.

In urban areas provided with water supply all the properties, except isolated ones which are outside the municipal boundaries, are connected to the main supplies. Meters are used in about 93% of the connected properties. In properties without meters, usage estimates are made to devise charges for water consumption.

The field survey also showed that water supplied from water schemes was acceptable from a public health consideration. It is found that no individual illness or epidemic of any sort originated from the use of existing water supplies.

Finally, it is found that 5 out of 9 water schemes were utilised in fire fighting. Eight urban centres (Ramadi, Habaniya, Haditha, Haqlaniya, Ana, Rawa and Karabla) were utilising the water supply schemes in fire fighting. The remaining urban centres were using Euphrates River directly for this purpose.

To measure the level of provision of water supply by urban size, three criteria have been chosen, they are per capita water consumption, condition of treatment plants and percentage of distribution network in a good condition.(1) The first criterion is of course the most important indicator of the level of provision. The resulting correlation matrix, (table 8.5), shows no association between urban size and per capita water consumption, while it shows very low positive and negative associations with both conditions of treatment plants and percentage of distribution network in a good condition which took the value of (0.164) and (-0.240) respectively. The above analysis suggests that the level of provision of the service is almost the same in all the urban centres provided with water supply.

(c) Electricity Services

Electricity is generally available throughout the region. It is obtained either from the national grid via primary and secondary sub-stations or from local diesel powered generators. The national system

(1) The conditions of the capital assets of different provided services are obtained from the relevant departments. The estimation of the conditions of the capital assets in each department depends on a set of criteria. These criteria include among other things the number of years the assets are in operation, the remaining length of life of these assets and the level of their operational performance.

Table (8.5)

Correlation Matrix (Water Supply)

Variable	1	2	3	4	5	6
1	1.000					
2	-0.390	1.000				
3	-0.525	0.970	1.000			
4	-0.075	0.347	0.981	1.000		
5	0.164	0.395	-0.630	-0.252	1.000	
6	-0.240	-0.560	-0.663	-0.571	-0.010	1.000

Where variable 1 = Population size,
2 = Per capita capital cost,
3 = Per capita annual running cost ,
4 = Per capita water consumption,
5 = Condition of treatment plants, and
6 = Percentage of distribution network in a good condition.

is based mainly on voltages of 132 and 33 KV. At primary sub-stations the voltage is transformed down to 11 KV. and distributed by a secondary distribution system to the larger industrial establishments and to number of sub-stations, where the voltage is further transformed down to 380/220 V. for supply of public distribution system and to the smaller industrial and commercial premises.

The field survey showed that, Ramadi City, Habaniya, Hit, Kubaisa, Al-Furat and Muhamadi towns are served from the national grid system via 33 KV. network, with Ramadi also being connected to the 132 KV. network. The remaining urban centres are served by diesel generators from Haditha, Ana, Qaim and Baghdadi towns, each serving the towns belonging to their Qadha except the one in Baghdadi which serves itself only.

As in case of water supply, all the properties within the municipal boundaries of each urban centre are supplied with electricity.

To examine the level of electricity service provision by urban size, three criteria have been chosen as in the case of water supply (table 8.6). The resulting correlation matrix indicates that the larger the urban centres, the higher the level of service provided is, where a very high positive correlation is found to exist between per capita consumption and population size (0.831) and a slight positive association between the latter and the condition of sub-stations and diesel generators.

Table (8.6)

Correlation Matrix (Electricity Services)

Variable	1	2	3	4	5	6
1	1.000					
2	0.762	1.000				
3	-0.562	-0.773	1.000			
4	0.831	0.831	-0.435	1.000		
5	0.286	0.854	-0.274	0.610	1.000	
6	0.020	-0.540	0.137	-0.515	-0.733	1.000

Where variable 1 = Population size,
2 = Per capita capital cost,
3 = Per capita annual running cost,
4 = Per capita consumption,
5 = Sub-stations and local diesel generators condition, and,
6 = Percentage of distribution network in a good condition.

(d) Telephone Services

All the urban areas of the region, except Al-Furat town, are provided with telephone services. Until 1976 the level of telephone service provision was very low indeed. In that year, the total number of installed telephones in Al-Anbar Muhafadha, and not the U.E.R. region, was 2885 telephones, i.e., 0.7 installed telephone for every

100 persons.[1] The field survey showed, as in the case of other services, a very rapid increase in the level of provision. It was found that the number of installed telephones in the study area alone increased to 4410 telephones. This increase brought the telephone ratio to 2.24 telephones per 100 persons, i.e., more than threefold increase over 1976.

To find out the variation in the level of telephone service provision by urban size, five criteria have been used, (see table 8.7). The resulting correlation matrix clearly indicates

Table (8.7)

Correlation Matrix (Telephone Services)

Variable	1	2	3	4	5	6	7
1	1.000						
2	0.849	1.000					
3	0.036	0.295	1.000				
4	0.017	0.372	0.218	1.000			
5	0.174	0.473	0.218	0.757	1.000		
6	0.330	0.419	0.212	0.223	0.288	1.000	
7	0.010	-0.133	0.093	-0.096	-0.087	0.141	1.000

Where variable 1 = Population size,
2 = Per capita capital cost,
3 = Per capita annual running cost,
4 = Actual telephone ratio,
5 = Telephone ratio if full capacity of exchanges are utilised,
6 = Exchanges conditions, and,
7 = Percentage of network in a good condition.

that no sign of association exists between the actual telephone ratio[2] and population size while it is found that a low but positive correlation

(1) Planar, op.cit., Appendices of Stage One, P.I.14.
(2) The telephone ratio is measured in terms of number of telephone lines per 100 persons. The actual telephone ratio means the number of telephone lines available at the time of carrying out the field survey per 100 persons.

exist between the latter and both telephone ratio if the full capacity of exchanges are utilised (0.174) and condition of exchanges (0.330). These correlations suggest that the larger the urban area is, the higher the expected telephone ratio will be and the better the exchanges conditions are. The matrix also suggests that telephone services are slightly better in larger urban centres.

(e) Mail Services

According to the data received from the post and telegraph department in Al-Anbar Muhafadah, during the field survey period, there were 19 post offices in the study area. The distribution of these post offices within the study area are shown in table (8.8).

Mail services are found to be more comprehensive in larger urban areas than the smaller ones. Table (8.8) best illustrates this, through analysing the type of mail services provided in each urban centre. Details of the table indicates that post office boxes are available in Ramadi City alone and are provided by one post office. Post Saving Services, on the other hand, are provided in 9 urban centres by 11 post offices mainly located in the main urban centres (second and third group of urban centres). Only the very basic mail services (letters, parcels and telegraph) are provided by all the post offices in the region. However, a number of very up to date comprehensive systems (comprising post, telegraph and telex services) are under implementation in several of the urban centres of the region, namely Ramadi, Hit and Qaim. This new system will be extended to include up to the Nahiya level.

Raising the level of provision of this service and communication services in general whether quantatively or qualitatively is of vital importance due to the economic development taking place in the region and its consequences on standard of living and mobility of population to the new employment locations which finally increase the demand on such services.

Table (8.8)

Types of Mail Services Provided in the Urban Areas of the U.E.R.

Urban Centres	Number of Post Offices	Letters	Parcels	Telegraph	Saving	Post Office Boxes
Ramadi	3	XXX	XXX	XXX	XX	X
Habaniya	2	XX	XX	XX	XX	
Tourist village	1	X	X	X	X	
Hit	1	X	X	X	X	
Baghdadi	1	X	X	X		
Kubaisa	1	X	X	X		
Al-Furat	-					
Muhamadi	1	X	X	X		
Haditha	1	X	X	X	X	
Haqlaniya	1	X	X	X		
Parwana	1	X	X	X	X	
Ana	2	XX	XX	XX	X	
Rawa	1	X	X	X	X	
Qaim	1	X	X	X	X	
Karabla	1	X	X	X		
Rummana	-					
Ubaidi	1	X	X	X		
Region's total	19	19	19	19	11	1

Note: Multiple X means that more than one post office are providing the specific mail service.

(f) Educational Services

Educational services is one of the most basic and essential pre-requisites of socio-economic development and for the welfare of the population. The Iraqi development plans since early 1970's, especially the National Development Plan, 1976-1980, have given special importance to the provision of education services at all levels and a considerable amount of investment has been channelled into this sector.

To assess the level of education services in the study area, different criteria have been chosen, such as the attendance ratio of children at each school age,[1] pupils per class, pupils per teacher and so on (see tables (8.9)-(8.11)). The level of provision of education services is analysed for the cases of kindergartens, primary and secondary stages. Vocational schools and higher education services are not included in this analysis due to their special requirements for their concentration in specific urban areas, mainly the very large and central ones, and not necessarily in all the components of the urban system.

(i) Kindergarten Services

Kindergartens provide their services to children 4-5 years of age. Only seven of the urban centres in the region were found to have kindergarten services. They are the central city in the region (Ramadi City), the central cities of Qadhas and only two important urban centres (Habaniya and Rawa), which are of the third administrative order (Nahiya Centre).

Analysis of the level of provision of kindergarten services in the above urban centres showed that the level of provision of this service is higher in the smaller ones among them. This general trend is reflected by a high and negative association between urban size and attendance ratio of children at age 4-5 years, which took the value of (-0.728) and the moderate and positive association between the former and both pupils per teacher (0.550) and pupils per class (0.574) (see table (8.9)).

The high and negative association between urban size and attendance ratio means that the bigger the urban centre, the less the attendance ratio , while the moderate and positive association between the former and both pupils per teacher and pupils per class means that the bigger the urban centre the higher the number of pupils per teacher and class and

(1) Attendance ratio is the number of pupils per 1000 inhabitants at the age of specific schooling stage. In Iraq the average schooling ages are 4-5 years for kindergartens,6-11 years for primary schools and 12-17 years for secondary schools.

Table (8.9)

Correlation Matrix (Kindergarten Services)

Variable	1	2	3	4	5	6	7
1	1.000						
2	-0.569	1.000					
3	-0.753	0.933	1.000				
4	-0.728	0.788	0.921	1.000			
5	0.550	-0.540	-0.680	-0.516	1.000		
6	0.574	-0.157	-0.290	-0.058	0.627	1.000	
7	0.031	-0.512	-0.481	-0.235	0.792	0.323	1.000

Where variable 1 = Population size,
2 = Per capita capital cost,
3 = Per capita annual running cost,
4 = Attendance ratio of children at age 4-5 years,
5 = Pupils per teacher,
6 = Pupils per class, and,
7 = Percentage of buildings built in 1975 and after.

consequently the lower the standard of provision of the service.

(ii) Primary Schools Services

Primary schools, normally provide their services to children 6-11 years of age. If Al-Furat, Muhamadi and Rummana towns are excluded (for reasons mentioned earlier in this section), all the urban areas in the region are provided with primary schools.

The level of provision of primary schools and the attendance ratio is very high, as a result of the compulsory primary education started in the academic year 1978-1979. No significant differences have been seen among different urban size centres and in many cases, it is found that the correlation co-efficient between urban size and the chosen criteria are approximately zero (see table 8.10). The evenness in the level of provision of this service could easily be attributed to the fact that the normal catchment area is small in some cases (up to 500 meters), so no significant proportion of pupils are expected to commute from other settlements, especially other rural settlements. This is true and confirmed by the availability of primary schools at every urban centre and even in each group of rural settlements.

Table (8.10)

Correlation Matrix (Primary School)

Variable	1	2	3	4	5	6	7	8
1	1.000							
2	-0.213	1.000						
3	-0.359	0.920	1.000					
4	-0.294	0.871	0.877	1.000				
5	-0.082	0.363	0.291	0.708	1.000			
6	-0.007	0.111	0.031	0.474	0.913	1.000		
7	-0.029	0.757	0.495	0.357	-0.031	-0.208	1.000	
8	0.109	-0.445	-0.271	-0.367	-0.302	-0.123	-0.117	1.000

Where variable 1 = Population size,
2 = Per capita capital cost,
3 = Per capita annual running cost,
4 = Attendance ratio of children at age 6-11 years,
5 = Pupils per teacher,
6 = Pupils per class,
7 = Percentage of buildings built in 1975 and after, and,
8 = Percentage of school buildings used in a shift system, (more than one school occupying the building).

(iii) Secondary Schools Services

Schools at this stage are provided for pupils of 12-17 years of age. Like primary schools, this service is provided in all the urban centres of the region except Al-Furat, Muhamadi and Rummana towns. The level of provision of secondary schools, in general, is very high again despite being lower than that of primary schools. The resulting correlation matrix, table (8.11), illustrates clearly that the larger the urban centre, the lower the attendance ratio. The correlation co-efficient between these two variables took the value of (-0.359). This does not mean that pupils aged 12-17 years in larger urban centres attend secondary schools in lower proportion, but rather it could be attributed to the fact that the proportion of the rural settlers' students to the urban students attending the secondary schools of the larger urban centres is smaller than their counterpart of smaller urban centres.(1) Hence this criterion would not reflect sufficiently the level of provision of secondary schools by urban size. However, two other criteria from the resulting matrix indicate that the level of provision of secondary services decreases with increasing urban size. The matrix shows clearly that there are a moderate but positive correlation between the urban size, on the one hand, and both pupils per teacher (0.422) and pupils per class (0.442). On the contrary, it is found that there is a slight inverse association (-0.140) between urban size and utilisation of school buildings on a shift system which indicates that the proportion of schools buildings used by more than one school in larger urban centres is slightly lower than that of smaller ones.

The above analysis suggests that because of the population threshold limitations of this service, secondary schools of the smaller urban centres are serving the rural settlements more intensively than the larger urban centres and that the level of its provision, in general, is also relatively higher.

(iv) Other Educational Services

Apart from the above educational services, the study area is provided with many other educational facilities, namely vocational schools, teachers' training institutes and technological institutes. Unlike the primary and secondary schools, these facilities are concentrated

(1) Unlike primary schools, secondary schools charactarise by higher population threshold which means that they cannot be provided in the dispersed and low density rural areas in a wide range. Accordingly, rural settlers' students are expected to attend the secondary schools of the nearest urban centres.

Table (8.11)

Correlation Matrix (Secondary Schools)

Variable	1	2	3	4	5	6	7	8
1	1.000							
2	-0.305	1.000						
3	-0.331	0.103	1.000					
4	-0.359	0.392	0.925	1.000				
5	0.422	0.199	-0.472	-0.173	1.000			
6	-0.007	0.488	-0.332	-0.004	0.786	1.000		
7	0.442	-0.128	-0.601	-0.530	0.205	-0.139	1.000	
8	-0.140	-0.551	0.361	0.100	-0.398	-0.477	-0.123	1.000

Where variable 1 = Population size,
2 = Per capita capital cost,
3 = Per capita annual running cost,
4 = Attendance ratio of people at age 12-17 years,
5 = Pupils per teacher,
6 = Pupils per class,
7 = Percentage of buildings built in 1975 and after, and,
8 = Percentage of school buildings used in a shift system.

in a very few urban centres mainly the central city, Ramadi. The technical institute, accommodating 387 students and the two teachers qualifying institutes accommodating 888 students are located in Ramadi City. One of the two industrial schools accommodating 612 students is in Ramadi City. The second one which contains about 251 students is in Ana town. The only agricultural school in the study area, which has 423 students, is also located in Ramadi City. However, with the recent completion of Hit industrial school and after the completion of the two commercial schools and one industrial school which were under construction at the time of the field survey in Ramadi, Haditha and Qaim respectively, the central city of the region and all the central towns of the Qadhas will be provided with one kind or another of this educational facilities.

(g) Health Services

Being a very essential requirement, health services are provided for every urban centre in the region. The type and level of its provision differs according to the hierarchy of the urban centre, for each type of health service has a minimum population threshold. Table (8.12), which illustrates the type and distribution of health establishments by urban areas, shows clearly that the larger the urban centre, the higher the level and the more diversified the health services provided are. Specialised hospitals, for instance, are provided only in the central city of the region to serve the whole area. General hospitals are provided in the main urban centres of the region which are mainly Qadha central urban centres, while in third and fourth urban size group, main health centres are provided. External clinics and other health services, such as, dental services, mother and child care centres and prevention health centres are provided mainly in Ramadi City and to a lesser extent in Hit and Haditha towns.

Because the health establishments serve not only the urban areas in which they are located, but also the lower settlements in the hierarchy, whether they are urban or rural, the resulting correlation co-efficient matrix (table 8.13) will not give any real picture of the level of provision of this service by urban size. Nevertheless, the matrix shows the existence of slight economies of scale in utilisation of paramedical staff and physicians in larger urban areas, where a slight and inverse association was found to exist between urban size and the ratio of both paramedical staff (-0.284) and physicians (-0.112). This suggests that, if the proportion of the services provided to people outside the boundaries of the urban centres is known and excluded, then the inverse associations would be more apparent and significant.

Table (8.12)

Type and Distribution of Health Establishments by Urban Areas of the U.E.R.

Urban Area	Specialised Hospitals	General Hospitals	Main Health Centres	Secondary Health Centres	External Clinics	Others	Total
Ramadi	1	1			2	4	8
Habaniya			2		1		3
Hit		1			1	1	3
Baghdadi			1				1
Kubaisa			1				1
Al-Furat			1				1
Muhamadi				1			1
Haditha		1			1	1	3
Haqlaniya			1				1
Parwana			1				1
Ana		1			2		3
Rawa		1			1		2
Qaim		1			1		2
Karabla			1				1
Rummana			1				1
Ubaidi			1				1

Note: According to the Ministry of Health definition the:

1. Specialised hospitals provide their services to the whole region or rather, Muhafadah.
2. General hospitals provide their services to the main urban centre of each Qadha and to the whole Qadha.
3. Main health centres serve a maximum of 20000 inhabitants. Each centre has at least one physician and a number of paramedical staff. They are usually located at Nahiyas Centres.
4. Secondary health centres serve a total population of about 5000. An assistant physician and a number of other paramedical staff provide the health care in each of these centres. They are usually located at main rural centres or urban centres of less than 2000 inhabitants and without administrative position.
5. External clinics provide external patient treatments in urban centres of not less than 5000 inhabitants and are administratively related to general hospitals in each Qadha.
6. Other health establishments include prevention health centres, mother and child care centres, dental service centres and so on.

Table (8.13)

Correlation Matrix (Health Services)

Variable	1	2	3	4	5	6	7
1	1.000						
2	-0.114	1.000					
3	0.069	0.616	1.000				
4	-0.112	0.766	0.764	1.000			
5	-0.049	-0.446	-0.096	-0.567	1.000		
6	-0.284	0.609	0.911	0.699	-0.136	1.000	
7	0.221	0.089	0.392	0.044	0.361	0.230	1.000

Where variable 1 = Population size,
2 = Per capita capital cost,
3 = Per capita annual running cost,
4 = Ratio of physiciansper 10000 persons,
5 = Ratio of dentists per 10000 persons,
6 = Ratio of Para medical staff per 10000 persons, and,
7 = Ratio of beds in hospitals per 10000 persons.

(h) Public Libraries

At the time of the field survey there were eight public libraries in the study area distributed among Qadhas centres and three Nahiyas Centres (Habaniya, Rawa and Haqlaniya). No town of the third urban size group, except Haqlaniya had a library at that time. A moderate and inverse association is found to exist between urban size and both the designed capacity of the libraries (-0.635) and the utilised capacity (-0.432), measured in seats per 1000 persons. This moderate association, if taken as an indication of the level of provision of public libraries, suggests that the level of provision of this service is higher in smaller urban areas than in larger ones. However, it is necessary to note that there is much concern about the provision of such services which are related with the enlightment of the masses and raising the level of their education, whether in general and/or in specialised terms. Accordingly six more public libraries were committed in the study areas in early 1981[1] to be located at all other Nahiya centres which did not have a public library at that time.

(B) Spare Capacity of Provided Services and Public Utilities

Analysis of previous sub-sections showed that, there is no clear trend of association between levels of services provided and the size of urban centres. While some services are higher in larger urban areas and generate a considerable amount of economies of scale and provide more rational utilisation of both manpower and equipment needed, it is found in other cases that the level of provision is higher in smaller urban centres. This is especially the case with services that require a minimum population larger than those of the smaller urban areas of the case study. Nevertheless, what is more important in assessing the urban growth distribution is the spare capacity of the provided services. The latter depend in addition to the chosen criteria stated earlier, on the long-range planning objectives in the country.

Table (8.14) summarises the additional population that could be accommodated in each of the existing urban centres proposed for further urban growth after the completion of the services schemes under construction, which the study assumes, for the purpose of the analysis of the spare capacities of services provision in the region, are actually implemented. The table also gives the expected monetary savings[2] as a result of utilising the expected potential capacities. Details of the method of extracting the additional population and monetary savings are explained in appendix (2). Additional population

(1) Ath-Thawra Daily Newspaper, (In Arabic), Baghdad, No. 3940, 11th March, 1981.

(2) The expected monetary saving given here represents a shadow value. They are given mainly for the purpose of comparison, hence they are not realistic values.

Table (8.14)

Additional Number of Population that could be Accommodated in Each of the Existing Urban Centres Proposed for Further Urban Growth and the Expected Monetary Cost Saving*

Urban Area	Water Supply		Telephone Service		Educational Services						Health Services		Public Libraries		Total monetary savings (I.D.)
					Kindergarten		Primary Schools		Secondary Schools						
	Population Number	Saving in monetary cost (I.D.)	Population Number	Saving in monetary cost(I.D.)	Population Number	Saving in monetary cost(I.D.)	Population Number	Saving in monetary cost(I.D.)	Population Number	Saving in monetary cost(I.D.)	Population Number	Saving in monetary cost(I.D.)	Population Number	Saving in monetary cost(I.D.)	
Ramadi Urban Node:															
Ramadi	181881	336745	130333	110094	Nil	Nil	Nil	Nil	Nil	Nil	135410	324567	18400	31096	802502
Habbaniya	Nil	Nil	Nil	Nil	Nil	Nil	9659	107022	3404	19811	Nil	Nil	28600	42000	168833
Hit Urban Node:															
Hit	3097	41829	Nil	Nil	Nil	Nil	Nil	Nil	3218	18903	Nil	Nil	34200	9741	70473
Kubaisa	Nil	Nil	Nil	Nil	1304	4994	205	2271	2927	17033	Nil	Nil	45400	9741	34041
Haditha Urban Node:															
Haditha	4971	46449	Nil	Nil	Nil	Nil	9761	37982	6119	19951	5246	44770	36800	5793	154945
Haqlaniya	Nil	Nil	Nil	Nil	917	3512	4761	37982	3954	19951	Nil	Nil	25200	5793	67238
Qaim Urban Node:															
Qaim	Nil	Nil	2150	9525	Nil	Nil	10670	116224	Nil	Nil	Nil	Nil	37200	53661	181410
Karabla	Nil	Nil	Nil	Nil	2657	10176	1352	14980	3734	21732	Nil	Nil	Nil	Nil	46888
Ubaidi	1982	26856	1117	4948	5266	20169	4153	46015	7431	43248	Nil	Nil	29400	49686	190922

* Details of the methodology of extracting the contents of the table are presented in Appendix (2).

that could be accommodated on the basis of spare capacities of both municipal and mail services were not calculated due to the absence of the standards for provision of such services. However, personal interviews with municipalities officials showed that there was no spare capacities in the provision of municipal services in any municipality within the region and the quantity of mechanical equipment and number of personnel needed by each municipality is a strong indication of such absence. The case is almost the same with regard to mail services. Additionally, the relative importance of per capita capital and annual running costs of mail services is very low and it could be neglected. The field survey showed that the average per capita capital and annual running costs of mail services provision to be 0.27 I.D. and 0.87 I.D. respectively compared to that of all the investigated services which is found to be 153.42 I.D. and 58.43 I.D. (see appendix (3)). The third type of service which has not been included in this analysis is the electricity service, where no access to the detailed data of the committed projects was possible. However, a tentative conclusion can be reached since all the urban centres which were not connected to the national grid at the time of the field survey are expected to be connected to the 132 KV. via sub-station within one year. Then it is expected that all the urban centres could be expanded without remarkable differences since the only differences will be in distribution cost which in turn are expected to be limited. Hence, excluding this service from the analysis, though it is found to contribute to about 9.39% and 8.39% of both average per capita capital and annual running costs of the total for all services (appendix (3)) would not affect the reliability of the analysis.

Taking each urban node separately, one can find that:

(a) For Ramadi urban node, considerable excess capacity exists among certain services which could be utilised to accommodate further urban growth. Ramadi City is shown to have the highest spare capacity not only with regard to Habaniya town which is located in the same urban node but also if comparison is made with any other urban node. Table (8.14), shows that there will be a spare capacities in water supply, telephone, health and public libraries services. The first three types of these services showed to have a potentiality to accommodate a number of population larger than the expected urban growth in this urban node. The relative importance of the services with spare capacity (measured in per capita capital cost) is about 21% of the total services. On the contrary, Habaniya town is shown to have a spare capacity in primary and secondary education, but not on a scale which could accommodate all the expected urban growth. It is shown to have a potential spare capacity in public libraries which could accommodate about 28600 persons. The latter service contributes only 1.1% of the total per capita capital cost of the total provided services.

Saving in monetary cost also suggests that Ramadi City is the most economical place of urban growth where, if the per capita capital cost of services provision is assumed to continue as it was found to be in the field survey,[1] then around 800000 I.D. could be saved by expanding Ramadi City against about 168000 I.D. in case of expanding Habaniya town.

According to the above analysis, to achieve the highest capital saving on service provision, Ramadi city will be given the highest priority for urban growth with 3 points while Habaniya will be given only 1 point.

(1) The above assumption is unrealistic as a result of the world wide phenomenon of inflation. However, since inflation is expected to be in the same rate for every urban centre, then the comparative analysis will not be distorted.

The establishment of completely new urban centres seems particularly expensive.[1] Since provision of any service is from scratch, the capital cost involved will be relatively high compared to expansion of existing urban centres. The annual running cost is expected to be even higher, where an entirely new staff is required. In addition to higher costs problem, the new urban centres are mostly small in size (in case of Ramadi urban node around 10000 persons). This small size of urban centres implies that the quality and type of provided services will be limited to the very necessary ones and those with small population thresholds. Hence, in this urban node, new town creation will be given a lowest priority with 1 point.

(b) For Hit urban node, the lowest rate of spare capacities are found in this urban node, with no remarkable differences between the two existing urban centres suggested for urban growth (Hit and Kubaisa towns). Tables (6.7) and (8.14) indicate that Hit has the potentiality to accommodate almost half the expected urban growth, as far as water supply and secondary schools are concerned. The spare capacity in public library services could serve the whole of the expected urban growth in this urban node. These three services contain only 13.5% of the total capital cost. Taking into consideration the coverage capacity of both water supply and secondary schools, then the capital cost savings of services will be reduced to about 7% only. The saving in case of Kubaisa town is even smaller, where there is only a significant spare capacity in secondary, kindergarten and library services, which contain about 7.5% of the total capital cost. Again taking the coverage of the available spare capacities of the total expected urban growth in this urban node, then the saving in capital cost of providing all the services will be reduced to about 4.5% only.

(1) United Nation, Urbanisation, World Bank, New York, 1972, P.27.

However, if the expected urban growth is distributed among these two urban centres, then the overall percentage saving will go up.

The above analysis suggests that Hit might be given the highest priority with 3 points and Kubaisa second priority with 2 points. For the suggested new town, since the total expected urban growth in this urban node is small (5764 persons), the cost of provision of services will be high, especially the water supply cost and in particular, the capital cost. This is a result of the new towns' location which is about 20 km. from the river. No other safe water source exists. Accordingly this alternative will be given the lowest priority with 1 point.

(c) For Haditha urban node, Haditha town was shown to provide the highest percentage savings in the cost of provision of services. The spare capacities in water supply, primary schools, secondary schools, health and public libraries services could accommodate additional population even larger than the expected urban growth in this urban node. (See table (6.7) and (8.14)). Services with spare capacities in the town contain about 30% of the total capital cost of the whole services (appendix (3)). Haqlaniya town, as well has spare capacity in a number of services (table 8.14), but the services with spare capacity that could cover the whole expected urban growth contribute to about 12% of the total capital cost of the provided services. Hence, it provides less than half the monetary saving that could be achieved in expanding Haditha town.

Accordingly, Haditha town will be given first priority with 3 points and Haqlaniya town will be given second priority with 2 points. On the contrary, the cost of providing services in the suggested new town near Haditha dam, like the two other cases will be very high, especially the expected urban growth in this urban node is even smaller than the two other cases. Hence this alternative will be given the lowest priority with 1 point.

(d) For Qaim urban node, Ubaidi town is shown to have the highest potential spare capacity of services, with very marginal differences compared to Qaim town, the central town of this urban node, (table 8.14). Most of the existing services in Ubaidi were shown to have a spare capacity, but their coverage of the total expected urban growth differs. While the coverage is about 3.5% in case of telephone services, it increases to about 6% in case of water supply, 13% in case of primary schools, 16.5% in case of kindergartens, 23% in case of secondary schools and almost full coverage in the case of library services. Although the above percentage coverages seems to be low, they are very important with regard to the high level of the expected urban growth in this urban node which is about 45% of the total expected urban growth in the region.

Qaim town was shown to have spare capacity in telephone services, primary schools and public libraries only. The percentage coverage of both telephone services and primary schools are found to be about 1/3 of the expected urban growth. Spare capacities in Karabla town are very limited and they are restricted to education services with very limited coverage of about 4-12% of the total expected urban growth in this urban node.

The above analysis suggests that the spare capacity of services in the three urban centres, especially Uabidi and Qaim towns, should be utilised to get savings in monetary cost of services provision. Both Uabidi and Qaim towns will be given the highest priority with 3 points each, while Karabla town, due to the very limited spare capacities available which do not contribute significantly in monetary savings, will be given the lowest priority with 1 point. The suggested new town will be given lowest priority with one point also, since provision of services in it will start from scratch leading to higher per capita costs, especially the per capita annual running costs.

8.4.2. Cost of Provision of Services and Public Utilities

It has been seen in chapter four that there has been a number of inconclusive studies on the relationship between city size and public services costs. The theoretical formulation developed by Evan in 1972 suggested that a close correlation exists between the cost of services provided and the size of urban areas. Richardson and Thompson have also emphasised that public services and utilities do show economies of scale up to specific population sizes which differ according to the type of the service under investigation.

Empirically, a number of analysts have also attempted to find the relationship between the cost of provision of public services and sizes of cities using cross-sectional data. Based either on empirical observation or upon engineering estimates, such studies found that for some urban services such as water, sewage, public transport, road, construction, school operation and so on, cost functions are u-shaped, initially declining and eventually rising at higher levels of either provision or urban population.

Hence, this part of the analysis provides an economic assessment to the cost of provision of different services according to the size of urban centres in the U.E.R. It tries to discover the relation between urban size and both the capital and annual running costs of the investigated services and whether economies of scale are achieved in larger urban centres or not.

In an attempt to test these relationships, per capita capital and annual running costs of provision of services were calculated for each service in each urban centre of the study area(1) and then correlation and multiple regression analysis were used in the testing process. These techniques appear as the most obvious techniques to use for such sort of analysis and have been widely applied in the regional planning literature in the search for functional relationships between a number of spatial patterns. The basic concept of multiple regression is "...to produce a linear combination of independent variables which will correlate as high as possible with the dependent variable. This linear combination can then be used to "predict" values of the dependent variable."(2)

The computer programme used was from the Statistical Package for Social Science. The sub-programme written into the computer was the "Step-Wise Multiple Regression". Step-Wise regression is a quick and efficient method which provides a near optimum solution to the problem at question. "It provides a means of choosing independent variables which will provide the best prediction with the fewest independent variables."(3) At each stage, one variable is added to the regression. The variable added is the one that is the best predictor.

To examine the above relationships, the analysis has been sub-divided into two sub-sections. Each sub-section will examine separately, the possible association between per capita capital and annual running costs, on the one hand, and urban size, on the other hand. Correlation Matrices presented in the last section are recalled again and will be used here in analysing and interpreting cost variation.

(1) For the details of the methodology of calculating both per capita capital and annual running costs,see section(7.3.1) and appendix (3).
(2) William C.Mitchell, "Multiple-Regression Analysis: Sub-Programme Regression", in Norman H Nie, et.al. (ed.), Statistical Package for the Social Sciences, Mark 6, P.175.
(3) Ibid, P.180.

(A) <u>Per Capita Capital Cost of Provision of Services and Urban Size</u>

In this sub-section, per capita capital cost is used as a dependent variable. The independent variables differ according to the type of service (see tables 8.15 to 8.23). The resulting summary of the multiple regression models, with the correlation matrices presented in the previous section reveal some interesting relationships which could be summarised, according to the types of the services provided, as follows:

(a) Municipal Services:

Correlation matrix, table (8.4) indicates that per capita capital cost of municipal services have a close and positive association with many other variables. The table indicates that a very high and positive association exists between per capita capital cost and each of the per capita areas of paved roads (0.840) and per capita park space (0.812). Per capita cost is also seen to have a high positive association with per capita annual running cost (0.713). On the contrary a low positive association is found between per capita capital cost and population size of the urban centres. It took the value of (0.230).

The multiple regression model, table (8.15), confirms that per capita capital cost of municipal services is positively related to population size. The latter factor is found to explain 22.9% of the variation in the dependent variable (the per capita capital cost). Beta values, which are standardised net regression co-efficients, and are used to assess the relative importance of each independent variable showed also that population size has the second most important role in explaining the per capita cost. It took the positive value of (0.499). The most importance factor to explain the variation in the dependent variable is found to be the per capita area of paved roads, with Beta value of (0.979).

The low positive association between per capita capital cost and population size does not mean that the larger urban centres do not offer economies of scale, but rather that, in general, the level of municipal services is higher in larger urban centres of the region (conclusion from the last section), which brought the relation to positive one. Another important factor expected to be contributed to this positive correlation, is the unknown percentage of some municipal services, particularly, mechanical equipment that are owned by higher order municipalities, but used occasionally in many other smaller order municipalities which lack them. These two factors, most probably brought the relation into a slight positive one instead of being a negative association.

Table (8.15)

Summary of Multiple Regression Model (Municipal Services)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.843	0.711	0.711	0.843	2.364	0.979
X_2	0.969	0.940	0.229	0.230	0.001	0.499

Where: Per capita capital cost is the dependent variable
X_1 = Per capita area of paved roads, and,
X_2 = Population size.

(b) Water Supply:

Per capita capital cost of water supply is shown to be inversely related to population size of urban centres. The multiple regression model, table (8.16) indicates that the simple correlation co-efficient between the population size and the dependent variable is negative. It took the value of (-0.390). The model also indicates that the per capita

Table (8.16)

Summary of Multiple Regression Model (Water Supply)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.560	0.313	0.313	-0.560	-0.615	-0.688
X_2	0.778	0.605	0.292	-0.390	-0.00003	-0.634
X_3	0.917	0.841	0.236	0.395	0.432	0.500
X_4	0.917	0.841	0.0006	0.347	0.027	0.032

Where: Per capita cost is the dependent factor,
X_1 = Percentage of distribution network in a good condition,
X_2 = Population size,
X_3 = Condition of the treatment plant, and,
X_4 = Per capita water consumption.

capital cost is not only inversely associated with population size but rather the latter has the second greatest significance in explaining or predicting the level of the dependent variable and is only marginally different from the value of the most important variable (the percentage of network in a good condition), where the R Square change[1] of the former independent variable took the value of 0.313, whilst population size took the value of 0.292. What confirms the inverse correlation between per capita capital cost and population size is the Beta value which took the value of (-0.634), against (-0.688) for factor number one. On the contrary, the condition of the treatment plant was shown to have a positive correlation with per capita capital cost. Both B, the partial regression co-efficient which measures the correlation between the independent variable and the dependent variable, and Beta values are positive. They took the value of (0.432) and (0.500) respectively.

(1) The R Square is the percentage of the variation in the dependent variable which is explained or predicted by the independent variable, The R Square change represent the contribution of every added independent variable to the value of R Square.

The per capita water consumption appears not to have any significant role in explaining the size of the dependent variable, where the form of the multiple regression in the table shows that, the partial regression co-efficient and Beta values are 0.027 and 0.032, denoting the insignificance of the factor.

To sum up, since no significant differences on the level of provision of water supply (conclusion from previous section), the supposition that the per capita capital cost of water supply is inversily related to urban size is confirmed.

(c) Electricity Services:

A high positive association is found between per capita capital cost of electricity provision and urban size. The correlation matrix, table (8.6), denotes that this association takes the value of (0.762). The high and positive association could be attributed to, first, higher level of service provision in the larger urban centres, represented by the very high level of per capita consumption of electricity in larger urban centres and a slightly better condition of the sub-stations and local diesel generators, (conclusion from previous section). The effect of the better conditions of sub-stations and diesel generators in larger urban areas seems to play a major part in raising the positive association between per capita capital cost and urban size. The very high positive and significant Beta value, which took the value of (0.854) confirms the importance of this factor in explaining, the high association between urban size and per capita cost of electricity provision. Second, electricity services may provide economies of scale in urban areas larger than those in the case study. The method of provision of electricity in existing urban centres of the study area, represented mostly by supplying the service to all urban centres of each urban node from its main urban centre and the proposed methodology of provision of this service, by 1982,

Table (8.17)

Summary of the Multiple Regression Model (Electricity Services)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.854	0.729	0.729	0.854	0.115	0.854

Where: Per capita capital cost is the dependent variable,
X_1 = Sub-stations and diesel generators conditions.

which will be by connecting the whole study area to four primary sub-stations could imply that the population threshold of electricity to gain significant economies of scale is in urban area larger than the existing ones in the region.

(d) Telephone Services:

A very high and positive association is found between per capita capital cost of this service and urban size. The multiple regression model, table (8.18), best expresses this high correlation, where the simple correlation co-efficient of urban size with the dependent variable found to be (0.849) and Beta value is (0.798) representing the most important factor in explaining the dependent variable. The actual telephone ratio is found to contribute considerably in explaining the level of per capita capital cost, where it is found to be a second most important factor in determining the dependent variable. The partial co-efficient regression, B, which took the value of 0.446 confirms the importance of this factor.

The close positive association of per capita capital cost with urban size, again does not mean, that economies of scale cannot be achieved with increasing population size, but rather it could be attributed, in this special case, to the differences of the technological level of different exchanges used in the study area, where in the central

Table (8.18)

Summary of the Multiple Regression Model (Telephone Services)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.849	0.721	0.721	0.849	0.00008	0.798
X_2	0.922	0.849	0.128	0.372	0.446	0.240
X_3	0.928	0.861	0.012	-0.133	-0.045	-0.120
X_4	0.932	0.869	0.008	0.419	0.009	0.086
X_5	0.935	0.874	0.005	0.473	0.047	0.117

Where: Per capita capital cost is the dependent variable,
X_1 = Population size,
X_2 = Actual telephone ratio,
X_3 = Percentage of distribution network in a good condition,
X_4 = Exchanges condition, and,
X_5 = Telephone ratio if full capacity of exchanges are utilised.

city (Ramadi), a very advanced (electronic and automatic) and modern (built in 1978) exchange with a very high spare capacity is used. In the second and third order urban centres, half autcmatic, and relatively older exchanges without spare capacities (except in case of Qaim town where a very limited spare capacity is found) are used. Finally exchanges used in the smallest urban centres are very old, magnetic and again without spare capacities (except in case of Ubaidi town). This of course, reflects highly the variation in the capital cost and consequently the per capita capital cost, even if the general conditions of most of the exchanges are good. Hence, if almost a similar, or at least, a limited difference in the technological level of different exchanges were prevailed, then a completely new relationship would be found. This new relationship may not be negative because of the capacity restrictions of using the very advanced exchanges in the smaller urban centres, where the threshold population of such exchanges is higher than the bearing capacity of these urban centres.

(e) Mail Services:

No significant association is found between urban size and per capita capital cost. The correlation matrix table (8.19),indicates that the correlation co-efficient between the two variables is -0.008. This zero correlation could be attributed to the fact, that mail services are of the type that exist in every urban settlement with limited differences in the level of provision. If the level of provision and type of mail and telegraph services are brought to almost a similar level in all the urban centres, then the almost zero correlation will be expected to be a negative one but low, indicating the possible economies of scale with increasing urban size. However, the per capita capital cost of mail services is very low, about 0.2% of the total per capita capital cost of the combined investigated services (appendix (3)), which will not affect the over all analysis significantly.

Table (8.19)
Correlation Matrix (Mail Services)

Variable	1	2	3
1	1.000		
2	-0.008	1.000	
3	-0.291	0.232	1.000

Where: (1) = Population size,
(2) = Per capita capital cost, and,
(3) = Per capita annual running cost.

(f) Education Services:

Unlike most the previous services, education services, especially kindergartens, primary and secondary schools, are characterised by lower population thresholds of providing them. To examine the economies of urban size in the case of education services, kindergartens, primary and secondary stages will be considered separately.

(i) Kindergarten Services:

It should be noted that the cost analysis in this case does not include all the urban size ranges. Urban centres less than 5000 inhabitants were not provided with this service.

The correlation matrix, table (8.9), shows that per capita capital cost of kindergarten provision increases highly with increasing the attendance ratio. It correlates highly and positively with attendance ratio at a level of 0.788. On the contrary, per capita capital cost correlates inversely and moderately with population size of the urban centres, the number of pupils per teacher and the percentage of buildings built in 1975 and after. These relationships took correlation co-efficient values of (-0.569), (-0.540) and (-0.512) respectively.

The multiple regression model, table (8.20) confirms the inverse correlation between urban size and capital cost, where, Beta took the highest value in the model (-0.540). The model also shows that attendance ratio is the most important factor in explaining the level of

Table (8.20)

Summary of the Multiple Regression Model (Kindergarten Services)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.788	0.621	0.621	0.788	26.115	0.288
X_2	0.857	0.734	0.113	-0.512	-0.068	-0.538
X_3	0.859	0.738	0.004	-0.569	-0.0001	-0.540
X_4	0.869	0.756	0.018	-0.157	0.154	0.343

Where: Per capita capital cost is the dependent variable,
X_1 = Attendance ratio of children at age 4-5 years,
X_2 = Percentage of buildings built in 1975 and after,
X_3 = Population size, and,
X_4 = Pupils per class.

per capita capital cost. The Beta value of this factor took the value of (0.288). The second important factor in the model is the percentage of school buildings built in 1975 and after. The importance of the latter factor due to the high rise in the cost of building in 1975 and after compared to the previous years.

Finally, the recently implemented kindergartens in smaller urban centres will increase even more the inverse correlation of capital cost with urban size, because the capacity of the implemented buildings is higher than the actual needs of these urban centres, as the previous section clearly indicate.

(ii) Primary School Services:

Per capita capital cost of primary schools provision seems to have a very high and positive correlation with attendance ratio (0.871) and percentage of buildings built in 1975 and after (0.757), (see table (8.10)). Furthermore, these high correlations are confirmed by the results of the multiple regression model, table (8.21), which also depicts a positive association between the dependent variable, the per capita capital cost, and each of the attendance ratio and the percentage of school buildings built in 1975 and after where Beta values are found to be (0.689) and (0.511) respectively.

Table (8.21)

Summary of the Multiple Regression Model (Primary Schools)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0;871	0.759	0.759	0.871	4.316	0.689
X_2	0.994	0.987	0.228	0.757	0.312	0.511

Where: Per capita capital cost is the dependent variable,
X_1 = Attendance ratio of children at age 6-11 years, and,
X_2 = Percentage of buildings built in 1975 and after.

Although, the multiple regression model does not denote any importance to population size in explaining the per capita capital cost of primary schools, nevertheless, the correlation matrix, table (8.10), shows that a slight economies of scale could be gained in larger urban centres, where the simple correlation co-efficient between urban size and per capita capital cost took the value of (-0.213). Even with these slight economies of scale the capital savings is considerable, if the relative importance of the capital cost of this item to the total capital cost of the investigated services is considered, as it makes up 11.08% of the total. Moreover, not only are monetary benefits achieved in larger urban centres, but rather a better utilisation of school buildings are expected to be experienced at off school times, such as utilising the buildings for adult education or utilising the main hall of the school as a theatre, for public meetings and so on. This is because such sorts of activities are expected to be practised more intensively in larger urban centres than in smaller ones.

(iii) Secondary School Services:

Per capita capital cost of secondary schools is shown to be inversely related to the use of school buildings in shifts and to population size, where the simple correlation co-efficients are found to be (-0.551) and (-0.305) respectively. On the contrary, moderate and positive association is found between the development variable and the attendance ratio. The importance of these associations, especially the ones between the dependent variable and both use of buildings in shifts and the attendance ratio is confirmed in the results of the multiple regression model, table (8.22), where use of buildings in shifts is found to be the most important factor in predicting the level of the dependent variable. In the second place comes the attendance ratio and then population size, with Beta taking the negative value of (-0.308) which confirms the inverse association between urban size and the

Table (8.22)

Summary of Multiple Regression Model (Secondary Schools)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.551	0.303	0.303	-0.551	-0.031	-0.469
X_2	0.711	0.505	0.202	0.392	1.380	0.452
X_3	0.751	0.564	0.059	-0.305	-0.00004	-0.308
X_4	0.782	0.611	0.047	0.488	0.145	0.296
X_5	0.802	0.644	0.033	-0.128	0.037	0.231

Where: Per capita capital cost is the dependent variable,
X_1 = Percentage of buildings used in a shift system,
X_2 = Attendance ratio of people at age 12-17 years,
X_3 = Population size,
X_4 = Pupils per class, and,
X_5 = Percentage of buildings, built in 1975 and after.

dependent variable. Hence, like the case of primary schools, a slight, but relatively higher, economies of scale are expected in larger urban centres, with all the implications stated in (ii) above, are applied in this case as well.

(g) Health Services:

Per capita capital cost of health services, is highly and positively correlated both to the ratio of physicians per 10000 persons (0.766) and the ratio of paramedicals per 10000 persons (0.609). On the contrary, a very slight and inverse association exists with population size, where the simple correlation co-efficient took the value of (-0.114). This is further confirmed in the analysis of the multiple regression model, table (8.23), where both, B, and Beta have been shown to have almost zero values (-0.00001) and (-0.026) respectively, denoting the insignificance of the factor. The insignificance of association could easily be justified since the higher level of health services are only provided in the larger urban centres to serve both the population of those centres, as well as population of other settlements (urban and rural) which are lower in hierarchy. Hence, urban size is a determinant of the level of health services provision, since the population thresholds increase with the level and order of the service.

Table (8.23)

Summary of Multiple Regression Model (Health Service)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.766	0.587	0.587	0.766	0.804	0.568
X_2	0.773	0.598	0.011	0.609	0.073	0.168
X_3	0.776	0.602	0.004	-0.446	-0.789	-0.131
X_4	0.778	0.606	0.004	0.089	0.020	0.078
X_5	0.779	0.606	0.0005	-0.114	-0.00001	-0.026

Where: Per capita capital cost is the dependent variable,
X_1 = Ratio of physicians per 10000 persons,
X_2 = Ratio of Paramedical staff per 10000 persons,
X_3 = Ratio of dentists per 10000 persons,
X_4 = Ratio of beds in hospitals per 10000 persons, and,
X_5 = Population size.

Finally, the multiple regression model confirmed the importance of ratio of physicians in explaining the main part of variation in per capita capital cost of health services, where both, B, and Beta took the positive values of (0.804)and (0.568) respectively.

(h) Public Libraries Services:

Per capita capital cost of public libraries seems to decrease with increasing urban size. The multiple regression model, table (8.24) provides that population size is very important factor in determining the per capita capital cost, where it is found that both the simple correlation co-efficient and Beta value have the negative value of (-0.647), which suggests that economies of scale are experienced in larger urban centres.

Table (8.24)

Summary of Multiple Regression Model (Public Libraries Services)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.647	0.419	0.419	-0.647	-0.00004	-0.647

Where: Per Capita capital cost is the dependent variable,
X_1 = Population size.

The analysis of the per capita cost of different services suggest that economies of scale are gained in larger urban centres in many cases and per capita capital cost is inversely related to urban size in case of water supply, kindergarten, primary schools, secondary schools, health and public libraries services. Some of these inverse associations are very slight, such as in the case of health services, where the higher order services provided in larger urban areas reduced the negative association to a very low level. Services found to have negative association with urban size, whatever the level is, contribute to about 32% of the total per capita cost of all the investigated services.

For all the other services that have been found to have a positive association with urban size, it does not necessarily follow that they do not achieve economies of scale. Alternative explanations may follow such as, first that the higher level of provision of the services in larger urban areas raise the per capita cost of services, such as, municipal, electricity, telephone and mail services. Furthermore the concentration of higher order services in larger urban areas, which do not serve these areas alone but also the smaller urban areas in the hierarchy and rural settlers may add to this state. This is the case with health services, where higher order services in larger urban areas reduced the negative association to a very low level and electricity service provision, where some central assets in larger urban areas are used to provide the service in lower urban areas. Second, the utilisation of modern or more advanced technology in larger urban areas, which is more costly for provision of some services may also distort the expected inverse association between urban size and per capita capital costs of some services. This case applies to the provision of electricity again and telephone services. Finally, economies of provision of certain services are achieved in urban centres larger than those examined. This again could apply in case of electricity provision.

To sum up, economies of scale are achieved in providing many services. Larger urban centres justify the provision of higher order services which need a population threshold larger than smaller urban centres can offer. Finally, larger urban centres are the places where modern and more advanced technology can be adopted more efficiently.

(B) Per Capita Annual Running Cost of Provision of Services and Urban Size

Per capita annual running cost is used as a dependent variable here. Again the independent variables differ according to the type of the service (see tables 8.25 to 8.34). The very important relations revealed from the correlation matrices and multiple regression analysis are summarised according to the type of services provided.

(a) Municipal Services:

Analysis indicates that the per capita area of paved roads, the per capita capital cost and the actual mechanical equipment ratio are the most important factors affecting the level of per capita annual running cost of municipal services. The correlation matrix, table (8.4) indicates that a high and positive association exists between per capita annual running cost and the above factors. The correlation co-efficients of these factors took the values (0.874), (0.713) and (0.637) respectively. These positive associations are very logical, since they imply that a higher number of personnel is needed to provide the service and a higher maintenance, depreciation and other annual running costs are required. However, what seems unexpected is the very high and positive association between needed municipal staff and mechanical equipment ratios and annual running cost which took the values of (0.935) and (0.947) respectively. The above two ratios, of course, do not affect the actual per capita annual running cost, because they are expected to happen in future, hence they are accidental associations and have been excluded from the multiple regression model, table (8.25). The model suggests, that capital cost is the most important factor in explaining the level of per capita annual running cost. It confirms the

Table (8.25)

Summary of the Multiple Regression Model (Municipal Services)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.713	0.508	0.508	0.713	0.429	0.892
X_2	0.809	0.655	0.147	-0.208	-0.0003	-0.408
X_3	0.826	0.682	0.027	0.212	-2.360	-0.186

Where: Per capita annual running cost is the dependent variable,
X_1 = Per capita capital cost of municipal services,
X_2 = Population size, and,
X_3 = Actual municipal staff ratio.

high and positive association between this independent variable and the dependent variable, where both, B and Beta values took the positive values of (0.429) and (0.892) respectively.

Population size of urban areas has very low and inverse association with per capita annual running cost , where the simple correlation co-efficient took the value of (-0.208) and the negative sign of Beta value (-0.408) confirms the inverse association between population size and the dependent variable. The per capita annual running cost is expected to be more highly and inversely correlated with urban size if; first, the level and order of municipal services provided in all the municipalities of the study area is the same; and second, the unknown part of municipal services, especially the administrative and supervisory services, which belongs to larger urban centres but serving the smaller urban centres in the hierarchy is excluded.

Hence, economies of scale and more rational utilisation of both manpower and mechanical equipment are achieved in larger urban areas. This finding is of crucial importance and will highly effect the forthcoming analysis of other services, since the annual running cost of providing municipal services account for around 13% of the total annual running cost of the investigated services (see appendix (3)).

(b) Water Supply:

Analysis of annual running cost of water supply proved to have very logical association with other variables used. The correlation matrix, table (8.5), noted that, a very high and positive association existed between per capita annual running cost and per capita water consumption, on the one hand, and per capita capital cost, on the other hand. They took the values of (0.981) and (0.970) respectively. The first correlation implies that with increasing per capita consumption, the required personnel and chemicals needed increases and then the per capita annual running cost increases as well. The latter correlation, in part, may imply that the technology used is higher and relatively modern, hence it requires less employees to operate it. This is very logical since the size and spacing of settlements do not allow the utilisation of higher technologies that require population thresholds far more than most urban areas of the region provide. It also implies that with increasing the capital cost the maintenance and depreciation costs increase as well, where the latter two cost items represent an important part of running cost in case of water supply.

On the contrary, both percentage of distribution network in a good condition and condition of treatment plants were shown to affect the per capita annual running cost inversely. The simple correlation co-efficients took the values of (-0.663) and (-0.630) respectively. Again these negative associations are very logical ones, since the better the conditions of the capital assets the lower the cost of maintenance is expected to be.

The multiple regression model, table (8.26) clearly indicates that per capita water consumption is the most important and decisive factor which influence the level of the dependent variable, (the per capita annual running cost) where the Beta value was found to be (0.981), whilst neither of the other independent factors is shown to have any role in explaining the level of per capita annual running cost. However, the moderate and inverse simple association of per capita annual running cost with population size which took the value of (-0.525) implies that considerable economies of scale are achieved with increasing urban size. The simple inverse association could be adopted for the purpose of the analysis here.

Table (8.26)

Summary of Multiple Regression Model (Water Supply)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.981	0.961	0.961	0.981	0.089	0.981

Where: Per capita annual running cost is the dependent variable,
X_1 = Per capita water consumption.

(c) Electricity Services:

The analysis of data indicates that per capita annual running cost of electricity provision is inversely associated with per capita capital cost, population size and per capita consumption. The per capita capital cost seems to be the most important factor in determining the level of the running cost, where the correlation co-efficient is found to be high and negative. It took the value of (-0.773). This high and negative association implies that the higher the capital cost and technology used, the lower the annual running cost is. This is certainly true, since the utilisation of more advanced technology needs less personnel to operate and maintain it. The moderate inverse association of the dependent variable with urban size, which took the value of (-0.562), indicates the potential savings in the running cost that occurs as population of urban areas increases.

The inverse association and importance of capital cost and population size in explaining the level of per capita annual running cost is confirmed by the results of the multiple regression analysis, where per capita capital cost is found to have the greatest importance in predicting the dependent variable, with B having a value of (-0.801). The population size came in the third place with Beta value at order of (-0.361) emphasising the state of economies of scale with urban size, see table (8.27).

Table (8.27)

Summary of the Multiple Regression Model (Electricity Services)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.773	0.598	0.598	-0.773	-0.801	-1.247
X_2	0.858	0.737	0.139	-0.435	0.025	0.901
X_3	0.880	0.775	0.038	-0.562	0.00003	-0.361

Where: Per capita annual running cost is the dependent variable,
X_1 = Per capita capital cost of electricity services,
X_2 = Per capita electricity consumption, and,
X_3 = Population size.

The inverse and moderate association of per capita annual running cost with per capita consumption, which took the value of (-0.435), could be attributed to the fact that a considerable amount of electricity in the study area is consumed by larger industrial establishments. This prevailing pattern of consumption means that less personnel are needed in metres reading and accounting purposes which in turn will lead to savings in monetary running costs. Moreover the above unexpected inverse association is not confirmed by the multiple regression model, table (8.27), where the standardised regression co-efficient is found to be positive and very high (0.901).

(d) Telephone Services:

Per capita annual running costs do not show any significant association with any of the variables used in the analysis of this service. The correlation matrix, table (8.7), indicates that the highest correlation co-efficient is found between the per capita annual running cost and per capita capital cost which took the value of (0.295) which in turn is low.

The multiple regression model, table (8.28), confirms the insignificant role of the independent variables in explaining the level of

Table (8.28)

Summary of the Multiple Regression Model (Telephone Services)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.295	0.087	0.087	0.295	0.463	1.257
X_2	0.502	0.252	0.165	0.036	-0.00004	-1.020
X_3	0.529	0.280	0.028	0.218	-0.132	-0.193
X_4	0.530	0.281	0.001	0.218	-0.008	-0.053

Where: Per capita annual running cost is the dependent variable,
X_1 = Per capita capital cost,
X_2 = Population size,
X_3 = Actual telephone ratio, and,
X_4 = Telephone ratio if full capacity of exchanges are utilised.

per capita annual running cost, where all the independent variables used explain only 28.1% of the variation. Population size seems to be the most important factor, where 16.5% of the variation is explained by this factor.

The above analysis suggests that factors other than those included in the model are mostly affecting the variation in the dependent variable.

The interview of telephone officials in Al-Anbar Muhafadah, showed that apart from exchange operators, which exist wherever telephone exchanges are found, most other running services (maintenance, administration, supervising and connection works), in urban centres less than 5000 inhabitants, are undertaken by the staff of the higher order centres, mostly the Qadha centres. This pattern of running telephone services seems to have affected the pattern of the per capita running cost, making it higher in larger urban centres and overcoming the possible economies of scale of urban size.

(e) Mail Services:

Analysis of the per capita annual running cost of mail services suggests that a slight economies of scale can be gained with increasing urban size. The multiple regression model, table (8.29) clearly confirms this finding. The model indicates that, per capita annual running cost has a low and inverse association with population size, where the simple

Table (8.29)

Summary of the Multiple Regression Model (Mail Services)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.291	0.085	0.085	-0.291	-0.00001	-0.290
X_2	0.371	0.138	0.053	0.232	0.427	0.229

Where: Per capita annual running cost is the dependent variable,
X_1 = Population size, and,
X_2 = Per capita capital cost.

correlation co-efficient took the value of (-0.291) and Beta took the negative value of (-0.290). However, neither of the independent variables used in the model explain significantly the variation in the dependent variable. This case, like that of telephone services, could be attributed to the unknown part of the running cost spent by larger urban centres to provide the service in smaller ones. This is true especially in the case of Ramadi City and to a lesser degree in other Qadha centres, where supervising the performance of the service in all the lower order urban centres is experienced there. In addition to the above factor, a more comprehensive and a higher order of mail services provided in larger urban areas contributed in reducing the negative association with urban size to a very minimum level. Accordingly, without the above inherent conditions of the mail system, more significant economies of scale could be gained with urban size.

(f) Educational Services:

Again to examine the cost savings in educational services, kindergarten, primary and secondary stages will be considered. Educational services play a very special role in the analysis of the annual running cost since they contain about 46% of the total per capita annual running costs (appendix(3)).

(i) Kindergarten Services:

Annual per capita running costs of kindergartens correlate highly and positively with both per capita capital cost and the attendance ratio. The correlation matrix, table (8.9), indicated that these correlations took the values of (0.933) and (0.921) respectively. These very high associations are very logical, since both of the factors reflect the higher level of provision of the service, which requires higher running cost. On the contrary, per capita annual running cost indicates to have a high and inverse association with population size of the urban areas and the ratio of pupils per teacher. The latter two correlations took the values of (-0.753) and (-0.680) respectively.

The above associations of the dependent variable are confirmed by the results of the multiple regression model, table (8.30). The per capita capital cost is shown to be the most important factor in explaining the variation in running cost, where Beta took the value of (0.491). Population size is shown to be the least factor affecting the level of the running cost. Hence, the differences in the level of provision of the service which shows to be higher in smaller urban centres, seems to be played an important role in explaining the high and inverse correlation co-efficient between the per capita annual running cost and the population size of the urban centres.

Table (8.30)

Summary of the Multiple Regression Model

(Kindergarten Services)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.933	0.870	0.870	0.933	0.056	0.491
X_2	0.980	0.961	0.091	0.921	3.750	0.364
X_3	0.993	0.986	0.025	-0.680	-0.013	-0.160
X_4	0.996	0.993	0.006	-0.753	-0.000004	-0.121

Where: Per capita annual running cost is the dependent variable,
X_1 = Per capita capital cost,
X_2 = Attendance ratio of children at age 4-5 years,
X_3 = Pupils per teacher, and,
X_4 = Population size.

(ii) Primary Schools:

Per capita capital cost and the attendance ratio, again are shown to be highly correlated with per capita annual running cost of primary schools. The correlation matrix, table (8.10) indicates that a very high positive association exists between the dependent variable and both the independent variables stated above. The correlation co-efficient took the values of (0.920) and (0.877) respectively. On the contrary, running cost, seems to have a low and negative association with population size, which took the value of (-0.359). The multiple regression model, table (8.31), confirms the special importance of per capita capital cost in explaining the variation of the dependent variable, where both, B and Beta took the negative values of (-0.077) and (-0.104) respectively. The table also confirms the very low and inverse association of the dependent variable with population size. This is a very logical finding since saving in salaries of the teachers, which constitutes the main part of running cost, could not be achieved as a result of urban size. Finally, pupils per teacher is shown to be an

Table (8.31)

Summary of the Multiple Regression Model (Primary Schools)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.920	0.847	0.847	0.920	-0.077	-0.104
X_2	0.935	0.875	0.028	-0.359	-0.000003	-0.007
X_3	0.943	0.889	0.014	0.877	6.799	1.472
X_4	0.995	0.990	0.101	0.291	-0.653	-0.714

Where: Per capita annual running cost is the dependent variable,
X_1 = Per capita capital cost,
X_2 = Population size,
X_3 = Attendance ratio of children at age 6-11 years, and,
X_4 = Pupils per teacher.

effective factor in explaining the dependent variable where both, B and Beta values took the negative values of (-0.653) and (-0.714) respectively.

(iii) Secondary Schools Services:

Attendance ratio is shown to be the most important factor in explaining the changes in per capita annual running cost. The multiple regression model, table (8.32) indicates that this factor explains 85.6% of the variation in the dependent variable. The simple correlation took

Table (8.32)

Summary of the Multiple Regression Model (Secondary Schools)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.925	0.856	0.856	0.925	6.469	0.969
X_2	0.978	0.956	0.100	-0.472	-0.255	-0.259
X_3	0.998	0.995	0.039	0.103	-0.493	-0.226

Where: Per capita annual running cost is the dependent variable,
X_1 = Attendance ratio of people at age 12-17 years,
X_2 = Pupils per teacher, and,
X_3 = Per capita capital cost.

the value of (0.925) and Beta took the value of (0.969). Pupils per teacher is also shown to have a moderate and negative association with per capita annual running cost. The, B and Beta values confirm this inverse association, where they took the values of (-0.255) and (-0.259) respectively.

Although population size does not seem to have any importance in explaining the dependent variable, nevertheless, the low and negative association with urban size (-0.331) (table 8.11) implies that a slight economies of scale could be achieved in larger urban areas.

(g) Health Services:

Not surprisingly, the ratio of paramedical staff per 10000 persons is seen to have the highest importance in explaining the per capita annual running cost of health services. This is because, the item of salaries and wages is a very important aspect affecting the total running cost of this service and because paramedical staff constitute a very important part of the health employment structure.(1) The multiple regression model, table (8.33), indicates that this factor contributed to about 83% of the variation, with the simple correlation

Table (8.33)

Summary of the Multiple Regression Model (Health Services)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.911	0.830	0.830	0.911	0.254	0.872
X_2	0.973	0.946	0.116	0.069	0.00009	0.338
X_3	0.982	0.965	0.019	0.764	0.182	0.193

Where: Per capita annual running cost is the dependent variable,
X_1 = Paramedical ratio per 10000 persons,
X_2 = Population size, and,
X_3 = Ratio of physicians per 10000 persons.

(1) The field survey showed that the average ratio of paramedicals per 10000 persons is 23.2 against 6.9 for physicians and 1.4 for dentists.

co-efficient taking the very high and positive value of (0.911). The Beta value confirms this very high positive association, where it took the value of (0.872).

Population size found to be the second factor in explaining the variation in the level of per capita annual running cost of this service. Although, the simple correlation co-efficient was found to be small and negligible, the Beta value confirms the positive association between the dependent variable and population size, where the latter took the value of (0.338). The very slight positive association between these two variables could easily be attributed, as in the previous sub-section (per capita capital cost of services) to the higher level and order of provided services in larger urban centres in the hierarchy, which without these qualitative differences, economies of scale would be very apparent.

Finally, the ratio of physicians per 10000 persons proved to have a very limited role in explaining the level of annual running cost, despite the high simple correlation co-efficient which took the positive value of (0.764).

(h) Public Libraries Services:

The multiple regression model, table (8.34), shows that 93% of the variation in the dependent variable is caused by the level of per capita capital cost. The importance of this independent variable is reflected by the positive and very high values of both the simple correlation co-efficient (0.966) and the Beta value (0.984), which suggest that per capita annual running cost is very highly and positively associated with capital cost. Increasing of per capita capital cost could be used as a measurement of higher level of service provided which consequently implies a higher running cost. On the contrary, despite the very low values of both, B and Beta (almost zero), the high and

Table (8.34)

Summary of the Multiple Regression Model

(Public Libraries Services)

Independent Variable	Multiple R	R Square	R Square change	Simple R	B	Beta
X_1	0.966	0.933	0.933	0.966	0.153	0.984
X_2	0.966	0.933	0.0005	-0.608	0.0000003	0.028

Where: Per capita annual running cost is the dependent variable,
X_1 = Per capita capital cost, and,
X_2 = Population size.

inverse association of population size with the dependent variable (-0.608), suggests that economies of scale could be achieved in larger urban centres and more rational utilisation of capital assets could be experienced.

The analysis of annual running cost of different services implies that unlike the capital cost, economies of scale are experienced in most of the investigated services, and an inverse association exists between the per capita annual running cost and population size of the urban area. The absence of the inverse association in very few cases could, in part, be attributed to the fact that part of the costs are spent by some larger urban centres to provide the services to smaller ones. This case applies mainly in the cases of telephone and mail services. It also extends to include all other services, where part of the administrative and technical staff assist smaller urban centres from the central city of the region, in providing these services. The administrative hierarchy then could be regarded as a factor in decreasing the negative association between urban size and per capita annual running cost of most services. Furthermore, differences in the level of provision of most services among different urban size groups also seems to play an important role in this decline.

The overall analysis of the cost of provision of services and public utilities suggest that, in general economies of scale could be gained by providing services in larger urban centres, by the more rational utilisation of both manpower and capital assets. This could result in a higher level and order of services being provided more economically which would serve not only the larger urban areas but the smaller ones as well. Furthermore, it should be noted that the size of urban centres in the region may be below the population threshold of providing the very specialised services and services that could utilise the very high and modern technologies. Hence, to experience at least some if not all the above stated advantages, the larger urban centres in each urban node should be expanded. For the purpose of the suggested urban growth strategy, these urban centres will be given the highest priority with 3 points. The other existing settlements will be given the second priority with 2 points, except Kubaisa town which will be given 1 point due to the very high per capita cost of provision of some services, especially water supply and in the future the sewage services. The suggested new towns at Habaniya tourist village, Hit and Haditha dam will also be given the lowest priority of 1 point since the population size expected to be accommodated in them is limited. It ranges between 3500-10000 persons.(1) Due to the higher number of population expected to be accommodated in the new town of Qaim urban node, which is around 32000 persons and which allow the provision of a relatively wider scale of services, hence this new town will be given the second priority with 2 points.

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(1) The size of population expected to be accommodated in the new town near Habaniya tourist village will be around 10000 persons and not 25000 persons(the total expected urban growth in Ramadi urban node) due to other limitations mainly the daily journey to work. The latter factor will be discussed in the next section.

8.4.3. Daily Journey to Work: travel time, travel time cost and cost of transportation

One of the most critical relationships is the link between homes and workplaces. This critical situation has been intensified in recent years with a trend toward increasingly concentrated employment and increasingly dispersed housing leading to longer journeys to work and its attendant problems.[1] This relationship, of course, is not the only one, but many other relationships exist, such as the ones between homes and shopping, entertainment, schooling and so on. Because of the lack of data on these relationships and the need for a detailed survey[2], which the time limitation of this study did not allow, the analysis has been restricted to the first relationship only (home/work relationship).

Having a long journey to work means a longer time is required for it, which may affect the time spent on other social and recreational activities of the commuter and may reduce his productivity as well. The latter case, is most probably valid in case of very long journeys to work (1-2 hours). Long journeys to work, on the other hand, mean higher transport cost and higher cost in terms of traveller's time. Accordingly, Planners' argue, that the daily journey to work (two way trip) should not exceed two hours. On the other hand, transport analysts have argued for years about the best value of a traveller's time in their studies. There is no agreement among them in this respect and the traveller's time has been given different values by different researchers according to the purpose of the journey. Beesely,developing

(1) Cambridge County Council, Cambridge Structure Plan, Report of Survey Consultation Draft, H.M.S.O., London, 1976, P.128.
(2) For details of the needed survey, see J.J.Warford, op.cit., Appendix II, P.181.

the notion of time costs of journeys, noted that the work trip time is valued at about one third of the wage rate.[1] Most commonly, in journey to work studies, time is valued as equal to the value of time in work. The original Roskill study of the Third London Airport, valued business travel time at the average hourly cost of employment.[2] Leisure time was valued at 25 per cent of average gross personal hourly income. The Commission recognised that these values were no more than estimates when they stressed that "...these figures are too crude to be used in anything other than an indicative sense. Any reliance on them is likely to be very misleading."[3] The South Atcham Scheme group also valued the time spent in travelling to agricultural work at the agricultural wage rate. However, although a number of economists have questioned such values, alternative values are difficult to estimate and harder to defend.[4]

In Iraq no domestic travel time costs exist. The foreign transport consultants dealing with transportation problems in Iraq, among them 'Scott Wilson Kirpatric and Partners', conducting at the present time a comprehensive transportation study for Baghdad city, in their economic assessments of the transportation plans they adopted some universal standards. A personal communication with Dr. A. Allos, one of the Iraqi transportation planners supervising the above mentioned study has reported that the study regards the travel time to work as a leisure time, hence work trip time is valued at 25 per cent of the wage rate. He added that in all previous transportation studies in Iraq this rate has been adopted. Thus, this rate will also be adopted in this study for the purpose of the analysis of the daily journey to work.

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(1) M.E.Beesely,"The value of Time Spent in Travelling:Some New Evidence", Economica, Vol. 32, 1965, PP.174-185.
(2) N.Lichfield,"Cost-Benefit Analysis in Planning: A Criteque...", op.cit., Appendix A and B, PP.180-181; and C.Choguill,op.cit., P.25.
(3) N. Lichfield, "Cost-Benefit Analysis in Planning: A Criteque....", op.cit., P.181.
(4) C.Choguill, op.cit., P.25.

However, it should be noted that whatever the amount of the value of the travel time to work is, there would be a value which affects the analysis of urban growth pattern in the U.E.R. Furthermore, since the study is a comparative one (comparing the differences in the travel time among different alternative strategies of each urban node), hence the proportional differences among different alternative strategies will be the same whatever the value given to the travel time is.

Hence, in analysing the daily journey to work, travel time, travel time cost and the cost of transporting employees will be taken into consideration. Details of table (8.35) and map (8.3) summarise the result of the analysis according to urban nodes.

(A) Ramadi Urban Node

The location of the committed basic employment in this urban node is mainly on the North west edge of Ramadi City. At this site, plans call for a glass and ceramic complex to provide 1446 new job opportunities. Not too far away, about 2 km, South west of the City, some 407 persons will be employed in the railway services of the area. The third major site of committed basic employment in this urban node, is at the Habaniya tourist village, which is about 20 km. off the Baghdad-Ramadi highway. The latter site will provide 1200 job opportunities.

According to the above spatial distribution of basic employment, the resulting pattern of daily commuting to work suggests that, for the employment in both the glass and ceramic industries and railway services, could be better accommodated in Ramadi City since, the travel time, travel time cost and cost of transportation are lower in this case compared to the two other proposed alternatives. The daily journey to work travel time is shown to be 20 minutes in the case of Ramadi City,

Table (8.35)

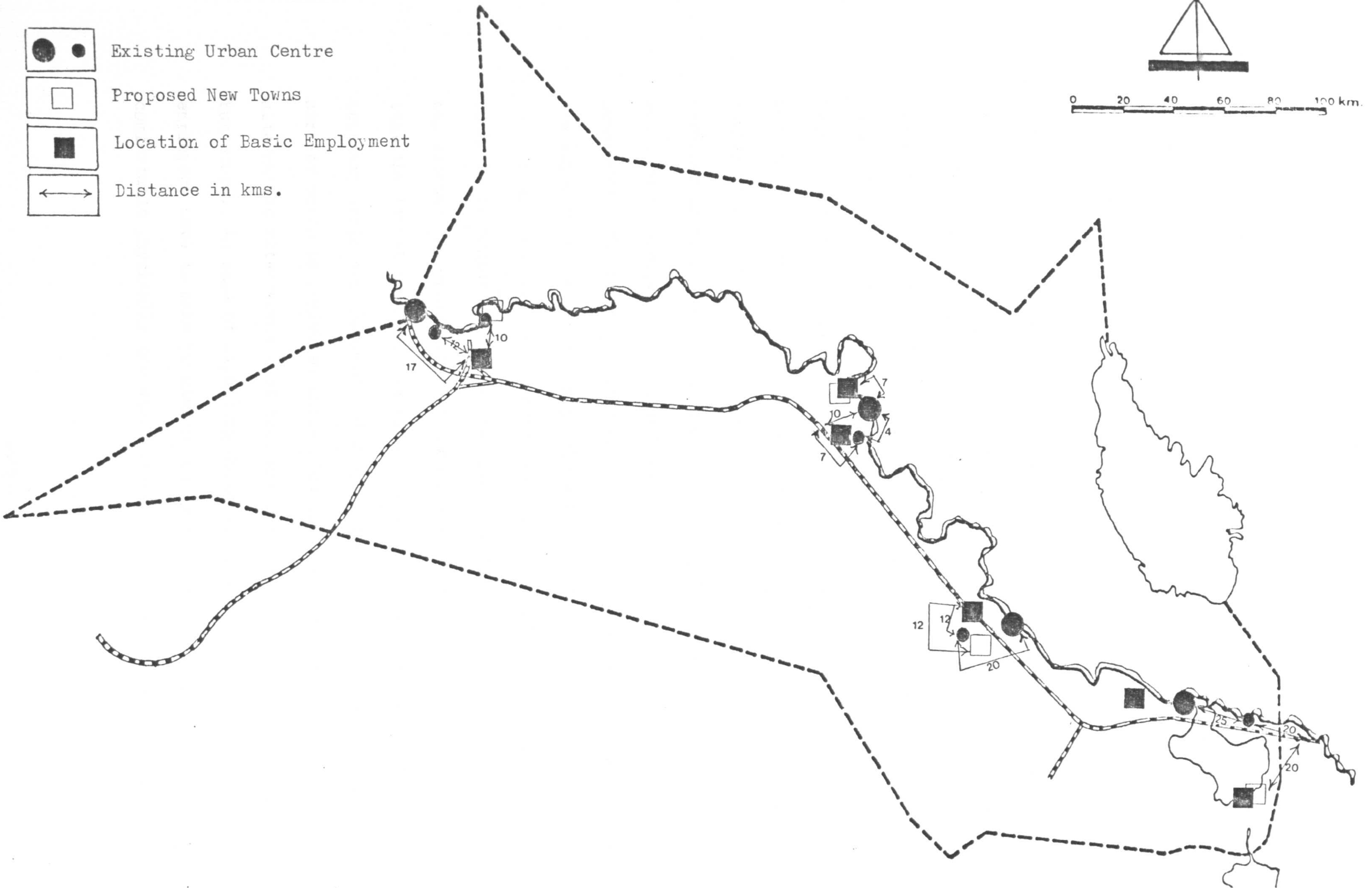
Daily Journey to Work: Travel Time, Tra vel Time Cost and Transportation Cost*

Urban Node	Location and Type of Basic Employ-ment	Suggested Place of Urban Growth	Travel Time per Person (minutes/day)	Total Travel Time Cost (hours/day)	Number of Needed Buses	Total Transportation Cost	
						Capital Cost (I.D.)	Annual Running Cost (I.D.)
Ramadi	Ramadi glass and ceramic complex	Ramadi	20	120.5	4	92000	46240
		Habaniya	50	301.25	12	276000	138720
		New Town	Not Valid	-	-	-	-
	Railway Services at Ramadi	Ramadi	20	34	2	46000	23120
		Habaniya	50	84.75	4	92000	46240
		New Town	Not Valid	-	-	-	-
	Tourist village	Ramadi	Not Valid	-	-	-	-
		Habaniya	90	450	10	230000	115600
		New Town	Within Walking Distance	0	0	0	0
Hit	Railway Services at Hit	Hit	20	9	1	9500	11560
		Kubaisa	35	15.5	1	23000	11560
		New Town	35	15.5	1	23000	11560
	Cement Factory at Kubaisa	Hit	60	150	5	115000	57800
		Kubaisa	25	62.5	5	115000	57800
		New Town	25	62.5	5	115000	57800
Haditha	Haditha Dam	Haditha	20	12.5	1	23000	11560
		Haqlaniya	40	25	2	46000	23120
		New Town	Within Walking Distance	0	0	0	0
	Railway Services at Haditha	Haditha	25	10.25	1	23000	11560
		Haqlaniya	20	8.25	1	15500	11560
		New Town	45	18.50	1	23000	11560
	Haqlaniya Stone Cutting Plant	Haditha	20	14.25	1	23000	11560
		Haqlaniya	Within Walking Distance	0	0	0	0
		New Town	40	28.75	2	46000	23120
Qaim	Qaim Chemical Complex	Qaim	40	425.75	22	506000	254320
		Karabla	30	319.5	22	506000	254320
		Ubaidi	20	213	11	253000	127160
		New Town	20	213	11	253000	127160
	Railway Services at Qaim	Qaim	40	224.25	12	276000	138720
		Karabla	30	168.25	12	276000	138720
		Ubaidi	40	224.25	12	276000	138720
		New Town	40	224.25	12	276000	138720

* For the details of the methodology of extracting the contents of the table see, Appendix (4).

Map (8.3)

Distances Between the Location of the Basic Employment and the Existing and the Proposed Urban Centres



against 50 minutes in case of Habaniya town and more than 2 hours in case of the suggested new town. Accordingly, there will be only 154.5 work wage hours lost in the case of a location at Ramadi City as against 386 work wage hours lost in case of accommodating them in Habaniya town. The transportation costs, in money terms, is also in favour of Ramadi City, where it is shown to be about a third that of Habaniya. It is found to be 138000 I.D. against 368000 I.D. for the capital cost and 69360 I.D. against 184960 I.D. for the annual running cost. The suitability of accommodating the committed employment of glass and ceramic complex in Ramadi City will even increase further if the residential complex of the existing factory, which is just west of the site of the factory, is expanded. This will not only lead to further decline in travel time, travel time cost and cost of transportation, but rather it will provide the opportunity for higher and more diversified services in this residential complex. The indirect and induced employment could be accommodated within any part of the city since they are mainly concerned with providing different types of services which many of them are expected to be centrally provided within the City.

On the contrary, employment created by tourist village in Habaniya could be accommodated in the new town with least, or if it is possible to say without any costs, where the analysis of the journey to work showed that the travel time will be within walking distance and accordingly no monetary costs are observed. Travel time cost in this case and the similar cases is neglected since accommodating the employees in alternative sites means that they are going to walk from their homes to bus stops. In case of expanding Habaniya town, this means that the employees have to make 90 minutes daily journey to work, which is not so comfortable physically and which means that there will be 450 work wage hours lost and a further capital and annual running costs of buses are needed for transportation, which are founded to be 230000 I.D. and 115600 I.D. respectively. Ramadi City has been excluded from analysis since the daily journey to work will be more than two hours. In addition to the problem of longer travel time, higher travel time cost and transportation cost which favour the new town location, the nature of the function of the tourist village needs a high proportion of the employees to be in an easy access to their place of work.

To sum up, the above analysis clearly indicates that, as far as the daily journey to work is concerned, the most suitable places for urban growth in Ramadi urban node are Ramadi City to accommodate the population increase resulting from the glass and ceramic complex and railway services and the proposed new town to accommodate the population increase resulting from the tourist village in Habaniya. Accordingly, Ramadi City and the proposed new town will be given the highest priority with 3 points each, whilst Habaniya town will be given the lowest priority with 1 point.

(B) Hit Urban Node

Out of the 708 committed job opportunities in this urban node, some 600 are located 12 km. north of Kubaisa town. The remaining 108 jobs are sited about 1 km. south of Hit. Such a spatial distribution pattern would suggest that basic employment could be accommodated in either of the three proposed alternatives (Hit, Kubaisa or the suggested new town), for each of the proposed sites are within an easy access to the location of basic employment.

Analysis of daily journey to work (table 8.35) reveals that, unlike the Ramadi urban node, the differences among various elements of the journey to work of the proposed alternatives are narrow, especially when measured in monetary terms. For railway services at Hit, although Hit town may be the most suitable and economical place to accommodate such potential employees of this service, the differences in travel time and travel time cost are, relatively speaking, not very high. They are 20 minutes per worker per day and 9 work wage hours lost per day, in case of Hit town as against 35 minutes and 15.5 work wage hours lost in case of both Kubaisa town and the suggested new town. The differences are even smaller if the monetary costs of transportation are considered. The capital and annual running costs were found to be 9500 I.D. and 11500 I.D. respectively, in case of Hit town as against 23000 I.D. and 11500 I.D. in the case of the two other proposed alternatives.

For cement factory employees, the analysis shows higher differences in travel time and travel time cost, with no differences in monetary costs. Hit town seems to have the highest societal transportation cost with 60 minutes per employee per day and 150 work wage hours lost per day, as against 20 minutes and 62.5 work wage hours for both Kubaisa and the proposed new town. The transportation costs in monetary terms were shown to be the same for all the proposed sites with 115000 I.D. capital cost and 57800 I.D. annual running cost in each case. The reason why there are no differences in the transportation cost among different proposed sites, despite having relatively high differences in travel time, is due to the fact that the number of buses needed for transporting the employees is equal and the differences in travel time does not allow, according to the assumptions adopted in this respect (See Appendix (4)), better utilisation of the buses, i.e., making more than one journey a day.

The above analysis suggests that the best places for urban growth, as far as the daily journey to work is concerned, in Hit urban node, are Hit town for accommodating railway services employees and either of the other two proposed sites for cement factory employees. However, since the cement factory is the major source of employment and since there are not major differences in the daily journey to work, in the case of the railway service employees, among the three proposed sites, Kubaisa town and the proposed new town will be given the highest priority with 3 points each, whilst Hit town will be given second priority with 2 points.

(C) Haditha Urban Node

The employment proposals for Haditha urban node are relatively modest and are concentrated in a small radius of about 8 km. of Haditha town centre. The most important of these is the Haqlaniya stone cutting plant which is located just 1 km. west of Haqlaniya town and about 4 km. from the centre of Haditha town. Of the others, 150 job opportunities will be created as a result of constructing Haditha dam, which is some 7 km. north west of Haditha town, and the remaining 99 job opportunities are in railway services, to be located about 10 km. south of Haditha town.

Like the case of Hit urban node, the prevailing spatial distribution pattern of the committed job opportunities would suggest that the basic employment could be accommodated in any of the three proposed alternatives (Haditha, Haqlaniya and the suggested new town some 7 km. west of Haditha), where the analysis of different aspects of the daily journey to work shows that the highest travel time is 45 minutes per employee per day. The differences in travel time cost and in monetary costs of transportation are very marginal.

However, the detailed analysis, table (8.35), shows that for Haditha dam employees, the suggested new town is the most suitable and economical place, since it is within walking distance of possible residential areas. For railway employees, either Haqlaniya or Haditha could be the most suitable place of urban growth, with Haqlaniya having a very marginal preference represented by lower capital cost of transportation and lower lost in travel time cost, (see table 8.35). For the stone cutting plant, Haqlaniya town is shown to be the most suitable place for accommodating its employees since it is within walking distance of the plant.

Accordingly, since the Haqlaniya stone cutting plant and Haditha dam are the major generators of basic employment in this urban node and since, the railway service employees could be accommodated in either Haqlaniya or Haditha towns, Haqlaniya and the suggested new town will be given the highest priority with 3 points each, whilst Haditha town will be given second priority with 2 points.

(D) <u>Qaim Urban Node</u>

Having the highest proportion of the committed growth in the region, Qaim urban node, is the most important. The suggested job creation schemes are, spatially speaking, highly concentrated. Akashat petro-chemical complex, which will employ 2555 persons, and the site of the railway services at this urban node, which will employ 1346 persons, are located some 17 km. and 14 km. from Qaim town. The size and the spatial pattern of the committed growth suggests that the daily journey to work analysis is far more important than the cases of Haditha and Hit urban nodes and a wider difference between the four alternative proposed sites could be found.

Details of table (8.35) reveal that for the Qaim Chemical Complex, Ubaidi town and the proposed new town north east of Ubaidi are the most suitable places for urban growth. The travel time, travel time cost and transportation cost are found to be at their lowest level in both areas, where the travel time is about 20 minutes per worker per day and the travel time cost is about 213 work wage hours a day as against 30-40 minutes and 319.5-425.25 work wage hours in case of Karabla and Qaim respectively. The differences in the capital and annual running costs of transportation are even higher. They are of the order 1 to 2.

For railway service employees, Karabla town is seen to be the most suitable place for accommodating these employees, where it is found that, the daily travel time (30 minutes) and the travel time cost (168.25 work wage hours per day) are lower than those which could be achieved in the three other alternatives (40 minutes and 224.25 work wage hours). However, no differences in transportation costs are expected.

The above analysis suggests that, as far as the daily journey to work is concerned, Ubaidi town, the suggested new town and Karabla town are the most suitable places to accommodate the expected urban growth, hence they will be given the highest priority, with 3 points each, whilst Qaim town will be given second priority with 2 points.

8.4.4. Availability of Land for Urban Growth

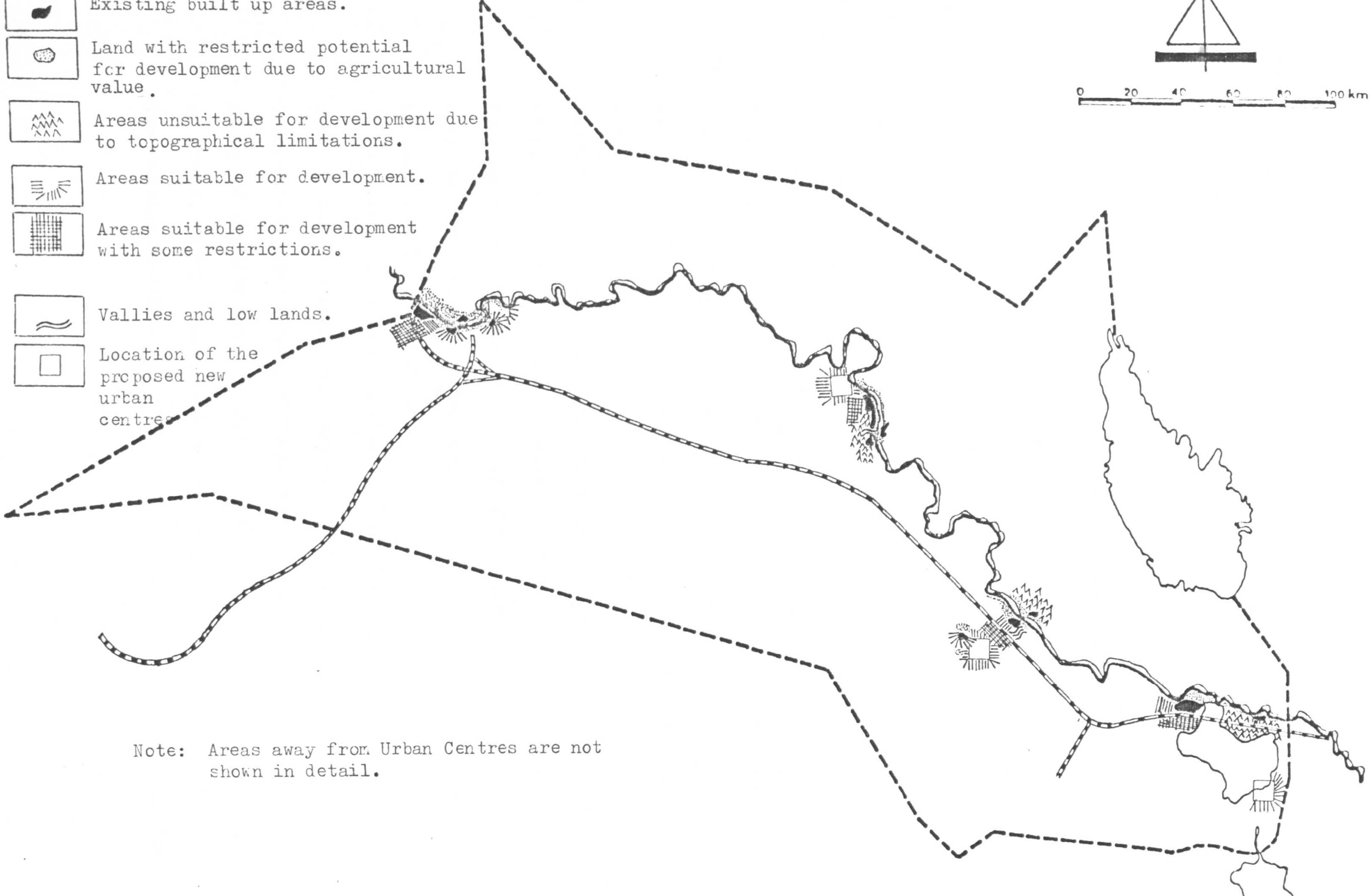
Availability of land for urban growth is defined as accessibility to a land without any agricultural value and without strong physical constraints, thus being economical for the purpose of urban development. These aspects have been regarded of special importance in deriving the appropriate urban growth strategy in the region and the availability of land for urban growth has been regarded as the first priority factor. The importance of this factor is due to first, as noted previously in chapter six , the region's lack of sufficient agricultural land to supply the present and expected population, with food supplies, especially the perishable agricultural products that are costly to transfer over large distances. The establishment of Haditha dam will adversely affect the agricultural situation at least temporarily as a result of the flooding of a considerable area of orchard and other land with high agricultural potential. Hence, in planning for any future growth in the region, the avoidance of agricultural land for such purposes should be practiced fully.

Second, even if all the positive consequences and aims of the other urban growth factors mentioned in table (8.1) are maximised in a specific urban area but there are physical constraints on the growth of that urban centre, such as, wide water fronts, extreme gradients and orientation of slopes, land liable to flooding, or man made restrictions such as motorways, main railway lines (which need a wide right of way) and polluting industries which need a large protection zone etc., then the expansion of that urban centre will be either very costly (in socio-economic terms) or in some cases, if the physical limitations are very strong, may be impossible.

From the study of the master plans of existing urban centres, personal interviews and discussions with both physical planners in the Physical Planning Commission of the Ministry of Planning and local planners at municipal level, and field visits to all the proposed areas for urban growth showed clearly that, taking all the above factors into consideration, most of the existing urban centres and all the proposed new towns have the potentiality of future growth with some qualitative differences, whether among the proposed urban centres of the same urban node or between those of different urban nodes. Table (8.36) and map (8.4) clearly confirms the above general findings which could be outlined according to different urban nodes, as follows:

Map (8.4)

Urban Growth Potential



(A) Ramadi Urban Node

In this urban node the growth potentiality of the proposed areas could be summarised as follows:-

(i) For Ramadi City, the current master plan of the city was produced in 1972 to cover the period until 1990. The area of the plan is occupied to a level of 80%, which means that about 20310 additional persons could be accommodated within the boundaries of this plan (see table (8.36)).

Apart from the potential urban growth within the existing master plan area, the city has unlimited potential of growth on the west (see map (8.4)), where the land is flat, the gradient level is very low and where the land has no agricultural value. The only limitation that should be taken into consideration if expansion is planned in this direction, is the site and layout of residential areas with regard to the glass industry, as this industry produces pollution. Even in the latter case the prevailing winds are generally north westerly and the suggested expansion is to the west of the industrial complex, which means that the pollution effects could be eliminated easily through a proper residential siting and layout. What varifies the argument is that the present residential quarter of the first glass factory is situated in the same suggested direction of urban growth without any noticeable pollution effects.

The city has the potentiality to expand to the south as well, but with some restrictions, where the growth should pass the railway lines and the main railway station in the region, with all the rights of way of the line and marshalling yards. This alternative direction of growth, at this stage, will be relatively more costly compared to the westerly expansion and could lead to some sort of separation of the

Table (8.36)

Urban Growth Potentials of Existing Urban Centres and the Proposed Ones

Proposed Urban Areas	Areas Available for Development (thousands m^2)	Number of Additional Population that could be Accommodated*
Ramadi Urban Node:		
Ramadi	Unlimited compared to	the expected urban growth
Habaniya	500	4545
New Town	Unlimited compared to	the expected urban growth
Hit Urban Node:		
Hit	2800	25455
Kubaisa	Unlimited compared to	the expected urban growth
New Town	Unlimited compared to	the expected urban growth
Haditha Urban Node:		
Haditha	2000	18182
Haqlaniya	500	4545
New Town	Unlimited compared to	the expected urban growth
Qaim Urban Node:		
Qaim	At least double the	expected urban growth
Karabla	At least double the	expected urban growth
Ubaidi	At least double the	expected urban growth
New Town	At least double the	expected urban growth

* It has been calculated on the basis of 120 m^2 per person in case of Ramadi city. This average per capita area requirement coincides with the average per capita area adopted by the prevailing Ramadi City master plan (1972-1990) which is 116.8 m^2 per person (see, Physical Planning Commission, Governorates Development Plans, 1981-1985: Master Plans for Cities, (In Arabic), Ministry of Planning, Baghdad, 1979, P.43). The new Industrial city of Al-Baker, also adopted the average of 120 m^2 per person, (see, Directorate Generate of Planning and Engineering, op.cit., P.32). For other urban centres (the smaller ones), the average of 110 m^2 per person is adopted. This in turn coincides with the planning standard in Iraq in planning for towns in such sizes which is between 100-110 m^2.

The average per capita areas includes; the residential uses which includes in addition to housing, the local roads, parking, incidental open spaces and children play areas, and; Ancillary uses which include central shopping areas, commercial facilities, community welfare and social facilities, open spaces provision and major roads.

city into two parts, especially since the rail line at this point will be a double track and it will be utilised very intensively for both passengers and goods transportation which also implies that a costly overpasses and/or tunnels would have to be built. In addition to the above restrictions, the land in this direction is liable to flooding of Al-Warar River. Hence, expansion in this direction at this stage is not feasible.

The growth of the city to the north is restricted by the very highly productive agricultural land and the rich orchards in the area which are both important to the agricultural production of the region, as well as their special landscape value. The Euphrates River is another growth limitation in this direction. To the east, Habaniya Lake prevents the city from any further growth in this direction. Apart from the above limitations, the ownership of land in the Northern and North eastern directions is a factor being either in private ownership or the right of utilisation belonging to private persons. The latter ownership form is called locally "Mamnuha Bel-Lazma". Both the very high agricultural value of land and the pattern of ownership raised the value of land in this direction to about 5-20 I.D. per square metre.(1) The value of land in all other directions is about 0.2 I.D. per donum. This is because land in these directions belongs to the State (locally is called Meri land) and has no agricultural value.

To sum up, Ramadi City has the potentiality of economical urban growth not only to accommodate the expected urban growth up to 1985, but even further urban growth that could be experienced beyond that time.

(1) The value of land in different urban areas of the region is obtained during the field survey from local planners and officials and represents the value as it was in 1980.

(ii) For Habaniya town, the urban growth potentiality is very limited. To the north is very good agricultural land, mainly utilised as orchards, which prohibits any urban growth. To the East and South the topography of the land puts limitations to expansion in these directions, where hills 20-30 metres in height above the plain ground level of the town exist. Hence, the expansion in these directions will make the process very costly, as far as the provision of services is concerned. The only direction for expansion of the town is to the South west its present boundaries, where some 500000 square metres, which could be utilised to accommodate about 4500 inhabitants, are in easy access to the proposed developments (see table (8.36) and map (8.4)). This population forms about 18% of the total expected urban growth in this node. Hence, this very limited urban growth potential should be preserved to accommodate the natural increase of the town.

(iii) For the new town, no real restrictions determine its establishment or future growth, where the land in all directions, except to the North where Habaniya Lake stands, is flat, economical to develop with no real agricultural value. Furthermore, the land belongs to the State.

The above analysis of urban growth potentials in this urban node, suggests that Ramadi City and the proposed new town will be given the highest priority with 3 points each, due to their unlimited growth potentialities compared to the expected urban growth and that expansion could be experienced in a very economical way, without facing threshold costs. On the contrary, the very limited potentiality of urban growth of Habaniya town and the additional costs that could be expected if urban growth is experienced extensively in this town suggests that it will be given the lowest priority with 1 point.

(B) Hit Urban Node

The relatively low expected urban growth in this urban node (5764 persons) could easily and without any threshold costs be accommodated in any of the three proposed areas (Hit, Kubaisa and the new suggested town), see map (8.4) and table (8.36), where:

(i) For Hit town, although physical and man-made restrictions of growth limit the expansion of the town, represented by the very highly productive agricultural land north east and to the north west of the town, the Euphrates River to the north and the lowlands with asphalt deposits to the south east, the only direction for the growth of the town is to the south, up to the railway line (about 1 km. south of the present boundaries of the town), the area could easily accommodate the expected urban growth. This direction provides 2,800,000 square metres of urban land which could accommodate, according to Iraqi planning standards, about 25455 persons, which in turn is almost about five times the expected urban growth in this urban node. This figure permits substantial urban growth beyond 1985.

It should be noted that recently, a new neighbourhood has been developed across the Euphrates River. Such development will be very costly when it comes to connecting the two parts of the town or in providing basic services. It also leads to the segregation of such a small town. Apart from these consequences, the available land for expansion on the other side of the river is a narrow strip between valuable agricultural and hilly lands which in turn, increases further the cost of development on this side. Hence, such a pattern for growth in a town of Hit's size should be denied and not encouraged at all.

(ii) For Kubaisa town, no restrictions on the growth of the town exist. The land available in almost all directions is flat, without any agricultural value, available in abundant areas and owned by the State.

The only restriction of growth is to the north, where valuable orchards exist. These orchards in addition of being utilised for agricultural purposes, could be utilised as a green belt to prevent the growth of the town in this direction, where a polluting cement industry is located some 10 km. to the north east.

(iii) For the suggested new town, in this urban node no restrictions, of any kind, determine its growth, whether for the time being or in the future.

The above analysis suggests that there are no restrictions on urban growth in this urban node. The urban growth potentials provide the opportunity for growth even beyond 1985, hence each of the proposed areas for urban growth will be given the highest priority with 3 points each.

(C) <u>Haditha Urban Node</u>

Unlike the two other urban nodes, existing towns in this node seems to be facing real physical restrictions, which could limit their growth. These limitations can be seen from the linear pattern of development of both Haditha and Haqlaniya towns, map (8.4). The urban growth potentials in this urban node could be summarised as follows:-

(i) For Haditha town, the Euphrates River from the east, Al-Ajlan Valley and the Haqlaniya town boundaries on the south and hilly lands, around 20-30 metres higher than the existing built up areas, from the west, represent the main obstacles of growth of the town. However, the upper part of the hilly land is relatively more accessible for the development than the lower part, despite being costly compared to development in fairly flat land. The upper part of the hilly land provides about 2 million square metres of land which could accommodate around 18000 inhabitants, see table (8.36).

It should be noted that about 50% of the land within the boundaries of the town are of very good agricultural value and are utilised as orchards. This land should be preserved for their crucial agricultural value.

(ii) For Haqlaniya town, limitations on its growth are even more severe than that of Haditha town. They are represented by the river and rich orchards from the east, hilly lands (25-35 metres higher than the existing built up areas) from the south and Al-Ajlan valley and Haditha town boundaries from the north. The only possible direction to expand the town, with some additional cost due to the high gradient of the land, is to the west, where around 500000 square metres are available which could accommodate about 4500 inhabitants, see table (8.36).

(iii) For the suggested new town near Haditha dam site, no restrictions are found to face the growth of this suggested town to a size many times as large as the expected urban growth in this urban node. The only direction to be avoided in future growth of the town is that of the river, where valuable orchards are concentrated.

Accordingly, the required 3500 inhabitants could be accommodated in either of the three suggested areas but with additional costs in both Haditha and Haqlaniya towns and without leaving a significant spare potentiality for the natural future growth of Haqlaniya town. Hence, the above analysis suggests that the suggested new town should be given the highest priority with 3 points, Haditha town will be given second priority with 2 points and Haqlaniya town will be given least priority with 1 point.

(D) Qaim Urban Node

Both table (8.36) and map (8.4) indicate that, not only the expected urban growth in this urban node can be accommodated within each of the four proposed areas, but rather further urban growth expected beyond 1985 could be accommodated in each of them on a considerable scale. The only restriction of growth, in this case, is the desirable direction of growth where:-

(i) For Qaim town, growth cannot be experienced in both northern and western directions due to the very good agricultural land and river restrictions on the north and the Syrian border on the south, where the boundary of the town at this direction represents the border of Iraq with Syria. Expansion of the town to the south can be experienced in an unlimited scale, but at present stage this direction of growth is not preferable due to the existence of a rail line and the expected growth would be beyond this line which will be relatively costly as a result of building either an overpass or tunnels to connect the town. However, unlike the case of Ramadi City the line at this point will be single track, which means the right of way will be narrower, and the frequency of utilising the line will be lower as a result of using it only for goods transportation.

The most economical and preferable direction of the growth of Qaim town is to the east, where the land is available in an abundant areas, without having any agricultural value and without any natural restrictions. Growth in this direction could accommodate at least double the size of the expected urban growth in this urban node.

(ii) For Karabla, Ubaidi and the suggested new town, expansion could be experienced in all directions, except in the Euphrates River direction, where no restrictions of any kind are prevailed and land is available to accommodate not only the expected urban growth but also a substantial growth that could be expected beyond 1985.

Accordingly, each of the four suggested places of urban growth, in this urban node will be given the highest priority with 3 points.

8.5. Summary

It should be noted from the beginning that due to the strong interlinkages between Chapters eight and nine, this chapter includes a fairly short summary. A more significant summary will follow Chapter nine, which will deal with both chapters to some degree.

In this chapter, three alternative urban growth strategies were proposed. Alternative one suggests that the expected urban growth could be directed to the main urban centre in each urban node. Alternative two suggests that the expected urban growth could be directed to the other proposed existing urban centres in each urban node. Alternative three suggests that the expected urban growth could be directed to the suggested new town in each urban node. The adoption of a control strategy in defining the alternative strategies was found to be helpful. It was found that the expansion of the existing urban centres is within the interest of the planning departments and coincides with the pattern of the committed economic development and the distribution of the major development projects in the study area. The new town option, as a radical option, was adopted because it is also within the concern of the Ministry of Industry and other planning department in the country.

The aims and objectives of the study were also defined at this stage. They have been derived from the analysis of the socio-economic and physical charactaristics of the study area. The declared national and regional aims and objectives were another source for the derivation of the aims and objectives of the alternative strategies.

This chapter also defined the factors that are expected to affect the urban growth pattern of the region and the weights given to them which reflect their importance. In whole, the factors incorporated in the analysis included socio-economic,physical, environmental and structural ones and the weights assigned to them to reflect their importance ranged from 1 to 3.

Finally, the first priority factors were tested in some detail in this chapter. The results of the analysis of these factors indicated that; First, the highest proportion of the spare capacities in the provision of some services concentrate in the largest urban centres, hence expanding the largest urban centre in each urban node will best utilise these spare capacities; second, economies of scale are experienced in providing many services. This is found to be more apparent in case of the annual running cost. In addition to the economies of scale that could be achieved in larger urban centres, the latter justify the provision of higher order services which need a population threshold larger than the smaller urban centres can offer. Furthermore, larger urban centres are the places where modern and more advanced technology can be adopted more efficiently; Third, the daily journey to work would be minimised, in all the four urban nodes, if the suggested new towns are created. On the contrary, the longest and most costly journeys to work would be in case of expanding the largest urban centres in each urban node except in case of Ramadi urban node where expanding Ramadi City will minimise them, and; Fourth, the creation of a new town and the expansion of the largest urban centres in each urban node could best achieve the most economical pattern of urban development as far as the availability of land for urban growth is concerned. They best preserve the good agricultural land.

CHAPTER NINE

TOWARD AN ALTERNATIVE URBAN GROWTH STRATEGY FOR THE U.E.R.

Two: TESTING OF THE SECOND AND THIRD PRIORITY FACTORS AND THE CHCICE OF A PREFERRED STRATEGY

CHAPTER NINE

TOWARD AN ALTERNATIVE URBAN GROWTH STRATEGY FOR THE U.E.R. TWO: TESTING OF THE SECOND AND THIRD PRIORITY FACTORS AND THE CHOICE OF A PREFERRED STRATEGY

INTRODUCTION

Following Chapter eight, this chapter will examine the second and third priority factors. It will evaluate the overall results of the analysis of the chosen urban growth factors and it will recommend what is thought to be the best urban growth strategy, taking into consideration the prevailed socio-economic and physical constraints. In choosing the preferred urban growth strategy a sensitivity analysis will be done through which the original assumptions of the study will be relaxed. This would help in testing the validity of the results of the study and whether its final conclusions would be changed highly, slightly or there would be no significant changes.

9.1. Analysis of Factors Affecting Urban Growth Distribution of the U.E.R. (Two: Second and Third Priority Factors)

9.1.1. Preserving Good Quality Landscape

The study of landscape on the regional or sub-regional level is generally looked at from the following points of view:(1) First, morphology of the area, i.e., the study of land form and physical charactaristics; Second, natural surface coverage, i.e., a study of type of cover (trees, grass, cropland) and its scale; Third, the study of the effect on agriculture, forestry and mineral working of the landscape; Fourth, the settlement pattern and degree of urbanisation, i.e., the extent to which the landscape was already occupied by urban and suburban development and the quality of such developments; and, Fifth, the general

(1) Leicester City Council and Leicestershire County Council, Leicester and Leicestershire Sub-Regional Planning Study, Report and Recommendations, H.M.S.O., 1969, P.144.

visual quality assessment, i.e., a subjective assessment of the landscape as a whole taking into account of the more particular elements mentioned above.

In principle, factors affecting change in landscape are on the one hand the loss of wood and trees, and on the other hand, the increasing introduction of man-made features. The rate of change in the man-made landscape is increasingly rapid and whilst some areas are capable of improvement, it is far easier to destroy than to restore natural landscapes which have taken centuries to develop.[1]

Since the main concern of this study is the achievement of a best distribution of the expected urban growth, the studies of the above elements, on a macro level, are beyond its scope.[2] What is of real importance here, is the micro study of landscape, i.e., the mutual relationship between the urban growth and the domestic landscape. This mutual relationship is represented, first, by preserving the very limited good quality landscape within the catchment area of the proposed places for expansion and/or new urban development, and second, the proper utilisation of these landscapes for aesthetical and environmental improvements of the proposed urban areas. To do so, natural, as well as man-made landscape preservation will be included in the analysis of this factor.

However, it should be mentioned that as of yet no objective survey method and techniques of analysis to be used for comparative evaluation of the landscape have been developed. Both the survey methods and the techniques to be used for comparative evaluation are highly subjective and based largely on visual criteria.

(1) Cambridge County Council, <u>op.cit</u>., P.140.
(2) Many of the elements of landscape are dealt with in Chapter seven, namely, the study of land and physical charactaristics of the study area, the agricultural potentials and the settlement pattern and distribution.

Water sites, orchards, and places with historic, archaeological or scenic interest are an important element in the U.E.R. landscape. These valuable elements can be summarised as follows:-

(a) Water Sites: water is an increasingly important element in the study area landscape. The most important water sites are, the Euphrates River, Habaniya Lake, Tharther Lake and Haditha Lake.

The Euphrates River runs through the study area from West to South east and has an extremely pleasant and charming character. The twisting behaviour of the river not only gives ample opportunity for such perception of natural landscapes seen from home, but improves the micro climate of the areas along it as well. In most parts of the river, especially between Hit and Ana towns, the traditional wheels which are still used in cultivation and the river's islands (Hawijas) which are rich with orchards and archaeological treasures, add further to the river's scenic quality. The river can therefore be considered, in addition to its special importance for cultivation, landscape value, and improving the micro climate, as a potential attraction for local recreational activities.

The three lakes within the region are spaced in a way which increase their importance in improving the micro climate and scenic quality of the study area. It also leads to a better and more economical utilisation of these water sources for different activities, mainly as tourist resorts, electricity generation, fishing and so on.

Habaniya Lake, the well known recreational site for day trips or short weekend holidays by Baghdadians, is located in the lower end of the study area. The recent, entirely new development to the south east of the lake will increase its importance as a tourist resort to serve many parts of the country, especially the U.E.R. itself and the central region of Iraq which includes, Baghdad, Daila, Wasit, Babylon, Kerebla and Najaf Muhafadhas.

Thurthar Lake, the largest among the three lakes, is to the east of the study area. In recent years, the lake has been utilised for swimming and boating on day visits from Baghdad.

Haditha Lake, which will result from the construction of Haditha dam is situated nearly in the central part of the study area. The location and the character of the lake seems that it will have a greater appeal than the two others. It will have greater scenic value. In their regional study, Planar's pointed out that, "Unlike the other lakes which have flat and featureless edges, this will have a distinctly featured shore line with cliffs and steep sides in places and a pronounced peninsular of land jutting out two or three kilometres into the lake from the southern shore. It will also have the appeal of being a major national achievement and a place to be visited."(1)

(b) Orchard Areas: As has been mentioned earlier, the Euphrates River is surrounded on both banks by farms and orchards creating a very rich contrast to the rather barren surroundings. Large areas of these orchards and farm lands are either within the boundaries of most urban areas of the region or just beyond their fringe, see map (8.4). Hence, any further urban development should avoid these areas due to their scenic values, improving the micro climate, as well as their extraordinary agricultural value. Apart from these orchards and good farm lands, the study area is very poor in vegetation where no wood land or any type of plants of real importance exist. Additionally, the natural vegetation is very poor, changeable and seasonal (found only in winter and spring seasons). It extends to include some common weeds,

(1) Planar, op.cit., Appendices of Stage One, P.F.6.

mustard, reeds, water lilies and grass[1] which have no significant importance in improving the landscape.

(c) Historical and Archaeological Sites: The study area has a rich archaeological heritage, and the knowledge of the existence of sites has increased rapidly in recent years as a result of extensive exploration.

Several existing towns in the study area are of historical interest. These urban centres are Ramadi, Hit, Haditha, Ana and Qaim. There are also several archaeological sites in the region, the most important of which are the river islands (Hawijas), the ancient rectangular walled city of Hindanu near Qaim dating from the old Babylonian period, the old citidel in Rawa dating from the Ottoman era, Ana's famous minerat, the town of Hadidanu near Haditha which has been important in every recorded period and Rapiqum, the most important early city in the southern part of the study area, dating from at least the Akkadian period (2300 B.C.).[2]

These places are not on the scale of some of Iraqis more famous historical sites. However, Hindanu and Rapiqum are very major sites. The remainder are unlikely to have more than local or regional importance, but do represent the study areas' heritage and as such help to provide a rapidly growing region with an identity and links with its long history.

Preservation and development of most of these historical and archaeological sites could be achieved in the preparation of the detailed local plans. This is particularly true in the case of Qaim, Karabla, Rawa, Haditha and Hit towns. The other historical sites are outside the boundaries of the urban areas and are of regional interest.

(1) Regional Planning Department, Planning for the U.E.R., op.cit.,P.157.
(2) For more detailed information about historical and archaeological sites in the study area, see, Appendix (5).

The above charactaristics of the landscape elements in the U.E.R. imply that, in general, the proposed pattern of growth of each suggested urban centre, presented in previous sections, coincides with the aim of preserving the landscape of good quality and utilising these landscapes in improving the built environment. This could be shown as follows:-

For Ramadi urban node; First, the suggested pattern of growth of Ramadi City to the west should avoid the good quality landscape along the river. At the same time it should utilise the proximity to Euphrates and Al-Warar Rivers and Habaniya Lake which means providing a pleasant environment to the newcomers; Second, the suggested growth pattern in Habaniya town should also avoid the good quality landscape along the river, but, as it has been seen, the proposed area for growth is very limited, which implies that any further growth would be at the expense of the good quality landscape; and, Third, the location of the suggested new town should take the advantage of being on Habaniya Lake which provides pleasant waterside scenery, with no limitation on urban growth of any type.

Accordingly, Ramadi City and the new town will be given the highest priority with 3 points each, whilst Habaniya town will be given the lowest priority with 1 point.

For Hit urban node; the suggested pattern of growth of each urban centre coincides with the aim of preserving the good quality landscape. The historical sites in Hit town could be preserved and developed, as important inheritance, through a detailed local plan. However, the location of both Kubaisa town and the suggested new town in the desert area do not provide the opportunity to get the benefits of being along the river's pleasant environment. The life in such places, as far as, climate is concerned, is hard. Hence, Hit town will be given the highest priority with 3 points, whilst the remaining two areas will be given the second priority with 2 points each.

For Haditha urban node; again the suggested pattern of growth of each suggested urban growth area coincides with the aim of preserving and improviding the good quality landscape. It also maintains pleasant waterside scenery of the Euphrates River and Haditha Lake in case of the suggested new town. The historical sites in Haditha town could also be preserved and developed through local planning. However, the above pattern of growth which took the landscape and environmental aspects into full consideration could accommodate a limited population in the case of Haqlaniya which means that any further expansion to accommodate the whole of the expected urban growth in this urban node, while still leaving a considerable area for future expansion, would be at the expense of the good quality landscape. Hence, Haditha town and the suggested new town will be given the highest priority with three points each, whilst Haqlaniya town will be given the lowest priority with one point.

For Qaim urban node; the suggested urban growth pattern of each urban centre coincide with the aim of preserving and developing the good quality landscape. It again utilises fully the pleasant environment of the Euphrates River. The historical tower of Qaim could be incorporated within the town and developed in a way which preserves its historical value. The only restriction on the suggested urban growth in this urban node is to the east of Karabla town, where the walls of the ancient rectangular walled city dating from old Babylonian period are still recognised on the ground. This site should be preserved and developed due to its special historical importance in this part of the region. However, the areas of land available on the other side of the town, still provide the opportunity to accommodate a far greater population than the expected urban growth in this urban node. Accordingly, all the proposed urban centres here will be given the highest priority with 3 points each.

9.1.2. Social Considerations: Social Relationships and Personal Preferences of Location and City-Size

Social considerations and individual preferences are other important factors in deciding the urban growth policy of any point in space. Both aspects have been given considerable attention in recent years in studying the question of city-sizes and distribution. Drawing a policy on a basis of maximising the economic benefits only is not adequate, unless the social relationships and individual preferences are incorporated within that policy or urban growth model. Earlier throughout this study, the importance given to such factors has been elaborated and optimal city-size models, such as, Laird and Mazek model of "City-Size Preferences and Migration," (1974) and Price model of "Individual Preferences and Optimal City-Size", (1978), relying on such factors in explaining the optimal city-sizes and distribution, have been presented and discussed.

In this study, unlike the above optimal city-size models, social relations and individual preferences will not be regarded as the only and most decisive factors of the U.E.R. urban growth model, but rather as an important aspect which with the results of the analysis of many other factors (economic, structural and environmental) will help in drawing a most appropriate distribution pattern of the expected urban growth in the study area.

Information for the analysis of social considerations and individual preferences are obtained mainly from the personal observations and communication with the study area different socio-economic groups and local officials, not only at the field survey period but rather since 1977, where the writer of this study participated in the planning committees involved with studying the question of resettlement of Haditha reservoir population. This relatively long-term involvement with the resettlement question helped in recognising the socio-cultural characteristics of the social groups in the region, establishing a more comprehensive outlook to the main social problems and helped to visualise the more reliable and realistic approaches of solving these problems, or at least minimising their consequences. It also helped in giving priorities to the solution side of these problems. Studies dealing with the social aspects of the study area are also considered of special importance in analysing this factor. These studies are mainly, "Planning for the U.E.R."[1], "Socio-Economic Study of the Haditha Dam Area"[2] and "U.E.R. Plan and Resettlement of Haditha Reservoir Population".[3] The findings of these studies are either based on field surveys and/or general observations and personal communication with different socio-economic groups and local officials in the study area. Both the findings from personal observations and communication and those resulted from the field survey confirm each other and could be summarised according to the two stated elements of the social considerations as follows:-

(A) The Social Structure of the Study Area

By social structure is meant the whole network of social relations in which the members of a given community are involved at a particular time. Of concern here is the social structure within the urban areas of

(1) Regional Planning Department, Planning for the U.E.R., op.cit., PP.245-257.
(2) Regional Planning Department, Socio-Economic Study of Haditha Dam Area, op.cit.
(3) Planar, op.cit., Appendices of Stage One, Appendix B, PP.B1-B10.

the region rather than the whole social structure (rural-urban). Hence, the analysis will concentrate on the social structure within urban areas. The family system and the degree of urbanism of the urban societies of the study area will be discussed here:-

(a) The family is the most fundamental and most important of all the components of the social structure. "It is an economic unit of production and consumption, a political unit within the confederation of the families that make up the clan, and finally a religious unit."(1) The family is also a unit with common interests and common culture. Planar's study pointed out that, the traditional family system in the study area is charactarised by being(2):

(i) extended, i.e., one household unites the father of the family, his wife or in exceptional cases wives, his unmarried children, his married sons and their families and maybe other relatives as well. In recent years, a considerable change has taken place in urban areas where married sons tend to move off to their own homes, and the unit of housing has changed accordingly to that of the simple (nuclear family). However, a considerable proportion of families are still of the sort of extended ones, and even in case of the simple families, links between families continues to be very strong. The conventional expectations of the traditional culture are that adult brothers will remain in contact with each other, and be mutually loyal and assist each other throughout their life time. Each married male is the head of his nuclear family, but he has obligations to his parents, brothers and sisters as long as they live. As a result, these considerations result in the extended family households with geographical propinquity.

(1) Ibid, P.B1.
(2) Ibid, PP.B1-B3.

Rapid urbanisation and industralisation are expected to fasten the breakdown of the traditional extended family. Widespread of education introduced will also further introduce new social values which counter the traditional way of life. All these economic and cultural transformations will lead the young people to favour independence;

(ii) Patrilineal, i.e., each individual belongs to his father's rather than his mother's line;

(iii) Patrilocality, i.e., a young couple generally lives in the locality of the husband's parents;

(iv) Patriarchial, i.e., the father is master of his family, while the eldest male who is head of the entire extended family as a ruler of the centre group;

(v) Endogamy, i.e., there is a general trend to marry within a relatively narrow circle. Marriages contracted in the large extended family have traditionally been preferred, and those between first cousins are still considered ideal, although they are less frequent than in the past. The relatively higher economic and cultural transformations in larger urban centres played a major role in breaking down the relative marriage system in these urban areas, especially the central city of the region (Ramadi) and Qadha centres urban areas, where marriage among relatives in such urban areas is far lower than in smaller ones and rural settlements,[1] and;

(vi) Occasionally polygymous, i.e., a man may marry more than one wife at the same time. The prevalence of polygamy has often been greatly exaggerated. Although it is lawful among Muslims, it is increasingly the exception rather than the rule. It is a very rare phenomenon in urban areas, especially the larger ones.

(1) A similar finding has been presented in the study of social relations of Haditha reservoir area, see, Regional Planning Department, Planning For...., op.cit., PP.249-250.

(b) Urban societies of the study area differ in the degree of urbanism, whereas in large urban centres, especially Ramadi City, a more urbanised way of life is practised while in the smaller urban centres, especially those evolved recently from large villages, tribal social structure and relationships are still noticeable. Both Planar's study and the regional planning department study of the region's development confirm the above generalisation, where Planar's study emphasised that "..., a distinction has to be made between old and new towns respectively, and between the indigenous population and recent immigrants. Newcomers tend to retain their traditional way of life, and therefore, their social structure is similar to that in their place of origin or village place. After a period of time they become more affected by the urban conditions and their social structure and even their family structure undergoes a considerable change."(1) The study added that, "In towns which evolved from large villages, and particularly in old towns which have preserved their traditional patterns of behaviour, the clan still plays an important role in determining the social structure among its members."(2) The regional planning department study also emphasised the same point. It found that traditions, values and systems of life of the social groups under investigation in Rawa, Parwana, Ubaidi and Karabla to be less urbanised than the social groups in Ana, Haqlaniya, Haditha and Qaim.(3) Accordingly, tribal relationships among the first group are more experienced. It is clear that, the first group of urban centres are smaller in size and mostly evolved from large villages while the second

(1) Planar, op.cit., Appendix B, P.B9.
(2) Ibid, P.B9.
(3) Regional Planning Department, Planning for...,op.cit., PP.246-247.

group is larger in size and have experienced a social, economical and cultural transformations throughout time. Such transformations led to the replacement of the tribal relationships by a new more urbanised and based on mutual interest. The rapid socio-economic and cultural transformations in the latter group of urban areas could be atrributed either to; their important location as transportation nodes, which introduced the local people to other social groups either from Iraq or Syria and the expected adoptation of new values and traditions as a result of such communication; or the shortage of traditional economic resources (mainly the agricultural potentialities) in and around larger urban areas compared to their human resources which forced the growing population of these areas to migrate to other parts of the country, especially Baghdad, the capital. This migration trend brought about new values (more urbanised ones) to the original areas of the migrants as a result of the strong linkages between the migrants and their families and relatives in their original areas. The existence of oil establishments at K3, south west of Haditha and Haqlaniya towns since 1932, also resulted in such transformations as a result of direct contacts between the local people at these areas and the British people which were exploiting these establishments.(1)

On the whole, the urban social structure based on the kinship system is weakening in small towns and in large urban centres, disappearing. Among the reasons for this are industralisation, urbanisation, the spread of education and the emergence of modern associations in the society. The trend of weakening the tribal social structure in the study area will even be accelerated as a result of the undergoing socio-economic development, where the declining importance of kinship ties in consolidating the social structure of the urban communities is generally accompanied by greater population size, density

(1) *Ibid*, P.248.

and heterogeneity.

Since the very traditional tribal relationships represent an under developed pattern of social life and economic organisation and do not cope with the needs of the socio-economic and cultural transformations, undergoing in the region and the country as a whole, then a more developed and open forms of social life and modern associations are needed. Hence, in planning for the distribution pattern of the expected urban growth, minimising the tribal relationships in existing urban centres and the suggested new ones is regarded to be of considerable importance. However, in smaller urban centres, where tribal relationships are relatively stronger and most of their population belongs to one clan or tribe, then such change should be scheduled in a very careful way over a longer period of time and cautiously to avoid any negative social consequences.

(B) <u>Preferences of Location and City-Size</u>

As a result of the strong family and social relationships in the urban areas of the region, one can easily find a general trend among urban settlers to live in their original places and in small groups. The most valuable study in this respect, which could be adopted for the prupose of analysing the personal preferences of location and city-size is the one conducted by the Regional Planning Department of the Ministry of Planning in 1977 entitled, "Socio-Economic Study of the Haditha Dam Area."(1) This study which was confined to the urban and rural settlements that will be flooded as a result of the establishment of the Haditha Dam, was based mainly on a field survey which included different socio-economic aspects of the population to be resettled. The field survey was carried out on the basis of a 10% random sample of urban and rural household heads in Ana and Rawa Qadhas. The study

(1) Regional Planning Department, Socio-Economic Study....,<u>op.cit</u>.

found that the majority of the inhabitants of Ana town (68%) preferred to remain in the vicinity of the new reservoir, see table (9.1). 12% of the inhabitants preferred the new town. Accordingly, the percentage of inhabitants preferring to continue to settle in the same community would be 80%. Only 15% of the existing population of Ana town prefer to move to other places of which 8% wish to go to Baghdad and 6% to Qaim Qadha where a phosphate complex is under construction. For Rawa urban population, a smaller percentage preferred to remain in the vicinity of the new reservoir (31%), whilst 36% of its inhabitants preferred to resettle in Qaim and Baghdad. These two preferred relocation sites do not reflect a desire on the part of the population of Rawa to shift up the community and/or to live in other urban communities, but rather reflect a concern about the future when the productive part of this town (the cultivable land) will be flooded. Hence they preferred places where alternative job opportunities could be found.

Table (9.1)

Future Location Desired (in relative terms)

Urban Area	Near the New Lake	New Ana Town	The Same Original Qadha	Haditha Town	Qaim Town	Baghdad	Other Areas	Total
Ana	68	12	-	1	6	9	4	100
Rawa	31	15	3	2	23	13	13	100

Source, Extracted from, Regional Planning Department, Socio-Economic ....., *op.cit.*, table A1, P.2.

The general trend of the urban population of Ana and Rawa to continue to live in a similar social environment to their previous one and within the same groups reflects the strong social soldarity among them, the attachment of the people to their environment and the willingness to continue to share the same common interest. This general trend could be found in other urban areas of the region but to a lower degree in Ramadi City, to a higher degree in the smaller urban centres and something inbetween in the remaining urban centres.

The urban population of Ana and Rawa not only prefer to continue to live in the same locality and environment, but rather they prefer to live within small communities. The above mentioned study (The Socio-Economic Study of the Haditha Dam Area) found that 42% of the urban population of Ana prefer to live in towns 250 families and over, whilst 43% prefer to live in urban areas smaller than 250 families. The remaining 15% of the inhabitants, showed no sign of size preference.[1] In Rawa town the situation is even more pronounced, where only 38% of its urban population prefer to live in areas with more than 250 families, whilst 54% of them prefer to live in settlements smaller in size than 250 families and 8% of the population had no size preference.[2]

Preference for small settlements also reflects a strong social soldarity and the willingness to live with very narrow social groups. It also reflects that a considerable proportion of the urban population in these urban areas either own or utilise agricultural holdings. The study found that about 31% of the urban population of Rawa and Ana were engaged in agriculture either entirely or as a second occupation.[3]

It could be generalised from the above analysis that the trends of population preferences to continue to live in their original localities and within small urban communities are applicable to other urban areas in the region with some expected qualitative differences. These trends are expected to be higher in smaller urban centres, especially those evolved from rural origin, lower in case of larger urban centres, such as

(1) Ibid, P.1.
(2) Ibid, P.1.
(3) Ibid, Table C1, P.10.

Hit, Qaim and Haditha and very weak in case of Ramadi City which is a more urbanised area, in the region, in whatever sense of the term.

The above analysis of social considerations, suggests that for distributing the expected urban growth in each urban node, the new towns could best meet the objectives of this factor. People willing to settle in most likely socially heterogeneous and small communities will join them. These new communities could be organised and built from the beginning on a modern basis and values of the society. Accordingly tribal structure and relationships could be eliminated in this case. Hence this alternative will be given the highest priority with 3 points in the case of each suggested new town.

In Ramadi City, the most urbanised area in the region, where the tribal relationships are very weak, the society is more heterogeneous than in other urban areas of the region and modern associations governing its society are more apparent. This city will be a preferable place to attract many groups, especially the skilled and qualified people and the groups of people which enjoy the social and recreational facilities of the larger urban areas. Larger urban areas mean a wider choice of housing, shopping centres, transport facilities and so on. Additionally Ramadi City itself will be the main source of the labour force required by the committed projects in this urban node especially the skilled personnel. The latter fact implies that the qualified personnel and other groups of the needed labour force who are originally from Ramadi City will prefer to continue to live in their city. Hence, expansion of this city will be given the highest priority with 3 points.

For the second order urban centres or the major urban centres in urban nodes, other than Ramadi urban node, such as, Habaniya, Hit, Haditha and Qaim, tribal social relations could be found. The newcomers would be expected to live in such towns although, at the first stage, some social problems may be found which could be solved through separation of the newcomers in special quarters of these towns. These urban centres and their hinterlands, on the other hand, provide a considerable proportion of the needed personnel to operate the development projects committed in their urban nodes. These employees would prefer to live in their original towns to keep their social relations. Expansion of these towns means a wider range of services could be provided which may be preferable to the newcomers. Finally their expansion means further weakening of the remaining tribal social structure which is a main aim of this factor. Hence, this group of towns will be given the second priority with 2 points each.

Finally, the smaller urban centres in each urban node will be given the lowest priority to expand with 1 point each. This is due to the fact that the tribal relationships in these urban centres are far more stronger and the acceptance of newcomers on a large number would not be acceptable by the original population of these towns. Such towns, on the other hand, are not the ones which the newcomers seeks to settle in, especially the qualified people who prefer to live in more open societies provided with wide range of urban life facilities and services.

9.1.3. Reinforcing the Existing Settlements and Increasing the Efficiency of the Settlement Pattern

As seen earlier in Chapter four, the national and/or regional system of urban centres plays an important role in the economic growth of any nation or region. It fulfils many other purposes that give justification to the view that it is an instrument for achieving national and regional growth. Among these other purposes it was found that the higher the order of an urban place in the hierarchy, the greater the opportunity of invention and adoptation of new ideas and technology are; innovations spread faster from central to middle-sized towns than from these to smaller ones and the adoption lags between the successive types of towns increase in length as the town size decreases; distance separating the central urban centre, the innovation generator, and the receiving centres affect the spread of the new innovations and ideas, where it is found to be inversely related to the distance separating the two areas; Hierarchy of urban centres permits specialisation, division of labour and differentiation in economic function. It offers a wider choice of location for different economic units and enables them to operate more efficiently; and, The leading city in a region plays an important role in the development of that region (the growth centre strategy).

Spacing of urban centres in the region is as important to the regional growth policy as the size distribution of them, whereas it has been seen earlier, Boventer in his analysis of interrelationships in space between urban centres, has argued that two main factors influence the ideal location for a city or a town: agglomeration economies gained by locating near a larger centre and hinterland effects which are small (or negative) near large cities because of competitive power but are strong at a distance because of the protection of a sheltered market area. According to Boventer, the optimal distance for a city is that which maximises the sum of agglomeration and hinterland effects.

Hence, due to the importance of both the size distribution and spacing of urban centres within the region for the well being of their population and growth and because of the unbalanced existing distribution and spacing of urban centres in the study area represented by the dominance of Ramadi City over the whole urban system, widening the deviation between the hypothetical and actual distribution patterns and the unbalanced hierarchy and spacing of the existing urban centres (see Chapter six), this factor has been given an importance in the analysis of the future urban growth pattern of the region. The introduction of this factor in the analysis then aims at improving the hierarchical pattern of urban centres in a way which promotes more efficient patterns of service provision, stronger interlinkages within the settlements of the hierarchy and hence establishes conditions that will encourage self-sustaining growth after 1985 and reduces the dominance of the regional capital city, Ramadi.

It should be noted from the beginning that the ribbon pattern of distribution of existing settlements along the Euphrates River; the spatial distribution of the committed basic employment; the lack of sufficient water resources, good agricultural land, basic infrastructure facilities and the environmental and natural constraints in areas outside the river basin are the main constraints of changing the present urban settlements pattern to a substantially more balanced one. However, the proposed alternative urban growth strategies indicate that a considerable change in the city-size distribution could be achieved, see table (9.2) and figure (9.1), with very limited or no change at all in the spacing of the urban centres due to the above mentioned restrictions. The expected city-size distribution pattern in 1985 could be summarised according to the alternative suggested urban growth strategies.

(A) <u>Alternative One: The Expected Urban Growth is Directed to the Largest Urban Centre in each Urban Node</u>

The resulting city-size distribution pattern according to this alternative implies that Ramadi City will continue to be the largest and predominant urban centre in the study area with a total population of about 117000 inhabitants, see table (9.2.1). Its predominance will

Table (9.2)

Expected City-Size Distribution in the U.E.R. by 1985, According to the Three Proposed Alternatives

1. If the Largest Urban Centre in Each Urban Node is Expanded(1)

Urban Area	Expected Size,1985(2)	% of the Largest City	Rank	Zipf Hypothetical Size	% of the Largest City
Ramadi Urban Node:					
Ramadi	116637	100.0	1	116637	100.0
Habaniya	21378	18.3	4	29159	25.0
New Town	9768	8.4	6	19440	16.7
Hit Urban Node:					
Hit	21514	18.4	3	38879	33.3
Baghdadi	1450	1.2	13	8972	7.7
Kubaisa	4500	3.9	10	11664	10.0
Al-Furat	950	0.8	15	7776	6.7
Muhamadi	1250	1.1	14	8331	7.1
New Town	-	-	-	-	-
Haditha Urban Node:					
Haditha	16578	14.2	5	23327	20.0
Haqlaniya	4850	4.2	9	12960	11.1
Parwana	2500	2.1	12	9720	8.3
New Town	-	-	-	-	-
Ana Urban Node:					
Ana	6850	5.9	7	16662	14.3
Rawa	5250	4.5	8	14580	12.5
Qain Urban Node:					
Qaim	44602	33.2	2	58319	50.0
Karabla	3150	2.7	11	10603	9.1
Rummana	850	0.7	16	7290	6.3
Ubaidi	550	0.5	17	6861	5.9
New Town	-	-	-	-	-

(1) Due to the inapplicability of this assumption in case of Ramadi Urban node, as far as the daily journey to work is concerned, (See 8.4.3) hence the expected urban growth is distributed among Ramadi City and the new town in accordance to the generated direct and indirect employment in each point (See 6.5.2).

(2) Calculated on the basis of 1980 population plus the expected urban growth to 1985 which is obtained from table (6.7). Urban centres which are not proposed for the purpose of the analysis of distributing the expected urban growth are assumed to be constant, as far as the population size is concerned.

decline relative to the 1977 position when the size of the second largest urban centre (Qaim town) will be about 33% of its size against 22% in 1977, i.e., the size of Ramadi City will decline from fourfolds to threefolds of the size of the second largest urban centre.

Qaim town, instead of Habaniya town, is going to become the second largest urban centre in the region with a population of about 45000 inhabitants. The expected change in the rank of Qaim town to second one is very important since Qaim town is just at the other end (west end) of the study area. Having an urban centre of such size in this part of the study area permits provision of a wider range of services, weakens the dependence of Qaim town and the nearby urban centres on Ramadi City, and will establish conditions that will encourage further future growth. Add to that the importance of the growth of Qaim town which will serve not only the regional population and economy but will also have a special importance in linking Baghdad and Ramadi, i.e., the Iraqi cities with Syrian cities, since it represents a mid point between these important urban centres.

According to this alternative, the relative importance (in population terms) of towns such as Hit and Haditha in the urban system will slightly increase. They will represent about 18% and 14% of the expected size of Ramadi City respectively, against 16% and 13% of its size in 1977. However, despite the insignificant increase in their relative importance, expanding such urban centres by about 39% and 28% of their size in 1977 will strengthen the interlinkages between different urban centres in the region, especially between the two main growth centres, Ramadi and Qaim. This is mainly due to the location of both Hit and Haditha towns which are some 60 and 160 km's to the north west of Ramadi City respectively. It also implies that a wider range of commodities and services could be provided for their populations and other urban areas and hinterlands connected to them administratively and spatially. On the contrary, the relative importance of all the other existing urban centres will decrease compared to 1977. However, almost all the urban centres which are not going to experience urban growth are within easy access to the main urban centres, where the expected urban growth is directed, according to this alternative. Hence they would benefit from the expansion of the main urban centres within their urban nodes. The benefit would be through having an easy access to a wider range of services and facilities provided in the latter urban centres.

Finally, this alternative permits the creation of a new town at Habaniya tourist village site to accommodate about 10000 inhabitants. However, due to the location of this new town at the eastern edge of the region and its relatively small size, its role in strengthening the overall urban system of the region is expected to be limited and confined mainly to the services provided by the tourist village.

The above changes in urban system imply that the deviation from the hypothetical pattern will be narrowed, (see figure, 9.1.1), compared to that of 1977, (see figure 6.2.2), especially in the upper and middle tails of the expected distribution curve. This means a more balanced distribution of city-sizes will be achieved. However, no influential changes in the spacing of urban centres are expected.

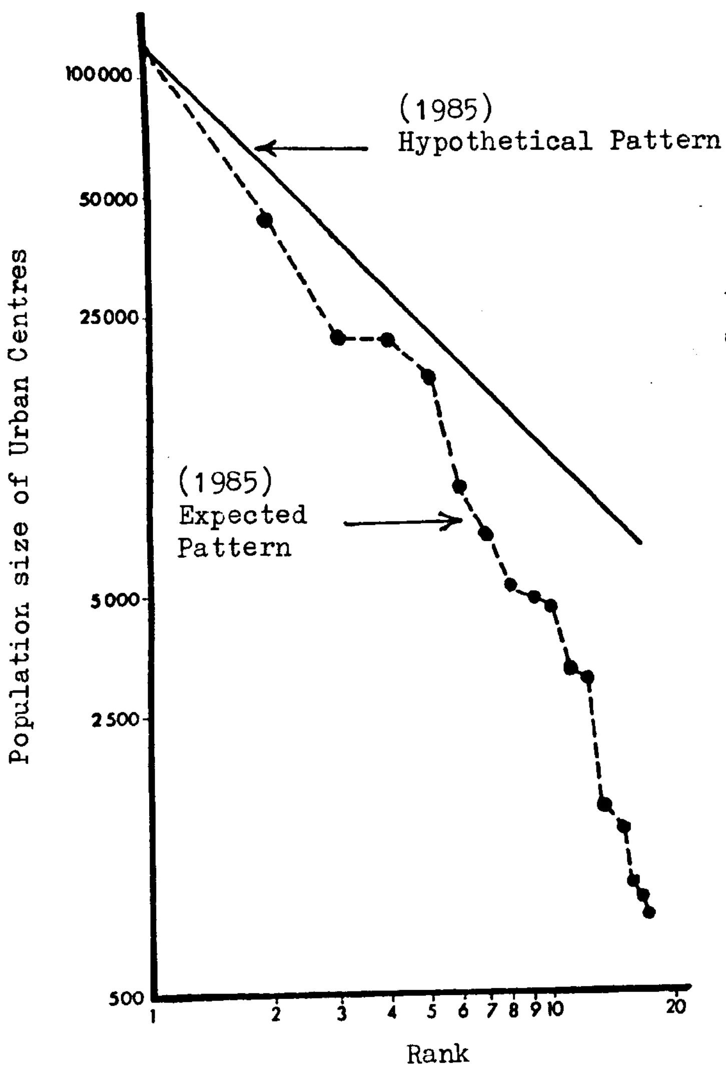
(B) Alternative Two: The Expected Urban Growth is Directed to the Proposed, Smaller Urban Centres in Each Urban Node

Although, it is assumed that, according to this alternative, Ramadi City will not experience any population growth, it will continue to be the largest city in the study area. However, its relative importance will decline as it will be no larger than twice the size of the second

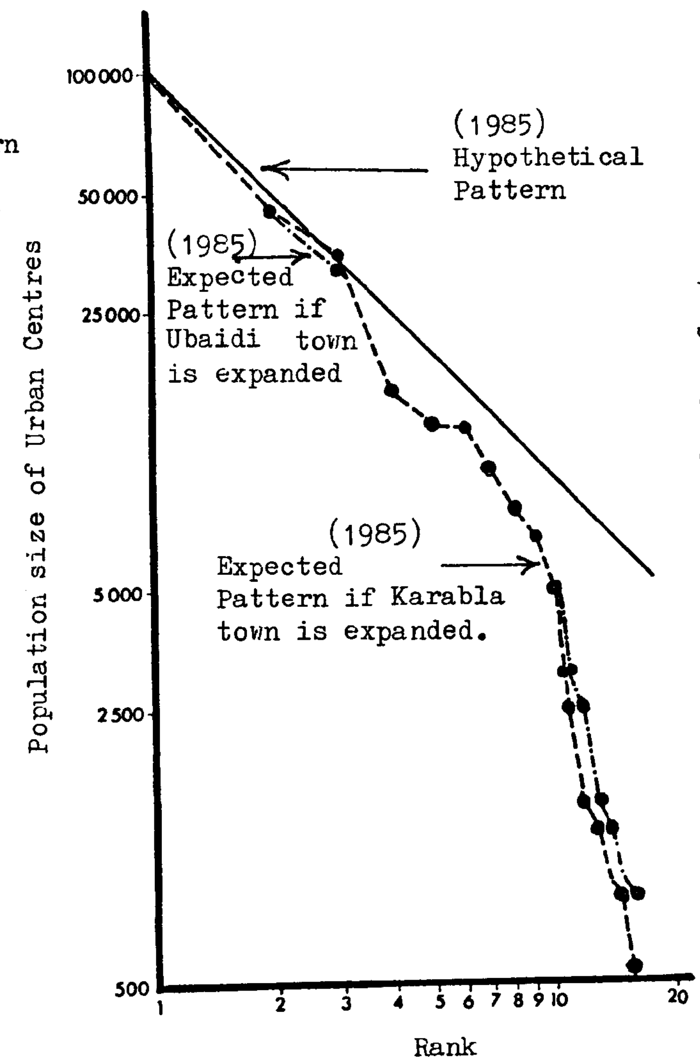
Figure (9.1)

Expected City-Size Distribution in the U.E.R. by 1985, according to the Three Proposed Alternatives:

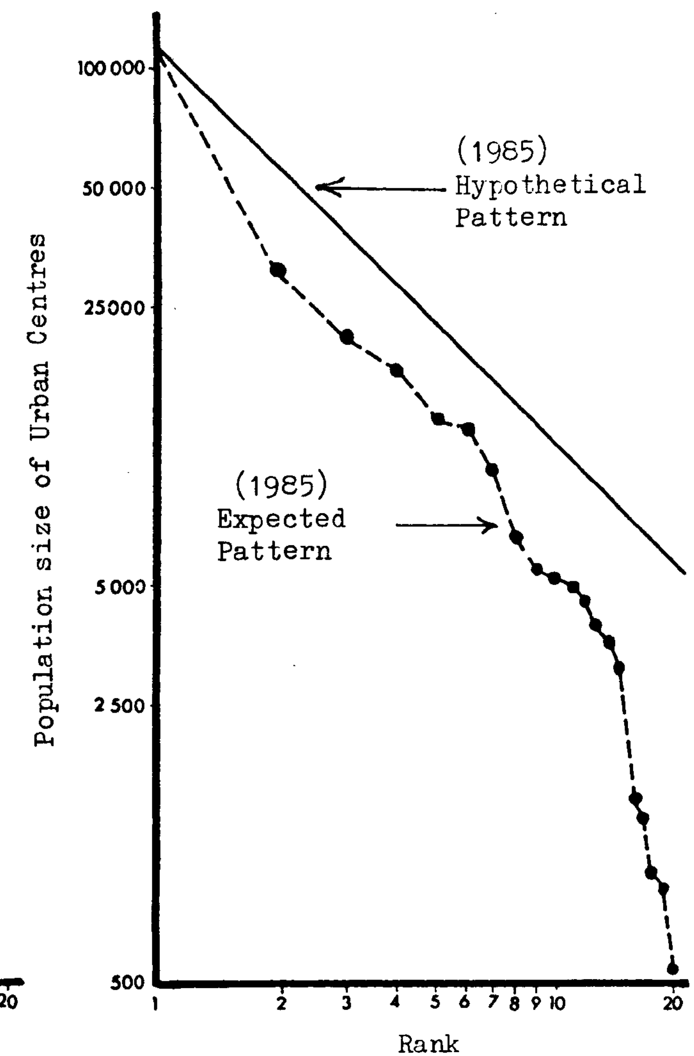
1. If Largest Urban Centre in Each Urban Node is Expanded.



2. If the Proposed Smaller Urban Centres in Each Urban Node are Expanded.



3. If the Proposed New Town in Each Urban Node is Expanded.



largest urban centre (Habaniya town in this case). Its population will continue to be 101000 inhabitants, whilst that of Habaniya will go up to about 46000 inhabitants, (see table 9.2.2.).

Unlike the case of the first alternative, the second largest urban centre (Habaniya town) is located in the same urban node as Ramadi City. It is some 25 km.'s south east of Ramadi. This implies that enlarging Habaniya town will not improve the level of the performance of the components of the urban system. It means that Habaniya town will not be able to cater the high order services and functions. This alternative also implies that no major urban centre will be created at the other end of the study area or elsewhere in between the two ends which will help in reinforcing the urban system. A town of a considerable size could be developed either in Karabla (about 35000 inhabitants) or in Ubaidi (about 32000 inhabitants). In any one of the two cases, such town sizes will not be in a position to compete with Ramadi City or to provide a substantially higher order services than those already provided by Qaim town. Towns such as Ana and Rawa will continue, in such a case to depend on the regional capital to fulfil their higher order needs from services, as well as other daily requirements. The continuation of such dependency on Ramadi City is very costly both in economic and social terms.

Apart from the case of Qaim urban node, enlarging the proposed smaller urban centres, in each urban node, will increase their relative importance, but to a level that cannot compete with the main urban centres in serving the population and economy of these urban nodes. The size of the proposed urban centres for urban expansion,according to this alternative, will continue to be smaller than the main urban centres. For instance, Kubaisa town will be expanded to accommodate

Table (9.2)

Expected City-Size Distribution in the U.E.R. by 1985,

According to the Three Proposed Alternatives

2. If the Proposed Smaller Urban Centres in Each Urban Node are Expanded

Urban Area	Expected Size,1985 (1)	% of the Largest City	Rank		Zipf Hypothetical Size		% of the Largest City	
			**	++	**	++	**	++
Ramadi Urban Node:								
Ramadi	101553	100.0	1	1	101553	101553	100.0	100.0
Habaniya	46230	45.5	2	2	50777	50777	50.0	50.0
New Town	-	-	-	-	-	-	-	-
Hit Urban Node:								
Hit	15750	15.5	4	4	25388	25388	25.0	25.0
Baghdadi	1450	1.4	12	13	8463	7812	8.3	7.7
Kubaisa	10264	10.1	7	7	14508	14508	14.3	14.3
Al-Furat	950	0.9	14	15	7254	6770	7.1	6.7
Muhamadi	1250	1.2	13	14	7812	7254	7.7	7.1
New Town	-	-	-	-	-	-	-	-
Haditha Urban Node:								
Haditha	13150	12.9	5	5	20311	20311	20.0	20.0
Haqlaniya	8278	8.2	8	8	12694	12694	12.5	12.5
Parwana	2500	2.5	11	12	9232	8463	9.1	8.3
New Town	-	-	-	-	-	-	-	-
Ana Urban Node:								
Ana	6850	6.7	9	9	11284	11284	11.1	11.1
Rawa	5250	5.2	10	10	10155	10155	10.0	10.0
Qaim Urban Node:								
Qaim	12850	12.7	6	6	16926	16926	16.7	16.7
Karabla	34902** 3150++	34.4** 3.1++	3	11	33851	9232	33.3	9.1
Rummana	850	0.8	15	16	6770	6347	6.7	6.3
Ubaidi	550** 32302++	0.5** 31.8++	16	3	6347	33851	6.3	33.3
New Town	-	-	-	-	-	-	-	-

(1) Extracted in the same way as in table (9.2.1).
** In case of expanding Karabla town.
++ In case of expanding Ubaidi town.

about 10000 inhabitants, i.e., less than the existing population of Hit town by about 5000 inhabitants. The differences between Haditha, the main urban centre in its urban node, and Haqlaniya, the recommended urban centre for expansion according to this alternative, also will be about 5000 inhabitants in favour of Haditha town, see table (9.2.2).

Hence, the expected distribution pattern of city-sizes according to this second alternative shows again that a deviation from the hypothetical pattern will be narrowed even to a higher degree than that which could be achieved from alternative one, (see figure 9.1.2), especially in the upper and middle tails of the expected distribution curve. The overall distribution pattern again seems to be relatively more balanced in the case of expanding Ubaidi town than that resulted from expanding Karabla town. This is simply because Ubaidi town is about 30 km's from Qaim while Karabla town is just about 5 km's from it. Its location in relation to Ana town to the south east (around 60 km's) is also better than that of Karabla (around 85 km's). Hence, it could better reinforce the interlinkages between Ana, Rawa and the other urban settlements in the region, from the one hand, and Qaim town from the other hand. However, according to this alternative no changes in spacing of urban centres will be experienced.

(C) <u>Alternative Three: The Expected Urban Growth is Directed to the Proposed New Towns</u>

The main feature of this alternative is that it will lead to a substantial increase in the number of urban settlements within the region. The number of urban settlements will increase from 16 to 20 by the year 1985, where a new town is suggested in each of the four urban nodes under investigation. Despite this substantial increase of about 25% in the number of urban settlements, the location of the suggested new towns will not have any significant role in changing the spacing pattern of the existing urban centres system. This is because the suggested new towns in each urban node are so close to the existing urban centres, except that of Habaniya tourist village. In most cases the municipal boundaries of the suggested new towns and the existing urban centres are either incorporated, such as the case of Kubaisa and the suggested new town in Hit urban node or very proximate to each other such as the case of Haditha and the suggested new town at Haditha Dam site, on the one hand, and Ubaidi and the suggested new town in Qaim urban node, on the other hand. Even in case of Habaniya tourist village new town, as mentioned earlier due to its size limitation and its location at the edge of the study area it will not play an important role in reinforcing the urban spacing pattern. The problem of having the urban centres separated by very large distances compared to their sizes will continue to be the case for some time and neither of the stated alternatives is seen to have an effective role in narrowing the gaps.

Again Ramadi City will continue to be the most important city in the region, with a relatively higher degree of dominance than in the two other alternatives. In this case the suggested new town at Qaim urban node which would become the second largest urban centre, would be about 27% of the size of Ramadi City, see table (9.2.3). As in the case of the second alternative, the second largest urban centre will not be in a position to compete in every respect with Ramadi City in serving the population and economy of Qaim and the nearby Ana urban nodes. Also the size of the new town (about 32000 inhabitants) will not offer a wider range of services than that already provided in Qaim town.

Table (9.2)

Expected City-Size Distribution in the U.E.R. by 1985, According to the Three Proposed Alternatives

3. If the Proposed New Town in Each Urban Node is Created

Urban Area	Expected Size, 1985 (1)	% of the Largest City	Rank	Zipf Hypothetical Size	% of the Largest City
Ramadi Urban Node:					
Ramadi	116637	100.0	1	116637	100.0
Habaniya	21378	18.3	3	38879	33.3
New Town	9768	8.4	7	16662	14.3
Hit Urban Node:					
Hit	15750	13.5	4	29159	25.0
Baghdadi	1450	1.2	16	7290	6.3
Kubaisa	4500	3.9	12	9720	8.3
Al-Furat	950	0.8	18	6480	5.6
Muhamadi	1250	1.1	17	6861	5.9
New Town	5764	4.9	9	12960	11.1
Haditha Urban Node:					
Haditha	13150	11.3	5	23327	20.0
Haqlaniya	4850	4.2	11	10603	9.1
Parwana	2500	2.1	15	7776	6.7
New Town	3428	3.0	13	8972	7.7
Ana Urban Node:					
Ana	6850	5.9	8	14580	12.5
Rawa	5250	4.5	10	11664	10.0
Qaim Urban Node:					
Qaim	12850	11.0	6	19440	16.7
Karabla	3150	2.7	14	8331	7.1
Rummana	850	0.7	19	6139	5.3
Ubaidi	550	0.5	20	5832	5.0
New Town	31752	27.2	2	58319	50.0

(1) Extracted in the same way as in table (9.2.1.)

The size of the suggested new towns, other than the new town at Qaim urban node, will not be of a size which will improve the servicing pattern of the urban population among their urban nodes. The largest of these new towns at Habaniya tourist village, will have the size of about 10000 inhabitants. The other suggested new towns at Haditha and Hit urban nodes will have a population of around 3000-5000 inhabitants. On the other hand, the existing main urban centres in each urban node, with the exception of Qaim town, will continue to be larger in size than the proposed new towns and accordingly will have the potentiality of providing higher order services.

Hence, the expected changes according to this alternative imply that the distribution pattern of city sizes seems to be less balanced than either of the two other alternatives, where the deviation from the hypothetical distribution pattern is, in general, wider than that which could be achieved by either of the two other alternatives, see figure (9.1.3).

To sum up, although alternative two, expanding the smaller urban centres in each urban node, could achieve a more balanced distribution pattern of city sizes, in terms of the deviation from the hypothetical pattern revealed in figure (9.1), nevertheless it concentrates on expanding the smaller urban centres and bringing them to a size which is still smaller than that of the main existing urban centres in each urban node, with the exception of Qaim. This implies that a very limited improvement in the level of servicing of both population and regional economy of these urban nodes could be expected from such expansion. Expansion of Habaniya town, on the other hand, to almost about half the size of Ramadi City is shown not to have any real impact on the performance of the expected urban system. This is due to its proximity to Ramadi City. On the contrary, alternative one, the expansion of the largest urban centre in each urban node, where the second largest urban centre will be Qaim, could be regarded the most influential of the three on the existing city-size distribution pattern. The size of Qaim town, according to this alternative, is expected to be around 45000 inhabitants. The location of a town of this size at the west end of the study area would have a pronounced effect on reinforcing the interlinkages between the components of the urban system. This alternative, like the second one would reduce the dominant role of Ramadi City and its relative importance in terms of sizes and functions performed. Expanding the main urban centres in each urban node reinforces such centres which are distant from the regional capital and helps in increasing the servicing levels of the smaller urban centres and rural hinterlands related to them. The latter proposition is because the smaller urban centres are close and in easy access to the main urban centres proposed for urban growth according to this alternative.

Accordingly, expansion of the main urban centres in each urban node will be given the highest priority with 3 points each. Expansion of the proposed smaller urban centres will be given the second priority with 2 points each. Analysis of alternative three, the creation of new towns, suggests that the suggested new towns in both Haditha and Hit urban nodes will be given the lowest priority with one point each. This is due to their limited role in reinforcing the interlinkages within the urban system and improving its servicing. The suggested new towns at Ramadi and Qaim urban nodes will be given the second priority with two points each. The higher values given to the latter new towns is because they are at a far distances from the main urban centres within their urban nodes and consequently would slightly improve the spacing of urban centres in the region. A new town at the site of Habaniya tourist village is about 65 km's south east of Ramadi City and about 45 km's south of Habaniya town. This new town, at a such location, could be utilised as a basis for any further urban growth expected in this area, beyond 1985. The suggested new town in Qaim urban node is about 30 km's east of Qaim town and about 60 km's north west of Ana and Rawa towns. This location suggests that this new town will have a pronounced effect in serving and increasing the interlinkages among the urban centres in this part of the study area, especially after the resettling of Ana town population in a new site (Rehana location) some 14 km's south east of the existing one. Additionally, the size of this new town will be relatively large (about 32000 inhabitants which suggests that a self sustaining growth after 1985 could be expected.

9.1.4. Accessibility to Regional and/or National Infrastructure Facilities and the Economical Utilisation of These Facilities

By this factor, it is meant the easy access and economical utilisation of the infrastructural facilities within the region by the urban centres and their settlers. Regional infrastructural facilities, in this specific case, are limited to the express way, highways, railway facilities, electricity and telephone lines. Higher accessibility reinforce the urban centres and make them more attractive areas for both businessmen to invest in and for individuals as settlement areas. Expanding more accessible urban centres, on the other hand, means less capital and annual running costs are needed to be spent on such important regional facilities. This in turn leads to a better distribution of the expected urban growth. Hence, to raise the performance of the resulted urban system, in both economic and non-economic terms, this factor should be included in the analysis of the distribution of the expected urban growth in the U.E.R.

As seen earlier, in Chapter six by implementing the committed infrastructure in the study area, accessibility, in general, will increase and the differences in accessibility to such facilities will be very marginal among most urban centres of the study area. The analysis of this factor and the preference among different proposed alternatives could be summarised as follows, see map (9.1).

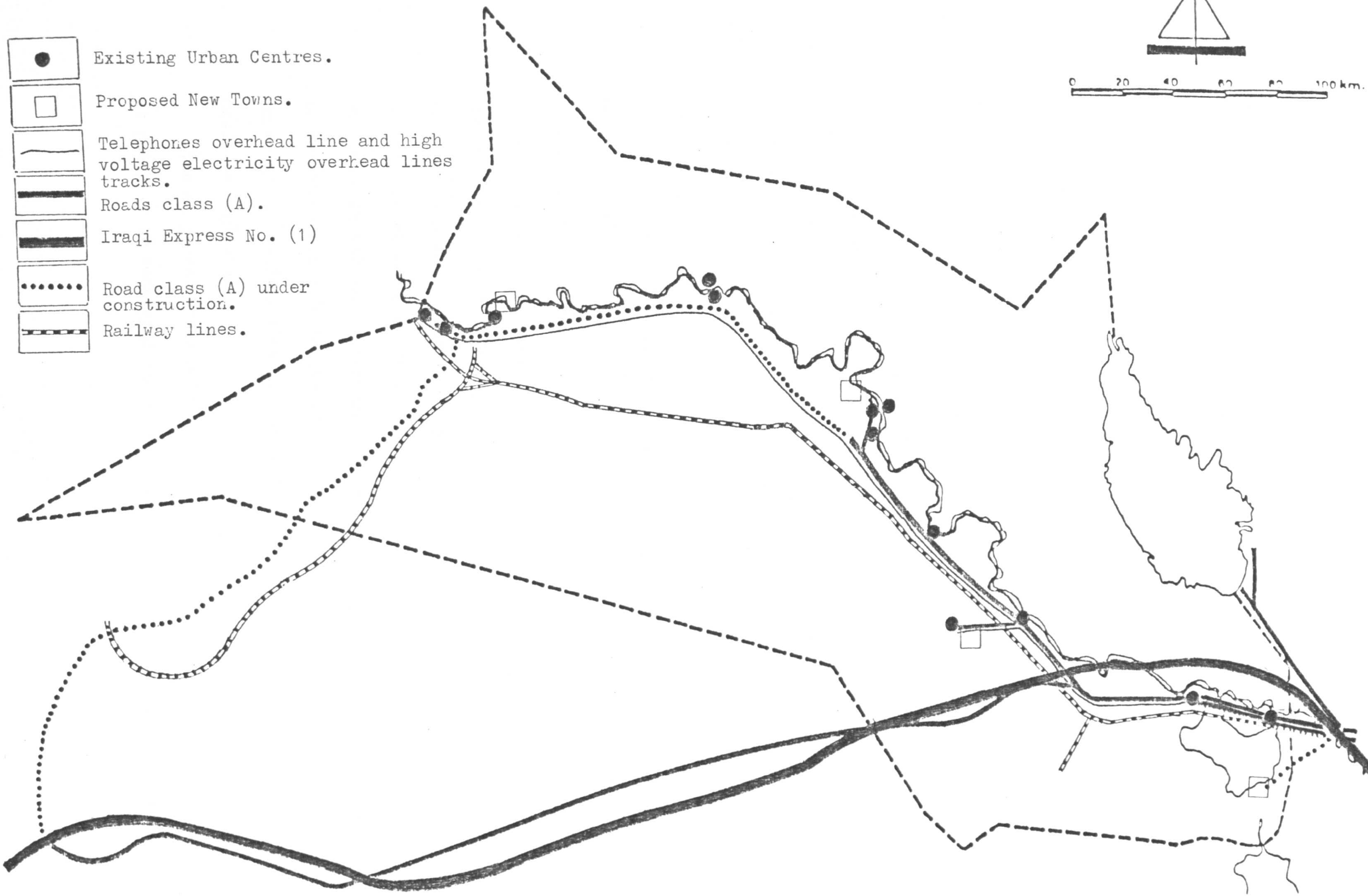
(A) For Ramadi urban node, both Ramadi City and Habaniya town have the highest accessibility to the existing and the committed regional infrastructural facilities in the region. Both urban centres are going to be served by the dual-carriage highway connecting Baghdad with Ramadi and Rutba. The railway line will by-pass these urban centres and serve them directly. One of the major stations will be at Ramadi City and a second station of less importance will be to the south east of Habaniya town. Both urban centres are also going to be within a very good accessibility to the Iraqi Expressway Number One. They are connected to the national electricity grid via primary and secondary sub-stations. Both of them again are within easy access to telephone overhead lines and are served by the new microweave communication network.

The new town is less accessible to such facilities. It is linked to Baghdad-Ramadi highway through a main road of about 20 km, with no direct railway services. Due to the potential for tourism in the area, it will be connected to the other infrastructure facilities of electricity and communication, hence the area will be in good accessibility to the latter types of infrastructural facilities, but at a relatively higher monetary cost.

Accordingly, expansion of both Ramadi City and Habaniya town will be given the highest priority with 3 points each, whilst the suggested new town will be given the second priority with 2 points.

Map (9.1)

Existing and Committed Infrastructure in the U.E.R.



(B) For Hit urban node, Hit town seems to be the most accessible urban centre to the available and the committed regional infrastructural facilities as the highway which connects Ramadi City with Qaim passes the town. The railway line is about one kilometer from it. It is also connected to the national electricity network via sub-station and in easy access to communication facilities. On the other hand,both Kubaisa town and the suggested new town are less accessible to the basic infrastructure in the region due to their location some 20 km's from the location of those types of facilities. They are connected to the Ramadi-Qaim highway through a main road about 20 km's in length and they are not going to be served directly by railway services.

This accessibility pattern suggests that the expansion of Hit town could be given the highest priority with 3 points, whilst the expansion of Kubaisa town and the creation of the new town will be given second priority with 2 points each.

(C) For Haditha urban node, the two suggested existing urban centres (Haditha and Haqlaniya) for the purpose of urban expansion, seem to have almost the same degree of accessibility to the available and the committed regional infrastructural facilities. Both of them are within easy access to the highway connecting Ramadi with Qaim. They are not going to be directly served by railway services but are to be connected to both the national electricity grid (via primary and sub-stations) and the communication services. However, although Haqlaniya town seems to be more accessible to the main regional infrastructural facilities (highway and railway lines), the differences are so marginal that they could be neglected.

The suggested new town seems to be relatively less accessible. It is going to be connected to the main highway by a main road via Haditha town (about 18 km's long). Accordingly, its accessibility to the railway services will be lower compared to the two other urban centres. However, as in the case of Haditha and Haqlaniya towns, it will be connected to both the national electricity grid and communication services.

Hence, Haditha and Haqlaniya towns will be given the highest priority with 3 points each, whilst the suggested new town will be given the second priority with 2 points.

(D) For Qaim urban node, all the suggested places for urban growth have almost the same degree of accessibility to the available and the committed regional infrastructural facilities, except Qaim town which will be served by railway services through a branch line from the chemical complex. All of them will have a very good accessibility to the under construction highway connecting Ramadi with Qaim, the national electricity grid via sub-stations and the microweave network.

According to the above pattern of accessibility, Qaim town will be given the highest priority with 3 points, whilst the remaining areas (Karabla and Uabidi towns and the suggested new town) will be given the second priority with 2 points each.

9.1.5. Future Potentials of Economic Development and Urban Growth

Future potentiality of urban growth of the proposed places is another factor that should be considered in distributing the expected urban growth. The importance of this factor stems from the fact that, if the expected urban growth is distributed either among existing proposed urban areas and/or the committed new towns and these areas have reached their threshold limitations, then the further future growth of these urban areas either it will be costly, in both socio-economic terms or even in some cases impossible. Hence, in deriving a strategy for urban growth in the U.E.R. the potential future growth of the proposed urban areas beyond 1985 is considered. Places without such potential capacities, especially if they and their hinterland are found to possess a good chance of future economic development, then they will be assigned a lower value in absorbing the present expected urban growth. Their present limited potentiality to expand will be left for the purpose of accommodating the natural increase generated by themselves. On the contrary, if the proposed urban areas possess future potentialities for large scale urban growth, then they will be regarded of high value in absorbing the present expected urban growth. So, to reach such conclusions, future potentials of economic development in the region and its expected spatial distribution pattern will be examined and the results of table (8.36) whichconcern the urban growth potentials of existing urban centres and the committed ones will be recalled.

In general, the study area possesses a great development potential in the long run, especially the development in the industrial sector which depends mainly on mineral deposits. The already established and under construction industrial activities and infrastructure could further encourage the future expected industrial development. Although, the long run development of the economy of the region cannot be forecast precisely due to the scarce knowledge about the exact nature of the investment which is likely to take place in that period, Planar's study of the development of the region have forecasted the tentative volume and nature of such development. In doing so, the study was based on two main targets: first, the balance between supply and demand of the labour force and the most efficient distribution of job opportunities among different parts of the study area; and, second, the utilisation of regional resources, mainly the mineral ones, i.e., the adopted development form is of the type called "Resource-Based Development". The study, after suggesting and discussing three different alternative forms of regional development concluded that the most suitable alternative was the one based on the balance between supply and demand of the labour force in the region and the utilisation of its regional resources.[1] According to this recommended alternative, the study found that 26600 new job opportunities between 1986-2000 could be created, see table (9.3). Almost half of these new job opportunities would be expected to be in the industrial sector. The agricultural sector would provide the next largest number of jobs, 23.9 per cent. Mining and tourist sectors would be expected to generate 15.8% and 12.8% of these new job opportunities respectively. The expected dominance of the industrial sector on the overall long range development of the region is due to the great potentialities it possesses in terms of raw materials, since industries expected to develop in this region are mainly raw materials-oriented industries. Other factors which would lead to further industrialisation are the modern infrastructure being developed in the region and the nature of the existing industrial base of the region, represented mainly by the glass and ceramic complex in Ramadi, the chemical complex in Qaim and the cement industry in Kubaisa. All of these factors are thought likely to further encourage the development of industries which might create complementarity in production, reinforce the industrial interlinkages between similar industries and consequently maximises economies of scale.

In the agricultural sector, the plan suggests that to increase the agricultural production, all the agricultural land in the study area should be utilised in a more advanced way through increasing the

(1) For the details of the alternative suggested regional development strategies, see, Planar, op.cit., Stage Two, PP.1-78 and Final Stage, PP.12-84.

Table (9.3)

Proposed Spatial Development in the U.E.R. in terms of Direct Employment (1986-2000)*

Sector	Habaniya Nahiya		Ramadi Qadha Centre		Hit Qadha		Haditha Qadha		Ana Qadha		Qaim Qadha		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Agriculture: Dairy & Egg farms Fishing, other agricultural and support projects.	1450	22.8 / 80.6	1450	22.8 / 11.2	800	12.6 / 43.3	750	11.8 / 27.3	950	15.0 / 82.6	950	15.0 / 15.4	6350	100 / 23.9
Mining and Quarrying: Stones, Aggregates, Asphalt, Gypsum and Phosphates	350	8.3 / 19.4	1000	23.8 / 7.8	450	10.7 / 24.3	750	17.9 / 27.3	200	4.8 / 17.4	1450	34.5 / 23.6	4200	100 / 15.8
Manufacturing: Cement, glass, ceramics, fertilisers, Petrochemicals, spin-off.	-		8450	66.8 / 65.5	200	1.6 / 10.8	250	2.0 / 9.1	-		3750	29.6 / 61.0	12650	100 / 47.5
Tourism	-		2000	58.8 / 15.5	400	11.8 / 21.6	1000	29.4 / 36.3	-		-		3400	100 / 12.8
Total	1800	6.8 / 100	12900	48.5 / 100	1850	7.0 / 100	2750	10.3 / 100	1150	4.3 / 100	6150	23.1 / 100	26600	100 / 100

Source, Planar, Stage Two, Alternative Strategies, op.cit., Appendix B, Table B.9.5.

* Only employment generated by investment with a confined spatial dimension is listed as this is the main determinant of the strategy.

utilisation of machinery, fertilizers and agricultural research instead of the present fallow system of utilising the agricultural land.[1] The plan also suggests that spray and dropping irrigation systems should be introduced to increase the areas of cultivable land. Poultry and livestock projects are also suggested as areas in which production can be increased in areas where industrial development potential is lacking.

The spatial distribution of the proposed long run development is based mainly on the development potentialities of each area. Details of table (9.3) indicate that Ramadi Qadha centre is going to be the dominant area to attract new job opportunities after 1985 as it is anticipated that, 48.5% of the expected jobs will be concentrated in this area. Qaim urban node will come in the second place with 23% of this development.

In both Ramadi Qadha centre and Qaim Qadha, the industrial sector is expected to be the main generator of jobs. 65.5% of the expected job opportunities in the former Qadha are expected to be generated by this sector because this part of the study area possesses the potentiality of industrial development, especially within the glass and ceramic industries. These potentialities are due to the availability of the necessary raw materials, experienced personnel and the present existence of such activities in this part of the region. The third factor adds an economic justification for such suggestion, since industries of this type tend to agglomerate at specific points in space, such as the case of Pilkingtons in Britain, Saint Gobian in France and Dow-Corning in the United States . This concentration results in a maximisation of both industrial linkages and economies of scale. In Qaim Qadha, 61% of the suggested new jobs are expected to be

(1) According to this cultivation system, which is locally called Al-Niereen System, the land is utilised every other year.

generated by industrial activities, especially the expansion or new establishment of further chemical industries in the area where the potentiality of its expansion are available in terms of the necessary raw materials used as inputs or the existence of the base industries, represented by the existing petrochemical complex. The expansion in this line could be either on the same types that are going to be produced in the existing complex or of other types (Nitrogen fertilizers, Ammonia and spin-off industries which depends on the products of such industries). The cement industry could also be developed in this part of the region. The Ministry of Industry and Minerals, recently decided to build a cement factory in the area with a total capacity of two million tons. Since most of the expected industrial activities in this Qadha are raw material oriented industries, the mining sector will generate about 24% of the total expected jobs in this Qadha.

In the other parts of the region, Ana Qadha, Habaniya Nahiya and Hit Qadha, agricultural activities are expected to be the dominant ones in generating jobs, where about 83%, 81% and 43% of the expected jobs up to the year 2000, in those areas respectively, are expected to be generated by agricultural activities. The role of the industrial sector in either of them will be very limited. Tourism is expected to have an important role in future development of Haditha Qadha, where about 36% of expected jobs are going to be generated by this sector as a result of building a proposed tourist village at Haditha Lake. The tourist sector is expected to have an important role in the development of both Hit and Ramadi where its contribution to the total expected jobs is expected to be about 22% and 16% respectively.

The above expected pattern of economic development in the long run implies that, if the direct, indirect and induced employment resulting from such a pattern of development is incorporated in the analysis, then an increase in the urban population by about 207164 inhabitants, in the year 2000, will be experienced, see table (9.4). Ramadi is expected to grow by about 105000 inhabitants. In second place is Qaim urban node which is expected to experience an increase of about 50000 inhabitants.

Table (9.4)

Expected Growth of Urban Population For the Period 1986-2000

Area	Direct Employ-ment	Indirect and Induced Employ-ment	Total Employment	Total Expected Urban Population Increase
Ramadi Qadha Centre	12900	13352	26252	105008
Habaniya Nahiya	1800	1863	3663	14652
Hit Qadha	1850	1915	3765	15060
Haditha Qadha	2750	2846	5596	22384
Qaim Qadha	6150	6365	12515	50060
Total	25450	26341	51791	207164

Source: Direct employment from table (9.3). Indirect and induced employment extracted on the basis that the Regional multiplier effects of employment is 2.035*. The total expected urban population increase for the period 1986-2000, is extracted on the basis of multiplying the total expected employment by the assumed family size (4 persons).

* The regional employment multiplier effect is expected to increase based on the assumption that the region will become more self-sufficient by the year 2000 and that there will therefore be less leakage from the economy. It is also expected that productivity will increase. However, since the overall picture of the economic development in the region is a tentative one, then the minor changes in the multiplier effect will not effect the analysis to a large extent.

The urban population of the other three areas, Habaniya Nahiya, Hit Qadha and Haditha Qadha are expected to increase by about 14.5, 15 and 22 thousand inhabitants respectively.

Now, if table (8.36), which measures the urban growth potentials of existing urban centre and the suggested new towns,and tables (6.7) and (9.4), which record the expected urban growth in each urban node, by the years 1985 and 2000 are combined, then one can find that all the proposed areas for urban growth, except Habaniya and Haqlaniya towns, have the potentiality to accommodate the expected urban growth up to the year 2000. Analysis of the factor concerning the availability of land for expansion proved that both Habaniya and Haqlaniya do not have the potentiality to accommodate the expected urban growth by 1985 and if they have to accommodate this growth that will be either at a relatively higher cost than average or at the expense of destroying the good agricultural and valuable landscape areas. Haditha town also seems to face a limited problem in accommodating the expected urban growth of both 1985 and 2000, where the already committed urban growth is around 3400 inhabitants and the expected one by the year 2000 will be around 22300 inhabitants bringing the total to about 25700 inhabitants against the urban growth potentiality which is estimated at about 18000 inhabitants.

According to the above analysis, Habaniya and Haqlaniya towns will be given the lowest priority to expand with 1 point each due to their very limited growth potentials. Haditha town will be given second priority with 2 points. The remaining proposed areas will be given the highest priority with 3 points each. This is due to their unlimited growth potentialities to facilitate the existing committed urban growth and the expected one up to the year 2000.

9.1.6. Improving the Urban Structure of Existing Urban Centres

Several distinguishing charactaristics among urban centres of the U.E.R. could be recognised. Some of these charactaristics are produced as a result of the predominant natural features and constraints of the study area itself, while others are due to the late introduction of town planning and the under developed state of development control.

The severe climatical conditions and the resulting physical constraints in the study area are among the factors which have confined urban growth along the river. All the existing urban centres except Kubaisa town evolved and grew along the river side creating a linear pattern of development of urban centres. The shortage of cultivable land (the main source of living until recent years) and its concentration in a narrow strip along the river, also encouraged such patterns of development and created orchard areas within the municipal boundaries of many urban centres, such as Haditha, Ana and Rawa. The cultivation of orchards and agricultural land within the municipal boundaries has a positive impact upon both the urban and greater regional economy. In addition it has created a group of people who live in urban areas but makes their living either in full or in part from agricultural activities. This has resulted in an occupational structure of the urban area which does not fully reflect the urbanised charactaristics of the region. The field survey carried on by the Regional Planning Department of the Ministry of Planning in 1977 showed that about 6% of Ana labour force and 20% of Rawa labour force are economically dependant on agricultural activities. Another 6% of the labour force in Ana and 3% in Rawa depend on agricultural activities as a secondary occupation.(1) The proportion of population making their living mainly from such activities is expected to be higher in Haditha, where about 50% of the area within the municipal boundaries is covered with orchards. In smaller urban centres, such as Rummana, Karabla, Uabidi and Parwana most of the labour force is engaged in agricultural activities since these towns have only recently evolved from large villages. However, the occupational structure is more urbanised in towns such as Qaim and Hit and very urbanised in Ramadi City.

(1) Regional Planning Department, Socio-Economic....,op.cit., table B1,P.4.

It is expected to become increasingly urbanised in almost all the urban centres of the study area due to the intensive industrial development under-way in the region.

It should be noted that the river side locations produce the opportunity to exploit the potentiality of such locations in open space provision to serve the population of the urban centres.

The late introduction of planning in an organised and systematic form has created another group of distinctive urban structure charactaristics. Until the late 1950's, there was little town planning in Iraq in general. Max Lock, among the first who carried out town planning in Iraq, in a paper presented to the Town and Country Planning Summer School in 1958 pointed out that "There is little, if any, town planning, only road planning, so that development tends to be entirely secondary to the road system..."(1) Accordingly, development had to go where the roads were and everybody sought a site upon it so that shops accumulated and sprawled in greater number than the population could support. Planning control was absent at that time. Lock emphasised this point and mentioned that, "At the moment there is little or no control of land use, no limiting of city spread by zoning, there is no sterilisation of land against development anywhere, except of course, where it has been acquired for public purposes."(2)

The situation was even worse in the study area, where town planning in a modern sense was first introduced in the region in the late 1960's in the major urban centres, such as Ramadi, Hit, Qaim, Haditha and Ana.

(1) M.Lock, "Town Planning in the Middle East with Special Reference to Iraq and Jordan, "Town and Country Planning Summer School, Bangor, 1958, P.157.

(2) Ibid, P.158. For further details about the state of development control in Iraq see M.S.Al-Mudhaffar, Development Control in Iraq, Including a Case Study of Development Control in Basrah, M.A.thesis, University of Sheffield, Department of Town and Regional Planning, 1980.

Later, in the 1970's all the urban centres in the region were included.

The late introduction of town planning led to the creation of uncontrolled development with mixed land uses in the older parts of the urban centres especially the smaller ones. On the other hand, the recently developed parts of the urban centres are in accordance with the directives and objectives of the master plans which were based on the principles of land use separation, introduction of vehicle roads system including, if possible, the older parts of the urban centres and density differentiation between different parts of the urban centre.

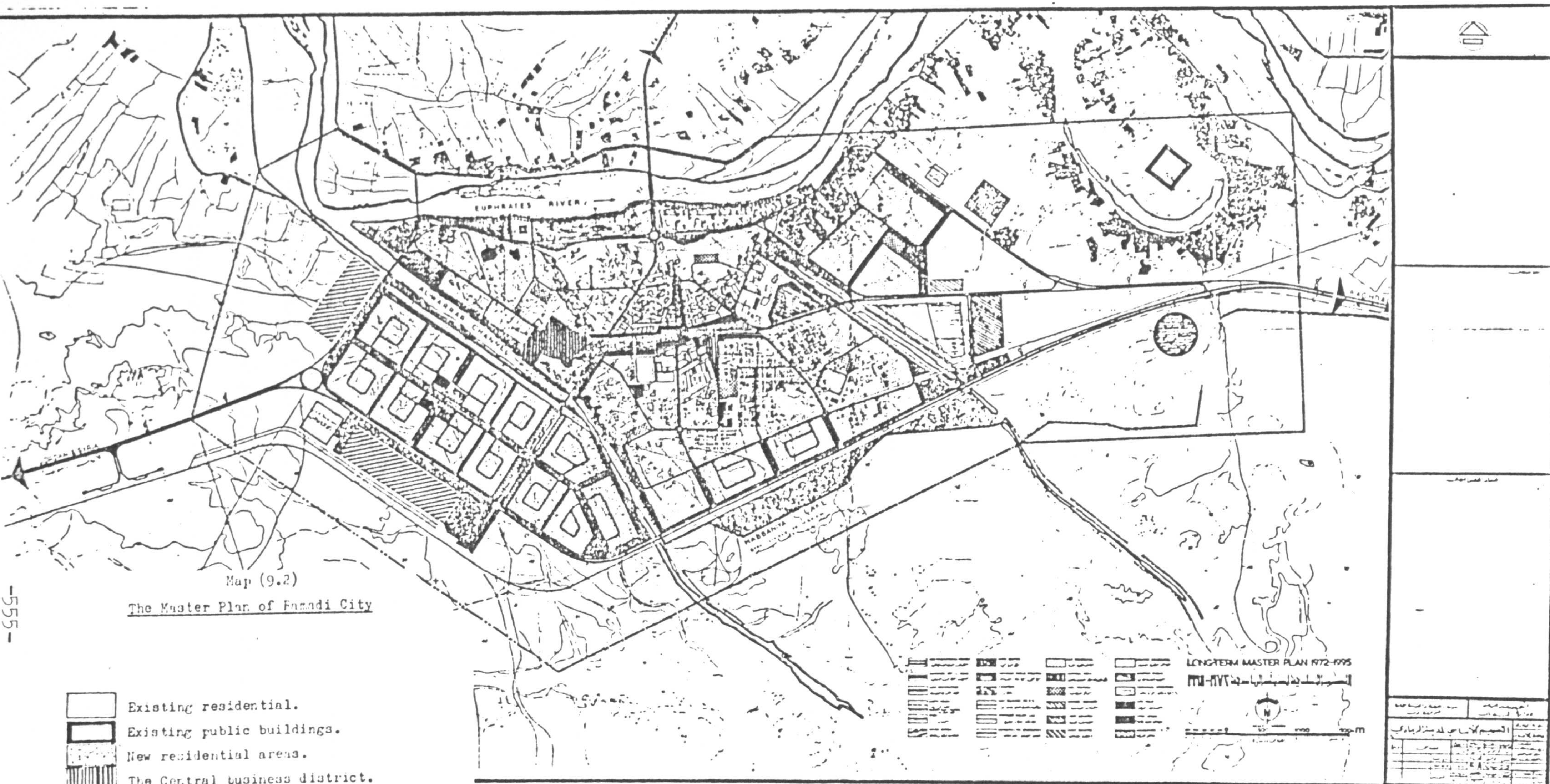
It is assumed from incorporating this factor, improving the urban structure of existing urban centres, in the analysis that the distribution of the expected urban growth among the existing urban centres will further improve their urban structure and enable them to cope with the new expected sizes. The improvements in the urban structure will depend on many factors such as the existing size of the urban centre, the existing quality and pattern of its urban structure, the size of the urban growth expected to be channelled to it, the spare capacity of different facilities, if any, within it and the date of introducing town planning practices in it. To find out the consequences on the urban structure of existing urban centres, the proposed ones for expansion will be examined separately.

(A) <u>Ramadi City</u>: The relatively early practicing of town planning in Ramadi City in 1960's brought about a more controlled urban development pattern compared to most other urban centres of the region. The road system is in accordance with the existing needs of the city and serves most parts of it. The separation in land uses is very clear and the new development in the city is according to the directives of the prevailing plan. The last master plan for the city was prepared in

1972, when its population was around 40000 inhabitants, to accommodate some 90000 inhabitants by 1995, (see map (9.2)). These figures indicate clearly that the latter master plan cannot cope with the present and the expected trends of growth of the city where already it is found that in 1980, the population of the city was around 101000 inhabitants and it is expected to grow to about 116 and 220 thousand inhabitants by the years 1985 and 2000 respectively.

The very rapid growth rates will necessitate many changes in the land use pattern, since the prevailing pattern cannot service the expected changes. The expected changes in the land use will be in particular in the central business district and the central residential quarters which are almost obsolete. These changes will be primarily in favour of more areas for commercial, administrative and public building uses in the central business district; shifting out the residential uses from the heart of the city; bringing about a more advanced transport and traffic system that could match with the new development; raising the density of population and building areas, especially in the central areas of the city; and, creating of a more self dependent sectoral and sub-sectoral business districts. These changes will definitely improve the urban structure of the city mainly through urban renewal schemes (redevelopment, rehabilitation and conservation schemes).

(B) Habaniya town: Until recently the town developed in uncontrolled way where no plan was available for it. In 1972 a tentative master plan was drawn which could not change a lot in the structure of the town except creating the main, secondary and service roads in a way which minimises the effects of such action on the existing properties. In 1979 a new plan was drawn which defined the location of basic services,



Map (9.2)

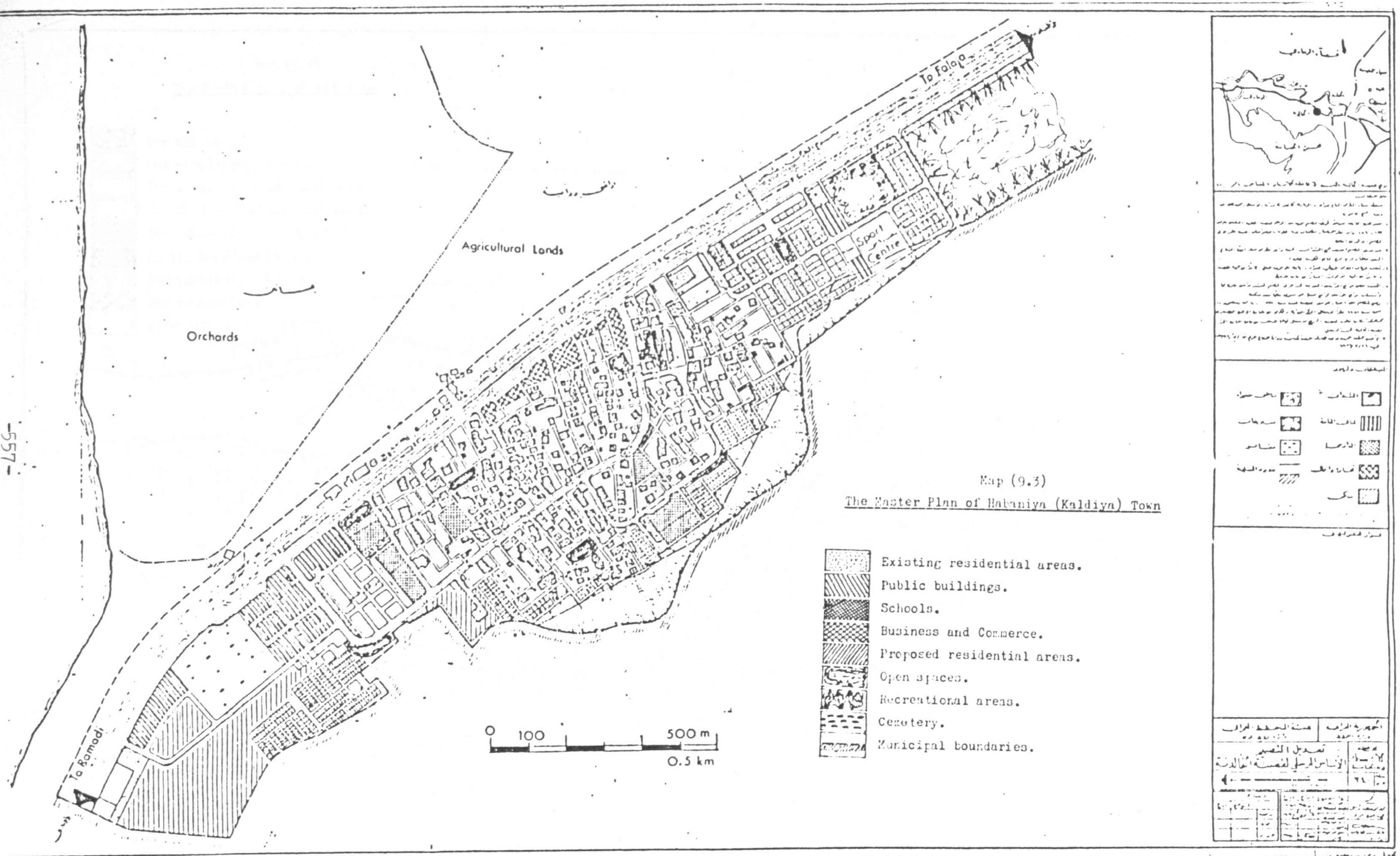
The Master Plan of Ramadi City

- Existing residential.
- Existing public buildings.
- New residential areas.
- The Central business district.
- Sub-centres.
- Heavy industries.
- Light industries and service industries.
- Date palm orchards.
- Existing and suggested open spaces.
- Municipal boundaries.

commercial and public buildings. It also suggested the direction of the expansion of the new residential areas, (see map 9.3). The plan continued the linear pattern of growth of the town along the highway connecting Ramadi with Baghdad, due to the physical constraints and the availability of valuable agricultural land (see analysis of the availability of land for expansion). Hence, if the analysis of the alternative strategies suggested that the expected urban growth is directed to Habaniya town, this will imply that, due to the physical limitations of expansion, most of the expected urban growth should be absorbed within the existing boundaries of the town which means that considerable changes in land use and density are required. These changes would in turn lead to an improvement in the urban structure and a better utilisation and distribution of land uses within it.

(C) Hit town: Unlike the pattern of growth in most other urban settlements of the study area, Hit town urban structure is a concentric one, where the old town (Al-Kala'a) is located directly on the river and the new town centre to the south west of it with all the administrative and commercial services concentrated in it and surrounded by the new residential area.

The present master plan of the town, which was drawn in 1975, is designed to guide growth up to 1995. The main direction of growth suggested by this plan is to the east of the town, (see map 9.4). Analysis of the availability of land for expansion carried out in this study questions the promotion of growth in this direction. The land to the east of the city is low and rich with asphalt deposits. These have an economic value. Additionally, it generates unpleasant odours. Instead, this study suggests that the growth should be mainly to the south of the town, in the area across the highway connecting Ramadi-Qaim

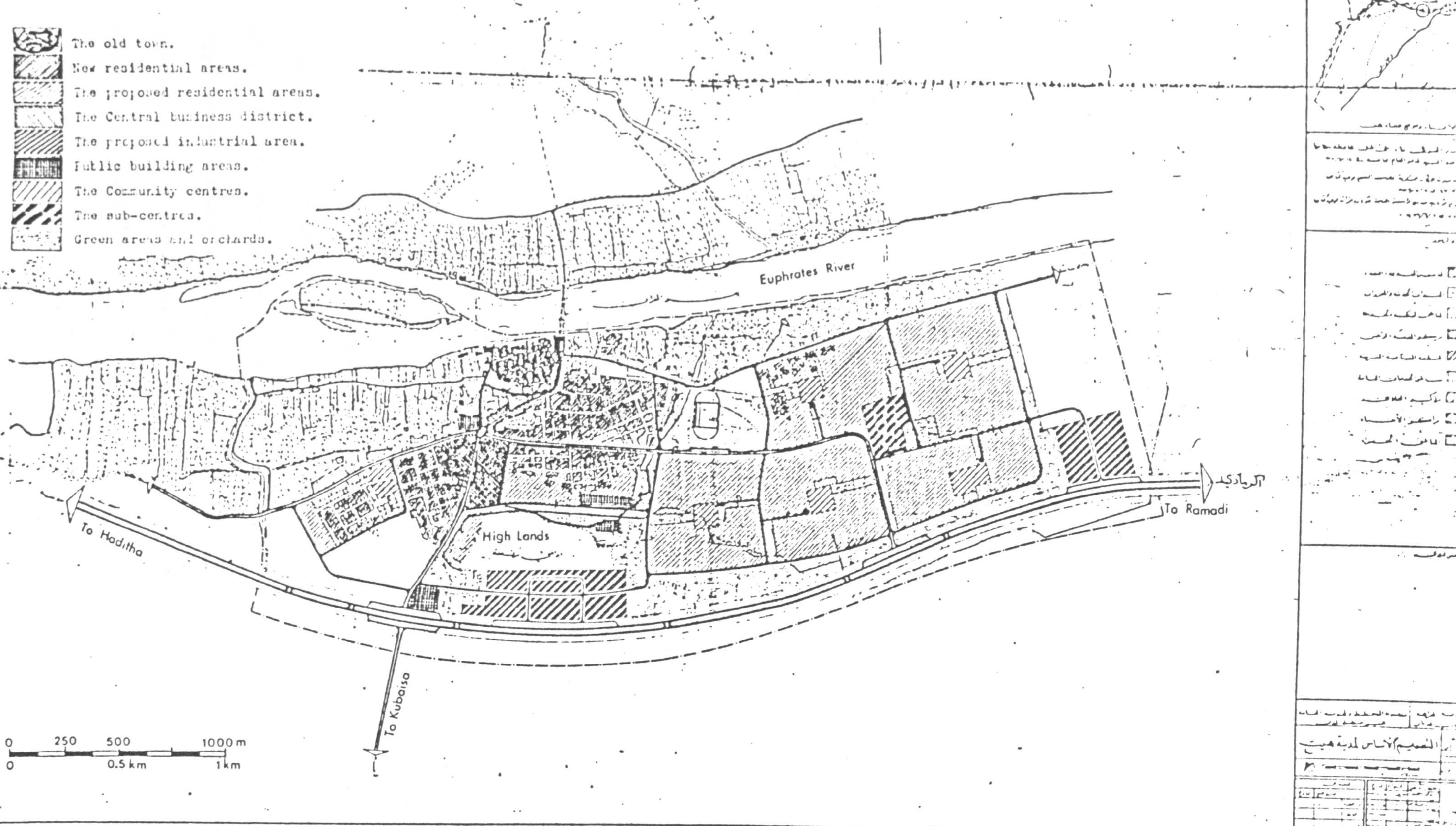


Map (9.3)

The Master Plan of Habaniya (Kaldiya) Town

Map (9.4)

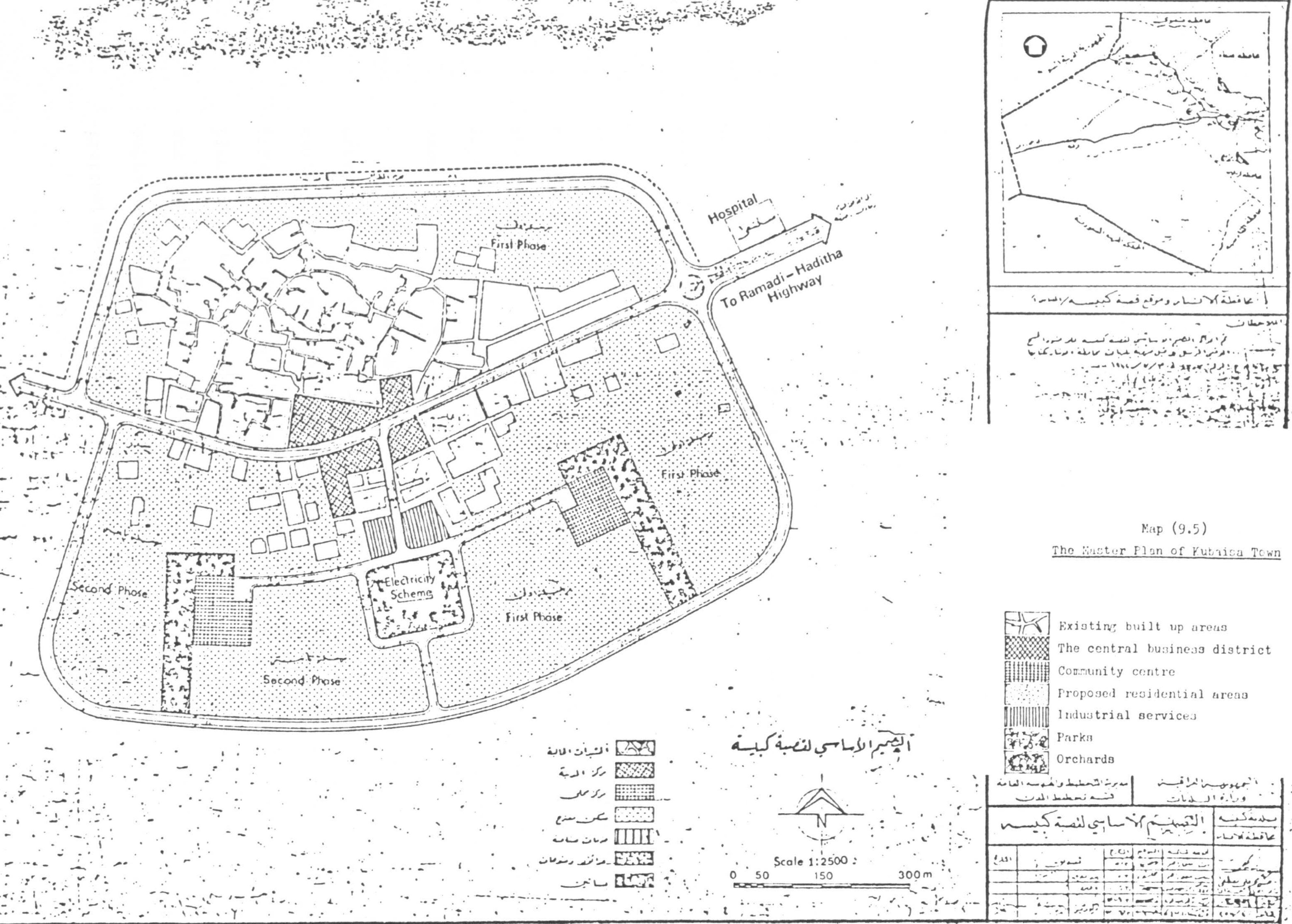
The Master Plan of Hit Town



and the railwayline.

Except the unplanned old town all other parts of it are developed according to the modern town planning principle of land use separation and hierarchy of services. This implies that expansion of Hit, which will be on a relatively small scale (about 6000 inhabitants) if this town is recommended for the purpose of urban growth, will have very limited effects on the change and improvement of its urban structure, especially that of the old town which is in a desperate need of improvement. The expected changes, limited in nature, will be mainly in the central commercial and administrative services within the town which will require additional areas in the central business district. Conservation and rehabilitation of most parts of the old town (Al-Kala'a) should be carried out regardless of whether or not the town is expanded as it has a unique architectural and historical value.

(D) Kubaisa town: Again the pattern of growth of Kubaisa town is a concentric one. Development in the town is in accordance to the master plan drawn in 1974. For the first time, in the town, the plan created some sort of land use separation without changing the old fabric of it, (see map 9.5). The relatively large amount of the expected urban growth compared to the present size of the town will have a remarkable effect on its urban structure, as more commercial areas, public buildings and industrial services will be required. This in turn will provide the opportunity for a clearer separation of land uses and further improvements in the urban structure. The preservation of old houses through the establishment of a conservation policy is very necessary and would provide the opportunity of preserving the special form of the urban structure of a town away from the river in a desert environment.



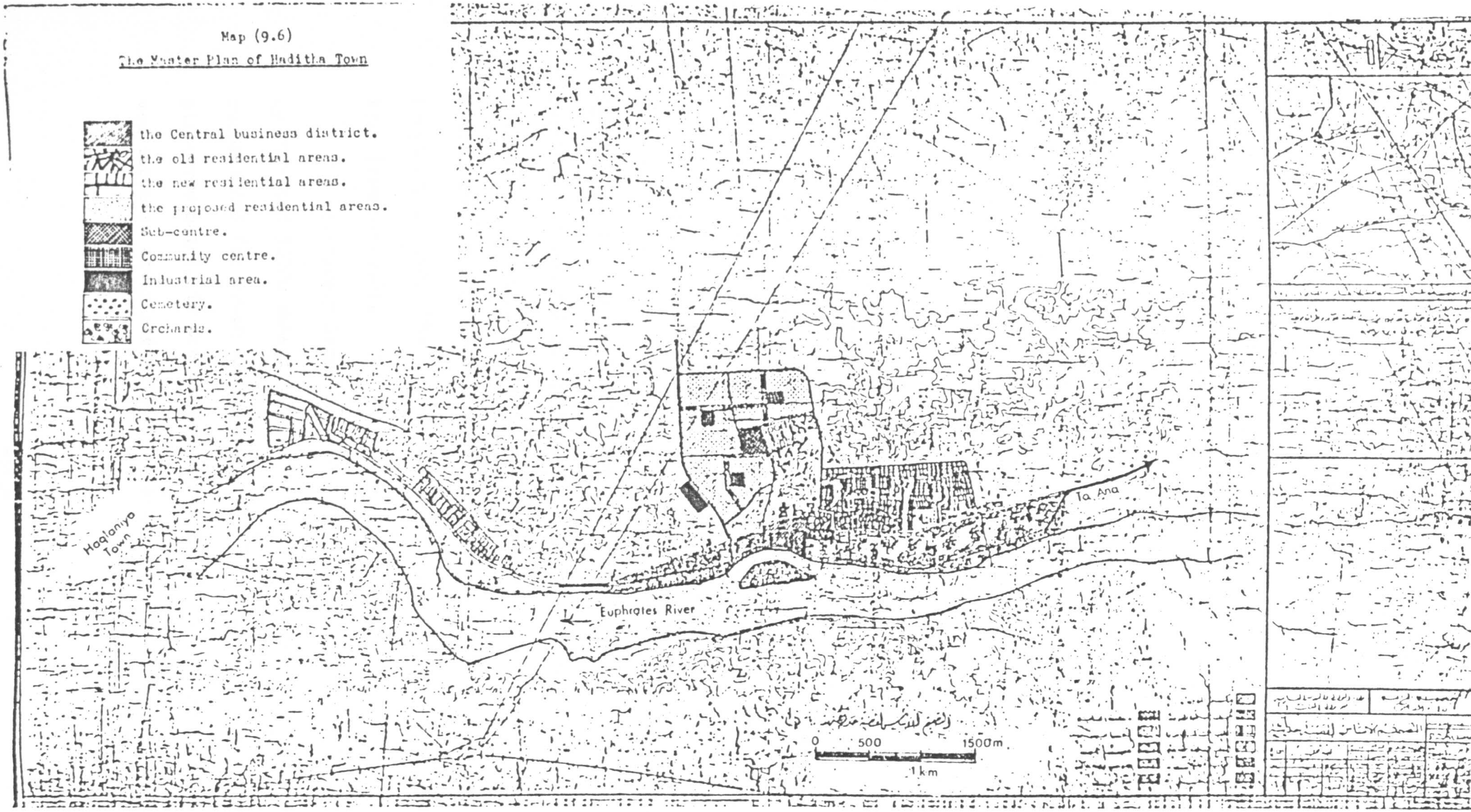
Map (9.5)

The Master Plan of Kubaisa Town

(E) Haditha town: The pattern of growth of Haditha town is a linear one along the Euphrates River. The plan which directs the pattern of its growth was drawn in 1974. According to this plan, the older parts of the town which were built originally in an unplanned way, were readjusted in a form which facilitated the use of vehicles at least at specific points through a newly created system of secondary roads. In these older parts no clear separation of land uses are found. However, the plan aimed at the creation of such separation and special areas are allocated for the central, commercial and administrative services (in the central areas of the town). The industrial area is located at the edge of the town. Secondary commercial and service districts are created to serve the distant and newly created residential neighbourhoods. Regarding the orchards directly along the river, the plan aimed at preserving them from any urban development, (see map (9.6)).

The small size of the expected urban growth (about 3500 inhabitants) by 1985 would not affect substantially the urban structure of the town, whether in terms of residential density, transportation networks within the town, or the proportion of land allocated to different uses. Hence, improvements in the urban structure as a result of the expected urban expansion will be very limited.

(F) Haqlaniya town: The development of the town until recently was uncontrolled. The mixed land use pattern was the predominant form of development. The complicated topography of the area added another factor to the random pattern of growth. In late 1978 a tentative master plan was drawn to direct development. All what the plan could achieve was the creation of a road system in the town which made the use of vehicles possible. Some sort of separation of land uses was also proposed where special areas have been allocated for public buildings,



Map (9.6)

The Master Plan of Haditha Town

commercial use, industrial use, recreational activities and so on, (see map 9.7). New residential areas were also suggested for the growth of the town but on a very limited scale due to the physical limitations stated in some detail early in the analysis concerning the limited availability of land for urban expansion.

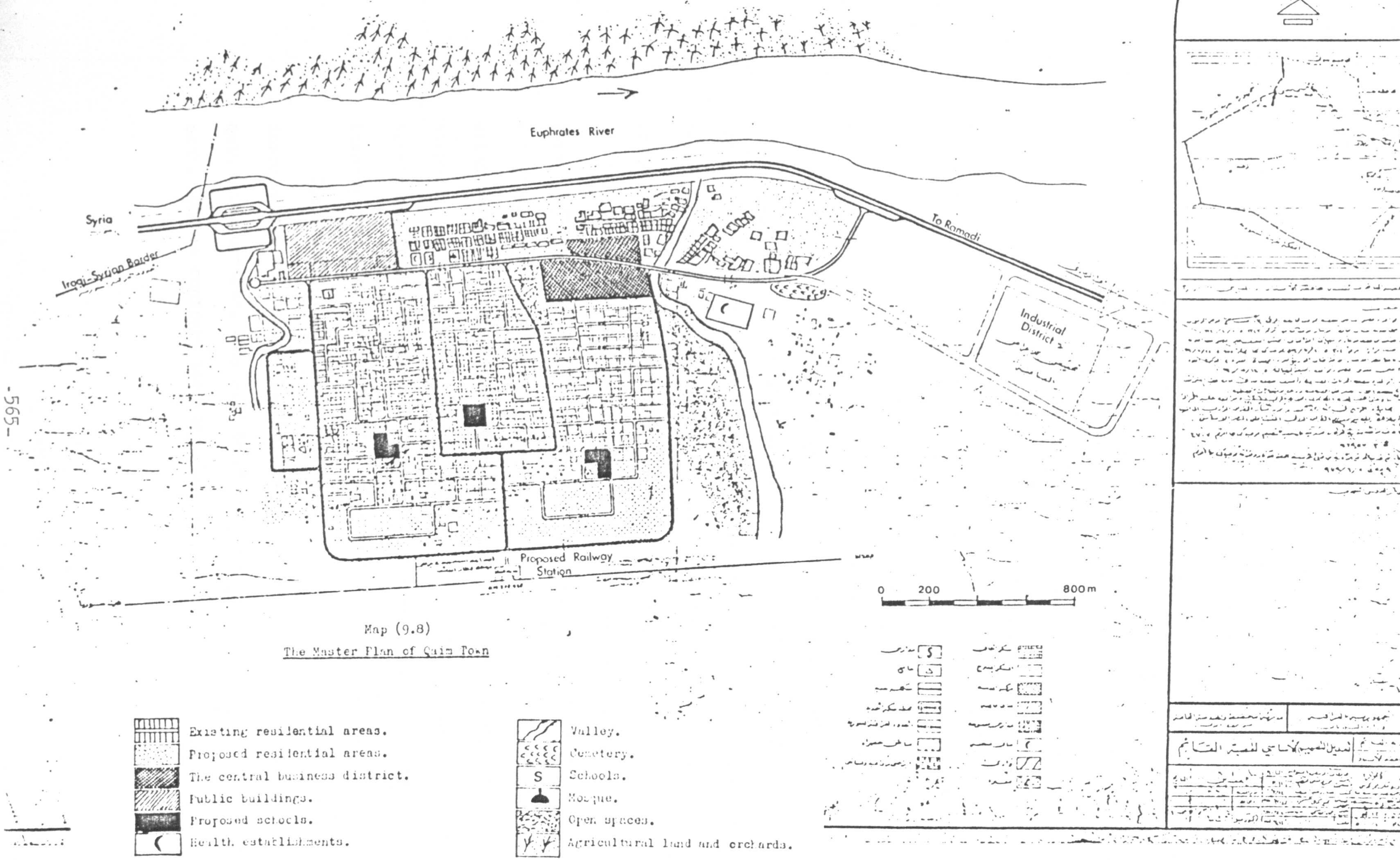
Expansion of Haqlaniya town on such a large scale, compared to its present size and the prevailing physical limitations, can lead, as in the case of Habaniya, to substantial improvements in its urban structure. The horizontal expansion will be very limited. Accordingly, the expected urban growth will take place mainly within the existing boundaries of the town which implies that a denser utilisation of land will be required. The increase in density could be achieved through redevelopment programmes which would provide an ample opportunity to improve the urban structure of the town, creating a more controlled pattern of development with a clearer separation of different land uses.

(G) Qaim town: Being a border town, Qaim is among the first urban centres in the region where town planning was introduced. Separation in land use is clearly found. The commercial and administrative services are located in the centre of the town. The public buildings are mainly concentrated in the west of the town. The services are distributed more or less in accordance withpopulation distribution and frequency of use. The industrial area is located at the edge of the town (see map 9.8).

The relatively large expected urban growth of about 32000 inhabitants by 1985 and 50000 inhabitants between 1986 and 2000, if Qaim town is recommended for urban expansion, would lead to a major change in its structure mainly in the central areas of the town where more commercial and business areas and public buildings would be needed to serve the

Map (9.7)

The Master Plan of Haqlaniya Town



Map (9.8)

The Master Plan of Qaim Town

newcomers. The road and transportation network will change to a more advanced one involving increased accessibility to various areas for the population of the town and the industrial establishments and other basic employments locations some 17 km's to the south east.

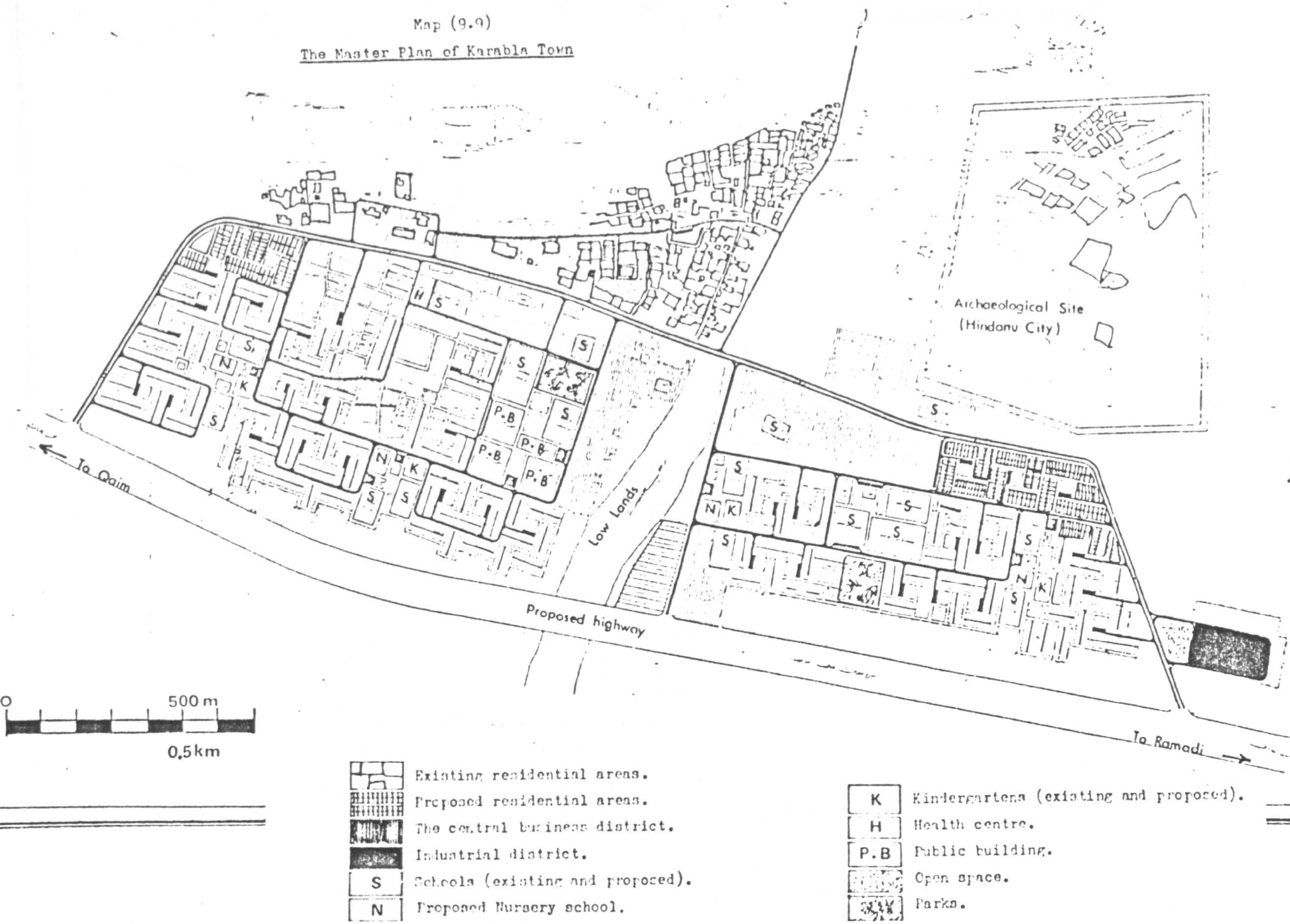
(H) Karabla and Ubaidi towns: A very limited urban structure could be found in both Karabla and Ubaidi. Both of them have recently evolved as new urban centres from large villages. A mixed land use pattern prevails and the agricultural occupation was and still is the main source of living of their populations. Master plans have been recently drawn for both towns. The one for Ubaidi town was drawn in 1979 and that of Karabla in 1980. These plans tried to introduce new principles for their development, such as separation in the land use pattern and the introduction of vehicle road systems, see map (9.9) and map (9.10). The new developments in both of them are now controlled in accordance with the main directives of the plans. The master plan of Karabla took the important archaeological site of Hindanu into consideration and prohibited any sort of expansion in that direction.

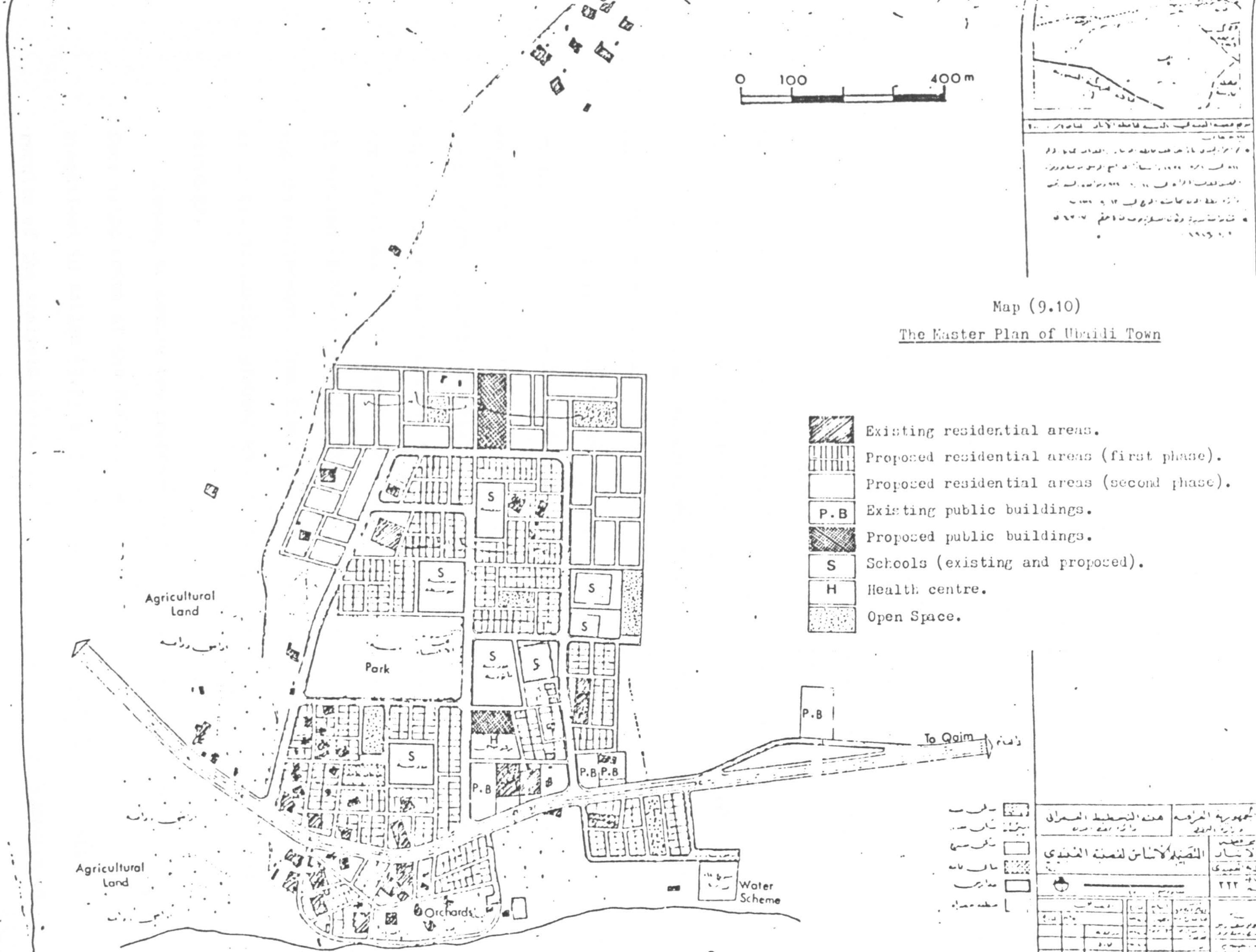
In both towns, especially in Ubaidi, the small size of present population compared to the large expected urban growth means that a completely new urban structure would be created if any of these two urban centres is recommended for urban expansion. The existing urban structure of both towns is poor. Neither town containsareas of either historical or architectural interest and as a result could either be incorporated into the recommended major expansion or redeveloped.

The overall analysis of this factor suggests that due to the major improvements and changes in the urban structure of Ramadi, Habaniya and Qaim urban centres, they will be given the highest priority with 3 points each. On the contrary the suggested new towns, towns which are expected

Map (9.9)

The Master Plan of Karabla Town





Map (9.10)

The Master Plan of Ubaidi Town

to experience very limited improvements in their urban structure, such as Hit and Haditha, and towns where the expected expansion will predominate the existing urban structure, such as Karabla and Ubaidi, will be given the lowest priority with 1 point each. The remaining two existing urban centres of Haqlaniya and Kabaisa will be given the second priority with two points each due to the considerable expected changes in their urban structure.

9.2. The Choice of a Preferred Strategy

This last stage of the analysis of urban growth patterns of the U.E.R. is concerned with the overall evaluation of the three alternative proposed strategies (see map 8.2) and the choice of a preferred one.

Because of the way the alternative strategies have been formulated, i.e., derived from the constraints prevailing in the study area and the objectives of the study (see sections 8.1 to 8.3), it is a natural development to use objective achievement tests to find out how far the different alternative strategies meet them.

In general, the preferred strategy for the purpose of this study, in each urban node, will be determined on the basis of the overall achievement of the stated aims and objectives. The alternative which best achieves all the objectives, i.e., the alternative with the highest weighted score is considered to be the best solution to the problem at hand. The degree of achievement of specific groups of objectives (socio-economic, physical, structural and environmental) and the achievement from first priority objectives, will also be locked at in the evaluation process and in making the choice of the preferred strategy.

Hence, to derive the preferred strategy for each of the examined four urban nodes of the U.E.R., the results of the previous analysis are summarised in tables (9.5) to (9.8). In all four cases, the overall results of the analysis indicate that alternative (A), the expansion of

Table (9.5)

Urban Growth Potentials (Ramadi Urban Node), According to the Original Assumption of the Study

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	3	3	1	1	9	3	3
2	Cost of providing services and public utilities.	3	3	2	1	9	6	3
3	Daily journey to work.	3	3	1	3	9	3	9
4	Availability of land for urban growth.	3	3	1	3	9	3	9
5	Preserving good quality landscape.	2	3	1	3	6	2	6
6	Social considerations: social relationships and personal preferences of location and city-size.	2	3	2	3	6	4	6
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	2	3	2	2	6	4	4
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	1	3	3	2	3	3	2
9	Future potentials of economic development and urban growth.	1	3	1	3	3	1	3
10	Improving the urban structure of existing urban centres.	1	3	3	1	3	3	1
	Total	21	30	17	22	63	32	46

Where: (A) = The expected urban growth to be directed to Ramadi City.
(B) = The expected urban growth to be directed to Habaniya town.
(C) = The expected urban growth to be directed to the proposed new town.

Table (9.6)

Urban Growth Potentials (Hit Urban Node), According to the Original Assumption of the Study

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	3	3	2	1	9	6	3
2	Cost of providing services and public utilities.	3	3	1	1	9	3	3
3	Daily journey to work.	3	2	3	3	6	9	9
4	Availability of land for urban growth.	3	3	3	3	9	9	9
5	Preserving good quality landscape.	2	3	2	2	6	4	4
6	Social considerations: social relationships and personal preferences of location and city-size.	2	2	1	3	4	2	6
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	2	3	2	1	6	4	2
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	1	3	2	2	3	2	2
9	Future potentials of economic development and urban growth.	1	3	3	3	3	3	3
10	Improving the urban structure of existing urban centres.	1	1	2	1	1	2	1
	Total	21	26	21	20	56	44	42

Where: (A) = The expected urban growth to be directed to Hit town.
(B) = The expected urban growth to be directed to Kubaisa town.
(C) = The expected urban growth to be directed to the new proposed town.

Table (9.7)

Urban Growth Potentials (Haditha Urban Node), According to the Original Assumption of the Study

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	3	3	2	1	9	6	3
2	Cost of providing services and public utilities.	3	3	2	1	9	6	3
3	Daily journey to work.	3	2	3	3	6	9	9
4	Availability of land for urban growth.	3	2	1	3	6	3	9
5	Preserving good quality landscape.	2	3	1	3	6	2	6
6	Social considerations: social relationships and personal preferences of location and city-size.	2	2	1	3	4	2	6
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	2	3	2	1	6	4	2
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	1	3	3	2	3	3	2
9	Future potentials of economic development and urban growth.	1	2	1	3	2	1	3
10	Improving the urban structure of existing urban centres.	1	1	2	1	1	2	1
	Total	21	24	18	21	52	38	44

Where: (A) = The expected urban growth to be directed to Haditha town.
(B) = The expected urban growth to be directed to Haqlaniya town.
(C) = The expected urban growth to be directed to the new proposed town.

Table (9.8)

Urban Growth Potentials (Qaim Urban Node), According to the Original Assumption of the Study

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies				Weighted Score			
			A	B		C	A	B		C
				B_1	B_2			B_1	B_2	
1	Availability and spare capacity of services and public utilities in existing urban centres.	3	3	1	3	1	9	3	9	3
2	Cost of providing services and public utilities.	3	3	2	2	2	9	6	6	6
3	Daily journey to work.	3	2	3	3	3	6	9	9	9
4	Availability of land for urban growth.	3	3	3	3	3	9	9	9	9
5	Preserving good quality landscape.	2	3	3	3	3	6	6	6	6
6	Social considerations: social relationships and personal preferences of location and city-size.	2	2	1	1	3	4	2	2	6
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	2	3	2	2	2	6	4	4	4
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	1	3	2	2	2	3	2	2	2
9	Future potentials of economic development and urban growth.	1	3	3	3	3	3	3	3	3
10	Improving the urban structure of existing urban centres.	1	3	1	1	1	3	1	1	1
	Total	21	28	21	23	23	58	45	51	49

Where: (A) = The expected urban growth to be directed to Qaim town.
(B_1) = The expected urban growth to be directed to Karabla town.
(B_2) = The expected urban growth to be directed to Ubaidi town.
(C) = The expected urban growth to be directed to the new proposed town.

the largest urban centre of each urban node seems to be the preferred strategy, at this stage of socio-economic development of the region. The overall results of testing different factors included in the analysis indicate that in each of the four urban nodes, the largest urban centre possesses the highest growth potential and is the most preferable place for urban growth until 1985. In case of Ramadi urban node, Ramadi City shows the highest potential for growth with 63 points against 32 points in case of alternative (B), the expansion of the proposed smaller urban centres in each urban node and 46 points in case of alternative (C), the creation of a new town in each urban node. The same conclusion applies in the case of the other three urban nodes, but with relatively lower growth potentials of their largest urban centres compared to that of Ramadi City. The total weighted score of the largest urban centre in the remaining urban nodes of Hit, Haditha and Qaim are shown to be 56 points, 52 points and 58 points respectively, compared to the 63 points in case of Ramadi City, see tables (9.5) to (9.8).

Accordingly, the superiority of the largest urban centres for the purpose of accommodating the expected urban growth in each urban node is clear. It is the highest in case of Ramadi City and the lowest in case of Qaim town. The degree of achievement of the overall objectives by the largest urban centres compared to the second best alternative in each urban node is found to be higher by 27%, 21%, 15% and 12% in case of Ramadi, Hit, Haditha and Qaim respectively.

Hence, evaluation of alternative strategies according to goals-achievement analysis suggests that alternative (A), the expansion of the largest urban centre in each urban node, is the solution which best meets the overall objectives of the study. In the second place comes either alternative (B), the expansion of the proposed smaller urban centres or alternative (C), the creation of a new town in each urban node. In two of the four cases (Ramadi and Haditha urban nodes), accommodating all or part of the expected urban growth in the proposed new towns shows to be the second best, whilst in the other two urban nodes (Hit and Qaim) expanding one of the existing smaller towns in shown to be the second best.

To test the findings of this study, another goals-achievement technique, "Holmes Disaggregated Matrix",(1) which concentrated on the achievement of the first priority objectives, is adopted. The application of this tecnique again clearly indicates that the largest urban centre in each urban node is the preferable solution to the problem in question, see tables (9.9) to (9.12). In each urban node, alternative (A), the expansion of the largest urban centre, is shown to come closest to meeting the first priority factors. In the case of Ramadi urban node, if Ramadi City is expanded all the four first priority objectives will be achieved while only two will be met by the establishment of the new town at Habaniya tourist village and none would be met in the case of expanding Habaniya town. The findings in the case of other urban nodes are similar to that of Ramadi but with smaller marginal differences between alternative strategies, especially in case of Haditha and Qaim urban nodes, where expansion of the largest urban centres in the latter two urban nodes is regarded as preferable not because of achieving more

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(1) J. C. Holmes, op.cit., PP.179-191.

Table (9.9)

Disaggregated Matrix (Ramadi Urban Node)

Class number	Criteria	Corresponding Positions 1	2	3	4	5
I	1	A	-	B/C		
	2	A	B	C		
	3	A/C	-	B		
	4	A/C	-	B		
II	5		A/C	-	B	
	6		A/C	B	-	
	7		A	B/C	-	
III	8			A/B	C	-
	9			A/C	-	B
	10			A/B	-	C
Position gained	A	4	3	3	-	-
	B	-	1	7	1	1
	C	2	2	4	1	1
Result		A	C	B		

Table (9.10)

Disaggregated Matrix (Hit Urban Node)

Class number	Criteria	Corresponding Positions 1	2	3	4	5
I	1	A	B	C		
	2	A	-	B/C		
	3	B/C	A	-		
	4	A/B/C	-	-		
II	5		A	B/C	-	
	6		C	A	B	
	7		A	B	C	
III	8			A	B/C	-
	9			A/B/C		
	10			-	B	A/C
Position gained	A	3	3	3	-	1
	B	2	1	4	3	-
	C	2	1	4	2	1
Result		A	B	C		

Table (9.11)

Disaggregated Matrix (Haditha Urban Node)

Criteria		Corresponding positions				
Class number		1	2	3	4	5
I	1	A	B	C		
	2	A	B	C		
	3	B/C	A	-		
	4	C	A	B		
II	5		A/C	-	B	
	6		C	A	B	
	7		A	B	C	
III	8			A/B	C	-
	9			C	A	B
	10			-	B	A/C
Position gained	A	2	4	2	1	1
	B	1	2	3	3	1
	C	2	2	3	2	1
Result		A	C	B		

Table (9.12)

Disaggregated Matrix (Qaim Urban Node)

Critera		Corresponding positions				
Class number		1	2	3	4	5
I	1	A/B_2	-	B_1/C		
	2	A	$B_1/B_2/C$	-		
	3	$B_1/B_2/C$	A	-		
	4	$A/B_1/B_2/C$	-	-		
II	5		$A/B_1/B_2/C$	-	-	
	6		C	A	B_1/B_2	
	7		A	$B_1/B_2/C$	-	
III	8			A	$B_1/B_2/C$	-
	9			$A/B_1/B_2/C$	-	-
	10			A	-	$B_1/B_2/C$
Position gained	A	3	3	4	-	-
	B_1	2	2	3	2	1
	B_2	3	2	2	2	1
	C	2	3	3	1	1
Result		A	B_2	C	B_1	

first priority objectives, but rather as a result of achieving more second priority objectives.[1] Both alternative (A), the expansion of the largest urban centre and alternative (C), the creation of new town, in case of Haditha urban node and alternative (A) and alternative (B_2), the expansion of Ubaidi town in case of Qaim urban node, meet the first priority objectives in the same degree. The achievement from second priority objectives, in both urban nodes, are higher in case of alternative (A) which gives it superiority over alternatives (C) and (B_2) see tables (9.11) and (9.12).

The second best alternative, according to this technique, comes either from the proposed new towns or the expansion of one of the smaller existing towns. The first case applies to Ramadi and Haditha urban nodes whilst the second applies to Hit and Qaim urban nodes, see tables (9.9) to (9.12).

However, due to the nature of such sort of analysis which might involve a considerable amount of value judgement, it is necessary here to relax the assumptions of the analysis and see the possible changes that occur to the findings of the study. The possible relaxation of assumptions that could be made at this stage is to change the values given to the factors incorporated in the analysis. Several patterns of changes could be adopted. These patterns are based on the following assumptions:-

First, the factors incorporated in the analysis of urban growth pattern are of equal importance.

Second, the priorities given to these factors originally in the study are reversed.

Third, the economic factors are given the highest priority (3 points each), while all other factors are given the least priority (1 point each).

(1) According to Holmes disaggregated matrix, when more than one alternative meet, in the same degree the first priority objectives, achievement from the second priority objectives are considered in choosing the preferred strategy and so on, (See Ibid, PP.179-191).

Fourth, the social factors are given the highest priority (3 points each), while all other factors are given the least priority (1 point each).

Fifth, the physical, structural and environmental factors are given the highest priority (3 points each), while all other factors are given the least priority (1 point each).

Sixth, the future potentials of economic and urban growth is given the highest priority (3 points), while all other factors are given the least priority (1 point each).

It should be noted that some of the factors, due to their nature, are given the highest priority more than one time. These factors are the daily journey to work, the availability of land for urban growth and the accessibility to regional infrastructure facilities and the economical utilisation of these facilities. The daily journey to work ones is regarded as an economic factor because it involves a considerable transportation cost and monetary savings. In another occasion it has been regarded as a social factor because it may involve in travel time which could be utilised by the workers as a leisure or social time. The availability of land for expansion is also treated as an economic factor and as a physical factor. The economic dimension of this factor is reflected mainly in preserving of the agricultural land from urbanisation, whilst the physical dimension is reflected in avoiding as possible the expansion of the proposed urban centres on a hilly land, valley's and so forth. Finally, the accessibility to regional infrastructure facilities and the economic utilisation of these facilities is treated ones as a structural factor because it effects the interlinkages of the whole components of the urban system in the region, from the one hand, and the interlinkages of the latter with the location of the committed basic employment, on the other hand. In another occasion, this factor has been regarded as an economical one since less distant and highly linked urban centres to each other and to the location of the committed basic employment involves a considerable saving in monetary costs.

The outcome of each of the above stated relaxations, table (9.5) to (9.8) and appendix (6) tables (X6.1) to (X6.20) indicate clearly that the largest urban centre in each urban node will continue to be the most preferable alternative for the purpose of urban growth up to 1985. The preference degree of the largest urban centres for urban growth is the highest if the economic, physical, structural and environmental factors are given the highest priority and the lowest if the social factors are given the highest priority. Only in the latter case it is found that in Haditha urban node, the creation of a new town near Haditha dam would be better alternative, in terms of the overall achievement of goals and objectives of the urban growth pattern of this urban node. Furthermore, Ramadi City best achieves the overall goals and objectives of the urban growth pattern in the region compared to other largest urban centres of the other urban nodes, under any set of the above stated assumptions. The marginal differences in the outcome of the relaxation of assumptions could be summarised as follows:-

1. In case of assigning equal value for different factors involved in the analysis, and assuming this value is (1) then the largest urban centres in each urban node shows to have the highest potential for urban growth with 30 points, 26 points, 24 points and 28 points in case of Ramadi, Hit, Haditha and Qaim urban nodes respectively. This is against 17 points, 21 points, 18 points and 21 or 23 points in case of expanding the proposed smaller urban centres and 22 points, 20 points, 21 points and 23 points in case of the creation of a new town in each urban node respectively, see tables (9.5) to (9.8).

2. In case of reversing the priorities given originally in the study to different factors, the largest urban centres, Ramadi, Hit, Haditha and Qaim gained 57 points, 48 points, 44 points and 54 points respectively. This is against 36 points, 40 points, 34 points and 39 or 41 points in case of expanding the smaller proposed urban centres and 42 points, 38 points, 40 points and 43 points in case of the creation of a new town in each urban node respectively, see appendix (6), tables (X6.1) to (X6.4). Hence, according to this assumption, the degree of achievement of the overall objectives by the largest urban centres compared to the next best alternative is lower than that obtained from the application of the original assumption of the study, except in case of Qaim urban node which is found to be higher by about 6%. The expansion of the largest urban centre in each urban node, compared to the next best alternative, better fulfils the objectives of the study by about 26%, 16.7%, 9% and 16.7% in case of Ramadi, Hit, Haditha and Qaim urban nodes respectively.

3. In case of assigning the highest priority to the economic factors, the largest urban centres in Ramadi, Hit, Haditha and Qaim urban nodes gained 60 points, 54 points, 50 points and 56 points respectively. This is against 33 points, 43 points, 40 points and 43 or 49 points in case of expanding the proposed smaller urban centres and 42 points, 40 points, 41 points and 45 points in case of the creation of a new town in each urban node respectively, see appendix (6), tables (X6.5) to (X6.8.) Hence, according to this assumption, the degree of achievement of the overall objectives by the largest urban centres compared to the next best alternative is again very high. It is even in some urban nodes higher than the case of the original assumption of the study. The largest urban centres, according to this assumption seem to fulfil the overall

objective of the study by about 30%, 20.4%, 18% and 12.5% higher than the case of the next best alternative in Ramadi, Hit, Haditha and Qaim urban nodes respectively.

4. In case of assigning the highest priority to the social factors, the superiority of expanding the largest urban centres will diminish to a large extent. Furthermore, in case of Haditha urban node, expanding the largest urban centre comes in the second order after alternative (C) which represents the creation of a new town near Haditha dam site. In the latter case expansion of the largest urban centre gained 32 points whilst that of the creation of a new town gained 33 points, see appendix (6), table (X6.11). The highest degree of the achievement of the overall objectives of the study by the largest urban centres compared to the next best alternative is in case of Ramadi urban node, where Ramadi City achieves the overall objectives by about 19% higher than what the second best alternative, the creation of new town, could do. This percentage drop to 5.9%, 2.8% and -3.1% in case of Hit, Qaim and Haditha urban nodes respectively, see appendix (6), tables (X6.9) to (X6.12). The latter percentage means that the creation of a new town achieves better the overall objectives of urban growth strategy in this urban node. However, this very low difference in the degree of the achievement of the overall objectives could be neglected and both cases could be considered of equal importance.

5. In case of assigning the highest priority to the physical, structural and environmental factors, the largest urban centres in Ramadi, Hit, Haditha and Qaim urban nodes gained 60 points, 52 points, 48 points and 56 points respectively, see appendix (6), tables (X6.13) to (X6.16). The differences in the degree of achievement of the overall objectives by these urban centres compared to the next best alternative are again very high. The largest urban centres better

achieve the overall objectives by about 26.7%, 17.3%, 14.5% and 22.4% respectively.

6. In case of assigning the highest priority to the future potentials of economic and urban growth, the points gained by the largest urban centres in Ramadi, Hit, Haditha and Qaim urban nodes declined highly to 36 points, 32 points, 28 points and 34 points respectively, see appendix (6), tables (X6.17) to (X6.20). This is due mainly to the nature of the assumption itself which implies that every other factor, except the above stated one, are of equal importance and consequently they have been given one point each. However, three degrees of objectives achievements by the largest urban centres continue to be high except in case of Haditha urban node which is found to be just 3.6% higher than what could the second best alternative, the creation of a new town, achieves. This percentage goes up to 22.2%, 15.6% and 14.7% in case of Ramadi, Hit and Qaim urban centres respectively. However, it should be noted here that including the above factor as the only forseeable change in the future in the region may not give a full picture. There are many other factors that chould be changed after 1985. Among these factors are the social relationships and social institutions, the personal preferences of city-sizes and location, technological changes in transportation and communication systems and methods of provision of services among other factors. However, due to the complexity of predicting such changes in a reliable way and the inapplicability of the assumption that the distribution of the expected urban growth up to 1985 should be delayed until such expected changes could take place, the study has unwillingly ignored them. It assumes that such changes could be fully considered when dealing with the problem of urban growth beyond 1985. Hence, it could be a recommended area of interest for further research

Accordingly, alternative (A), the expansion of the largest urban centre in each urban node, is confirmed to be the best alternative to accommodate the expected urban growth. The superiority of this alternative is most apparent in case of Ramadi urban node, where whatever the priorities given to the factors incorporated in the analysis, Ramadi City is found to achieve best the objectives of the analysis compared to other largest urban centres of the remaining urban nodes. The superiority of expanding Ramadi City over the next best alternative is very high according to different assumptions just made. It is 30% higher if the economic factors are given the highest priority, 27% if the physical, structural and environmental factors are given the highest priority, 22% if the future potentials of economic and urban growth is given the highest priority and 19% if the social aspects are given the highest priority. However, it should be noted that despite having Ramadi City with very high potentials of growth compared to the other two alternatives within Ramadi urban node, it would not be feasible to accommodate that part of the expected urban growth generated by Habaniya tourist activities, which includes about 9768 inhabitants in Ramadi City. Such action would mean that the daily journey to work would be more than two hours (see section 8.4.3) which is too long for a normal daily commuting. Furthermore, the type of services provided by the tourist village require a considerable proportion of its personnel to be within easy access to the place. Hence, in this case, the proposed new town at Habaniya tourist site is recommended to accommodate this part of urban growth. For the other urban nodes, the superiority of the largest urban centres differs according to the assumptions made. This could be summarised as follows:-

1. For Hit urban node, the superiority of Hit town, the largest urban centre in this urban node, over the next best alternative shows to be very clear according to the original assumption of the study (21%), if the economic factors are given the highest priority (20.4%), if the physical, structural and environmental factors are given the highest priority (17.3%) and if the future potentials of economic and urban growth is given the highest priority (15.6%). This superiority degree declines to(5.9%)if the social factors are given the highest priority. This implies that Hit town is more feasable to expand if the economic, physical, structural, environmental and the future potentials of growth are considered whilst it is relatively less preferable to expand if the social considerations are regarded of crucial importance.

2. For Haditha urban node, the superiority of Haditha town, the largest urban centre in this urban node, over the next best alternative shows to be clear in case of giving the economic factors the highest priority (18%), according to the original assumption of the study (15%) and if the physical, structural and environmental factors are given the highest priority (14.5%). The superiority degree of Haditha town declines to 9% if the original priorities given in the study are reversed and(3.6%)if the future potentials of economic and urban growth is given the highest priority. If the social factors are given the highest priority then the creation of a new town near Haditha dam site will become more preferable and in this case the latter site will be more suitable for urban growth by about(3.1%)compared to Haditha town. However, being very low, this difference could be neglected and both Haditha town and the suggested new town could be regarded of equal importance in meeting the objectives of the study.

3. For Qaim urban node, the superiority of Qaim town, the largest urban centre in this urban node, over the next best alternative is most apparent if the physical, structural and environmental factors are given the highest priority (22.4%). Its superiority declines to (14.7%)if the future potentials of economic and urban growth is given the highest priority and is in its minimum level if the social factors are given the highest priority (2.8%). This implies that no structural, physical or environmental obstacles prevent the town from expansion whether now or in future. It also implies that socially, no real difference exist between expanding Qaim town or the creation of a new town near Ubaidi which represents the second best alternative in this case.

In total, alternative (A), the expansion of the largest urban centre in each urban node, minimises the cost of urban growth. This minimisation is achieved mainly through; first, minimising the cost of provision of different services and public utilities which in turn is achieved either through utilising the existing spare capacities of services (see section 8.4.1) or through achieving economies of scale with city-size (see section 8.4.2); and second, providing an economical interlinkages between the proposed urban growth sites and the basic infrastructure facilities in the region.

In addition to minimising the cost of urban growth, expanding the largest urban centres incorporates an objective directed toward the preservation of scarce agricultural land and good quality landscape from use in expected urban growth. It also preserves high quality scenic sites through expanding urban centres along Euphrates River. It tries to minimise the associated social problems and it took the future potentialities of both economic and urban growth into full consideration.

Furthermore, it is the best alternative in reinforcing the existing imbalance of the urban settlement pattern in the region and where the expected urban growth is relatively high, this alternative best leads to the improving of the urban structure of the existing urban centres.

On the contrary, the alternative concerning the creation of new towns minimises the daily journey to work, provides huge areas of land without agricultural and landscape values for the purpose of urban growth and minimises the social problems associated with urban growth. Finally the alternative concerning the expansion of smaller urban centres in each urban node did not show any kind of distinctive charactaristics and/or common advantages.

Furthermore, each of the alternative proposed strategies will have different effects on the socio-economic groups of the study area. Alternative (A), the expansion of the largest urban centre in each urban node, will best benefit the central and local government budgets. This is mainly through the minimisation of the cost of provision of services, public utilities and regional infrastructure facilities. It will be in favour of the newcomers, especially those seeking the city life and wider range of services and urban amenities. However, the existing population in urban centres other than Ramadi City, may not highly welcome the newcomers due to the relatively strong social relationships in these areas. To avoid this possible problem the study suggested that the newcomers should, at this stage, be accommodated in a special residential quarters. Like the case of the other two alternatives, expanding the largest urban centres will raise the demand on the agricultural products produced in the region and consequently improve the standard of living of those involved in agricultural activities, leading to a more stability in the rural areas of the region.

Expanding the largest urban centres will also enhance the commercial and retail services sectors in these areas and consequently the group of people involved in such activities will financially benefit through raising the demand on their services. It will also benefit the property owners in these urban areas. This latter case will apply especially in Ramadi and Qaim urban centres, where as it has been found in section (9.1.6) the expansion of these centres will change their structure, especially the central business districts which will be more intensively utilised. The changes in the structure and utilisation of land and properties in the central business districts will raise the value of these properties and consequently enrich the owners of these properties.

On the contrary, alternative (B), the expansion of the smaller urban centres will be more costly to the central and local government budgets. Neither the newcomers nor the original residence of the smaller urban centres due to their strong social relationship will enjoy the company of each other, see section (9.2.1). However, the expansion of the smaller urban centres will directly benefit the basic employment of the committed development projects through minimising the daily journey to work, whereas it has been found in section (8.4.3) that the daily journey to work will be minimised except in case of expanding Habaniya town of the Ramadi urban node. Alternative (C), the creation of new town in each urban node will also be most costly to the central and local government budgets. It will avoid the social conflicts associated with adopting alternative (B). It will be better than alternative (B) benefit the basic employment of the committed development projects through minimising the travel time to work. Unlike the case of the above two alternatives, the creation of new towns will not create any speculation activities since the land where these towns will be built belong to the

State and the services and public utilities will basically be provided by the State as well.

In total, enlarging the main urban centres in each urban node will positively effect larger number of population in the study area, enrich many groups, especially the landowners and those involved in retail and commercial activities and it will minimise the public expenditure needed to accommodate the expected urban growth.

Finally, it should be noted that the advantages of expanding the largest urban centres over other alternatives does not mean that this urban growth pattern (beyond 1985) should necessarily continue in the same line, but rather further investigations, taking into consideration both the prevailing conditions and the committed aims and objectives at national and regional levels, at that time, should be undertaken. Furthermore, the factors involved in the analysis of this study and the priorities assigned to them could be changed according to the new conditions and constraints.

9.3. <u>Summary</u>

As it has been mentioned in the summary of Chapter eight, this summary will to some degree deal with both Chapters eight and nine. This is due to the complementarities of the two chapters in drawing the alternative urban growth strategy for the U.E.R. However, to avoid a considerable repetition, the conclusions stated in Chapter eight will not be repeated in detail.

In general, an alternative urban growth strategy to be followed to 1985 in the U.E.R. was given in this part of the study. In testing and evaluating this alternative strategy a goals-achievement analysis technique was developed. Three alternative strategies were proposed for the purpose of the distribution of the expected urban growth in the region. These three alternatives were:-

(a) the expansion of the main urban centres in each urban node;

(b) the expansion of one or more of the other urban centres in each urban node, and;

(c) the establishment of a new town in each urban node.

The aims and objectives of the study were derived from the analysis of the physical, economic and social charactaristics of the study area, i.e., the local constraints were a vital source for the derivation of the aims and objectives of the alternative proposed strategies. The declared national and regional aims and objectives were another source for this derivation. The most important aims and objectives of the proposed strategies were to minimise the cost of urban development through minimising the cost of provision of services and public utilities, preserving the very scarce agricultural land and good quality landscape, minimising the daily journey to work and the creation of a more balanced urban settlement pattern in the region. Other objectives of lesser importance were also included in the analysis. In whole the factors incorporated in the analysis included socio-economic, physical, environmental and structural ones.

According to the goals-achievement analysis these factors were given different weights. The weights given to them ranged from 1 to 3. Factors with greatest importance were given three points, whilst those with lowest importance were given 1 point. Factors inbetween these two categories were given 2 points each. The study area was divided, for the purpose of the analysis into four urban nodes. These urban nodes were Ramadi, Hit, Haditha and Qaim. Each urban node included all the urban centres which were within a diameter not more than one hour travel time, with Qadhas centres as focul points of these urban nodes.

A detailed analysis and testing of different factors included in the study was given in both Chapters eight and nine. The methodology of testing each factor differs according to the nature of the factor. In the end of testing each factor different grades were assigned to the alternative strategies. For the purpose of the analysis of this study three grades were distinguished. The highest weight (3 points) was given to the alternative which best achieves or maximises the aims of the factor under investigation. The lowest priority was given to the alternative which does not correspond, or corresponds to a very limited extent, to the achievement of the aims of that factor. The criteria of the assignment of the grades differ from one factor to another and in some cases from one urban node to another in case of the same factor.

The overall analysis of the choice of the preferred strategy which was determined on the basis of both the overall achievement of the stated aims and objectives and the achievement from the first priority factors suggested that, at this stage of socio-economic development in the region, the expansion of the largest urban centre in each urban node is the best alternative to accommodate the expected urban growth in each urban node. To examine the possible changes, if there are any, to the overall results of the analysis, a sensitivity analysis was conducted. A set of new assumptions regarding the priorities given to the factors included in the analysis were adopted. The new assumptions ranged from; first, giving all the factors included in the analysis the same importance; second, reversing the priorities originally given in the study, and; third, assigning the highest priority to a group of factors, represented by economic factors, social factors, physical, environmental and structural factors and the future growth potentials. The results of the relaxation of the assumptions confirmed that the expansion of the largest urban centres is the best alternative of urban growth at this stage of the socio-economic development of the region. Hence, the result reached by this study is that the expected urban growth up to 1985 in the U.E.R. should be accommodated in the largest urban centre of each urban node. The only exception is that the expected urban growth generated by Habaniya tourist village should be accommodated in the suggested new town in Ramadi urban node. This result differs from that of Planar's study which without a systematic and comprehensive analysis of the problem of the urban growth in the region, accepted the proposals made by the Ministry of Industry and the State Organisation of Tourism to establish a new town in each urban node to accommodate the expected urban growth.

The superiority degree of alternative (A), the expansion of the largest urban centre in each urban node, is most apparent in the case of Ramadi City, the regional capital. In total this alternative is found to minimise the cost of urban growth. This could be achieved mainly through the minimisation of the cost of provision of different services and the expected economies of scale that could be achieved in larger urban centres and the provision of an accessible sites to different types of regional infrastructure facilities. Beside minimising the cost of urban growth, this alternative considers other issues in the process. It incorporates objectives directed toward the preservation of the very scarce agricultural land and the good quality landscape from urbanisation. It is found to be the best alternative in bringing about a more balanced urban settlement pattern in the region and best leads to the improving the urban structure of the existing urban centres.

The alternative concerning the creation of new towns shows to be the second best alternative. Its main charactaristics are, it minimises the daily journey to work, provides huge areas of land, without agricultural and landscape values, for the purpose of urban growth and minimises the associated social problems. Alternative (B), the expansion of the smaller urban centres in each urban node did not seem to have any kind of distinguishing charactaristics and/or common advantages. It least achieves the aims and objectives of the study.

Finally, each of the alternative proposed strategies expected to have some different effects on the socio-economic groups of the study area. Again, the expansion of the largest urban centres, is expected to have the highest positive effects on a larger number of population of the region. It will best benefit the central and local governments budgets, through minimising the public expenditure on public services.

CHAPTER TEN

FINAL CONCLUSIONS, RECOMMENDATIONS AND SCOPE FOR FURTHER RESEARCH

CHAPTER TEN

FINAL CONCLUSIONS, RECOMMENDATIONS AND SCOPE FOR FURTHER RESEARCH

10.1. Final Conclusions

A summary is given in the end of each chapter or more than one related chapter containing the main conclusions and findings reached in that chapter or group of chapters. Also a general discussion of the results of the study and the evaluation of the alternative proposed strategies of the urban growth of the U.E.R. are given in section 9.2, the choice of a preferred strategy. Hence, in order to avoid a detailed repetition a very brief conclusion will be given here.

The study dealt with the urban growth problems in the U.E.R. of Iraq up to 1985. This region was found to have the potential of urban growth as a result of the committed economic development projects in it. For the purpose of analysis the region was divided into urban nodes each containing the urban centres which are within a diameter of not more than one hour travel time, with Qadhas centres as a focal point of these urban nodes. It was found that the expansion of the existing urban centres is within the interest of the planning departments and coincides with the pattern of the committed economic development and the distribution of the major development projects in the study area. The new town option, as a radical option, was adopted because it is also within the concern of the Ministry of Industry and other planning departments in the country. Accordingly, three principlesvariations were examined, they were:-

(a) the expansion of the major urban centre in each urban node.

(b) the expansion of one or more of the other urban centres in each urban node.

(c) the establishment of a new town in each urban node.

To facilitate the understanding of the analysis of the urban growth pattern of the study area, the theoretical part of the study focused on the casual relationship between urbanisation and economic development in developed as well as developing countries and the development of the theoretical formulations of the question of city sizes and distribution. In this part the main conclusions drawn were that:-

First, discussions in this part provided a general understanding of the problem of the urban growth. Generalisations regarding the positive correlation between economic development, industrial development and urbanisation process helped in explaining the causes of urban growth in Iraq and the U.E.R. in the past few decades. It also helped in visualising the size of the expected urban growth in the U.E.R. as a result of the committed economic development.

Second, the fact that remarkable differences exist between urbanisation of the developed countries during their early stages of development and that of present developing countries and the prevalence of different sets of socio-economic, political and cultural forces behind such differences implies that when planning for urbanisation in a developing region such as the one in question, the direct copying from the experiences of the developed countries should be avoided and the adoptation of many of the facts developed there should be undertaken cautiously and in accordance with the socio-economic circumstances of a particular case or that of the similar cases.

Third, the review of the literature on the city size distribution models and theories provided the following conclusions:-

(a) many of the models and theories examined were found to be satisfactory in the sense that they generate size distributions of cities that are consistent with those found in the real world (see section 4.4). However, it is improbable that any one of these models would be universally acceptable, where there are so many influences interacting to mould the relative size of cities that it would be difficult to include them all within a single model. It was found that most of the examined models and theories for the purpose of simplifying and expeditting the analysis are based on one or very few factors in explaining the city size distribution. They are based on certain unrealistic assumptions. Most of these models and theories are static ones i.e., they do not provide the opportunity to predict the future urban size distribution, taking into consideration the expected future changes in the prevailing socio-economic and physical aspects and very few of them consider the space separating urban centres, as well as the city size distribution.

Hence, basing on the above limitations, the resulted city size distribution theories and models are far from being a general urban growth models or theories. Furthermore, the discussion in part one suggested that a multi-disciplinary approach to the urban growth and city size distribution problem, is not merely desirable, it may be essential to a deeper understanding of urban growth, simply because it will rest on a more realistic basis.

(b) the existence of a well spaced hierarchical system of cities is very important, both for the well being of the population and the economy of the nation or region (see section 4.4). On the contrary, the review of the optimality on city size models suggested that although there is some empirical evidence of city size, basing upon the cost of urban services alone, it would appear difficult to reach any conclusions that an optimal size of city at a given population level exists. Even from a theoretical view point the search for the optimal city size encounters many problems.

(c) the rank-size literature suggests that regularities in the city size distribution can be detected in different parts of the world, developed as well as developing. Although the occurances of the rule is more apparent in the developed countries and it lacks theoretical justification but it could be a useful analytical device for the purpose of explaining the balance in the urban hierarchy in the developing countries.

(d) the theoretical as well as the empirical evidence suggests that economies of scale could be achieved with increasing city size. This is particularly true in case of the cost of provision of public services and utilities. However, after a particular size a diseconomies, instead of economies of scale would be experienced.

Further discussions of the applicability of the urban growth theories and models to the problem of urban growth in the U.E.R., section (7.1), which depend on choosing certain criteria for evaluation suggested that the extensive reading in urban theory and examination of many theoretical studies does not provide any ready made answer to the problem of urban growth pattern in this region. Instead, the study suggested that an alternative approach of analysis appropriate to deal with the problem of urban growth in a developing region was sought. The detailed examination of the urban growth techniques showed that due to the time limitation, the nature of the study and the lack of the kind of detailed qualitative and quantitative data required for the application of more sophisticated alternative techniques, such as the cost-benefit analysis and its refinement, the planning balance sheet, and threshold analysis, the goals-achievement analysis was shown to be the most appropriate technique to study the urban growth problem of the U.E.R. However, it should be noted that many basic principles of the theoretical formulation of city sizes and distribution models were utilised in the formulation and evaluation of the alternative proposed urban growth strategies of the study area.

The application of the goals-achievement analysis clearly indicates that, at this stage of the socio-economic and physical development of the region, the expansion of the major urban centre in each urban node (Ramadi City, Hit, Haditha and Qaim towns) is the best alternative. Due to the daily commuting limitations of the tourist village employees to Ramadi City, the suggested new town near the tourist village was recommended for accommodating the expected urban growth in this area even though it constitutes no more than a "second-best" solution in the overall analysis.

Expansion of the largest urban centre in each urban node will lead to the minimisation of the cost of the urban growth mainly through the minimisation of the cost of provision of many services. The minimisation of the cost of provision of services is found to be achieved through first the utilisation of the spare capacities in the provision of existing services in the proposed urban areas and through the economies of scale that could be achieved according to urban size. The study found that, in all four urban nodes, the main urban centres have the highest potentialities of urban growth, as far as the availability and the spare capacity of services provided is concerned, where in all cases a significant spare capacity in the provision of services prevailed. Other existing urban centres are shown to have lower potentialities to expand except in case of Ubaidi town where a significant spare capacity in the provision of the services exists.

Second, the economic assessment of the cost of provision of different services according to the size of urban centres also showed that considerable economies of scale could be achieved in the case of expanding the larger urban centres of the study area. To reach definite results in this respect both the per capita capital and annual running costs were included in the analysis and a correlation and multiple regression analysis was carried out. The analysis of per capita capital cost of different services suggested that economies of scale are gained in the larger urban centres in many cases and per capita capital cost is inversely related to urban size in case of water supply, kindergarten, primary schools, secondary schools, health and public libraries services. These services contributed to about 32% of the total per capita capital cost of all the investigated services. For the other types of services, the absence of the negative association with urban size was found to be as a result of factors such as the higher level of provision of services in larger urban areas, such as in case of municipal, electricity, telephone and mail services; the concentration of higher order services in larger urban areas which do not serve only the areas in which they are located but the smaller urban areas and the rural settlers as well. This is the case with health services; and the utilisation of modern or more advanced technology in larger urban areas, which is more costly for provision of some services such as electricity and telephone services. Furthermore, in some cases economies of provision of certain services are achieved in urban centres larger than those examined in this case study. The latter proposition could also apply to electricity provision. Hence, in addition to the possible economies of scale that could be achieved in larger urban centres, they justify the provision of higher order services which need a population threshold larger than smaller urban centres can offer and they represent the places where modern and more advanced technology can be adopted more efficiently.

The analysis of the annual running cost of different services also showed that economies of scale are experienced in most of the investigated services and an inverse association exists between the per capita annual running cost and population size of the urban areas. Whether this inverse association is high or not, it will lead to a great deal of cost savings. In the very few cases where the inverse association was found to be absent, factors such as the level and hierarchy of the provision of services and the administration of provision of services were the main factors behind that, where part of the annual running costs are spent by the larger urban centres to provide the services to smaller ones and even to rural settlers. This applies in case of telephone services among others. The differences in the level of provision of most services among different urban size groups also played an important role in either the decline or the absence of the inverse association between per capita annual running cost and urban size.

In addition to minimising the cost of provision of services through expanding the largest urban centre in each urban node, the study found that these urban centres are the most accessible urban growth sites to different types of regional infrastructure facilities. This in turn will contribute in reducing the cost of the expected urban growth in the study area.

Beside minimising the cost of urban growth, the alternative concerning the expansion of the largest urban centre in each urban node considered many other issues in the process. It preserves the scarce agricultural land and good quality landscape from urbanisation. It is shown to be the alternative which brings about a relatively more balanced urban settlement pattern in the region based on the criteria chosen. Furthermore, according to the assumptions of the study, expanding the largest urban centre in each urban node, best leads to the improving of the urban structure of the existing urban centres.

To confirm the results of the analysis "Holmes Disaggregated Matrix" which concentrates on the achievement of the first priority objectives was employed in testing the results. The application of this technique to the results of the analysis confirmed that the largest urban centre in each urban node is again the preferable solution to the problem in question where alternative (A), the expansion of the largest urban centre in each urban node, found to best meet the first priority factors in case of Ramadi and Hit urban nodes and to meet an equal number of the first priority factors with alternative (C), the creation of new town in case of Haditha urban node and alternative (B_2), the expansion of Ubaidi town in case of Qaim urban node. The preferable position of alternative (A) in the latter two cases was found to be because of its higher achievement from the second priority factors.

However, it should be noted that because of the considerable amount of the value judgement expected to be involved in adopting the goals-achievement analysis, the study in evaluating the alternative proposed strategies used sensitivity analysis. The priorities given to the factors involved in the analysis were changed according to the following assumptions:-

First, the factors incorporated in the analysis were regarded of equal importance.

Second, the original priorities given in the study for different factors were reversed.

Third, the economic factors were given the highest priority.

Fourth, the social factors were given the highest priority

Fifth, the physical, structural and environmental factors were given the highest priority.

Sixth, the future potentials of economic and urban growth was given the highest priority.

The outcome of each of these relaxation of assumptions proved that the largest urban centre in each urban node continued to be the most preferable place to accommodate the expected urban growth up to 1985. The preference degree of the largest urban centres for the purpose of the urban growth was found to be the highest when the economic, physical structural and environmental factors were given the highest priority and the lowest when the social factors were given the highest priority.

Accordingly, the hypothesis stated in the beginning of the study proved to be right, where; first, it is found that alternative urban growth patterns could be adopted for the purpose of the distribution of the expected urban growth in the region up to 1985; second, the socio-economic, physical, structural and environmental factors affect highly the expected pattern of urban growth, and; third, the goals-achievement analysis proved to be effective in giving a solution to the problem in question.

10.2. <u>General Recommendations</u>

The main recommendations which follow from this study are:-

First, it is found that the spatial distribution pattern of the economic development affects to a large extent the urban growth pattern. On the other hand, the pattern of urban system affects the overall well being of population and economic growth. Hence this mutual relationship between economic development and urban growth and the over concentrated pattern of urban growth in Iraq in very few urban centres suggests that the effects of the regional development plans on the urban growth and consequently the pattern of urban growth should be regarded as one of the prime aims of the regional policy in Iraq. Accordingly, the pattern of regional development which creates a more balanced urban system should be encouraged to accelerate the process of decentralisation of urban population and participate in solving the existing very concentrated pattern. This proposition implies the introduction of the principle of structure plans in the planning process of Iraq of which the urban growth problem is an important element. The structure plans of different regions could be either undertaken in the region itself or by the Physical Planning Commission of the Ministry of Planning. At the present stage, where a shortage of qualified staff prevails, such plans should be undertaken by the latter department. In the long run, it is possible to be undertaken by the planning units in each region or sub-region, according to the availability of the qualified staff and the physical planning departments structure that may be set in the future. It should be noted that in 1977 there was a proposal for establishing planning departments in each Muhafadah, responsible for the preparation of a comprehensive development plans for the Muhafadahs and the administration and follow up of the implementation of the committed development projects in them. This proposal was not adopted due to the shortage of qualified staff. However, the latter problem could be solved in the near future due to the existence of a centre for urban and regional planning of the University of Baghdad[1] which awards a degree of M.A. in the field of urban and regional planning for an average number of students of about 10 a year.

Second, since the distribution of cities in space, and in particular, the distances between all cities, influences the degree of their economic integration within the national economy and the spread of innovations and since agglomeration economies are generated not only within city limits but also as between cities, depending on the space separating them (the wider the space the lower the agglomeration economies expected are), hence in analysing the urban growth pattern in any region of the country, spacing of urban centres as well as their size should be included in the analysis due to the very and equal importance of both aspects.

Third, to achieve a better urban growth pattern in any region or sub-region of the country a comprehensive and analytical approach of analysis should be adopted. This study provided an example of such

(1) The centre for urban and regional planning of the University of Baghdad was established in 1972.

approach (the goals-achievement analysis) which could be utilised for this purpose. Alternative approaches, such as the cost-benefit analysis, threshold analysis, development potential analysis and the disaggregated matrix could also be adopted for the purpose of urban growth pattern. The application of any sepcific technique as it has been seen earlier depends on the type and quality of the available data, the time allocated for the study and the planning team in charge of the study. The more complicated techniques, such as cost-benefit analysis and the threshold analysis, though they seem to be attractive techniques to deal with the problem of urban growth, require a great deal of detailed data which reduce the liklihood of their adaption in Iraq at present due to the deficiency of local data in the country.

Fourth, urban growth factors incoporated in the analysis and the importance assigned to them would differ according to the aims and objectives of the plan and the local constraints within each region or sub-region. It also differs through time, hence the urban growth strategies drawn for different regions should be checked and if necessary changed to meet the new aims and objectives and local constraints.

Fifth, the co-ordination and complementarities between urban growth strategies of different areas, at a point of time, should be taken into consideration in order to achieve the national urban system capable of meeting a national growth and promoting of interregional equity among others. This co-ordination process should be undertaken by a central planning body, namely the Physical Planning Commission of the Ministry of Planning which provides a link between the Planning Board and Ministry of Planning on the one hand and the City Planning Departments at Muhafadahs level on the other hand. The position of the Physical Planning Commission enables it to absorb the national strategies on the proposed urban growth plans and to direct the urban growth pattern in each region or sub-region of the country according to the local constraints and requirements.

Sixth, to facilitate the urban growth studies a detailed quantitative and qualitative data should be made available. This could be undertaken in part through the Central Statistical Organisation of the Ministry of Planning and its branches at Muhafadahs level, where this department is responsible for providing different types of data and information needed for the purpose of the planning machinery in Iraq. Hence data for the purpose of the urban growth studies, such as the cost of provision of services by urban size, and availability of services among others could be incorporated as part of the annual programme of the Central Statistical Organisation. The Physical Planning Commission of the Ministry of Planning and the City Planning Departments at Muhafadahs level could provide the detailed studies on the growth potentials of different urban centres. The University Research programmes, especially in the field of urban and regional planning and urban geography, could also participate in providing the necessary studies and methodological approaches of the analysis of the urban growth problem.

10.3. Scope for Further Research

There are a number of occasions in the course of this study where up-to-date data or more detailed information would have been an enormous advantage. However, it seems not feasible to make a complete list of all the points where improvement could occur. Nevertheless, the view is that the most important areas for further research would be pointed here. It is supposed that the suggested further research would add to a better understanding of the U.E.R. and the way it is changing.

Furthermore, it will help in the formulation of future policy of the urban growth pattern in the region.

Two most important areas for further research would be emphasised here. The first one deals with planning methodology, implementation of the national as well as the regional development plans and the follow up system of development planning in Iraq. These studies basing on the examination of the drawbacks of the planning, implementation and follow up systems in Iraq, if there are any, could suggest alternative systems which could improve the planning machinery, further increase the implementation levels and suggest a follow up system capable of matching the planning machinery and the aims and objectives of the national as well as the regional development plans. Having reliable planning, implementation and follow up systems would provide the opportunity for more accurate understanding of what is going to happen in the future and consequently would help in drawing a more reliable solution to the planning problems, such as the one in question in this thesis.

The second area for further research stems directly from this research. It concentrates on carrying out several important related empirical studies. These studies are:-

- The study of the origin of the needed labour force, i.e., from where the direct, indirect and induced employment required for the operation of the committed development projects will come. Is it from the same region or from other regions of the country. This study is not likely to be undertaken for this region by itself but rather for different region and/or sub-regions of the country, taking into consideration the supply and demand for different skillness and qualifications. It will facilitate an important information concerning the socio-economic background of the newcomers to the region and their future needs and aspirations in the new place of residence. Hence, it will better help in deciding whether socially it is more acceptable, from the point of view of the original population and the newcomers, to accommodate the latter group in the largest urban centres, the smaller ones and/or the proposed new towns.

- The study of the cost of provision of public services and utilities in a wider range of urban areas to include urban areas larger in size than the ones existing at present in the region. It was found throughout the analysis of this aspect in this thesis that the size of urban centres in the region is relatively small and some of the provided services needs higher population thresholds for their economic provision. Hence, carrying out such a study for urban areas of different sizes (i.e., more than a million, 500000 - 750000, 250000, 100000, 50000, 10000 and less than 10000) and in a representative sample would help in finding the most efficient range of provision of different services. This would help great deal in drawing a policy for the urban system in any region of the country. It will further help when drawing the urban growth pattern in the studied area beyond 1985.

- An estimation of a domestic travel time cost, based on the Iraqi socio-economic constraints, should be carried out. Such study would provide the opportunity to avoid the use of western standards in this respect and consequently it may give better and more reliable results when dealing with the problem of the pattern of urban growth in Iraq.

- A more detailed study of land capability for agricultural production should be carried out. Such study will provide a detailed information about the areas of land with agricultural capability, their productivity and type of production and consequently their degree of importance for the economy of the region. This study will also provide the criteria to distinguish between different classes of the agricultural land. Hence, it will ease the decision making process when evaluating the alternative proposed strategies.

A similar study of the quality of landscape and the necessity of preserving it from urbanisation is also needed, like the above suggested study, the latter one will provide the criteria to be used in determining the quality of landscape and consequently ease the decision making process.

- The effect of physical limitations on the cost of urban development, i.e., the study of what is called in threshold theory terminologies, the physical threshold of urban growth. Such study will provide a relatively precise estimation of the additional cost of urban development in hilly areas, lowlands and so forth. It will consequently help in giving a more clear picture of the cost of the alternative urban growth strategies.

- The study of the expected future changes in socio-economic and technological aspects and their expected effects on the urban growth pattern of the study area. This study will provide the opportunity for incorporating such aspects in the analysis of the urban growth pattern and consequently it could provide a more comprehensive solution to this problem.

- Investigate the feasibility of other areas for the purpose of urban growth. Such study may provide new areas suitable for this purpose and could consequently breakdown the existing pattern of the urban system in the region leading to a relatively more suitable pattern of urban growth which was one of the aims this thesis seeked to achieve. The application of the development potential technique in generating the alternative strategies would highly achieve this objective. It provides the procedure where no realistic strategy would be precluded, nor would be potential of any part of the study area be neglected.

- Testing the socio-economic consequences of the existing study if applied in practice. Such study could be undertaken after few years of implementing the plan. It would provide the opportunity to see the drawbacks as well as the strong points of this plan. It could also pin-point the possible missed aspects in the present exercise.

APPENDICES

Appendix (1)

The Field Survey Questionnaire

1. Municipal and Administrative Aspects

1.1. Name of the Urban Centre ______________

1.2. Municipal Rank of the Urban Centre:

Class One ☐ Class Two ☐

Class Three ☐ Class Four ☐

1.3. Administrative Hierarchy of the Urban Centre:

Muhafadah Centre ☐ Qadha Centre ☐

Nahiya Centre ☐ Municipal Centre ☐

2. Municipal Services

2.1. Municipal Personnel in the Urban Centre:

Position	Number in each position	Qualification	Wage or Salary (I.D.) per month	Number of additional personnel in each position, if there is any	Number of needed personnel in each position	Notes

2.2. Municipal Mechanical Equipment in the Urban Centre:

Type of mechanical equipment	Number		Capital Cost (I.D.)	Annual Running Cost (I.D.)			Condition of the Equipment		
	No. in use	Total existing number		annual wages and salary	annual maintenance cost	other annual running costs	poor	good	very good

Purchasing date (year)	Needed mechanical equipment		Notes
	Number	Type	

2.3. Refuse Collection:

2.3.1. Methods used in refuse collection

Manual ☐ Mechanical ☐

2.3.2. Cost of providing refuse collection services

(a) Capital cost ____________ I.D.

(b) Annual running cost ____________ I.D.

2.3.3. The area of the urban centre provided with this service

All the urban centre ☐ Part of the urban centre ☐

If part, please state the percentage served ______%

2.3.4. Level of provision of the service ____________.

2.3.5. Health considerations of the prevailed means of refuse collection

Acceptable ☐ Unacceptable ☐

2.3.6. The possibility of utilising more advanced and efficient methods of refuse collection and their advantages over the existing methods ____________.

2.3.7. Is there a refuse treatment in the urban centre

Yes ☐ No ☐

If Yes, please mention

(a) what is the total cost of the factory __________I.D.

(b) what is the total annual running cost __________I.D.

(c) the spare capacity of the factory __________.

2.3.8. The committed refuse collection schemes

Type of the scheme	Capacity (tons/day)	Expected number of population to be served	Expected date of completion	Notes

2.3.9. Any further comments ______________________________.

2.4. Road Paving Services:

2.4.1. Total area of paved roads ________sq.km.

2.4.2. The area of the urban centre served by paved roads

All the urban centre ☐ Part of the urban centre ☐

If part of the urban centre is served, please mention the percentage _____%

2.4.3. Cost of paving roads

(a) Capital cost ________I.D.

(b) Annual running cost ________I.D.

2.4.4. The committed road paving schemes

Type of road	Length (km)	Expected area of the urban centre to be served (sq.km.)	Expected date of completion	Notes

2.4.5. Any further comments ____________________.

2.5. Parking Services:

2.5.1. Types of parking spaces ________________.

2.5.2. Number of parking spaces ___________and area ________sq.km

2.5.3. Spare capacity of parking spaces Yes ☐ No ☐

If yes, what is the number of additional vehicles that could be served ___________.

2.5.4. Cost of existing parking spaces

(a) Capital cost ________I.D.

(b) Annual running cost ________I.D.

2.5.5. The committed parking schemes

Type	Number	Area (sq.km.)	Capacity (cars)	Expected date of completion	Notes

2.5.6. Any further comments ______________________.

2.6. Parks Spaces:

2.6.1. Number of park spaces serving
(a) the neighbourhood ________ (b) the district ________
(c) the whole urban centre ________ and (d) others ________.

2.6.2. Area of park spaces serving
(a) the neighbourhood ________ sq.km. (b) the district ________ sq.km. (c) the whole urban centre ________ sq.km. and (d) others ________ sq.km.

2.6.3. Cost of existing parks spaces
(a) Capital cost ________ I.D.
(b) Annual running cost ________ I.D.

2.6.4. The committed parks schemes

Type	Number	Area (sq.km.)	Expected date of completion	Notes

2.6.5. Any further comments ______________________.

3. <u>Water Supply</u>

3.1. Water Source: River ☐ others to be mentioned ________.

3.2. The safety of water source: Safe ☐ Unsafe ☐

If not safe, please mention why? ______________________.

3.3. Source of water supplies: Water Scheme ☐ Common Tap ☐

others to be mentioned ______________________.

3.4. The public health considerations:

3.4.1. Is the water supply source acceptable from the point of view of health authorities? Yes ☐ No ☐

3.4.2. Does some of the individual illness or an epidemic of some sort might originate from the using of existing supplies? Yes ☐ No ☐

If yes, please mention the number of cases per year

____________________.

3.5. Water supply production and consumption:

3.5.1. Number of water schemes __________.

3.5.2. Capacity of the water supply schemes _________m^3/hr.

3.5.3. Utilised capacity of the water supply schemes _________%

3.5.4. Percentage of losses in the distribution network _________%

3.5.5. Number of dwelling units connected to the main supplies __________.

3.5.6. Number of dwelling units unconnected to the main supplies __________.

3.5.7. Annual water supply consumption according to different uses

Residential __________. Commercial __________.

Industrial __________. Government offices __________.

Others __________.

3.6. Water supply cost:

3.6.1. Capital cost

(a) Treatment, pumping and elevated water storage tanks (EST) costs __________I.D.

(b) Distribution network cost __________I.D.

(c) Other capital costs (include cost of land, buildings, vehicles, furniture and so on __________I.D.

3.6.2. Annual running cost

(a) Wages, salaries and incentives __________I.D.

(b) Chemical cost __________I.D.

(c) Depreciation cost __________I.D.

(d) Other running costs __________I.D.

3.6.3. Connection cost __________I.D.

3.7. The remaining length of life of all assets of the present schemes

(a) Treatment ________years.

(b) Pumping main ________years.

(c) Elevated water storage tanks ________years.

(d) Distribution network ________years.

3.8. Condition of the assets of the present scheme

Type of the assets	Condition poor	good	very good
Treatment			
Pumping main			
Elevated water storage tanks			
Distribution network			

3.9. Utilisation and efficiency of the present sources in fire fighting

Utilised ☐ Not utilised ☐

Efficient ☐ Not efficient ☐

3.10 The commited water schemes projects

Type of water scheme	Number	Capacity m^3/hr.	Expected number of population to be served	Expected date of completion	Notes

3.11. Any further comments ________________.

4. <u>Electricity Supply</u>

4.1. Source of electricity supply

Local diesel generator ☐ sub-station ☐

others to be mentioned ________________.

4.2. Year of the establishment of the scheme _________.

4.3. Electricity production and consumption:

4.3.1. Number of electricity local diesel generators or sub-stations _________.

4.3.2. Capacity of the electricity scheme _________k.w.h.

4.3.3. Utilised capacity _________k.w.h.

4.3.4. Percentage of losses in the distribution network _____%

4.3.5. Number of dwelling units connected to energy source _________.

4.3.6. Number of dwelling units unconnected to energy source _________.

4.3.7. Annual electricity consumption according to different uses.

Residential _______k.w.h. Commercial _______k.w.h.

Industrial _______k.w.h. Government offices _______k.w.h.

others _______k.w.h.

4.4. Electricity provision cost

4.4.1. Capital cost

(a) Distribution cost _________I.D.

(b) Land and buildings costs _________I.D.

(c) Vehicle and other mechanical costs _________I.D.

(d) Furniture and other miscellaneous tools and equipment costs _________I.D.

4.4.2. Annual running cost

(a) Wages, salaries and incentives _________I.D.

(b) Depreciation cost of the distribution network _________I.D.

(c) Other running costs _________I.D.

4.4.3. Connection cost _________I.D.

4.5. The remaining length of life of the assets of the present scheme.

(a) Sub-stations or local diesel generators _______years

(b) Distribution network _______years

4.6. Conditions of all the assets of the present scheme

Type of the asset	Condition		
	poor	good	very good
Sub-station			
Local diesel generator			
Distribution network.			

4.7. Type of connection of the distribution network

Underground ☐ Overground ☐

4.8. The committed electricity schemes

Type of the scheme	Number	Capacity k.w.h.	Expected number of population to be served	Expected date of completion	Notes

4.9. Any further comments ____________.

5. <u>Telephone Services</u>

5.1. Number of the existing telephone exchanges ________.

5.2. Type of the existing telephone exchanges

Magnet ☐ Half automatic ☐ Automatic ☐

Electronic ☐ others to be mentioned ____________.

5.3. Capacity of the telephone exchanges ________lines.

5.4. Utilised capacity of the telephone exchanges ________lines.

5.5. Cost of provision of telephone services

5.5.1. Capital cost

(a) Cost of exchanges ________I.D.

(b) Cost of the network ________I.D.

(c) Other capital costs (land, buildings, vehicles and other mechanical equipment, furniture and so forth) ________I.D.

5.5.2. Annual running cost

(a) Wages, salaries and incentives __________ I.D.

(b) Depreciation cost of exchanges and distribution network __________ I.D.

(c) Other running costs __________ I.D.

5.5.3. Connection cost __________ I.D.

5.6. The remaining length of life of the assets of the present scheme

(a) Telephone exchanges __________ years

(b) Distribution network __________ years

5.7. Conditions of all assets of the scheme

Type of assets	Condition		
	poor	good	very good
Telephone exchange			
Distribution network			

5.8. Type of connection of the distribution network

Underground ☐ Overground ☐

5.9. The committed telephone schemes

Number of exchanges	Capacity (line)	Expected number of population to be served	Notes

5.10. Any further comments __________________________.

6.1 <u>Mail Services</u>

6.1. Number of post offices __________.

6.2. Types of services provided

Letters ☐ Parcels ☐ Telegraph ☐

Saving ☐ Post office boxes ☐

others to be mentioned ____________________.

6.3. Means of collection and delivery of mails

Buses ☐ Bicycles ☐ others to be mentioned ____________

6.4. Cost of provision of mail services.

6.4.1. Capital cost

(a) Cost of land ________I.D.

(b) Cost of buildings ________I.D.

(c) Cost of vehicle and other mechanical equipment ________I.D.

(d) Furniture cost ________I.D.

6.4.2. Annual running cost

(a) Wages, salaries and incentives ________I.D.

(b) Other running costs ________I.D.

6.5. The committed mail service schemes

Type of the scheme	Number	Expected Number of population to be served	Expected date of completion	Notes

6.6. Any further comments ____________________.

7. <u>Educational Services</u>

7.1. Existing educational facilities

Type of the school	Number of schools	Date of establishing the building	Number of classes	Designed capacity of the school	Existing number of students at school

Total area of the school (m^2)	Total built up area (m^2)	Original use of the building	Conditions of the building		
			suitable	need maintenance	unsuitable

Ownership of the building		Number of schools utilising the building	Number of teaching staff	Notes
Govern-mental	Rented			

7.2. Cost of provision of educational services.

7.2.1. Capital cost

(a) Cost of land ________ I.D.

(b) Cost of buildings ________ I.D.

(c) Cost of furniture ________ I.D.

7.2.2. Annual running cost

(a) Wages, salaries and incentives ________ I.D.

(b) Other running costs ________ I.D.

7.3. The committed educational facilities

Type of the school	Number	Capacity of the building (student/ school)	Expected number of population to be served	Expected date of completion	Notes

7.4. Any further comments ____________________.

8. <u>Health Services</u>

8.1. Existing health facilities

Type of health estab-lish-ment	Number	Condition of building			Original use of the building	
		suitable	need main-tenance	unsuitable	health use	other uses

Possibility of future expansion		Date of establishing the building	Number of physicians		Number of dentists
possible	impossible		specialist	general	

number of para medical staff	Number of beds	Number of Ambulances	Notes

8.2. Areas served by the health establishments of the urban centre ______________.

8.3. Cost of provision of health services

8.3.1. Capital cost

(a) Land cost ________I.D.

(b) Building cost ________I.D.

(c) Furniture and vehicle costs ________I.D.

(d) Medical equipment cost ________I.D.

8.3.2. Annual running cost

(a) Wages, salaries and incentives ________I.D.

(b) Medicine cost ________I.D.

(c) Other running costs ________I.D.

8.4. The committed health schemes

Type of the health establishment	Number	Capacity in terms of		Expected number of population to be served	Expected date of completion
		beds	patients		

8.5. Any further comments ____________________.

9. Public libraries

9.1. Number of public libraries ______________.

9.2. Capacity of existing libraries

(a) Designed __________ seats

(b) Utilised __________ seats

9.3. Year of the establishment of the library ______.

9.4. Cost of provision of public libraries

9.4.1. Capital cost

(a) Cost of books and periodicals __________I.D.

(b) Cost of land and buildings __________I.D.

(c) Cost of furniture __________I.D.

9.4.2. Annual running cost

(a) Wages, salaries and incentives __________I.D.

(b) Other running costs __________I.D.

9.5. The committed libraries schemes

Number	Capacity (seats)	Expected number of population to be served	Expected date of completion	Notes

9.6. Any further comments ____________________.

10. Cost of provision of public transport

10.1. Capital cost

(a) Cost of buses __________I.D.

(b) Land and building cost __________I.D.

(c) Furniture cost __________I.D.

(d) Other capital costs __________I.D.

10.2. Annual running cost

(a) Wages, salaries and incentives __________I.D.

(b) Maintenance cost __________I.D.

(c) Other running costs __________I.D.

10.3. Number of public buses __________

11. <u>Physical constraints of urban growth</u>

11.1. Exposure levels ____________________.

11.2. Gradient and orientation of slopes ____________________.

11.3. Land liable to flooding ____________________.

11.4. Amenity assets - quality of landscape and scenic values which might impose severe restrictions for future urban development ____.

11.5. Others to be mentioned ______________________________.

12. <u>Land Availability and Value</u>

12.1. The total area available for the future expansion of the urban centre ____________________.

12.2. Agricultural value of the land:

(a) Agricultural capability of land ________________.

(b) Agricultural productivity ____________________.

(c) Type of agricultural utilisation ____________________.

(d) Number of farmers utilising the land ____________.

12.3. Land value __________I.D. per donum.

12.4. Land ownership

Public ☐ Private ☐

Others to be mentioned __________________________.

13. <u>Establishments already exist in the Areas required for Urban Expansion</u>

13.1. Type of establishment: Agricultural ☐

Industrial ☐ Public Utilities ☐

Others to be mentioned __________________________.

13.2. Value of the establishments __________I.D.

13.3. Importance of the establishments to the economy of the area ____

______________________________.

14. Accessibility of the Urban Centre and/or the Suggested New town Site to the Main Infrastructure Facilities in the Region

14.1. Roads ______________________________.

14.2. Railway lines ______________________________.

14.3. Electricity facilities ______________________________.

14.4. Communication facilities ______________________________.

14.5. Others ______________________________.

15. Existing and Future Planning Standards

15.1. Land use standards ______________________________.

15.2. Services provision standards ______________________________.

Appendix (2)

Methodology of Calculating the Components of Table (8.14)

The components of table (8.14) are computed in two separate steps:-

1. The number of additional population that could be accommodated in each proposed urban centre for the purpose of urban growth was computed on the following basis:-

1.1. For water supply; (i) the planned capacity of the committed water schemes in each proposed urban area for the purpose of accommodating the urban growth, after subtracting 20% for distribution losses was added to the actual capacity of the existing water schemes, after subtracting 30% for distribution losses.(1)

(ii) the total resulting capacities in (i) above, were divided by 100 gallons/day/person, which represents the target of the Water and Sewage State Organisation of the Ministry of Local Government to be reached by 1990. The outcome of this process represents the effect of the water constraint on the total number of population that could be accommodated in each urban centre on the basis of a consumption standard of 100 gallon/day/person, and;

(iii) to find the number of additional population that could be accommodated, the 1980 population of each urban centre was subtracted from the outcome of point (ii) above.

1.2. For telephone services; the capacity of the committed exchanges in the study area was not obtained, in the field survey, hence in calculating the additional number of population that could be accommodated on the basis of this service, the design capacity of existing exchanges, the standard of service provision to 1990 (6 telephones per 100 persons)

(1) The water authorities in the Muhafadah are expecting to reduce the losses in the distribution network from 30% to 20% as a result of the improvements and new work in the network.

and the 1980 population were used.

1.3. For kindergartens; (i) the total capacity of suitable and unrented kindergarten buildings plus the total capacity of kindergartens under-construction was calculated;

(ii) total number of population that could be accommodated was calculated on the basis of 30 pupils per class and an attendance ratio of 300 per 1000 pupils aged 4-5 years (6.9% of the population were in this age group according to 1977 census), and;

(iii) the additional population that could be accommodated on the basis of this service, was obtained by subtracting the 1980 population from the outcome of the calculations in section (ii) above.

1.4. For primary schools; the additional population was calculated in the same way as in case of kindergartens. The only difference is that solving the problem of shifts use of buildings was considered in calculating the total capacity of the school buildings. The long term target of 36 pupils per class and the attendance ratio of 1000 pupils per 1000 persons aged 6-11 years were considered in the computing process.

1.5. For secondary schools; the additional population was calculated in the same way as in case of kindergartens and primary schools, with the following differences: 76.2% of the population at age 12-17 years (representing 14.3% of the total population) were expected to complete their intermediate and preparatory schoolings (these two stages together form the secondary level). The above percentage has been calculated on the following basis;

(i) enrolment in intermediate schools will be compulsory by 1984[1], hence the 7.5% of the total population aged

(1) Planar, op.cit., Final Report, P.49.

12-15 years by law be using the system;

(ii) the enrolment in preparatory schools will be compulsory by 1986. Since 50% of the pupils graduating from the intermediate schools will attend vocational schools at that time,[1] then 50% of the 6.8% of the total population aged 15-17 years were included.

1.6. For health services; (i) total number of beds in existing hospitals and the committed ones are considered;

(ii) 30.5 beds per 10000 persons, which represent the long term development target has been adopted to find out the total additional population that could be accommodated in each urban centre, and;

(iii) since hospitals provide this service to all the lower order settlements then, the total population of Qadhas are considered, instead of those of the urban centres alone.

1.7. For public libraries; (i) total number of seats in existing and libraries under construction have been computed, and;

(ii) the planning standard, 5 seats per 1000 persons, is adopted in estimating the total number of additional population that could be accommodated in each urban centre.

2. The capital monetary savings in each urban centres is calculated by multiplying the additional population that could be accommodated in case of each service by the average per capita cost of that service in the study area. The per capita cost of different services in turn are obtained from appendix number (3). In case the additional population that could be accommodated is higher than the expected urban growth in specific urban node, then the latter was considered in computing the capital monetary savings. The capital monetary savings does not represent the real saving but rather shadow values adopted for the purpose of the analysis.

(1) Ibid, P.50.

Appendix (3)

Average and Relative Importance of Per Capita Capital and Annual Running Costs of the Provided Services in the U.E.R.

Code	Type of Service	Annual Running Cost		Capital Cost	
		amount I.D.	%	Amount I.D.	%
1	Municipal Services	7.63	13.1	72.56	47.3
2	Water Supply	3.30	5.7	13.55	8.8
3	Electricity	4.90	8.4	14.41	9.4
4	Telephones	1.70	2.9	4.43	2.9
5	Mail	0.87	1.5	0.27	0.2
6	Education Services:	26.98:	46.2:	33.45:	21.8:
6.1	Kindergarten	0.85	1.4	3.83	2.5
6.2	Primary	9.96	17.1	11.08	7.2
6.3	Secondary	4.55	7.8	5.82	3.8
6.4	Vocational	3.44	5.9	10.26	6.7
6.5	Others	8.18	14.0	2.46	1.6
7	Health	12.74	21.8	13.06	8.5
8	Public libraries	0.26	0.4	1.69	1.1
	Total	58.38	100.0	153.42	100.0

The table shows the average per capita annual and capital costs of provision of different investigated services in the urban areas of the U.E.R. Both of the average per capita costs for each service have been extracted by dividing the total resulting costs by the total urban population provided with the service in question. Annual running cost and capital cost for each service and the resulting costs in terms of urban centres have been calculated as follows:-

1. The annual running cost of each service is based on the actual official figures for twelve months of 1979. It includes every detailed item of expenditure to run the service. It consists mainly of four parts:

First, wages, salaries and incentives of all the labour force utilised to provide the service.

Second, maintenance cost of all capital assets belonging to that service and used for its provision.

Third, annual depreciation cost of the capital assets. The depreciation rates of different capital assets are unified for the same items among all government departments, for a uniform accountancy system is applied in the country. The prevailing annual depreciation rates, at the time of carrying out the survey, are given in table (7.3).

Fourth, other running costs which include all the other expenses necessary to continue the provision of the service, such as the cost of fuel, miscellaneous costs of running offices, insurance costs, electricity and water costs and so on. In the case where some special items for running a specific service were required, these items were also included in the calculations. Examples of such running costs were chemical costs in case of water supply and medicine and food costs in case of health services.

2. As it has been shown in section (7.3.1) the capital cost of providing each service is also based on official figures. The values of capital assets were given as they were valued at the end of 1979, i.e., the costs of all capital assets are discounted back to that time. The discount rates usually used by different governmental departments are the same but vary according to the types of the capital assets. Because there are considerable differences in the capital components of different services, the capital cost elements of each service is given separately as follows:

2.1. The municipal services capital cost includes the cost of land and buildings, furniture costs, cost of mechanical equipment, the cost of paving roads within the municipal boundaries, the cost of parking spaces and the cost of parks and their installations. The total municipal capital cost in the U.E.R. is the sum of the capital costs of all the municipalities in the region.

2.2. The water supply capital cost includes the cost of treatment, pumping mains and the elevated storage tanks, the distribution network cost and other capital costs which in turn include the cost of land, buildings (other than treatment building which is usually included within treatment costs), vehicles and furniture.

2.3. The electricity services capital cost include distribution costs only. The generation and transformation costs of electricity were not included because no access to data of this type was possible. Even if data had been made available, the comparison between the cost of provision of the service and city size would be unrealistic as has been seen in the text. Part of the urban centres in the region are supplied from the national grid via primary and secondary sub-stations. These stations are not only serving the urban centres where they are located but other urban centres in addition to rural areas. Furthermore, if data on generation and transformation costs were available the comparison (as far as the capital costs are concerned) between the urban centres provided with electricity from the national grid and those provided from local diesel powered generators would again be unrealistic. This is due to the differences in the scale and methodology of generation of electricity in both cases and the transformation costs involved in case of providing electricity from the national grid. Hence to avoid these above problems and to be more realistic, the capital cost analysis of electricity service was confined to distribution costs which include cost of cables, underground and overhead lines cost, transformers and miscellaneous tools used in distribution network and other capital costs such as that of land, buildings, vehicles, furniture and miscellaneous tools and equipment.

2.4. The capital cost of telephone services include the cost of exchanges, the cost of the distribution network, the cost of telegrams equipment installation, land, buildings, furniture, vehicles and other miscellaneous tools. The costs of cables and other installations not serving specific urban centres, but the whole region were not included in the capital cost analysis.

2.5. Mail services capital cost include the cost of land, buildings, vehicles, furniture and other miscellaneous tools and requirements.

2.6. The educational services capital cost includes the costs of provision of educational services at different levels (kindergarten, primary schools, secondary schools, vocational schools and high schools). In each case the cost of land and buildings were included. The cost of furniture which is an important element in this case was not included due to the unavailability of data on this item. However, the total costs of land and buildings are sufficient to make the comparison since it is reasonable to assume that the cost of furniture is almost the same for schools of the same size and educational stage in different urban centre because the supplier of the furniture is the same (a special government department) and there are no differences in the quality of furniture of schools in cities of differing urban size. The only expected difference is the time when the furniture was obtained which would, of course, affects its current value.

2.7. The health services capital cost includes the cost of land, buildings and furniture. Cost of medical equipment which is again a very important item of cost in this respect was not included because data on such items on Muhafadah level were not available. The supplier of this item is, again, a special government department, which centrally distributes the needs of different health establishments all over the country. To know the share of different urban centres from this source would have been time consuming process and unrealistic since part of the equipments supplied are either at the time of the survey unusable or are no more within the existing assets of that urban area. However, again, the cost of land, buildings and furniture are sufficient for the purpose of capital cost analysis of the health services since the type and consequently the cost of medical equipments for each urban size group are expected to be almost the same.

2.8. The public libraries capital cost includes the cost of land, buildings, furniture, books and periodicals and other miscellaneous equipment. The value of books and periodicals were valued at the time of their purchase since it was impossible to incorporate depreciation into the methodology of such items.

Appendix (4)

Methodology of Working the Components of the Daily Journey to Work, Table (8.35)

The analysis of the daily journey to work has been applied to each urban node and for each proposed alternative. It has been done in relation to the location of the basic employment. The components of the daily journey to work are calculated on the following basis:-

1. The daily journey to work time has been calculated on the basis of an average travel time of 60 km/hr. In many cases where traffic passed through urban centres, the average speed within municipal boundaries were regarded as 30 km/hr.

To be more realistic, 20 minutes was regarded as the minimum travel time (return trip), even if the distance was between 1 - 2 km. The term 'Not Valid' used in the table means that the daily journey to work is more than 2 hours and wherever this term prevailed, the urban area is not considered in that specific case.

Since in all cases, other than those within the walking distance, the employees are expected to walk from their homes to bus stops, hence in cases the daily journey to work is within the walking distance, the travel time value has been neglected.

2. Daily journey to work time is valued at 25% of the wage rate of time in work, i.e., the assumption adopted in Iraqi transportation studies, is also adopted here.

3. In calculating the number of required buses for employee transportation the following assumptions have been made:

First, all the projects operate on the basis of three shifts, except in case of Haqlaniya stone cutting plant which operates on a basis of two shifts. Haditha dam, which indeed will operate for 24 hours daily, do not need all the staff at site all the time, hence it has been calculated on the basis of two shifts.

Second, buses could make two journeys in case of having 20 minutes travel time (i.e. two way trip).

Third, the capacity of buses is assumed to be 40 passengers, except in cases of accommodating the railway service employee at Hit and Haqlaniya towns, where a small bus with a capacity of 12 and 18 passengers was used respectively.

4. The capital and annual running costs per bus has been obtained in the field survey from the public transport establishment in Al-Anbar Muhafadha, according to 1980 prices. They were found to be 23000 I.D. and 11560 I.D. respectively. The prices of buses with a capacity of 12 and 18 passengers has been obtained from the General Automobile Company.

It should be noted that, these costs are subject to inflation. The inflation rate is not determined only by local factors, but international market as well. Hence its rate is unknown. However, the rate of inflation is not so important, in this special case, since we are dealing with a comparative analysis and any expected changes in rate of inflation would effect the proposed alternatives in the same degree, leaving the proportional weights the same.

Appendix (5)

Historical and Archaeological Sites in the U.E.R.[1]

The study area has a rich archaeological inheritance, and our knowledge of the existence of sites has increased rapidly in recent years as a result of extensive exploration.

Several existing towns in the study area are of historical interest. Archaeological research shows at least five urban centres which still are occupied and have been in existence since ancient times. These urban centres are Ramadi, Hit, Haditha, Ana and Qaim. Table (X5.1) records the names of these urban centres according to the historical periods on which documents are available.

Table (X5.1)

Historical Towns in the Study Area

Modern	Ottoman	Medieval	Roman/Byzen	Ancient
Qaim	Chaime/Anqa	?	Giddan	Hindanu
Ana/Rawa	Anna	Anna	Anatha	Anat/Hanat
Haditha	Aditi	Alusa	Izan	Hadidanu
Hit	Eit	Hit	Aipolis(Is)/ Diacera	Ibu
Ramadi	Caragnol	Al-Anbar	Neapolis/ Pirissabora	Rapiqum

Source, Planar, op.cit., P.K.3.

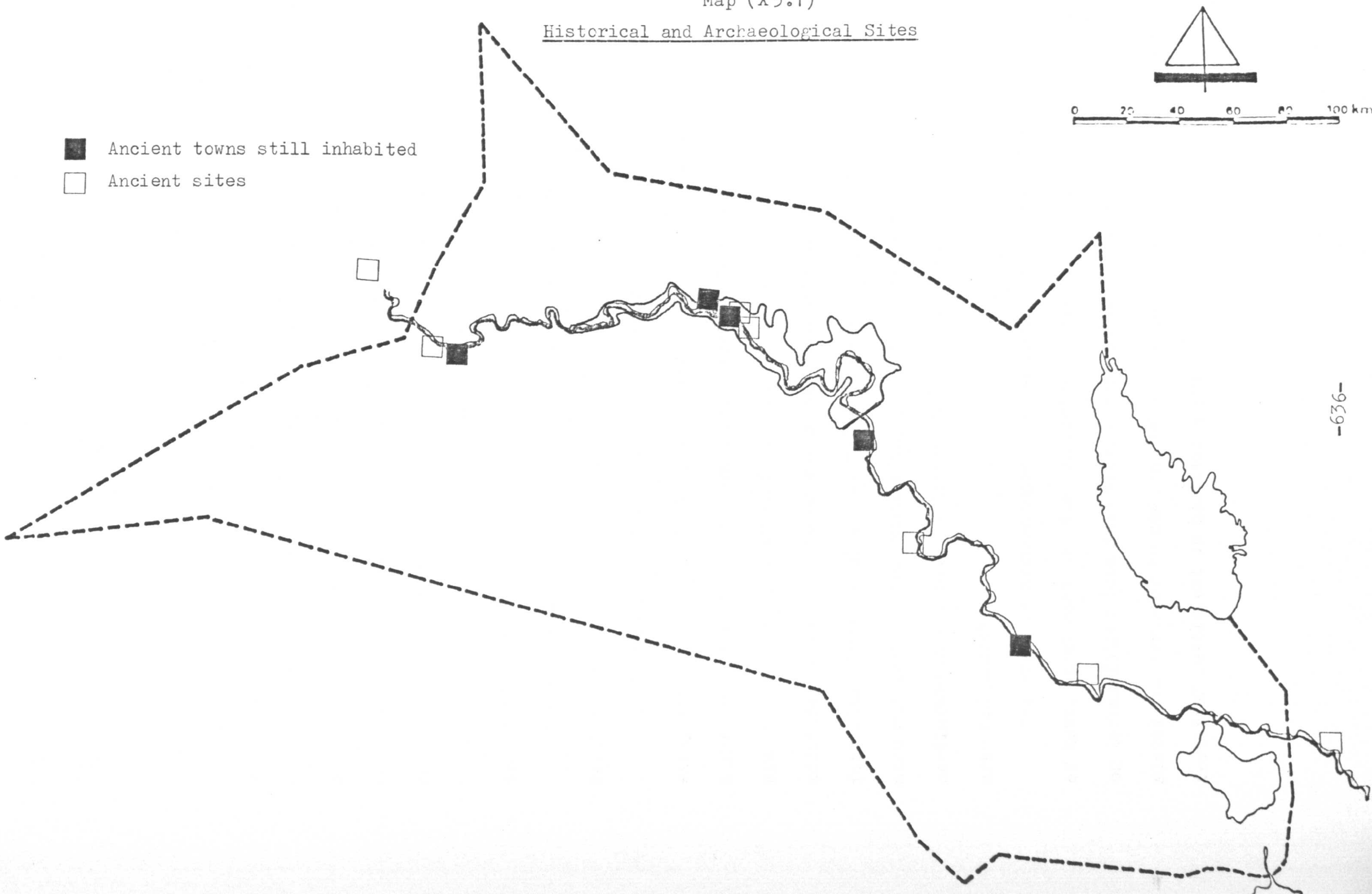
There are also several specifically archaeological sites in the region, the most important of which are the following:-

First, Hindanau (near Karabla), a major ancient, rectangular walled city dating from the old Babylonian period not far from the famous site of

(1) This appendix based mainly on appendix (K) of Planar's Upper Euphrates Region Plan, op.cit., Appendices of Stage One, PP.K1 - K15; and Regional Planning Department, Planning for the U.E.R., op.cit., PP.161-162.

Map (X5.1)

Historical and Archaeological Sites



Mari across the Syrian border. It was known in this period as Hidan. Middle and Late Assyrian sources call it Himdanu and Hindanu. The modern name is Tell al-Jabiriyah or Anqah or Sheikh Jabar, after a tomb which was built on the ruins.

This city, of a size comparable with Assyrian and Babylonian Cities, is a true conglomerated settlement, a powerful defensive entity, and potentially the most interesting and rich archaeological site in the northern end of the study area. Until recently, the site was almost free of modern houses and the massive city walls, as well as the internal wall, were easily visible on the ground. Most of the city wall remains intact on the western, eastern and southern sides. The side on the river seems to have been destroyed, probably to construct post Assyrian buildings or the modern town of Karabla.

Second, Qaim town itself, contains a tower which dates from the Parthian period.

Third, Ana-Rawa has probably been occupied continuously from very early times. Its importance and longevity stem from its geography. The higher promotory on which Rawa rests dominates the river. Anyone holding Rawa could control river traffic. The string of islands down stream gave additional space for houses and gardens, as well as the opportunity for fortified strong points. The valley broadens slightly at Ana, allowing more cultivation than usual along the left bank. Ana-Rawa is also the confluence of a number of tracks that link it with Hatra, the Tell Afar area and Tikrit.

The greatest archaeological potentials here is under the present town of Rawa, which contains the old citidel dating from the Ottoman era, and on Labbad Island (One Ana) where a famous minerat still exists and is slated for transfer to new Ana town. The Island was probably the main fortified settlement in historical periods.

Fourth, the river islands (Hawijas) are rich with archaeological treasures. Most famous of these are Allous and Talbis. The latter one which is known from Middle and Late Assyrian texts, from the "Parthian Stations" as Thilabus, from Ammianus Marcellinus as Thilutha is going to be flooded by Haditha reservoir. Recent work by the State Organisation of Antiquities has shown there to be man-made caves with many chambers on the right bank of the river and a settlement on the left. Details of dating are not available.

Fifth, Haditha area (Hadidanu): Haditha and other sites near it, have been important in every recorded period, but little information is available on specific finds. The town of Hadidanu, important in the New-Assyrian period, is believed to be nearby, as should be the late classical town of Izan. However, the existing Haditha town, contains the mausoleum of Najam Aldin similar to that of Al-Sit Zubaidi in Baghdad.

Sixth, Jubba which contains Islamic monuments.

Seventh, Hit, because of its bitumen sources, was probably occupied in prehistoric times and continued without interruption to the present. Shreds dating from the Akkadian to the Islamic periods have been collected from the tell on which the modern town is built. Probably much older material is to be found.

From the historical sources available, it is clear that Hit was vital to Babylonia. Its bitumen was of such great commercial and strategic importance (used in affixing blades to handles; to waterproof vessels, bags, reed boats; to lay bricks and for many other purposes), that the Babylonians are assumed to have had access to it.

Eighth, Rapigum, the most important early city in the southern part of the study area, is known from at least the Akkadian period (2300 B.C.).

Until the Neo-Assyrian, records on the city are not numerous, but it is clear that, as a first big city on the Euphrates as it breaks into the alluvial plain it was of great strategic importance and was probably wealthy. The city not only controlled river traffic, but also dominated the route that links the Euphrates with the Tigris at their closest point of contact. The city was, in the Ibin-Larsa and old Babylonian period, when archaeologists know most about it, at least sometimes independent. It was once destroyed by Ibid-AdadII of Eshnunna: it joined with a coalition of city states including Babylon, Isin, Uruk and a tribal group called the Suteans against the dominant power Larsa, and lost the war.

When Hammurabi came to the throne of Babylon, sometimes after 1800 B.C., he began to expand and unify a larger empire, In his 11th year, he captured Rapiqum, perhaps in alliance with Shamshi-Abad of Assyria, who also held Mari. Later in the reign of Hammurabi , the Babylonians conquered Eshnunna and Mari. In his 42nd year he built a defensive wall around Rapiqum, which lay on the right bank of the river. The location of Rapiqum is not as yet known. The river has changed its course several times and the city may now be on the left bank. It should, however, be somewhere close to Ramadi.

Table (X6.1)

Urban Growth Potentials (Ramadi Urban Nodé), If the priorites are Reversed

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	1	1	3	1	1
2	Cost of providing services and public utilities.	1	3	2	1	3	2	1
3	Daily journey to work.	1	3	1	3	3	1	3
4	Availability of land for urban growth.	1	3	1	3	3	1	3
5	Preserving good quality landscape.	2	3	1	3	6	2	6
6	Social considerations: social relationships and personal preferences of location and city-size.	2	3	2	3	6	4	6
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	2	3	2	2	6	4	4
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	3	3	3	2	9	9	6
9	Future potentials of economic development and urban growth.	3	3	1	3	9	3	9
10	Improving the urban structure of existing urban centres.	3	3	3	1	9	9	3
	Total	19	30	17	22	57	36	42

Where: (A) = The expected urban growth to be directed to Ramadi City.
(B) = The expected urban growth to be directed to Habaniya town.
(C) = The expected urban growth to be directed to the proposed new town.

Table (X6.2)

Urban Growth Potentials (Hit Urban Node), If the Priorities are Reversed

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	2	1	3	2	1
2	Cost of providing services and public utilities.	1	3	1	1	3	1	1
3	Daily journey to work.	1	2	3	3	2	3	3
4	Availability of land for urban growth.	1	3	3	3	3	3	3
5	Preserving good quality landscape.	2	3	2	2	6	4	4
6	Social considerations: social relationships and personal preferences of location and city-size.	2	2	1	3	4	2	6
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	2	3	2	1	6	4	2
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	3	3	2	2	9	6	6
9	Future potentials of economic development and urban growth.	3	3	3	3	9	9	9
10	Improving the urban structure of existing urban centres.	3	1	2	1	3	6	3
	Total	19	26	21	20	48	40	38

Where: (A) = The expected urban growth to be directed to Hit.
(B) = The expected urban growth to be directed to Kubaisa.
(C) = The expected urban growth to be directed to the proposed new town.

Table (No.5)

Urban Growth Potentials (Haditha Urban Node), If the Priorities are Reversed

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	2	1	3	2	1
2	Cost of providing services and public utilities.	1	3	2	1	3	2	1
3	Daily journey to work.	1	2	3	3	2	3	3
4	Availability of land for urban growth.	1	2	1	3	2	1	3
5	Preserving good quality landscape.	2	3	1	3	6	2	6
6	Social considerations: social relationships and personal preferences of location and city-size.	2	2	1	3	4	2	6
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	2	3	2	1	6	4	2
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	3	3	3	2	9	9	6
9	Future potentials of economic development and urban growth.	3	2	1	3	6	3	9
10	Improving the urban structure of existing urban centres.	3	1	2	1	3	6	3
	Total	19	24	18	21	44	34	40

Where: (A) = The expected urban growth to be directed to Haditha
(B) = The expected urban growth to be directed to Haqlaniya
(C) = The expected urban growth to be directed to the proposed new town.

Table (X6.4)

Urban Growth Potentials (Qaim Urban Node), If the Priorities are Reversed

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies				Weighted Score			
			A	B		C	A	B		C
				B_1	B_2			B_1	B_2	
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	1	3	1	3	1	3	1
2	Cost of providing services and public utilities.	1	3	2	2	2	3	2	2	2
3	Daily journey to work.	1	2	3	3	3	2	3	3	3
4	Availability of land for urban growth.	1	3	3	3	3	3	3	3	3
5	Preserving good quality landscape.	2	3	3	3	3	6	6	6	6
6	Social considerations: social relationships and personal preferences of location and city-size.	2	2	1	1	3	4	2	2	6
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	2	3	2	2	2	6	4	4	4
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	3	3	2	2	2	9	6	6	6
9	Future potentials of economic development and urban growth.	3	3	3	3	3	9	9	9	9
10	Improving the urban structure of existing urban centres.	3	3	1	1	1	9	3	3	3
	Total	19	28	21	23	23	54	39	41	43

Where: (A) = The expected urban growth to be directed to Qaim.
(B_1)= The expected urban growth to be directed to Karabla.
(B_2)= The expected urban growth to be directed to Ubaidi.
(C) = The expected urban growth to be directed to the proposed new town.

Table (X6.5)

Urban Growth Potentials (Ramadi Urban Node), If Economic Factors are given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	3	3	1	1	9	3	3
2	Cost of providing services and public utilities.	3	3	2	1	9	6	3
3	Daily journey to work.	3	3	1	3	9	3	9
4	Availability of land for urban growth.	3	3	1	3	9	3	9
5	Preserving good quality landscape.	1	3	1	3	3	1	3
6	Social considerations: social relationships and personal preferences of location and city-size.	1	3	2	3	3	2	3
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	1	3	2	2	3	2	2
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	3	3	3	2	9	9	6
9	Future potentials of economic development and urban growth.	1	3	1	3	3	1	3
10	Improving the urban structure of existing urban centres.	1	3	3	1	3	3	1
	Total	20	30	17	22	60	33	42

Where: (A) = The expected urban growth to be directed to Ramadi City.
(B) = The expected urban growth to be directed to Habaniya town.
(C) = The expected urban growth to be directed to the proposed new town.

Table (X6.6)

Urban Growth Potentials (Hit Urban Node), If the Economic Factors are given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	3	3	2	1	9	6	3
2	Cost of providing services and public utilities.	3	3	1	1	9	3	3
3	Daily journey to work.	3	2	3	3	6	9	9
4	Availability of land for urban growth.	3	3	3	3	9	9	9
5	Preserving good quality landscape.	1	3	2	2	3	2	2
6	Social considerations: social relationships and personal preferences of location and city-size.	1	2	1	3	2	1	3
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	1	3	2	1	3	2	1
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	3	3	2	2	9	6	6
9	Future potentials of economic development and urban growth.	1	3	3	3	3	3	3
10	Improving the urban structure of existing urban centres.	1	1	2	1	1	2	1
	Total	20	26	21	20	54	43	40

Where: (A) = The expected urban growth to be directed to Hit.
(B) = The expected urban growth to be directed to Kubaisa.
(C) = The expected urban growth to be directed to the proposed new town.

Table (X6.7)

Urban Growth Potentials (Haditha Urban Node), If the Economic Factors are given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	3	3	2	1	9	6	3
2	Cost of providing services and public utilities.	3	3	2	1	9	6	3
3	Daily journey to work.	3	2	3	3	6	9	9
4	Availability of land for urban growth.	3	2	1	3	6	3	9
5	Preserving good quality landscape.	1	3	1	3	3	1	3
6	Social considerations: social relationships and personal preferences of location and city-size.	1	2	1	3	2	1	3
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	1	3	2	1	3	2	1
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	3	3	3	2	9	9	6
9	Future potentials of economic development and urban growth.	1	2	1	3	2	1	3
10	Improving the urban structure of existing urban centres.	1	1	2	1	1	2	1
	Total	20	24	18	21	50	40	41

Where: (A)=The expected urban growth to be directed to Haditha.
(B)=The expected urban growth to be directed to Haqlaniya.
(C)=The expected urban growth to be directed to the proposed new town.

Table (X6.8)

Urban Growth Potentials (Qaim Urban Node), If the Economic Factors are given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies				Weighted Score			
			A	B		C	A	B		C
				B_1	B_2			B_1	B_2	
1	Availability and spare capacity of services and public utilities in existing urban centres.	3	3	1	3	1	9	3	9	3
2	Cost of providing services and public utilities.	3	3	2	2	2	9	6	6	6
3	Daily journey to work.	3	2	3	3	3	6	9	9	9
4	Availability of land for urban growth.	3	3	3	3	3	9	9	9	9
5	Preserving good quality landscape.	1	3	3	3	3	3	3	3	3
6	Social considerations: social relationships and personal preferences of location and city-size.	1	2	1	1	3	2	1	1	3
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	1	3	2	2	2	3	2	2	2
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	3	3	2	2	2	9	6	6	6
9	Future potentials of economic development and urban growth.	1	3	3	3	3	3	3	3	3
10	Improving the urban structure of existing urban centres.	1	3	1	1	1	3	1	1	1
	Total	20	28	21	23	23	56	43	49	45

Where : (A) = The expected urban growth to be directed to Qaim.
(B_1) = The expected urban growth to be directed to Karabla.
(B_2) = The expected urban growth to be directed to Ubaidi.
(C) = The expected urban growth to be directed to the proposed new town.

Table (X8.9)

Urban Growth Potentials (Ramadi Urban Node), If Social Factors are given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	1	1	3	1	1
2	Cost of providing services and public utilities.	1	3	2	1	3	2	1
3	Daily journey to work.	3	3	1	3	9	3	9
4	Availability of land for urban growth.	1	3	1	3	3	1	3
5	Preserving good quality landscape.	1	3	1	3	3	1	3
6	Social considerations: social relationships and personal preferences of location and city-size.	3	3	2	3	9	6	9
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	1	3	2	2	3	2	2
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	1	3	3	2	3	3	2
9	Future potentials of economic development and urban growth.	1	3	1	3	3	1	3
10	Improving the urban structure of existing urban centres.	1	3	3	1	3	3	1
	Total	14	30	17	22	42	23	34

Where: (A) = The expected urban growth to be directed to Ramadi City.
(B) = The expected urban growth to be directed to Habaniya town.
(C) = The expected urban growth to be directed to the proposed new town.

Table (X6.10)

Urban Growth Potentials (Hit Urban Node), If Social Factors are given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	2	1	3	2	1
2	Cost of providing services and public utilities.	1	3	1	1	3	1	1
3	Daily journey to work.	3	2	3	3	6	9	9
4	Availability of land for urban growth.	1	3	3	3	3	3	3
5	Preserving good quality landscape.	1	3	2	2	3	2	2
6	Social considerations: social relationships and personal preferences of location and city-size.	3	2	1	3	6	3	9
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	1	3	2	1	3	2	1
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	1	3	2	2	3	2	2
9	Future potentials of economic development and urban growth.	1	3	3	3	3	3	3
10	Improving the urban structure of existing urban centres.	1	1	2	1	1	2	1
	Total	14	26	21	20	34	29	32

Where: (A) = The expected urban growth to be directed to Eit.
(B) = The expected urban growth to be directed to Kubaisa.
(C) = The expected urban growth to be directed to the proposed new town.

Table (X6.11)

Urban Growth Potentials (Haditha Urban Node). If Social Factors are given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	2	1	3	2	1
2	Cost of providing services and public utilities.	1	3	2	1	3	2	1
3	Daily journey to work.	3	2	3	3	6	9	9
4	Availability of land for urban growth.	1	2	1	3	2	1	3
5	Preserving good quality landscape.	1	3	1	3	3	1	3
6	Social considerations: social relationships and personal preferences of location and city-size.	3	2	1	3	6	3	9
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	1	3	2	1	3	2	1
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	1	3	3	2	3	3	2
9	Future potentials of economic development and urban growth.	1	2	1	3	2	1	3
10	Improving the urban structure of existing urban centres.	1	1	2	1	1	2	1
	Total	14	24	18	21	32	26	33

Where: (A) = The expected urban growth to be directed to Haditha.
(B) = The expected urban growth to be directed to Haqlaniya.
(C) = The expected urban growth to be directed to the proposed new town.

Table (X6.12)

Urban Growth Potentials (Qaim Urban Node), If Social Factors are given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies				Weighted Score			
			A	B		C	A	B		C
				B_1	B_2			B_1	B_2	
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	1	3	1	3	1	3	1
2	Cost of providing services and public utilities.	1	3	2	2	2	3	2	2	2
3	Daily journey to work.	3	2	3	3	3	6	9	9	9
4	Availability of land for urban growth.	1	3	3	3	3	3	3	3	3
5	Preserving good quality landscape.	1	3	3	3	3	3	3	3	3
6	Social considerations: social relationships and personal preferences of location and city-size.	3	2	1	1	3	6	3	3	9
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	1	3	2	2	2	3	2	2	2
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	1	3	2	2	2	3	2	2	2
9	Future potentials of economic development and urban growth.	1	3	3	3	3	3	3	3	3
10	Improving the urban structure of existing urban centres.	1	3	1	1	1	3	1	1	1
	Total	14	28	21	23	23	36	29	31	35

Where: (A) = The expected urban growth to be directed to Qaim.
(B_1) = The expected urban growth to be directed to Karabla.
(B_2) = The expected urban growth to be directed to Ubaidi.
(C) = The expected urban growth to be directed to the proposed new town.

Urban Growth Potentials (Ramadi Urban Node), If the Physical, Structural and Environmental Factors are given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	1	1	3	1	1
2	Cost of providing services and public utilities.	1	3	2	1	3	2	1
3	Daily journey to work.	1	3	1	3	3	1	3
4	Availability of land for urban growth.	3	3	1	3	9	3	9
5	Preserving good quality landscape.	3	3	1	3	9	3	9
6	Social considerations: social relationships and personal preferences of location and city-size.	1	3	2	3	3	2	3
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	3	3	2	2	9	6	6
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	3	3	3	2	9	9	6
9	Future potentials of economic development and urban growth.	1	3	1	3	3	1	3
10	Improving the urban structure of existing urban centres.	3	3	3	1	9	9	3
	Total	20	30	17	22	60	37	44

Where: (A) = The expected urban growth to be directed to Ramadi City.
(B) = The expected urban growth to be directed to Habaniya town.
(C) = The expected urban growth to be directed to the proposed new town.

Urban Growth Potentials (Hit Urban Node), If the Physical, Structural and Environmental Factors are given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	2	1	3	2	1
2	Cost of providing services and public utilities.	1	3	1	1	3	1	1
3	Daily journey to work.	1	2	3	3	2	3	3
4	Availability of land for urban growth.	3	3	3	3	9	9	9
5	Preserving good quality landscape.	3	3	2	2	9	6	6
6	Social considerations: social relationships and personal preferences of location and city-size.	1	2	1	3	2	1	3
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	3	3	2	1	9	6	3
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	3	3	2	2	9	6	6
9	Future potentials of economic development and urban growth.	1	3	3	3	3	3	3
10	Improving the urban structure of existing urban centres.	3	1	2	1	3	6	3
	Total	20	26	21	20	52	43	38

Where: (A) = The expected urban growth to be directed to Hit.
(B) = The expected urban growth to be directed to Kubaisa.
(C) = The expected urban growth to be directed to the proposed new town.

Urban Growth Potentials (Haditha Urban Node), If the Physical, Structural and Environmental Factors are given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	2	1	3	2	1
2	Cost of providing services and public utilities.	1	3	2	1	3	2	1
3	Daily journey to work.	1	2	3	3	2	3	3
4	Availability of land for urban growth.	3	2	1	3	6	3	9
5	Preserving good quality landscape.	3	3	1	3	9	3	9
6	Social considerations: social relationships and personal preferences of location and city-size.	1	2	1	3	2	1	3
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	3	3	2	1	9	6	3
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	3	3	3	2	9	9	6
9	Future potentials of economic development and urban growth.	1	2	1	3	2	1	3
10	Improving the urban structure of existing urban centres.	3	1	2	1	3	6	3
	Total	20	24	18	21	48	36	41

Where: (A) = The expected urban growth to be directed to Haditha.
(B) = The expected urban growth to be directed to Haqlaniya.
(C) = The expected urban growth to be directed to the proposed new town.

Urban Growth Potentials (Qaim Urban Node), If the Physical, Structural and Environmental Factors are given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies				Weighted Score			
			A	B		C	A	B		C
				B_1	B_2			B_1	B_2	
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	1	3	1	3	1	3	1
2	Cost of providing services and public utilities.	1	3	2	2	2	3	2	2	2
3	Daily journey to work.	1	2	3	3	3	2	3	3	3
4	Availability of land for urban growth.	3	3	3	3	3	9	9	9	9
5	Preserving good quality landscape.	3	3	3	3	3	9	9	9	9
6	Social considerations: social relationships and personal preferences of location and city-size.	1	2	1	1	3	2	1	1	3
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	3	3	2	2	2	9	6	6	6
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	3	3	2	2	2	9	6	6	6
9	Future potentials of economic development and urban growth.	1	3	3	3	3	3	3	3	3
10	Improving the urban structure of existing urban centres.	3	3	1	1	1	9	3	3	3
	Total	20	28	21	23	23	58	43	45	45

Where: (A) = The expected urban growth to be directed to Qaim.
(B_1) = The expected urban growth to be directed to Karabla.
(B_2) = The expected urban growth to be directed to Ubaidi.
(C) = The expected urban growth to be directed to the proposed new town.

Urban Growth Potentials (Ramadi Urban Node), If Future Potentials of Economic and Urban Growth is given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	1	1	3	1	1
2	Cost of providing services and public utilities.	1	3	2	1	3	2	1
3	Daily journey to work.	1	3	1	3	3	1	3
4	Availability of land for urban growth.	1	3	1	3	3	1	3
5	Preserving good quality landscape.	1	3	1	3	3	1	3
6	Social considerations: social relationships and personal preferences of location and city-size.	1	3	2	3	3	2	3
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	1	3	2	2	3	2	2
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	1	3	3	2	3	3	2
9	Future potentials of economic development and urban growth.	3	3	1	3	9	3	9
10	Improving the urban structure of existing urban centres.	1	3	3	1	3	3	1
	Total	12	30	17	22	36	19	28

Where: (A) = The expected urban growth to be directed to Ramadi City.
(B) = The expected urban growth to be directed to Habaniya town.
(C) = The expected urban growth to be directed to the proposed new town.

Urban Growth Potentials (Hit Urban Node). If Future Potentials of Economic and Urban Growth is given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	2	1	3	2	1
2	Cost of providing services and public utilities.	1	3	1	1	3	1	1
3	Daily journey to work.	1	2	3	3	2	3	3
4	Availability of land for urban growth.	1	3	3	3	3	3	3
5	Preserving good quality landscape.	1	3	2	2	3	2	2
6	Social considerations: social relationships and personal preferences of location and city-size.	1	2	1	3	2	1	3
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	1	3	2	1	3	2	1
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	1	3	2	2	3	2	2
9	Future potentials of economic development and urban growth.	3	3	3	3	9	9	9
10	Improving the urban structure of existing urban centres.	1	1	2	1	1	2	1
	Total	12	26	21	20	32	27	26

Where: (A) = The expected urban growth to be directed to Hit.
(B) = The expected urban growth to be directed to Kubaisa.
(C) = The expected urban growth to be directed to the proposed new town.

Urban Growth Potentials (Haditha Urban Node), If Future Potentials of Economic and Urban Growth is given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies			Weighted Score		
			A	B	C	A	B	C
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	2	1	3	2	1
2	Cost of providing services and public utilities.	1	3	2	1	3	2	1
3	Daily journey to work.	1	2	3	3	2	3	3
4	Availability of land for urban growth.	1	2	1	3	2	1	3
5	Preserving good quality landscape.	1	3	1	3	3	1	3
6	Social considerations: social relationships and personal preferences of location and city-size.	1	2	1	3	2	1	3
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	1	3	2	1	3	2	1
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	1	3	3	2	3	3	2
9	Future potentials of economic development and urban growth.	3	2	1	3	6	3	9
10	Improving the urban structure of existing urban centres.	1	1	2	1	1	2	1
	Total	12	24	18	21	28	20	27

Where: (A) = The expected urban growth to be directed to Haditha.
(B) = The expected urban growth to be directed to Haqlaniya.
(C) = The expected urban growth to be directed to the proposed new town.

Urban Growth Potentials (Qaim Urban Node), If Future Potentials of Economic and Urban Growth is given the Highest Priority

Code	Factor	Priority or Weight of the Factor	Value Given to the Alternative Strategies				Weighted Score			
			A	B		C	A	B		C
				B_1	B_2			B_1	B_2	
1	Availability and spare capacity of services and public utilities in existing urban centres.	1	3	1	3	1	3	1	3	1
2	Cost of providing services and public utilities.	1	3	2	2	2	3	2	2	2
3	Daily journey to work.	1	2	3	3	3	2	3	3	3
4	Availability of land for urban growth.	1	3	3	3	3	3	3	3	3
5	Preserving good quality landscape.	1	3	3	3	3	3	3	3	3
6	Social considerations: social relationships and personal preferences of location and city-size.	1	2	1	1	3	2	1	1	3
7	Reinforcing the existing settlements and increasing the efficiency of the settlement pattern.	1	3	2	2	2	3	2	2	2
8	Accessibility to regional and/or national infrastructure facilities and the economical utilisation of these facilities.	1	3	2	2	2	3	2	2	2
9	Future potentials of economic development and urban growth.	3	3	3	3	3	9	9	9	9
10	Improving the urban structure of existing urban centres.	1	3	1	1	1	3	1	1	1
	Total	12	28	21	23	23	34	27	29	29

Where: (A) = The expected urban growth to be directed to Qaim.
(B_1) = The expected urban growth to be directed to Karabla.
(B_2) = The expected urban growth to be directed to Ubaidi.
(C) = The expected urban growth to be directed to the proposed new town.

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