A CONCEPTUAL FRAMEWORK FOR A NONSTRUCTURAL APPROACH TO REDUCE FLOOD IMPACT IN URBAN CATCHMENTS

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Abstract

Owing to historical processes that can be traced back over two millennia, flooding in urban catchments is managed using the wider UK flood risk management (FRM) cost-benefit approach focussing on *structural* defences. While in principle, structural defences are effective for managing flooding in urban catchments, difficulties in *appraising* the consequences of this type of flooding in terms of derived economic benefit, means providing structural protection for urban catchments is often economically inappropriate. Since the benefits of structurally protecting urban catchments rarely outweigh the costs, incidences of flooding in urban catchments are inevitable. The conceptual basis for a non-structural approach to reduce flood risk is developed in this PhD thesis. The findings indicate that over the long-term, a non-structural approach can reduce flood risk, be less expensive than the structural counterpart and serve as an additional dimension to the current FRM system.

Tangible and *intangible* Flood Impact (the core components of flood *risk*) is reduced through a process of influencing behaviour through stakeholder group-specific Capacity Building using appropriate and effective engagement of stakeholders and novel use of existing technology systems such as GIS. Tangible Flood Impact such as flood damage can be reduced by providing *tactical* stakeholders (TSHs) with quality catchment data that over time will enable creation of greater accuracy drainage models. Intangible Flood Impact such as *trauma* can be reduced by providing inexpensive but *comprehensive* and *appropriate* support to *receptor* stakeholders (RSHs) and dwellers.

The framework has been derived from involvement in three case studies: ERA NET CRUE case study, Glasgow, Scotland, *Non-Structural Responses (NSR)*, Defra case study FD 2603 (part of INTERREG ivb[1]), *Managing Adaptive REsponses to changing flood risk in the North Sea Region (MARE)*, and; Defra case study, West Garforth, England, *Integrated Urban Drainage pilot (IUD)*. The basis for the framework was identified in the Glasgow NSR case study and was derived from engagements with professionals and dwellers in Glasgow. This basis was developed into a conceptual framework during the remaining two case studies which involved engagement with professionals and dwellers in England. The framework is now available for application.

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[1] INTERREG IVB is a financial instrument of the European Union's Cohesion Policy. It funds projects which support transnational cooperation.

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ACAH	Advisory Council for Agriculture and Horticulture
ACC	Aberdeenshire Council
ADA	Association of Drainage Authorities
DEFRA	Department for the Environment, Food and Rural Affairs
DI	Direct Intangible damage or impact
DT	Direct Tangible damage or impact
EPR	Equivalent Professional Role
FAG	Flood Action Group
FIAC	Flood Issues Advisory Committee
FIR	Flood Impact reduction
FRM	Flood Risk Management
GCC	Glasgow City Council
GIS	Geographic Information System
GSDP	Glasgow Strategic Drainage Plan
IDB	Internal Drainage Board
II	Indirect Intangible damage or impact
IT	Indirect Tangible damage or impact
LA	Local Authority
LeA	Learning Alliance
LMBC	Leeds Metropolitan Borough Council
MAFF	Ministry of Agriculture Fisheries and Food
NFF	National Flooding Framework
NRA	National Rivers Authority
NSR	Non-structural Response
NTAG	National Technical Advisory Group
OFWAT	Office of Water Services
PPS	Planning Policy Statements
RCC	Renfrewshire City Council
RSH	Receptor Stakeholder
RSPB	Royal Society for the Protection of Birds
RTN	Resilient Telecommunications Network
SEA	Strategic Environmental Assessment
SEGC	Strathclyde Emergency Co-ordination Group
SEPA	Scottish Environment and Protection Agency
SH	Stakeholder
SLC	South Lanarkshire Council
SNIFFER	Scotland & Northern Ireland Forum for Environmental Research
SPR	Source-Pathway-Receptor
SW	Scottish Water
TSH	Tactical Stakeholder

Glossary

Adaptive Capacity	The ability to become adapted (Gallopin 2006) often as a result of an external disturbance
Built capacity stakeholders	Receptor or tactical stakeholders with *built capacity* implies stakeholders that are able to make decisions and act (if necessary) based on an appropriate understanding of the context in which they exist (as professional or dweller) and their roles within that context with respect to reduction of Flood Impact
Capacity Building	Capacity Building is a means of adjusting the awareness of an individual or group of individuals toward greater perceptive clarity of their stake in FIR order that the individual(s) can make informed decisions based on the heightened awareness of context and limitations therein toward appropriate contribution to FIR in a system-wide perspective
Catchment	A catchment is an area that serves a river with rainwater, i.e., every part of land where the rainfall drains to a single river. Hills and high ground are often the boundaries between catchments. (Environment Agency 2008)
Descriptive engineering	Descriptive engineering: a term coined during this project. Descriptive engineering means describing technical aspects of engineering in terms of their function. An example is a traditional dam, most people can conceptualise the function of a dam without having to understand the technical aspects required in order to design one. Context relevant examples may be; understanding of the basics of the major/ minor system interaction; dweller behaviour affect on flows, how grills function to prevent detritus entering, how water infiltrates into the system, how sedimentation occurs and its effect on capacity etc.
Dwellers	Defined as individuals who have, are or will be flooded within a given urban catchment. Dweller is the status of these individuals before they become involved in active Capacity Building activities
Exposure	An internal property of vulnerability, (Gallopin 2006). Exposure is necessary for a system to suffer impact to that which it is vulnerable.
GIS	Geographical Information System, incorporating any system which displays geographic information stored within a database, The GIS may also have ability to manipulate the data.
Intangible Impacts	Impacts resulting from vulnerability to exposure to urban flood risk that are difficult to quantify such as stress, trauma and the loss of possessions such as memorabilia
Non-structural approach	A non-structural approach is a response to reduce Flood Impact in urban catchments that may not involve fixed or permanent facilities. Positive contribution to the reduction of that impact occurs through a process of influencing behaviour, through building capacity in all stakeholders through active learning and appropriate and effective engagement between stakeholders. (Taylor and Wong 2002, adapted)
Resilience	See multiple definitions, table 2.2
Risk	The product of the probability and consequence of an event.
Robustness	The ability to resist disturbance without adaptation or deformation
Urban Area	The physical locality in which a community resides including physical (buildings etc) and non-physical (people, networks) components
Vulnerability	'the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt.' (Adger 2006)

1. Chapter 1 - Introduction

1.1. Background

This research focuses on flooding of urban catchments in England. While there may be applicability to the wider United Kingdom, Scotland, Wales and Northern Ireland, the devolved responsibilities of the other constituent countries means that not all the content in this thesis is applicable. As such while this thesis only refers to England in the text, it should be considered that there will be circumstances of applicability to the wider United Kingdom.

1.1.1. Flood Risk Management in England today

The number of properties at risk of flooding is increasing. Properties that have never flooded before are starting to flood. Increasing urbanisation in England is exerting increased pressure on existing drainage systems further increasing the number of properties at risk of flooding. Climate change predictions indicate higher intensity and duration events meaning further flooding (Evans, et al., 2004). Climate change also introduces further uncertainty in weather predictions based on empirical data (Milly, et al., 2008). This leads to problems calculating risk, based on the product of probability and consequence since the *probability* term is now uncertain.

The removal of the 'no benefit, no rate' system of funding flood defences by the implementation of the Land Drainage Act (1930) means that funding for the management of the flood risk of the 5.2 million 'at risk' properties in England (Environment Agency 2009) is paid for by all 30.5 million UK taxpayers (HMRC 2010[1]) through a *cost-benefit* appraisal process. As argued by Johnson, et al., (2007), this system cannot offer equity as it is incapable of targeting areas that are vulnerable to flooding but have relatively little economic *value*. Although the FRM scheme appraisal process has recently been *upgraded* (NFF 2008) to provide greater emphasis on benefits to people and the most vulnerable communities, flood defence schemes can still only be provided where benefits outweigh costs. The Pitt Report (2008) indicated that this method of management is no longer acceptable.

The current FRM approach is appropriate as a means to provide funding for structural protection for essential infrastructure and high value locales such as city centres. This is due to the ability to *conceptualise* these locales in terms of the *economic benefit* derived from protecting them from the consequences of flooding. This approach is not appropriate for

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[1] www.hmrc.gov.uk/stats/income_tax/table2-1.pdf accessed 10th January 2010

managing flooding in urban catchments in England because of difficulties *appraising* the consequences of this type of flooding in terms of economic benefit, meaning structural protection is often economically inappropriate. Inability to protect urban catchments from flooding means that incidences of flooding are inevitable.

It is necessary to clarify the terminology used to describe the individuals who reside in the urban catchments who have flooded or *will* flood at some point in the future. The term 'dweller' is used to refer to this group. It is necessary to apply a different title based on the level of *capacity* that this group, or individuals within this group has. *Capacity* is defined below. For purposes of clarity in this thesis, dwellers who have *built* capacity are referred to as 'receptor' stakeholders (in concomitance with the Source-Pathway-Receptor model) to allow a common terminology. In this same regard, dwellers who may be at risk of flooding, but have low capacity, and are perhaps in *denial* of flooding, are referred to as *public*. The term *resident* is used in instances where reference is made to either a member of the public, a dweller or a receptor stakeholder but in the case where their *status* is not known. For example, if referring to a group of people living in a town in which no data is available regarding the *capacity* of the people, they would be referred to as *residents*.

1.1.2. Drivers for a new approach

Drivers for a new approach to 'managing' flooding in urban catchments in England are founded on the inappropriateness of managing this type of flooding using the current cost-benefit appraisal process. Prioritisation of funding for *all* English FRM schemes is calculated based on the financial benefit that *protection* will achieve. The *benefit* of protecting an urban catchment is *framed* under the current FRM *system* using the concepts of *tangible* and *intangible* impacts. For example property damage and psychological trauma respectively. While guidance is available to calculate the cost of tangible impacts, difficulties quantifying intangible impacts (Lekuthai and Vongvisessomaj 2001) mean they do not feature *appropriately* in the overall appraisal. Recent literature indicates that intangible impacts are *at least* equal to tangible impacts (see for example Tapsell, et al., (2001), Tapsell, et al,. (2002), Werrity, et al., (2007), Newman, et al., (2008)). The failing of the current FRM scheme appraisal system to 'account' for intangible impacts is the basis of the driver for this research.

1.2.   Research perspective

The context of this research is defined by problems arising from *conceptualising* flood management in urban catchments within the *wider* scope of FRM, a situation exacerbated by

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the effects of climate change. As such, it is *appropriate* to develop a methodology to reduce flood *risk* which focuses on managing the *consequences* of flooding in urban catchments. For this PhD research, flood management in urban catchments is reconceptualised to account for these *consequences* in a manner *equivalent* to that which FRM conceptualises protection of high value locales. As such *Flood Impact reduction* (FIR) is adopted for this research. A research perspective appropriate to this re-conceptualisation was developed based on the outcomes of the first research activity undertaken during this PhD[2] and is defined as a *non-structural approach*. A non-structural approach is defined as follows:

> **A non-structural approach is a response to reduce Flood Impact in urban catchments that may not involve fixed or permanent facilities. Positive contribution to the reduction of that impact occurs through a process of influencing behaviour, through building capacity in all stakeholders through active learning and appropriate and effective engagement between stakeholders.**

This definition has been adapted from the original, see the Appendix for the original definition. The application of the concept of *stakeholder* allows an *ethnological* description which incorporates the specific characteristics of this context[3] *and* the specific characteristics of the people[4]. Based on this non-structural approach and a review of relevant literature a *socio-technical* perspective is adopted for this PhD research. The ethnological description of this *whole* is presented here as a socio-technical *system*.

1.2.1. Disciplinary perspective

A multi-disciplinary perspective has been adopted in this research thesis based on engineering and sociology, see Figure 1.1.

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[2] CRUE ERA NET case study, Glasgow – see table 1.2
[3] The existence of professional bodies and their systems: technological, legislative, procedural etc
[4] The ability of individuals to adapt, the influence of Capacity Building on behaviour (both dwellers and professionals), and their interactions
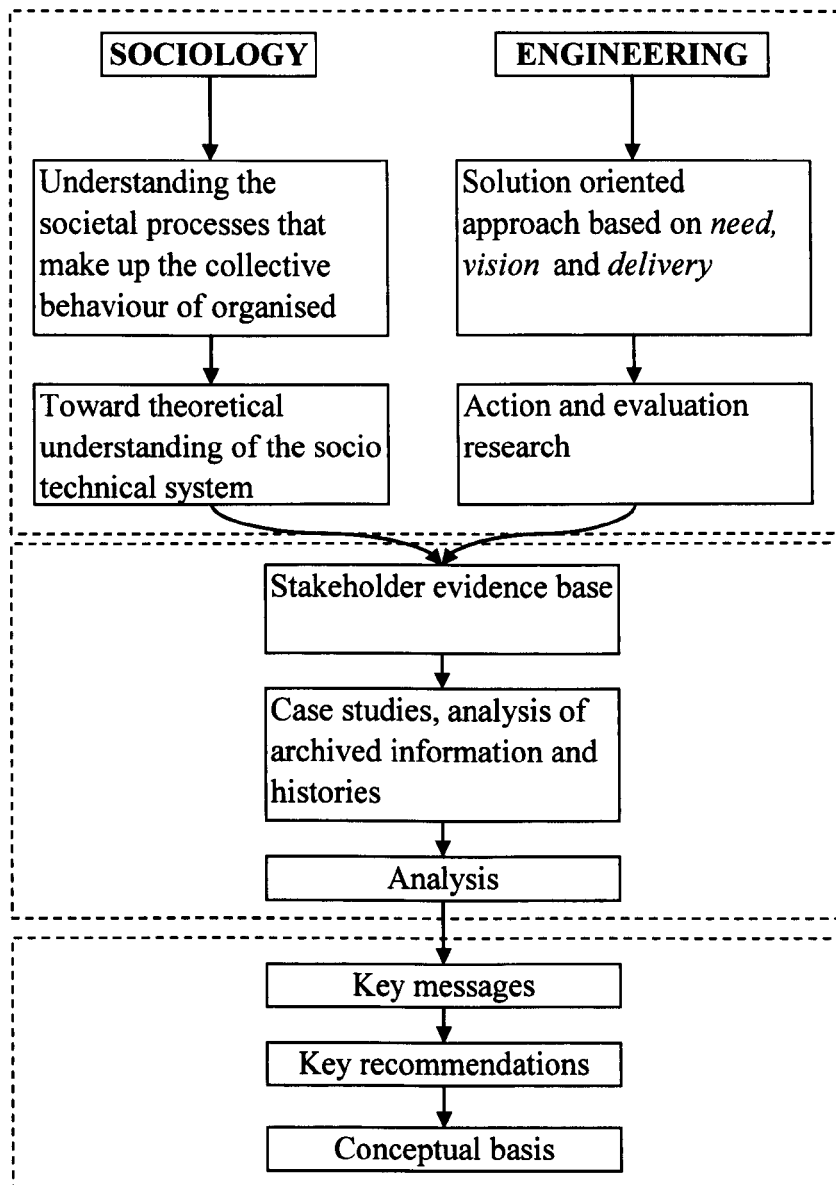
Figure 1-1 Disciplinary perspective adopted in this PhD research

The mode in which these two perspectives are integrated, and the reason for this integration is outlined as follows:

The engineering perspective may be seen as a pragmatic, solution-oriented approach based on *'need, vision and delivery'* (RAE 2005), as opposed to a more traditional perspective based on *'...harnessing the great forces in nature for the use and convenience of man'* (ibid):

- *Need* – recognising and understanding the nature of societies needs,
- *Vision* – conception and management of a creative vision to meet the demand,
- *Delivery* – assembling and managing resources needed to create an efficient and appropriate design.

These three *components* of the engineering perspective span the whole of the research process adopted here. '*Need*' is based on identifying a research problem including understanding the context (also see the sociological perspective, next paragraph). 'Vision' incorporates developing a *research design method* that is appropriate to the context. Finally, 'delivery' is the process of acquiring the data (research) and interpreting it into the research aim: a conceptual framework for a non-structural approach to reduce Flood Impact in urban catchments.

The sociological perspective is toward understanding the *societal* processes that make up the collective behaviour of organised human groups[5]. This additional dimension was manifest in a need to *explore* particular issues: an approach based solely on acquisition of *specific* data goals may ignore crucial nuances leading to misinterpretation of the *system* impacting the quality of the research. This is especially relevant due to the type of stake the research participants have in the subject itself namely professional and non-professional (dweller), i.e., those charged with *managing* flooding and those who *are* flooded. To this end it was necessary to understand how these groups *framed* their position with respect to the subject in order to gather data. As such a flexible research methods were chosen (see Chapter 3: Methods for further details).

1.3.   Research aim

The research *aim* is to produce a context appropriate, conceptual framework to reduce Flood Impact in urban catchments which *complements* the existing FRM *structural* approach. As indicated above, the existing structural approach is appropriate for protecting high value assets and locales, but not urban catchments where determination of the economic benefit of protection is inappropriate based on the way impact is *manifest* in those urban catchments (i.e., tangible *and* intangible, as opposed to just tangible). The complementary approach outlined here, defined as a *non-structural* approach is appropriate for reducing Flood Impact in urban catchments since its efficacy is not based on an economic appraisal, rather, use of existing resources (stakeholders and existing technologies) in a novel and integrated way to reduce both intangible and tangible impacts.

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[5] http://www.britannica.com/EBchecked/topic/551887/sociology accessed 21st December 2010

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The conceptual framework will provide the conceptual basis for a *strategic* framework, *facilitated* by Local Authorities in concomitance with the move to manage responsibility of flooding to those authorities as outlined in the Flood Risk Management Act (2010).

The conceptual framework comprises the following core components:

- **Building stakeholder capacity (professional and non-professional or dwellers)**: the definition of Capacity Building adopted in this thesis is: *Capacity Building is a means of adjusting the awareness of an individual or group of individuals toward greater perceptive clarity of their stake in FIR in order that the individual can make informed decisions based on the heightened awareness of context and limitations therein toward appropriate contribution to Flood Impact reduction in a system-wide perspective.* On this basis, stakeholder group specific Capacity Building regimes are identified in order to realise this goal (tactical stakeholders use *Learning Alliances,* and dwellers use *Flood Action Groups*).

- **Endowing dwellers with *equivalent professional roles***: founded on the hypothesis that tactical stakeholders will benefit from acquisition of dweller information described as *local knowledge* such as asset performance, observed flood levels, locations of standing water and other historical information such as locations of culverted watercourses etc.

- **Formalising *appropriate* communications and interactions of stakeholders using existing technologies**: communication between stakeholder groups is often problematic due to, for example, difficulties in understanding the *perspective* of the other stakeholder group. Much of the communication between these two groups can be achieved using an appropriate internet-based technology portal which can be utilised by both stakeholder groups. The additional benefit of such a system is that, if used, it can begin to break down some of the common misconceptions that stakeholder groups perceive of each other through building mutual trust and respect.

Examples of these practices are cited in the literature review providing an evidence base for their efficacy: Capacity Building regimes for tactical stakeholders (Learning Alliances – the DCLA) and also various Flood Action Groups (FAGs) in England. Also cited are examples of *Equivalent Professional Role* (Cambridgeshire County Council: Flood Memories Project) and *Formalising Stakeholder Interactions* (the '311' helpline in New York City, USA).

Problems arise however if these systems are not *integrated*: while the flood memories project is *productive* in the sense that *useful* data is being obtained from the dwellers and transferred to the professionals, the system is also experiencing resistance due to the effect on house prices and insurance premiums that publishing such data has by effectively indicating locations of properties 'at risk'. FAGs provide support for residents as 'stand alone' units, but they need contact from the professionals to advise and feed-back on requests for information to reduce tangible impacts within the urban catchments. Learning Alliances also function as 'stand-alone' units, but they too need to be appropriately *linked* to other stakeholder groups, such as governments and dwellers, otherwise they run the risk of becoming *detached* from the reality and hence not delivering context appropriate outputs.

Therefore, the efficacy of delivery of an *integrated* system may be thought of as being 'greater than the sum of its parts': linking professionals and dwellers appropriately allows a mutually beneficial system: professionals get data and dwellers get feedback and support.

The conceptual framework provided by this research is intended to provide the basis for development of an integrated *strategic* framework. Clearly, establishing such a framework is a long-term goal, involving different stakeholder groups, some of whom have not yet been identified.

1.4. Research objectives

Based on the research aim outlined above, the research objectives are outlined as follows, and are the basis on which the research questions were developed:

- **Objective 1:** Identify the opportunities and barriers to meet drivers for a new approach to reduce Flood Impact in urban catchments.
- **Objective 2:** To understand how stakeholder Capacity Building contribute to the non-structural approach.
- **Objective 3:** To explore the efficacy of dweller Equivalent Professional Role (EPR) with respect to reducing Flood Impact.
- **Objective 4:** To understand how stakeholder group interactions be improved or formalised.

1.5.   Research questions

Table 1.1 indicates the research questions posed in this thesis developed from the research objectives (section 1.4 above) and the research sub-questions that are necessary to answer each individual research question.

Research questions		Research sub-questions
1 – Identify the opportunities and barriers to meet drivers for a new approach to reduce Flood Impact in urban catchments	1	What opportunities and barriers have been identified in this research that exist within the socio-technical system that will form the basis of a new approach?
2 - How does stakeholder Capacity Building contribute to the non-structural approach?	2a	What is the evidence supporting the efficacy of building the capacity of *system* stakeholder groups?
	2b	What is the motivation for establishing and maintaining FAGs in urban catchments?
	2c	What is the motivation for establishing and maintaining Learning Alliances?
3 – What is the efficacy of dweller Equivalent Professional Role (EPR) with respect to reducing Flood Impact?	3a	What is the basis for the efficacy of the dweller EPR?
	3b	How may the dweller EPR become active within wider FRM?
	3c	What are the key issues surrounding acceptability of EPR to dwellers?
	3d	How can the dweller EPR be maintained, particularly during non-flooding times?
4 – How can stakeholder group interactions be improved or formalised?	4a	Which stakeholder interactions are appropriate to 'formalise' using an internet based portal?
	4b	What are the conditions under which both stakeholder groups would view such an internet based portal as 'acceptable'?
	4c	What are the appropriate technological considerations for the internet based portal?

Table 1.1 Research questions as associated core research components

1.6.   Research approach

The research approach adopted for this PhD thesis comprises engagement with the ethnological group defined as stakeholders of Flood Impact reduction in urban catchments. Table 1.2 indicates the research activities chosen for this research, and a brief description:

Research activities		Activity description
Desk study/ literature review		The desk study was undertaken to provide initial researcher capacity and knowledge pertaining to the research field in order to define 'boundary conditions'.
Case study	Glasgow (NSR), Scotland 'Effectiveness and Efficiency of Non-structural Flood Risk management Measures' (Defra case study FD 2603, part of CRUE ERA NET[6]). May 2007 – April 2008.	Tactical stakeholder engagements with 'high-level' TSHs (head of department and managerial) in a context of exploration of the efficacy of non-structural responses.
		Receptor stakeholder engagements allowing exploration of the notion of EPR in the wider context of exploration of the efficacy of non-structural responses.

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[6] http://www.crue-eranet.net/ accessed 20th December 2010

Case study	**West Garforth IUD**, England 'Integrated Urban Drainage pilot' (Defra[7] case study). November 2006 – April 2008.	This case study provided an opportunity to test the efficacy of the use of RSH data in a TSH context: development of a surface water drainage system model for West Garforth.
Case study	**MARE** - Managing Adaptive Responses to changing flood risk in the North Sea Region (MARE) (INTERREG[8] case study). October 2008 – present.	This case study provided a platform for investigating the efficacy of the Learning Alliance approach as a regime to build TSH capacity.
Case study	**West Garforth dweller engagement,** (continuation with dweller participants of West Garforth IUD study) June 2009 – June 2010.	This dweller engagement provided an opportunity to engage dwellers who are considered to rave a relatively high capacity due to their involvement in the West Garforth IUD pilot, and a relatively sophisticated flood group allowing deeper exploration into the notion of EPR.

Table 1.2 Research activities and description chosen for this research

A flexible research approach was selected based on the different types of research participant and the research question being asked (see Chapter 3: Methods, for full details). The research strategies chosen to collect data were *case studies, analysis of archival information* and *histories*. The method of collecting the data within each case study was through *interview* (qualitative: structured, semi-structured, unstructured and informal). The interview types were: *one-to-one, group meetings* and *forums* (full details can be found in Chapter 3: Methods). Table 1.3 indicates each research activity, the associated research design, strategy and finally a matrix indicating which research objective each research activity contributed to achieving.

		Research activity			
	Literature review	Glasgow (NSR)	West Garforth IUD	MARE	West Garforth dweller engagement
			Research design		
		Action research	Evaluation research	Evaluation research	Evaluation research
			Research strategy		
	Analysis of archival information, Histories	Case study (interviews)	Analysis of archival information	Case study (interviews)	Case study (interviews)
			Matrix indicating the role each research activity had in the overall research process		
Research objective 1	●				
2	●	●		●	●
3	●	●	●		●
4	●	●			●

Table 1.3 Outlining how the research activity, design & strategy relate to the research objectives

Figure 1.2 indicates the way in which the research aim and objectives relate to the chapters in this thesis and the way the chapters are structured to form a *complete* thesis.

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[7] http://www.defra.gov.uk/environment/flooding/documents/manage/surfacewater/wgarforthreport.pdf accessed 20th December 2010

[8] http://www.northsearegion.eu/ivb/projects/details/&tid=95 accessed 20th December 2010
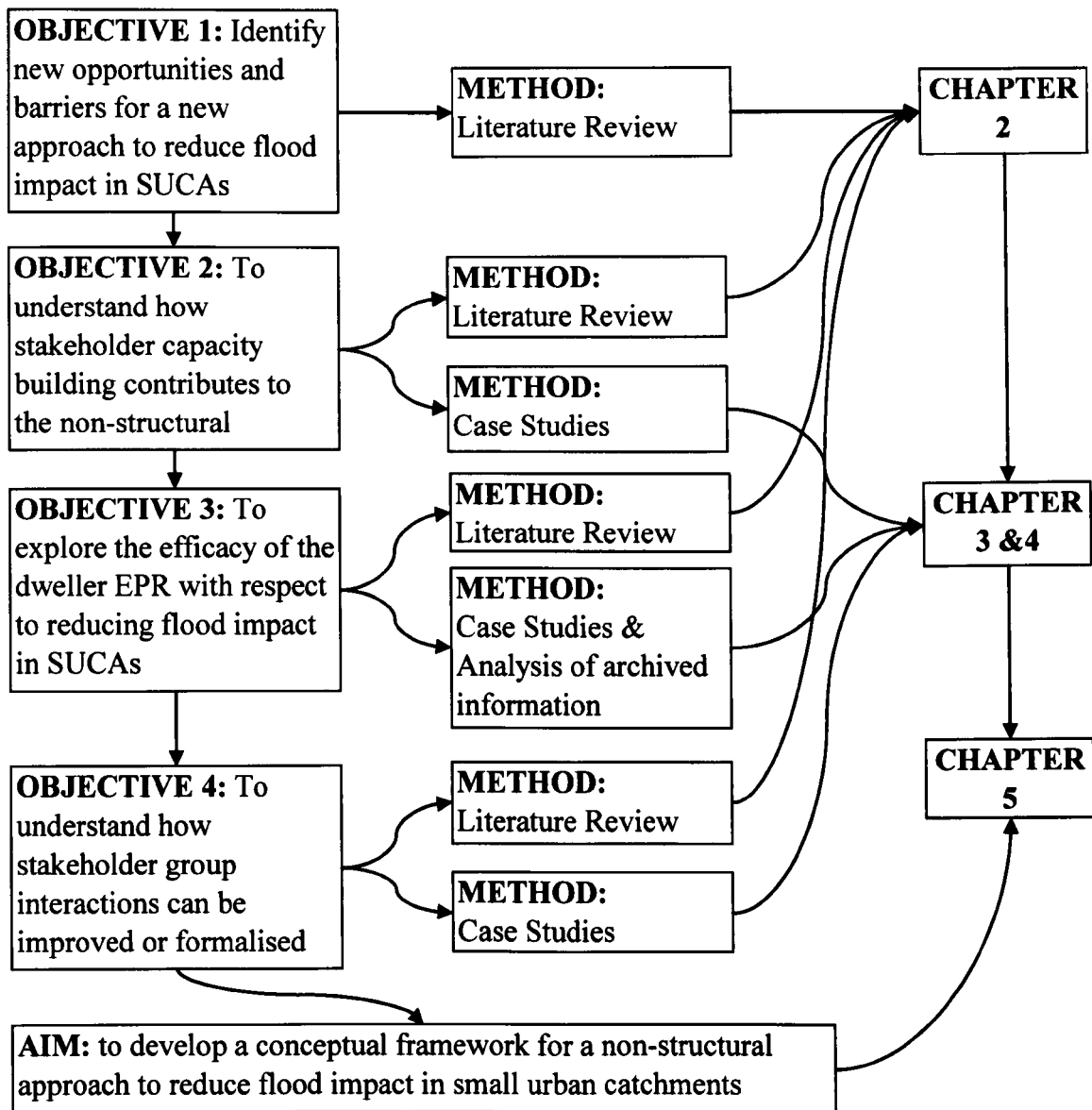
Figure 1-2 Outlining how research aim and objectives relate to each chapter within the thesis.

1.7. Originality and contribution

This section outlines the way in which this thesis contributes to new knowledge production:

- Presentation of a conceptual approach to managing Flood Impact in urban catchments.

- Integration of research methods in a novel way to provide the conceptual framework to manage a 'real-world' problem in a way that is context appropriate.

- Integration of concepts that are in their 'infancy', but have efficacy (Capacity Building, Equivalent Professional Roles and Formalising Stakeholder Interactions).

- Provision of an example of *interdisciplinary* research project applicable to a real-world context.

- Provision of a greater understanding of engaging public: what it means, why it is necessary, the need and efficacy for stakeholder groups to be aware of each others

perspectives and stakes. It also identifies opportunities and barriers to aid future engagements.

- Presents the origins of the problem of flooding in urban catchments in England from a historical perspective.

- Presentation of new concepts such as *receptor stakeholder*, *Descriptive Engineering*, *equivalent professional role* etc.

1.8.   Thesis structure

The following outlines how the chapters in this thesis are structured:

- Chapter 2 – Literature review: This chapter presents a review of existing literature forming the knowledge upon which this PhD research is based. This literature review explores the theoretical perspectives supporting a new non-structural approach to reduce total Flood Impact in urban catchments based on resilience theory.

- Chapter 3 – Methods: This chapter describes the research activities chosen during this PhD research and the methods used to obtain the data evidence to answer the research questions. This chapter is structured into three sections: the first provides the theoretical background to the methods used to gather the data including philosophical approach, research strategy, research design and disciplinary perspective. The second section outlines *all* the research methods used to collect the data. The final section outlines *how* these methods were applied in each research activity to collect the data during that activity.

- Chapter 4 – Results: This chapter contains the data obtained during the research activities outlined in the methods chapter. The data is categorised into sections comprising each research activity. The data in each section is further categorised into the research question that the data 'answers' allowing the reader to follow the logic used toward analysis of the data in chapter 4.

- Chapter 5 – Analysis: The chapter is structured into three sections: a critical analysis of the research design methods chosen to gather data; a re-contextualisation of the results obtained from the research activities in terms of the overall thesis aim, and; presentation of the strategic framework based on these results. Section one is divided into two parts; an analysis of the overall methodological approach and an analysis of the individual methodologies selected to obtain data during each research activity. Section two presents an analysis of the data obtained during each research activity to obtain the salient findings in order that they may be aggregated to provide the basis for the strategic framework. Data analysis is presented categorically with respect to the

research question that each particular data contributes to. Section three is an aggregation of the salient findings obtained during the data analysis to present the strategic framework.

- Chapter 6 – Conclusions: This chapter provides the overall research conclusions. Also presented is a discussion regarding the strengths and weaknesses of the research methods chosen, and associated the data in the context of the final research aim. Also presented is an outline of the further work needed in order that the conceptual framework can be transformed into a strategy to reduce Flood Impact in urban catchments.

2. Chapter 2 – literature review

2.1.   Introduction

The previous chapter outlined the research perspective, context and drivers for this research. This chapter presents a review of existing literature forming the knowledge upon which this research is based. The literature review explores the theoretical perspectives supporting the conceptual basis for a new *non-structural* approach to reduce Flood Impact in urban catchments based on resilience theory. This chapter is structured into three parts as follows:

- Part 1. Reconceptualising FRM in urban catchments based on the specific characteristics of that type of flooding. Theories are then presented which underpin the conceptual basis for a new approach.

- Part 2. Introducing the theoretical perspective underpinning the new non-structural approach to manage flooding in urban catchments.

- Part 3. Chapter summary and introduction of the research hypothesis and research questions.

Three topics are covered in this literature review. Topics 1 & 2 outline *existing* theoretical perspectives relating to part 1 of the review. Topic 3 outlines the theoretical perspective to develop the new non-structural approach.

- Topic 1. Flood impact, vulnerability and adaptive capacity,

- Topic 2. Resilience as the theoretical basis for a new approach,

- Topic 3. Mobilising resilience theory: a socio-technical systems approach:
  - o   Stakeholder Capacity Building,
  - o   Endowing dwellers with equivalent professional *roles*,
  - o   Formalising stakeholder interactions.

The topics address the research questions in this thesis as follows. Topics 1 and 2 form the theoretical basis with which to answer the first research question:

Research question 1: Identify the opportunities and barriers to meet drivers for a new approach to reduce Flood Impact in urban catchments.

Topic 3 forms the theoretical basis of this research to answer research questions 2, 3 & 4:

Research question 2: How does stakeholder Capacity Building contribute to the non-structural approach?

Research question 3: What is the efficacy of dweller Equivalent Professional Role (EPR) with respect to reducing Flood Impact?

Research question 4: How can stakeholder group interactions be improved or formalised?

2.2. Part 1 - Reconceptualising flood risk management in urban catchments

Part 1 of this literature review outlines the *literary* and *theoretical* perspectives which underpin a requirement for a re-conceptualisation of flooding in urban catchments, and the theories which underpin a new approach based on this re-conceptualisation. Initially the historical perspective is presented describing the manner in which flood management in England is *framed*. Presented next is the current theoretical perspective of Flood Impact as the basis for re-conceptualisation, followed by a context relevant discussion of vulnerability, adaptive capacity and resilience providing the theoretical basis for the new non-structural approach.

2.2.1. History of flood management in England

This section provides an historical account of the changes in the English approach to land drainage processes over the last 2,000 years which have influenced the way flooding is *managed* in England today. As outlined by Scrase and Sheate (2005) the frame of the majority of the last two millennia of English flood risk management (FRM) may be described as solving land drainage problems for personal profit derived from crops grown on land that previously were marsh and swamp. Increased agricultural activity led to difficulties in land management from the perspective of landowner responsibility towards one's neighbour: that is, the change created instances of flooding on neighbouring properties where none had existed before. The introduction of the Sewers Act (1532) provided regulation and with it guaranteed protection for landowners by introducing a 'no benefit, no rate' funding system, allowing localised management and funding of schemes based on a principle whereby the beneficiary paid.

The growth of free trade during the industrial revolution, and more especially the repeal of the Corn Laws in 1846 which were seen as subsidising the landowning classes, brought about a fall in prices, a surge of imports and an improvement in diet. This period marked the demise of localised agricultural systems since their primary purpose of food production was eroded thanks to the availability of cheaply imported alternatives. The growth in cheap food imports also allowed the increasingly urbanised and growing population to be fed. During and between World Wars I and II, importing food was less viable, making food production a high national priority once again and imparting a legacy of sensitivity over food security and self-

sufficiency. The Land Drainage Act (1930) provided some momentum for the radical changes that allowed a return to national food production. The Act abolished the no benefit, no rate system of funding flood defences, thus removing the guarantee of protection and replacing it with catchment scale funding capable of supporting the large-scale engineering works required.

Arguably the approach at that time was appropriate given the threat of war and related food shortages, together with a rising population. The paradigm established through the implementation of the Land Drainage Act, and the institutional structures it gave rise to, became accepted and entrenched to the point that the system (the human and physical components responsible for its implementation) fell into what Walker (2000) calls a state of 'entrapment'. Walker describes this as when a system can no longer respond and adapt appropriately to change drivers. This was evidenced in pressures exerted on the Ministry for Agriculture Fisheries and Food (now the Department for Environment Food and Rural Affairs) by environmental groups (e.g., Barber D. 1970; cited by Scrase and Sheate, 2005) to account for environmental concerns. More recently, there has been a shift in the conceptualising of the rural landscape, from a view of the countryside as being predominantly agro-rural to the current position which has seen the suburbanising of the landscape.

The Land Drainage Act and funding of the large-scale engineering works it necessitated, required creation of institutional structures, of a largely technological nature, in line with the import of the Act. The agglomeration of technical expertise required to create and maintain the engineering and drainage works, the financial and institutional superstructures needed for their maintenance, support from agricultural and landowning interests and concomitant political support effectively gave rise to a predominantly technocratic hegemony intent on maintaining its dominant position. This effected a state of entrapment within its own paradigm, protected by the scope of the 1930 Act. The situation has remained relatively unchanged since, despite pressures such as climate change, urbanisation, growing societal aversion to risk and conservation.

2.2.2. Problems with the current conceptualisation of FRM in England

As outlined in section *1.1.2 drivers for a new approach*, the current *flood risk management* approach in England is appropriate as a means to provide funding for structural protection for essential infrastructure and high value locales. This is due to the ability to conceptualise these locales in terms of the economic benefit derived from protecting them from the consequences

of flooding. This approach is not appropriate for managing flooding in urban catchments in England because of difficulties appraising the consequences of this type of flooding in terms of *derived economic benefit*, meaning structural protection is often economically inappropriate. Inability to protect urban catchments from flooding means that incidences of flooding are inevitable. Therefore it is appropriate to develop a methodology to reduce the *consequences* of flooding in urban catchments. In order to achieve this it is necessary to reconceptualise FRM to account for these consequences in a manner *equivalent* to that which FRM conceptualises protection of high value locales. This section presents an alternative conceptualisation of flooding in urban catchments which is *appropriate* to the characteristics of the consequences of this type of flooding to found a theoretical basis of approach to develop a methodology to manage that flooding.

Flooding ideologies have shifted from principles primarily concerned with land drainage (pre-1970s), to flood defence (1980s-1990s) to flood risk management (FRM) (2000+) (Johnson, et al., 2007). A commonly accepted definition of *risk* is the product of the *probability of occurrence* and *consequence*. Traditionally flood defences have been designed from this *risk* perspective: a function of the consequence and return period using empirical data. However, due to the *'death of stationarity'* (Milly, et al., 2008), this empirical data is no longer relevant. Proposed within this thesis is a conceptualisation of flooding in urban catchments based on the remaining *term* in the risk equation: *consequence*.

Consequences of flooding are defined by Penning-Rowsell, et al., (2003) as *damages*. The concept of flood damages is used to calculate the economic consequence of a flood as a basis with which to prioritise structural responses (see Messner, et al., 2007). Flood damages are categorised as *direct* and *indirect*, each of these categories are further sub-divided into tangible and intangible (see figure 2.1). Direct damage is the result of direct contact of water with human beings, property or other objects. Indirect damage occurs as a result of the contact with water, but in a space or time outside the event (Buechele, et al., 2006).

The term *damage* is inappropriate for use in this thesis as it implies reference to the *physical* consequences of flooding only. Therefore, *impact* is chosen as the overarching term to describe the consequences of flooding.

The scope of this thesis focuses on *direct tangible* (DT) and *indirect intangible* (II) impacts of flooding in urban catchments only: It is hypothesised that only DT and II impacts can be

influenced *directly*. The remaining two impacts, direct intangible (DI) and indirect tangible (IT), are *effects* of DT damage. For example, it is not possible to stop injury from floods or disruption to business unless DT damage is prevented. While injury may cause II impacts (trauma), the only way to prevent this II impact is by preventing the DT damage. Therefore when reference is made to the output of this research providing a conceptual basis for a non-structural approach to reduce impact, the impact refers to DT and II impact reduction. In certain cases in the literature outlined below, no reference is made in the source text to specify whether an impact is *direct* or *indirect*, as such the text has been left as in the original source text, i.e., *tangible* or *intangible*.
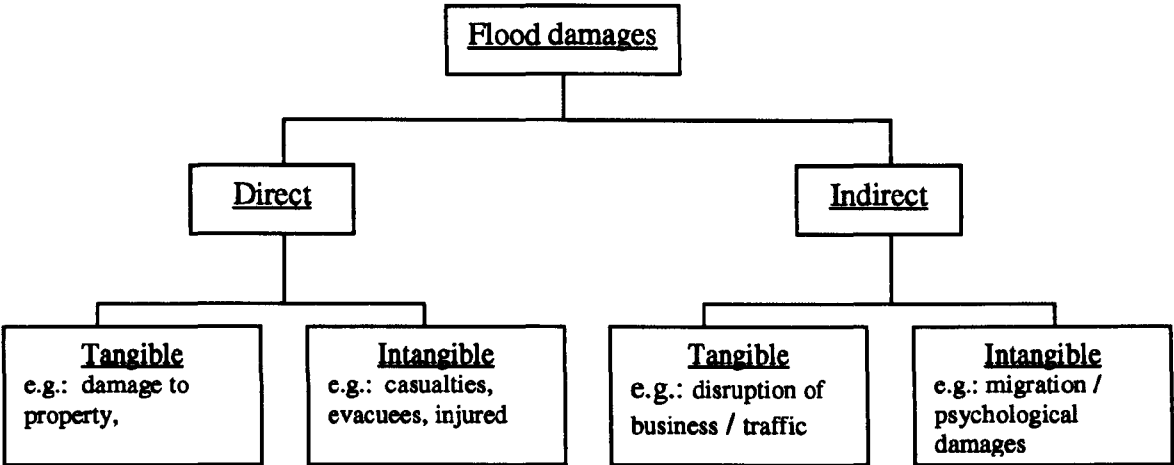
Figure 2-1 Classification of flood damages (source: Merz 2006)

It is becoming more widely accepted that from the perspective of those who suffer the impacts, the indirect intangible consequences of flooding such as psychological consequences and loss of personal possessions exceeds the loss of tangible consequences such as personal financial costs (Tapsell, et al., 2001, Tapsell, et al., 2002, Werrity, et al., 2007, Newman, et al., 2008 and others).

Based on the perspective that indirect intangible consequences from flooding in urban catchments can exceed the tangible consequences it is inappropriate to focus solely on tangible consequences when *conceptualising* flooding in urban catchments. As such, for purposes of this research Flood Impact is proposed as the *unit of analysis* allowing recognition of the consequence of both tangible *and* intangible impacts. Therefore to conceptualise the problem of flooding in urban catchments in the context of managing the consequences of that flooding, Flood Impact *reduction* (FIR) is adopted.

2.2.3. Current perspective of Indirect Intangible impacts of flooding in urban catchments

Outlined below is the current English FRM perspective (unless stated otherwise) on II impact. This perspective indicates that indirect intangible impacts of flooding are conceptualised *within* the remit of the *economic appraisal* process as outlined above. Then outlined are examples found in the literature, and obtained empirically which serve as a contrasting perspective to support the inappropriateness of conceptualising indirect intangible Flood Impacts on an economic basis.

Impacts of direct and indirect intangible damages are defined by Defra (2004);

'...include stress-related health impacts and loss of, or damage to, irreplaceable personal possessions (e.g. family photos, diaries etc.) and manifest themselves as the value of lost utility because of restricted activities, pain and suffering, anxiety about the future and concern and inconvenience to family members and others'

Regarding the *nature* of direct and indirect intangible damages (ibid):

'stress, health effects and loss of memorabilia can be as important as the direct material damages...' (ibid)

The whole is framed by Defra (ibid) as an *economic* appraisal and as such the results of the research concluded:

'...avoiding the health impacts [intangible] *of fluvial flooding is in the order of £200 per household per year...*[however] *even from the relatively large sample used, it was not possible to find any clear relationship between individual valuations and household or flood characteristics...researchers have professionally interpreted their results based on the survey data to develop a practical methodology for* general application *to project appraisal.'* (ibid emphasis in original)

The above guidance is issued to 'operating authorities' (ibid) to enable them to apply a monetary value to intangible Flood Impacts in urban catchments in order that cost saving estimations may be derived by the provision of FRM schemes.

Further guidance toward accounting for intangible impacts are given by Penning-Rowsell, et al., (2003). Again, the conceptualisation of these intangible impacts is as an economic appraisal, and the subsequent monetary benefit of inclusion of intangibles:

'in recognition of the need in project appraisals for quantitative monetary values for these losses [intangible] *(and hence the benefits of flood alleviation)...experimental work has been undertaken relating monetary losses...to these intangible losses by deriving 'equivalent values' for these intangible items'* (ibid)

The Scotland and Northern Ireland Forum For Environmental Research (SNIFFER 2006), as part of the UKCC10 project; 'Assessing the benefit of flood warning: A scoping study', again frames the aspect of intangible impacts as provision for assessment of the benefit of provision of a FRM scheme:

'[Intangible] losses are extremely difficult to quantify in economic terms, but are important considerations when evaluating the benefits of any flood management scheme, particularly flood warning where significant impacts can be made through facilitation of timely evacuation of those at risk' (ibid)

2.2.4. Indirect intangible impacts and re-conceptualisation of flooding in urban catchments

This section outlines indirect Intangible Impacts and their effects from the perspective of the dwellers. This perspective provides an evidence base supporting the case to reconceptualise flooding in urban catchments in terms of these impacts. These findings present two salient points: firstly the high probability of widespread occurrence of such impacts in a flooded urban catchment, and; secondly, the findings serve to represent the dweller experience of suffering these impacts.

The table 2.1 indicates some examples found in literature and from empirical research detailing the sources of intangible impacts of flooding in urban catchments and the effects that these impacts can have on the dwellers and their community (also see Tapsell and Turnstall (2008) and Carroll, et al., (2009))

Source of intangible Flood Impact	Effect of impact on dweller or community	Reference
The...flooding and recovery process	'Some [dwellers] displaying signs of common mental disorders associated with experiencing a traumatic event'	Tapsell, et al., 2002

Evacuation from homes	[Seen as] 'stressful and several people had still not returned to their properties'	
Those who did not evacuate...	'...faced months of living in damp and dusty conditions...disruption to daily life was great'	
Rainfall after the event...'	'[Caused] anxiety...many had adjusted their behaviour [such as] monitoring river levels'	
Loss of irreplaceable items and memorabilia	Seen as the most important losses (including *economic* losses)	
Strong feelings were expressed of having to fight for any advice and assistance in the recovery process	'The effects of this had significant implications for peoples' health and well-being'	
'Homes...'	'no longer have the same meaning for people as they did before the flooding'	
Non contact from any professional body after flood	Feeling of abandonment, isolation and exclusion	Newman, et al., 2008

Table 2.1 Examples of sources of intangible impacts and their effects of dwellers

The next section outlines the theoretical perspective underpinning the specific circumstances that must occur for an urban catchment to experience *impact* from flooding based on the concepts of vulnerability, hazard, exposure and adaptive capacity.

2.2.5. Vulnerability and adaptive capacity

Outlined at the beginning of this literature review are the problems associated with provision of structural protection for urban catchments to prevent flooding. The implication therefore is that on occasion, exceedance[9] water (Ciria 2006) will enter urban catchments. For a urban catchment to experience *impact* it must be *exposed* and *vulnerable* to that *hazard* (exceedance water). Therefore reduction of Flood Impact in urban catchments is contingent on removing (or reducing) at least one of these components. As outlined above, difficulties in provision of structural protection dictate that *exposure* and *hazard* are fixed quantities. Therefore the only way to reduce the impact is by managing *vulnerability* (Cardona 2004). The following introduces the *general* concept of vulnerability to exposure to hazard. Cardona (2004) defines vulnerability as:

'an internal risk factor of the...system[10] that is exposed to a hazard and corresponds to its intrinsic predisposition to be affected, or to be susceptible to damage. In other words, vulnerability represents the physical, economic, political or social susceptibility or predisposition of a community to damage in the case of a destabilising phenomenon of

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[9] Ciria (2006) defines exceedance as 'periods...when the rate of surface runoff exceeds the drainage system inlet capacity, when the pipe system becomes overloaded, or when the outfall becomes restricted due to flood levels in the receiving water.'

[10] Reference to the word *system* in these definitions refers to that which can be affected by a hazard. For example a system may be a village exposed to a hazard, therefore any component of that village (system) that is vulnerable will be affected by the hazard.

natural or anthropogenic origin...and...could thus be understood as the reduced capacity to
'adapt to', or adjust to, a determined set of environmental circumstances'

From this perspective, vulnerability describes the 'state' of a system and not the subject or system itself. Hilhorst and Bankoff (2004) further this by arguing that vulnerability is not a property of social groups or individuals, it is a result of the effects of complex social relations and processes.

Smit and Wandel (2006) comment: *'consistent throughout the literature is the notion that the vulnerability of a system (at any scale) is reflective of (or a function of) the exposure and sensitivity of that system to hazardous conditions and the ability or capacity or resilience of the system to cope, adapt or recover from the effects of these conditions'.*

Berkes F (2007): *'...vulnerability is registered not by exposure to hazards alone; it also resides in the resilience of the system experiencing the hazard'*

Adger N (2006): *'Vulnerability is the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt'*

Gallopin G (2006): *'...vulnerability is a function of the system's sensitivity and capacity of response, and the transformation suffered by the system is a function of its vulnerability, the properties of the perturbation, and the exposure of the system to the perturbation'*

These perspectives indicate that vulnerability is a *state* of a system rather than a *permanent property* of that system, and that it is influenced by its capacity to *adapt* or *cope*. This is of relevance here since it implies that vulnerability can be *influenced*. From a review of the literature, the most commonly used term to describe this ability to adapt or cope is *resilience*[11] (for example see Carpenter, et al., 2001, Cumming, et al., 2005, Adger 2006, Berkes 2007). The theoretical perspective of resilience is presented next as a *measure* of the ability of a system to adapt or cope and thus influence its vulnerability.

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[11] *Robustness* is also included in the cited literature as being applicable to reducing vulnerability. It is not relevant to this literature review since the term implies *protection* from *exposure* to a *hazard*, equivalent to structural defences, which as outlined are often not appropriate for urban catchments under the current FRM.

2.2.6. Resilience theory

Resilience as a concept originated in the natural sciences, where it was used to describe the capacity of a material or system to return to its original state (Gordon 1978). The field of physics adapted this definition to include the *rate* at which this process occurred, and it is this adaptation that caused the term to be seen as usefully transferable to other disciplines (Norris, et al., 2008).

Holling (1973) was arguably the first (Carpenter, et al., (2005), Manyena, S. B. (2006), Brand and Jax (2007) and others), to adapt application of the term to describe the behaviour of ecosystems in the context of their response to external change. From this original descriptive basis, the term resilience has been *'frequently redefined and extended by heuristic, metaphorical, or normative dimensions'* (Brand and Jax 2007).

Table 2.2 displays an adaptation of Norris, et al's., (2008) representative definitions of resilience to provide a representation of the level of interest in the concept of resilience and in addition, the level of analysis at which it has been applied.

Reference	Level of analysis	Definition
Godschalk, (2003)	City	A sustainable network of physical systems and human communities, capable of managing extreme events; during disaster, both must be able to survive and function under extreme stress
Brown D and Kulig J (1996)	Community	The ability to recover from or adjust easily to misfortune or sustained life stress
Sonn C and Fisher A (1998)	Community	The process through which mediating structures (schools, peer groups, family) and activity settings moderate the impact of oppressive systems
Paton, et al., (2001)	Community	The capability to bounce back and to use physical and economic resources effectively to aid recovery following exposure to hazards
Ganor M and Ben-Levy Y (2003)	Community	The ability of individuals and communities to deal with a state of continuous, long term stress; the ability to find unknown inner strengths and resources in order to cope effectively; the measure of adaptation and flexibility
Ahmed, et al., (2004)	Community	The development of material, physical, socio-political, socio-cultural, and psychological resources that promote safety of residents and buffer adversity
Kimhi S and Shamai M (2004)	Community	Individuals' sense of the ability of their own community to deal successfully with the ongoing political violence
Coles E and Buckle P (2004)	Community	A community's capacities, skills, and knowledge that allow it to participate fully in recovery from disasters
Pfefferbaum, et al., (2005)	Community	The ability of community members to take meaningful, deliberate, collective action to remedy the impact of a problem, including the ability to interpret the environment, intervene, and move on
Scottish Govt. (2003)	*Community*	*[being] 'able to recover quickly and easily'*
Holling C (1973)	Ecological system	The persistence of relationships within a system; a measure of the ability of systems to absorb changes of state variables, driving variables, and parameters, and still persist
Waller M (2001)	Ecological system	Positive adaptation in response to adversity; it is not the absence of vulnerability, not an inherent characteristic, and not static

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Klein, et al., (2003)	Ecological system	The ability of a system that has undergone stress to recover and return to its original state; more precisely (i) the amount of disturbance a system can absorb and still remain within the same state or domain of attraction and (ii) the degree to which the system is capable of self-organization (see also Carpenter, et al., 2001)
Longstaff P (2005)	Ecological system	The ability by an individual, group, or organization to continue its existence (or remain more or less stable) in the face of some sort of surprise....Resilience is found in systems that are highly adaptable (not locked into specific strategies) and have diverse resources
Resilience Alliance, (2008)	Ecological system	The ability to absorb disturbances, to be changed and then to re-organise and still have the same identity (retain the same basic structure and ways of functioning). It includes the ability to learn from the disturbance. (Accessed on10th October 2008 http://www.resalliance.org/564.php)
Manyena S B (2006)	*Ecological system*	*the amount of deformation of disturbance a system can withstand before it loses a capacity to bounce back*
Schlüter, M. (2007)	*Ecological system*	*new approaches to ecosystem and resource management that try to enhance a system's capacity to cope with change*
Butler, et al., (2007)	Individual	Good adaptation under extenuating circumstances; a recovery trajectory that returns to baseline functioning following a challenge
Masten, et al., (1990)	Individual	The process of, capacity for, or outcome of successful adaptation despite challenging or threatening circumstances
Egeland, et al., (1993)	Individual	The capacity for successful adaptation, positive functioning, or competence...despite high-risk status, chronic stress, or following prolonged or severe trauma
Gordon J (1978)	Physical	The ability to store strain energy and deflect elastically under a load without breaking or being deformed
Bodin P and Wilman B (2004)	Physical	The speed with which a system returns to equilibrium after displacement, irrespective of how many oscillations are required
Adger N W (2000)	Social	The ability of communities to withstand external shocks to their social infrastructure
Bruneau, et al., (2003)	Social	The ability of social units to mitigate hazards, contain the effects of disasters when they occur, and carry out recovery activities in ways that minimize social disruption and mitigate the effects of future earthquakes
Carpenter, et al., (2001)	*Socio-ecological system*	*Resilience is the magnitude of a disturbance that can be tolerated before a socio-ecological system moves to a different region of state space controlled by a different set of processes*
Walker, et al., (2006)	*Socio-ecological system*	*Resilience is the capacity of a system to experience shocks while retaining essentially the same function, structure, feedbacks and therefore identity*
Cumming, et al., (2005)	*Socio-ecological system*	*We equate resilience with the ability of a system to maintain its' identity, where system identity is defined as a property of key components and relationships (networks) and their continuity through space and time. Innovation and memory are also fundamental to our understanding identity and resilience*
Adger, et al., (2005)	*Socio-ecological system*	*The capacity of linked social-ecological systems to absorb recurrent disturbances such as hurricanes or floods so as they retain essential structures, processes and feedbacks. Resilience also reflects the degree to which a complex adaptive system is capable of self organising*
Walker, et al., (2002)	*Socio-ecological system*	*Resilience, therefore, is the potential of a system to remain in a particular configuration and to maintain its feedbacks and functions, and involves the ability of the system to reorganize following disturbance driven change.*

Table 2.2 Representative definitions of resilience (adapted from Norris, et al., (2008)

The interest the term has created across scientific disciplines and 'between science and policy' (Brand and Jax 2007) is well documented (Bruneau, et al., (2003), Cumming, et al., (2005), Anderies, et al., (2006), Janssen (2007) and others). Practical applications of resilience are problematic however, due to the original meaning of the term (ecological, descriptive) being diluted, and used ambiguously and widely (Brand and Jax 2007).

2.2.7. Resilient communities: a way to manage vulnerability?

This section presents the theoretical perspective adopted in this PhD upon which the theory of resilience is *operationalised* into a set of *adaptive capacities* upon which the aim of this research, the conceptual framework is based. The theory of *community resilience* (Norris, et al., 2008) forms the basis of this theoretical perspective and is outlined below. The theory has been adapted by other theoretical perspectives as indicated in the text in order for appropriate application to this research.

There is much research to date which indicates the intangible impacts of disasters on communities are managed adequately by those communities themselves, (see Pandey and Okazaki (2005), Rahman, M.S. (2003) Holland and VanArsdale (1986) Rubin, C. B. (1985) and others). Bruneau, et al., (2003), Godschalk (2003), Landau (2004), Murphy (2007), Norris, et al., (2007), Walsh (2007) and others term this 'community capacity to manage', *community resilience.*

Norris, et al., (2008) define community as:

'not always, but typically, a community is an entity that has geographic boundaries and a shared fate...composed of built, natural, social and economic environments that influence one another in complex ways'

Within the context of disaster management, Norris, et al., (2008) distinguish between the resilience which may be found within an individual, and a resilient community. Individual resilience then may be defined as:

'a process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance' (ibid)

...and community resilience defined as:

'a process linking a set of networked *adaptive capacities to a positive trajectory of functioning and adaptation in constituent populations after a disturbance'* (ibid, emphasis added)

The key term within these definitions is 'adaptive capacities'. For resilience at either level (individual or community) adaptive capacities must be present (Norris, et al., 2008) and are defined as:

'resources with dynamic attributes, i.e., resources that are robust, redundant or rapidly accessible'

Furthermore, Norris, et al., (2008) argue that this adaptive capacity is manifested in 'population wellness', defined as:

'high and non-disparate levels of mental and behavioural health, functioning and quality of life'

Therefore, a resilient community is one that has adaptive capacities composed of *dynamic resources*, defined by Norris, et al., (2008) as *Economic, Social Capital, Information and Communication* and *Community Competence,* and that the community is 'well' enough that these resources may be mobilised when necessary.

Along with the adaptive capacities and population wellness, Godchalk (2003) and Pfefferbaum, et al., (2005) argue that a resilient community must have a 'physical resource base' comprising of land, raw materials, physical capital, accessible housing, health services, schools and employment opportunities.

While this research focuses on urban catchments only, the literary perspective on *city* resilience is also relevant. Godschalk (2003) argues that a resilient city (in the context of urban hazard mitigation) is a combination of two factors; *human communities,* comprising the social and institutional components of the city, and, *physical systems,* comprising 'built roads, buildings, infrastructure, communications, energy facilities, waterways, soils, topography, geology and other natural systems'.

Mileti (1999; cited by Godschalk 2003) summarise 'city resilience' (within the context of urban hazard mitigation) as:

'[the ability] *to withstand an extreme natural event without suffering devastating losses, damage, diminished productivity, or quality of life and without a large amount of assistance from outside the community*'.

2.2.8. Community adaptive capacities

This section outlines *potential* adaptive capacities as found in the literature, which are available to communities that will enable that community to act resiliently under flood conditions.

Economic resources within a community have an impact on community resilience, not only from the perspective of the total volume of resources, but upon their diversity of distribution. Adger (2000) illustrates that dependence on a narrow range of resources within a community can increase variance in income thus decreasing *social* resilience. An example is provided by Cutter, et al., (2006) who described a community devastated by hurricane Katrina in 2005 since its economy was purely dependant on an all but wiped-out shrimping industry.

Past disaster research has also indicated that those of lower social-economic status (SES) are more likely to suffer adverse consequences than those of a higher SES, since they are less likely able to mobilise any resources they may have. While one may argue that under such circumstances poorer communities may receive support under the banner of the '*rule of relative needs*' (Norris 2008), more often support follows the '*rule of relative advantage*' (ibid), since '*ones embeddedness in the community, political connections, and social class*' (Kaniasty and Norris 1995) determine the availability and accessibility of resources.

Norris, et al., (2008) argue that *social capital*; '*something that is generally functional to social systems*' (Kadushin 2004) also plays a key role in community resilience. Social capital is described as the way in which 'individuals invest, access and use resources embedded in social networks to gain returns (Lin 2001). Social capital is reliant on network structures and linkages in the community, community bonds, roots and commitments (Norris, et al., 2008).

Information and communication are also key to resilient communities. 'Adaptive performance' (Comfort 2005), the measurement of the success of the adaptation of resources to suit a situation, is reliant on information (Norris, et al., 2008) including warnings, guidance and technical information. Communication refers to the creation of common meanings and

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understandings and the provision of opportunities for members to articulate needs, views and attitudes (Norris, et al., 2008).

Community competence is a measure of the ability to acquire trusted and accurate information, to reflect on that information critically and to solve emerging problems (Longstaff 2005). Longstaff sees this as more important to community resilience than having a 'detailed security plan that rarely foresees all contingencies' (ibid) or put another way, to *'plan for not having a plan'* (Norris, et al., 2008). 'Community competence arises from collective action and decision making and capacities that may stem from collective efficacy and empowerment' (Norris, et al., 2008).

2.2.9. Mobilising 'adaptive capacities'

A system that has resources or tools that enable it to cope with adversity is not an unusual concept, however, what is unusual about *community resilience* resources is that mobilisation of these resources, and hence subsequent functioning upon exposure to a hazard is dependant almost solely on population *wellness* (Norris, et al., 2008); defined as 'high and non-disparate levels of mental and behavioural health, functioning, and quality of life'. Or put another way, without community *wellness*, mobilisation of adaptive capacities which enable the community to *cope* is reduced, thus reducing the community's ability to cope.

This psychological impact can be illustrated by the following research carried out by Lin, et al., (2008). Severe flooding and landslides in Taiwan in 2004 prompted a survey by the National Science and Technology Centre for Disaster Reduction (NCDR 2006). This survey comprised data gathered from 2,914 households, of which 751 households were directly affected by a flood or landslide and the remainder were not. Results of this study concluded: (1) The victims (the 751) were less likely to adopt 'risk mitigation measures' than those not affected, even though the victims perceive greater risk, worry more (about flood and/ or landslide) and pay more attention to hazard information than non-victims: (2) Psychological vulnerability is a negative predictor of the likelihood of adoption of mitigation measures, i.e., the higher the psychological vulnerability, the less likely the adoption of mitigation measures becomes: (3) Psychological variables are more likely to predict mitigation behaviour than socio-economic status, i.e., understanding the psychological variables is more likely to lead to an understanding of the type of response behaviour adopted by victims.

Drawing on these components of community resilience, Norris, et al., (2008) developed a model of community resilience to hazards based on Dohrenwand's (1978) model of psychosocial stress, and is shown in figure 2.2.
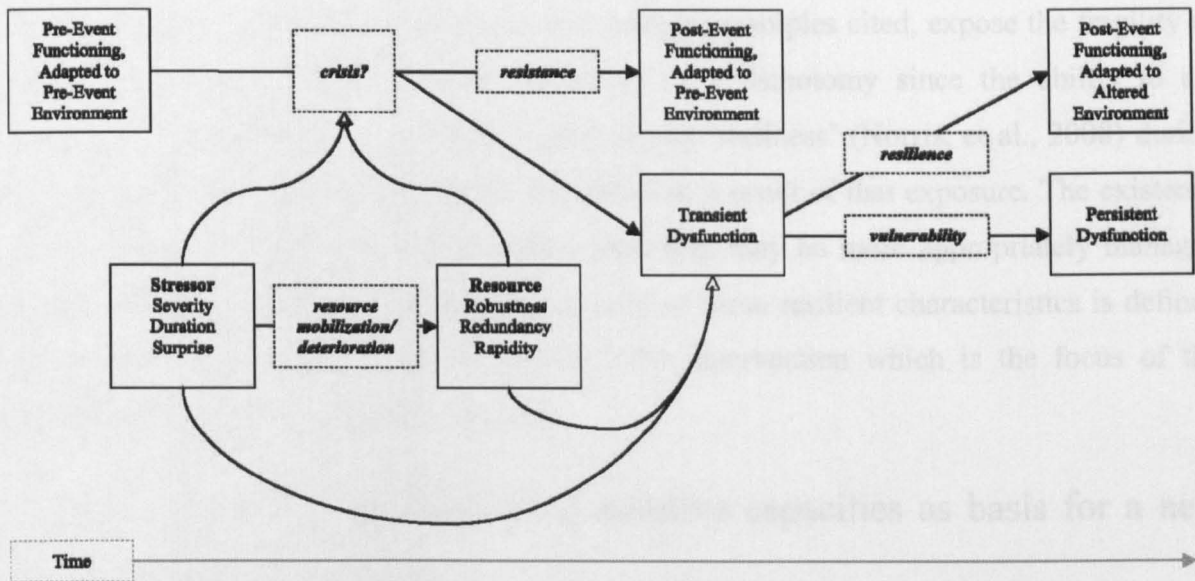
Figure 2-2 model of community resilience (Norris, et al., 2008 adapted from Dohrenwand 1978)

Essentially this model illustrates that the response of community exposure to a hazard is dependant on the dynamic resources available to that community and the use of these dynamic resources to fulfil this function is called *resource mobilisation*. Successful resource mobilisation can lead to a resilient outcome, or adequate coping. Unsuccessful resource mobilisation essentially means that the tools available to the community to cope with the hazard cannot be used.

The primary reason for this inability to mobilise these resources is a lack of 'wellness' (defined above). The lack of wellness has a 'double negative' effect as not only does it reduce the ability of the community to cope with the effects of the hazard, it can actually lead to the community *perceiving* itself as more vulnerable than it actually is, thus in certain circumstances unnecessarily creating a disaster from a hazard, as was found by Kimhi and Shamai (2004):

In a study of perceptions of community resilience across four community's proximity to the Israel-Lebanon border (therefore proximity to the 'threat of political violence' (ibid)), those communities that were exposed to the highest threat for the longest time were found to perceive their community as having the lowest resilience (Kimhi and Shamai 2004). Hobfoll (2006) explains this reaction through 'Conservation of Resources' (COR) theory, in which the

basic premise is that individuals 'strive to obtain, retain, protect and foster those things that they value', termed 'resources', and that stress occurs when these resources are threatened or lost.

This, perhaps non-intuitive response, and the previous examples cited, expose the fragility of community resilience. This leads to something of a dichotomy since the ability to act *resiliently* is dependant on a community maintaining 'wellness' (Norris, et al., 2008) during exposure to hazard, but that wellness is threatened as a result of that exposure. The existence of this dichotomy implies that the adaptive capacities may be more appropriately managed *outside* of that community. External management of these resilient characteristics is defined here as *intervention*, and it is this nature of this intervention which is the focus of the remaining section of this literature review.

2.3. Part 2 - Application of adaptive capacities as basis for a new conceptual approach

The previous section introduced the theory of *community resilience* as a response to reduce the impact of exposure to a *non-specific hazard* on that community. Also introduced was the dichotomy arising from the potentially reduced ability of that community to *act* resiliently during exposure to the non-specific hazard. Finally introduced was the notion of intervention by a third party (with respect to the community) in order to address this dichotomy and maintain the characteristics of resilience (adaptive capacities) during that exposure. This section explores the literary perspective on the nature of this intervention with respect to mobilising the adaptive capacities to reduce impact of exposure to the *specific* hazard of *flooding* in urban catchments to provide a basis on which to found the program of empirical research. Upon presentation of the theoretical basis of the mode of intervention, the method by which that intervention may be manifest is outlined.

As outlined in table 3.1, the Newman, et al., (2008) case study contributed significantly to this PhD research. Any references made to this case study throughout the remainder of this literature review are to be considered aspects of the PhD research itself. As such, reference to the Newman, et al., (2008) study is not intended as reference to external literature, more to the case study itself and how it relates to the overall PhD research.

Table 2.3 shows the progression of the theory outlined in Part 1 of this chapter toward development of the conceptual basis for the non-structural approach: the aim of this research.

Table 2.3 has been created by adapting the literature outlined in the previous section and on empirical evidence (see Newman, et al., 2008). Table 2.3 indicates the *adaptive capacities* of a flood-resilient community within a urban catchment; *how* the adaptive capacities may reduce Flood Impact in a urban catchment, and; the *nature of intervention* by which the adaptive capacity may be mobilised in order to reduce impact.

Hypothesised adaptive capacities of a flood-resilient community	Reference	How each adaptive capacity can reduce Flood Impact (hypothesised)	Reference	Nature of intervention (hypothesised)	Reference
Access to and availability of information - including warnings, guidance and technical information	Norris, et al., 2007 (adapted). See also Newman, et al., (2008), Longstaff (2004), Working group on governance dilemmas (2004), Draper, et al., (2006), Landau and Saul (2006), Tierny, et al., (2006)	Intangible impact: dwellers desire an understanding equivalent *technical* understanding. They are 'happy to take action, but do not know what to do'. Tangible impact: providing warnings are accurate, tangible impact can be reduced	*(Newman, et al., 2008)*	Formalising stakeholder communications, stakeholder Capacity Building	*(Newman, et al., 2008)*
Communication (*including appropriate methods of*) -creation of common meanings, provision of opportunities of members to articulate needs, views and attitudes		Intangible impact: dwellers feel isolated and excluded if not contacted by professionals. Lack of communication also causes resentment toward professionals. Tangible Impact: Benefit derived from endowing dweller with *equivalent professional roles* provides cost effective resource for professionals, and intangible impact reduced through the act of dweller inclusion	*(Newman, et al., 2008)*	Formalising communications, Capacity Building, Endowing dwellers with *roles*	*(Newman, et al., 2008)*
A *level of* community competence (ability to acquire trusted and accurate information, reflect on that information, and solve problems)	Longstaff 2005 (adapted), and Norris, et al., (2008). See also Cottrell (1976)	Intangible impact: by being able to 'define' the situation, access information and act in the most appropriate manner dwellers 'feel' as though they regain some control	*(Newman, et a.,l 2008)*	Formalising communications, Capacity Building	*(Newman, et al., 2008)*
A *level of* social capital – the way individuals access and use resources embedded in social networks to gain returns	Norris, et al., (2008) (adapted). See also Gilespie and Murty (1994), Longstaff (2004), Newman, et al., (2008), Perkins, et al., (2002), Goodman, et al., (1998), Tartaglia (2006), Wandersman (2000), Kadushin (2004), Lin (2001)	Intangible impact: belonging to a 'pressure group' will provide a method of 'being heard'	*(Newman, et al., 2008)*	Formalising communications, Capacity Building	*(Newman, et al., 2008)*
A *diverse* economic resource *base* – diversity in sources of economic gain imply redundancy, high levels of economic resource generally implies less adverse economic consequence from hazard	Adger 2000 (adapted). See also Norris, et al., (2008), Cutter, et al., (2006), Kaniasty and Norris (1995), Godschalk (2003), Adger 2000	This topic is not included within the remit of this research as it is not relevant to the research enquiry since influencing the economic status of a urban catchment is not feasible.			

Table 2.3 Hypothesised adaptive capacities of a resilient community, and how these capacities reduce Flood Impact

The column entitled *nature of intervention* in Table 2.3 is the first iteration of the conceptual basis for the framework and comprises three primary components:

- Stakeholder Capacity Building;
- Endowing dwellers with equivalent professional *roles*;
- Formalising stakeholder communications.

The focus of the remainder of this literature review is toward obtaining the state-of-the-art theoretical perspective on these components in order that they can be developed into a conceptual framework during the remainder of this PhD research.

Since there is no existing theoretical perspective integrating the above topics in the context of this research, each topic is explored individually in respect of relevant and available theory. These individual perspectives are then summarised at the end of the section.

2.3.1. Toward a socio-technical systems perspective: flooding in urban catchments

This section outlines the socio-technical perspective adopted in this research. The aim of this research is a conceptual framework for a non-structural approach to reduce Flood Impact in urban catchments. The definition of a non-structural approach is repeated below for ease of reference.

'*A non-structural approach is a* response to urban Flood Impact *reduction* that *may* not involve fixed or permanent facilities *where positive contribution to the reduction of Flood Impact occurs* through *a process of* influencing behaviour, *usually through building capacity in all stakeholders through active learning and appropriate and effective engagement between stakeholders.*' (Taylor and Wong (2002) adapted)

As indicated by this definition, the non-structural approach is contingent on behaviour change of the stakeholders. A stakeholder is defined by Freeman R E (1984) as '*any group or individual who can affect or is affected by the achievement of the organisation's objectives*'. This definition is adapted to suit the purposes of this research as follows:

- *Organisation* is defined as the socio-technical research context, the urban catchment,

- *Any group or individual who is affected* is/ are defined as individual(s) who are exposed and vulnerable to flood hazard within the urban catchment and consequently suffer *impact*,

- *Any group or individual who affects* is/ are defined as individuals and/ or organisation(s) who are responsible for managing that *impact*,

- *Achievement of its objectives* is the *goal* of the output of this research thesis: reduction of Flood Impact within the urban catchment using the framework.

In concomitance with the Source-Pathway-Receptor (SPR) model those who are affected *by* Flood Impacts, *dwellers* are defined here as *receptor* stakeholders. Those who *affect* Flood Impact, professionals and the bodies they represent, are defined as *tactical* stakeholders. The term tactical is used in concomitance with the Scottish Government system of scaling responses to flood risk (Newman, et al., 2007b). These stakeholder definitions are adopted to allow a common terminology when referring to each group.

Finally then, integrating the conceptual basis of Flood Impact reduction (FIR), with the non-structural/ socio-technical research context and the perspective of stakeholder allows a conceptual basis upon which these elements can be integrated in order to introduce a *socio-technical systems* perspective. A *socio-technical* system comprises physical systems, organisational systems and social norms (Sharpe, et al., 2007). Furthermore it consists of the practices, procedures, protocols and framing, the language deemed acceptable and the broader contexts into which the people and technical processes are enmeshed. The term implies, for example, that not only is data important, but that the kinds of data that are important are decided through social, not merely technical means. A further implication of taking this view is that the notion of 'system' shifts away from that conventionally understood within engineering circles. Rather than meaning an abstraction of some kind, it implies a *situatedness* to the possibilities for action.

The concept of Capacity Building and its theoretical effect on stakeholder behaviour is explored in the next section. As introduced above, Capacity Building is the first of the three components which underpin the conceptual framework. Initially, the origins of the term are presented, followed by its application to England, including the most recent developments of use of

Capacity Building in flood management. Finally presented is the definition of Capacity Building that has been adopted for this research thesis.

2.3.2. Conceptual framework component 1: stakeholder Capacity Building

This section outlines the first conceptual component of the framework: stakeholder Capacity Building. The origins of Capacity Building are outlined, followed by examples of its real-world application. In addition difficulties with the theoretical basis of Capacity Building are presented as found in the literature. Then presented are the stakeholder specific capacity regimes adopted in this research and the theoretical basis supporting their adoption in this work. This section forms the theoretical basis from which to answer the second research question:

Research question 2: What is the evidence supporting the efficacy of building the capacity of *system* stakeholder groups?

Introduced below are some examples of Capacity Building, predominantly related to the water sector in developing countries. Following this short introduction is a discussion of more recent developments in Capacity Building related to English flood management.

Capacity Building was defined as a concept in Agenda 21 (Chapter 37, UNCED, 1992[13]). In 1991, UNDP and the International Institute for Hydraulic and Environmental Engineering organised the symposium 'A Strategy for Water Sector Capacity Building' in Delft, The Netherlands. They defined 'Capacity Building' as:

- the creation of an enabling environment with appropriate policy and legal frameworks,
- institutional development, including community participation,
- human resources development and strengthening of managerial systems.

Capacity Building is a long-term, continuing process, in which all stakeholders participate (ministries, local authorities, non-governmental organizations and water user groups, professional associations, academics and others). However, in the UNDP Briefing Paper, Capacity Building is much more than training and includes the following:

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[13] http://www.un.org/esa/dsd/agenda21/res_agenda21_37.shtml accessed 3rd September 2007

- **Human resource development:** the process of equipping individuals with the understanding, skills and access to information, knowledge and training that enables them to perform effectively.

- **Organisational development:** the elaboration of management structures, processes and procedures, not only within organisations but also the management of relationships between the different organisations and sectors (public, private and community).

- **Institutional and legal framework development:** making legal and regulatory changes to enable organisations, institutions and agencies at all levels and in all sectors to enhance their capacities. (ibid)

Capacity Building as an integral component of FRM in England (and the wider UK) is in it infancy due to the reasons outlined in section 2.3.3 below. There are however, a number of other on-going initiatives to further develop Capacity Building – invariably aimed at developing countries[14] the SWITCH[15] project being a notable example (see Lundy, et al., (2005), Moriarty, et al., (2005), Butterworth and Morris (2007), Smits, et al., (2007), Verhagen, et al., (2008), Butterworth, et al., (2008a), Butterworth, et al., (2008b)). In England the need to develop capacity in the widest sense is not generally appreciated. For example, the South East Climate Change Partnership (2005) when dealing with development planning, mentions only structural measures in this context and in a later document on climate change and sustainable communities (South East Climate Change Partnership, 2006) does not mention 'capacity' at all.

A Recent Defra publication (Defra 2010) presents Capacity Building as a 'tool' for local authorities to help them deliver their new roles as part of the Flood Risk Management Act (2010) the Flood Risk Regulations (2009) and other recommendations as outlined in the Pitt Review (2008). In response to Pitt's recommendations the government have committed £1m to support the development of local authority Capacity Building (Defra 2010). The report focuses predominantly on recommendations regarding *how* the Capacity Building programme can be integrated into local authorities in order to deliver built capacity.

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[14] For example, Cap-Net is the Capacity Building network for integrated water resources management (http://www.cap-net.org/) accessed 5th September 2007
[15] http://www.switchurbanwater.eu/index.php accessed 14th December 2010

Few ((2006) cited by Werrity (2007)) indicates that '*response to flood risk that is rooted in public inclusion and local scale Capacity Building is a key element in long term risk reduction*'.

Shaffer (2010) indicates that '*Capacity Building...includes the process of enabling individuals and organisations to understand the problems, access information and develop the skills to help them perform more effectively...It also includes approaches to improve the interaction between individuals and organisations, the development and support of management frameworks. This should assist with the management of relationships between different organisations and sectors (public, private and the community), and include the development of champions to deliver progress*'.

2.3.3. Capacity Building: theoretical difficulties

This section explores the literary perspective regarding the theoretical basis for the efficacy of Capacity Building in this context in order to found development of Capacity Building regimes for the stakeholder groups identified in the section above. It is hypothesised that lack of a theoretical basis to the approach will lead to development of inappropriate Capacity Building regimes which will ultimately be rejected by stakeholders. Therefore it is necessary to have the most up-to-date understanding of this theoretical basis in order to meet this challenge. Capacity Building, in the context of this research is defined below based on the above literature and empirical evidence gained during the Newman, et al., (2008) study:

Capacity Building is a means of adjusting the awareness of an individual or group of individuals toward greater perceptive clarity of their stake in FIR order that the individual(s) can make informed decisions based on the heightened awareness of context and limitations therein toward appropriate contribution to FIR in a system-wide perspective.

Following on from this definition, what may be described as the *ultimate* state that stakeholders can reach under Capacity Building is defined here as *built capacity*. Therefore reference to receptor or tactical stakeholders with *built capacity* implies that those stakeholders are able to make decisions and act (if necessary) based on an appropriate understanding of the context in which they exist (as professional or dweller) and their roles (discussed subsequently) within that context with respect to reduction of Flood Impact.

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The definition of Capacity Building was partly derived from a finding obtained during a dweller forum (see results chapter, table 4.6). One of the forum participants expressed the desire for a 'large storage tank' to 'take away' flood water to prevent her home from flooding. When the difficulties of implementing that type of 'structural' solution were outlined *appropriately*[16] (including cost, hydrological considerations, construction problems etc) the participant became aware that such a solution was *in*appropriate.

Penning de Vries F T W (2007) also alludes to this potential capability of Capacity Building in the context of 'multiple use [water] systems' in developing countries indicating that Capacity Building is necessary to allow users to identify their *own* optimal multiple use water solutions.

The examples presented below outline some recent English activities which incorporate Capacity Building to aid achievement of the objective of that particular activity. What is generally found is the efficacy of Capacity Building with respect to achieving these objectives, however as indicated, the theoretical basis on which the Capacity Building activities are founded is absent. The examples are both flood related and non-flood related.

In April 2003 the office of the deputy prime minister (ODPM) and Local Government Organisation (LGO) established the Capacity Building programme (CBP), a three year initiative to support improvement in local government. The objective of the project was '*to enhance and develop councils' confidence, leadership and skills to drive forward improvement...developing their capacity to learn, innovate and share knowledge and expertise about what works and how*'[17]. The overall final report (CLG 2008a) indicated successes from the project including increased skill levels, improved program management and improved management performance. Part of the CBP initiative was the Beacon Scheme, set up in 1999 to share best practice in service · delivery across local government[18]. Findings of the scheme were published in a recent report (CLG 2008b) and concluded the following with regard to the theoretical perspective of Capacity Building: '[there is a need] *for a clear framework that explains how individual and organisational learning leads to innovation, organisational change and improvement in public services'*. Hartley (2005) also indicates '*research is needed to illuminate and explain the*

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[16] Using 'non-patronising' language and *descriptive engineering* techniques (see results chapter, table 4.7)
[17] http://www.idea.gov.uk/idk/core/page.do?pageId=1092290 accessed 15th December 2010
[18] http://www.localinnovation.idea.gov.uk/idk/core/page.do?pageId=17570098 accessed 15th December 2010

processes which support or which undermine innovation. Rashman and Radnor (2005) also compliment this perspective '*there is a...need to develop models that can inform...Capacity Building programmes to deliver local service improvements which are built on a theoretical framework...so that sustainable long-term value can be gained for all stakeholders*'.

There is no reference to the theoretical basis upon which any of the Capacity Building activities are based in any of Few (2006), Pitt (2008), Defra (2010) or Shaffer (2010) publications.

2.3.4. Proposed Capacity Building regimes

Outlined above are difficulties facing Capacity Building from the perspective of provision of a theoretical base with which to found Capacity Building approaches and the requirement for knowledge regarding such a theoretical basis to enable transferability to develop Capacity Building regimes for the stakeholders of FIM. In addition, the definition of Capacity Building adopted for this research was outlined. Introduced next are Capacity Building approaches hypothesised as appropriate for each stakeholder group based on the recent research activities and literature.

Two platforms that currently exist within England and which are hypothesised as appropriate as Capacity Building regimes are *Learning Alliances* (tactical stakeholders) and *Flood Action Groups* (receptor stakeholders). These two platforms are relatively new phenomena and have emerged as effect of flooding as opposed to being purposefully developed based on a theoretical framework. Nonetheless, a theoretical basis for each of these two platforms can be identified, and as such strengthen the robustness of each platform retrospectively. Each platform is presented here from the theoretical perspective, and then from the perspective of current application in England.

2.3.4.1. Learning Alliances (LeA) a theoretical perspective

Although the realisation of Learning Alliances as an approach to water management may appear to be relatively new, its origins may be traced back to discourses of social capital and collective action underpinning community based approaches to the delivery of water and sanitation services as well as irrigation schemes (Kähkönen, 1999). Cooperation, networks, mutual trust and associations among users and stakeholders were seen as key elements in the successful implementation and delivery of projects (Ostrom, 1992), noting that those accustomed to working

together and sharing social norms made collective action easier (Kähkönen, 1999). In the review of this social capital literature, Kähkönen identified the constituent components of social capital in irrigation management, rural drinking water delivery and urban sanitation; some of which related to information, knowledge, coordination, behaviour and communication processes. Whilst recognising that the existence of social capital had a positive effect this earlier literature was less engaged in how such capital could be fostered.

The International Center for Tropical Agriculture (CIAT) adopted the ideas of social capital, reframing it under the title of Learning Alliances. Learning Alliances were seen as a way of overcoming the limitations associated with moving from research to development outcomes (Pachico and Fujisaka, 2004) and to promote a greater interaction between researchers and farmers (Lundy, 2004). The emphasis though was to feed research outputs into the activities of international development agencies and foster long-term, collaborative inter-organisational relationships. This would enable the scaling up and out of the outcomes of agricultural research so that they were shared, adapted, used and innovated upon (ibid). By establishing positive relationships, processes of institutional learning and change would be improved and clear links between learning and action established (Solomon and Chowdhury, 2002). So through Learning Alliances innovations arising out of research would be replicated by partners to new sites (scaling out) as well as expanding upon their area of coverage (scaling up) (Pachico and Fujisaka, 2004).

Out of this work the idea of Learning Alliances became incorporated into a number of development projects, e.g. Post Harvest Innovation Learning Alliance (PHILA) (Morris, et al., 2006), Wastewater Agriculture and Sanitation for Poverty Alleviation (WASPA) (Smits and Verhagen, 2006), Learning for Practice and Policy on Household and School Sanitation & Hygiene (LeaPPS Uganda) and Euro-Med Participatory Water Resource Scenarios (EMPOWERS), see also Moriarty, et al., (2005) pp21-22. Coming out of these programmes the foundations and constituents of Learning Alliances have been gradually broadened to include aspects such as collaborative research initiatives, action-reflection and influencing other key players outside of the alliances.

In the field of urban water management the SWITCH (sustainable water management improves tomorrow's cities' health), project (Moriarty, et al., 2005) adopted a LeA based approach for scaling up innovation especially as a means to support stakeholder-led innovations through a

focus on processes. One of the features of SWITCH was the recognition of the need for *intervention* in order to overcome barriers to interaction and communication and to enable shared learning. In this respect there is a more explicit link with action research, Capacity Building and multi-stakeholder platforms than in previous examples of LeA as well as recognition of the failings of earlier work. It also recognised that there have to be links between policy, legislation and behaviour; a sympathy to empowering people and an acceptance of bottom up and adaptive planning and management. In other words here LeA should be more than just research and the research community drivers, but later work by Butterworth, et al., (2008 p5) suggests that LeAs in SWITCH were promoted as 'means to achieve an improved research process'. Whether the research process means improving how multiple stakeholders in the innovation system work (doing things differently) and leads to interventions having greater impact implies an increase in social capital is not clear. Butterworth, et al., (2008) appear to suggest that SWITCH ended up being more about new research rather than creating a learning sector (p10).

A Learning Alliance is defined in the SWITCH project as 'a group of individuals or organisations with a shared interest in innovation and the scaling-up of innovation, in a topic of mutual interest' (Batchelor and Butterworth, 2008). Alliances are formed by individuals and organisations with a common purpose. Membership of alliances is voluntary. In order to sustain the membership level, therefore, it is necessary to ensure that the needs and expectations of each and every member are satisfied. Within the SWITCH project, the limited financial resources and great demands on the time of those participating in the alliance meant it was essential that each member see that the benefits arising from membership outweigh the time and cost of their engagement.

It may be argued that the apparent emphasis in the above examples of LeA on research and researchers and on innovation as 'doing things differently' in order to scale out and up, inadvertently privileges their role over that of other stakeholders. Whilst there is some recognition of the need to create a safe environment for learning the importance of creating such spaces has not been explicitly recognised. Effective LeAs need to recognise that in addition to the conditions already discussed they also need to address asymmetries in power relations and to give respect and legitimacy for all opinions (Chaitin, 2003). Thus different and new ideas and suggestions can be considered and the importance of seeking mutual solutions stressed. In the light of this it is apparent that there is a need to place the role of communication in LeA and its contribution to social capital within a wider construct.

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While the concept of a LeA is a simple one, application of a theoretical social perspective allows a deeper understanding of the benefits in terms of provision of context appropriate solutions. To this end, the investigation in situated within the context of Jürgen Habermas' analysis of 'knowledge constitutive interests' (1972) and his subsequent 'Theory of Communicative Action' (1987). Ideally the aim of discussion is to reach a consensus based on an acceptance of true facts, informing the best course of action arrived at on the basis of good reasoning. The conditions necessary for achieving this require a balance between structural or 'systemic' thinking which is technical-rational and communicative reason. However, Habermas has argued that effective communication is systematically distorted by prevailing power relationships, which treat problems that are of a moral and social nature rather as being technical ones. Privileging systemic rationalisation gives rise to ever more bureaucracy and classification of social problems as technical problems and an associated growth of technocratic management and expert cultures, masking a system of social control which implicitly excludes certain sections of society or stakeholders. Expert cultures are frequently by their nature disconnected with the realities of everyday life and where interests are what determine what counts as knowledge. The characterisation of problems as being of a technical nature – with all that this implies makes them vulnerable to crises of legitimacy. For Habermas the key to improving the quality of deliberation is to create forms of 'discursive' democracy[19] that rebalances the relationships, removes inequality or constraint and re-establishes communicative reasoning. Technical rationalisation can be challenged through co-operative action based upon deliberation and argumentation (Habermas 1987). In Habermas' view communication with others offers opportunities for rational criticism and coherence through discussion. From a perspective of communicative ethics, it is arguable that there exists an obligation to debate with others in order to invite such criticism and hence access a greater variety of information with which to make our decisions, thus it can be perceived as a tool which can help transform our environment (Cashman, unpublished, 2004). Thus the creation of 'safe spaces' for communication becomes a necessary condition for rational and open communication, as envisaged by Habermas. The resultant outcomes are thus, by definition, pragmatic. But as noted by Moriarty, et al., (2005) this takes time, resources and champions so that not only are the conditions created but that the barriers to communication can be broken down and learning through action and cooperation can occur. It also follows that just

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[19] A communicatively rational democracy that stresses the importance of active citizenship and public discourse (Dryzek, et al., 1995)

because there is an intention to adopt a LeA based approach this does not in itself guarantee success rather it highlights the myriad of difficulties that need to be addressed.

Cashman (unpublished, 2004) argues that the theoretical perspective of Habermas can be translated directly to the idealised concept of the LeA through comparison to a radically democratic society. In such a society each individual will have access to the tools of reason and the opportunity to contribute to the argument and be considered in the final verdict. This is the key to the strength of the concept of an LeA, since an idealised LeA sits in an artificially constructed democracy: Theoretically information can be identified and if appropriate, integrated into decision making without the usual barriers associated with, for example, the type of bureaucracy often encountered when attempting data acquisition from parallel organisations.

The Don Catchment Learning Alliance (DCLA), situated geographically in the River Don catchment in Yorkshire, England, has been set up as a requirement) of European INTERREG IVb project MARE (managed adaptive responses). The DCLA is a sub-set of the wider Yorkshire & Humber Learning and Action Alliance (YHLAA), set up separately and previously to the DCLA as part of two other INTERREG IVb projects entitled SKINT (skills, integration and new technologies) and FloodResilienCities. These INTERREG projects share the common objective of mitigating flood risk by providing the means for adaptation among stakeholders through integrating activities and identifying best practice. The interested reader is directed to Ashley, et al., (2010a) for further details.

2.3.4.2. Flood Action Group (FAG)

This section outlines how Flood Action Groups can be utilised as Capacity Building platforms for dwellers and receptor stakeholders. The FAG may be seen as *equivalent* to the LeA as Capacity Building regime for the professional stakeholders. This sections outlines the theoretical perspective of FAGs and some incidences of their use in the UK.

The National Flood Forum[20] describes flood action groups as follows:

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[20] http://www.floodforum.org.uk/ accessed 15th December 2010

'[FAGs] *act as the representative voice for their community with the Environment Agency, Local Authorities, Water Companies and the Emergency Planning agencies...*[they] *work on behalf of the local residents and businesses in finding ways of minimising the effects of flooding...* '[21]

The Vale of White Horse District Council[22] define flood action groups as:

'*...groups of people who work together to reduce flood risks with the Vale of White Horse District Council, the Environment Agency, the Parish or Town Council and the County Council.* '[23]

While the Scottish Flood Forum[24] does not actually define what a flood action group is, it summarises the aims of a flood action groups as:

'*...establish*[ment of] *a town wide watch system,* [to raise]*...awareness of factors contributing to flood risks,...develop local community flood action,...minimise the danger of flooding within the* [urban catchment]*,...assist at times of flooding and to support people who have experienced flooding to ensure effective support is available to assist recovery* '[25]

There are many examples of FAGs that have been formed in response to flooding, for example, Freuchi FAG[26], Morpeth and Morpeth FAG[27], Cockermouth FAG[28], Kempsey FAG[29], Cambridge FAG[30], Brandesburton and North Frodingham FAG[31] etc.

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[21] http://www.floodforum.org.uk/index.php?option=com_content&view=article&id=62&Itemid=33 accessed 15th December 2010

[22] http://www.whitehorsedc.gov.uk/default.asp accessed 15th December 2010

[23] http://www.whitehorsedc.gov.uk/community_support_and_advice/emergencies/DetailPage-3765.asp accessed 15th December 2010

[24] http://www.scottishfloodforum.org/ accessed 15th December 2010

[25] http://www.scottishfloodforum.org/wp-content/uploads/2010/07/SFF-Community-Flood-Action-Group-Constitution.doc accessed 15th December 2010

[26] http://www.floodaction.org.uk/blog/ accessed 15th December 2010

[27] http://www.morpethfloodaction.org.uk/ accessed 15th December 2010

[28] http://www.cockermouthfloodactiongroup.org.uk/ accessed 15th December 2010

[29] http://kempseyflag.info/ accessed 15th December 2010

[30] http://www.floodforum.org.uk/index.php?option=com_content&view=article&id=22 accessed 15th December 2010

[31] http://www.thisishullandeastriding.co.uk/news/Flood-plans-news-door/article-723968-detail/article.html accessed 15th December 2010

The following list is taken from Scottish Flood Forum Community Flood Action Group draft constitution document[32] and illustrates some of the actions that may be achieved under a state of *built capacity* that may be achieved upon mobilisation of the adaptive capacities:

- To meet regularly to ensure that flood preventive methods are being maintained and monitored,
- To monitor and report to the appropriate agencies those areas which are at risk of flooding through lack of maintenance or repair,
- To raise the awareness of personal and collective actions to limit the occurrences of flooding,
- As a group to engage with local Authorities and other organisations to reduce the risk of flooding,
- To agree and implement a programme of activities of interest to all members;
- To develop a local community flood awareness training programme,
- To promote flood protection equipment and materials to prevent further flooding to property,
- To engage in stimulating and social activities.

The theoretical basis of the FAG is similar in many respects to the Learning Alliance concept. As such Habermas' 'Theory of Communicative Action' (1987) is applicable as a theoretical basis of the efficacy of FAGs: Discussion to reach a consensus based on an acceptance of true facts, informing the best course of action arrived at on the basis of good reasoning. In addition the FAG can be thought of as a forum from which to mobilise the adaptive capacities shown in table 2.3 (adapted from Norris, et al., 2008).

2.3.5. Conceptual framework component 2: dwellers equivalent professional roles

This section outlines the second conceptual component of the framework: dweller equivalent professional role (EPR). The circumstances under which this perspective was derived are outlined, followed by examples of EPR as found in practice. This section forms the basis of understanding to answer the third set of research questions:

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[32] http://www.scottishfloodforum.org/wp-content/uploads/2010/07/SFF-Community-Flood-Action-Group-Constitution.doc accessed 15th December 2010

The conceptual basis of dweller EPR within the socio-technical system was identified during the Newman, et al., (2008) study: The head of area planning at Glasgow City Council stated that '*the community are the experts of their own community*' during a meeting (see results chapter table 4.3). The implication of this statement is that the community has knowledge pertaining to particular aspects of that community which is not directly available to individuals who are not part of that community. Within the context of flooding in urban catchments this *knowledge* consists of information relating to the hydrological properties of the catchment such as locations of blocked drains, locations of water pooling during heavy rain, historical watercourse locations, locations of covered culverts etc. This information is referred to as 'local knowledge' among dwellers in urban catchments, and the perception of this type of *hydrological* information often increases if dwellers have experienced flooding (see Tapsell, et al., 2002).

The following outlines examples of application of EPR in practice. They are presented here as examples of *indirect* application of EPR. *Indirect* application indicates circumstances where information is obtained from the 'public' in order to provide data which will subsequently be used by 'professionals', but not in a manner in which the public role is 'framed' as an EPR. This is due to the fact that the concept of EPR does not exist in practice as an entity in its own right. However, the efficacy of the approach is easily observed from the following examples.

Cambridgeshire County Council have set up a project called the 'Flood Memories Project' to enable Cambridgeshire's Flood Risk Management Partnership to identify potential 'wetspots' around the county.[33] The idea behind the project is that Cambridgeshire residents who have experienced 'small and medium floods' will be asked to complete an online or paper based survey. The driver behind the project was to '*build our local knowledge of smaller floods over recent years..._the evidence we gather will help us put a strong case to Government for more*

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[33]

http://www2.cambridgeshire.gov.uk/db/pressrel.nsf/6fcbd4565a583c6480256b52004254fd/bd0f8576edc75f9e80257 7ac0041c9d2?OpenDocument accessed 15th December 2010

funding to address Cambridgeshire's flood risk challenges' (Cambridgeshire County Councillor Tony Orgee, Cabinet Member for Economy and the Environment[34]).

In 2003 the city of New York, (USA) launched the '311 helpline' a telephone based helpline dealing with non-emergency municipal services. The line was created to divert call traffic away from the existing '911 helpline', a dedicated emergency helpline, similar to the '999 helpline' in the UK. The 311 helpline provides a list of services including information and access to City government services, translation services and a social service information and referral centre[35]. On October 20th 2010[36], using the internet based technology of 'cloud computing', the 311 service consolidated all of the municipal services provided by New York City (NYC) into what is equivalent to a single database. The relevance of the 311 helpline to this research is based on the manner in which that data is stored and obtained. When a resident of NYC calls the 311 helpline to report a non-emergency incident, such as illegally dumped refuse, the operator who has direct, real time access to the database will log the information on the database. This information can then be immediately accessed by another operator, and subsequently any other caller. Therefore, the residents of the city are providing information that is stored on a central database and can then be used for the benefit of the city as a whole.

2.3.6. Conceptual framework concept 3: Formalising Stakeholder Interactions

This section outlines the third conceptual component of the framework: Formalising Stakeholder Interactions. The circumstances under which this perspective was derived are outlined, followed by examples of Formalising Stakeholder Interactions as found in practice. This section forms the basis of understanding to answer the final set of research questions:

Research question 4: How can stakeholder group interactions be improved or formalised?

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http://www2.cambridgeshire.gov.uk/db/pressrel.nsf/6fcbd4565a583c6480256b52004254fd/bd0f8576edc75f9e80257
7ac0041c9d2?OpenDocument accessed 15th December 2010
[35] http://www.nyc.gov/html/doitt/html/about/about_311.shtml accessed 15th December 2010
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http://www.nyc.gov/portal/site/nycgov/menuitem.c0935b9a57bb4ef3daf2f1c701c789a0/index.jsp?pageID=mayor_pr
ess_release&catID=1194&doc_name=http://www.nyc.gov/html/om/html/2010b/pr439-
10.html&cc=unused1978&rc=1194&ndi=1 accessed December 15th 2010

The previous two concepts have been outlined in respect of their theoretical underpinnings, and examples have been given in literature and current practice. The final concept may be seen as the *structure* within which the first two components must 'sit' in order to integrate the conceptual framework. The efficacy of Capacity Building regimes (learning alliances and FAGs) and dweller EPRs has been demonstrated. The following examples identified in the Newman, et al., (2008) study illustrate the *need* for the final component: the networked structure provided by Formalising Stakeholder Interactions, in order to link the first two concepts so they can *function*:

- During extended periods in which a particular urban catchment experiences no flood activity, the FAG may become dormant, if the urban catchment becomes flooded again, it will be necessary to reactive the FAG, and in this case it is appropriate for *intervention* from a local authority to facilitate this reactivation.
- If key members leave the FAG then their knowledge may leave with them.
- Certain aspects of the Capacity Building in the FAG require input from the tactical stakeholders.
- A significant aspect of indirect intangible dweller impact originate in the perception that they are 'isolated' from the tactical stakeholders.

The concept of Formalising Stakeholder Interactions is based on utilisation of existing systems in order to ensure that the proposed conceptual framework is desirable in respect of cost effectiveness for local authorities. Many of the current interactions between stakeholder groups (tactical and receptor) are performed by direct face-to-face contact, telephone or letter writing etc. Identified in the Newman, et al., (2008) study was that many of these interactions could be performed using automated systems providing some relatively straightforward conditions were met from the perspective of the dwellers. Some examples of these conditions are outlined below:

- That attempt is made to *listen* and *respond* to dwellers,
- That dwellers are treated with *professional equivalency* – communication is not 'top-down',
- That dwellers are treated appropriately with respect to their stake: tactical stakeholders can 'go home' at the end of the day.

The internet is a primary example of an 'existing system' with which programmers have made software available that has allowed streamlining of many human-based processes. Notable

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examples of such processes are those related to communication between people and include email, social networking, visual telecommunications allowing face-to-face meetings without leaving the workplace or home.

2.4. Part 3 - Chapter summary and implications

This literature review has built on the concepts outlined in the introduction to this thesis, namely the drivers for research arising from the removal of the guarantee of protection of flooding by abolition of the 'no benefit, no rate' funding system by the Land Drainage Act (1930).

Problems managing flooding in urban catchments using the current FRM approach is outlined based on the difficulty of appraising the financial benefit of protecting urban catchments. As such an alternative conceptualisation of flooding in urban catchments was presented based on the *impacts* as consequence of flooding in urban catchments. This reconceptualisation allows development of a framework which can meet and reduce the consequences of flooding in urban catchments appropriately.

Outlined next was an exploration of community resilience as an appropriate theoretical approach to manage vulnerability of urban catchments to exposure to flood hazard. Community resilience was then introduced as comprising a set of *adaptive capacities* (access & availability of information, communication, community competence, social capital and economic diversity) *potentially* available to communities which increase *resilience* and therefore reduce vulnerability to exposure to hazard. Finally these adaptive capacities were adapted for applicability to urban catchments at risk of flooding based on literature in order to present a set of third party *interventions* to increase the resilience of such urban catchments.

Then presented was the theoretical framework based on empirical evidence and literature indicating how these *interventions* could be activated and mobilised to provide what has been defined as a non-structural approach to reduce the impacts of flooding in urban catchments. Based on the theoretical concepts of *stakeholder Capacity Building* using stakeholder specific Capacity Building regimes, and *dweller equivalent professional roles*, a theoretical structure was outlined based on *Formalising Stakeholder Interactions* to enable these two concepts to be mobilised. The literature review has outlined the theoretical basis of the proposed conceptual framework in order to provide a basis for the remainder of the research.

2.4.1. Thesis hypothesis

The following hypothesis has been developed based on the Newman, et al., (2008) study and the literature reviewed in this chapter:

Structural flood protection is too expensive to be utilised to prevent flooding in urban catchments. Tangible and intangible Flood Impact in urban catchments can be reduced through: (1) facilitating dweller transition to stakeholder status by endowing them with an Equivalent Professional Role (EPR) and (2) formalising interactions between public and professional stakeholders based on the dynamic. Both conditions are achieved under stakeholder specific Capacity Building regimes.

2.4.2. Development of research questions

The research questions have been developed based on the review of literature and the hypothesis above. The four research questions were developed based on the four research objectives:

- **Objective 1:** Identify the opportunities and barriers to meet drivers for a new approach to reduce Flood Impact in urban catchments.
- **Objective 2:** To understand how stakeholder Capacity Building contribute to the non-structural approach.
- **Objective 3:** To explore the efficacy of dweller Equivalent Professional Role (EPR) with respect to reducing Flood Impact.
- **Objective 4:** To understand how can stakeholder group interactions be improved or formalised.

Each research objective was approached by developing a research questions to meeting the above objectives. These questions are as follows:

- **Research question 1:** Identify the opportunities and barriers to meet drivers for a new approach to reduce Flood Impact in urban catchments
- **Research question 2:** How does stakeholder Capacity Building contribute to the non-structural approach?
- **Research question 3:** What is the efficacy of dweller Equivalent Professional Role (EPR) with respect to reducing Flood Impact
- **Research question 4:** How can stakeholder group interactions be improved or formalised?

Each research question was further divided into research sub-questions:

- **Research sub-question** 2a: What is the evidence supporting the efficacy of building the capacity of system stakeholder groups?

- **Research sub-question** 2b: What is the motivation for establishing and maintaining FAGs in urban catchments?

- **Research sub-question** 2c: What is the motivation for establishing and maintaining Learning Alliances?

- **Research sub-question** 3a: What is the basis for the efficacy of the dweller EPR?

- **Research sub-question** 3b: How may the dweller EPR become active within wider FRM?

- **Research sub-question** 3c: What are the key issues surrounding acceptability of EPR to dwellers?

- **Research sub-question** 3d: How can the dweller EPR be maintained, particularly during non-flooding times?

- **Research sub-question** 4a: Which stakeholder interactions are appropriate to 'formalise' using an internet based portal?

- **Research sub-question** 4b: What are the conditions under which both stakeholder groups would view such an internet based portal as 'acceptable'?

- **Research sub-question** 4c: What are the appropriate technological considerations for the internet based portal?

3. Chapter 3 - Methods

3.1. Introduction

This chapter describes the activities and methods chosen during this PhD research to obtain the data to answer the research questions. The chapter is structured into three sections

- The first section provides the theoretical background to the methods used to gather the data including philosophical approach, research strategy, research design and disciplinary perspective.
- The second section outlines *all* the research methods used to collect the data.
- The final section outlines *how* these methods were applied in each research activity to collect the data during that activity.

The philosophical research approach adopted in this thesis is *critical realism* expounded by Bhaskar (1978) which combines a general philosophy of science with a philosophy of social science enabling a description of the conjunction of the natural and social worlds. The founding concept of critical realism is that reality exists independently of our awareness of it (Robson 2002) and empirical observation is not appropriate to describe *all* the processes occurring in the 'real world'. This approach is appropriate to this research due to the socio-technical system being researched, i.e., the people, their processes and procedures. These events *'cannot be defined objectively but only subjectively: reality is interpreted social action...quantitative measurement...cannot capture the real meaning...'* Sarantakos (1988) (cited by Robson 2002).

3.2. Research strategies

Three strategies were selected for this research: *case studies*, *histories* and *analysis of archival information*. The choice of research strategy is based on the peculiarities of the research: the type of research question; the degree of control the researcher has over actual behavioural events and; the focus on contemporary or historical phenomena (Yin 2003). The case study strategy is explored in more detail below.

Gerring (2004) defines a case study as *'an intensive study of a single unit with an aim to generalise across a larger set of units'* and is defined by its sampling mode, *'a case is a single instance; a sample of one'* (Easton 2010). The efficacy of the case study is outlined by Yin

(2003), and the concomitance of the case study approach with the critical realist philosophy is evident:

'...the case study is used in many situations to contribute to our knowledge of individual, group, organisational, social, political and related phenomena...the case study method allows investigators to retain the holistic meaningful characteristics of real-life events – such as individual life cycles, organisational and managerial processes, neighbourhood change, international relations, and the maturation of industries'

Research opportunities presented by the case study approach include the ability to *'understand a phenomenon in depth and comprehensively...*[and] *tease out and disentangle a complex set of factors and relationships'* (Easton 2010). The case study strategy can also offer an iterative progression toward knowledge gain due to the *'...continuous moving back and forth between the diverse stages of the research project'* (Verschuren (2003) cited by Easton (2010)).

Definitional problems with *case study* have meant that it is not always considered as a formal research *method* at all, or been confused as a 'data collection technique' (Yin 2003). As such the *technical definition* of, and reasoning for use of the case study strategy within this research is repeated here. A case study is an empirical enquiry that:

- *'investigates a contemporary phenomenon within its real-life context, especially when,*
- *the boundaries between phenomenon and context are not clearly evident,*
- [The case study enquiry] *copes with the technically distinctive situation in which there will be many more variables of interest than data points,*
- [and] *relies on multiple sources of evidence, with data needing to converge in a triangulating fashion,*
- [and] *benefits from the prior development of theoretical propositions to guide data collection and analysis'* (ibid).

In addition to the criteria outlined above, the case study was selected as an appropriate research strategy for two purposes:

Firstly, answering the research questions required an understanding of the *mechanisms* (Robson 2002) of the socio-technical system, necessitating a need to ask '*how*' type questions. Such questions are problematic using, for example, surveys/ questionnaires as they rely on the research participant to supply quality, in-depth data (i.e., entailing the individual writing long answers). *Immersion* (also described by Robson (ibid) as an *embeddedness*) in the socio-technical system allows data collection of a higher quality as the emphasis is on the researcher to seek and record the data. In addition, the survey/ questionnaire approach pressurises the researcher to be much clearer in the design of the questionnaires/ surveys. The case study strategy allows clarification of any inquiry from the researcher should there be any confusion.

Second, due to the complexity of the *system*, it was anticipated that *researcher* Capacity Building should remain integral to the overall research strategy throughout this research process. It was anticipated that data would be obtained during the research process that would necessitate adjustment to the strategy, as stated by Yin (2003) such '*revelations can be enormously important, leading to your modifying your original* [strategy]'. Using a *fixed* design would not allow such flexibility.

To address both of these points two approaches were incorporated into the research design: *action research* and *evaluation research*. Both action research and evaluation research are *critical realist* designs advocating researcher *immersion* in the subject matter.

The case studies selected for this research all had research objectives over and above that of this research, i.e., their primary objectives were not the objectives of this PhD research. As such the case studies were chosen that would allow this PhD research to be *absorbed* into the overall case study objectives. This has both advantages and disadvantages, outlined in chapter 5: Analysis.

3.3.   Research design

A research design is the logic that links the data to be collected (and conclusions to be drawn) to the initial question of study (Yin 2003). Since the research involved *people* in real-world settings, control over the research events was limited and a *flexible* (Anastas and MacDonald 1994, cited by Robson 2002) research design was selected. A *flexible* research design may be summarised as: '*typically mak*[ing] *substantial use of methods which result in qualitative data...and the design*

evolves, develops and 'unfolds' as the research proceeds' (ibid). Typically, within the *flexible* design approach is use of *mixed-methods* of data gathering.

Table 3.1 presents the research activities, the research design and research strategy used for each activity and a description of how each activity addresses the core research components (and thus the associated research questions).

		Research activity			
	Literature review	Glasgow (NSR), Scotland 'Effectiveness and Efficiency of Non-structural Flood Risk management Measures' (Defra case study FD 2603, part of CRUE ERA NET[37]); (both TSH & RSH engagements). May 2007 – April 2008	West Garforth, England 'Integrated Urban Drainage pilot' (Defra[38] case study). November 2006 – April 2008	Managing Adaptive Responses to changing flood risk in the North Sea Region (MARE) (INTERREG[39] case study). October 2008 – present	West Garforth dweller engagement (continuation with dweller participants of West Garforth IUD study) June 2009 – June 2010
		Research design			
✕		Action research	Evaluation research	Evaluation research	Evaluation research
		Research strategy			
	Analysis of archival information, Histories	Case study (interviews)	Analysis of archival information	Case study (interviews)	Case study (interviews)
		Outline of how each research activity will gather data for each core research component			
Research objective	*1 - Identify the opportunities and barriers for a new approach to reduce FI in urban catchments*	Literature review part 1				
	2 - To understand how stakeholder Capacity Building contribute to the non-structural approach.		In addition to literature reviewed during year 1 of research, this case study provided exposure to relevant aspects of Scottish flood management in order to propose the hypothesis above and begin to identify the research objectives based on outcomes of this case study. As such the basis of all the research findings originated in research carried out during this case study. – i.e., the Glasgow study uncovered each of these elements – or put another way identified questions to be answered based on evidence obtained in that case study		Set up and facilitate a LeA for TSHs to deduce feasibility as a Capacity Building regime and how such an approach may be implemented in other catchments	A dweller engagement with residents who have 'built capacity' to focus on the notion of EPR (acceptability, content, activation and maintenance)
	3 - To explore the efficacy of dweller Equivalent Professional Role (EPR) with respect to reducing Flood Impact.	Literature review part 2		Aggregate receptor stakeholder (RSH) and tactical stakeholder (TSH) data in order to demonstrate the efficacy of EPR		A dweller engagement with residents who have 'raised capacity' and who are members of a Flood Group (FG) to understand the efficacy of a FG as a platform for RSH Capacity Building. In addition the engagement provided understand of how such FGs could be initiated in other urban catchments
	4 - To understand how can stakeholder group interactions be improved or formalised.					An engagement with residents who have 'raised capacity' focusing on innovative methods to address problems with communication between stakeholder (SH) groups

Table 3.1 Indicating research activities, research design and research strategies undertaken to answer research questions

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[37] http://www.crue-eranet.net/ accessed 20th December 2010

[38] http://www.defra.gov.uk/environment/flooding/documents/manage/surfacewater/wgarforthreport.pdf accessed 20th December 2010

[39] http://www.northsearegion.eu/ivb/projects/details/&tid=95 accessed 20th December 2010

3.4. Research methods

The research design consists of three stages; the first stage a desk *based study/ literature review* (archival records), and the second stage: *action research* (case study) and the third stage: *evaluation research* (case study, documentation and archival records). Each of these design methods is discussed more fully in this section. The following section indicates how each method was applied in each research activity to gather the data to answer the research questions specific to that activity.

3.4.1. Ethics

To ensure that research does not cause *harm*, the University of Sheffield imposes an ethical code on researchers' activities, enforced through internal university procedures. The overall research proposal must also gain university approval including all research modes, such as stakeholder engagements. All research participants (stakeholders) were also required to acknowledge their consent. This was achieved by issuing consent forms at the beginning of each engagement. These forms protect the data obtained from the research participants under the UK Data Protection Act 1998. Example forms can be found in the appendix to this thesis. The methodology adopted during this research was founded on these ethical principles.

3.4.2. Action research design

Action research is a mode of research whereby a researcher becomes involved in the subject of research itself in order to effect, and observe the effect of researcher involvement. Action research is generally concerned with the emancipatory aspect of research (Robson 2002). This type of research is often employed in instances whereby some form of organisational change is desired such as optimisation of practice within education (Somekh 1998). Typically, researchers work *alongside* members of the organisation with the aim of progressive iteration toward a particular goal or goals. Action research adds *improvement* and *involvement* to the traditional research processes of description, understanding and evaluation (Robson 2002). The purpose of action research then is to:

- *'First, improvement of a practice of some kind,*
- *Second, improvement of the understanding of a practice of some kind by its practitioners,*
- *Third, improvement of the situation in which the practice takes place'* (ibid).

Most of the action research processes found in the literature are *cyclical* (for example Somekh 1998, List 2006, Mckellar 2002) to allow an iterative research process with research participants toward greater clarity regarding a particular subject. The action research approach was applied in the Glasgow (NSR) case study (see table 3.1). The purpose of action research here was to develop the theoretical basis of the *conceptual framework* using the activities forming the case study. This was achieved through an iterative process of acquisition of knowledge from research participants, processing and analysis, then presenting the new findings back to the participants for evaluation and further information.

3.4.3. Evaluation research design

Evaluation research is undertaken in order to assess the effects and effectiveness of some innovation, intervention policy or practice (Robson 2002). Evaluation research was used as a research design to *evaluate* the three core research components identified during the action research. This entailed *re-presenting* them to the research participants as actual conceptual entities (*Capacity Building, equivalent professional roles* and *Formalising Stakeholder Interactions*) in order to *evaluate* stakeholder acceptance and also their efficacy with regard to FIR in urban catchments. The evaluation research approach was applied in West Garforth IUD cast study, MARE case study and West Garforth dweller engagement see table 3.1.

3.4.4. Data collection

Data was collected using the following techniques; interview; documentation and archival records. The technique(s) chosen to collect data within each research activity is presented in the section specific to each *research activity* below. *Selecting* a data collection technique is based on the kind of information sought, from whom and under what circumstances (Robson 2002)

3.4.4.1. Interview method

This section describes the different interview styles and techniques used for data collection. This section outlines *all* the interview techniques chosen in this research. Not all techniques are used in all research activities – please refer to the specific research activity section for details regarding the choice of interview style.

All of the **interview styles** chosen were *qualitative* (King 1994, cited by Robson 2002)). Qualitative interviews are appropriate in the following circumstances:

- *'Where a study focuses on the* meaning *of a phenomena to participants,*
- *Where individual perceptions of processes within a social unit are to be studied,*
- *Where historical accounts are required of how a particular phenomenon developed'* (ibid, emphasis added*).*

The choice of qualitative interview style allowed for the research participants to explore the subject area with the researcher without feeling confined in respect of the time taken to respond or their choice of language etc. Anticipation of the type of *answering style* that participants would take (often lengthy answers) meant that this was *expected.* Thus, this characteristic could be incorporated into the design of the data analysis, i.e., a method was required which could analyse a significant quantity of text and/ or audio files, see below.

The choice of qualitative style is appropriate for use in case studies where the interviews are more likely to be fluid as opposed to rigid (Rubin & Rubin, cited by Yin 2003). The qualitative interview styles chosen here were semi-structured, unstructured and informal:

- *Semi-structured;* predetermined questions, but the order can be modified based on the interviewer's perception of what seems most appropriate. Question wording can be changed and explanations given; particular questions which may be inappropriate to a given interviewee can be omitted or additional ones included.
- *Unstructured interviews;* the interviewer has a general area of interest and concern, but lets the conversation develop within this area.
- *Informal interview;* (a sub-set of the unstructured interview) where the interviewer takes opportunities that *arise* with individuals within the research setting. It is unlikely that formal data will be recorded in such interview, but the information can often serve to provide vital background information on the subject of research. (adapted from Robson 2002)

Three **types of interview** were chosen in this research; one-to-one interviews, groups interviews (meetings) and forums:
- *One-to-one interviews;* an interview setting where the researcher is alone with the interviewee. Can be either semi-structured or unstructured,

- *Group interviews (meetings);* An interview setting where the researcher has more than one interviewee,

- *Forums;* often seen as a precursor to develop a more structured engagement in the future, for example to develop a more focused basis for future one-to-one interviews.

The **question type** chosen for each interview is dependant on the purpose of the interview, for example if the focus of the interview is toward gaining *specific* information, then *closed* questions are chosen, these questions will often be *what/which* type questions. If the interview is of a more *exploratory* nature then *open* questions are more appropriate, for example these questions will often be *how/why* type questions.

Prompts such as pictures and diagrams were used in situations where there it was perceived that the interviewees may not understand the focus of the interview leading to misinterpretation. This type of prompt is particularly useful in forums.

Choosing **questions** or **topic sequence** before the interview, and maintaining the questions of sequence allows consistency across all the interviews. It can also allow the researcher and interviewee to be more comfortable with the process.

A **list of self instructions** is a template for the researcher to enable the interview process to be more *fluid*, it also can add consistency to interviews. This can be useful in situations where the researcher is nervous since the protocol provided by the list can serve as a sequence to follow. Also this list will contain information of use to the interviewee such as confidentiality reassurance, potential data usage, purpose of the research etc.

Analysis of interview data – while high quality research data can be obtained using *interviews*, it can be problematic getting the qualitative data into a format in which it can be analysed (Robson 2002). Transcription is essential for a permanent record but the time consuming nature of the task can influence the interview design. Two techniques were adopted in this research: Where full transcription was feasible it was done (for example, an available budget in the Glasgow (NSR) case study allowed this). The transcript was then analysed afterward and pertinent data identified. Where full transcription was not feasible detailed notes were taken and a

digital audio recording was made including a record of the time where 'pertinent' points were made in the recording. Then the notes, and the audio files were triangulated after the interview.

3.5. Application of research design to research activities

The case studies utilised for this PhD research were part of wider research projects (CRUE ERA NET, Defra IUD and MARE – see table 3.1) each with its own specific research objectives (see sections 3.3.1 (ERA NET CRUE), 3.3.3 (Defra IUD) and 3.3.4 (MARE) for more details). Therefore, the activities described below are those that relate only to *this* PhD research. Interest in the wider case study objectives should be directed to the final reports relevant to each study (see Glasgow (NSR) – Newman, et al., (2008); West Garforth IUD – Defra (2008), MARE – this project is due to complete in 2013 at which time final reports will be available on the MARE website[40]).

3.5.1. Glasgow (NSR) case study part 1 - Tactical stakeholders

This case study was situated in Glasgow, Scotland. The research activities undertaken in Glasgow comprised engagements with Tactical and Receptor stakeholders. The Glasgow (NSR) case study builds on the Cashman (2007) case study focussing on the behaviour of the tactical stakeholders, their institutions in Scotland, and how these interactions changed prompted by the flooding in 2002. The 2002 flood event occurred on 30th July and lasted for approximately ten hours, in which time the equivalent of one month's rainfall fell, having an estimated return period of more than one hundred years (Cashman 2002). The high intensity and duration of the storm caused the most devastating rainfall event to hit Glasgow for the previous fifteen years causing widespread flooding at a number of locations. This PhD research builds on the Cashman (2007) case study by focusing on what it was that prompted the behaviour change in the tactical stakeholders which allowed a shift in focus away from solely structural responses toward acknowledgement of more context appropriate alternatives.

3.5.1.1. Activity associated research questions

Table 3.2 indicates the research activity, and the research sub-questions which the activity addressed. In addition Table 3.2 indicates the rationale supporting the use of each particular research activity to address each research sub-question.

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[40] http://www.mare-project.eu/ accessed 4th July

Research activity	Research sub-question addressed	Rationale behind research activity selection
Case study - Glasgow NSR Tactical stakeholder engagement	Overview	This case study was chosen as it necessitated engagements with 'high-level' TSHs (head of department and managerial) in a context of exploration of the efficacy of non-structural responses
	2a	Tactical stakeholders in Scotland have Flood Liaison & Advisory Groups (FLAGs) which perform Capacity Building functions relating to flood management. This provides an opportunity to understand issues of acceptability to the TSHs
	2b	There are likely to be parallels between maintenance of FLAGs groups an Learning Alliances
	3a	TSHs in various organisations are involved in 'community' engagements, therefore there will be opportunities to explore the notion of 'roles' for dwellers in the context of impact reduction
	3b	To answer this question will likely involve understanding how current liaisons between tactical and receptor stakeholders occur which may provide a list of opportunities and barriers with which to understand how this *initiation* of EPR might occur in practice
	3d	The TSH engagement will provide an opportunity to understand protocols during non-flooding time
	4a	Engagements with both TSH will identify some likely *interactions* that may be suitable, and then evaluated during the next stage of research
	4b	This issue can be explored during TSH engagements
	4c	Acceptable modes for the *formalising* can also be explored with the TSH

Table 3.2 Research activity, associated question and activity rationale

3.5.1.2. Research activities

The research activities consisted of five separate tactical stakeholder engagements, each incorporating individual meetings, summary details of which can be found in table 3.3. These meetings were arranged as part of the remit of the Glasgow (NSR) case study.

Meeting Information	Date	Organisation	Department	Venue
Glasgow (NSR) interview set 1: The first set of meeting was to gain background to the processes associated with tactical stakeholders of FRM in Glasgow.	11th &12th June 2007	Glasgow City Council	Development & regeneration services	Glasgow City Council offices
		Glasgow City Council	Development & regeneration services	
		Renfrewshire City Cnl.	Flood prevention	Renfrewshire City Council offices
		Scottish Water	Asset development planning	Scottish Water offices
		Scottish Water	Asset development planning	
		Hyder Consulting	Independent consultant	
		South Lanarkshire Cnl.	Flood prevention and geotechnical	SEPA offices
		SEPA	Flooding unit	
Glasgow (NSR) interview set 2: The Second set of meetings was to understand the workings of the Glasgow Strategic Drainage Plan (GSDP) in order to understand the context in which NSR may *fit* in the future. These meetings were held solely with members of Glasgow City Council.	5th July 2007	Glasgow City Council	Area planning	Glasgow City Council offices
	5th July 2007	Glasgow City Council	Emergency planning	
	6th July 2007	Glasgow City Council	Landscape & environment	
	9th July 2007	Glasgow City Council	City planning	
Glasgow (NSR) interview set 3: Meetings with representative of Glasgow Category 1 responders were appropriate, however only the police accepted interview.	13th September 2007	Police Service - Strathclyde Police Divisional Headquarters	Emergency response	Strathclyde Police Divisional Headquarters
Glasgow (NSR) interview set 4: Following the above engagement it was necessary to hold a tactical stakeholder meeting to discuss findings identified up to this point.	14th September 2007	Glasgow City Council	Area planning	Glasgow City Council offices
		Glasgow City Council	Landscape & Env.	
		Glasgow City Council	Emergency planning	
		Glasgow City Council	Development & regeneration services	
		Scottish Water	Asset development planning	
		Scottish Water	Asset development planning	
		SEPA	SEPA flooding unit	
		South Lanarkshire Council	Flood prevention	
		Renfrewshire City Council	Flood prevention	
		Kaya Consultants	Independent consultant	
Glasgow (NSR) interview set 5: Flood Liaison Advisory Group (FLAG) meeting to understand their purpose and whether there may be transferability to English FRM.	14th September 2007	Glasgow City Council	Development & regeneration services	Glasgow City Council offices
		Renfrewshire City Council	Flood prevention	

Table 3.3 Tactical stakeholder meeting details for the Glasgow (NSR) case study

3.5.1.3. Methods

The action research approach was applied as described above. The interviews were semi-structured but *open* in order that pertinent issues not identified when structuring the questions beforehand could be included if appropriate. All interviews were recorded using a digital audio device, agreed beforehand by the interviewees. The interviews were then transcribed in order that the information could be analysed after the event. Table 3.4 indicates the interview techniques and associated methods used during these engagements.

Interview technique	Meeting set 1 Description	Meeting set 2 Description	Meeting set 3 Description	Meeting set 4 Description	Meeting set 5 Description
Interview style	Structured	Unstructured	Unstructured	Unstructured	Unstructured
Interview type	Group interviews (meetings)	One-to-one	One-to-one	Group Interview (meeting)	Group Interview (meeting)
Question type	Closed	Open	Open	Open	Open
Prompts	None	None	None	Glasgow NSR report 1 (Newman, et al., 2007a) circulated for comment before meeting	None
Questions or topic sequence	See Appendix for question list	None	None	None	None
Self instructions	None	None	None	None	None
Data analysis method	Notes taken from 2 researchers (see appendix 3)	Interview digitally recorded (audio analysed and pertinent points taken – see chapter 4: Results)	Interview digitally recorded (audio analysed and pertinent points taken – chapter 4: Results)	Interview digitally recorded and transcribed (see appendix 3)	Interview digitally recorded and transcribed (see appendix 3)

Table 3.4 Interview techniques employed in meeting sets 1-5

3.5.2. Glasgow(NSR) case study part 2 - Receptor stakeholders

In order to better understand the role of receptor stakeholders in the context of FIR with respect to NSR, it was necessary to engage the receptor stakeholders. The engagement was designed as a *pilot* since it had already been acknowledged that this PhD research would be reliant on stakeholder engagements to gather data, as such this was an opportunity for exploration in terms of approaches for future engagements.

The pilot receptor engagement took place in Shettlestone, a residential suburb in east Glasgow. The pilot engagement took place over a two week period and consisted of one-to-one interviews with receptor stakeholders, and an open forum. In order to organise these events significant effort went into publicising them involving handing out flyers to local businesses and residents, meetings with community groups, and an interview on a local radio station. The publicity strategy was devised to attract people from the Shettlestone area who were flooded during the event in 2002 or who had been affected by the flood. The attendance list to the forum can be found in the Appendix to this thesis.

3.5.2.1. Activity associated research questions

Table 3.5 indicates the research activity, and the research sub-questions which the activity addressed. In addition Table 3.5 indicates the rationale supporting the use of each particular research activity to address each research sub-question.

Research activity	Research sub-question addressed	Rationale behind research activity selection
Case study - Glasgow NSR Receptor stakeholder engagement	Overview	This case study was chosen as it necessitated engagements with RSHs allowing exploration of the notion of EPR in the wider context of exploration of the efficacy of non-structural responses
	2a	Exposure to RSHs would allow exploration of the idea of Capacity Building with regards to it being contributory to RSH 'well-being' (and therefore a source of intangible impact reduction – see literature review), and the acceptance of practical approaches to achieve this
	2b	Exposure to dwellers would allow feedback to be obtained regarding the manner in which the FAG would be acceptable and productive
	3a	Exposure to RSHs would allow exploration of the scope of EPR in a non-threatening manner to deduce the potential efficacy of the approach from their perspective. It was also considered that clarification of the efficacy of the notion would occur
	3b	Exposure to these stakeholders would allow exploration of the EPR with regards to these issues
	3c	
	3d	The RSH engagement may provide an opportunity to understand protocols during non-flooding time. This community is particularly suitable for this as there has been no flooding for 6 years.
	4a	Engagements with RSH will identify some likely *interactions* that may be suitable, and then evaluated during the next stage of research
	4b	Exposure to RSHs would allow exploration of their perspective of the efficacy of actively allowing transference of significant portions of communication into an automated 'system'. It is also likely that RSHs would provide information regarding the role that TSHs would have to play in order to ensure acceptability for the RSHs (i.e., what would the TSHs have to do in order that formalised communication become acceptable to the RSHs)
	4c	Acceptable modes for the *Formalising Stakeholder Interactions* can be

		explored during the RSH engagements

Table 3.5 Research activity, associated question and activity rationale

3.5.2.2. Research activities

Date	Activity
13-Jan-08	Arrive Glasgow
14-Jan-08	Search for local community groups, radio stations etc to enable our transition and acceptance into the community
15-Jan-08	Meeting at Glasgow City Council to finalise location for engagement. Pick up flood extent map of location. Began distributing flyers around Shettleston.
16-Jan-08	Morning attendance at 'Shettlestone Local History Group'. Contacted a number of radio stations to try to get some 'air-time' to promote our presence and its purpose.
17-Jan-08	Received invitation to appear on 'Sunny Govan FM' Tuesday 22nd January. Booked hall to hold forum. Wrote agenda for forum.
18-Jan-08	Began engagement process with dwellers by knocking on doors of properties in Shettleston affected by the floods in 2002.
19-Jan-08	Weekend
20-Jan-08	
21-Jan-08	Due to lack of response from engagement process on 18-Jan-08 flyers have also been posted in Greenfield, an area adjacent to Shettleston which was also affected by the floods in 2002.
22-Jan-08	Morning spent at Sunny Govan radio station offices. Afternoon spent further planning the forum.
23-Jan-08	Organising 'housekeeping' aspects of forum (refreshments, projector, presentations etc).
24-Jan-08	Meeting with Joe Whitley of Shettlestone Housing Association (who attended the forum) to discuss how he may be able to aid future engagement.

Table 3.6 Schedule of activities for the Glasgow (NSR) pilot dweller engagement

Time	Agenda item
19:25-19:30	Introduction and welcome
19:30-19:55	Presentations
19:30-19:40	David Drabble – 'Professional flooding stakeholder interaction and how this relates to you'
19:45-19:55	Richard Newman – 'Flooding background and context appropriate solutions'
20:00-20:50	Breakout into groups, themed discussions and feedback
20:50-21:00	Summary
21:00-21:10	Feedback forms collected

Table 3.7 Forum agenda

3.5.2.3. Methods

It was envisaged at the outset that the engagement would utilise two action research formats: a *forum* and *interviews* with the receptor stakeholders. The research team was interdisciplinary comprising a civil engineer (Richard Newman) and a sociologist (David Drabble). It was thought this combination would allow for a synthesis between the technical aspects and the social impacts of flooding.

A meeting with a representative of GCC at the beginning of the pilot indicated *Shettleston* as an appropriate case study area fulfilling the criteria for the pilot study: The area was flooded severely in the 2002 event; there had been limited receptor engagement since then; there had been

none or little apparent changes in flood risk since 2002. A flood inundation extent map of Shettlestone were provided by GCC (please see the Appendix to this thesis for this map). Using this map, the list of the properties affected by the floods in 2002 was identified. Dwellers engaged in this research were resident in Shettlestone during the floods in 2002.

In order to engage the stakeholders in Shettleston it was appropriate to identify potential barriers to researcher acceptance into the 'community' in order to perform research. The main barriers identified were related to community acceptance and trust. There were also issues of confidentiality and security for both researchers and the receptor stakeholders. Two main strategies were used: door to door interviews; and a forum open to all Shettleston residents affected by the floods in 2002. In attempt to address the issues of community acceptance to allow the research activities an interview was given on local radio (Sunny Govan FM41). Flyers were also posted through the doors of all the houses and businesses in Shettleston that were affected by the floods in 2002 (please see the Appendix to this thesis for an example of the flyers). As an incentive for people to attend the forum, refreshments (sandwiches, snacks, tea and coffee) were provided.

To further increase the attendance, pre-existing community groups were sought out in the Shettleston area so as to facilitate integration of the researcher activities into the area. This was considered useful as by first engaging with a representative of a pre-existing community or network and communicating the importance of the work, it was more likely that a response could be elicited from other members of the community. A key contact group were 'the Shettleston Local History Group'[42] who meet in the area weekly. The attendance list at the forum is in appendix 3.

Given the time lapse between the 2002 flood event and the date of this engagement (January 2008) it was anticipated that there may be residents who were *not* resident for the 2002 flood event. In addition, the six year time lapse between the event and the engagement may cause difficulties with respect to the residents' memories of the event, and hence impact the quality of the data obtained. Also, these factors may influence the number of people willing to take part in

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[41] http://www.sunnygovancommunitymedia.org/ Interview took place at: Sunny Govan Community Media, Glasgow Media Business Park, 249 Govan Road, Glasgow, G51 1HJ accessed 10th January 2011
[42] http://bridgeton.eveningtimes.co.uk/events//202820-3382.html accessed 10th January 2011

the research since they may feel it no longer relevant. In addition this time lapse may have been such that some residents may not wish to 're-live' memories of the event, thus precluding them from the research process. While these factors were acknowledged during this engagement, there was little that could be done to influence them other than being mindful of these issues when approaching residents. Table 3.8 indicates the interview techniques and associated methods used during these engagements.

Interview technique	Interviews with dwellers	Forum
Interview style	Unstructured	Semi-structured
Interview type	One-to-one	Group Meeting (forum)
Question type	Open	Open
Prompts	None	See presentations, Appendix
Questions or topic sequence	None	See presentations, Appendix
Self instructions	None	See presentations, Appendix
Data analysis method	Notes taken, no transcript	Interviews digitally recorded and transcribed (audio analysed and pertinent points taken – see chapter 4: Results) (see the Appendix)

Table 3.8 Interview techniques employed in pilot dweller engagement

3.5.3. Garforth IUD case study

Involvement in this case study provided a second platform for this PhD research. The IUD project aim was to examine a range of approaches to develop more integrated urban drainage including provision of best practice examples. The West Garforth catchment has a long history of flooding problems dating back to the 1980s and earlier. The drainage infrastructure in West Garforth is a system of inadequate culverted watercourses, passing through many private properties. A map indicating incidences of flooding that has occurred in West Garforth since the 1980's was made available by Leeds City Council, however, due to the confidential and sensitive nature of this information, it has not been included in this thesis. This Defra IUD project was carried out by a partnership involving Leeds City Council, Bradford Metropolitan District Council, Yorkshire Water, the Environment Agency and the Pennine Water Group (Bradford and Sheffield Universities).

The relevance of the case study to this PhD research centres on the outcome of collaborative activities undertaken by the two stakeholder groups (receptor and tactical) toward provision of a surface water drainage system model of the West Garforth catchment (see Defra 2008). This model was a requirement at the beginning of the project in order that the current performance of

the catchment could be assessed to establish likely flood locations, the volume of exceedance water under different storm conditions and the associated damage costs. The computer model was constructed using data sourced from receptor and tactical stakeholders, the data sources included photographs, video footage, letters written to local authorities and questionnaires (please see the Appendix to this thesis for copies of this data). The study was undertaken as part of this PhD research to assess the efficacy of the concept of *equivalent professional role* in a single instance, in a 'real' setting to establish whether dweller 'local knowledge' was sufficiently accurate to be used by the tactical stakeholders.

3.5.3.1. Activity associated research questions

Table 3.9 indicates the research activity, and the research sub-questions which the activity addressed. In addition Table 3.9 indicates the rationale supporting the use of each particular research activity to address each research sub-question.

Research activity	Research sub-question addressed	Rationale behind research activity selection
Case study - West Garforth pilot Integrated Urban Drainage study	Overview	This case study provided an opportunity to test the efficacy of the use of RSH data in a TSH context: development of a surface water drainage system model for West Garforth
	3a	Given the requirement of this case study to create a catchment flood model, it provided an instance in which data held by RSHs could be interpreted into TSH 'usage' in order to determine compatibilities of the two data sets in terms of producing an accurate model. Furthermore this scenario would likely feedback further information regarding the acceptability of the notion of EPR from the perspectives of each SH group

Table 3.9 Research activity, associated question and activity rationale

3.5.3.2. Methods

The method chosen to obtain data during this activity was analysis of archived information.

3.5.3.3. Research activities

The data used to compile the est Garforth surface water drainage system model was collected by Leeds City Council and delivered to the University of Sheffield for analysis. The data was sourced originally from dwellers of West Garforth and consisted of photograph and video evidence taken during flood events, written records for insurance purposes, diaries and various other sources dating back to 1986 (please see the Appendix to this thesis for copies of this data).

3.5.4. MARE case study

The MARE (Managed Adaptive Resources) case study is a EU INTERREG IVb North Sea Region Programme case study with collaboration from partner institutions in Norway, England, Germany and the Netherlands. The aim of MARE is to enable widespread implementation of local adaptive measures that mitigate flood risk. By applying adaptive measures to flood risk in local communities MARE will contribute to: stronger economies and improved conditions for inward investment by reducing risk of damage or disruption; improved safety and quality of life, by reducing uncertainty and risk to loss of life: cost-effective environmental policy by long-term cost-benefit optimisation of Flood Risk Management options. The role of the University of Sheffield in this case study was to set up and facilitate the Don Catchment Learning Alliance (DCLA), a learning alliance nested within the wider Yorkshire & Humber Learning Alliance.

The research objective here was to investigate the efficacy of the LeA approach as a Capacity Building regime for tactical stakeholders. In addition, to deduce how such an approach may be implemented and maintained for applicability to urban catchments.

3.5.4.1. Activity associated research questions

Table 3.10 indicates the research activity, and the research sub-questions which the activity addressed. In addition Table 3.10 indicates the rationale supporting the use of each particular research activity to address each research sub-question.

Research activity	Research sub-question addressed	Rationale behind research activity selection
Case study - Managed Adaptive Resources (MARE)	Overview	This case study provided a platform for investigating the efficacy of the Learning Alliance approach as a regime to build TSH capacity
	2a	Functioning as a facilitator of a Learning Alliance in a research context related to that of this PhD would allow exploration of the efficacy of the LeA approach as a Capacity Building regime for RSHs.
	2b	In addition this exposure would likely yield information regarding implementation and maintenance of LeAs in other geographical locations

Table 3.10 Research activity, associated question and activity rationale

3.5.4.2. Research activities

The activities undertaken during this case study relevant to this PhD research comprised tactical stakeholder engagements and a stakeholder analysis, as outlined in table 3.11. The stakeholder analysis was performed (in compliance with stakeholder theory as outlined in the literature

review) based on the SAK toolkit (Kennedy S. 2010) to ensure that each stakeholder group was represented appropriately in terms of power, legitimacy and urgency (Mitchell, et al., 1997). In addition the analysis was performed to obtain feedback from members of the Learning Alliance to determine *their* perspective regarding the efficacy of a Learning Alliance to reduce Flood Impact.

Activity	Activity purpose	Date	Organisation	Venue
Learning & Action Alliance teleconference	*Reconnaissance* teleconference with a member of the SWITCH[43] project in order to initiated understanding of how LeAs function, and what outcomes may be expected	2nd April 2009	IRC International Water and Sanitation Centre, Delft, the Netherlands, University of Sheffield, UK	University of Sheffield
Setting up Learning Alliances meeting	This meeting was held with representatives of the partner institutions and a member of the SWITCH project (see box above) in order to introduce the concept of LeAs to them, and to begin a dialogue with the partners to enable them to initiate LeAs in their respective countries. Also introduced was the fact that a *stakeholder analysis* would also be necessary as part of the LeA. In addition the dialogue was also intended to encourage the partners to think about how outcomes and learning could be shared among *all* partners to increase the quality of the overall project output.	22nd April 2009	Sheffield City Council, England	TU Delft, the Netherlands
			Province of Zuid Holland	
			Municipality of Bergen, Norway	
			City of Bradford Metropolitan District Council, England	
			Technical University Hamburg, Germany	
			UNESCO-IHE, the Netherlands	
			Province of Zuid-Holland	
			Erasmus University	
			City of Hannover, Germany	
			Pennine Water Group (University of Sheffield)	
			IRC International Water and Sanitation Centre, the Netherlands	
Stakeholder analysis questionnaire meeting 1	Initial meeting with researchers experienced in stakeholder engagements and analysis to devise an appropriate stakeholder analysis for the Don Catchment Learning Alliance (DCLA).	5th August 2009	Pennine Water Group (University of Sheffield)	University of Sheffield
Stakeholder analysis questionnaire meeting 2	Second meeting with the same researchers in the above box to further develop the stakeholder analysis.	18th August 2009	Pennine Water Group (University of Sheffield)	University of Sheffield
Two part Meeting: Part 1 - Work Package 1 – Stakeholder Analysis Part 2 – partners met at the COST C22 Conference Paris November 2009	Meeting with Dutch partners to compare progress on the respective stakeholder analyses.	13th November 2009	Netherlands Ministry	UNESCO IHE Delft, the Netherlands
			Municipality of Dordrecht	
			Pennine Water Group (University of Sheffield)	
DCLA meeting: 1st round of stakeholder analysis	LeA meeting where the first round of the stakeholder analysis was issued to the DCLA members.	11th December 2009	Attendees[44]	RMBC, Rotherham, England

Table 3.11 Indicating research activities undertaken in the MARE case study[45]

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[43] See section 2.3.4.1 and http://www.switchurbanwater.eu/ for further details (website accessed 5th July 2011)

[44] The data in this column was unobtainable at the time of writing this thesis

[45] The minutes that were taken during these activities can be found in the Appendix

3.5.4.3. Methods

Table 3.12 indicates the methods used during this research activity.

Interview technique	Learning & Action Alliance teleconference	Setting up Learning Alliances meeting	Two part Meeting: Part 1 - Work Package 1 – Stakeholder Analysis Part 2 - COST C22 Conference Paris November 2009	Stakeholder analysis questionnaire meeting 1	Stakeholder analysis questionnaire meeting 2	DCLA meeting: 1st round of stakeholder analysis
Interview style	Unstructured	Unstructured	Unstructured	Unstructured	Unstructured	Semi-structured
Interview type	Group	Group	Group	Group	Group	Group
Question type	Open	Open	Open	Open	Open	Open
Prompts	None	Butterworth '10 lessons' see appendix 3	'Setting up Learning Alliances' document (see Ashley, et al., 2010b)	Based on feedback given by Monash University (see results section table 4.10)	Based on results of 'Stakeholder analysis questionnaire meeting 1'	None
Questions or topic sequence	None	None	None	None	None	None
Self instructions	None	None	None	None	None	None
Data analysis method	Notes taken	Minutes taken (see appendix 3)	Notes taken	Notes taken	Notes taken	SAK toolkit (Kennedy 2010)

Table 3.12 Interview techniques employed in MARE interviews

3.5.5. West Garforth dweller engagement – verifying receptor data

The West Garforth receptor engagement was a stand-alone activity organised outside of the remit of the three case studies undertaken during this PhD research. The participants in the engagement consisted of members of the West Garforth flood group who also participated in the West Garforth IUD case study. The residents were introduced to this PhD research during the West Garforth IUD case study, and agreed to take part in this additional engagement process. The purpose of the engagement was to enter into a structured discourse with the residents to *evaluate* the three core research components identified during the action research.

The flooding that these residents were subject to was caused by storm events initiating a combination of minor system capacity exceedance and exceedance of culverted watercourses which caused overland flow which then entered properties. Photographs of the flooding, taken by residents, can be found in the Appendix.

3.5.5.1. Activity associated research questions

Table 3.13 indicates the research activity, and the research sub-questions which the activity addressed. In addition Table 3.13 indicates the rationale supporting the use of each particular research activity to address each research sub-question.

Research activity	Research sub-question addressed	Rationale behind research activity selection
Stakeholder engagement - West Garforth RSHs	Overview	This dweller engagement provided an opportunity to engage dwellers who are considered to have a relatively high capacity due to their involvement in the West Garforth IUD pilot, and a relatively sophisticated flood group allowing deeper exploration into the notion of EPR
	2a	Exposure to such dwellers who are already members of an advanced level FG would likely yield pertinent information regarding the efficacy of such a group as a Capacity Building regime.
	2b	In addition, information regarding implementation and maintenance of such a group would also be accessible
	3a,b,c,d	Exposure to such dwellers would allow what may be described as an 'advanced' exploration of the notion of EPR meaning that high quality and specific data regarding scope, initiation, acceptability and maintenance would be accessible
	4a	Exploration of which roles may or may not be acceptable and under which circumstances will be possible during engagements
	4b	Exposure to such dwellers would provide similarly 'advanced' information with regards to Formalising Stakeholder Interactions in respect of the efficacy of approach and acceptability to RSHs
	4c	Exploration of acceptable and appropriate modes of formalisation of interactions will be achievable particularly as these dwellers are more likely to 'conceptualise' the system 'working'

Table 3.13 Research activity, associated question and activity rationale

3.5.5.2. Research activities

The forum tool place on 15th June 2009 at Ninelands lane Primary School, Garforth, not all the dwellers who attended the forum accepted interview, those that did are indicated in table 3.14, (also see appendix 3 for a photograph taken at the forum). Table 3.14 indicates the dates on which the interviews took place and information regarding the number of times the residents had flooded and the length of residency in West Garforth.

Name	Post code	West Garforth resident since	Number of times flooded	Date of engagement
Mrs A	LS25 1AU	~1978	Unknown	01/06/10
Mr A	LS25 1AU	~1978	Unknown	01/06/10
Mrs B	LS25 1AU	1961	8	02/06/10
Mr B	LS25 1AU	pre-1950	Unknown[46]	02/06/10
Mrs C	LS25 1AU	1989	7	03/06/10
Mr C	LS25 1AU	1989	Unknown	03/06/10
Mr D	LS25 1NT	1977	3	04/06/10
Mrs E	LS25 1ES	Unknown	Unknown	04/06/10
Mr E	LS25 1ES	Unknown	Unknown	04/06/10
Ms. F	LS25 1AX	~1960	Unknown	07/06/10
Mr G	LS25 2BS	~1967	Unknown	08/06/10
Mrs G	LS25 2BS	~1967	Unknown	08/06/10
Mrs H	LS25 1BP	~1986	Unknown	10/06/10
Mr H	LS25 1BP	~1986	Unknown	10/06/10

Table 3.14 Indicating date of engagement, postcode of dwelling, number of times flooded and length of residency in West Garforth

3.5.5.3. Methods

The West Garforth dweller engagement featured a forum, followed by a two week engagement period consisting of one-to-one interviews with members of the West Garforth flood group. The purpose of the forum was to formally introduce the research to the group and to invite the individual residents to take part in the interview process.

The forum was publicised to the members of the group by the flood group leader, and it occurred in place of one of the standard flood group meetings. The approach to the forum follows the ethical stance and techniques outlined at the beginning of this methods chapter. Sandwiches were provided for attendees of the forum, and the format was informal. This PhD research was introduced at the start of the forum, and a structured discussion with the residents was achieved and a consensus of understanding reached. Dwellers who took part in this engagement process were invited to do so through the West Garforth flood group leader after the forum described above. Not all those who attended the forum accepted the invitation for a further interview. Those who chose to take part in the dweller engagement are shown in table 3.14 above. The names and addresses have been removed and replaced with a code for purposes of data protection.

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[46] Discrepancies in the data obtained from married couples regarding the number of times flooded (see Mr & Mrs B, and Mr & Mrs C) are explained by the fact that the data was recorded in separate questionnaires, and the likelihood is that one partner in the marriage had forgotten the exact number of times they had been flooded.

The one-to-one interviews took place during a two week period. Each resident was contacted directly and a time was arranged. The interviews took place in the residents' houses for their comfort and convenience. Each interview was done with the researcher and one receptor stakeholder and took on average one and a half hours. Although in many cases there was more than one person per household to interview, it was deemed advantageous to perform the interviews on a one-to-one basis to avoid the interviewees influencing each others' responses. The interviews were structured according to the objectives outlined at the beginning of this section. While these objectives were the primary theme of each interview, it was necessary to allow the interviewee to guide certain aspects of the dialogue. This was necessary since it was identified that the interviewees in many cases required information, or needed to discuss a particular topic. In such cases it was deemed appropriate to incorporate such discussions into the interview for reasons outlined in the action research section above, namely such exploratory discussions can often yield an important and relevant perspective on the issue being discussed. The box below indicates the themes guiding the researcher during the interviews.

- Ask if the dweller has any questions of queries about the interview process.
- Introduce key research themes: Local knowledge, Professional equivalence.
- Explain the PhD research.
- Explore the following themes: local knowledge, professional equivalence and efficacy of automating *some* stakeholder interactions using technology systems.

In order to analyse the data obtained during this engagement, it was necessary to devise an appropriate method to record the data. A transcription method was utilised during the tactical engagements in the Glasgow (NSR) study, but was deemed not appropriate here. The amount of research time necessary to transcribe the Glasgow (NSR) engagements was significant. Since it was clear that the volume of information obtained during the West Garforth engagement would be greater, an alternative method was required that would still allow acquisition of high quality data, while not precluding its analysis. The approach adopted was to hold open interviews, structured around the points outlined in the introduction to this section in an attempt to retain topical coherence throughout the interview. The interviews were all recorded but not transcribed. During the interview notes were taken, and salient points were recorded temporally in order that they could be reviewed easily afterward. Upon conclusion of

the interviews, the transcripts were listened to again after to ensure that salient data had been noted.

Interview technique	Forum	Two week dweller engagement (all interviews)
Interview style	Semi-structured	Semi-structured
Interview type	Group	One-to-one
Question type	Open	Open
Prompts	See appendix	See box above
Questions or topic sequence	See appendix	See box above
Self instructions	See appendix	See box above
Data analysis method	Interview digitally recorded (audio analysed and pertinent points taken – see results chapter)	Interview digitally recorded (audio analysed and pertinent points taken – see results chapter)

Table 3.15 Interview techniques employed in West Garforth dweller engagement

4. Chapter 4 - Results

4.1.   Introduction

This chapter contains the data obtained during the research activities outlined in chapter 3: Methods. The data is categorised into sections comprising each research activity. The data in each section is further categorised into the research question that the data contributes to answering allowing the reader to follow the logic used toward analysis of the data in chapter 5: Analysis.

The results of this PhD research are illustrated in a table per research activity (see tables below). The columns in each table highlight the categories of information needed to support the research hypothesis. The column headings for each table are consistent throughout the results aside from instances where a particular column is unnecessary. The column headings in each table are as follows:

- *Subject:* The overall *topic* to which each data items relates.
- *Finding:* The finding relating to the *subject.*
- *Research implication:* This column outlines the way in which the *finding* contributes to the conceptual framework as a *whole*: the framework is considered to be comprised of many details, and it is understanding how these details *integrate* to form the framework which is the aim of this PhD research. Therefore the research implication column highlights how each individual finding *may* contribute to the framework.
- *Organisation:* The organisation to which the research *participant* belonged.
- *Department/ role:* Further details regarding the research participant.

The data obtained from the Glasgow (NSR) case study and the West Garforth stakeholder engagement originated from stakeholder engagements. The dialogues were recorded using a digital voice recorder. In most cases the recordings were transcribed. Instances where transcription did not take place were due to either financial constraints imposed on the project or where the quantity of text was too great to feasibly transcribe. In cases where the engagement was transcribed, but is still too lengthy for the Appendix, only the comments that are used as data sources are included in the Appendix, this is described in the text below as

'summarised transcriptions'. Each instance of engagement recorded below details the source of the information and whether it was transcribed. Instances where transcription did not take place, an alternative method of recording the data is given.

The data obtained from the West Garforth IUD case study was obtained during a desk based study focussing on analysis of data presented to the Pennine Water Group by Leeds Metropolitan Borough Council (MBC) for the purpose of contributing to development of the surface water drainage system model for West Garforth, part of the remit of the West Garforth IUD study (see Defra 2008). The data from Leeds MBC consisted of questionnaires, dweller photographic and video evidence, dweller letters written to Leeds MBC and historical data held by dwellers. Each data source had an associated address to relate it geographically to the catchment. The source of each item of data is given.

The data obtained from the MARE case study originated from meetings with stakeholders and facilitators of the MARE project and from Learning Alliance meetings. The sources of the data come from minutes of these meetings, feedback from researchers regarding the stakeholder analysis methodology and results of the stakeholder analysis performed on members of the Learning Alliance. The source of each item of data is given.

4.2.   Findings relating to ethical considerations

While the ethical code imposed by the University of Sheffield[47] is relatively comprehensive in its objective to protect the researched and the researchers, it was identified that it was necessary to develop the approach further in order that it was appropriate for the research activities undertaken here. The following paragraphs illustrate the experiences during this research which lead to this conclusion.

With respect to engaging Receptor stakeholders it was necessary to devote a significant amount of research time to ethical issues, namely the effect of the research approach on those being researched and its impact on the research data obtained. Clearly it is not productive to enter a research engagement if ethical constraints themselves preclude data acquisition. However, it was identified during the Glasgow (NSR) pilot engagement that the distinction

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[47] As outlined in the Methods chapter.

between ethical and non-ethical practice was nuanced, meaning some unethical practices would not be picked up by university ethics procedures alone. The example evidencing this point was related to the way receptor stakeholders (involved in the Glasgow (NSR) pilot dweller engagement) had been engaged in a prior research project on a similar theme (see table 4.6 below). At the end of the engagement, the researchers published their findings academically, but neglected to inform the research subjects themselves of what they had found. From the perspective of the research subjects, they were being 'ignored', the result of which being a negative feeling toward the researchers and the research process itself. Arguably, the researchers may not have acted in a purposefully unethical manner but the results of their actions were that the research subjects were reluctant to be researched again. The implications for this research were that it was necessary to rebuild the trust between the research subjects and the researchers to enable a productive engagement for both parties.

A further issue was identified regarding the effects of the research process itself on those being researched and the effect on the research data obtained during involvement in the MARE case study. During the case study in question it was deemed necessary to attend the Wicker Community Forum[48], an action group organised by receptor stakeholders in Sheffield, a mixture of businesses and residents. Attendance of the meeting was on an informal basis and as such no evidence of the activity is available. It became apparent that researchers from two different University of Sheffield departments had representatives performing research activities at the forum but their presence was unknown to each other. The effects of this situation on the research subjects themselves (The Wicker Community Forum) was one in which the University appeared to be 'incompetent' in that it did not know what its 'staff' were doing. The impact on the trust between research subjects and researchers in this instance could again be significant. Arguably, in reality it would be complex with respect to university ethical procedures to coordinate research departments and their activities in a way which precluded this type of occurrence.

In concomitance with these findings and the University of Sheffield ethical research procedures, the research methodology implemented during this research was adjusted

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[48] This meeting was held at South Yorkshire African Caribbean Business Centre (SYAC ltd), 120 Wicker, Sheffield, S3 8JD on 1st June 2009.

accordingly. As such the research subjects have been made aware that the overall research findings will be made available to them. In addition the research subjects have been kept informed of the research progress throughout this PhD. Additional ethical findings relating solely to a particular research activity are detailed below in the appropriate section.

4.3. Case study - Glasgow (NSR)

4.3.1. Introduction - Glasgow NSR stakeholder engagements

As outlined in chapter 3: Methods, the data collected during this period of research was obtained through five sets of meetings with tactical stakeholders associated with the Glasgow Strategic Drainage Plan (GSDP), and a pilot engagement with the receptor stakeholders in Glasgow. Details of these engagements including a summary of the purpose of each meeting can be found in table 3.3, chapter 3: Methods.

4.3.2. Meeting set 1 - main stakeholders

Table 4.1 indicates the results obtained from meeting set 1 with tactical stakeholders. The meetings were recorded but not transcribed though detailed notes were taken by two researchers (Richard Newman and Professor Richard Ashley) which can also be found in the Appendix.

Relating finding to research question		Subject	Finding	Research implication	Organisation(s)	Department(s)/ role(s)
1, 2a	*Meeting 1a*	Receptor SH role in relation to tactical SH capacity	Reluctance to 'involve community without fully understanding the problem [from professional perspective - flooding in urban catchments] first'	Barrier to RSH inclusion: assumption that the 'problem' *is* conceivable may delay benefit	Glasgow City Council	Development and regeneration services, strategic drainage group (GSDP)
		Perceived (tactical) benefits of community involvement	Acknowledgement that appropriate 'community involvement' could be beneficial in terms of delivery of appropriate responses [both utility and amenity]	Indication that receptor stakeholders have a role (tactical perspective), even if the role is not clear		
1, 2a	*Meeting 1b*	Knowledge and data storage	GIS seen as an appropriate platform for storage of data and knowledge. A significant benefit is reduced costs	Significant cost benefits of GIS and compatibility with existing systems	Renfrewshire Council	Assistant principle engineer
		Champions and role demarcation	Champions are necessary, but they must have both a budget and a technical understanding in order for delivery of appropriate responses	Role demarcation may allow appropriate context perception (among other benefits)		
1, 2a	*Meeting 1c*	Temporary/ household flood defences	Temporary solutions are often resisted by homeowners for example wishing to sell their houses	Implications for a 'systems' approach akin to the Dutch	Scottish Water, Hyder Consulting	Technical liaison manager, Asset Development Planning, Principle engineer
1, 2a	*Meeting 1d*	Resistance to engagement if not been flooded	When engaging public, there is often resistance from those who have not been flooded such as: 'why are you here?' The presence of 'professionals' can be perceived as actually initiating the problem	Implicates a link between the 'capacity' of Receptor SHs with respect to 'problem' admission which may have detrimental 'knock-on' effects	South Lanarkshire Council, SEPA	Flood Prevention officer, SEPA Flooding unit
		Knowledge and data storage (GIS)	Floodline (Scotland) maybe similar to the 311 service in New York (USA) where a database is kept of information recorded during flood emergencies	Implies an acceptance of such an approach		
		Power/ influence	Influence seen as being comparative to power	Economic implications;		

Table 4.1 Indicating the results of meeting set 1

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4.3.3. Meeting set 2 - Glasgow Strategic Drainage Plan (GSDP) stakeholders

Table 4.2 indicates the results obtained from meeting set 2 with tactical stakeholders from Glasgow City Council only since the discussions focused on the GSDP in relation to use of NSR. The meetings were recorded but not transcribed though detailed notes were taken by one researcher (Richard Newman) which can be found in the Appendix.

Relating finding to research question		Subject	Finding	Research implication	Organisation(s)	Department(s)/ role(s)
1, 2a	*Meetings 2a*	Perception of effects of an 'informed public'	There is a perception that an informed public [Capacity Building] will mean that they become 'tooled up' for a conflict	Maintaining the 'status quo' of barriers between 'public' and 'professional'	Glasgow City Council	Area Planning & Sustainable development
		Common language	Differences in professional language [surveyors to planners for example] is reported as problematic	May support argument for GIS based communication		
		Departmental collaboration	A member of GCC says he has become a 'pain in the arse' by demanding collaborative working	Implications for a 'systems' approach		
		Dweller equivalent professional role	'the community are the experts of their own community' (Head of area planning, GCC interview 7th July 2007 – see table 3.4)	Conceptual basis for 'dweller equivalent professional role'		
1	*Meeting 2b*	Developers' manipulating planning guidance	Developers can get round planning rules very easily	Implies that a shift in *stake* on behalf of developers may be beneficial	Glasgow City Council	Landscape & environment
1, 2a	*Meetings 2c*	Champions, knowledge And career stage	Often departments run well because there is a champion with experience, knowledge and has been there some time, when that person leaves, all that leaves too. Also, often such people tend to be at the end of there careers	May support argument for a GIS based system to store knowledge, apprenticeships may partly address retirement and staff turnover	Glasgow City Council	Emergency planning
		Local knowledge among the tactical stakeholders	Restructuring of the MET office has removed 'local knowledge', since before people from the MET office knew the areas they were talking about personally	May support argument for creation of a knowledge store with equivalency to local knowledge (GIS)		
1, 2a	*Meeting 2d*	'Professional' knowledge has limits	It is important for the tactical stakeholders to emphasise that they do not know everything	Implications for the 'role' of receptor stakeholders	Glasgow City Council	City Planning
		Public have responsibility for raising awareness of issues	It is important that the 'public' are aware of their responsibilities to bring issues 'to the table'	Implications for the 'role' of receptor stakeholders		
		Professionals to identify awareness raising issues	It is a role of the professionals to identify areas of awareness that the 'public' would benefit from 'having' or 'increasing'	May be achieved through GIS		

Table 4.2 Indicating the results of meeting set 2

4.3.4. Meeting set 3 - Category 1 response stakeholders

Table 4.3 indicates the results obtained from meeting set 3 with tactical stakeholders from the Category 1 response services in Glasgow. Only the Police accepted an interview meaning that the perspectives of the ambulance and fire services could not be included in this thesis. The meeting was recorded but not transcribed.

Relating finding to research question	Subject	Finding	Research implication	Organisation(s)	Department(s)/ role(s)
1	Police have preparation 'role'	Preparation an unusual role for the police	Implications for the efficacy of Category 1 responders to have adjusted 'stake' in FRM	Strathclyde police divisional headquarters	Emergency response coordination
1	Police officer experience	Police officer experience has significant role: the interviewee knew through experience who would 'turn-up' at a flood event, for example from GCC etc	Negative implications for staff turnaround on continuity of approach		
1	People and procedures: a systems approach	For successful preparation and response: organisational framework *plus* the right 'people' are necessary	Implications for appropriateness within roles: automated (GIS) and human		
1	Communication problematic during event	Perception that during the event communication is the most significant difficulty. It is anticipated that this will always be so	Implications for more *effective* and *appropriate* preparation (communication and knowledge in GIS)		
1	Partnerships with other stakeholders	The police perceive that they have improved 'partnership working' (communities, other tactical stakeholders)	Implications for role 'broadening'		

Table 4.3 Indicating the results of meeting set 3

4.3.5. Meeting set 4 - main stakeholders

Table 4.4 indicates the results obtained from meeting set 4 with tactical stakeholders associated with the GSDP. The meeting was recorded and transcribed. The summarised transcription from which table 4.4 was generated can be found in the Appendix. Each comment in the table has a reference number associated with it to enable ease of reference to the source material.

Relating finding to research question	Subject	Finding	Research implication	Organisation(s)	Department(s)/ role(s)	Ref
1	Emergency response and planning	Effective emergency response requires all local authority departments to function in an integrated manner *before* the event	Learning Alliance approach may encourage collaborative attitude providing pressure to change working practice	Renfrewshire City Council	Assistant principle engineer	RC01, 5
1, 2a	Sand bagging discussion	While sandbags can provide protection from flooding the circumstances of which are specific. Reported here are instances where sandbags provide psychological relief but little apparent protection. The level of capacity of both receptor and tactical stakeholders has significance since some tactical SHs are of the opinion that sandbags do nothing	Cost implications if the role of sandbags is predominantly psychological	Glasgow City Council, Scottish Water, Renfrewshire Council, SEPA	Landscape & environment (GCC), Technical liaison manger (SW), Emergency planning (GCC), Assistant principle engineer (RC), SEPA flooding unit (SEPA)	S7
1	Developers, planners and the 'economic' stake	In the context of developers' interest and financing new developments; an economically dominant stake will always override other types of stake - planning legislation is perceived as being insufficient as a tool to redress the balance	Adjusting the *stake* developers have in a project may encourage greater *sustainability*. This approach was attempted in MARE (see section 4.5 below)	Glasgow City Council	landscape & environment	GC05, 8
1	'Human' related issues within organisations: effect on FIM	Career security, department reorganisations, retirement etc., can effect information continuity held within that department: personal decisions, then can affect the workings of a tactical department	Appropriate centralised storage (GIS) of data may alleviate	Scottish Water	Technical liaison manager	SW01, 9
1, 2a	Problem acknowledge-ment	There is consensus among the TSHs that admitting problems, then acknowledging them to the 'public' is problematic	Implications for the current 'system': difficulty balancing variable capacity 'public' expectation with reality	Renfrewshire City Council	Assistant principle engineer	RC01, 11
1, 2a	Low 'public' capacity	In a context of emergency response: varied and inconsistent public capacity can mean that some responses available to the tactical SHs cannot be used because the 'public' may not	This has implications for the efficacy of raising receptor stakeholder capacity	Renfrewshire City Council	Assistant principle engineer	RC01, 12

		understand their efficacy				
1, 2a	Risk aversion	People tend not to like risk; temporary measures are often removed by the house holder because it makes their house stand out.	Implies a discrepancy requiring subterfuge: implications for a 'systems' approach	Scottish Water, Glasgow City Council	Technical liaison manager (SW), landscape & environment (GCC)	SW01, 18; SW02, 18; GC05, 18
1	Role of legislation?	There is a consensus that the 'responses' themselves (either structural or non-structural) are well understood but that the mechanism for implementing them is not. This is viewed by tactical SHs as being a legislative barrier	Potentially similar to the economic issues with developers: if legislators were an appropriate part of a Learning Alliance their stake may become adjusted toward a more appropriate contribution to the whole.	Scottish Water	Technical liaison manager	SW01, 21
1	Public vs. private as tactical stakeholders	It is suggested that the problem in Scotland may be simpler than in England due to the organisations involved being public bodies as opposed to private (like the water authorities)	Implications for the difficulties in stake caused by the differences in involvement of public and private bodies	Glasgow City Council	Development & regeneration services	GC01, 22
1	Centralising pertinent knowledge	The question is posed, regarding 'knowledge', would it be a good idea to have a centralised database of all the knowledge.	Implication for a 'systems' approach is positive, however the current 'system' may suffer (DG5 register problems in England as an example)	Kaya Consultants	Independent Flooding Consultant	YC01, 22
1, 2a, 4a	'uninformed-public' involvement	There is concern among the TSHs about 'uninformed – public' involvement, i.e., the 'public' acting on taking measures into their own hands.	Lack of structured 'engagement' with the public can lead to indirect intangible impact			
1, 4a	Role of knowledge	A broad knowledge base within tactical stakeholder groups is identified as a critical component of a non-structural approach.	Implications for use, storage and dissemination of knowledge (GIS) since further tactical 'education' problematic	Glasgow City Council	Landscape & environment	GC05, 13

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1, 4a	Scientific knowledge and 'dumbing' it down for accessibility	Converting 'scientific' knowledge into useable, non-'dumbed' down information that is of use to all stakeholders is problematic. Examples given of conflict within organisations (between PR and technical staff) where information was thought by some to be 'too technical' to be understood. It is suggested that each aspect of 'knowledge' may be presented at different 'levels' appropriate to who is using or viewing the knowledge. A problem with this approach is that there is still a risk of appearing to 'dumb down' knowledge if the level of separation is not done sensitively	Implications for GIS applicability where information can be 'translated' for use at different 'levels'	SEPA, Glasgow City Council	SEPA flooding unit, Landscape & environment	GC05, 16; SE01, 15
4a, 4c	Awareness of 'at risk' locations	Necessary for ALL stakeholder groups to be made aware of at risk areas, including associated area peculiarities such as access difficulties	Theoretically straightforward using a GIS accessible by all tactical SHs	Scottish Water	Technical liaison manager	SW01, 6

Table 4.4 Indicating the results of meeting set 4

4.3.6. Meeting set 5 - Flood Liaison Advisory Group (FLAGs) stakeholders

Table 4.5 indicates the results obtained from meeting set 5 with tactical stakeholders associated with Flood Liaison Advisory Groups (FLAGs). The meeting was recorded and transcribed. The summarised transcription from which the table 4.5 was generated can be found in the Appendix. Each comment in the table has a reference number associated with it to enable ease of reference to the source material.

Relating finding to research question	Subject	Finding	Research implication	Organisation(s)	Department(s)/ role(s)[49]	Ref
1	Core FLAG strength: allows separation from other agendas such as economic considerations	FLAGs actively tend to not get involved in economic issues (such as the costs) so they can focus on providing 'appropriate' solutions	Implies a benefit from 'blue sky thinking' approach	Renfrewshire Council		RC02, 5
1	Non-engineers' perspective of engineers	Referring to a comment GC01 had made in an earlier meeting; 'he's an engineer. He sees it in those terms'	Implies that in the experience of this individual the engineers approach is a 'silo' approach	Glasgow City Council	Development & regeneration services	GC08, 9
1	FLAG origin with Scottish Government	FLAGs as an idea originated with the Scottish Executive, the perceived result is that 'they were a good idea, representing massive benefits in terms of officers' time'	Implicating the efficacy of the FLAG/ Learning Alliance approach	Glasgow City Council	Development & regeneration services	GC08, 11
1	FLAGs as Continuing Professional Development (CPD)	FLAGs are seen as similar to CPD	This concept is not dissimilar to Learning Alliances and Capacity Building	Renfrewshire Council		RC02, 12
1	Perceived changes in flooding	Flooding used to be something that happened 'every generation', now it happens every year or two	This may have beneficial implications for maintaining system memory	Glasgow City Council	Development & regeneration services	GC08, 18
1, 2b	FLAGs origins	FLAGs started post 1995 flood, and originated from NPPG7: 'whoever' started up the FLAGs was well aware of the need for having planners and engineers sitting together	Implications for role demarcation, efficacy of the Learning Alliance approach	Glasgow City Council	Development & regeneration services	GC08, 4
1, 2b	FLAGs processes timescale	Attendees of FLAGs tend to be those from organisations and/ or institutions with the capacity for 'staying power' such as the public sector.	The 'slow' timescale may exclude some Tactical stakeholders (such as developers)	Glasgow City Council	Development & regeneration services	GC08, 3

[49] The department of the second interviewee is unknown

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1, 2b	'Power' of FLAGs	FLAGs are deliberative bodies and do not hold actual power. Their 'power' lies in persuasion and influence	Implies efficacy of the Learning Alliance approach providing there is capacity to act on the outcome of the FLAG deliberation	Glasgow City Council	Development & regeneration services	GC08, 3
1, 2b, 2c	Benefits of having stakeholders with similar capacities	There are perceived difficulties in reaching a consensus regarding a problem if those making the decision have varied capacities with regard to flood management	This implies efficacy in maintaining similar stakeholder 'scales' for FLAGS or Learning Alliances, ideally the pertinent information from each stakeholder group can be shared	Glasgow City Council	Development & regeneration services	GC08, 14
1, 2b, 2c	Exposing the learning process in FLAGs	The FLAGs members' are *concerned* about inviting the public since the FLAGs are a fora for the tactical stakeholders to build capacity it is felt inappropriate to expose this to the 'public' due to the consequence on public confidence	As per comment GC08, 14 this also indicates efficacy with respect to maintaining stakeholder scales for FLAGs or Learning Alliances	Renfrewshire Council		RC02, 15
1, 2c	Political representation at FLAGS	Political representation at FLAGs is actively discouraged since it gets in the way of 'doing business'	Implies subterfuge is necessary to deliver. A 'systems' approach may negate the need for this type of approach	Glasgow City Council	Development & regeneration services	GC08, 4
1, 2c	Political agenda can 'twist' FLAG recommendations	Problems with the FLAGs only *informing* the political agenda is that the outcomes of the FLAGS can be twisted to suit the agenda. Therefore suggestions are at risk of being subject to local political pressures	Implies that an adjustment of the political *stake* (in accordance with comment GC08, 4 above) with respect to FLAG may be beneficial (toward a 'systems' approach)	Glasgow City Council	Development & regeneration services	GC08, 7,
1, 2c	FLAG 'cycle' understanding an iterative experience	This first 10 years on FLAGs is referred to as 'the first iteration' of the cycle: it is referred to as an 'educational experience' and 'we are much better at it now'	Positive implications for the 'try it and see if it works' approach	Glasgow City Council	Development & regeneration services	GC08, 7

1, 2c	'Top-down' pressure from Scottish Executive	The FLAGs representatives perceive that the reason Scotland can make positive changes (in relation to England) is because the pressure comes from the Scottish Executive (now the Scottish Government) to the FLAGS, whereas in England it is the other way around (where Learning Alliances put pressure on the Government)	Implicates the necessity for a system-wide change from the perspective of a similar countries' successes	Glasgow City Council	Development & regeneration services	GC08, 13
1, 2c	The role of development capital	There is not the financial resources within the public sector to 'plan properly', these resources exist only in the private sector, thus inviting a compromise	Implications for adjusting the stake the private sector have in the issue: representatives at FLAGs and Learning Alliances	Glasgow City Council	Development & regeneration services	GC08, 16
1, 4a	Flooding awareness in the public domain	Awareness raising about flooding must be continuous since memory is only sustained by flooding events	This has implications for *appropriate* engagement with the 'public': initiating flood groups with the ability to lie 'dormant' when necessary may address this – the GIS plays a role here since although a group may be dormant it is still necessary to provide current information such as locations of nearby non-dormant flood groups	Renfrewshire Council		RC02, 17

Table 4.5 Indicating the results of meeting set 5

4.3.7. Glasgow NSR pilot dweller engagement

Table 4.6 indicates the results obtained from the pilot dweller engagement comprising informal discussions and interviews and culminating in a forum. The forum was recorded (aside from the first 25 minutes during which the recording device failed to pick up sound) and transcribed. The summarised transcription from which the table 4.6 was generated can be found in the Appendix.

Relating finding to research question	Subject	Finding	Research implication
1	Tactical SH perception of Receptor SHs	Tactical stakeholders were 'nervous' about researchers welfare in Shettlestone, however, the opposite was found: people were non-aggressive, sociable and welcoming	Implies a disparity between perception and reality which may prevent engagement
1	Frustration triggered by research	Frustration is felt by dwellers when researchers do not inform the researched of research outcomes	Implications for 'equal status' among stakeholders
1	'Jobsworth' attitude in tactical staff	Demarcation in the tactical organisations gives the impression of 'lack of a grand plan'	Implications for a 'system' wide change, however improved capacity and communication may provide benefit
1, 2a, 2b	Flood groups	Setting up of pressure groups in flooded areas desired by locals	Implications for the will and desire for Flood Groups (one role of a FG is as pressure group)
1, 2a, 3a	Receptor 'role' acceptability	People very keen to do something, happy to take action, but need guidance on what to do	Implies a willingness to act: such information could easily be managed using GIS
1, 3a, 3b, 3c, 4a	'Equivalent professional status'	Receptor SHs feel their 'comments' should be treated as 'equivalent' to professional stakeholder comments	Significant beneficial implications if managed appropriately: if receptor role is acknowledged by the tactical SHs this is likely to assuage trust and perception of exclusion issues
1, 3a, 4a	Desperation and the relationship to 'stake'	Those who attended were almost desperate for change: participants reported searching for solutions without any [tactical] support. Also happy to be 'proved wrong' by positive action from the professional stakeholders	Implies a willingness on behalf of the receptor SHs to perform or adopt a 'role'. Clearly such perspectives are driven by the stake provided by 'being flooded'
1, 4a	Receptor *stake* in relation to flood experience	Receptor behaviour with respect to management of flooding at household level is influenced by any experience of flooding: increased sensitivity to flood related issues	Implications for 'system' memory storage which is likely to reduce under no flooding circumstances: role for GIS
1, 4a	A need to lay blame	Many believed the council were to blame for most problems and weren't helpful	Implies that if this were not actually true then it could be managed with 'appropriate' engagement
1, 4a	Receptor SH perception of tactical SHs' perception	The 'Council' are scared of residents	Evidences a viscous circle exacerbated by lack of contact
1, 4a	Receptor perception post-flood	People felt isolated and excluded after the flood. They were not reassured as desired	Implications of not addressing this may be significant in cost terms, findings imply the efficacy of use of an appropriate GIS portal

1, 2a, 4a	Developing a 'system' language	Dwellers indicate a desire to better understand 'technical' aspects of their surroundings	Implies applicability to employ 'Descriptive Engineering[50]' techniques
1, 4a	Institutionalised communication improvements	Institutionalised improvements in communication required, lack of communication causes resentment	Since not all communications require direct contact, there are implications for the efficacy of appropriate GIS based communications for certain applications
1, 2a, 4a	Potential damage from hypothesising	Several comments regarding a belief that the 'lack of maintenance' in the area is a large contributor to flooding	Implies hypothesising among receptor SHs: there is likely efficacy in providing accurate information since this made lead to a desire for inappropriate solutions
1, 2a, 4a	Desire for 'big' solutions	Big solutions are desired (large storage tank mentioned frequently)	Implications that a lack of capacity or understanding can lead to a desire for inappropriate costly structural solutions
1, 4a, 4b	Trust	Trust in the tactical SHs is perceived as essential	Implies a significant positive impact if managed appropriately: GIS type approach can aid this
1, 4a, 4b	Results	Serious concerns with 'top-down' communication	Implications for benefit of horizontal communication provided by GIS based communications
1, 4a, 4b	Appropriate communication	It is acknowledged by one attendee that engineers may find it difficult 'to speak to these folk' (referring to engaging)	Implications for 'third party' [GIS] communication to address this difficulty, as opposed to inappropriately forcing communications
1, 4a, 4b, 4c	Receptivity to alternative receptor-tactical communication modes	Forum participants open to a web-based feedback forum providing it is likely to bring about change: It is seen as a method of informing the professionals' about problem areas (such as blocked drains). The GIS would also provide a platform for those voices who are too *shy* to be outspoken, but who may have important views.	Implies that direct communication between tactical and receptor SHs is not necessary (evidencing efficacy for a GIS) providing it is appropriately responded by the tactical SHs

Table 4.6 Indicating the results of the Glasgow (NSR) pilot dweller engagements

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[50] Descriptive engineering: a term coined during this project. Descriptive engineering means describing technical aspects of engineering in terms of their function. An example is a traditional dam, most people can conceptualise the function of a dam without having to understand the technical aspects required in order to design one. Context relevant examples may be; understanding of the basics of the major/ minor system interaction; dweller behaviour affect on flows, how grills function to prevent detritus entering, how water infiltrates into the system, how sedimentation occurs and its effect on capacity etc.

4.4. Case study – Defra IUD project

4.4.1. Introduction

As outlined in chapter 3: Methods, the data collected during this period of research was obtained through a desk study during which data obtained from Leeds MBC was analysed to identify information that would contribute to the development of the surface water drainage system model for the West Garforth IUD study (see Defra 2008).

4.4.2. Data used in the West Garforth IUD surface water drainage system model

The results displayed in table 4.7 below was taken solely from records obtained from Leeds MBC as part of the Defra IUD pilot study. These records originated from dweller data which included questionnaires, dweller photographic and video evidence, letters written to Leeds MBC and historical data held by dwellers. Each result is attributed to the property in which the data was sourced. In the case where the individual(s) residing in that property also took part in the final dweller engagement (see section 4.6), a coded reference is also included (for example Mr & Mrs B). If no coded reference is included, this indicates that the individual did not take part in the final dweller engagement. Please see table 4.7 which indicates the location in the Appendix where copies of these records can be found. The data obtained from Leeds MBC was assumed to be accurate and complete. No data was available regarding the source of flooding that occurred in each incident since these details were obtained from the dwellers only. This information contributes to answering *research question 3a*.

Postcode & data source	Number of flood incidents [1]	Years in Property [1]	Information used to build catchment flood model
LS25 1AU (Mr & Mrs C)	7	18	- 25th June 2007 at 11:50 the depth of flood water at the south-east side of the property is approx 250mm[2]. - By 15:00 the depth at the same location is around 750mm[2]. - The water continued to rise until the last photo was taken at 18:10 at which point the level is around 850mm. There are no more photographs to indicate whether or not the depth increased after this point[2]. - Initially (11:50) the water appeared to be coming from the south west, this is evidenced as the water is pooling around the house, but there is no flow of water down the driveway (the driveway goes from Barleyhill road to the house in a south-westerly direction). However, video files taken at 14:00[3] indicate that the water begins to flow down the driveway, depth approximately 25mm, flow rate appears to be just under 1m/s. by 15:10[3] the flow down the driveway has doubled in depth (at least) and the flow rate also appears to have doubled. There are no more video files before and after these indicated above. Therefore the time that the water began to flow down the drive was between 12:00-15:00. - The duration of this storm was at least 6 hours.
LS25 1AU (Mr & Mrs B)	8	42	According to the report of one resident, the depth of flooding around the above property is 21"[1], no date was recorded. This may be a maximum depth, there is no datum for this depth.
LS25 2AR (Property 1)	60	40	n/a
LS25 1ES (Property 2)	3	8	n/a
LS25 1JJ (Property 3)	4	26	n/a
LS25 1BP (Property 4)	3	-	n/a
LS25 1EH (Property 5)	2.5	10	n/a
LS25 1EH (Property 6)	20	27	12 June 2007, residents noticed surface water drains on Lidgett lane become blocked very quickly whenever it rains causing a large puddle of water[4].
LS25 1JQ (Property 7)	13	20	n/a
LS25 1JQ (Property 8)	180	30	n/a
LS25 1EJ (Property 9)	8	16	n/a
LS25 1EJ (Property 10)	15	12	Regularly has standing water in their cellar. Yorkshire water tell them it is due to groundwater and there is nothing to be done[5].
LS25 1EJ (Property 11)	33	33	n/a
LS25 1EJ (Property 12)	16	8	n/a

LS25 1NT (Mr D)	3	26	n/a
LS25 1AZ (Property 13)	-	-	20th may 1986: flood depth at rear of property approx 250mm, hard standing has been removed by residents presumably in an attempt to increase pervious area[6].
LS25 1JG (Property 14)	many	41	This information came from photos and not direct observation from resident: 13 June 2003[7] – photos depict surface water pooling in front of 2 Rydal avenue, depth approx 100mm, no further information. 8 September 1993[8] – photo depicts pooling of water in same location.
LS25 1AT (Property 15)	25	34	n/a

Reference: (all found in the Appendix):

1 – Defra Integrated Urban Drainage pilot questionnaire

2 – Photographs – Appendix – times were taken from the digital watermark left by the digital camera

3 – Video footage – times were taken from the digital watermark left by the digital video camera (not in Appendix)

4 – Letter from resident 12th June 2007

5 – Email from resident 22nd May 2007

6 – Photograph, date recorded in image title when digitally scanned by Leeds MBC

7 – Photograph, Appendix – times were taken from the digital watermark left by the digital camera

8 – Photograph, Appendix - date recorded in image title when digitally scanned by Leeds MBC

Table 4.7 data used in the West Garforth IUD surface water drainage system model

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4.5. Case study – MARE INTERREG project

4.5.1. Introduction

As outlined in chapter 3: Methods, the data collected during this period of research was obtained through meetings and interviews with stakeholders and facilitators of the MARE project and from Learning Alliance meetings.

4.5.2. Implementing Learning Alliances as Tactical Capacity Building regimes

Table 4.8 indicates the results of the meetings with Learning Alliance facilitators as outlined in table 3.11, chapter 3: Methods. The table details the findings relating to implementation of Learning Alliances as Capacity Building regimes for use within the conceptual framework, the aim of to this research. Table 4.9 details findings adapted from Butterworth J. (2009)[51] presented at the MARE stakeholder meeting on 22nd April 2009 regarding establishing Learning Alliances. The source document can be found in the Appendix.

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[51] 10 pitfalls in establishing learning alliances. Note presented at MARE WP1 meeting, UNESCO IHE Delft 22nd April.

Relating finding to research question	Subject	Finding	Research implication	Reference
2b, 2c	Implementing Learning Alliances	The SWITCH[52] project made mistakes early on in the project particularly with respect to the way the project was structured; not enough consideration was given to the whole life interactions of the project (i.e., future impacts from poor or not fully considered decisions made now)	Implies derived benefit from long term consideration of the LeA objectives at the start of the project	MARE minutes 2nd April 2009, item 1.2
2b, 2c	Champions	A leader or champion is an important aspect of a learning (and action) alliance	If champions are considered necessary by facilitators and stakeholders, there are implications for increasing the understanding of this role scientifically with respect to 'initiation' of champions in other LeAs	MARE minutes 2nd April 2009, item 1.2
2b, 2c	Stakeholder range	Important to include as wide a range of stakeholders as possible (land & water)	To enable a greater knowledge base for the Alliance. This corroborates the requirement for a stakeholder analysis	MARE minutes 22nd April 2009, item 3.1
2b, 2c	Delivery of 'quick wins'	There is a need to deliver some 'quick wins' to retain interest from stakeholders	While the efficacy of a quick win is apparent, care should be taken to not overshadow the long term objectives of the LeA	MARE minutes 22nd April 2009, item 3.2
2b, 2c	Buy-in from high-level stakeholders (Government and decision maker level)	It is important to get buy-in from the highest level stakeholders (governance level) for 'progress' to be made using the Learning Alliance approach	To initiate change, the LeA must convey findings to governance level stakeholders and decision makers in an appropriate manner, therefore consideration should be given to *their* stake in the LeA and how it relates to the LeA itself	MARE minutes 22nd April 2009, item 3.5
2b, 2c	Importance of a Stakeholder Analysis	Mistakes made in the SWITCH project: Many mistakes were made; stakeholders were not selected carefully, no appropriate stakeholder analysis was performed	Developing a *stakeholder* appropriate stakeholder analysis is essential and should be considered as thoroughly as possible before the stakeholder analysis is initiated. It is feasible that the importance of a stakeholder analysis is only overshadowed by the manner in which the stakeholder analysis is performed	MARE minutes 22nd April 2009, item 3.6
2b, 2c	Silos in the Learning Alliance	Governance and social inclusion were not addressed. Silos not identified in the early stages of the project were 'kept' or remained throughout.	The LeA approach is designed to address problems of silos (see Newman, et al., 2011) therefore care must be taken throughout the LeA process to reduce this.	MARE minutes 22nd April 2009, item 3.6

[52] http://www.irc.nl/page/28905 (Accessed 1st December 2010)

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2b, 2c	Type of facilitators	The SWITCH project was managed by researchers which meant non-inclusion of certain groups simply because the agenda tended to be steered toward research outputs as opposed to the project outputs.	A balance is necessary within facilitators to reduce the likelihood of a dominant agenda with respect to the facilitators. There are implications for the type of *stake* that the facilitators should have since this may influence the direction of the LeA and conflict with LeA members	MARE minutes 22nd April 2009, item 3.6
2b, 2c	Learning Alliance funding	In the SWITCH project, the LeA was not adequately funded from the outset (there was actually no funding at all initially for the LeA. The LeA was seen as an add-on and not important)	Availability of funding for a LeA relates to its ability to achieve its objectives. However, this relates to the *stake* that members of the LeA have with respect to confidence in the LeA approach, which in turn relates to appropriate structuring of the LeA in its early stages. The implications here are that the ability of the LeA to achieve its objectives is closely related to the manner in which the LeA in initiated	MARE minutes 22nd April 2009, item 3.6
2b, 2c	Separation of the LeA from research obligations	Being 'unburdened' with research obligations is important for the success of the LA	This suggests that any research agenda should be kept separate from the LeA agenda. It does not mean there cannot be a research agenda. The implications are toward appropriate structuring of the LeA in its early stages	MARE minutes 22nd April 2009, item 3.6
2b, 2c	LA management structure	In terms of role responsibility, care must be taken when formalising roles since this can lead to bureaucratic problems	Implies that a return to the 'silo' approach may occur if the stakeholder activities and positions within the LeA are not monitored. Implications for the benefit of an ongoing stakeholder analysis to ensure that an appropriate balance be maintained throughout	MARE minutes 22nd April 2009, item 3.6
2b, 2c	Continuity within the LA	Key people (champions) need to be retained in order for continuity within the LeA and its projects	While this is advantageous, it may not be feasible. Therefore benefit would be derived from further research into the nature of 'champion' with the objective of 'transference' of the role to another member if such a person leaves the LeA	MARE minutes 22nd April 2009, item 3.6
2b, 2c	Bottom-up 'approach'	A bottom up approach is preferable	Such an approach allows the members themselves to 'set' the agenda implying initiation of 'stake' necessary to create a LeA	MARE minutes 22nd April 2009, item 3.6
2b, 2c	Formal role of champions	In terms of a 'champion', the SWITCH project experience was that no 'formal' champion emerged, but there was an understanding that there were several champions within the group who performed particular roles	Benefit is implied by furtherance of the understanding of 'champion' since in a given LeA it is feasible that no particular champion(s) 'emerge' naturally. Implications for further research into the nature of 'champion'	MARE minutes 22nd April 2009, item 3.6
2b, 2c	Academic bias in the LeA	Care must be taken with an academically biased approach as it can 'drive' some stakeholders away	Implications for the efficacy of separation of academic and stakeholder objectives.	MARE minutes 13th November 2009, item 1.2

Table 4.8 Indicating the results of the meetings with Learning Alliance facilitators

Relating finding to research question	Subject	Finding
2c	An unrepresentative management structure	Involve legitimate representation of learning alliances (as users) within the project management structure and including involvement in budget allocation decision-making. Conflicts of interest between learning alliance representatives and investigative providers (e.g. whether the learning alliance facilitator or coordinator comes from an academic partner in the consortium) should be avoided or carefully managed.
2c	Unclear investigative priority setting processes	There should be a transparent mechanism for the process of priority identification (i.e. vision and short, medium and long term tasks, activities and investigations) by learning alliances, approval of learning alliance recommendations, investigative team formation, action planning and budgeting with communication back to the learning alliance at all steps. It is essential that the vision of the LAA is formed with the participation of all its members and is perceived to be a shared, common goal. It should be made clear at all times how the activities of the LAA relate to delivering the vision to ensure members do not perceive others of perverse behaviour.
2c	No flexibility in resource allocation	Don't allocate all resources in such a way that this cannot be modified, and don't allocate all resources to LeA activity that is not linked to clearly expressed LeA needs. A mix is usually best where some funds are allocated to activities identified by the LeAs (throughout the course of the project), and some to more investigative-led topics (may be from the outset or later, and may be less action-orientated). Learning alliances should also have some (even very limited) amount of flexible funding that is untied and can be used to address local needs as they emerge including additional investigative topics, additional documentation or communication activities etc.
2c	Misunderstanding stakeholders	Carry out a stakeholder analysis properly. Allocate sufficient resources to the task; ideally get support from a specialist with experience of institutional issues, and ideally don't continue with (very pressing and exciting) activities until this is completed.
2c	Wasting the capacity of facilitators	Avoid overloading facilitators, but also avoid setting up a structure where facilitators don't have enough to do and are just sitting around for the next team of investigators to arrive and are restricted to working as logistics managers or translators. Encourage facilitators to become task managers and action investigators themselves.
2c	Action research teams composed of only 'investigators'	Action research should be undertaken by teams selected and composed of learning alliance members: investigations by implementers supported by 'academics – or trained researchers'. Traditional 'researchers' then take a backstopping role playing key roles in planning, methodological development, training and supporting documentation. 'Researchers' often need a lot of support in adapting to this new but potentially challenging and rewarding role.
2c	Presenting results (at the end)	LAs will require a variety of outputs and will require frequent and regular sharing and discussion of results. Rapid and short cycles of action research and feedback are more desirable and more likely to lead to uptake than just sharing results at the end of a project. Providing appropriate and timely outputs for LeA members does introduce challenges for review and quality control, but can be compatible with also producing high quality external publications.
2c	Missing why changes occur	Develop a process documentation plan to ensure the *capture of why things happen* as well as *what happens* during the project. Process documentation needs specific skills (may require additional people) and consider taking time-out from other activities to focus on reporting (e.g. allocating every sixth month solely to reporting).
2c	Learning alliances on paper	Too often LeAs may be included in a project as a means to secure funding for an attractive idea and way of working, without an adequate understanding and commitment (in management, funding etc) to really changing the balance of stakeholder engagement in the process. It is important to ensure that stakeholders are aware of

		exactly what they possess a stake in and that this is reinforced throughout the setting up process.
2c	Underestimating the costs	Unfortunately, multi-stakeholder transaction processes are expensive. Costs of promoting change are also high and frequently underestimated. While many partners will readily contribute inputs in kind and their own time, the initial facilitation, training and Capacity Building inputs needed are considerable. It is difficult to secure additional funding later for such 'software elements' and since they are critical and needed at the start of a project especially, they should be fully funded from the main budget.

Table 4.9 findings relating to establishing Learning Alliances adapted from Butterworth J. (2009)[53]

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[53] Please see the Appendix for the source document from which these findings were obtained.

4.5.2.1. Stakeholder Analysis methodology development:

The following table charts the results of the progress made regarding development of the methodology to incorporate a stakeholder analysis into the overall Learning Alliance structure. The first stakeholder analysis was constructed based on the SAK toolkit (Kennedy S. 2010) in what may be described as a 'traditional' questionnaire format. This questionnaire is found in the Appendix. Table 4.10 indicates informal feedback regarding the content of the first stakeholder analysis questionnaire from researchers at Monash University, Victoria (Australia)[54]. The subsequent development of the stakeholder analysis methodology in response to this feedback is displayed in table 4.11.

Table 4.12 indicates the feedback given on the updated methodology during a formal meeting with Steven Kennedy[55] (post-doctoral researcher, member of Pennine Water group (PWG) and author of SAK toolkit (Kennedy S. 2010)) which was used for the stakeholder analysis during MARE study.

Relating finding to research question	Subject	Finding	Reference
2c	Stakeholder Analysis approach development initial feedback	Informal feedback from researchers at Monash University (Melbourne) regarding the stakeholder analysis questionnaire (see the Appendix) indicated that stakeholders would not respond since it was (i) too long (ii) too technical (iii) no feedback was given to the participants. It was felt generally that the questionnaire needed to focus more on respecting the time of the participants.	MARE minutes 5th august 2009, item 4.1

Table 4.10 Indicating informal feedback from Monash University on the first stakeholder analysis questionnaire

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[54] As this was informal feedback, no written record was kept: the information was passed verbally from researchers at Monash University to researchers at University of Sheffield

[55] http://www.shef.ac.uk/penninewatergroup/people (accessed 1st December 2010)

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Relating finding to research question	Subject	Change implemented to stakeholder analysis approach	Reference
2c	Response 1 to feedback: Respect of member's time	In order to respect member's time, it has been proposed to send a single question at a time (monthly or bi-monthly). Each 'question' must comply with a strict philosophy (max. word number, max. question length, language use restriction etc). Done through www.surveymonkey.com (each question/page must be identical each time to enable continued user familiarity with the interface).	MARE minutes 5th august 2009, item 4.2
2c	Response 2 to feedback: Encourage trust in academic facilitators	If the above philosophy is adhered to, it will encourage trust in the academic facilitators (Pennine Water Group – University of Sheffield) in respect of the stakeholder analysis process: When each 'question' appears in the users' email 'inbox', the user will know that it will only take a short amount of time and not require excessive 'thinking'. The philosophy behind this is that when filling in a multi-themed questionnaire, the mind has to 'reboot' to conceptualise each theme; for example the themes may cover drainage, public engagement, water reuse etc. For each new 'theme', the users' mind has to clear itself and re-think about the new question. This may lead to answers that are given to just 'finish the questionnaire as quickly as possible'. It is thought that this may be avoided by approaching one issue at a time.	MARE minutes 5th august 2009, item 4.2
2c	Response 3 to feedback: Informing user's of results	To address this criticism each subsequent new question sent to the user will contain relevant results of the previous question (for example: 'did you know that 56% of members replied that they would like to see a change in ...).	MARE minutes 5th august 2009, item 4.2
2c	Response 4 to feedback:	Each individual question will form part of a greater 'theme' which will be 'teased' out over the course of the questions, this will allow modification of the questions/ question type/ tone etc to maximise information gathering while remaining respectful of respondents time etc.	MARE minutes 5th august 2009, item 4.2
2c	Response 5 to feedback: Develop a constitution	To encourage a common 'stake' among users it is appropriate to develop a constitution representing the objectives of the alliance and each stakeholder. Linking the constitution to the efficacy of a stakeholder analysis will further encourage user acceptance of the stakeholder analysis	MARE minutes 5th august 2009, item 4.2
2c	Response 6 to feedback: Test the approach on appropriate academics before use	It has been proposed that the questionnaire be tested on a group of academics who are aware of the issues mentioned above in order to foresee and prevent any obvious problems	MARE minutes 5th august 2009, item 4.2

Table 4.11 Indicating responses to the stakeholder analysis methodology prompted by feedback from researchers at Monash University

Relating finding to research question	Subject	Finding	Change implemented to stakeholder analysis approach	Reference
2c	Employee turnover during the process	If implementing a 'questionnaire' process that runs over a long timescale, it is feasible that employees may join or leave the company causing potential knowledge discontinuities	If the stakeholder analysis approach is appropriate to its members (i.e., they consider themselves and/ or their organisation to have a stake) then there is a likelihood that the process of transferring the role to another staff member may be seen as important, in which case this aspect is dealt with by the member them self	MARE minutes 18th august 2009, item 5.2
2c	'Forgetting' about the topics in-between 'questions'	If topics or themes are issued on a single issue basis as shown above then there is a risk that the users may 'forget' previous topics	If the process is accepted by members then include a 'recap' section where the user can view previous data	MARE minutes 18th august 2009, item 5.2

Table 4.12 indicating feedback given on the updated approach to the stakeholder analysis

4.5.2.2.   Updated Stakeholder Analysis findings

Displayed in the Appendix is round 1 of the updated Stakeholder Analysis in accordance with the findings outlined in tables 4.10, 4.11 and 4.12 above. Table 4.13 indicates the levels of response to each part of the analysis as an indication of the acceptability of the method of approach. This information contributes to answering *research question 2b*.

Number of individuals invited to respond	Organisations invited to respond	Number of individuals who responded to Q1	Number of individuals who responded to Q2	Number of individuals that left feedback
44	Barnsley Council, Bradford Council, British Waterways, Chesterfield CC, CIRIA, Derbyshire CC, Doncaster Council, Doncaster MBC, Environment Agency, Forestry Commission, MWH, NE Derbyshire Council, Peak District, Peak District National Park Authority, RMBC, Sheffield CC, University of Sheffield. Yorkshire Forward, Yorkshire Water	14	14	7

Table 4.13 indicating the response rates to the stakeholder analysis

4.5.3. Learning Alliances as tactical Capacity Building regimes

Table 4.14 indicates the number of members in attendance of the Learning Alliance meeting over the period between 19th March 2009 and 1st October 2020 and the organisations to which the member belongs, and the number of members of the organisation at each meeting. Table

4.14 is the only recorded indication of the acceptance of the Learning Alliance approach to the members. This information contributes to answering *research question 2b*.

Learning Alliance meeting date	*Number of members in attendance*	*Organisations that the individual belongs to. Numbers in brackets indicate that more than 1 person attended from that organisation*	*Location of meeting*
19th March 2009	12	Black & Veatch, Chesterfield CC, Derbyshire CC [3], Environment Agency [2], Hansons, NE Derbyshire Council, Peak District National Park Authority [2], University of Sheffield [2], Yorkshire Water	Rotherham Metropolitan Borough Council (RMBC)
31st March 2009	22	Barnsley Council, Bradford Council, British Waterways, Chesterfield CC, Derbyshire CC [2], Doncaster Council, Environment Agency [2], Green Estate, RMBC [4], Sheffield CC [3], University of Sheffield [4], Yorkshire Forward	Rotherham Metropolitan Borough Council (RMBC)
19th June 2009	19	Chesterfield CC, Doncaster Council, Environment Agency, Green Estate, RMBC [6], Sheffield CC [2], University of Sheffield [5], Yorkshire Water [2]	Rotherham Metropolitan Borough Council (RMBC)
18th September 2009	24	Barnsley Council [2], Chesterfield CC [2], Doncaster Council, Environment Agency [4], NE Derbyshire Council, RMBC [5], Sheffield CC [4], University of Sheffield [4], Yorkshire Water	Rotherham Metropolitan Borough Council (RMBC)
11th December 2009	19	Chesterfield CC [2], Derbyshire CC [2], Doncaster MBC, Environment Agency, MWH, Peak District, RMBC [4], Sheffield CC [4], University of Sheffield [3]	Rotherham Metropolitan Borough Council (RMBC)
23rd July 2010	19	Barnsley Council, Chesterfield CC [2], Derbyshire CC, Doncaster Council, Environment Agency, Hull CC, JBA, RMBC [3], Sheffield CC [5], University of Sheffield [2], Yorkshire Water	Rotherham Metropolitan Borough Council (RMBC)
1st October 2010	18	Chesterfield CC, Derbyshire CC [2], Doncaster Council [2], Environment Agency [3], JBA, RMBC [5], Sheffield CC, University of Sheffield [2], Yorkshire Water	Rotherham Metropolitan Borough Council (RMBC)

Table 4.14 indicating the membership rates of the Learning Alliance

4.6.   Dweller engagement - West Garforth

4.6.1. Introduction

As outlined in chapter 3: Methods, the data collected during this period of research was obtained through a dweller engagement with members of the West Garforth flood group.

4.6.2. Results of the West Garforth dweller engagement

The dwellers found in table 4.15 – 4.24 below were invited for interview during a forum outlined in chapter 3: Methods. Five of the dwellers who accepted an interview also took part in the West Garforth IUD pilot. This information is detailed in table 4.7. The following data

has been taken from notes and audio files obtained during the engagements. Text in square brackets has been added to clarify the text where necessary. The audio files have not been transcribed due to the high quantity of text. As such each comment has been referenced to the point in time during the recording that the comment was made.

Relating finding to research question	Subject	Finding	Research implication	Ref
Mr A, 1st June 2010				
1	Household 'resilience' measures (such as flood guards, air grill covers, resilient flooring such as concrete, relocating electric points above flood water etc)	Household 'resilience' measures are not appealing, it would be time to leave when that became necessary	Evidences the ultimate need to reduce flood risk to an *acceptable* level	00:11:09
1	Making decisions without including 'local knowledge'	Antagonism is generated when decisions are made which do not account for local knowledge: instance is given of permission being granted for new development which does not account for hydrological conditions with regards adding to current system capacity and hence increasing risk of flooding	Evidences frustration felt at not accounting for data which is directly relevant to planning decisions. Implications for both increases tangible and intangible impact	00:24:20
2a	Perception of effects of urbanisation	Perception that the drainage has not kept up with the rate of urbanisation	Evidences hypothesising of causes of flooding	00:02:40
2a	Increased sensitivity to weather	Resident has increased sensitivity to signals that indicate a likelihood that flooding is imminent	Evidences a raised awareness caused by flooding	00:04:30
2a	Capacity Building	Resident capacity has been built by champion (and associated staff) within Local Authority	Implies a willingness to achieve a greater level of understanding in order to reduce Flood Impact	00:28:40
2a	Properties of a 'successful' flood group	West Garforth Flood Action Group is a success in terms of reducing impacts because the way it is run, it is now able to source funding	Implies the efficacy of the flood group approach, in addition that the structure of management is important for success, and that this structure can provide a template for transferability elsewhere	00:44:18
2a	Local 'measures'	Local measures are seen as beneficial due to residents' awareness of the constraints to building in an already 'developed' area	Implies a built capacity of the resident: structural responses are often inappropriate	00:49:00
2a	Tactical stakeholder responsibilities	Frustration over observation of organisations 'squabbling' over who is at fault or whose responsibility it may be	Implies, from the dweller perspective, that flooding is not the main issue. To the dweller it makes no difference. Implies a need for a transparent integration between tactical stakeholders	01:00:16
2a	Research seen as 'useful' from the dwellers' perspective	Defra pilot study very useful as it may generate funding for solutions in West Garforth	Implies an understanding of the efficacy of the research process with respect to reducing Flood Impact	01:01:00
2a	Perception of 'local' management' and a structural approach	Local management is acceptable as an approach, but only upon demonstration that there is no alternative [funding for	Implications for the efficacy of Capacity Building among receptor stakeholders	01:04:42

		structural defences]		
2a, 4a	Pressure groups as a representative 'voice'	Local pressure groups as voices of the residents	Implying a double benefit if the 'voice' can communicate in the most part through a GIS: the information can be used easily by tactical stakeholders and receptor stakeholders are 'listened to'	00:58:30
2a, 4a	Denial of flooding 'problem'	Many residents 'totally denied' there was a flooding problem even though 'their' house took weeks to dry out after the flood	Implications for an integrated approach: many dwellers do not declare their problems due to housing valuations or problems with insurance premiums	01:02:37
2b, 2c	Flood group member 'hierarchy'	Flood group member hierarchy: those who have been flooded more are generally 'higher' up	Implications that there is an appropriate 'management' structure for flood group, a template for transferability elsewhere	01:05:30
3a	'Tactical' champions	Tactical champions essential to ensure that 'things get done'	Implies difficulties for dwellers if there are no champions in the local authority: implies efficacy of a framework which can function in an equivalent capacity to the champion	00:42:05
3a	'Local knowledge' acquiring 'professional status'	Local knowledge needs to be given 'professional status' and could then be accounted for in planning applications	Implies a benefit to both tactical and receptor stakeholders: enhanced data for tactical stakeholders and a role for the receptor stakeholders reducing intangible impacts	00:47:05
4a	Insurance companies procedures increasing stress	Insurance companies can impose extra stress if they are not sympathetic to realities of flooding from dweller's perspective: instance given is of micro as opposed to macro management approach from insurance companies	Evidences a need to integrate tactical and receptor processes to avoid additional impacts	00:19:00

Table 4.15 results from Mr A, 1st June 2010

Relating finding to research question	Subject	Finding	Research implication	Ref
Mrs A, 1st June 2010				
1, 2a	Effect of flood risk denial	Reasons for not 'getting involved' stem from denial about being flooded. Only overcome by repeated flooding	Implies that dweller capacity is related to the number of times they experience flooding	00:32:00
1, 2a	Effect of limited flood 'experience'	Residents who have been flooded for the first time demand action 'now'	Implies a relationship between the number of times flooded and the perception of what is feasible in terms of 'responses'. The implications here are that those who are flooded most are more likely to accept a 'non-structural' approach	00:34:09

1, 2a	Flood group member hierarchy	The West Garforth Flood Action Group hierarchy is delineated by those who have been flooded the most	Implies that the flood group has a hierarchical structure which may provide the format for transferability elsewhere	00:37:04
1, 4a	Managing intangible impact	It feels better when someone is listening to you	Implications for reduction of intangible impact through Formalising Stakeholder Interactions	00:32:36
2a	Perception of inappropriate tactical stakeholder management structure	Perception that at 'higher level' [within tactical organisations, mainly local authorities] 'no-one is talking to each other'	Implications for an integrated approach: an objective of the Learning Alliance approach is addressing 'silos' within organisations	00:12:51
2a, 2b	Properties of the flood group leader	Leader of the West Garforth flood group is very organised, and understands the situation 'she has her finger on the button'	Implications for the efficacy of Capacity Building among receptor stakeholders	00:36:14
2a, 4a	'Professionals' scared of residents	It is perceived that 'professionals' are reluctant to attend the flood groups because they are 'scared' of the residents	Positive implications for Formalising Stakeholder Interactions to help address this	0:30:00 (recording number 2)
3a	Role of local knowledge	Acquisition of local knowledge by tactical stakeholders seen as essential in order to begin to relieve problems	Implies a willingness to provide data to the tactical stakeholders	00:14:13
3a	Loss of knowledge through 'streamlining'	'Black areas' were known to the council [when the council was run locally by Garforth Council – now taken over centrally by Leeds Metropolitan Borough Council] such as culverts that block regularly; this knowledge now does not exist other than in the minds of the residents	Implies that water management in West Garforth functioned more appropriately when locally run. The proposed framework could offer an equivalent situation by utilising dwellers as part of an integrated approach	00:28:17
3c, 4b	Formalising 'dweller' roles	'Formalised' local [dweller or receptor stakeholder] involvement is acceptable to this resident providing that it is *listened* to in order that it can be put into practice	Implies efficacy of roles for receptor stakeholders providing it is treated appropriately by tactical stakeholders	00:31:52
4a	Formalising dweller roles and appropriateness	Formalising the informal relationship between receptor and tactical stakeholders would be beneficial providing it is appropriate	Implications of receptor acceptance of the efficacy of the formalising hypothesis outlined in chapter 3: Methods	00:34:00

Table 4.16 results from Mrs A, 1st June 2010

Relating finding to research question	Subject	Finding	Research implication	Ref
Mr B, 2nd June 2010				
2a, 3a, 4a	'Hydrological' perception of surroundings	Water bodies have appeared where they did not before	Implies that receptor stakeholders' hydrological awareness of their surroundings	00:28:58
2a, 4a	Access to a flood group	Resident feels that 'everybody should have access' to flood	Implications for the efficacy of transference of	00:26:20

2a, 4a		groups, even if just for purposes of [support]	the flood group approach elsewhere	
2a, 4a	Communication flow with 'council' is perceived as 'top down' only	Perception that the 'council' 'don't ask' – that it is 'very dictatorial'	Implies that the current communication method may be contributing to increased intangible impact	00:37:19
3a, 4a	Local authority planning and local knowledge	Perception that planners do not investigate properly with respect to building new properties; cites an example of flooding in a new development that did not investigate properly – this knowledge is 'readily available' within locals	Implications for the efficacy of inclusion of local knowledge in an integrated approach whereby local information is accessible by tactical stakeholders	00:04:50
3a, 4a	Local authority planning ignores local knowledge	Perception that planning decisions are based using not enough information – this information is perceived as being readily available and accessible within locals as local knowledge	Implications that tactical data can be enhanced though acquisition of receptor stakeholder data	00:34:20

Table 4.17 results from Mr B, 2nd June 2010

Relating finding to research question	Subject	Finding	Research implication	Ref
Mrs B, 2nd June 2010				
1, 2a, 3a, 4a	Professional – dweller role reversal	'Reversed roles' – 'professional's don't like being told' – they have learned the theory but do not listen, 'they use a different terminology'	Evidences difficulty in the basic communication structure between receptor and tactical stakeholders: implications for the efficacy of formalising this communication using GIS	00:23:54
2a	Relationship between number of times flooded and expectance	People who have only been flooded once, and then attend the flood group demand action immediately – 'they expect someone to wave a magic wand'	Implies that a 'newly' flooded dweller is less likely to be able to contribute to the integrated process due to relatively lower capacity with regard to available responses	00:08:25
2a	Perception of household resilience measures	The 'small' measures [flood guards etc] that the local authority have installed are perceived by this resident as being 'token gestures' only	Implication for research to identify the usefulness of these measures, and Capacity Building to provide reassurance to dwellers (if they do work)	01:01:20
2a, 2c	Perception of the necessity of the presence of champions within local authorities	Champions within local authorities are seen by this resident as essential for action	Implications for furtherance of the understanding of the nature of 'champion' in order to address situations in other similar urban catchments in which no champions exist	00:52:26
2a, 3a, 4a	Perception of accuracy of local knowledge	Local knowledge is thought by this resident as very accurate	Evidences further frustration if the information is not accepted by tactical stakeholders: implications for further intangible impacts, and reduced knowledge on behalf of the tactical stakeholders	00:26:00
3a	Perception of role of 'small measures'	Small measures are see as essential such as fly tipping prevention and drain clearance	Implications for an EPR	00:15:07
3a, 4a	Importance of recording local knowledge	Important to be able to record local knowledge since if someone move it will leave – it needs to be catalogued somewhere	Implications for the efficacy of recording receptor information onto a GIS database	00:57:55

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3a, 4a	Perception of local knowledge and planning decisions	This residents also feels that local knowledge should be integrated into planning decisions		01:07:48
3c	notion of 'equivalent professional role'	Having an 'equivalent professional role' is acceptable because of the continued experience of flooding	May imply that receptor stakeholders have few options to reduce their flood risk	00:30:00

Table 4.18 results from Mrs B, 2nd June 2010

Relating finding to research question	Subject	Finding	Research implication	Ref
Mrs C, 3rd June 2010				
2a	Increased sensitivity to weather	This resident has developed an increased sensitivity to the type of rain that will cause a flood. This implies that the resident has learned to distinguish between different *intensity* and *duration* storms in the same way that storms are classified using *return periods*	There are implications for EPR and its relationship to Capacity Building since the residents are able to perceive such nuances as a result of being flooded	00:09:52
2a	Perception of those flooded infrequently	People who have not been flooded many times who attend the flood group are often 'bolshie', have the 'wrong impression' of what the group is for, and often come and talk about 'very random stuff': there is a difference between these people and those who have been flooded regularly	There appears to be a difference in *capacity* between those who have flooded and those who have not	00:32:17
2a	Flood is not incentive enough to move house – notion of 'home'	The notion of 'home' is very strong – it would take a lot to move out	Implies that moving out of the house (or home) is rarely an option for those who have been flooded	00:37:50
2a, 3a, 4a	Flood Action Group recommendations	This resident believes that the [local authority] council have listened to recommendations made by the flood group	Implications for the efficacy of the flood group with respect to reduction of intangible impacts	00:19:18

Table 4.19 results from Mrs C, 3rd June 2010

Relating finding to research question	Subject	Finding	Research implication	Ref
Mr C, 3rd June 2010				
2a	Problems with flood warning systems	This residents understands that warning systems are not accurate enough to forecast a flood event	Evidences built capacity among receptor stakeholders	00:22:41
2a, 4a	Flood group as voice of the dwellers	The flood group is seen by this resident as giving weight to his 'voice'	This implies a reduction of intangible impact due to *being listened to*	00:17:49

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2c	Origin of the flood group	The flood group 'emerged' out of the flood events since 2007	Implication for the basis of a flood group in a new urban catchment	00:06:18
3a	Flood group recognised by other tactical stakeholder groups	The flood group is perceived as having 'weight' with the environment agency and Yorkshire water	This implies a reduction in intangible impact as the dwellers are being taken seriously in regard of equivalent professionalism	00:21:30
3a	Flood group constitution	The flood group has a constitution which maintains its focus, there is 'no moaning' in flood group sessions – in addition it is understood that such [unconstructive] behaviour is unlikely to encourage action from local authorities	Evidence that the flood group operates in a similar manner to a 'professional' organisation: implications here are that this would allow ease of integration between stakeholder groups	00:21:30
3a, 4a	Flood group roles	Part of the remit of the flood group is to 'keep an eye on the drains'	Implies that receptor stakeholders already perform roles in an equivalent professional capacity	00:16:30

Table 4.20 results from Mr C, 3rd June 2010

Relating finding to research question	Subject	Finding	Research implication	Ref
Mr D, 4th June 2010				
2a	Flood group and intangible impact	The flood group provides 'comfort' in knowing 'I am not the only one'	Evidences that the flood group provides a measure of intangible impact reduction	00:08:36
3a, 3c, 4a	Professional equivalence	'sometimes when you give advice they [tactical stakeholders] think they know better as they have the plans in front of them', 'what you are saying cannot be right', 'they *have* the knowledge, because they are the *professionals*'	If this dweller was right, there are implications for the need for an appropriate *voice*	00:16:55

Table 4.21 results from Mr D, 4th June 2010

Relating finding to research question	Subject	Finding	Research implication	Ref
Mr and Mrs E, (interviewed together) 4th June 2010				
3a	Local knowledge	These residents believe they should be listened to, since they have knowledge of local hydrology	If this dweller was right, there are implications for the need for an appropriate *voice*	00:20:04
4a, 4b	Demarcation problems	The residents expresses problems regarding communication within local authorities	Implications to transfer *some* communications to GIS	00:39:28

Table 4.22 results from Mr and Mrs E, (interviewed together) 4th June 2010

Relating finding to research question	Subject	Finding	Research implication	Ref
Mr G, June 8th 2010				
2a	Tactical responsibility difficulties	Resident has awareness of the issues surrounding tactical responsibility for flooding	Evidences built capacity	00:08:19
2a	Local 'hydrological' knowledge	Resident has accurate knowledge and understanding of the flow characteristics during a flood (i.e., where it originates and how it progresses through Garforth)	Evidences built capacity	00:19:57
2a, 4a	Difficulty of acquiring information from those not willing to declare their flood risk	Engagement can be difficult since some people do not wish for insurance companies to be aware of their problem, therefore knowledge that may be held by these people is inaccessible. This resident concedes debating about whether or not to 'stay quiet' regarding their flooding	Evidences difficulties with the current approach	00:28:16
3a, 3b, 4a	Benefit of local knowledge, difficulty of obtaining it	It is the opinion of this resident that 'you can only do so much using professionals: local people are in the know'. Concession is given regarding the difficulty of obtaining this information from 'local people' particularly with respect to problems of denial of flooding incidents	Implies that use of local knowledge by tactical stakeholders will improve impact reduction	00:26:49
3a, 4a	Loss of knowledge through centralising local authority roles	It is the opinion of this resident that Garforth Urban District Council (ended in 1974) identified drainage problems which contribute to the flooding today	Implications for the need for a system of recording and sharing dweller information	00:44:05

Table 4.23 results from Mr G, June 8th 2010

Relating finding to research question	Subject	Finding	Research implication	Ref
Mr and Mrs H (interviewed together) 10th June 2010				
2a	Heightened awareness of weather	Report heightened awareness during 'intense rain'	There are implications for EPR and its relationship to Capacity Building since the residents are able to perceive such nuances as a result of being flooded	00:02:59
2a, 4a	Frustration at 'uncoordinated' professionals	Frustration felt regarding the apparent lack of coordination and communication between professionals	Implies that transparency in the overall process would be beneficial since there may not be a lack of coordination among professionals	00:16:58
2a, 4a	Effect of denial of flood risk	There is a perception that many people in Garforth are in denial about the floods suggesting there may be more properties at risk than are currently	Implications for an integrated approach: many dwellers do not declare their problems due to housing valuations or problems with	00:45:30

		acknowledged	insurance premiums	
2c	Importance of flood group leader	The flood group leader [in West Garforth] is perceived as pivotal regarding progress toward reducing the flood risk in Garforth	Implications for furtherance of the understanding of the role of champion	00:41:50
3a	'Willingness to act'	Displayed willingness to act and be involved in whatever capacity to reduce flood 'risk'	Implications for a willingness to act with professional equivalent	00:07:54
3a, 4a		These residents have installed an office in their house to manage all the communications necessary [with local authorities and other tactical stakeholders] to improve their situation		00:20:35
4a	Local measures/ defences such as constructions that will reduce the flood risk of the property, but which are funded by the property owner only	Residents were advised by Yorkshire Water to build their own defences, and did so	Demonstration of efficacy of *useful* and accessible information	

Table 4.24 results from Mr and Mrs H (interviewed together) 10th June 2010

5. Chapter 5 - Analysis

5.1. Introduction

The chapter is structured into three sections:

Section 1 – a critical analysis of the research design methods chosen to gather data:

- An analysis of the overall methodological approach, and;

- an analysis of the individual methodologies selected to obtain data during each research activity.

Section 2 – a re-contextualisation of the results obtained from the research activities in terms of the overall thesis aim:

- Data obtained during each research activity was analysed to obtain the salient findings, and;

- the data is aggregated to provide the basis for the conceptual framework.

Section 3 – presentation of the conceptual framework:

- The aggregated findings were analysed to present the conceptual framework.

5.2. Section 1 - Research method analysis

This section provides a critical analysis of the research design methods chosen to gather data during this PhD research. The section is divided into two parts; an analysis of the overall methodological approach, and; an analysis of the individual methodologies selected to obtain data during each research activity.

5.2.1. Research strategy analysis

As outlined in chapter 3: Methods, the *case study* was selected as the most appropriate research strategy for this research. The case study strategy is often criticised as a *stand-alone* research strategy and instead more commonly seen as a method of data collection only (see Yin 2003, Goode and Hatt 1952). This section outlines some common criticisms of the *case study* as a research *strategy*, and an overview of the steps taken to address these criticisms, in order to obtain *quality data*. Section 5.2.3: *Research activity specific analysis*, outlines the specific measures taken to address these criticisms.

* *Bias* - A criticism of the case study strategy is that the results may be biased by researcher views since the data obtained is more likely to be qualitative than

quantitative. This necessitates interpretation by the researcher as opposed to a quantitative analysis (Goode and Hatt (1952).

✓ To avoid problems of bias, Denzin and Lincoln (2005) suggest that the researcher needs constant input from *'conscience, from stakeholders and from the research community'*. The *embeddedness* of the researcher in a dual-disciplinary research context throughout the research project allowed a constant feedback toward *reducing* this bias.

✗ *Statistical representation* – the case study as research strategy is also criticised for its low statistical representativeness (Easton 2010, Hammersley 1994) and providing little basis for scientific generalisation (Yin 2003).

✓ Case studies are *'generalisable to theoretical propositions and not to populations or universes. In this sense, the case study...goal will be to expand and generalise theories'* (Yin 2003). Or as stated by other case study *scientists, 'the goal is to do a 'generalising' and not a 'particularising' analysis'* (Lipset, Trow and Coleman 1956 cited by Yin 2003). This complies with the aim of this research to provide a *conceptual* basis for a new approach to reducing Flood Impact in urban catchments. In addition, the case study *enquiries* were *longitudinal*, meaning investigative consistency was retained. The research participants themselves were not longitudinal, the case studies were based in different geographical locations but with similar demographics and within the same ethnology.

✗ *Unmanageable data quantity and analysis* - a further criticism of the case study strategy is the *quantity* of data generated (Devine and Heath 2009) leading to problems analysing that data.

✓ It was anticipated within the research design that a large volume of data would be obtained, and an appropriate method of gathering, recording and analysing that data was developed. It was considered that any approach that may limit the quality of data through constraining the research strategy was not appropriate. For example, questionnaires and surveys were considered as strategies, but such approaches would not yield the *depth* of data anticipated necessary to provide a conceptual framework appropriate to modify the socio-technical system, the aim of this research.

✗ *Stakeholder typology imbalance* – during group interviews and forums, individual characteristics of research participants (stakeholders) can overtly affect the research

outcomes. For example if a participant is particularly dominant then other participants may not feel comfortable speaking, meaning some *voices* are not heard proportionally in the research data.

✓ A stakeholder is defined by Freeman (1984) as *'any... individual who can affect or is affected by the achievement of the organisation's objectives'*, and while Kochan and Rubinstein (2000) criticise this definition as being too broad, it suffices to illustrate the point here: Supplanting *organisation* with *case study* it follows that there is a relationship between the stake an individual has in the output of the case study and the contribution that that individual will make toward that output. Mitchell, et al., (1997) and Frooman (1999) develop the notion of stake further by indicating that the type of contribution an individual will make is based upon possession of one, two, or three of the attributes *power*, *legitimacy* and *urgency*. The number and combination of these characteristics that a stakeholder has will influence their own behaviour, and can influence the behaviour of the other stakeholders and potentially steer a project into undesired trajectories. A stakeholder analysis (for example the SAK toolkit Kennedy S. 2010) is proposed as an integral component of the conceptual framework as a method of organising stakeholders in light of their possession of these characteristics in order that the project remains focussed on its goal.

5.2.2. Research design analysis

This section outlines some general criticisms of the research design chosen during this PhD research. Section 5.2.3: *Research activity specific analysis,* below outlines the specific measures taken to address these criticisms (where appropriate).

5.2.2.1. Action research design - analysis

Action research was used to *identify* the three core research components (stakeholder *Capacity Building, equivalent professional roles* and *Formalising Stakeholder Interactions*). The action research approach is justified based on the need for iterative knowledge exchange between researcher and research participant forming a feedback loop allowing accumulation of data leading to *attainment* of the three core research components.

A criticism of the action research approach lies in the nature of continuous collaboration of researcher and research participant throughout the research activities. If notions of 'collaboration and participation' are taken seriously, then the researcher runs a risk of losing 'some power of decision' about aspects of the design and data collection (Robson 2002).

5.2.2.2. Evaluation research design - analysis

Evaluation research was used as a research design in the third stage of the research to *evaluate* the three core research components identified in the second stage (*action research*). This entailed *re-presenting* these core research components to the research participants (Receptor and Tactical stakeholders) as entities in order to *evaluate* their efficacy with regard to FIR in urban catchments *and* stakeholder acceptance.

The strength of the evaluation research method is the ability to use mixed methods of data collection to obtain data (Robson 2002), meaning that the method can be adjusted if a *research opportunity* arises. As Jones (1985, cited by Robson 2002) puts it, *'use whatever you have in your toolbox that will get the job done'.*

This approach was invaluable for the evaluation research process since two different research strategies were required (mixed methods - *case study* and *analysis of archival information*). It was also necessary to take research opportunities when they arose. For example it was necessary, on occasion to clarify a particular aspect of the research during a 'chat' (*informal interview*) with a dweller during a site visit, or a professional during a meeting. This information contributed to the overall evaluation.

With respect to obtaining *quality* data, the evaluation research design was a useful method as it allowed high quality data since the research process was effectively continuous. The ability to collect research data in this way is also the main weakness of the approach since validation of the data is subjective.

5.2.3. Data collection

This section provides an analysis of the data collection techniques employed during this PhD research with respect to their appropriateness given the objectives and context of the research, and the research subjects.

5.2.3.1. Interviews

In this section, interviews are analysed with respect to their efficacy as data collection methods (summarised from Robson 2002). Specific examples of applicability of these points is given in section 5.2.3: *Research activity specific analysis.*

✓ The line of enquiry can be adjusted to suit the situation; for example, interesting points can be elucidated etc. Postal questionnaires and other 'fixed' designs cannot account for this.

✓ Potential for high quality research data including identification of relevant histories enabling identification of other sources of evidence.

✗ Obtaining high quality data from an interview is dependant on the interviewer being skilled in the task.

✗ The lack of standardisation implied raises concerns about data reliability.

✗ Interviews can be time consuming. Also it is often difficult to keep to a schedule, due either to the interviewee or interviewer being unable to keep to the schedule.

✗ Too much data can be problematic, and there are associated analysis issues.

5.2.3.2. Focus groups

Focus groups are analysed with respect to their efficacy as data collection methods (summarised from Robson 2002). Specific examples of applicability are given in section 5.2.3: *Research activity specific analysis*.

✓ An efficient technique for data collection since the *amount* and *range* of data increase with increased participants.

✓ Data *quality* can be *controlled* naturally due to participants *moderating* each other.

✓ The group dynamic helps to focus on what is most important.

✓ A focus group is inexpensive and quick to organise.

✓ Participants can feel empowered.

✓ Contributions from those reluctant to be interviewed alone may be available.

✓ People who cannot read or write become more *accessible*.

✗ Limited question numbers and scope of enquiry.

✗ Facilitating a focus group requires experience.

✗ The process needs to be well managed otherwise some *voices* may not be heard.

✗ Conflicts may arise in the focus group.

✗ Confidentiality can be a problem.

✗ The results are difficult to generalise as they may not be representative of the wider population.

5.2.3.3. Data limitations

Limitations to the data obtained during this PhD research are outlined in this section. The data obtained is predominantly qualitative in nature, meaning that its analysis is subject to criticisms of subjectivity. As such, effort has been made to display the results in their fullest form and in a manner that retains their meaning while at the same time allows the reader to follow the logic of analysis. The data collected through case study strategies are prone to researcher subjectivity, and the relatively small number of case studies indicates that the data may not be statistically representative. However, the *quality* of the case studies allowed access to stakeholders with the necessary experience and knowledge to generate high quality research data, offsetting the small number of case studies.

The case study strategies were also *non-longitudinal*, meaning that the research participants and geographic locations were not consistent throughout the research activities Due to the nature of the case studies and the aims of the research, it was not feasible to perform longitudinal case studies (see chapter 3: Methods for further details).

5.2.4. Research activity specific methods analysis

This section outlines the aspects arising from the choice of *research method* for each research activity which affected the research process and/ or the quality of the data obtained.

5.2.4.1. Case study - Glasgow (NSR) tactical

This section outlines the aspects arising from the choice of research method for the Glasgow (NSR) Tactical case study which had an influence on the research process and/ or the quality of data obtained:

- *Bias* - the Glasgow (NSR) case study guided the direction of this research in its initial stages toward identification of the overall research aim, using the action research approach outlined in chapter 3: Methods thus addressing the need for *constant input from stakeholders.*

- *Stakeholder typology imbalance* - Since a stakeholder analysis was not a viable option for the engagements undertaken in this case study, the meetings occurred 'naturally' meaning that problems of dominance or the presence of inappropriate stakeholders was not possible to address. This meant that the quality of the meeting in terms of quality data output was reliant on researcher experience to select individuals who would be appropriate.

The method selected to access appropriate quality data to provide evidence to answer the research questions outlined in table 1.2 was founded on *action research* theory as outlined in the literature review.

A general limitation of the method applied relates to data gathering in a case study which was not initiated solely for the PhD research (see chapter 3: Methods for more details). The research activities undertaken for this PhD were integrated into the overall Glasgow (NSR) project activities, meaning that lines of enquiry originating in this PhD research needed to be confined within the wider project activities. For example there was on occasion, efficacy with respect to data collection for this PhD, to obtain feedback on a particular line of enquiry from the *main* stakeholders. However, due to the need to operate within the confines of the wider project objectives this was not always possible. In addition, because these stakeholders attended the meetings without any form of remittance it was necessary to respect this, as indicated in chapter 4: Results. Selecting alternative case studies or creating new case studies would provide an alternative option, however it is less likely to obtain the exposure to such high quality data sources.

5.2.4.2. Case study - Glasgow (NSR) Receptor

This section outlines the aspects arising from the choice of research method for the Glasgow (NSR) Receptor case study which affected the research process and/ or the quality of data obtained:

- *Bias* - the Glasgow (NSR) case study guided the direction of this research thesis in its initial stages toward identification of the overall research aim, using the action research approach outlined in chapter 3: Methods thus addressing the need for *constant input from stakeholders.*

- *Stakeholder typology imbalance* - Since a stakeholder analysis was not a viable option for the engagements undertaken in this case study, the meetings occurred 'naturally' meaning that problems of dominance or the presence of inappropriate stakeholders was difficult to control. This meant that the quality of the meeting in terms of quality data output was reliant on researcher experience to select individuals who would be appropriate.

- *General community acceptance* - In an exercise like that reported here, it was found essential to establish trust from the community being engaged in order for community

acceptance to allow data gathering. It was hypothesised that without trust and acceptance from the community information may be withheld or not be accurate. It was identified that the reason for this was suspicion of what the data would be used for.

The process of community acceptance of researchers was found to be related to the researchers' respect for the community and its views; people tend to be proud of their dwellings and communities regardless of how the dwellings and communities appear.

Common sense 'action' was important with regard to engagement including maintaining a smart appearance to demonstrate respect for the community and acknowledgement that the researchers were guests in the community and would abide by its rules. Good eye contact and remaining non-judgemental regarding the data obtained was also necessary.

Identification of the local existing community groups, and engagement with them was found to be an effective way of integration into the community. Identification of such groups may be done effectively by performing a web-search before the engagement process is undertaken.

- *Publicising forum* - Publicity on local radio was the most effective way of raising awareness of our research and to populate the forum which was seen as the main data gathering activity (since door knocking was generally unsuccessful). Many geographical areas have a local radio dealing with community issues and it was found in this case that the radio station was keen to publicise the research. Care had to be taken during the radio interview to maintain sensitivity toward the community flooding issues and to avoid sensationalisation which may have been interpreted as disrespectful.

- *Obtaining permission for interview* - The approach of 'door knocking' to obtain permission for interviews with dwellers was not productive since people were wary or too busy to give their time. This approach was carried out during the day when often a partner or spouse would be at work and hence have a heightened wariness about two perceived strangers knocking at the door.

It was expected that the 'door knocking' approach would be aided by publicising the researchers' presence in advance. This would be achieved through radio publicity, postering, handing out flyers and speaking to local residents.

The most effective way of data collection overall was found to be by personal interview after community acceptance through radio broadcast, this is likely due to the introduction of the research on the radio program . However, the process of interviewing was time consuming and relatively little data was gathered this way.

- *Forum method conclusions* - Updating the agenda for the forum to include an 'unwinding' period for attendees at the beginning of the forum allowed the agenda to be followed, but in an order led by the participants. This was because many attendees arrived in a state of anger or high emotion about the flooding and needed to be allowed to 'vent their anger'. Without this it was considered less likely that they would have been able to engage in the pertinent aspects of the forum, and therefore participate effectively.

Balance between *sensitivity* and *control* played a significant role in the forum: sensitive enough to allow dwellers to divulge their opinions, whilst still maintaining control of the agenda.

Other issues to be dealt with included managing particular participants, for example some liked to talk at length, or respecting and accommodating those who preferred to talk in one-to-one type situations. Care had to be taken to ensure that all participants were given the *opportunity* to make their *voice* heard. It was anticipated that most people attending the forum had something to contribute.

The time of day the forum was held had a large affect on attendance. Many people were not comfortable going out in the dark, or if the weather was bad. Therefore the forum needed to be held during daylight.

As serious flooding has only happened once in the Shettleston area (in the memories of the forum participants), there was a strong perception that it was due to error on the part of the FRM professionals. If flooding occurred more regularly then it would 'somehow make more sense' since in that case it would be clear that the location was 'at-risk'. The rarity of flooding also has an effect on system memory (i.e. people forget). Therefore many responses from dwellers related to surprise since there had been no flooding recently.

5.2.4.3. Case study - West Garforth IUD

This section outlines the aspects arising from the choice of research method for the West Garforth IUD case study which affected the research process and/ or the quality of data obtained:

Since this method relied on *analysis of archival information* only, methodological limitations were founded in the quality of the archival information. The concept of Equivalent Professional Role (EPR) was tested during this research activity by analysing the appropriateness of the data obtained from the dwellers to create a *surface water drainage system* model. Two limitations of this method were related to the data obtained. Firstly the quantity of data in relation to the topic areas was sometimes small and, secondly the data that was obtained from the dwellers could not be corroborated in any way.

5.2.4.4. Case Study – MARE

This section outlines the aspects arising from the choice of research method for the MARE case study which affected the research process and/ or the quality of data obtained:

While this case study provided an appropriate platform upon which to research the efficacy of the LeA concept as a method of establishing it as a regime for tactical Capacity Building, the relative 'infancy' of the concept of the learning alliance meant that the members and researchers alike often found difficulties with the concept particularly with regard to delivery of the objectives of the alliance. While this is a trait of the early stages of establishing a learning alliance, it meant that obtaining information pertaining to its efficacy was problematic. However, with respect to the interest expressed in the alliance, table 4.14 in chapter 4: Results indicates that membership rates remained consistent throughout the process.

5.2.4.5. Dweller engagement – West Garforth

This section outlines the aspects arising from the choice of research method for the West Garforth dweller engagement which affected the research process and/ or the quality of data obtained:

Difficulties arose in the dweller engagements due to the way that the dwellers 'framed' the overall interview. Even though the discussions were meant to focus on the framework,

residents perceived that the discussion was far more about 'their' personal situation. In addition this meant that the point of the discussion was often hard to achieve.

5.3. Section 2 – Analysis of results

Presented in this section is a re-contextualisation of the results obtained from the research activities in terms of the overall thesis aim. The results are organised and presented with respect to the research question that each particular data contributes to. The data was then aggregated and summarised to provide the basis for the conceptual framework.

5.3.1. Analysis strategy

The strategy chosen to analyse the data is termed *relying on theoretical propositions* (Yin 2003). An analysis technique used for case studies, this technique entails a review of the data from the perspective of the theoretical propositions which led to the case study (or in the case here, the research itself). These have been defined in this research as the *core research components* upon which the research questions were developed. Therefore the strategy for analysis is based on *how* each data contribute to answering each research question. The analysis technique chosen is *pattern matching* (ibid).

Pattern matching is based on matching empirical data with prior predictions or hypotheses. For this research, the *empirical data* are the results (see chapter 4: Results), and the *prediction* is the research hypothesis (see chapter 2: Literature review), formulated into the research questions (chapter 1: Introduction) with which to support or disprove the hypothesis. As such, the data shown in chapter 4: Results, was analysed in terms of identification of data contributing to answering the research questions. Limitations of this method include uncertainties regarding how relatively representative each data is, since there may be significantly more available data for one topic than another. However, this analysis technique did not allow for weighting of the results and hence each data item was treated equally.

5.3.1.1. Question 1

What opportunities and barriers have been identified in this research that exist within the socio-technical system that will form the basis of a new approach?

- *Cost benefits;* use of existing technological systems (Local Authority GIS would be appropriate) to 'host' the framework proposed by this research, has associated cost benefits since the technology exists and is in use already.

- *Existence of champions can steer the process;* champions play pivotal roles in guiding some of the processes researched in this PhD. However the concept needs to be clearly understood in order that this aspect can *contribute* to the overall conceptual framework.

- *Current FRM 'system' inconsistencies;* particularly the influence that non-transparency with respect to identifying and acknowledging areas at-risk of flooding (i.e., confidential DG5 register) has on RSHs. This also causes difficulties for TSHs for example, acknowledging responsibility.

- *Engaging non-flooded or newly flooded;* Engaging with 'dwellers' can be problematic if they have not flooded.

- *Language barriers among and between stakeholders;* Differences in language between Tactical stakeholders (for example, planners, engineers, landscape architects etc) *and* between the Tactical and Receptor stakeholders can cause barriers to communication.

- *Dwellers as professionals;* The 'community are the experts of their community'.

- *Imbalanced 'stake' in stakeholders;* The stake that some professional bodies have in the FIR *system* is imbalanced (developers for example are perceived as being able to *manipulate* planning regulations).

- *Knowledge retention and information continuity in stakeholders;* staff turnover, departmental reorganisation, retirement and 'silo' working practices within organisations are barriers to continuity.

5.3.1.2. Question 2a

What is the evidence supporting the efficacy of building the capacity of *system* stakeholder groups?

- *Low capacity in RSHs can lead to demand for inappropriate solutions and blame allocation;* based on 'hypotheses' founded on 'grapevine' evidence, this can equate to 'misunderstanding' of TSH activities often leading to conclusions such as 'nothing is being done'.

- *Effects of denial of 'risk' in RSHs;* denial is most likely the first response from RSHs when flooded. Aside from psychological explanations, denial can be a *favourable* response as insurance premiums and house values can remain fixed. However, denial prevents acceptance of the *actual* context in which flooded RSHs residing in urban catchments exist.

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- *'Built capacity' RSH are more context 'aware';* including an acceptance of flood risk and context confinement (low likelihood of structural defences) can lead RSHs to consider more *appropriate* solutions.

- *Incorrect TSH perception of RSHs;* TSHs can perceive that RSHs do not have a *stake* in FIR in urban catchments in which they live (i.e., RSHs cannot be part of the 'solution'). This *imbalance* between stakeholders can have significant effects such as inappropriate or no contact, feeling of abandonment and exclusion from RSHs and a perception of hostility toward TSHs.

- *Awareness of RSH perspective;* TSHs can act without consideration for the RSH perspective, this is most plainly explained with regard to the *stake* each group has: TSHs are involved on a *temporary* basis (for example core working hours; 9 a.m. till 5 p.m.), whereas, RSHs are *always* involved as they live there. The fact that one group of stakeholders can 'go home' appears to be reflected in their *practices*. For example a 'builder' may be replacing the floor in a *house*, but to the owner it is a *home*.

- *Influence of demarcation on FRM*; is perceived as a problem by both TSHs and RSHs in TSH organisations. This is related to the *RSH perspective* point above. The reasons why demarcation exist are not explained by the data gathered during this research. The perception is that collaborative working can begin to allow understanding of other 'departments' and 'organisations' thus begin to 'dissolve' demarcation.

- *Learning alliance efficacy;* direct determination of the efficacy of the Learning Alliance approach *as* a Capacity Building regime was problematic (see section 5.2.3.4 above).

5.3.1.3. Question 2b

What is the motivation for establishing and maintaining FAGs in urban catchments?

- *Provision of a 'voice' from the RSHs to the TSHs;* the most important role of the FAG is a *single, representative* 'voice' of the community. This 'distilled' information can be managed more easily by TSHs. In this respect the FAG is seen as being *embedded* in the practices of the TSHs.

- *Provides a support forum for all 'dwellers';* dwellers who are 'newly' flooded and those who have suffered frequent flooding have different perspectives necessitating different needs. The FAG is a 'first port of call' for them reducing the pressure on TSHs to perform this 'role'.

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- *Manifestation of a regime for change;* the FAG is the 'focal' point for the urban catchment to bring about change in that urban catchment; in a similar respect to a pressure group.

- *Account for effects of long periods of non-flooding;* long dry spells affects the membership rate of FAGs (those who have flooded least tend to attend less frequently). *Skeleton* FAGs or *dormancy* (provision of a main borough or county group) in the FAG provides adaptation during such times. Efficacy for automation in this exists since it allows people to 'forget' without affecting the overall *system.*

- *Provision of an organisational structure for RSHs;* the most significant role is the group leader. Such an individual must be networked closely to the group members and in addition to TSHs. This role requires a person with the capacity to understand the perspective and context of both stakeholder groups.

- *Structure and hierarchy;* the observed hierarchy is that those who have been flooded most are 'higher up' in the group, though the 'leader' may not have been flooded at all (as is the case in West Garforth). As with most hierarchies those higher up perform functions of increasing *responsibility.*

5.3.1.4. Question 2c

What is the motivation for establishing and maintaining Learning Alliances?

- *A forum for collaboration;* the LeA provides a forum for professionals to meet to engage in flood related issues with other *professionals* with a stake in FIR.

- *A 'non-research' environment;* allows members and potential members of an LeA to understand that the objectives of the LeA can be action based, and not just for purposes of research.

- *Provision of an arena for stakeholders of similar scales;* having stakeholders (LeA members) who are of similar 'scales' and 'capacities' allows members to relate more easily.

- *An appropriate forum for inclusion of different stakeholder groups and associated scale representation;* political representation may be discouraged on the grounds that it 'gets in the way of business'. As wide a range of stakeholders as possible is desirable. 'Public' representation at LeAs is beneficial if they have 'built capacity'.

- *Appropriate 'inclusion' of governance in decision making;* while political agendas that are not concomitant with the LeA are discouraged, the LeA may provide a forum in which the LeA can *inform* political agendas for the benefit of the LeA.

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5.3.1.5. Question 3a

What is the basis for the efficacy of the dweller EPR?

The following analysis of the results with respect to Equivalent Professional Role (EPR) is confined to the context of FIR in urban catchments. While EPR may be applicable in other contexts, investigating the EPR outside of this context was beyond the scope of this research.

- *RSH willingness to 'act';* RSHs display a willingness to 'act' with regard to contributing to FIR in their urban catchment, perhaps in place of structural protection. There is an observed relationship between RSH capacity and the degree of *willingness* to act. It is reported by RSHs that they 'need guidance' on what they should do.

- *RSH 'desire' for equivalent professional status;* RSHs desire to be acknowledged with professional *equivalency* meaning that they are treated 'as equals' by the 'professionals'. The finding 'communities are experts of their own communities' may illustrate the *basis* of this desire.

- *The value of 'local' knowledge to the wider FRM 'system';* local knowledge has been illustrated as beneficial to TSHs in the example given in chapter 4: Results (the surface water drainage system model - West Garforth IUD pilot – see chapter 3: Methods and chapter 4: Results). This type of knowledge may not be *framed* in the same way as TSHs – professional language and terminology is developed within professions in a way that communities are less likely to do due to the different inherent *focus* of each stakeholder group. The knowledge *itself* may be comparable. The knowledge held by RSHs may be described as *equivalent hydrological awareness.*

- *To retain local knowledge;* due to reported loss of 'local council services' by dwellers it is perceived that much catchment information now only exists with residents. In addition, if any RSHs leave the catchment then that knowledge will also be lost.

5.3.1.6. Question 3b

How may the dweller EPR become active within wider FRM?

The following analysis of the results with respect to Equivalent Professional Role (EPR) is confined to the context of FIR in urban catchments. While EPR may be applicable in other contexts, investigating the scope of EPR outside of this context was beyond the scope of this research.

- *Improve the TSH perception of RSH;* the dweller EPR is more likely to become *active* if the TSHs treat RSHs with *professional equivalency*, this can be equated to *respect.* In addition it is necessary that the RSHs can and do trust the TSHs.

- *RSH Capacity Building to attain built capacity;* it was identified that dwellers are more likely to perceive that they *have* roles and that they are *willing* to perform these roles if they have 'built capacity' due to the heightened awareness that 'built' capacity can afford (see definition of built capacity, Glossary).

- *Implement a 'systems' approach of which RSHs are part;* if RSHs perceive that the EPR is part of an overall strategy to reduce Flood Impact then the RSH roles are more likely to be welcomed by RSHs and therefore become active.

5.3.1.7. Question 3c

What are the key issues surrounding acceptability of EPR to dwellers?

The following analysis of the results with respect to Equivalent Professional Role (EPR) is confined to the context of FIR in urban catchments. While EPR may be applicable in other contexts, investigating the scope of EPR outside of this context was beyond the scope of this research.

- *Being regarded with 'professional equivalence' by TSHs;* as indicated above, the notion of *professional equivalence* is paramount for RSHs for willingness to adopt roles to reduce their Flood Impact.

- *The EPRs must produce results;* it is necessary that RSHs *EPRs* achieve outcomes (tangible or intangible) relating to a reduction of Flood Impact. This may mean in addition, an improved perception from TSHs.

- *Provision of feedback and support from TSHs;* it is necessary that feedback and support is provided to the RSHs from the TSHs within the overall context of Flood Impact reduction.

5.3.1.8. Question 3d

How can the dweller EPR be maintained, particularly during non-flooding times?

The following analysis of the results with respect to Equivalent Professional Role (EPR) is confined to the context of FIR in urban catchments. While EPR may be applicable in other contexts, investigating the scope of EPR outside of this context was beyond the scope of this research.

- *Provision of dormancy in the EPR;* a degree of dormancy in the EPR may be appropriate, allowing flexibility in times where the roles may not be required.

- *Appropriate information storage;* it is found that 'system memory' within RSHs declines with time after a flood event, therefore there is efficacy in maintaining description of the EPR 'roles' on a centralised database accessible by dwellers to address this.

5.3.1.9. Question 4a

Which stakeholder interactions are appropriate to 'formalise' using an internet based portal?

- *Acquisition, storage and dissemination of knowledge and data;* a diverse knowledge base within the *system* of TSHs is seen as *critical*. In addition the method of access of data and the type of data needs to be *appropriate* to all stakeholders.

- *Creation of a uniform language;* differences in terminology and language particularly by TSHs can cause barriers and resentment. Few principles are un-explainable using *appropriate* terminology (see *Descriptive Engineering*, table 4.6 chapter 4: Results), therefore the knowledge held centrally on GIS could be 'translated' over time for use by appropriate stakeholders.

- *Recording system memory;* problems with areas that have not flooded recently: loss of system memory and associated problems. Also knowledge held within individuals with TSH organisations (particularly 'champions').

- *TSH to RSH feedback system (variable scale);* a method of leaving 'comments' and obtaining 'feedback' is desirable by RSHs. A method of 'screening' comments will reassure TSHs will know there is no superfluous information.

- *Some aspects of the FAG voice;* it is not considered appropriate for *all* communications between RSHs and TSHs to be handled using an internet based portal. For example incidents when *personal* contact is necessary (i.e., emergencies etc). however much of the communication between these stakeholder groups is appropriate to be handled using an internet based portal such as incidences involving exchange of simple information.

- *Expansion of TSH's accessibility to FAGs;* some TSHs are 'fearful' of attending flood groups, or may have other accessibility issues. In such cases an internet based portal for information may be appropriate.

- *Provision for 'horizontal' communications between stakeholders;* the basic communication structure between RSHs and TSHs is often reported as problematic

from both stakeholder perspectives including a perception from RSHs of too much 'top-down' communication, and a perception from TSHs of too much 'superfluous' information.

5.3.1.10. Question 4b

What are the conditions under which both stakeholder groups would view such an internet based portal as 'acceptable'?

- *Where there is perceived or actual benefit for both stakeholder groups;* the system must have *potential* to bring about change.

- *Where RSHs are able to trust TSHs;* related to the point above, such a system must be perceived as being 'listened' to by the TSHs.

- *Where a 'common' language dominates 'professional' language;* must be used to avoid perception of top-down, derogatory or patronising language (issues of *respect* are related).

- *Where TSHs have 'respect' for the RSH stake;* as mentioned above, the *stake* that each group holds is quite different requiring mutual acknowledgement for integration. Therefore this must be reflected in any automated system.

- *Where the portal is used appropriately by TSHs;* RSHs must not think that the system is a way of TSHs avoiding 'real' engagement with RSHs.

5.3.1.11. Question 4c

What are the appropriate technological considerations for the internet based portal?

- *Data storage;* GIS-based internet portals are appropriate for *storage* of the data. Issues of confidentiality need to be addressed.

- *Appropriate accessibility for RSHs;* although access to the internet is increasing, not all people have access, therefore it is necessary to allow use of mobile phones, land-line telephones (voice activated data acquisition etc) to allow access from those who do not engage with technology at all.

- *Interface simplicity and ease of use for RSHs;* the input mode, using any of the available modes needs to be simplistic, yet appropriate.

- *Data quality moderation;* to function appropriately the RSHs should be able to enter 'data' into the 'portal' without any special training, and the data that TSHs 'draw'

from the portal should not require any interpretation for use. Therefore the data needs to be moderated at the input stage to allow these functions.

5.3.2. Summary: answers to research questions

This section summarises the answers to each research question (sections 5.3.1.1 – 5.3.1.11 above) in order to provide an overview of the pertinent details in order that the conceptual framework can be identified.

Research question 1: Identify the opportunities and barriers to meet drivers for a new approach to reduce Flood Impact in urban catchments?

Research sub-question 1: *What opportunities (✓) and barriers (✗) have been identified in this research that exist within the socio-technical system that will form the basis of a new non-structural approach?*
✓ Cost benefits
✓ Existence of champions can steer the process
✓ Dwellers as professionals
✗ Current FRM 'system' inconsistencies
✗ Engaging non-flooded or newly-flooded
✗ Language barriers among and between stakeholders
✗ Imbalanced 'stake' in stakeholders
✗ Knowledge retention and information continuity in stakeholders

Table 5.1 Summary answers to research question 1

Research question 2: How does stakeholder Capacity Building contribute to the non-structural approach?

Research sub-question 2a: *What is the evidence supporting the efficacy of building the capacity of system stakeholder groups?*
• Low capacity in RSHs can lead to demand for inappropriate solutions and blame allocation
• Effects of denial of 'risk' in RSHs
• 'Built capacity' RSH are more context 'aware'
• Incorrect TSH perception of RSHs
• Awareness of RSH perspective
• Influence of demarcation on FRM
Research sub-question 2b: *What is the motivation for establishing and maintaining FAGs in urban catchments?*
• Provision of a 'voice' from the RSHs to the TSHs
• Provides a support forum for all 'dwellers'
• Manifestation of a regime for change
• Account for effects of long periods of non-flooding
• Provision of an organisational structure for RSHs led by the RSHs
Research sub-question 2c: *What is the motivation for establishing and maintaining Learning Alliances?*

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• A forum for collaboration
• A 'non-research' environment
• Provision of an arena for stakeholders of similar scales
• An appropriate forum for inclusion of different stakeholder groups and associated scale representation
• Appropriate 'inclusion' of governance in decision making

Table 5.2 Summary answers to research question 2

Research question 3: Explore the efficacy of dweller Equivalent Professional Role (EPR) with respect to reducing Flood Impact

Research sub-question 3a: *What is the basis for the efficacy of the dweller EPR?*
• RSH willingness to 'act'
• RSH 'desire' for equivalent professional status
• The value of 'local' knowledge to the wider FRM 'system'
• To retain local knowledge
Research sub-question 3b: *How may the dweller EPR become active within wider FRM?*
• Improve the TSH perception of RSH
• RSH Capacity Building to attain built capacity
• Implement a 'systems' approach of which RSHs are part
Research sub-question 3c: *What are the key issues surrounding acceptability of EPR to dwellers?*
• Being regarded with 'professional equivalence' by TSHs
• The EPRs must produce results
• Provision of feedback and support from TSHs
Research sub-question 3d: *How can the dweller EPR be maintained (e.g., during non-flooding times)?*
• Provision of dormancy in the EPR
• Appropriate information storage

Table 5.3 Summary answers to research question 3

Research question 4: How can stakeholder group interactions be improved or formalised?

Research sub-question 4a: *Which stakeholder interactions are appropriate to 'formalise' using an internet based portal?*
• Acquisition, storage and dissemination of knowledge and data
• Creation of a uniform language
• Recording 'system' memory
• TSH to RSH feedback system
• Aspects of the FAG voice
• Expansion of TSH's accessibility to FAGs
• Provision for 'horizontal' communications between stakeholders
Research sub-question 4b: *What are the conditions under which both stakeholder groups would view such an internet based portal as 'acceptable'?*
• Where there is perceived or actual benefit for both stakeholder groups

• Where RSHs are able to trust TSHs
• Where a 'common' language dominates 'professional' language
• Where TSHs have 'respect' for the RSH stake
• Where the portal is used appropriately by TSHs
Research sub-question 4c: *What are the appropriate technological considerations for the internet based portal?*
• Data storage
• Appropriate accessibility for RSHs
• Interface simplicity and ease of use for RSHs
• Data quality moderation

Table 5.4 Summary answers to research question 4

5.4. Section 3 – the conceptual framework

This section is divided into two parts. The first presents a diagrammatic representation of the conceptual framework illustrating how the core components of Capacity Building, Equivalent professional Role & Formalising Stakeholder Interactions link with RSH and TSH stakeholders to form a complete *system*. This can then be used as a conceptual basis with which to develop a strategy to reduce Flood Impact in urban catchments: the *non-structural approach*. The second part of this section outlines the critical aspects of each core component with respect to their implementation as part of a *strategy*.

5.4.1. Diagrammatic representation of framework

Based on the analysis of the results, summarised in tables 5.1 – 5.4 a framework can be identified which illustrates how the *core components* (Capacity Building, equivalent professionals roles and Formalising Stakeholder Interactions) link together to create the conceptual framework. This framework is based on the *potential* capability of the 'system' based on the evidence obtained during this research. It is likely this *potential* may differ from what is actually found when implementing the framework in *reality*. Figure 5.1 below illustrates how the core components are linked to form the conceptual non-structural framework. The two stakeholder groups are represented as separate entities in the framework. This is appropriate since while there may be several instances of interaction between these two groups they are fundamentally different with respect to *daily functioning*.
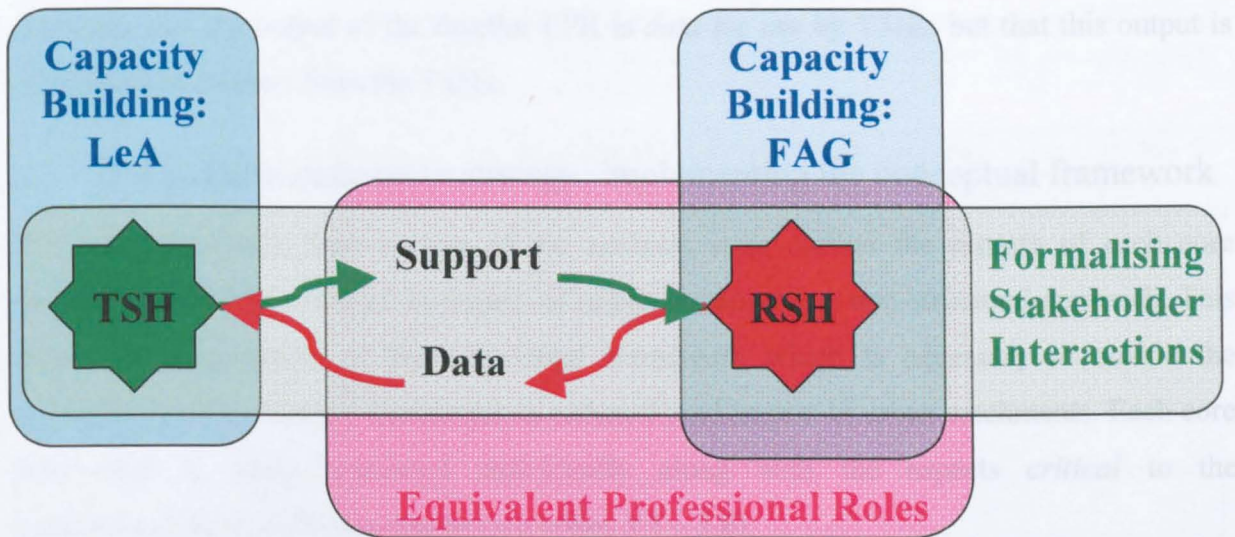
Figure 5-1 Illustrating the relationship between the core components of the conceptual framework

5.4.1.1. Formalising stakeholder interactions

Formalising stakeholder interactions provides the *structure* that holds the remaining core components together forming the framework. Formalising interactions between stakeholders effectively allows the necessary communications between stakeholders in a manner appropriate to those stakeholders. This formalisation is summarised into two categories as illustrated in the diagram: *data* and *support*. Data and support are the two *outputs* that may be achieved through the process of attainment of built capacity through the Capacity Building regimes. These *outputs* are the components of the framework which contribute to a reduction of Flood Impact: data flow from RSHs to TSHs improves the TSHs understanding of the catchment including hydrological and dweller information which can lead to a reduction of *tangible* Flood Impact. *Support* which may envisaged as a flow from the TSHs to RSHs is the key component at reducing *intangible* Flood Impact.

5.4.1.2. Stakeholder Capacity Building

Stakeholder Capacity Building regimes are specific to each stakeholder group, and in most respects the Capacity Building entities are separate, and as such are not *directly* linked in the diagram. The mode in which the Capacity Building regimes *are* linked is through the formalisation of stakeholder interactions which is the *structure* which holds the core components together.

5.4.1.3. Dweller equivalent professional roles

The diagram illustrates that the dweller EPR is contingent on *support* and *data* components of the framework, and is also an aspect of *Formalising Stakeholder Interactions*. The diagram

illustrates that the *output* of the dweller EPR is *data* for use by TSHs, but that this output is contingent on *support* from the TSHs.

5.4.2. From concept to strategy: implementing the conceptual framework

The purpose of this final section of the analysis is to outline the aspects of each core component which are *critical* in respect of implementation as a non-structural approach. This forms the final aspect of the conceptual framework which is necessary to enable the development of a *strategic* framework to reduce Flood Impact in urban catchments. Each core component is again presented individually along with the aspects *critical* to the implementation of each component (see tables 5.5 – 5.8).

5.4.2.1. Capacity Building and FAGs

Framework core concept	Core concept components	Description
Capacity Building and FAGs	*Dormancy/ skeleton FAG*	FAG needs to be flexible to demand (dry spells etc.) also there may be efficacy in a *centralised* FAG for each catchment which runs continuously to allow RSHs to attend if their own FAG becomes 'dormant'
	FAG formation	Formation – upon identification of urban catchment at risk of flooding, a methodology is required to initiate the FAG (direct engagement, forum, contact local community groups etc)
	FAG structure and hierarchy	Needs appropriate structure and hierarchy regarding members of the FAG which complies with the non-structural approach
	Technology	The FAG requires access to appropriate technological resources to allow deposit and retrieval of information. There does not necessarily need to be this technology available on a *personal* basis to each member of the FAG
	New members	Need to be able to identify and 'absorb' new members appropriately (those who have not but will flood, and those newly flooded), the FAG needs to manage; denial, low capacity (grapevine hypothesising etc). The goal of the FAG is toward 'built capacity'
	Communication with TSHs	Optimum system is when RSH 'hydrological equivalent' data is transferred to TSHs. Requires appropriate 'moderation' of information
	FAG leader	FAG leader *role* is important; certain characteristics are essential such as being networked to both the members of the FAG and TSHs. It is also advantageous for the leader to have 'built capacity' to understand both RSH and TSH perspective)

Table 5.5 Conceptual framework recommendations; Capacity Building Flood Action Group

5.4.2.2. Capacity Building and Learning Alliances

Framework core concept	Core concept components	Description
Capacity Building and Learning Alliances	*Stakeholder analysis*	This is an essential component of the LeA to have appropriate stakeholder typology and representation within the alliance
	LeA objectives	Long term objectives and quick wins are both important to assuage TSH doubts at the inception stage of the LeA, but also to ensure that the objectives of the alliance can be achieved
	Government perspective	Ensure the alliance is 'nested' appropriately with respect to government in order that their role can be appropriately included in the alliance (LeAs are about influence and not power)
	Champions	Identify champions as they are critical to the functioning of the LeA

	Knowledge retention and information continuity	Stakeholder knowledge needs to be stored centrally (GIS) to allow other TSHs to access the data and to ensure to minimise data and information loss when stakeholders leave the alliance
	Specific content to be addressed in alliance	There are several issues that will aid the integration of the TSHs into the format indicated by figure 5.1 such as awareness of the RSH perspective (*home* not *house*), problems of demarcation within TSH organisations etc
	Key components of LeA	Non-research environment, identify champions, stakeholders of similar scales advantageous, prevent over formalisation to reduce bureaucracy, bottom up approach

Table 5.6 Conceptual framework recommendations; Capacity Building Learning Alliance

5.4.2.3. Equivalent professional roles

Framework core concept	Core concept components	Description
Equivalent Professional Roles	RSH 'ideal' status for EPR	Built capacity RSHs advantageous for adoption of the EPR
	GIS access	Access to GIS is necessary to record RSH information (data) and feedback from TSHs (support)
	Feedback	It is necessary for TSHs to provide feedback to the RSHs in a manner appropriate to both stakeholder groups
	GIS characteristics	GIS database should be dynamic in its construction to allow it to be adapted if necessary. For example to account for new techniques for improving data collection, identification of further roles etc to allow for future changes to the *system*, technological advances etc
	Technical interface (characteristics)	Technical interface must be simple, also *modes* of access need to be appropriate, for example mobile phone, landline, non-technology based etc
	Technical interface (appropriateness)	Technical interface must be appropriate; the system must provide useful information to the TSHs therefore the 'distillation' method at interface is crucial
	Dormancy	Dormancy in the EPR may be appropriate to allow for 'dry spells'
	System memory	Account for system memory reduction after flooding

Table 5.7 Conceptual framework recommendations; Equivalent Professional Role

5.4.2.4. Formalising stakeholder interactions

Framework core concept	Core concept components	Description
Formalising stakeholder interactions	Accessibility	GIS system must be appropriately accessible by all stakeholders to allow access and depositing of data
	Balancing language/ language translation	Account needs to be made of differences in the language used by each stakeholder group in order to facilitate interactions between stakeholders groups. This may be facilitated automatically in the portal, or through behaviour modification on the part of stakeholders, or both
	Technological considerations	Input mode, interface etc.
	Data moderation	In order to prevent too much superfluous information from RSHs

Table 5.8 Conceptual framework recommendations; Formalising stakeholder interactions

In this chapter the results obtained during the PhD research have been analysed and a conceptual framework has been developed based on this analysis. Initially the results were analysed with respect to the research questions and sub-questions that they contribute toward answering. Answering these research questions provides the detail for the framework. With

the detail identified, the manner in which the core components of the framework (Capacity Building, Equivalent Professional Role and Formalising Stakeholder Interactions) are integrated was outlined. The manner in which the detail and the core components are integrated provides the conceptual basis for the framework which can then be developed into a *strategic* framework.

6. Chapter 6 - Conclusions

The context of the research has been outlined in the introduction to this thesis based on difficulties in structurally protecting urban catchments due to the current conceptualisation founded in terms of the economic benefit derived from protecting them from the consequences of flooding. Therefore under the current regime, the inability to structurally protect urban catchments means that incidences of flooding are inevitable.

Presented in this thesis is a conceptual framework forming the basis of a non-structural approach to reduce Flood Impact in urban catchments which complies with the above context. The framework is based on taking existing components within the socio-technical system defined in the literature review, and enhancing particular qualities of those components using techniques that are both novel *and* appropriate to this ethnological group.

The conceptual framework presented in this thesis is appropriate to this context in two fundamental respects. First, the approach is appropriate since it is relatively inexpensive (relative to the cost of structural protection) as the approach relies predominantly on behaviour change and novel use of *existing* technology systems. Second it accounts for the specific characteristics of the dwellers of urban catchments, namely the nature of the effect of the intangible impacts flooding can have on dwellers.

As outlined in the literature review, the effects of a flood on a community can be unpredictable, but a level of community *resilience* defined by the existence of a set of *adaptive capacities* within that community can reduce the impacts that come as a result of a flood.

It is hypothesised that the non-structural approach outlined in this research, once operationalised into a *strategic* framework (see below) will have the potential, over the long term, to reduce *both* tangible *and* intangible impacts from flooding.

The effect on *tangible* impact is unlikely to be immediate, but it is likely to increase over time since the approach will not stop flood water entering an urban catchment. However, building capacity of stakeholders (FAGs and LeAs) and building catchment knowledge (through the EPR) will identify the critical hydrological issues within the catchment. This will allow identification of the lowest cost and highest benefit solutions. In addition the increased

capacity of stakeholders will also encourage the most context-appropriate solutions based on innovation.

The effect on *intangible* impact that the operationalised *strategic* framework will have is more immediate. As evidenced by the data collected in this research the current approach to managing flooding in urban catchments is often inappropriate based on misconceptions and the effects of those misconceptions that dwellers and professionals have toward each other. Through *appropriate* integration of these stakeholder groups it will be possible to *realise* the strengths of those groups: with respect of the dwellers, they can provide the professionals with catchment knowledge, with respect to the professionals, they can provide guidance relating to *cultivating* resilience to reduce the impact that the dwellers desire.

While this conceptual framework has been developed using both Scottish and English case studies, transferability to catchments in the wider UK (besides those that have been researched during this PhD) is likely to be achievable. This is principally due to the reliance of the framework on *behaviour change* of stakeholders. In addition this framework complies with the most recent government legislative change to shift responsibility of managing flooding in urban catchments back to the Local Authorities in which the flooding occurs.

The strengths of this conceptual framework is that it is *embedded* in the real, existing socio-technical context and as such the research output is realistic with respect to its appropriateness to the ethnological group concerned.

Limitations of the framework are also founded in this respect. Due to the necessity to research the ethnological group in the manner outlined in this thesis, the data obtained, while rich in depth and quality and corroborated by several experienced individuals (both professional and non-professional), is sourced using a relatively small number of instances (see chapter 3: Methods and chapter 4: Results).

6.1. Conceptual component conclusions

6.1.1. FAGs

Flood Action Groups have been researched to understand their efficacy with respect to being Capacity Building regimes for receptor stakeholders. The conceptual basis of the FAGS are similar to the LeAs, however the FAGs also act as a support network for members. The

evidence obtained during this research indicates the efficacy of the FAG as a Capacity Building regime, and in addition the efficacy of the *act* of Capacity Building for receptor stakeholders has been identified.

6.1.2. Learning Alliances

LeAs are founded on a principle of stakeholder inclusivity to initiate a process among all stakeholders to identify co-operative action possibilities. These include identification of approaches to address FRM problems which may reduce the likelihood that solutions become the source of future problems. The following conclusions are discussed in light of the Don Catchment Learning Alliance (DCLA). More than one year after the inception of the DCLA, some conclusions can be drawn regarding success of the LeA concept as applied to this type of problem. The most salient conclusion is that, at the beginning such collaborative endeavours can present significant difficulties. Primarily as the approach relies on stakeholder interaction in a manner in which many stakeholders are unaccustomed. Barriers in the form of personality, legislative issues and company policy dominated the initial stages of the inception of the DCLA and provided the most significant challenges to the academic facilitators. It was assumed there would be a collective drive toward collaborative working however, the reality is that it has taken much of the first year of the inception of the DCLA to develop a common arena for discussion in which its stakeholders feel comfortable. In a similar way to the conclusions drawn from dweller forums, there needs to be an initial stage where participants become accustomed to their surroundings and ways of working.

Informal discussions with DCLA stakeholders reveal almost unanimous support for the DCLA, and that progress toward the DCLA objectives is being made, though few tangible deliverables have yet to emerge. We argue, however, that although the pressure to deliver solutions is increasing, the machinations of the DCLA must be allowed to continue to avoid delivering 'rushed' solutions which may exacerbate problems in the future; a viewpoint also corroborated by DCLA stakeholders.

Learning alliances are proposed as a means to reduce entrapment based decisions toward providing context appropriate approaches to managing water. The example of the 1930 Act demonstrates the effect entrapped decision making can have, though arguably, it remains unclear how the knowledge of this type of circumstance could be employed to avoid similar decisions today. Incorporating adaptability and reversibility into decision making may provide relief, however, this could also be perceived by some stakeholders as a lack of confidence in

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the approach thus casting doubt over the possibility of implementation. The answer may lie in the composition of the LeA, namely with respect to the breadth of the stakeholder groups: a broader selection of stakeholders may 'ward off' enticement into selection of inappropriate or silo approaches due to the increased probability that pertinent information is available. The data obtained during this research indicates that there are roles within an LeA that are essential, such as a 'champion', but further recommendations for the optimal structure of an LeA require further work.

The LeA must also hold a legitimate position of power with respect to affecting decisions since if this is limited or can be limited; there exists the possibility of suffering further entrapped decisions.

6.1.3. Equivalent Professional Role

The efficacy of the equivalent professional role has been identified from examples cited in the literature. The evidence obtained during this research corroborates the efficacy of dwellers performing a *professional equivalent role* providing certain conditions are met. These conditions are that the outcome of the roles must contribute to a reduction of impact in the urban catchment, that the dwellers are treated with respect and *equivalency* by the professional stakeholders. An important consideration for the EPR is the necessity for the data to be 'moderated' before it is received by the professional stakeholders. This is in order to reduce the amount of 'superfluous' information obtained by the TSHs.

6.1.4. Formalising stakeholder interactions

Formalising stakeholder interactions can be thought of as the *structure* of the conceptual framework. The *Capacity Building activities* and *equivalent professional role* need to be facilitated by an appropriate communication structure. While there is efficacy in Formalising Stakeholder Interactions, care must be taken when identifying which roles are appropriate to formalise. Also the manner in which the technological system is manifest is critical to its uptake, for example it must be able to comply with changes in demand for technology (i.e., smart phones etc).

6.2. Further work

As indicated in the introduction to this thesis, the aim of this research was to develop a conceptual basis for a non-structural approach with which a *strategic* framework can be developed and operationalised through *focused* engagement with tactical stakeholders. The

following indicates the work that is required to develop this conceptual framework into an *operationalised strategic* framework.

- *Government 'buy in'*: government 'buy-in' is essential for such an approach since it represents a shift away from the traditional type of approach whereby professionals 'provide' solutions for the 'public'. Therefore it will need support from influential bodies. Capacity Building is also related to this issue. During 'informal' discussions with members of the DCLA the influence of the 'Press' in flood related matters arose with regard to the influence they could have. The 'press' have always been actively excluded from such events, however there may be a method of utilising this *resource*.

- *Technical*: the following technical aspects need to be developed in order that the framework can function appropriately. The GIS interface must be technically capable of handling requirements. This includes administrative tasks such as setting up a Descriptive Engineering 'dictionary', developing a further understanding of appropriate dweller 'input' modes such as the most popular type of device. The way that the data is 'moderated' in order that it is useful for the professionals is also necessary to clarify.

- *Capacity Building 'agenda'*: it is necessary to provide a *focus* for the Capacity Building agenda for both stakeholder groups. This entails identifying areas which have the most significant detrimental impact on the functioning of an integrated system. Examples identified in this research include the imbalanced perspective of the *type* of stake that each stakeholder has. The stakeholder Capacity Building agenda must be tailored specifically to each group.

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APPENDIX

THESIS APPENDIX – Table of contents

Original definition of Non-Structural Responses (NSR)

The following is the original definition of NSR which was adapted for use in this PhD thesis:

Non-structural responses are responses to urban flood risk that do not involve fixed or permanent facilities and they usually work by influencing behaviour through government regulation, persuasion, and or economic instruments. (Taylor and Wong 2002)

Complete list of NSR found in the course of this study

		Column 1	Column 2	Column 3
COMMENTS		Advantages include community ownership of issues upon acceptance. However, careful handling required. Proposed by ERA-NET CRUE as 'Interactive learning groups'	Advantages include flood attenuation, and reduction of peak discharges, and improvement of water quality. Disadvantages are length time for maturity of planting. Can be created from modification of existing features. Use forms part of treatment train as opposed to being a complete solution. limitations include maintenance issues and downstream pollution. Measure proposed by ERA-NET CRUE	At present in Scotland, the emergency authorities do not, or are not required to have the same jurisdictional boundaries. In circumstances where an incident is within the boundary of one emergency authority, but not in another will cause coordination problems, particularly since at present the communications networks across the emergency authorities are not coordinated
Applicability of measure to Glasgow case		High	Medium	Medium/ high
Requires construction [6]		No	Yes (unless existing or natural features available)	No
Applicability - Pollution/ Water quality or Flood Risk/ combination		Combination	Combination	Flood Risk
USA	WEF/ ASCE[1]	Programmes to raise awareness of issues in order to gain positive public backing. Workshops, open houses &	Focus on pollution removal, however flood attenuation included	N/A
UK	CIRIA[2]	Stakeholders include; local authorities, Environmental regulators, Sewerage undertakers, Highways authorities, Private landowners or managers	Focus on pollution removal, however temporary runoff storage included	N/A
Responsible Stakeholder		Local Authority	Local Authority	Local Authority
Description		To gain acceptance by relevant stakeholders of issues surrounding flood events	Shallow ponds containing vegetation for treatment or removal of pollution, also function as detention/ retention systems	Ensuring the jurisdictional boundaries of each emergency response authority is the same (police, fire, ambulance, coast guard etc).
Non-Structural Responses		Awareness Raising/ Improving Information for all Stakeholders [5]	Constructed Wetlands/ Polders [2]	Co-ordinating Emergency Authority Jurisdiction Boundaries

Will increase response efficiency by reducing potential 'bottlenecks' in response activities	Measure proposed by ERA-NET CRUE		Requires suitable downstream storage. High failure rate if soil and subsurface conditions unsuitable. Use forms part of treatment train as opposed to being a complete solution. Unsuitable for high water tables and extreme flood events	These work well in residential areas, though can only store small amounts of runoff. Can provide areas of recreation. Use forms part of treatment train. Limitations include inability to deal with large drainage areas and does not provide significant attenuation of flow during intense rain events
Medium	High	High	Low	Low
No	No	No	Yes	Yes (unless existing or natural features available)
Flood Risk	Combination	Flood Risk	Flood Risk	Combination
N/A	No guidance given	N/A	Usage similar to UK practice	Permanent vegetated strip situated between pollution source and water body with purpose of treating pollution
N/A	No guidance given	N/A	Trenches filled with permeable material used to convey runoff from impervious areas to suitable downstream areas	Wide sloping areas of vegetation that treats runoff from impervious areas
Local Authority	Politicians	Local Authority	Local Authority	Local Authority
A method of informing emergency response crews of locations and necessary procedures of dwellers with	Financial incentives	A public access helpline which holds information regarding any emergency	Runoff conveyance to suitable storage/ downstream removal	Runoff treatment from adjacent impermeable areas
Dwellers with special requirements register	Economic Instruments[4]	Emergency Helpline	Filter Drains & Perforated Pipes[2]	Filter Strips[2]

	Measure proposed by ERA-NET CRUE	Benefits are the ability to represent detailed information in a manner that can be understood by 'laypersons', useful in public consultation sessions. Problems with creating useful GIS systems revolve around the initial data collection required for success of the system. However, once installed such systems can be added to simply and can provide essential information regarding flood events	Effective in minimising runoff during short intense summer storms. Care needs to be taken in choice of planting a soils in order to prevent polluting. Measure proposed by ERA-NET CRUE	Mainly a pollution reduction measure, however, prevention of non-dissolvable solids infiltration allows for better minor system performance
High	High	High	Low	Medium
No	No	No	Yes	No
Flood Risk	Flood Risk	Flood Risk	Combination	Combination (But mainly Pollution)
No guidance given	No guidance given (mainly since emphasis	N/A	Filters, absorbs & detains rainfall.	Focus on pollution removal, however prevention of solids into minor systems enables system design behaviour to be retained. Storm
Areas with higher consequence from flood risk should be given higher priority from emergency services, for example medical facilities and operational headquarters	EA has produced flood maps that provide and	N/A	Vegetation on roofs lain on drainage layer providing	No guidance given, however responsibility lies with stakeholders outlined in 'Awareness raising/ Improving information for stakeholders box above (see comments)
Local Authority	Local Authority	Local Authority	Local Authority	Local Authority
Location specific procedural guidelines for flood events highlighting high risk areas and the specific information and who the information is	Identification of high risk areas using maps	A visual representation of data required to enable understanding potential flood behaviour in	Vegetation on roofs, providing temporary	Regulation of permitted substances into minor system. Blockage prevention
Flood Risk Emergency Plans[3]	Flood Risk Maps[3]	GIS Database	Green Roofs[2]	Illegal Dumping Controls[1]

Mainly a pollution reduction measure, however, prevention of illicit connection to minor systems has beneficial effect on runoff flow volume	Ability to implement these measures relies on personal ability and available finances. Also for the response to be successful, it requires advance warning of the event	Use forms part of treatment train as opposed to being a complete solution. Limitations include potential failure if improper design, siting and maintenance not addressed. Not suitable on fill sites or steep slopes. Groundwater contamination possible in very coarse soils	Advantages include control of quantity and quality of runoff. Use forms part of treatment train as opposed to being a complete solution. Measure proposed by ERA-NET CRUE	At present, UK insurers reluctant to insure for 'extreme' events, i.e., those above 1 in 30 and below 1 in 100 (CIRIA, 2007)
Low	Medium (Situation specific)	Medium	Medium	Medium
No	May require small scale construction from individual	Yes (unless existing or natural features available)	Yes (unless existing or natural features available)	No
Combination (But mainly Pollution)	Flood Risk	Combination	Combination	Flood Risk
Prevention, Detection & Removal, Leaking septic tank control	N/A	Off-line, end of pipe solution designed to intercept a maximum quantity of runoff	Device or BMP designed to capture, retain,	No guidance given
No guidance given, however responsibility with stakeholders outlined in 'Awareness raising/ Improving information for stakeholders box above (see comments)	N/A	Depressions covered with vegetation, used to store runoff, and allow infiltration into ground	Temporary storage of runoff from development to allow	See comments
Local Authority	Dweller	Local Authority	Local Authority	Dweller
Regulation of connections into minor systems	Measures of flood prevention or reduction performed by dwellers. Examples are installing hardwood flooring or raising possessions	Runoff storage	temporary runoff storage	re-imbursement of costs incurred by
Illicit Connection Control[1]	Individual Measures	Infiltration Basins[2]	Infiltration Devices[2]	Insurance[5]

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Certain SUDs systems require restrictions on the solids entering the system for it to function correctly	Effective method of managing runoff, however, improper design causes blocking. Maintenance levels are high. Use forms part of treatment train as opposed to being a complete solution. Measure proposed by ERA-NET CRUE	Proposed by ERA-NET CRUE as flood risk adapted land use	
Medium	Medium	High	High
No	Yes	No	No
Combination	Combination	Combination	Combination
Alternative product selection, good housekeeping practice	Surfaces replacing normal impervious surfaces to allow runoff detention	Measures include Better site design, Low Impact Developments (LID), Vegetation controls, Green Roofs, Reduction/	Public education/ Outreach in order to involve public in flood mitigation decision making (US approach is pollution centred)
No guidance given, however responsibility lies with stakeholders outlined in 'Awareness raising/ Improving information for stakeholders	Surfaces replacing normal impervious surfaces to allow runoff detention	No guidance given, however responsibility lies with stakeholders outlined in 'Awareness raising/ Improving information for stakeholders box above (see comments)	No guidance given, however responsibility lies with stakeholders outlined in 'Awareness raising/ Improving information for stakeholders box above (see comments)
Local Authority	Local Authority	Local Authority	Local Authority
Controlling use, storage and disposal of materials	Device to allow infiltration to storage or conveyance	Minimising flood risk through effective planning and management of new sites, and adaptation of existing (Resilience measures etc)	Behaviour change through system understanding
Materials Management[1]	Pervious Surfaces[2]	Planning & Management[1]	Public Education/ Persuasion[1,4]

Retaining system, memory at present in Glasgow City Council emergency planning dept tends to be held in the memory of the individuals involved. When staff leave, memory can often leave with them.	Proposed by ERA-NET CRUE as changes to 'building codes'	Satellites are not vulnerable during emergencies like mobile networks or landlines. The main drawback of this system is coordinated implementation among all emergency services in the UK7	A barrier to sandbagging is that it relies heavily on loading time for the bags since at present there is no 24 hour cover, therefore the delivery time is dependant on the speed at which staff can get in, which is also dependant upon the emergency situation.		Effective in controlling peak discharges. Use forms part of treatment train as opposed to being a complete solution. Limitations include unsuitability for drainage areas of less that 10 acres
High	High	High	High	Low	Medium
No	No	No	No	No	Yes (unless existing or natural features available)
Flood Risk	Combination	Flood Risk	Flood Risk	Pollution	Combination
N/A	USEPA	N/A	N/A	Plans to stop source of spill, contain and cleanup. For example storm drain stencilling as source prevention	Dry systems detain a volume of runoff for subsequent release. Wet systems retain
N/A	EA/ DEFRA	N/A	N/A	No guidance given, however responsibility lies with stakeholders outlined in 'Awareness raising/ Improving information for stakeholders box above (see comments)	Normally dry, but with permanent pools at inlet & outlet. With runoff storage and treatment capacity
Local Authority	Politicians	Local Authority	Local Authority	Local Authority	Local Authority
System memory comprises of records of previous emergency events and the manner in	Behaviour change through enforcement	The RTN is a system of communication among all emergency response authorities and which relies on satellites for transmission of data	Sand bags are simple but effective methods of preventing infiltration of flood	Prevention of pollution of groundwater before it enters the system. If prevention cannot take place then measures to cleanup the pollution	Runoff treatment and stormwater treatment
Recording System Memory	Regulation[4]	Resilient Communications Network (RTN)	Sand Bag delivery	Spill Prevention & Cleanup[1]	Stormwater Ponds/ Detention/ Retention Basins (Dry/ Wet)[2]

		Provision for temporary storage of stormwater, more suitable for small areas. Use forms part of treatment train as opposed to being a complete solution. Limitations include ability to treat small area only	
Medium	High	Medium	High
Yes (unless existing or natural features available)	No	Yes (unless existing or natural features available)	No
Combination	Combination	Combination	Flood Risk
Landscape watering, Toilet flushing, Cooling water, Aesthetic & recreation ponds	Street cleaning, Catch basin cleaning, Storm	Shallow vegetated conveyance channels, usually used to pre-treat runoff	
No guidance given, however responsibility lies with stakeholders outlined in 'Awareness raising/ Improving information for stakeholders box above (see comments)	No guidance given	Broad shallow channels covered with vegetation, used to convey or store runoff, or allow infiltration into ground	
Local Authority	Local Authority	Local Authority	Local Authority
Reuse of stored/ collected stormwater	Maintaining minor system entry points	Runoff conveyance and/ or storage channels	Contact between Emergency Planning Departments and the Meteorological Office in order to provide lead times for emergency flood
Stormwater Reuse[1]	Street/ Storm Drain Maintenance[1]	Swales[2]	Weather Warning Systems

1 WEF and ASCE (1998)
2 CIRIA (2007)
3 (Todini 2000)
4 Taylor and Wong (2002)
5 (Manzel and Kundzewicz, 2003)
6 Indicates that a new construction is required or modification of an existing structure. 'No construction' means that an existing 'system' can be used without modification.
7 A key player in the implementation of these systems has been the head of emergency planning, Glasgow City Council

Research ethics form submitted for the Glasgow (NSR) case study

DEPARTMENT OF SOCIOLOGICAL STUDIES
SHEFFIELD UNIVERSITY

RESEARCH ETHICS FORM

Research Ethics Review Form

Name of Principal Investigator	Richard Newman		Email	cip06rdn@sheffield.ac.uk
ERA-NET CRUE - Risk assessment and risk management in small urban catchments				
URMS / RGC2 reference number: Unknown				

Summary of project, outlining methods to be used

Project Summary
Many older European cities are affected by floods from small rivers and stream whose catchments are almost entirely within the urban area. Heavy modification by urban development means that they have a high percentage of impermeable surfaces and rapid discharge of storm water through pipes, culverts and channels with few opportunities for the retention of storm runoff. Little cooperation and coordination exists between cities on this field. Indeed there are often conflicting responsibilities of local government and regional or national bodies in urban flood management. Thus there is a need to exchange present practice of flood management for these urban catchments on a European level and to identify good practice solutions and improved ways of managing urban streams to cope. This project will focus on the present practice of flood management and non-structural flood measures of these small urban catchments and on providing decision making tools for flood managers. It intends to contribute to the development of a European framework of flood management for small urban catchments and will be part of a European Flood programme within the Water Framework Directive. Based on case studies in Bradford, Manchester, Glasgow, Hamburg and Paris the effectiveness and efficiency of non-structural measures to reduce flood damage will be analysed and evaluated with respect to: the feasibility of assessing and mitigating flood risk from hidden watercourses and culverts in urban areas. The possibilities and ways to implement effective, non-structural solutions (e.g. rising flood awareness, regulations in spatial planning, wetlands in open spaces) to minimise flooding from these sources. The value of removing culverts and restoring open channels that include space for flood storage.

Project Objectives
To identify dependencies between the societal structure, the cultural conditions and the stakeholders' "risk culture".
To correlate the level of flood risk awareness and response to the socio-economic situation, the applied information policy and the administrative regulations.
To identify the efficiency of various methods of flood information in raising stakeholders' risk awareness and readiness for appropriate response.
To use Interactive Learning Groups to demonstrate stakeholders' learning capabilities and to identify which stakeholders, including policy makers and civil society organisations, would support increased multi-purpose use of small urban streams to gain flood risk mitigation benefits.

Project Methods
In order to achieve the above objectives it will be necessary to liaise with necessary stakeholders, particularly residents dwelling in the flood risk areas as outlined above. The purpose for gaining this type of stakeholder feedback is essential in understanding the dynamics of the interaction of flood events, stakeholder perception and potential mitigation of the risks using stakeholder input and knowledge. Stakeholders at risk from flooding retain a high degree of 'system memory' from previous flood events which is essential to enable future events to be understood and damaged reduced.
The methods proposed to glean this information from the stakeholders will be in the form of questionnaires, interviews and meetings. The questionnaires will be posted to the relevant stakeholders with optional completion and anonymity.
The interviews and meetings will be arranged and agreed upon by the relevant stakeholders beforehand, no 'cold-calling' techniques will be employed.

Research checklist

	(Please tick)	YES	NO

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1. Does the study involve participants who are particularly vulnerable or unable to give informed consent?		√
2. Will it be necessary for participants to take part in the study without their knowledge/consent at the time?		√
3. Will the study involve discussion of topics, which the participants might find sensitive (e.g. sexual activity, own drug use)?		√
4. Could the study induce psychological stress or anxiety or cause harm or negative consequences beyond risks encountered in normal life?		√
5. Will the study involve prolonged or repetitive testing?		√
6. Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants?		√
7. Will the study involve recruitment of patients or staff through the NHS? If it does you are alerted to the requirements for ethical approval of NHS related research activities.		√
8. Does your research involve participants under the age of 18? **		√
9. Does your research raise any issues of personal safety for you or other researchers involved in the project?		√

NB:** IF YOU HAVE ANSWERED "YES" TO THIS QUESTION YOU WILL NEED TO OBTAIN A CRB CHECK.

IF YOU HAVE ANSWERED YES TO ANY OF THE ABOVE QUESTIONS, IN THE BOX BELOW, PLEASE NOTE THE NUMBER AND PROVIDE FURTHER INFORMATION ABOUT HOW YOU WILL MANAGE THIS ISSUE – CONTINUING ON THE BACK IF NECESSARY

When reviewing the answers to these questions the ethics reviewer will be concerned primarily with whether you have mounted an adequate defence of how you intend to handle any ethical issue that arise.

Please note that it is your responsibility to follow the University's Code of Practice on Research Ethics http://www.shef.ac.uk/r/researchoffice/RO/ethics_policy.pdf and the BSA guidelines http://www.britsoc.co.uk to which the Department subscribes. Data should also be handled in a manner compliant with the Data Protection Act.

Please sign below to say that you have read the University and BSA Codes of Practice and that the information that you have provided here is accurate.

Signature:

Date: 1st April 2007

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Agreeing to take part in an engagement process

Please read this information carefully, this will be read at the start of any engagement;

The word *engagement* means a process of obtaining data through any one of the following means; focus group, discussion group, questionnaire or interview. I will ask you to sign this form to say that you agree to take part in the engagement and that you are happy for us to record your views. Please note that because you consent to give your views does not mean that you are obliged to take part in *all* the types of engagement above.

Who am I?
I am a researcher from the department of Civil Engineering at the University of Sheffield. I am undertaking a PhD related to building resilience to flooding within the urban area. I am interested in your experiences of flooding in West Garforth, what you did during the floods and your views on how things could be improved in the future.

What we will do after the discussion
The data obtained during this engagement will be used as evidence to support a PhD thesis. No personal data whatsoever will be published in any form. It will however, be necessary to link your views to the postcode in which you live since it is necessary to understand how the results relate to the location to which they are applicable, your name and address (and any other personal details) will NOT be shown.

If you don't want your views to be reported in one of these ways, please tell me and your views will only be used where you wish.

Confidentiality
I may ask you your name, postcode and employment. Your name won't be recorded anywhere or used in the report (though they will see your postcode). You will not be contacted by any readers of the thesis. ALL obtained information will be kept safe by me at the University of Sheffield and will not be used in any ways other than those stated above. This is so we comply with the UK Data Protection Act 1998.

If you want to ask me any questions about this, please do. If you wish to ask questions after the meeting please call Richard on 07902268603 or email me at r.newman@sheffield.ac.uk.

Once you have read this and agree to take part, please sign and date BOTH parts below:

I agree to take part in the interview:-

Signature: _____ Date: ___/___/____

(to be kept by interviewee)

- -
TEAR HERE ➔
I agree to take part in the interview:-

Signature: _____ Date: ___/___/____
(to be kept by the interviewers)

ERA-NET CRUE

Risk Assessment and Risk management: Effectiveness and Efficiency of Non-structural Flood Risk management Measures -
RISK ASSESSMENT AND RISK MANAGEMENT IN SMALL URBAN CATCHMENTS
Defra project FD2603

Objective from the SE project proposal

To extend the original eranet CRUE project aims to include a wider view of all flood risks, at various scales, their mitigation and management using non-structural (NS) measures. Overall the aim will be to help protect people, property and their environments by helping them to help themselves in terms of scope for individual or collaborative responses. Other means such as insurance and emergency service responses will also be reviewed. This will also inform the key stakeholder service providers as to where and when their support is needed.

What we need to find out

1. What the current structure is for responding to flood risk in Glasgow (development since Cashman, 2006).
2. If the professional stakeholder processes for working together and formulating an integrated and sustainable flood management plan are working.
3. What solutions have been identified and if any of these may be NS (We need the Glasgow Strategic Drainage Plan, GSDP).
4. If any NS measures have been agreed, are underway, are being implemented.
5. If the Cashman identified problems and limitations in citizen engagement to build capacity, social capital and to really provide means to empowerment have been acknowledged and addressed – many NS responses rely on this. Have e.g. community action groups been set up?

Local Authority questions

(NB Renfrewshire have a unique and forward looking view as both planning and engineering are in same department – with a 'Water Vision' similar to many continental EU states)

1. LAs now have a duty to carry out work to 'reduce the likelihood of flooding – are you funded properly to do this? How do you see citizen involvement in this? Are you proactive for example in watercourse maintenance and gully cleaning?
2. How do you see the role of the Flooding Issues Advisory Committee (FIAC) and the National Flooding Framework (NFF) - how do you see the delivery of 'sustainable' flood solutions using the 4As in your area? Is the membership of these groups wide ranging?
3. How effective is your working with the other professional stakeholders – is it effective? Is the heralded 'multi-agency' approach effective?
4. Where are the biggest barriers to delivering solutions?
5. What are your public engagement processes? Has 'community action groups' been set up?
6. What FLAGs do you have and who are members?
7. What solution options do you see as working and how are these being funded/actually implemented? Given the drive to use SUDS – how are these to be maintained?
8. What role do you see for NS solutions? What proportion of people in your area do you think has insurance against flood risk?
9. Is there in your view any conflict between providing water quantity and quality solutions? Do you see a role for the amenity (aesthetic) value of water?
10. who owns the 'GSDP'? Is it collective or led mainly by one agency? Which stage are we now at of the 4[1] planned.
11. how effective are your interactions between your engineering and planning functions?
12. You are responsible for contingency planning – hence there is a need for you to integrate both horizontally with others in regard to water issues and vertically with other emergency response functions – is this working? Are you building citizen capacity for this and how?
13. do you pay out to flooded property owners who are not insured?
14. how important do you see NS responses (without building anything) what is your role in building capacity for this? Would you for example, encourage dwellers to move away?
15. Do you view the people you provide a service to as customers?
16. who should maintain both SUDS systems and sustain NS measures (many of which require continuing interest by individuals, e.g. regular insurance payments)?
17. where do you see your role as including social justice and inclusion?

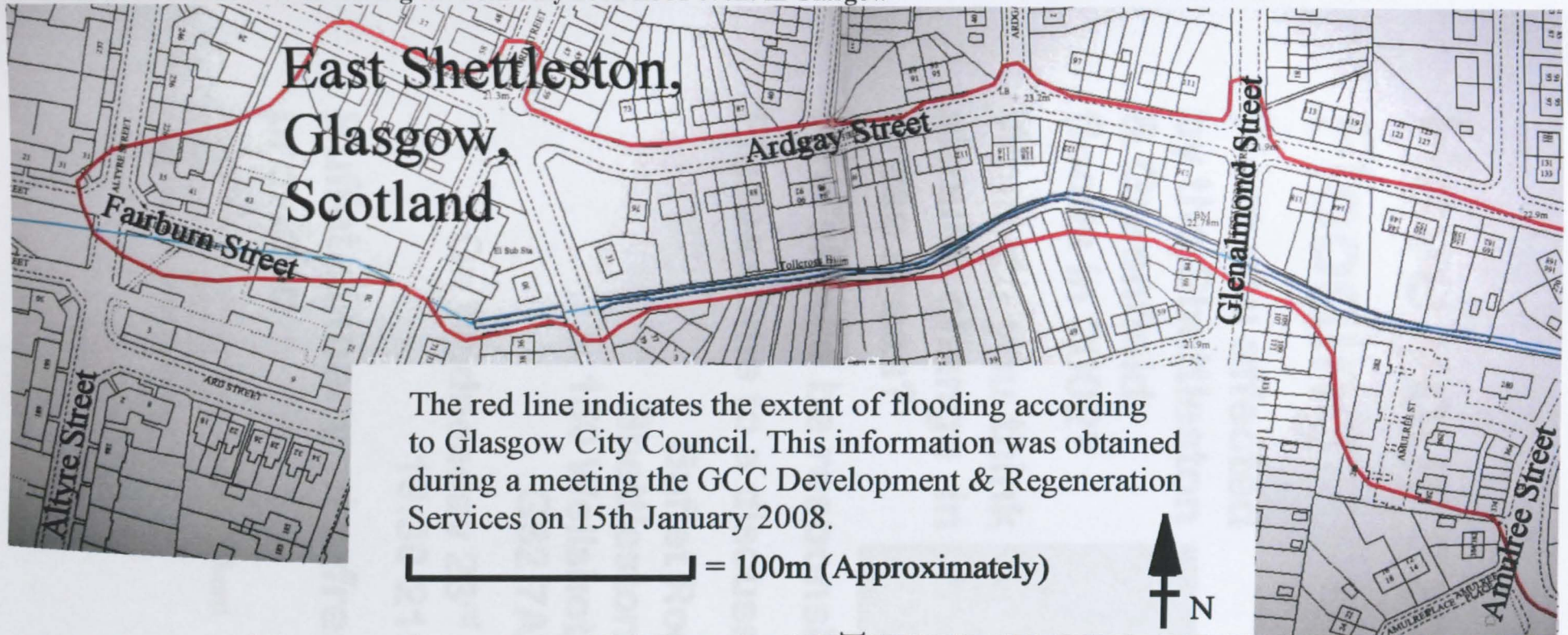[some of the above also apply to the other two 'professional stakeholders']

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[1] 1: initial strategic DP; 2: plans for wastewater treatment plants and UPM; 3: detailed masterplan and SWMPs; 4: design, implementation and commissioning.

Scottish Water

1. SW has undergone considerable turmoil since it's establishment – do you feel you have maintained your institutional expertise and authority and the key people who often sustain implicit knowledge about issues such as flooding?
2. How do you see the role of the Flooding Issues Advisory Committee (FIAC) and the National Flooding Framework (NFF) - how do you see the delivery of 'sustainable' flood solutions using the 4As in your area? Is the membership of these groups wide ranging?
3. What solutions are on the table in your view – where do SW fit in terms of responsibilities? Coastal – river- urban drainage – it is clear there is a sewer responsibility – but where do you see the boundaries? How do you see the funding and do you agree with WIC that climate change is an irrelevance?
4. how do you see your relationship with the SE? will it change now with a change in administration? Are they realistic about the necessary funding?
5. do you pay out to flooded property owners who are not insured?
6. You seem to have a duty now to take on the maintenance of certain SUDS – can you explain which/when?
7. how important do you see NS responses (without building anything) what is your role in building capacity for this?
8. How do you see the partnership working across the professional stakeholders in Glasgow – has this been effective and does it continue so, even without David Wilson?
9. What do you see as the role of citizens in the flood risk response process in Glasgow?
10. do you see the responses to the problems as being very much professionally generated – with the place of citizens really being to endorse these?
11. It seems difficult for you to fund 'soft' engineering solutions under the 1961 Act - how important do you see NS responses (without building anything) what is your role in building capacity for this? Would you for example, encourage dwellers to move away? Do you view the people you provide a service to as customers?
12. How can we sustain NS measures (many of which require continuing interest by individuals, e.g. regular insurance payments)?
13. it seems there is a view that engaging with citizens is not cost-effective and that only the minimum need be done to satisfy legislation? Is this a generally shared view?
14. are you willing to fund a solution that is really in another stakeholder's domain? Is this an example of applying the 'spirit' of regulations rather than the 'letter'?
15. where do you see your role as including social justice and inclusion in your activities in this area?

SEPA

1. SEPA have a discretionary duty to provide flood warnings – how comprehensive is the coverage of this? Coastal – river – urban (other causes)? How well used is Floodlines? And is it widely accessible? Do you have a door-knocking service?
2. where do you see SEPA in contingency planning overall – and how does this fit with the local authority role?
3. how do SEPA balance the quality-quantity issue for water management?
4. you are the main agency responsible for River Basin Management Plans (RBMPs) under the WFD – and do not use Catchment Flood Management Plans as in England. With 'Area Advisory Groups' (AAGs) – what stage are these at? Is there any public presence on them?
5. how do you see your working relationship with the other professional stakeholders? How well does it function?
6. how do you see your relationship with the public as a whole? Given your discretionary functions and your inability to 'build' anything do you feel that you lack power and effectiveness? What is your role in building citizen flood resilience capacity?

7.

Flood inundation extent locations during the 30th July 2002 flood event in Glasgow

East Shettleston,
Glasgow,
Scotland

The red line indicates the extent of flooding according
to Glasgow City Council. This information was obtained
during a meeting the GCC Development & Regeneration
Services on 15th January 2008.

⊢━━━━━━━━━⊣ = 100m (Approximately)

N

West Shettleston,
Glasgow,
Scotland

Have your say on Flooding

We're on Sunny Govan 103.5 FM Tuesday 22nd Jan 11:30 onwards!

Were you affected by the Shettleston & Greenfield floods in 2002?

What do you think should change in these areas?

Who should be responsible for changes?

Please come to a discussion meeting at:

Buffet Room,
Shettleston Hall,
150 Wellshot Road,
G32 7AX

On Wednesday 23rd January 2008
19:30-21:00

Buffet dinner and refreshments will be provided

For further enquires please contact Richard Newman on 07902 268603 or r.newman@sheffield.ac.uk

The University Of Sheffield.

PENNINE WATER GROUP

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Postcode	Other
G32 6XL	Janitor of primary school (Wellshot Primary School, 285 Wellshot Road, Glasgow. G32 7QD)
G32 6XL	Resident
G32 6XY	Resident
G32 7XR	Maintenance manager at Shettleston housing association
G32 9DW	Resident
G32 9DW	Resident
No address lesft	Resident

Photograph taken at forum in West Garforth (15th June 2009)

ERA-NET CRUE

Risk Assessment and Risk management: Effectiveness and Efficiency of Non-structural Flood Risk management Measures -
RISK ASSESSMENT AND RISK MANAGEMENT IN SMALL URBAN CATCHMENTS
Defra project FD2603

Notes on meetings held in Glasgow 11th June 2007

The GSDP is very complex and comprises more than just a number of reports – it 'fills a room'. 'You have to be 'steeped in it''. It is 'an ethos' – a 'way of working'. GSDP has been a 'talking shop' and 'information gathering' since 2002. It has the ideas – but 'how do we deliver it'? It has been set up and delivered by a 'number of good officers'.

Glasgow CC 'do SUDS'

In discussion about what we mean by NS measures it emerged that these were not perceived as any special 'class' of responses to FRM. Glasgow promote porous surfaces and use of gardens as part of city planning – in conjunction with the sustainable projects team (dealing with new environmental strategy, C footprinting – under. There is a sustainable construction policy which includes FRM. The following are used: BREEAM (buildings – schools require a 'very good' rating); CEQUAL (civil engineering; flood prevention schemes), ECOHOMES (houses) as sustainability baseline standards. For urban drainage there is an emphasis on runoff control. The city development plan (on web and out to consultation) includes the use of SUDS. Sustainable construction policy document is also available.

GSDP deals with the 'big picture' and an integrated vision and deals mainly with the legacy position. [This was also made clear by SW and seems to mean putting right the past poorly performing drainage infrastructure - Current planning documents etc. are more concerned with promoting and managing growth and new developments]. There is still a need to 'create capacity' in the drainage systems.

SW have an agenda for delivering the GSDP 'from their point of view'. GCC have development plans via the Clyde Gateway plans linked to developers and green space strategy. [SW indicated that the Gateway boundary was 'political' rather than water catchment based].

High level forum – Metropolitan Glasgow Strategic Drainage Plan (GSDP) Board. Includes main stakeholders – Phase I – implementation based on Clyde Gateway (Dalmarnock, 810ha, 'the size of Montrose'). National sports arena (demolish Celtic park or flood it) and Commonwealth Games. Clyde Gateway surface water plan – like an enormous pilot. Plan for 4 large regional ponds. For these the up to 1 in 30 year storms will pass routinely into the Clyde; any excess will be stored in dispersed ways around the catchment. Water management will be linked to green space and will also benefit downstream WWTP by taking water out of combined sewers/infiltration etc. People buying into the idea – but funding still 'sitting in silos'. For example Scot Exec (SE) funding for flood prevention is 'difficult to unlock' [SW: cost benefit (CB) has to show a ratio of >1 for this].

'SW have funds, but these are controlled by WIC'.
The Phase II GSDP is looking for 'biggest bangs for bucks' via steering group.

Not many residents in Gateway area – future expect fewer people per household. East End draft local development strategy document is 'with planners'.

'If we had only NS measures – nothing would happen' (SG).

'WLC of NS measures need to be taken into account - longevity'.

Glasgow CC' see their 'job is to improve the capacity of watercourses'. 'No way will we reach the SE flood prevention scheme CBA criterion of >1 in urban areas'.

GCC – why should we put time into helping the CRUE study? What's in it for GCC?

SEPA's role in water quality (main regulator) – need to get their buy-in to longer term plans (25 years) – if we can get an agreed long term plan then in future any development can just be 'slotted-in' and this would then be automatically accepted.

White Cart flood prevention scheme now starting – 3 new storage areas – construction to begin in September 2007. [*NB on 5th July RA saw Jacobs representative at the Defra conference and he has been involved in this project for more than 10 years – willing to discuss*]

Things are changing? GCC had responsibility for maintenance of small watercourses. GCC now dealing with implementation (eg White Cart). GCC dealing with strategic drainage and flood prevention (90% culverted in East End). Riparian landowners responsible for culverts and watercourses. But Council has 'substantially – ' under '97 act.

XX did retrofit SUDS report, but not much use. Tick boxes 'take out any individuality'.

XX work has been more valuable – but little bit slow in progressing ideas within the industry, but what he has produced may be ok – not sure if it fits into planning perspectives. Looked at SUDS in greenspace and how it ties into planning. Mainly structural approaches.

4 FLAGS (catchment) & 1 strategic – no citizen involvement, other than possibly some farmers. May be less useful (comprehensive) than would be ideal.

Surface water management system – Torrey Glen. Also has retrofit capacity. Extensive consultation with local community (SUDS pond – now taken ownership). GCC – interactions with community. Out to tender.

Glasgow use CIRIA SUDS manual (consultants). Community Action Groups – White Cart – extensive community involvement. Urban Water INTERREG project – SUDS scheme on a hill with 2/3 ponds cascading. 'Blossomed' into regeneration of whole park. New school adjacent. Community embraced this. Creating storm water capacity to enable school to be built. Formerly run-down park.

Had to demonstrate value of public participation in these schemes. Clare Champion (TRUST) – Tim Mitchell – writing East End development strategy – Ruchill. All been done with a team of 3 or 4 people.

Future – RN to spend time with DRS department at GCC.

Not a lot for community involvement up to now.

SW less opportunity to engage than LA's.

Whole project subject to SEA.

Difficult to involve community without understanding of problem first.

TRUST done this well.

Stephen Tingle Renfrewshire Council

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ODPM gave matched funding assistance to Renfrewshire for INTERREG.

Now SE for INTERREG IV + WWF –> SFM pilots of 'multiple benefits'.

Multiple benefits – pollution fits within SFM (others don't always believe this).

By definition – incremental storage reduces volumes and hence pollution.

A lot of CSO spills - £0.5M spent cleaning watercourses (contractors).

24 Oct – 15 Jan 07 – 776mm of rain (daily rainfall for a period of 5 weeks).

Watercourses full/ground saturated (took a month to reduce)/sewers full. Lots of roads suffered from groundwater. One example – junction without sub grade drainage had been patched and went suddenly and dramatically.

Discussion with SW – plans of where problems from sewers are. No facilities for SW to use sandbags etc. SW failed to 'turn up' to address the problems. SW formed special group – their view is that they have a main duty to protect <u>water supply</u>. Their view is that events were outside 1 in 30 year events and not their responsibility. SW now going into INTERREG IV.

Park Ave – combined system – model said 3000m^3 tank (too costly). Looking at alternatives to reduce costs – overload pathways, SUDS, disconnections. SW only interested in defined unsatisfactory CSO's (not all CSO's and polluting potential as such).

GC04[2] see models as providing means of defining how much these other options can benefit.

Highway Asset Conference – TRL – subjective multiple benefits for doing nothing up to full aspects.

Roads engineers don't talk to others. But GC04 closer as planning and transport together gives a starting point and frame of reference (planners are more subjective).

Problem of multi-benefits apportioning out to who can claim them (also double counting). How to get environmental people in (ours are not asking for enough) especially at planning development stage – but when involved requires large resources.

Revenue capital vs Fees (bringing money in – some complications here internally).

Stuff in parks mitigating flooding – engineering – cross-budgets needed after installation (who should pay?).

Capital receipts – from selling off land. But can blight this if it is stated it is at flood risk. Timescales – as to when flooding may occur. Issue of finance people keeping this budget separately is a problem.

Scrutiny board can allow catchment interference to respond to climate change. Only takes a line in structure plan for multiple benefits – to get it into local plan.

Inter-relationship with energy (SPP6) – development control should deal with this. Engineering may need to deal with assessments. Staffing issues and reorganisation in process.

Housing still owned by Council (HA not agreed by public). HA's still expect contingency planning function and responses by LA. Formerly, did not include sandbag provision. Housing sandbags provided by LA tenancy to their tenants.

As roads authority – main mission was to sandbag to maintain roads. Almost over-stretched during last winter.

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[2] This code refers to an individual - see 'meeting set 4 transcripts' page XXX

Clearly some tensions about what LA's can/should do regarding sandbags.

Watercourse 'cleansing' duty – for 'substantially....' (SPP7 – neutral or better).

LA 'assesses' watercourses – no duty for survey or model under act.

Modelling needed for 'sustainable flood management'.

Short-cuts to getting close to the answer.

GC04 supports GSDP – text generated to support Clyde Valley structure plan. Renfrewshire doing something different, but complementary.
- GSDP is about everything needed to be done about assets and demand money.

GC04 see guidance as more appropriate, (including storage and flow paths) for development. GC04 believe they can reduce watercourse conveyance demand by 25% in next 50 years [*by managing surfaces*].

Long storms – need to maximise conveyance in dry periods (provided it does not impact d/s). Need a balance between storage and conveyance. Prefer to utilise tail water storage in watercourses (not hydro brakes).

Last winter – surprising how quickly road will flood – loss of access to hospital and death (intangibles – how to account). Try to attach stuff to planning. Road asset management – key to dealing with pollution control as well as flooding.

Sewers for Scotland (2nd revision) has wrong timescales.

SW sort out with developer what SUDS are required after planning permission required – but need SUDS and exceedence flow planned together. Difficult issues here about SW's funding contribution (makes it more certain for SW liability risk and company running SW), but not for developer. (PAN79)

30 year standard for sewers.

Beyond SPP7 – flooding from a river different in GC04.

Sewers for Scotland – now SUDS back to roads.

SW played around so much that they only have to adopt 'appropriate' SUDS.

Best SUDS closest to roads and fit together 200 year flow path – water from any source.

Storm water sewers/drains collapsing over past winter.

Not much road sub-base drainage.

'No man's land' of between road and properties – who is responsible? Can be dealt with by sub grade drainage.

Where do benefits accrue and funds come from for removing storm water?

Move from 'Water Vision' (at present) to 'Water Plan' (still not complete).

Deliberately going down this route as **'not a cat in hell's chance'** of getting funding through GSDP.

Trade-off 'no care worker' for someone vs a 'new screen' for culvert to help with flood prevention.

Do it through re-development, but will take time (25% in 50 years) allows us to put 'things in the right place'.

Aren't enough human resources to do it. SW have combined sewer models, but no local knowledge (sacked staff). This is with GC04. GC04 see GIS as knowledge retention in future – given lack of staff.

Draft 200 year (IFP map – mobile GPS based) for duration critical for that watercourse. Likely that surface water will dominate. Shows overland flow pathway. Some errors picked up by local knowledge. If development banned in these risk areas Council would be liable for compensation. SEPA equivalent maps – we don't believe [are accurate].
- Done by Wallingford in urban areas (without site visits)
- JBA have done coastal maps

Proximity maps (SFRA equivalent) – needed if in proximity of a watercourse (50m) LIDAR (1m centres) now reasonably accurate.

10 year event is the trigger level for SW – outside this SW not interested.
30 year is the optimum.

Public domain – will tell public the outline, but only in terms of how responses are being focused and not to make bigger mistakes in additional developments (eg new school locations).

'I in 4 chance in 50 years'

Want to re-open many culverted watercourses and need to engage public. Will need to fence these! Consultation essential.

Councillors may say 'no' if public unhappy.

Structure plan – by nature looks at structural solutions.

Structure (Clyde Valley) FLAG and Carts FLAG (30% of Scottish pop. covered).

Core team is local authority groups
- Arguments over who has mandate to take part (some people may not speak) SEPA unrealistic

RBMP – only worked to 'prohibit' things not to deliver anything

SEPA come in to push and prohibit – then 'step out' to leave it to LA's.

(GC04 flood risk 'about ½ a network short – in terms of capacity)

Could GC04 support NS solutions? Can we see them as useful?

In urban areas solutions will be multiple components – 'flooding train'.

Be careful what is meant by 'cost'.

Removing flood risk can 'put money on house prices'.

SW view was 'come and see us when you have got it designed' and we will tell you if you can build it. Lots of consultants in area now do know what they are doing.

Original approach was virtual watercourses – ie. Where we may need a new one. 'Stealth tax' on cost of new houses to cope.

Renewal of sewer assets and renewal of road assets (including surface as drain) – these should go 'hand in hand' and with SUDS. Other service providers should get opportunity as well. Money has been passed across from SW to GC04 where their scheme raised flood risk in a watercourse – 'safeguarding opportunity' – 'opportunity banking' – doing things together – to harmonise opportunities (timing may be a problem). Requires information sharing.

INTERREG has been enabling.

Looked at gully by-passing for overland flow. Seems lots of flows coming out of gullies and going back in elsewhere.

Champion has to be 'head of service' with budgets and technical understanding should be able to bridge sections and groups – enabling and 'driving thru'.

Hyder Consulting/ Scottish Water

Q & S programme (2) now taken over SW thinking.

David Wilson – Hyder started up Stage I GSDP (left for 2 years) and came back to find Q & S programme had 'taken over'; interim period lost direction of GSDP rather.

SW appointed to pick up this and work with Scottish Enterprise and Commonwealth Games. Original cost £1.4bn from studies. GSDP now at Stage 2.5 (Stage I finished) - £1.4bn probably over-estimate. And without (Next [SR10] expenditure period).

'Getting smart' on collaboration and funding splits.

GSDP started as flooding evolved into 'environmental' – now focused on UIDs and moving flows around.

Stage 2 work completed (assumed by Hyder). But Stage 2.5 introduced because of reflection on Q & S and deepening catchment studies.

SWMP pilot in one part of Dalmarnock – Clyde Gateway integrated water plan main project. Actually covers full Dalmarnock catchment. Some studies pretty well completed. Hyder focused on UIDS.

Clyde Gateway boundary is 'political' SWMP broken down into sub-areas, with regional facilities. Evolving.

South Lanarkshire planners resistant to not using high flood risk areas.

Worst flooding is upstream in Dalmarnock area. Has river flooding.

SW provide flood guards (some 250 so far) – not only due to failure of SW asset (but because sewage mixed on)

1 in 10 flood risk register in Scotland.

What does the RP mean? Whole or part of event?

1 in 10 or 1 in 30 really only applies to 'structural' design for exceedence should cope with larger (any size) events.

2002 events occurred in 'natural' low points/or barriered due to embankments.

Often 'no way out' for the flow.

More than 200 off the register since 2002. £49777/property guide figure for cost allowed for prevention by WIC (£20M so far spent) – benefit/but can group.

Purchased 2 properties – but problem still there and environment problems. Also factory in area floods.

GSDP Stage 1 – SUDS retrofit potential thru whole Dalmarnock. Used GIS then/now LIDAR. Linked to 2D Mike21.

Used Stovin hierarchy – much more potential for reducing flows in watercourses than in combined sewers.

Watercourse attenuation also possible. <u>SW don't think they are mainly driven by Q & S</u> despite their answers here!.

Gully separation been delivered in a number of areas eg. Bishopbriggs – one scheme, 200 gullies (Q & S 2, 2004) raised kerbs and intercepted with new local SW drain – contravened WFD, unlikely to be acceptable now. Managed exceedence flow. Co-funded with East Dumbartonshire (SWS)

SUDS – controlled activities Regs – general building rule: 'SUDS system or equivalent'.

'Sewers for Scotland' – public consultation underway.

SW cannot adopt 'amenity' aspects of SUDS – overlaps with 'park' function - WIC wont' allow

Barbara Barbarito (SW in charge) – unhappy with 'swales', 'linear ponds' etc.

SW – small detention ponds OK – less keen on Regional SUDS.

SW look at adoption case-by-case.

Happy if the swale is upstream of SW adoptable pond.

Don't like infiltration systems.

Ok with underground storage tanks, detention basins and ponds.

Where multiple owners/developers and full SWMP required by SW.

Problem of funding larger solutions now for future redevelopment (but who pays?)

Widespread integrated solutions have funding barriers due to timing of developments (coming in sequentially). SW not funded.

SW think local plans have to include these aspects. But planners not clear on this.

Sensitivity about us releasing site specific information. Need an agreement on releasing/sharing information in public domain for CRUE

Cases in East End where costs of solutions exceed £50k and no response has been possible within the current period. We need to explore the 'temporary' solutions. Costs of structural solutions worked out. We could use these as case studies for NS options.

SW (Kieran Downey) pricing getting all properties off register (outstanding 300 props).

[1048 whole of Scotland (expecting 456 coming off by 2010)].

Still have some tide-locked outfalls – may conflict with flood prevention schemes promoted by LA's (requires pumping stations). Change in risk, may not allow responding to new at risk properties as a consequence.

Only interested in groundwater with regard to infiltration and knock-on flooding effects. Some systems designed for burn to overflow into the sewer (remediation may lead to huge knock-on costs).

East End sewers have a lot of capacity, but watercourses have not been well enough designed (when culverted) and variable sizes (constraints!).

Legal system – much easier to put in a new sewer than a big flood relief scheme (has to go through a series of orders).

What is a SUDS? Open up because underground has limited capacity.

Renfrewshire has requested overflowing a watercourse into a sewer – may be most cost-effective option, rather than a new drain.

'Soft' measures funded jointly with Councils (thru capital maintenance) – serviceability not an enhancement driver).

This expenditure period we are funded for growth (development).

Climate change is part of GSDP, but SW are most funded for climate change (options reports do not include allowance) but sensitivity testing with 10% eg. Uplift? No view on low-flows. An 'add-on'.

Big scheme now to deal with big legacy problems – future use SUDS etc to offset climate change.

Not sure SEPA view on this.

Public engagement - flood investigation team asset planners – understand how flood mechanisms work. Flood teams engage themselves directly with those at risk. Customer liaison only occurs during floods.

Applies only to incapacity not 'other causes'. Also install package pump stations and non-return valves.

Exact project needs and what we envisage as involvement.

Speak with:

Flooding Register	XX
Permanent Solns	XX
Temporary Solns	?????

Deal with SW – produce 1 page of what we want.

Re-emphasise our motives.

SW do not try to give flood warnings – have suggested fitting flood guards with warnings once in past as an exercise (cry wolf problem).

Belief that 'hard solutions' <u>are a once and for all</u> that give best 'whole life costs' return than local soft solutions – but climate change confounds this.

Resistance to temporary solutions by people who wish to sell their properties.

Despite issuing flood guards often they are not used – even in heavy rain.

1. Glasgow City Council -

'If we had only NS measures – nothing would happen' (SG).

'WLC of NS measures need to be taken into account - longevity'.

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SW less opportunity to engage than LA's.

Difficult to involve community without understanding of problem first.

2. Renfrewshire Council

Roads engineers don't talk to others. But GC04 closer as planning and transport together gives a starting point and frame of reference (planners are more subjective).

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Housing still owned by Council (HA not agreed by public). HA's still expect contingency planning function and responses by LA. Formerly, did not include sandbag provision. Housing sandbags provided by LA tenancy to their tenants.

As roads authority – main mission was to sandbag to maintain roads. Almost over-stretched during last winter.

Clearly some tensions about what LA's can/should do regarding sandbags.

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3. Scottish Water/ Hyder consulting/

SW provide flood guards (some 250 so far) – not only due to failure of SW asset (but because sewage mixed on)

Purchased 2 properties – but problem still there and environment problems. Also factory in area floods.

Public engagement - flood investigation team asset planners – understand how flood mechanisms work. Flood teams engage themselves directly with those at risk. Customer liaison only occurs during floods.

Future:-

For future engagement – need to produce exact project needs and what we envisage as involvement.

SW do not try to give flood warnings – have suggested fitting flood guards with warnings once in past as an exercise (cry wolf problem).

Belief that 'hard solutions' are a once and for all that give best 'whole life costs' return than local soft solutions – but climate change confounds this.

Resistance to temporary solutions by people who wish to sell their properties.

Despite issuing flood guards often they are not used – even in heavy rain.

4. SEPA and South Lanarkshire Council

Question 10 – Public engagement in flooding issues – please give some background

SEPA response-

SEPA admitted that technical/ engineers are not the best for addressing community engagement…

Flood awareness;
- Floodline – specialists who answer phones, give general information, or forward the call to the most relevant party. Act as a hub or coordinator.
- Responsibilities to identify areas that require public engagement
- Duties to go into community to raise awareness of flooding
- Good and bad experiences reported
- Difficulties have been raised as to addressing those who need help the most

Renfrewshire
- Some feedback from communities " I have never been flooded, why are you here?"
- Some people in denial of flood risk, and there were worries that by indicating that certain properties were at risk of flooding would have negative impacts on themselves

Glasgow
- Community engagement practices;
    - Identification of community (community is those who have flooded, as opposed to traditional idea of community, i.e., borough, development etc. Ideas is to target those at risk, and identify them as a community
        - Identify community groups
            - Give presentations
            - Informal discussions

Other types of community engagement
- SEPA visited 10 primary schools
        - Put on play highlighting flooding issues to the children
        - children go home and raise issues with parents
        - intention to generate interest in flooding to all

Blockages
- problem area
- awareness programs to reduce this risk (no note of name of this initiative)

Dumpers
- Awareness raising against fly tipping and dumping

Non-structural measures
- Fire service are perceived to be important NS measure/ response. However, they require more support both in terms of technical and social understanding, and in terms of kit/ manpower

South Lanarkshire Response

- SL hold flood awareness days to address the following issues;
        - to make management (SL) aware of the issues involved in flood risk
        - how to deal with communities
        - roles to play in such situations
        - in order to disseminate information to other parts of SL

- Resource expectation (i.e., resources available to tackle flooding issues, funding, People, training etc)
        - demand for such resources is higher than the supply

- therefore this requires sensible management

30 July 2002 flood event in Cambuslang
- DR believes flood was caused by 2 bathtubs blocking watercourse/ conveyance channel

Awareness raising to Older People
- Sent a calendar to seniors, which was then expanded to all of SL, raising flood awareness information, regarding blocked grills etc

Large item removal
- SL provide a service to remove all large household items for free to prevent them ending up in a watercourse, in order to help prevent flooding from blockages. Adverts also request residents to report blocked culvert inlets.

Inter agency relationship
- SL reported good interagency relationships, i.e., established communication networks etc

Other types of community engagement
- comparison with SEPA
      - Road safety
      - Educating kids re interaction with water (relevant to daylighting etc)

- Both expressed concerns re safety issues with water, daylighting watercourses, fencing them off to prevent children falling in etc.

Question 1 – SEPA have a discretionary duty to provide flood warnings – how comprehensive is the coverage of this? Coastal – river – urban (other causes)? How well used is Floodlines? And is it widely accessible? Do you have a door-knocking service?

SEPA response

Basic service
- A basic service is provided to all in the county, known as 'floodwatch'.
- Rain gauges and river gauges provide information (not automatically/ wirelessly sent)
- 3 times per day and officer checks gauges, also on call 24/7
- the main driver is warning of winter events (defined by SEPA as 30mm/24hrs)

Firth service
- Aims to provide a 3 hr lead time
- no warning is provided for a lead time of greater than 3 hrs
- more research is required here – i.e., will a lead time of 1 hr be useful?

Flood forecasting
- mathematical methods, if approved for use, are passed onto LA's in order to inform key partners. These partners 'can' then discuss the magnitude of likely event, visual representation required.
      - benefits to public:
            - information updated onto 'floodline'
      - police also informed

Future awareness and community involvement
- an iterative process, if warnings don't work, then they will be changed
- Floodlines offices deals with this
- from the point of view of PR, the methodology is to 'try everything'

SL response

<u>Sewers for Scotland</u>
- consultation exercise

<u>Flood warning systems</u>
- receive a forecast 3 times/ day
- threshold is 5mm/hr or 25mm in a 24 hour period, this activates flood procedure
- since April 2000, response units have been released 550 times
- response : sensitive sites visited throughout the duration of a forecast: 2 particular sites have a culvert crew on station throughout the event

Question 5 - how do you see your working relationship with the other professional stakeholders? How well does it function?

- SL & SEPA meet at FLAGS
- Plenty of contact between SEPA & SL
- discuss planning applications
- both report they are viewing problems from the same perspective

South Lanarkshire response
- Trying to get to grips with the WFD
- building up contacts and working relationships
- FLAGS are the main driver to progress
- 'SCOTS (Society of Chief Officers Transportation Scotland) Group' one person from each LA attends

Question 6 - how do you see your relationship with the public as a whole? Given your discretionary functions and your inability to 'build' anything do you feel that you lack power and effectiveness? What is your role in building citizen flood resilience capacity?

SEPA response
- Does not limit effectiveness since if you are a national body you can influence ways of working by other means
- As opposed to EA, SEPA can have an objective viewpoint on solutions since they are there in a consultant role (unbiased) they can 'stand back and regulate'. SEPA feel that the EA may have potential conflicts due to this lack of objectivity they have
- SEPA understand the drivers for flood protection, from their point of view of objectivity, balanced guidance can emerge.
- EU floods directive throws up questions regarding roles and responsibilities
- can help to get the correct funding for the required response scheme

SL response
- Sometimes advantageous to have an independent arbitrator to implement such schemes, for same reasons as above

5. Glasgow CC - (Area Planning) 9am Thursday 5th July 2007 & (DRS)

Is the GSDP an example of a case study of an attempt at integrated approach towards sustainable flood management?

Yes with out a doubt, however, the solutions are very much focused on structural as opposed to ns measures.

Awareness raising, how is it done, who has responsibility?

SW have register of properties at risk from sewer flooding.

SW responsible only for sewer flooding

Can you see within the realms of the GSDP these issues can be addressed (joined up thinking etc)

DRS – part of the issue is the way the SE is funded; (17:00)
-water & environment side fund flood prevention schemes, regarding water courses and rivers, and
-Water industry commissioners who funds Scottish water
Very little communication between these departments, projects running parallel, no mechanism to join these two depts together.
Big wall at the top: ministerial level preventing this communication

(19:00) GCC – asking ministers to get their head round what the service problem actually is, service challenge, supply, demand and treatment. Administrative and regulatory framework is completely out of sync with realities of the issue.

(20:43) Bosses (senior managers in planning dept) are sh*t scared that consultation means that 'joe public' becomes tooled up to be more aware of their situation. They want to 'dampen down' community aspiration for future quality of life. East Glasgow has some of the worse health statistics in Europe, where the average life expectancy for a male is around 52.
-Clyde Gateway project – all bumf says lets raise the aspirations of the area, but the senior managers say the opposite out of fear for what will actually happen.

(22:50) - to find holes in the GSDP in which ns measures can be inserted and then use the overall momentum to drive the measures forward

Regulatory framework is essential to allow linking things up: GCC work; regulatory framework for land use in the east end linking with David Russell and his colleagues work regarding water.

East-end local development strategy (document)

Interesting meeting on Friday where the planners invited the water engineers and green space 'people' into one room(tm refers to document he gave me)

Green space regarded as 'green infrastructure'
infrastructure network of 3 parks will be described as 'access infrastructure'

GCC – requirement for SUDS pond, but GCC states why cant we have instead of a pond, and canal type situation with paths and cycle routes etc.
From the planners point of view, links between green infrastructure are of high importance, (understanding why is a matter of experience I think, but will accept), therefore having SUDS systems that can form a link as well as their primary function will enable a better solution. Result is a 3 in 1 solution.

GCC – all developers need to liaise with planning and sustainable development

Made Case for 'infrastructure network' set out in 'Changing places: changing lives document', and consulted on it, and it has been proven popular with communities and national agencies. In the final draft which will be approved by the council at xmas, we have confidence to call this 'infrastructure networks' and therefore upon council approval "we will require it to happen", this is an example of planning policy, approved by the council in the Clyde gateway area which is an area of priority for the Scottish exec.
Case study of this in above document. Green engineering = green infrastructure (called green eng in doc).

Did two things in doc ::

-As far as zoning land for green space we will abolish it
Cos if its not in the right place, or if people do not use it (info obtained by consultation process) then it is pointless.
- go to sppg11 (green space and stuff) and bring the above in.
- reinventing Glasgow, wiping slate clean, understanding what is required and implement it using sppg11

How do you deal with the shortfall of $1.4bn?

(31.53) CBA is an inappropriate technique to evaluate the problem.

Consultation outcomes

DRS – many outcomes of the Tory Glen consultation process – "your not potting water near here, our kids will drown" etc
"cars will be driven into it" "why are you dumping these things on us"
(32:47) Seems like there is a chip on the shoulder of the area that says that anything that is given to the area will be as the result of a ulterior motive of a 'better' part of Glasgow. This is an area of community consultation that is important, and will most likely take some time for the community to realise that they are not necessarily the dumping ground for everyone.
"Tory Glen impoverished community who have issues"

Local community angry since the pond is serving 5 other development sites. Now they understand that this pond is kicking off the proposed development sites.

Ruchill successful because planners agenda was joined up with the engineers agenda.

Clyde gateway:

Surveyor who has senior role in delivering Clyde gateway project cannot communicate with anyone other than a surveyor – example of disciplines inability or reluctance to understand each other. Different language set, experience etc.

Consultation

One aspect is to reduce threat. Example by GCC is that a woman talking to a woman is less threatening than a man, particularly a male engineer.

(42.23) Manner of engagement is very important (NS measure)

IMPACT – water safety in schools (think I have a copy of this) NS measure

Drama as a communicator

Objections are that this aspect because not understood can be seen as sugar on the cake, and therefore can be ignored, or not implemented, but the reality is that this may be key to obtaining adoption of a project.

DR- engagement 100% vital.

QA procedure for consultation process

A note book called "consider this" NS measure

A simple way of unlocking a complex problem

47:17 Visual ways of representing data, public are not engineers, therefore plans sections and the like are basically useless. GCC found that the correct way was by buying disposable cameras and scrapbooks and telling the story in a picture board way and he found the results "very powerful"

Distillation of the issue – not being a smart engineer or good planner the issue is communication what needs to happen in a way the communication cab be received and understood, without using the word 'acceptance'. Even though you want them to accept them

No objecting to ruchill or tory glen schemes.

Is there some way that the community can benefit from the scheme being implemented

PAT principle ns measure (consultation)

Aching for good quality outdoor space. Do not require large space, just lots of small ones that link one piece to the next

Photograph questionnaire – which one of these would you like your space to look like – great response from community

Human instincts need to be acknowledged

Best to go into meeting and offer options from their world as opposed to theirs.

1:02:00 DR leaves the interview for prior engagement

Is the role of a champion outside the remit of his or her contract?

Comes from experience

East end is hard knocks kind of world

GCC – botany background, Greenpeace background, Schweppes campaign in the 70's responsible for all this. Has a wider understanding and appreciation.

Health issues of dense living – first proposed by the grandfather of planning for Scotland, Patrick Gettys (also botanist) he said we need more open space due to the health issues associated with dense living. Welwyn garden city, roots in green space.

GCC – why are we reinventing the wheel – in the 30's we ere doing this well.

GCC – has become a pain in the arse in the GCC offices. He wants collaboration between staff. Introducing what ifs etc.

(1:11:00) Bus services in Glasgow can be run anywhere that can be proved that a profit can be made. The regulatory framework prevents bus services in Glasgow's east end.
A solution would be to get so many people living there a bus service will be profitable.
However, all they really want is to be able to walk from place to place safely.
Essence of the problem is to provide walk able neighbourhood.

A bottom line

How do you get public agencies and the private sector acting together?
Water and green space can actually add 10-15% to a development.

1:17:47 "the community are the experts of their own community"

6. GCC (Landscape & environment)

Principal of the landscape and environment team. Deals with issues from the planning perspective.
-2 planners
-3 landscape architects
-archaeologists etc

- Calvin Clyde green space project deals with 2/3 of the city of Glasgow; develops green space projects which are community lead. Came from the old river valley projects.

-1/3 left covered by the Carts green space project joint project between Glasgow, east Renfrewshire and Renfrewshire council because it's the old carts river basin, Pollock area of Glasgow.

(7:17) -Provide Policy development for the natural environment, provide advise on how to 'blend' things together. Responsible for developing green space open space strategy and audit for Glasgow. Objective is to try to get ahead of what we think will come out in the SPP11 which is immanent.

They think that spp11 will require all councils to have an open space strategy and an audit.
East-end most problems related to drainage. Called in GCC to their working group to have the linkage between the pure planning solution and the natural environment stuff at the start, which lead to an understanding that they had to sort out the green infrastructure first. Then look to the land that is left and then develop that, (old way was opposite way round).

(9:00) Planning gain NS response

GCC is one of the only councils that do not have planning gain, therefore developers see Glasgow as an easy target. A way of getting around this and getting green infrastructure on site is by linking It in the need to provide sustainable urban drainage. Sustainable urban drainage was a lever by which the senior managers were persuaded to implement this green integration

Open space strategy – green space Scotland have produced 'leap framework'

Based on social economic development – 4 themes

- Develop green space development partnership which hooks everybody in
- Audit – knowing what we have got
- Pursuing community engagement
- Sustainable management and maintenance

7. Emergency Planning - GCC

EMERGENCY PLANNING OFFICER = NS MEASURE!!!

Sandbagging
GCC is testing the use of police escorts for sandbagging, since during flood events chaos on the roads makes traffic flow slow.

Champions (community)

A positive example of the benefit of a champions in the community is the that fact that the Millbury Crescent community group fell apart when its leader/ champion left.

Individual measures

An example of response from an individual who is flooded frequently was to install polished hardwood floors , in the event of flooding, plastic covers are attached to furniture legs, and each piece of furniture has wooden legs in order to raise the item from the flood water. In this incident, flood water rarely rises higher than a couple of inches above GF level, (flood water enters the basement).

Current procedure

The procedure that GCC runs at the moment is because effective according to him. An observation is that he is well versed in terms of his response during flood emergencies. However, the procedure is good and works because he is experienced and he knows the areas etc. GCC expressed concern that due to a lack of **apprenticeships** which would allow the passage of his knowledge onto his juniors does not exist. What tends to happen is staff move around at the whim of economics so, for example, a pay rise may draw away valuable staff to other departments.

Another observation is that senior members don't tend to move around so much, which is +ve, i.e., once they are there, they tend to stay.

However, a point raised by GCC is that the senior members of the team tend to be at the 'end' o their careers, for example, ex-fire chiefs etc, and that it can be seen that they are on a 'wind-down' of their careers.

Key personnel

According to GCC, XX is the most knowledgeable member of GCC in terms of system memory and knowledge of the area.

Weather warnings

Historically, the emergency planning department have always retained close contact with the met office. The met office was based in Glasgow, therefore the staff had system knowledge, and therefore the system was successful. The met office subsequently moved up to Aberdeen, where, system memory was depleted slightly, but still some system memory was retained, since staff still had knowledge of Glasgow. However, when the met office moved to Exeter, it obviously became less productive since many staff would have no knowledge of Glasgow, and to quote GCC "some staff did not even know where Glasgow was. Therefore this results in uniformed information being passed on. Again **system memory** in this instance is helpful, however a method of storing this information outside of the 'heads' of key personnel would mean the system could function in their absence.

Public education

GCC's view on this is that they are only interested if they are flooded. However, it must be borne in mind that GCC's job is to respond to situations occurring on the ground, and therefore it can be seen that at these particular encounters with the public may have negative attitudes towards greater understanding of the event, and perhaps more likely to be "just reduce my damages etc"

If given a blank cheque

Work with the public more with tabletop consultation exercises

Systems memory (**method of retaining is a NS measure**)

How can it be retained?

- apprentice scheme

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- in the past, employees would spend 2-3 years in emergency planning (see 'current procedure' above)

- in GCC's view it is difficult to obtain younger staff due to the way interviews are judged and structured

Rest areas

- GCC indicated that the manner in which new schools are designed prevent their being used as such areas. They now tend to have large open halls at the entrance, as opposed to the traditional way of having the storage at the back. Cannot remember why, but for some reason this prevents their use.

- transport is provided for the public affected by emergency, there are 230 mini buses available, and also GCC has access to First Buses.

- cornerstone of this process is cooperation between involved parties

Strathclyde Emergency Coordination Group (SECG) helpline (devised by GCC 5 years ago) **NS measure** **0870 0501999**

Overview - This is a helpline (similar to EA flooding helpline) that the public can phone and get information regarding any emergency event, if there is no emergency, then the caller is told this, if there are more than one emergency, there are options to enable the callers to find more specific information, therefore the system is layered as it were. Eventually if the caller needs to speak to someone, they will be put through to an advisor, however, GCC states that 95% of callers are weeded out automatically before this stage.

- there are 81 platform (partners) involved in the scheme, and each of these partners has a special access code which enables the partner to leave a message on the system which can then in turn be picked up by the general public

Matching Emergency authority boundaries (**NS measure**)

- at present, police, fire, ambulance etc do not necessarily have the same physical boundary areas. So the areas that the fire dept are responsible may not match ambulance, which in certain circumstances will cause slow response or other problems

General
- at present, one of the main reason the system works is because the people care, and have good communications between relevant parties, police, fire, met office, sepa, sw etc. This system is not down to council procedures, but down to the fact that the people care, and have thus set-up a network of communication. If these key personnel were to leave, the system would collapse, and rely on subsequent personnel to create a new system. Making this a formal system would help to reduce the problem of 'system memory' being retained by key personnel only.

- emergency planning dept is knowledgeable of all aspects of Glasgow city council

- being 'pally' with the police and other departments ensure short cuts in emergency situations

- in GCCs view, successful emergency planning is all about knowing people.

8. GCC City Plan

ST's Responsibility to drive forward Glasgow's development plan
    -city plan and
    -Glasgow and Clyde valley joint structure plan

Both these feed in to the national planning framework

Is the professional/ public stakeholder process working?

ST impression is that an important factor of the consultation process is to bring to the table the notion that we as professionals don't know everything and that the public are as responsible for bringing issues to the table as the pros. One of the major roles of the pros is to indicate that there are awareness issues that need to become part of the public psyche in order to achieve a good result for all. (me: this is a delicate but integral part of public consultation process)

Moving things forward

Climate change – st starts to think as an individual, 'do I need to make this journey etc?'

'In 1989 1 in 10 planning apps were difficult, now they all are'

Friday 14 September 2007
Glasgow City Chambers

Key:
RN   Richard Newman – University of Sheffield (meeting organiser)
GC01 Glasgow City Council – Development and regeneration services
GC04 Glasgow City Council – Emergency planning
GC05 Glasgow City Council – Landscape and environment
GC07 Glasgow City Council – Area Planning
SW01 Scottish Water - Technical liaison manager, Asset Development Planning
SW02 Scottish Water
SE01 SEPA – SEPA flooding unit
RC01 Renfrewshire Council – Assistant principle engineer
YC01 Kaya Consulting – Independent Consultant

RN   OK. Well in which case I guess we will just make a start. We kind of had a much more structured agenda, but after talking about it with Richard, it just seemed to be better to have some more general discussion points So basically what we are looking at at the moment is this first report has been opportunities for these non-structural measures in Glasgow, so really what can be, what are non-structural measures and how can these specific measures be used in the east Glasgow case. The report now ... so we are in between the Stage 1 and Stage 2 ... is where ... what the barriers to these non-structural measures against specifically to eastern Glasgow. I think in my mind certainly we could be the non-structural measures themselves I think we've highlighted most of them. I say 80-85% of them. There are clearly other aspects but I think most of them have been highlighted. I think the issue now is the interface between these kind of measured, if you like, and how they can become part of reality. So there are two sides to the meeting if you like, (1) the discussion of what we have highlighted in terms of these measures; and (2) what is preventing them from being implemented. So obviously providing that they are potentially effective in the first place. So the first part we have said here, discuss the effectiveness of the opportunities provided by the NSRs to the Glasgow case highlighted in this report. Erm being an emerging concept involving these complex social issues and I think we ... a point raised by one of my supervisors was the ... because they involve so many social issues the difficulty is kind of with the dwellers in the community, kind of imposing these measures on these people without erm ... and kind of just saying right we are the experts - this is what we think you should have, without kind of having the dwellers in the community seen as experts in their own right as it were. So ...

GC01   Just for clarification is the measure you are talking about on Table 6.2.

RC01, 5   I think after last winter we tried to rearrange our weather warning system and the way we do things. As far as the big rivers go, I think there are mainly warnings where appropriate. What we tend to do - and this is the Civil Contingencies Unit or the Emergency Unit whatever you want to call it. But for ??? [9.52] what we are finding is that we are using ... the Engineers are using road casts, if you have three weather warning systems or rainfall warning systems you have got three different answers so you try to balance the books with these, but that comes down to other aspects which is the maintenance and efficiency of the water courses. You've got to keep those going and you are not quite sure how much rain is going to come but you know that you have got to get as much water out as possible, so its not quite reaching the Civil Contingencies Unit. What we had till this year was Roads Department, deals with the Watercourse Maintenance, Cleansing and then all of a sudden ... bang! Emergency Civil Contingences Unit takes over. We have just got Board reports trying to get it at the moment and they are saying there is another stage in the middle where we have to stop and get permission to spend money in the Stage 2 in the middle where you need that point to actually get to the Stage 3 level in preparation. So it is not just the Civil

Contingencies Unit. In terms of actually having the information to prepare yourself - the proactive maintenance and things like that - you have to be ... you have to have somebody working at it before then. And to the extent where you might be totally out of everything – every resource. Before you get to Emergency. So it is not just the Civil Contingencies Unit - it goes all the way down through the existing systems and the arguments we have got is why should certain departments that manage land not do anything and it's left to the Roads Division. So there is, it is fast then spread right across education, leisure, parks and everybody else they have all got their own part to play before you get to an emergency. You should get to an emergency quicker in an urban situation unless you do something proactive. So I think when it comes to referring to the contingencies and non-structural responses you are actually looking at an organisational structure response, way before then across the council.

RC01   There's at least two stages but in terms of Emergency Plans, traditionally it was dealing with it after the event and how to get people out because that was what we were required to do, get people out and help them if they were flooded. So, one of the best non-structural responses is actually plan flow mapping so that you know which refuges are not safe, so they're not proper refuges. And you also find out how all the sub-stations are located in the middle of these flood footprints so you get no power as well. So these are the non-structural responses for emergencies which actually I think came with all the other non-structural responses for planning and things like that.

SW01, 6   What is a flood risk emergency plan meant to show? From my point of view it would be where we were likely to get flooding and houses that are going to inundated and what we would have to do. But from your point of view and what you just mentioned there it might be actually a key strategic piece of infrastructure like power stations, like hospitals, or whatever. I don't know.

RN   Sorry to but in, but I think we are looking at the GIS system for this so instead of having just like a flood risk emergency plan sounds like it just has just got flow or something on it but it will have all sorts of information on it that the public can access or access maybe part of it but more professional as well, so you can have layer upon layer of information on this. So that probably needs changing that title to make it all combining with the GIS down below I think to make it a little more.. a little clearer.

SE01   I agree that we should make sure that all people involved in a flood response are fully aware of those areas that are at risk. You know, people like the fire service who perhaps haven't been as involved in this up to now. You know there are plenty of community groups that need to get involved in this as well, right down to the public as well, it comes into public awareness.

RN   Sure this is what I wanted to look at very much in this meeting actually because I think the second half of it certainly, because it is like you say one of the most important things about the whole thing, I think.

SW01   The word plan suggests to me that it is not just about recording the factual things about potential routes flow. It's what you are actually going to do if an incident occurs. Communication links, who are you going to contact, what measures are you going to put in place if that flooding event occurs in that flood prone area. So what you are going to do not just about the recording of facts.

YC01   That's quite right because there is a similar deal with the dam break analysis where you prepare the emergency plans where it identifies risk and also identifies what you need to do, who needs to do it and how it needs to be done, demarcation and all these sorts of things so it is a whole plan going from ? [23.49].

GC05, s7   Sandbags.

SW01, s7   Sandbags. They don't work, so why have them.

RN   OK

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GC05, s7	They are a visual reassurance for people that are in the house – they feel as if they are doing something. They may not work but they are a visual ...
SW01, s7	I wouldn't want to rely on them.
GC05, s7	No but if you think about it, if you were in a house and you feel that you have to do something - it allows you to do something ...
SW01, s7	... until the water comes up and starts running through your house.
GC05, s7	Rather than what you think you should do, which is lift all your furniture up to the top floor and sit in your loft. So you wonder why they sandbag instead of simply what you are saying don't give them sandbags we will tell them shift all your furniture up to your loft.
SW01, s7	GC04's regularly ... we've gone through the exercise of putting sandbags out and it is ... well I don't know what your thought is on that ... causes reassurance.
GC04, s7	I think it is reassurance and our policy is always to sandbag an area and not individual houses and that causes a problem as well because they see sandbags coming out and they are not going to their particular house and the number of phone calls that this generates ... we have got a limited number of staff to actually deal with these calls.
GC05, s7	It's not ... it's when you look at the flood occurrences that happen and I suppose the classic one is Carlisle where there are all these people with sandbags saying we lost all these photos and we lost all the ... is it not about awareness. It's about shift all your stuff to the safest place, forget about the ground floor ...the ground floor is going flood, so move your valuables to somewhere where you feel comfortable.
GC04, s7	There is a use for sandbags and out at Knightswood where we had the flood four weeks ago, we used sandbags at doorsteps and they did stop water lapping into literally the floor level of the house. If it had gone up much higher they would have been useless. Where they were at that particular time, they did work. So I mean there is a use for them but they are very labour intensive.
RN	Can I just jump in here? I think something GC04 was maybe saying just to expand on it perhaps and this is the kind of the further work of this report. I think if sandbags are a response that you maybe use when people don't understand flooding, but if the people understood flooding then they would know that sandbags are not so good and would shift everything upstairs.
GC05, s7	It's about having seen the TV things my gut reaction if I saw water coming in was to get all my valuables as high up in the building as possible.
RN	Sure, because you understand it. I mean I think this is a key thing I think, if the communities or they say the dwellers as we are calling them here in the East End understood flooding and the kind of impact on their community, then they would not want sandbags perhaps in 90% of situations and they would spend that time making their house resilient to the flood.
GC05, s7	I think if the sandbags gave you a chance to lift all your stuff to a safe place because I suppose it depends on the flow of the water and how fast it's coming as the house could probably flood in minutes if the water, if something is backed up and its hit a level and it is not a steady trickle, sometimes it's the level of the water on the ground, I suppose it's a balance between educating people and telling them, if they are in a flood risk area what the sensible thing is to do.
RN	So I think the time that getting the bags there before that, because that is a ... you were talking about a flood event like ... the word has gone from my head ... like a sudden event where you have got a huge amount of flow, you are going to have a high prediction to get the sandbags there to stop that flow in the first place which is unlikely. I just think it is just, I think this comes very much in turn. I mean this is my Sociology Professor/Supervisor talking very much here, but I think your ... by raising awareness or having this awareness in the community of how these events occur and function you would get a much better response

	to the incident I think. In a sense in my mind, putting the bags there kind of separates it – it's like we are trying to protect these people rather than involve them in the situation and I think the involvement seems to kind of reduce the impact of the situation.
GC05, s7	I think that when you listen to people who have been flooded and they are talking about the experience and they talk about it afterwards, the things that they value, the things that they want to protect and get are things like photographs and the electronic things are the things that ... you can replace the fridge, you can replace the microwave, you can replace the sofa, OK it stinks and it smells and it's a pain the neck but its that kind of when they talk about it afterwards it's the time to get the irreplaceables to somewhere safe.
RC01, s7	That came over so strongly from the flooding in England this summer. You know the people who were flooded, lost photos and personal possessions and that came across very strongly.
SE01, s7	I think it links again with death and nature and what we have to remember is that the water course system – the sewer system has been overloaded for say 30 years if that. The road becomes water course, if it is not houses. So that is the system that we are actually trying to constrain – overloading. So sandbags are really quite useful in there to actually direct the water back into where there is capacity because there is always smaller capacities. You can always bypass it somehow and it's usually the road, so your sandbags are really good there. The public will try and steal them for their doorstep so you have got to keep replacing them, if you label them they will complain about it, but they do reassure and they do do some things but a willy nilly just ... here's some sandbags let's stick them across your door and by the way it's going to be a meter and a half deep ... does not really do anything. It doesn't work and neither does a kilometre of sandbags leaking like a sieve all put up on side and you are just circulating it. So it's just finding the appropriate use for them.
GC04, s7	This really comes back to whether sandbags are worthwhile ...
[all laugh]	
GC04, s7	... and what we seem to be saying here, if I am hearing this right, is that in terms of sandbags from an individual house owner's point of view, they are not particularly useful but from a flood management and a technical viewpoint we are having to control overland flows etc they perhaps have a use. Although there may be better ways of doing it, but householders – we're looking for individual householder's protection – it should be some proprietary system. There should be some boards or little telescopes up there, over there periscopes over there, bricks, whatever it might be. That's the level it would have to be at if you are going to have non ... but is that non-structural? I don't know.
RN	But I mean it seems interesting to me that part of the use of the sandbags is how it makes people feel than rather than whether actually the sandbags are useful themselves.
GC04, s7	That then is perhaps you misleading the public because they're bugger all use and really the only way ... so why bother?
GC05, s7, 8,	I think builders are very canny and they will always manage to maximise their profit even if it means they have to be innovated by default and will use the innovations as a selling point so you have now got a developers using their ??? [41.31] as their selling point because it is a nice landscape to look at and they will continue to do it. They won't lose their profit - they will just find a different way of selling it. In all likelihood it might actually bring their costs down and increase their margins because the innovation might be cheaper.
RC01, s7	Non-specific, non-structural response really is not the delivery of sandbags - its giving guidance to the public and the developer of what is required. You said yourself, again its pre-emptive; you have got to work out what guidelines you are going to give.
GC05	It gets towards a discussion that GC01 and I had with others yesterday about the way the planning system works that we actually need to be looking towards the Dutch system of having your water planned first and then that informs your Local City Plan and then that informs your Local Development Strategy or Master Plan and we have got that missing link.

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GC05	I think it's a kind of reaction - this has been the most flood events in Glasgow and we are looking at replanning parts of the City – one of the key parts is the East End - and you know it's a major flood risk, you would abandon it and go somewhere else but we can't. So what would have made it easier, when we have looked at it, we build things as green infrastructure and start with that first, rather than the traditional way of how many houses do we need, how many factories do we need, how many offices do we need and where do we put it. It's - how do we deal with the green infrastructure first and what does that leave us to build on. But what would have made that even easier would have been to have a proper water plan for Glasgow because you cannot plan the East End in isolation, because the impacts are not local to the East End. Something can happen up river that impacts on the East End, something can happen in North Lanarkshire that happens in the East End. You can have major rain fall over Stirling and it will start to impact on the East End. It is that kind of thing. It's one of the things I think the National Planning Framework for Scotland needs to tackle water as part of its National Strategy. We need those levels coming down, we don't have that system in place at the minute.
GC05	It kind of brings you on where you jump to your emergency responses where you have got the development planning in and it is about the kind of non-structural response to that and about having the right guidance at national level, so having the right SPP's and planning advice notes coming from a national level and having the right national planning framework in place and then having that replicated at a sub regional level and then at a Council level and then having that information. And it is also about the of looking at different solutions and the duality of uses and what you can use if you are doing SUDS then it's your green space as well - as long as the SUDS is designed in a way that it has a use and is not … and that brings us into who maintains, who manages and whatever, so that takes you into a different …
GC05	RC01's point is all that is about redevelopment and surely under current planning legalisation, there shouldn't be problems with flooding if it's applied to the letter across the City Centre or wherever it is, and there should not be any problems with properties flooding. People should feel safe that the planners have done their job and their flood risk assessments have been done and that the impact assessments have been done, everything's in place and their property is safe from flooding from whatever source. The problem we have got is the legacy position we have. Where is ??? [50.04]
GC05, 13	If you look at the plan of the redevelopment planning management application they are given an application on a site by site basis. They need the back up of confidence and knowledge of who to talk to and its not just flooding legislation they need to know about, they need to know about nature conservation legislation, sustainability legislation, building legislation, nursery care legislation, education legislation, there is all that kind of thing coming into play, but what we don't have at the minute because of the amount of applications from a Glasgow prospective and a churn of development management planners because every Council is stealing from everybody else at the minute because we are all going from single status and the wages are bouncing up all over the place and we have got a whole load of consultants as well, they are bouncing about all over the place but there is a whole load of consultants as well out there that are taking people out with ??? [51:41]. You don't have the consistency of somebody coming through knowing those regulations and knowing who to speak to and knowing where to go for information. In an ideal world everything would be linked up and somebody dealing with development management application would understand all the policies and the planner that they are working with would understand who to talk to if they didn't understand those policies and would understand the responses they were getting from Scottish Water and SEPA and specialists. The problem is they don't understand everything that is coming through and because the control on development management is about the percentages of applications you get through and not the quality of the decision that is where it falls down.
RC01	What I have found is that the, when it comes to underlying information and technical information in terms of flood risk to new developments, that knowledge base is exactly the

knowledge base that you need for the existing ? [52.35] so it's of multiple benefit and that is one of the things that comes through all of this, is that although it may be focused here at existing areas, it is really needed for other things as well. So its multiple benefits. You find that anything you do type of thing with existing development flooding problems is of use to new developments, or something else, or somebody else's responsibility. So I think that is worth highlighting that the tendrils of this non-structural response actually goes much further than flood events actually on existing properties because as soon as you actually mobilise resources to do it, that resource is available for everything else and it has a much bigger impact and much more of an organisational impact across Council departments as well. See I'm changing the culture.

SW01, 9   I do think that the problem is ??? [53.39] people moving about but I mean is it any worse than any other industry? Can we really put that up as a reason why things aren't happening? It is mentioned in the back end of this report along with people moving on etc but I don't know if it's any worse than any other industry.

RN   I think yeah, I mean it seems to be kind a way of managing all these things, like you were talking about the planning and how to kind of incorporate all these issues into like a single idea and as SW01 says, these problems are kind of human issues aren't they. I guess we just kind of have to deal with it. I mean I have got this from an article written about Melbourne case study because of obviously having similar problems and they highlight the impediments of this kind of innovative and broad sense urban design as they call it and they have got insufficient skills and knowledge, organisational existence, lack of political will, unsuitable institutional capacity and limited regulatory incentives, and kind of part of that is to do with the legacy and the history and how things have been dealt with a little bit and I was wondering if maybe we can ...

GC05   I think a lot of what you have just read out there would apply here - it is the same kind of thing, but you might call it something slightly differently. But it is the kind of thing that if you want the continuity, then we need internal or advice notes or stuff that explains things to people in plain language, because a lot of time planners tend to be a jack of all trades and a master of none, so as a planner, I know a little bit about engineering and a little bit about landscape architecture, a little bit about architecture, a little bit about social history, a little bit of and I can pull those things together and hope that the sum of the parts is greater than the bits that I have put in. But it is that bit about if you want the continuity of having that information in chunks that people can understand why they are doing something, why its important that they do something when they are dealing with a development application and why when we create new policies because the best policies in the world work if they are straightforward, simple, limited amount of words and it says what it does on the tin, you know it is going to prevent this or going to make you do that and the technical explanation can sit somewhere on a dusty shelf somewhere as long as the policy is clear, all the background information and explanation of why you are doing it is clear.

RC01   Before you get a product you have to get the tools to make a product and I do think that we are still making the tools to a great extent. Glasgow is way ahead but there is a lot of bodies that haven't got the tools made yet and that's where we are, we have to have the tools that have not been in the shop, now we have them it's a question of are we allowed to spend money to actually have them.

GC01   To have to use these non-structural responses, you have to have the tools. You have to have ... we're right back to the point ... everybody knows where it's going to flood. You have to know where the water is going to come from and we don't know that. And without that information then non-structural responses ... I've got my doubts about some of these non-structural responses, the effectiveness of them, but any plan has to come from that base and that isn't available.

GC01   So you have to deal with it there and what we seem to be talking roundabout here is the residual flooding that is left after SW01 and SW02 and myself and RC01 have actually come

	up with the structural responses whether its sewers or tunnels or suds or flood prevention schemes there is always going to be some water flowing from somewhere and it has to be dealt with and we have to manage these overland flows. And I think some of this is quite a nice idea, however, I don't know if SW01 would be able to sleep well at night knowing that Mrs McGlumphey has actually got sandbags so it will be all right, or ...
SW01	I care. I care passionately.
GC01	I know you care, but you wouldn't sleep if that was what your flood prevention scheme, i.e. your flooding relied on. So you and ... we're all talking to one another, yes that has to happen but the way it happens has to be a hard ??? [59:12] solution.
RN	I would be quite happy to take sandbags out of this completely and justified by saying that if people understood it more that we don't need sandbags then maybe as YC01 was saying having divisional measures if, maybe they haven't been invented yet, but I think it is a red herring really and I would much prefer to see someway of having people understand. When I talk to my friends about flooding living in Sheffield you know and everyone in Sheffield was affected this year, my girlfriend and all the neighbours all their cellars were flooded for the first time every, you know but no one understands it, no-one has a clue and all the opinions that float around even on the radio, and it is something that people have no idea at all ... and I think addressing that would go someway to helping the problem.
SW01	But how do you address that? How do you address it, because nobody knew it was going to happen. It's the same as in 2002 in the east end, no-one knew that that was going to happen and the same out at Knightswood... there was flooding - no-one knew it was going to happen. And it's only down to getting tools and running the scenarios and ensuring you understand as much as you can, what every situation is going to be. If you dump a storm here what is going to happen, if you dump a storm there what is going to happen, it is all about probability. And then, giving over to the technical people to say how do we deal with that, what are our opportunities to deal with that? And anything that is left you can then say to the woman, well look at your insurance. You need to make your house resilient to flooding or there's areas we can't tackle in terms of, we can't justify in terms of cost benefit, whatever. I think there is a place for it but there is quite a lot of criticism about the hard engineering of ignoring anything else. I think my point is - hard engineering has got to be done first, whether that is sewers, suds whatever it is – and I wouldn't call SUDS and flood prevention schemes are necessarily hard engineering. I would call them soft round the edges engineering, but I think I would have great concerns about things like individual measures, green roofs, water barrels etc
RC01	Going back to the tool box again for whatever measure you use whether it is a final solution or an interim solution you still need that underlying toolkit.
SW01	Yeah as part of the package you can't get away from some of the flood problems are so stark and so frequent it seems to be some sort of 10 year cycle for a very rough looking weather patterns you can't avoid working at the hard engineering solutions, they have got to be at the forefront.
SW01	For example in the East End and Knightswood or wherever - if you go into the locals and say what we are going to do we are going to give you sandbags, I mean, it is just not a professional, sensible, logical response to the problem that big you have got to look at big solutions to big problems.
RN	But this is we have been given East Glasgow's as a case. But the second thing is there is a school of thought that says until something happens, an incident happens in a place then nothing will be done about it anyway ... which is and then once that happens then you can say OK, well East Glasgow was flooded, Sheffield was flooded, Hull whatever ... then the people are aware. And it seems in my mind that that awareness will go someway to maybe that is not an NSR and maybe that should be a separate issue I don't know.

RN	Yeah one thing I was kind of trying to say at the start. If you just have non-structurals and let's say, assuming they are functional, if you just have non-structurals but the people who are your ... let's say imposing these methods on ... don't understand them then they may look at you and think well you are not doing anything. You're just giving us these woolly solutions - they aren't going to work. But let's say if they do work and people don't understand, then you kind of ... you've made these amazing responses but no-one understands and that lack of understanding will prevent their implantation.
SW01	I absolutely agree with you and you have to take the community along with you, particularly when you are looking at and it goes back to GC04's point about using these works to have community benefits, as well as green space, open water, biodiversity - whatever it might be - you have to bring the community along with you and that's the only way we and from our side of it can actually work. If you want to put in flood prevention schemes then that's only ... and he never mentioned ... I don't think he mentioned Flood Prevention and Land Drainage Act in here and the limitations of that. That's the only way we would actually deliver something. We will not be able to impose it. Scottish Water have a slight advantage there. I think you just do what you want to do and then worry about the consequences ...
RC01	Yes and it just does certain things but it is not really giving us a lot of support. To go back a step in terms of working together. Well, the size of the problem is such that you will not get answers straight away. We are talking about years and years – decades - but it's about opportunity, the way you do things, where the biggest ? [73.44]. Now it may be that if the overland flow areas are identified, that maybe Scottish Water may decide to cleanse those particular sewers more than the other ones, because they are the areas where we have got to get the water out. But that is the sort of political thing we have to bring all the things together with. And it's against discussing things but again without that information, it's hard to actually say what is the opportunity here, can we get that in our asset funds three years hence, can we get that vision or that water plan centre?
RC01, 11	Admitting the problem and telling the public what the problem is an awkward bit. There's no two ways about – it's awkward.
RN	Again it comes down to the ehm ...
RC01, 12	It comes back to the water visions and bringing the public in. Now the way we have looked at it is, a certain area and we feel we had to have a look at the option before we went to the public. The Dutch seem to be quite happy to actually open the question to the public before they had even thought of the answer. Traditionally we just built it and then give the public a chance to object to it. So we have gone halfway nearly, but we have still got to go through the local councillors to actually see whether ... what their response is. Now there is a report on flooding last winter going through, now there was an appendix attached to that. I don't really want this going off. There was an appendix attached to that which actually highlighted what I thought we would have to do at about half past two in the morning for the next day if the rainfall came down as it was expected to. People would get worried and run about like headless chickens, if they looked at what we were thinking of in terms of block this road off etc, etc. If this floods, this could flood and then sewage could go then. If that blocks then leave it alone don't tear it apart because the next one would have a worse consequence downstream. People could get very upset at that because it was in the heat of the moment and it's raw. So that has to be changed to leaflets on displays, talking people through what an ? [77:03] is, what a sewer is. What a water course is. Where it is. You know, the public would probably have no clue. It was only four years ago we had some ? [77.14] what the CSO was. You know, there is a huge amount of discussion to take place to get things going. But there is this problem of the worry over a knee jerk reaction to the public and financial consequences on the public as well, in terms of forecasting ? [77.35].
RC01	People that live somewhere near a main river have some sort of notion that, yes, the river floods oh that's a surprise, but that's different to someone who is living in the middle of an urban area to be suddenly told that sewage is going to come through their door. That is quite

a shock to people and it's ... tailor it bit by bit, but it is going to be quite awkward to deal with. And that doesn't mean it shouldn't be dealt with. But the consequence of dealing in terms of telling the public that, lets say the technical people want to tell the public what the real problem is. The public then go to their councillors or their MSPs and then you have a proper full debate. And whether we have care homes for the elderly or whether we can have prevention, these sort of things. But yes a debate will be required. I would like to see more positive non-structural response not just saying that's a flooded area, but that's an area where these measures are the sort of things we want to place, what do you think about these? ? [79.28]. I think to say that flooding is the next step -it has to be very very positive if we want to get it done and that can only happen really if you have got the confidence and tools that you have got ? [79.42].

SE01   Yeah, but in some areas there is not going to be any structural response you can make because of cost benefit issues. So you have still got these residual issues where perhaps a non-structural ... you know, other methods need to be employed. So you have got to make people aware of that.

RC01   Going into cost benefit and they are being counted now. But one of the things in terms of multiple benefits is a ... ? [80.08] doesn't really cover it properly. In reality you really have to join with other things, other budgets, across budgets, across bodies and then you end up thinking about whether you should have opportunity. Opportunity is a thing that underlines non-structural response as well, because you may have to work in a red amber green system - when you have five reds its time to do something. Maybe there was one particular location that a sewer has clapped out, the ? [80.41] drain is non-existent, the road's practically non-existent, there are pot holes and you have got in the middle of a functional floodplain. And there is a pollution problem and the public wants their environmental control as their 60s housing is leaking. Maybe at that time – that's when the money goes in - ad-hoc and normal, but then you are into the different ways of actually controlling your finance and beyond ... or going further back beyond the toolkit ... is finding money to build the toolkit so you are always coming back to this again as well and its how much and how quickly can you afford it to build that toolkit. Whether it is human resources, or whether its skills or whether its money ...

RC01   In terms of the east end - Glasgow's east end - there is a huge amount of money that has obviously gone into develop that to build that knowledge base up. But the question is then, do you repeat that elsewhere or are there other ways of assisting. Some areas may not need as much as that - some areas might need just as much as that and so the transcript of responses is what relies ... what depends on the progress the east end has had. How do you actually ? [82.28] structural response actually get the money while understanding isn't it available to get bodies to actually get together. So Scottish Water have to have an ?[82.52]. Now if memory ... that's a fairly recent thing, studying the assets but we haven't got any assets? And we are the ones that are charged for actually having models of 200 year events and so on, but until we actually develop them we haven't even got a framework to talk to each other with, so all of that toolkit to actually talk to each other, that fundamental ability to actually come a frame of reference is not getting a response.

RN   Sure. There is a barrier to ... if you haven't got the tools to even talk about it?

GC01   Well we're starting to get it in Glasgow. There is quite a lot of information in Glasgow as your team, you are on an awful lot of time and effort and expense in the main and Glasgow as well has contributed to that. We are getting there but without that we wouldn't be able to take anything on.

GC04   It underpins all future actions and ? [83.52] to work with and that's true of any project but its particularly true of ...

RC01   You would think it's obvious wouldn't you? When you look back on it, it is obvious. But that has never been the reason for doing it in the past, whether it's flooding or other things because it won't be councils that actually say ? [84.12].

GC01	So what we are saying here is that the biggest non-structural response or the most effective non-structural response is actually knowledge.
RC01	Yes.
RN	Modelling and understanding the ...
GC05	I think it is knowledge but it is also putting that knowledge out in a way that people that I know and non-engineers and non-planners and non whatever bit its come from have half a hope of actually understanding it, because you could come up with the knowledge from an engineering point of view but you need to be able to explain that to planners who are writing policy within development management in order for us as planners to implement it and vice versa. We could come up with the knowledge from a planning point of view, but we need to take it out of planning speak and put it into plain English.
SE01, 15	That is quite interesting because our flood maps, you know, obviously it's on the website and you want a user friendly front end so people can understand it. But there was this conflict in developing that web page about what goes on it. The technical people really wanted something ... we were trying to educate people so we were pushing more technical advice on there but ...
GC05	But you don't want to dumb something down to the point where it's useless.
SE01, 15	No but we feel that it has been slightly dumbed down and that's quite an interesting conflict there between what our PR people wanted and the what the technical staff want.
SW01	But regards ? [85.30], you've also got to take cognisance of the data sets – what you use them for might not be up to scratch entirely. There might be flaws in some aspects of information you have got. You might not have all the models you want but that itself is not a reason for standing back and saying that we can't do anything till we improve the data. We have got to do something ongoing with the data that you have right now because you wait forever refining a dataset.
GC05, 16	There are also levels of knowledge in that you have got ... what you're talking about is the maps. There's a level of knowledge using SEPA maps that other professionals will need to have an understanding of it. But they don't need a degree in engineering to understand it, a kind of common sense knowledge will help and there is a different level of understanding that the man on the street requires of it and we sometimes break it down because we either try to put everything out to the level that the man on the street will understand which means that the technical bits that you need to actually implement it get lost. Or everything gets put out so that all the professionals can understand it and the man on the street hasn't got a hope in hell of understanding it and you lose the kind of ... you need to know this kind of thing.
GC05, 16	But it's about putting that knowledge out at different levels, because you need it to go out at certain levels so the people implement it, run with your advice and use it and you need professionals to be able to get on with it and use it and you need the man on the street to run with that advice and use it as well, without being bamboozled by the science.
GC01	But the man on the street doesn't want to know because when you put out your flood maps and we did that exercise with the Cart three or four years ago about be a good neighbour and alert people and so on when we want to put up these 30ft towers with flood gauges on them and so on - the number of people who contacted us and said we are not in a flood area - don't you dare contact us, and you are on the flood maps in the 1 in 150 years etc and they didn't want to know.
GC05	Was that not the way you spin it to use the technology?
GC01	No this was based on the insurance thing. That if you are telling us we are on a floodplain, we have got a problem with our insurance and that is where that was coming from and they were turning a blind eye. We haven't been flooded and we are not going to be flooded. It is exactly the same when ...

SE01	...in relation to the flood map they may not have been flooded it is such an extreme event mapping a 200 year event that it is unlikely that they will have been flooded and then there is this inbuilt resistance to accepting ...
GC01	When you go out to a flood, it is a case of Why have you let this happen? What are you going to do and we want it done now. And there is absolutely no lead in. I mean, Knightswood is a prime example. Scottish Water would have been hanged if they were out there that day a month ago and we were getting all the flack from it. And they are taking no responsibility from the previous flood to say well we will now do this and we will take these procedures to try and mitigate our own ... because what you are saying about the photographs and so on, they are wanting the official bodies to do it all and they are not wanting to do anything. They are wanting to live in their house where they are in a dry area and you stop it flooding.
GC05	What I'm saying about it is some people don't realise there is a need to know. It is also about the way you spin it. People are turning a blind eye because oh my god it's going to mean I can't insure my house or I can't sell or whatever, it's not about that. It's about you want a quality of life in a place that you choose to live and therefore you need this information. These conversations need to happen with the insurance companies, so that the insurance companies reassure ...
SW01, 18	I disagree. I think you are right. I think it is fundamentally oh my god I can't sell my house and I can't insure it. That's it and if we come along and say well we've have had these flood risks maps and all this information and we are going to come over and put a wee periscope in your airbrick and we are going to put slots or boards on your front door and then you will be fine because we think this might flood a 1 in 100 year event. They'll say before you get to the end of the road they will take them off and will have been away because it shows that they are in a flood area and its fundamentally economics for them.
SW02, 18	We have people in the Cart area who phone us up two weeks before Easter saying take these sandbags away. And they come up with all sorts of reasons for taking them away but the net result is they want to sell their house but they can't if the thing looks like Beirut.
GC05, 18	What I mean, is I understand all of that. What I think I was trying to say was yes, its economics. Yes they want to turn a blind eye. But that just means that as councils and other bodies, we have to find a way of telling the wider public the story without cutting somebody's economic individual ...
RC01	I think a lot of it is down to just being told you have got a problem because being told there is nothing we can do about it ? [90:52]. When we have say North Renfrew Flood Prevention Scheme footprint covers about 1,000 properties. So we get as many as 80 people have a look at the plans. Now that is quite a good turnout but what we have done is we have said this is the footprint, this is what we are doing so they go back into inertia again the public generally pop in for a break from the rain outside or occasionally they'll actually look at the plans. When you actually look at the urban areas which are processes of adaptation and so on, then what we had in mind was to try and copy the Dutch approach to some extent and that's to make sure we could do something and then say to the public, look we would like to actually change our environment over the next three generations this way. What are your thoughts? Now we can only do that if the council are committed of the time with other parties for this to actually put things right, but that's the thing - if you are going to say you are going to put something right you have got half a chance. If they believe you. Traditionally the public think my god if the council can do anything we'll be bloody lucky therefore it will probably be OK. If you have got a consultant on board well OK they won't make a complete mess of it - that's the way the public think. Now it is actually the other way round as far as I can see in many cases. But it's that having to be positive and that being positive actually means you have got the funders on board to actually take things forward, which means you are drifting into national security in terms of whether the national government is prepared to actually stand and back you up over a period of time. So yes you can be positive, you can get all

these non-structural responses in place, it gets harder and harder. Yes you need the toolkits, you need all the knowledge base, but it gets muddier and harder because you've then got to bring in the people that actually control the funding.

GC05   You also get towards where you could say right we are going to put in these floodplains. We are going to give it to everybody across the board so nobody knows who is flooded and who is not. Its like the fuel 200 quid that everybody gets if they are over a certain age to make sure they stay warm in the winter regardless of what they earn or what their pension is, so if you put flood boards and periscopes in absolutely every house then nobody would know which one was a flood risk and which one wasn't.

RN   Or another way of doing it would be to have flooding in common parlance so everyone understands it. I mean again, it is probably as unrealistic to try and do that as giving everyone the flood prevention, but it is the same idea. I think if it was understood throughout peoples mind ... if it was kind of well understood as a general whatever ... then when kind of that situation is less likely to arise.

GC05   You need a positive spin on what people see as negative.

RN   But it's like you say, there's no ... you are not going to draw anyone into the flood argument if they refuse to accept that they are going to get flooded. But at the same time, you have to somehow involve these people and it's kind of like, how do you do that? Like educating doesn't work, raising awareness doesn't work because you are kind of forcing things on people. And also OK people who have been flooded then want to get involved but then you've got ... on both those occasions you have got half the people who are neglected, let's say. On both those occasions you have to have everyone ... well it has be in everyone's awareness I think, rather than against the fire fighting, it just seems to be like fire fighting a little bit.

GC05   I think it's about educating people about flooding without them realising that they are being educated. It's the accidental education and giving them knowledge though a different method, and if they get that method it's that stealth kind of thing that ...

SE01   I think in the schools what we have done is ...

GC05   Tell the kids and the adults will know.

SE01   I was quite cynical about this but actually I think it is really good because it comes back to the parents and OK we might only get 10%-15% of areas in a flood risk but you target them correctly you know ...

RN   Because they might actually look at their roads and actually look at the level of that compared to the river and stuff. We probably are in a flood risk area, obviously not everyone is technically minded or whatever but ...

SE01   It just puts it in the home and in front of them. If the kids are going on about it they will usually ...

RN   So maybe we need to make a film or something, one of these Disney films.

SE01   I think we are being definitive [all laughing]. These people flood and these people don't.

RC01   You know it's not that definitive. So that when it comes to actually frightening people you can put a spin on it. Those people that are supposedly safe are not safe, because as long as there is a way through their doorway on the ground they are not safe because in theory something could actually ... it could be a water main, it could be something on the wall next to them, in the garden that directs the water through to them - all sorts of things. All of these things will envelope ...

GC05   I think when I talk about planning and I talk about SUDS, the ideal SUDS from my planning perspective will want more green space because people do not know they are looking at a drainage system. They just think they are looking at a nice environment that adds value to

	their house and gives them somewhere nice they can go on a nice sunny day. It's that kind of accidental ... they don't need to know it's there doing the prevention behind the scenes.
RN	I disagree with that actually. We had this discussion before. I think it's the other way round. I think ... and again the example in Sheffield where the people understood what was going on there and at the end of this treatment train was a fishing lake and because of this understanding of what the situation was there, waste water was feeding this fishing lake eventually. Ended up as much more of an adoption of the system, so there are two ways of looking at it I suppose, but this is maybe perhaps my perception on things but if you understand what you are going on, particularly in climate change and the globe is ... we are looking at things differently to we have always done, I think having an understanding of the impact of your actions and behaviour can go some way to altering that behaviour and having understanding that this beautiful lake with the swans and the rest of it is being fed by your waste if you like, or partially fed by your waste could in some people's mind increase that adoption of it and use and ... sometimes.
SW01	I think what the ideas sparked round here is you need planning, you need information, you need to plan and yes people have to be aware and whether they choose to accept that information or not is entirely up to them. We weren't aware of those reasons - you are on a floodplain and, by the way, here is our plan for dealing with flooding in Glasgow and you don't figure in that until 2020 so you better make sure that you know what you are going to do and here is the things you can do to protect yourself should that arise. And if it does arise, then an Emergency Planning Officer is going to have these plans to help you out of your house with a big reasonably burly fireman.
SW01	That ties in with going back to ... going back to what GC07 was talking about ... we would have to have flood prevention schemes and we'd take the green space and you would have to ... part of the city plan ... the city plan would have to help deliver that. But we can all talk round and about it, but the people who really matter in making sure that that all comes together are the regulators - the politicians. Because the regulations and legislative instruments don't necessarily make that easy.
RC01	I think it's worthwhile pointing out as well that if you ... for a current structural response - a big one - talking about a decade if you're lucky, but we need to emphasise for non-structural responses the timescale is three generations. I think that is the key differences in there.
RN	I think that is what seems to be key. but how would you get people to accept that?
GC01	Well it's too long a timescale for people to comprehend so it has to be here and now, this is where you are, this is what your risk is. This is the information we have got and there is your risk. Here is how we are trying to manage that risk on a citywide scale and you are down there.
RC01	I would think that you start now and you keep developing and you're applying non-structural responses such as planning aspect, but in terms of actually ... the knowledge base - I think that will keep going. Three generations basically ? [104.32] so that will keep going. In terms of things it raises like ad hoc, well there will be bits of measures and structural measures that have come out of this, things that people can't wait and they will be subject to finding money in the next decade of several asset plans as we are talking about the underlying knowledge here fixing into asset management plans, whether its roads, sewers or whatever. So there's - in terms of the public - then there is a question of prioritisation or not versus opportunity and somebody has to make a decision on terms of which ... probably councillors ... which areas get something first and who gets partial solutions whatever.
RC01	So if we apply planning guidance overland flow storage, we might get an extra few years 25% of what we want. That leaves 75% to deal with by other means, but it's good to have 25%.

SW01	Yeah just in terms of the picture that was then put out regarding this whole subject area, I mean hard engineering, big scheme takes 10 years or so, then this will take three generations, so we are not exactly selling it.
GC05	I think we. If you think about the kind of way knowledge comes through and we are all on 2007 going climate change/carbon footprint, don't travel, don't do this don't do that - that's come and evolved over the last 25-50 years. The same thing, you go back about 50 years and everybody thought smoking was a great thing to stop you getting colds and everything else, there has been an evolution. And there is an evolution of ideas and you react to the idea that is common and current at point in time and you start reacting to it and solving that problem. As you start solving that problem, it involves another one that you start tackling. So there isn't an end in any way shape or form because the climate will always change. The environment you are reacting to will always change because we are all evolving, nature is evolving, the climate is evolving. So there is never an end game. You can say to get to your ideal world, it's your grandkids. It's all about the kind of ... whatever I do from a planning point of view, isn't really going to have a major impact on me, its going to have a major impact on the kids that are being born today. I know that. Because I don't have to live with the mess that I create for more than another 40-50-60 years if I am extremely lucky, but the kids born today have got to live with for 80 to 100 years. That's why you are talking about generational.
SW01	I am just talking about in terms of the message that's been put out about it. You're less inclined to get buy in from organisations or people if they can't visualise the timescale. If it is so far ahead there is less probability that they will buy it, especially when it's at the margins of solving the solution.
RN	How is this addressed then? How can this be addressed? Like with ,OK let's say it's clearly going to take 50 years to solve the problem in the Glasgow east end let's say. Just accept that as a premise. But also clearly we need to appear to be doing something now, or something needs to be done straight away. Does that sound acceptable, does that sound a ...
RC01	I think it is more a case of wanting to bring the public up to a defined standard over a certain period of time and are just going to start spending now with people that know they have got problems and you are going to worth through to people who don't know they have got problems to a defined standard that you think the public is willing to tolerate and, on behalf of the public you're saying, the council are going to spend x amount of money to bring you and your children to a standard of such and such. We will deal with the known problems and deal with the unknown problems which are actually worse than you know about, and the rest will follow in due course. And it's subject to you and your children to actually decide what environment you want to live in because it's all interlinked. Its not just replace a sewer with a water butt, it's the whole thing ...
GC05	If you think about it now ... if you are talking about drainage, we are dealing the consequences and decisions that were made in about 1880 and 1890 to deal with cholera epidemics and that's what led to the creation of the planning system in the first place. It was to deal with unhealthy urban environments in the 1880s and 1890s. That's the system you are working with. It's a 100 year old Victorian system that is now failing so you are in that exact time lag that you were talking about moving to the next way of dealing with it.
SW01	Do you have to put a timescale to it but the problem is it's more a process that you are talking about here and we are starting the train just now – the train is leaving the station. In fact hopefully in Glasgow's institution it's got to the end of platform 11A and its on its way down the road, so there is a process going on here and everything you have got in here is part of that process and I don't think you will ever come to the end of it because we could put a solution in place tomorrow and 10 years down the line there will be something else that will pop up. So it's a continuing process and we will always be looking at flooding solutions and if it's not where we are going just now, it'll be somewhere else. Something else will happen so that in parallel to these hard engineering - and I use hard engineering advisedly - there has

to be the non-structural responses which is perhaps the public's response or the public's responsibility in relation to themselves. All of these things in here, yep, they're fine, but are being done ... I think most of these are being done as part of the process that we run in Glasgow. We currently have a warning system. We do have some procedures for flood risk. We do have sandbag delivery and there is co-or ... I don't know if there is co-ordination really, as it's the authority's ... development planning. Development planning, decision support systems, economic instruments, flood risk maps, GIS database, planning and management - all these things are strong call that maintenance. A lot of these things are happening.

RN	It's how to deal with the knowledge.
SW01	It's gathering knowledge and managing knowledge ...
RN	And dealing with it.
SW01	... and coming up with solutions. You can't get away from that and I think the non-structural responses ... if that's the reason non-structural responses ...a lot of them are happening. The ones that we need to ... that we have spending the last hour talking about is how does does wee Mrs McGlumphey in Elmbank ... in Elmvale Row respond to her ... respond to the potential that she is on a floodplain. Nothing will happen for another 5 10 years.
RN	Sure, so in conclusion from that perhaps that maybe make people happier to hear it, but instead of putting a timescale on it, you can make it ... make people aware that it's a process rather than something is going to happen. You know, you call it a process and its about gathering knowledge, dealing with it and kind of disseminating it amongst the people who ...
RC01	I think maybe one of the things to change the three generations then is to actually just emphasise that the non-structural approach will just be ongoing and continuous development. Within that context you are putting in structural measures.
SW01, 22	I can accept all these things in there. I think these are all valid for Glasgow. Most of them, not all of them. And the key one from my point of view is that the regulators and politicians to bring together, to synchronise the legislation, to synchronise the funding streams so that a guy like SW01 and myself, SE01 and KC01 and RC01 etc call pull together solutions that we can actually deliver. Integrated solutions – because they keep mentioning the integrated solutions in here and the solutions might be integrated but the mechanism for delivering these solutions certainly aren't.
GC04	And the design criteria.
SW01	And the design criteria. So that ... there are problems there. Right I'll get off my soap box now.
RC01	We can maybe highlight that out of sight is not out of mind and that is half our problem. We've not been able to see what we have got - what is clear and what is not clear. We thought we had done quite well keeping the gullies [115.54] clear until we found the gully ?tails? [115.56] weren't clear or crushed so for the first time, we're actually having to look at gully [116.02] connections.
SW01	There is always something out there, but we'll never get to the end of it. And as climate changes with this then 50 years from now people will be sitting down saying well these guys are clever because they built in flexibility, but I wish they had built in a little bit more, we are going to use it all up next year.
RC01	It's an expensive job to put everything in a pipe. If you are going to go much higher you are going to have to go back to more natural ...
SW01	That's what it ... that's the collaborative approach we've got and that's where we have the opportunity I think to do something a little bit different.

SW02	I mean there is talk just now about very high levels of changes to drainage authority, make up in responsibilities and remits but that will take a while to come to fruition, if ever I would think.
SW01	So I would not fill in my application form yet for that.
GC04	It would probably be a lot better in hindsight if it was all controlled in the one organisation.
SW01	That's the talk just now.
GC04	And now we have to just live with what we've got at the moment and I think even down south is worse because you've got that many different – and they don't seem to work together.
GC01, 22	The difference down south is ... the benefit we have up here is that all the authorities who are working together are public bodies essentially and we have a public body mentality. Down south that is not necessarily the case so I think that is a big advantage that we have.
RN	I just wanted to ask you actually, sorry to jump in here. The single agency - could you run the risk of a kind of monopoly situation there if there is something ...
SW01	Somebody want to buy flooding off us?
[all laughing]	
RN	If you have an innovation - if you've only got a single agency and there is some innovation let's say and they decide that it's not an innovation then that's it - it kind of kills it dead, whereas if you have got a few agencies, then ...
SW01	Every new organisation will come with dangers and plus points and negatives and might well be something that needs to be considered ... or it would be considered in advance of a new organisation being set up. But it's only been muted in the light of the recent situation ... the recent floods down in England because its accepted. I mean, the drainage remit up here is not exactly simple either in certain parts of the water that we are responsible for, so yes what you're talking would be something that would have to be discussed and talked through but the main imperative just now is the flooding and how you handle it, but that would be a peripheral issue – well maybe not a peripheral issue but an issue that needs to be discussed.
GC05	If you just think about how 10-12 years ago water sat with the regional councils. There was River Protection Boards and SEPA didn't exist in its current form so we have gone from where you had generic water services sitting completely within regional councils as was, to quangos and some stuff left behind at the councils.
SW01	To almost mirror the English PLC setup and that's ...
RC01	If you go further to actually bring in public ownership of the problem and the environment and how that attaches into whatever we are doing and gradually you are almost wanting more local response so you are almost going back to the old water network system where it is smaller ...
GC05	Water Boards.
RC01	... and Water Boards and local Councils you can ...
SW01	Yeah, there's negative aspects to that as well because some of the flooding issues in Metropolitan Glasgow Strategic Drainage Plan it spans to the councils probably more than they were, so one way is looking at it is locally is good in terms of solving individual solution, but globally ... and you touched on it ... I think it was yourself GC01 that touched on it earlier on ... some of the problems can lie outwith the local authority area, that the local authority is responsible for. So the collabor ... you can't get away from the collaborative aspect of these.
RC01	If I had to choose a system I would pick smallish local authorities and smallish water boards over the regional council funding. I don't know how you would do it, but that is the sort of

thing you need the strategic approach on the funding but you need the local approaches with the actual implementations.

YC01, 23   We talked about the knowledge and at the moment obviously three main organisation, Scottish Water, the councils and SEPA have their knowledge base and is there enough coordination between the three organisations to bring together all that knowledge? Because everything based on that knowledge, as we have talked about, and bringing them together centrally may be accessible by interested parties or the relevant parties. Is there enough co-ordination between these three organisations?

RC01   It depends which area you are talking about, certainly Glasgow and Renfrewshire are pretty well tied in with Scottish Water but I can't speak about other areas – are they as joined up as that elsewhere?

SW01   Well I'm specific to Glasgow. I mean in terms of what you just said, yeah I agree with that and Glasgow and some of the peripheral councils do work well together but in terms of how it works Scottish Water wide, I couldn't really comment.

SE01   Are you talking about the data?

YC01, 22   Maybe I could just ask a question. Should there be a centrally managed database of that knowledge?

GC01   Well I think there has to be because em ... and that is part of what we are looking at the moment is ... we have a huge amount of information and we have an integrated model for the east end. OK that's got to be developed, that's got to be verified – a lot of work to be done on that - but you can't then take that and put it on the shelf. It has to ... cos it'll be out of date tomorrow. So we need to manage and maintain that what will effectively become a model with a database attached to that. And that has to be available for people like yourself KC01, and who will feed the beast as it were with further data as developments happen, and that is a very complex problem to solve. Who manages it? How do we make sure it's up to date, it's robust. So that's a big issue that's being considered at the moment.

RC01   I thought it might be a too unmanageable beast to just have one. I thought it would probably have to be multiple ones. Scottish Water would have one because they're a national body, so they would have one national body. I would have thought local councils would have had them and then it's a matter of snapshots being passed around between the different bodies.

GC01   That's even more complex I think.

RC01   Possibly, but what we are faced with is actually getting the information we have across our own Council so that in itself is a management problem and we'll make decisions and then that information is to be available. Whether it is available up to date by the week, I doubt we will get to that.

GC01   No, you'll get to that, but it might be if it's up to date within a timescale of 6 months, you'll have done really well.

RC01   I thought six is best ... best we could do is 6 months.

GC01   But your point is right. If we are going to do all this, then we need to have a co-ordinated management of information and I don't know we do it. But you're right. But we are trying to do something along these lines, but how effective it'll be I don't know.

SE01   Clearly it may, you know, with things like the EU Flood Directive and the drivers for the change in legislation, you know, these things may come about. We are starting to go down that road anyway in terms of SEPA's a national organisation providing a national flood map yet we don't have the detailed models of the Glasgow east end and whether it's appropriate to have that I don't know. But you know, we've got a national co-ordinator and the Executive have done, you know, National Flood Defence Asset database so there's other information and there's a research project as well in terms of how we collect data and how we manage data and who manages that data. A collection programme as well so things are

moving on on this and I would expect to see this move forward quite rapidly in the next year or so.

SE01   It depends on what you want it for. For example, if we put out our floodplain maps going what we will then do from a national viewpoint is what we have now got, or will have, is a whole rake of properties that are in these areas. Now we would argue that we would take some off the SEPA maps because some bits aren't right. But we'd add in more to the urban areas, so that information is a national thing. But we would see that as actually passing that across rather than somebody focusing on the national effect and working their way down to fine detailing. We would like to do the detail as we are local and we understand it and we are aware of things and generate it up as it comes less precise let's say, less accurate, but on average appropriate for a national viewpoint. That is the way we are looking at the moment.

Friday 14 September 2007
Glasgow City Chambers

<u>Key:</u>
RN: *Richard Newman – University of Sheffield (meeting organiser)*
GC08:   *Glasgow City Council – Development and regeneration services*
RC02:   *Renfrewshire Council –*

RC02: But [1995] that was the first mention of Flood Appraisal Groups in Scotland and primarily they were focussing on co-ordinating the interests of planning authorities, water authorities and other parties including – and I suppose they were looking really at forestry interests, farm interests as well – but the way it emerged here ... the primary focus really is on integrating of advice consultation between the planning authorities - well really local authorities – Scottish Water and the Scottish Environmental Protection Agency. Although there are certain other parties may join FLAGS at certain points, but that's the main focus of it.

GC08: Except the context for the action, because as local authorities we don't do anything generally unless someone asks us to, if it's the Executive or whatever. So they set the guidance out. And there's a catch-all term in there that's still operating. Or anyone with an interest in.

GC08: OK, so ... it's up to the people running the FAGS as they were and the FLAGS as they are now because new guidance has come out that's tweaked the role slightly but I suppose the key thing up here, apart from who attends – cos generally it's only people working in bureaucracies that's got the staying power to keep attending ...

RN: Sure, so nobody ... the people at the bottom if you like ... the dwellers ...

GC08, 3 They don't even get there. OK, well we're just talking about its people with an interest. And generally people with an interest who have the staying power and the long term view tend to be in organisations or represent organisations and those organisations, through themselves, pull in the representation from the community or the members or whatever because generally processes are too slow for the timescale you're operating them, in terms of educating the community or whatever. If they attend and don't see any results tomorrow or whatever, they don't see the point. But what people who work in these things know, just the scale of what's involved takes time. A lot of time. So you've gotta have a sense of perspective to deal with these things.

RC02: To some extent I think it's really ... these are deliberative bodies. They're not policymaking bodies or decision-making bodies and the primary function is to really, following the floods in the early 90s was to sort of ... NPPG7 was planning advice and the primary function of that was to relate planners to the importance of considering flooding issues in the plan making processes and development control because for quite a number of years perhaps this has slipped onto the back burner. It was also focussing on need for integrated action, particularly with Scottish Water and wider range issues and obviously with SIPA – it formed in 1995 – and with this remit under the ... its environmental remit, water quality issues ... obviously there was a need for integration between these three for an awareness more than just the creation. But all of the respective functions and roles of one another so that we could come together and appreciate the wider problem.

RC02: So that was really ... you gotta appreciate, that's its main function and really, it's from there that from each of these parties responsible have got their own plan making and bodies to

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which they report. You know, SIPA Boards, local authority boards and committees etc, who in turn approve policy which goes out to the public. And it's through those vehicles that engagement with the public would take place. FLAGS are very much a front end – you know, considering issues and options and exchanging knowledge and information so ... to really sort of – it's almost like a CPD for professionals.

GC08:   It's the birthplace of things that subsequently get into the public domain.

GC08, 4   The other interesting thing about it is that ... well two things the French talked about. One of the other key things that stressed in the original document is that essentially there should be planners and engineers, right? Whoever set it up was well aware that these people, within organisations, need to talk to each other and between organisations. And that actually has been one of the strengths of the processes that planners and engineers have been talking together within the same organisation, which they didn't necessarily do and by doing so, the policies and strategies that are coming out have got some power behind them, because they're well informed. And they're not airy fairy – they're extremely practical. They're about solving problems, which makes them very powerful. The other thing about them – they make not be clear – I don't know this situation down south, but up here it's stressed in the guidance ... we had one FLAG network meeting ... I conducted a sort of questionnaire thing ... but one of the things that came out of that from all of the FLAG members who responded is – they didn't want political representation on these things. It gets in the way of doing business. For the kind of business we're talking about. What the people do is, they go away and through their internal processes, they report and engage with the politicians. The politicians don't necessarily have the sense of perspective beyond the things they're focussing on and their timescales are quite short. You know, so you're out of cash, how you deliver to them in terms that give something to them, but also take in the wider perspective. And that's the power of the FLAG mechanism too – there isn't any other vehicle like it for doing that I don't think. Is there RC02?

RC02, 5   Yeah, well everything's ... well it's the Water Commissioner who sets out ... ultimately the Scottish Minister sets out the objectives and yes they're very much driven by the four year programme of investment. But we're not specifically interested ... involved in their programmes as such. Really it's the ... obviously for example, at the present moment in time, the water industry commission's trying to encourage integrated catchment approaches into their investment programme. The FLAGS would have a role to play in discussing what we mean at the local level by integrated catchment management. I mean, what planners can do, what local authority engineers can be doing, what SIPA can be doing, what Scottish Water might contribute to these sort of concepts. And it's developing the concepts, developing the knowledge that FLAGS are really ... its concepts and ideas, but that's what its real strength lies in.

RN: To step back just a moment, just to allow me a bit more understanding. How many people are working on these FLAGS? Is it .. do you have ...?

GC08:   The don't work – they attend.

RN: Sorry attend. But how does it work? It must be ...

GC08:   In different areas, it's different, but in this part of the world an agreement was reached. Can't remember ... RC02 was it through the auspices of the structure plan people or whether the local authorities agreed themselves?

RC02:   It was the structure ... setting up the groups now?

GC08:   Yeah.

RC02:   Well the groups in our area were set up in 96 following the NPPG7 and indeed that followed hard on the heels of severe flood events in 1992/94 throughout Scotland. So there was quite an impetus to take forward the advice in NPPG7. So in 96, the new local authorities were formed in Scotland and within Glasgow and the Clyde Valley area the 8 authorities came together to form the Glasgow and Clyde Valley Joint Structure Plan Committee and it was under the agents of the Joint Structure Plan Committee that the FLAG groups were set up and it comprised basically of a strategic flag which would cover the entire sort of conurbation area and the major rivers in there – the Kelvin, the Clyde, the Carts – the overview on the strategic flying issues and within that there were three localised flags set up – Carts, Kelvin and the Clyde. They were set up. It was comprised ... the planning authorities were sort of Chair and his followers and primarily it was SIPA, Scottish Water, Scottish Natural Heritage is an amazing group – we were all invited to attend and the meetings really got underway from about the back end of 96/97 and have continued since. I mean the local FLAGS tend to meet perhaps three / four times a year. The strategic FLAG less often, perhaps only once, perhaps twice a year. I've got an agenda for the ...

RN: The strategic one is driven by maybe incidents themselves, or ... ?

RC02:   For example, we had a meeting of the strategic FLAG at the beginning of the year – April / May – and the main purpose of that FLAG was to bring all the authorities together to consider the implications arising from the severe flood ... severe weather events and flooding that we had in December across the conurbation area to acknowledge the sort of lessons learned and to discuss these with Scottish Water its effects, so given that that was a widespread major event [****17.40] convene the strategic FLAG primarily to consider that particular issue and how the authorities there are giving their accounts of what had happened, what were the responses, where were the flaws, where were the problem areas both in terms of our own reactions and the reactions of our partners etc and what lessons to take forward from it. So that would be an area that was, you know, worthwhile bringing everyone together.

RN: So did the outcomes of these meetings, these groups ... obviously they get fed into ... at some point they get fed into legislation or ...

GC08:   The inform policy and they inform ...

RN: But indirectly ...?

GC08   Yeah. Because the local authorities ... well it becomes historical generally. Usually if someone volunteers to do something, they get stuck with it. The Cart is chaired by Renfrew and Renfrew, because of the severe flooding they had and because of where they are in the flood plain and because there was a big political stushie about people getting flooded and all the rest of it – have a dedicated team. When the engineering [****19.10] deal with these things, they're well resourced and their flag is, you know, one of the Rolls Royces of FLAGS. The Kelvin on the other hand is I suppose, it's like [laughs], it's the Ford Fiesta of FLAGS. It was supported by one man and a dog and it tended to focus around the flood prevention scheme that they were setting up then, because they had extensive major flooding in the late 90s, and that one particularly had on it representatives from farming interests because a lot of farming land had been flooded and all kinds of things to do with that. They had other people on it too – they had the local environmental projects groups. So they had more representatives from the community or people who dealt with the community than the Cart might have because it's a smaller operation, much more local in focus sort of thing. There's a much more operation ... and the Glasgow one's sort of in between, but obviously it's got Glasgow [**** 20.35] major developments on their impacts and there are issues about the river and then upstream and so on, but it tends to focus on the developments

relating to the river and what to do with the river and all the rest of it. But obviously the local authorities are providing the secretariat because they have the continuity, they have the resources and they have the staff that are used to doing it. So that means that they'll run forever until someone says stop, or there's no utility. So that's the aspect of it that ensures ... the information just flows internally and uhm ... RC02 was telling you about, well he got an agenda. The things that he was talking about were a big concern to Renfrew because they've suffered badly in that thing and Glasgow had to a certain extent. But there are a lot of other things on the agenda that are of wider interest because they affect all of the local authorities. Stuff to do with river basin management planning and EU directives and things like that. Now to place the [****21.38] outcome to a consensus view ...

RC02:   There's a typical agenda there. That will give you an idea – a lot of these are standing items.

GC08:   Because it's one of the other powers of the original concept which is why it's worth reading NPPG7 and the revised ... as one of the other things is, it was seeking that the local authorities find consensus. Particularly because in planning terms – which we struggled with, despite the guidance in this area – it makes no sense, we're dealing with developers ... because the boundaries ... local authority boundaries pay no attention to the river catchments or anything in the urban area anyway. So I decided for a river, you've got two local authorities and you have different sets of standards. All kinds of things. It would make no sense for a developer straddling that river to be operating to two different sets of standards and all the rest of it, so the whole idea of this is to try and seek concensus across the catchment area within flood plain so you have some sort of coherent view about how you deal with these issues.

RN: Sure. So it's like the waterfront with directive in basement rather than country.

GC08, 7   That's right. This stuff then inform the approach to policy and standards and guidance in plans which affects all development. And this then sets the ground rules. But obviously you're directing investment to the right place to get the right outcome, so you're making the maximum ... you're gaining the maximum utility or the best utility you can from doing that, because otherwise it would be a waste. You have two different standards and they get a flood event, well you'll find out which one will work from the one that didn't. Then there's a whole load of other issues that came to inform that. But it's quite a struggle because there's no political input which is a good thing at one level. What it does mean though, is when the advice goes away from the professionals who are sharing it and starts going into the machine, it can be twisted or adjusted depending on the local political agenda. And that then means that the balance can be changed. And so the harmony that you see and the consensus may be put under strain because of the local political requirements. But that's the nature of democracy and so on, but it can make things more difficult than otherwise. So there's a sort of tension ... an inevitable tension that you get in such an environment. Because we're not one big planning authority ... we're not one big local authority, especially across a conurbation. There's 5 or 6 key ones and you've got to try and find common ground between them or ... you know, well that tension will always exist in this situation unless there's dictat from government that says the standard will be this. You know, if it's left to negotiation, then you'll always have that tension. So it took a bit of bawling and shouting and whatever, but eventually ... because this has all been done for the first time. So it's not like we had a track record or anything – this was the first time. So that was quite an educational experience but having gone through one iteration of the cycle, we're much better at it now. And through that very process, the local authorities put a lot of pressure on the Executive to say – right, that guidance was, you know, took us so far but it hasn't taken us far enough. We need better guidance and we need better guidance on this, this, this and this, which is the power of the FLAG process because we'd all been in extensive dialogue about, well what standards are we going to use, what should be doing about this that and the other? How far should we be going? And then looking at the legislation requires us to do this, but

that conflicts with this. You know, there's these sort of tensions and there's this whole set of non joined up policy at the Executive level where, you know, we're supposed to be taking on board climate change but the rules you have to use to test your flood prevention scheme against its cost benefit analysis are based on a flood prevention level that we all know is out of date. But they haven't changed the rules. So there's this tension again because the government itself hadn't got itself sorted out because the thing was changing so fast.

RN: It seems ... again, one thing GCC representative said earlier ... this report's on non-structural measures and I think the impression was from GCC representative that I'm kind of behind these things and it's like, right, this is what's needed to solve these problems. You know, maybe a treatment train, a structural ...

GC08, 9 He's an engineer. He sees it in those terms.

RN: Yeah, but I mean, I can understand that ...

GC08: Yeah, I know [laughs]

RN: But it seems like ... so anyway, I ... I ... the report is really – are these things useful? Can they help out in the east end of Glasgow? And I'm sort of going from one side to the other, you know. Sometimes they seem to be, sometimes they don't. But one aspect of it seems to be kind of champions in organisations and it seems to be, you know, it's not particularly well defined term let's say, but it seems to be the FLAGS would fall into kind of that area because it's ... I mean correct me if I'm wrong, but it seems to be like, something needs to be done here. The legislation can't cope with it, with the bureaucracy and so on and so forth. So this has emerged through people's experience and understanding of the situation and like a hole has appeared that needs to be filled and the FLAGS have ... the groups have appeared here.

GC08: I'd say, again, this ... I don't know whose idea it was at the Executive to put it in the guidance. I don't know where that came from.

RN: FLAGS?

GC08: Yes.

RN: Right.

GC08, 11 OK. If it came from the local authorities, great. Or if it came from someone, but ... the idea of introducing that into the process was a very powerful idea, which the local authorities took on board because it was good advice. Because half the time they don't necessarily get good advice. Because from the Executive you can get conflicting advice, even in the same document or even on the same page. But that was a good idea that the local authorities took up and ran with. And it's paid good benefits. For the amount of officer time involved, the benefits have been massive.

RN: Cost benefits ...

RC02, 12 Well its best use is scarce manpower resources because obviously is only one issue in terms of ... in relationship to engineering functions of local authorities. It's certainly only one issue to the relationships of the planning functions of local authorities. It was fully explained within the 8 councils of the conurbation, different authorities are staffed differently depending on the problems in the local area and Renfrewshire, because of the particular flooding problems we have, we've got the benefit of having a number of engineering hydrologists on staff, so obviously when it comes to the FLAG groups, these people are able to contribute quite effectively and inform other authorities who might not have that expertise.

So consequently you get a systems approach. You just get more understanding, particularly in interesting new concepts. I mean, when it started off, the FLAGS ... one of the main focuses was just to get the appropriate return period into local plans and get an agreement on what that concept meant of the concept of risk and the idea of employment change factors. Now obviously with expertise available in one authority, that is able to be shared throughout all the authorities so that every authority began is fully conversant with the risk factors and as GC08 was touching on earlier, we achieved a degree of consistency across all the authorities and the consequence of that kind of collaborative effort and cross exchange of information and at the present moment in time I suppose, a sort of integrated catchment planning ... softer approaches again are benefiting from the work done in Glasgow under the GSDP and the work done in Renfrew under its inter [****30.32] project. So that, you know, you're getting this shared experience round the table at the FLAGS which is facilitating the wider understanding across the table. So we get a more focussed approach across the conurbation, rather than just the one expert in one out of two authorities, you spread that knowledge and understanding so that when it comes to individual actions within the authorities, they have got the necessary understanding to put that into their own plans and actions within their own authorities or indeed to push it up to the structure plan and everyone's focussed on the key issues because you've attained this degree of understanding around the table. As I said at the outset, you know, the FLAGS really operate as a bit CPD for planners and engineers in terms of ...

RN: Indeed. So it's like almost ... the FLAGS almost seem to be like a consultant in a sense, but without an agenda. So it's like, you don't ... you get actual information.

GC08: Well the agenda is driven ...

RN: But it doesn't have like a political agenda, but ...

GC08: No no no.

RN: ... but it's got an agenda to sort flooding out.

GC08: Yes, which is what we're required to do.

RN: So they are erm ...

GC08: Well the interesting thing again – well I don't know about England ... it's where I grew up but I can't remember ... I read their stuff and it's got so little to do with what's happening in Scotland, it's chalk and cheese.

RN: There's a lot of beurocracy I think down there.

GC08: They caved in earlier, let's just say – the political pressure was such that they'd build in stupid places and that chicken has come home to roost big time. But the other key thing was that ... what was I gonna say ...? It's the ... God, it's gone. No. Move on. It'll come back to me.

RN: So I was saying about .. the consultant ...

GC08, 13 That's it, yes. It's more to do with the fact that that pressure has come from the Executive. Oh right. It's to do with the political fallout. It just seems to be the nature of the beast. This may or may not have anything to do with your PHD or not, but the nature of the best is it takes a disaster to get politicians to do something, right?

RN: Indeed.

GC08: So every time we have a flood, the politicians get it in the neck from the voters and then resources and bodies are thrown at the problem or people who are really overworked are told to do something about it. And you know, what happened here is ... that's what happened in Renfrew and Renfrew got resources politically driven. But also at the level of the Executive, again, I don't want any of this written down, but – at the level of the Executive, a politician came out and got serious abuse from the constituents and that politician ... this is the ... I don't know if it's true or not ... went back over there and said, right, we're not dealing with flooding any more. Get that over to the local authorities. Subsequently, the legislation was changed ... I'm giving you a story ... this is a bit of a fairy tale but it sums up what the process was ... and in the Act – the 67 Act? Here?

RC02: The 67 Flood Prevention ... read it.

RN: Yeah, I've got that. Yeah.

GC08: There were things in there that were at the discretion of local authorities. In the 96 Act? ...

RC02: 97 ...

GC08: 97.

RC02: 97 Amended.

GC08: Yeah, the 97 amendment, not long after their guidance came out, those things then became duties. Now once those things become duties, we are bound to deal with them. And that's what it's about now. We have no choice but to deal with them, OK? And that is where the utility of the FLAGS comes in. And all the stuff RC02 was telling you about – that's an important change. Massively significant. But also it took, you know, it switched the political focus now because the centre can say, well it's not us it's the local authorities, although they changed the rules, they didn't provide the resources. This is another big issue. Have as much legislation as you like, Labour Government and the Tories before them – very good at it ... passing legislation, but without the resources, nothing can be done.

RC02, 15 [****35.16] It's worse than that. We're understanding the nature of the problem. It must seem ridiculous looking back but the whole focus was on fluvial flooding [****35.28] and the idea of flood prevention schemes. They completely ignored the under capacity within the sewerage network and the drainage flooding issues which ... this has now been addressed in SPP7 coming out and subsequent follow up in 2004. But back at the start of the process, we weren't even understanding the nature of the problem. So you can see how we're miles away from talking to the public because we're not ... even the people who were leading off were still dealing with ... were focussed on almost a silo mentality on the issue. So you know, to some extent we've had to go through that process of introducing learning. I mean the particular learning was obviously the planning authorities, but even among the engineers themselves. Particularly the fact that so much now is dependent on the planning process. They have to understand the planning process, so there's a two way education here. So you can see ... you can begin to appreciate just now far we are from engaging with the public, because we've really got to define the problem, define appropriate responses, address these in our own planning mechanisms through our own ... planning mechanisms be the, you know, the [****36.51] management plan of the local authority, local plans and structure plans. And then it goes out to the public, though all those planning processes, discuss the potential outputs. But we're really really ... FLAGS are really really dealing with concepts.

RN: Sure. So you can't ... yeah ... I see what you mean because this was a point raised by one of my supervisors. If these NSR, let's say if you believe they're gonna be productive or not, if

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you kind of start say pushing them on the public, then the public aren't gonna understand and it's gonna look like you're doing something like you're avoiding the issue or taking the easy option by implementing non-structural measures, woolly measures that obviously aren't gonna work and not building anything ...

GC08, 14   Well I would say without a clear idea of what kind of return are you supposed to get from dealing with a room full of people each with their varying understanding – unless you're gonna ... are you gonna force them to take university courses to, you know ... night classes in flood prevention and land drainage ...? [laughs]

RN: Sure. At the end of the day it's a lot of whether you can sell your house, what effect it's gonna have ...

GC08:   This is where planning is so important. Again, you're an engineer. Don't know if you've sort of got a handle on it or not.

RN: Planning?

GC08:   Yeah. Planning is really ...

RN: Yeah, a little.

GC08, 16   Planning affects how people make money and as soon as you see a plan go out to consultation – I'm currently processing responses to a consultation exercise – the biggest set of responses come from the development industry or their representatives because the stuff in the plan, what land's designated, what standards are set affects how they are gonna make money and what they can make money on and what they are gonna have to spend. This is big business. We're talking, over the life of a plan, whatever, in a place like Glasgow – you're talking billions of pounds will be spent. So the plan's important because it affects how that money's gonna be spent and what's going to be done with it. So that's where planning's extremely important because new infrastructure comes it. That's why we need to engage because we're trying to set any new infrastructures ... we're trying to make it more fit for purpose than the infrastructure we've built before which is definitely not fit for purpose.

RN: Well I think, listening to the meeting this morning, it seemed to be ... really the key issue – planning. I mean everything. You know, having an integrated plan seemed to be the most important thing.

GC08:   Yeah, but the problem is, there's just not enough money.

RN: Well I've got some numbers here. There's ... here we are ... I don't know if these are exactly right but ... you've got 1.8 billion available nationally for investment – that's including the UK – for flooding. 35 million available to tackle the problems in Glasgow and it's felt that it will need 320 million ...

GC08:   Billion. Billion or million?

RN: Million. So you've got nearly 10% of what is needed in Glasgow to cope with the flooding problems. So it's like well, I mean you've got 10% of this ... I mean obviously, so it's not ...

GC08:   That doesn't ... that's 10% available to the local authority, then that means the development industry is gonna have to come up with the rest.

RN: Yeah, yeah.

GC08: You know, that's it. But then the issue is about you have to convince these people ... this is why you go through the process that it's in their interest. A) either because the insurance industry won't insure it otherwise, because erm the actual structures themselves unless they're built properly won't have the life they're designed to because there will be all kinds of political fallout further down the line. So these things need to be taken on board. But the plan is the one place where, if you don't get it right, you're knackered. Until the next iteration of the plan. You know, it's extremely important. And again, you've got this you know ... climate changes is the sort of ... the big ...

RN: The unknown.

GC08: The thing ... yeah. The big unknown looming over it that people are arguing about causes and process product ... in planning terms that's irrelevant because it's happening so you have to plan for it and you have to plan for it well, on the basis that the structures that we build now are gonna be here for 30, 40, 50 or 250 years, so on the basis that stuff is happening now, we need to be building them in at least anticipation of some level of change carrying on for some period of time. Our biggest problem is trying to get advice on how much and for how long because that affects the advice you give. And it's a moving face because as we've already said, we're in the middle of it. There is no script.

RN: You have to assume ... I assume everything you say that you believe this building as it were has to be exactly right and justifiable otherwise you could be held accountable for that and if you don't actually know really whether you're 80% certain this is gonna happen, but don't know ... if anyone gets hold of that, it's like ... and it's wrong let's say ...

GC08: Yeah, but no-one can prove it's wrong because ...

RN: Wrong shed [laughs]

GC08: This is the debate we got into in the first iteration of the plans. But in a way the development industry attacked some things and not others, but the principles they were recognising them in a way that the underlying forces had to be dealt with and then there some arguing about how they should be dealt with.

RC02: To some extent, the first iteration really is to deal with the return period and appropriate locations for development and to some extent, we didn't have any significant challenges throughout the authorities in terms of ... in making projections and ...

GC08: Well we had a few about particular sites, but they were all seen off on the basis of ...

RC02: I think as we move into the next stage, the idea is that we move into areas such as ... integrated catchment management and suds contributions to infrastructure. As we go more into providing, you know, standards there and policy basis in the next set of local plans that are coming forward, then I think there's more scope for the industry to perhaps object then. But certainly at that stage, we have to be very solid in our reasoning and justification before that, because obviously the plan is open to public local enquiry and you have to have a reasonable justification for it. For everything that we do.

GC08: So it's scrutinised by experts ...

RC02: And we've got to be careful again we don't step too far outwith the bounds of planning action in terms of precedents that have been set in the past and what has been set under the SPP guidance. So there's ... I think perhaps as we move into seeking the developer contributions to a future infrastructure through the planning mechanism, I think as we go there and refine that in our local plans, I think you might find at that stage, it would be more

... more elements of the plan might become more strongly contested than they have been to date.

GC08: Again, well that's where the tension will arise because there's an inherent tension in the planning process anyway between development and not development. You know, there's a lot of political pressure for development and their end of the tension is, allowing this development in this place under these conditions would not be a good idea. So in future we would be facing a situation where certain things may have happened because they were politically expedient but the political consequences further down the line could be quite extreme. And then the politicians will have to take that flak, because they're the ones ... That's a process that's going on but the consequences become more difficult to deal with in this urban situation where we've got, you know, this new infrastructure that we're forcing the development industry to pay for.

RN: Right.

GC08: The thing is, if they want development and they want it there, well we say the only way you can have it there is if you put this infrastructure in. You know, otherwise the infrastructure elsewhere in the system cannot cope. Then there will be a whole set of pressures because for particular reasons people will want that development to happen in that area because it delivers X Y and Z. The fact that it throws all the rest of the system out of kilter around it is going to be difficult to deal with but we haven't actually faced that yet, but we'll face it in the future.

RN: But presumably providing the reason to develop is higher than the restrictions you impose on them, it will be ... ie. don't drive the developers elsewhere.

GC08: Well you may have to. I mean this is the ...

RN: What drive them elsewhere you mean?

GC08: Well no. The iron lure of the inability of the infrastructure to cope will do that. Because this is another thing that's coming through the process, again ... I dunno it's tentiential to FLAGS but it's griss to the their mill in that the planning regime is only one set of regulatory mechanisms. There are other mechanisms that will equally stop development. So even if we grant planning permission – this has got nothing to do with FLAGS, although FLAGS debate this kind of stuff – a development may not go ahead because Scottish Water say, well we can't serve it – there's no sewers, there's no water. Stick your planning permission, it's not worth anything. Well even if they agree, SIPA will say, well I'm sorry the quality of the water that's gonna come out of that means we're not happy with it. You're not gonna do it unless you spend X Y and Z purifying the water. So it's still not worth anything. You know, this is how these things have got to mesh. We're talking three separate regulatory regimes and they've all got to mesh to come together for a development to happen. And that wasn't so crucial in the past but it's crucial now.

RC02: Oh it's crucial now, yeah.

GC08: For every development.

RC02: It's crucial now and it's really ... I mean the constraints issue is really forcing it. I mean it's the constraints issue more than ... well, as well as flooding issues that are ... drainage and flooding issues that are focussing attention onto integrated catchment approaches. Because the situation may be that, you know, while Scottish Water has had additional funding for what's called the growth programme for development in light of development constraints, this focuses on the strategic assets – the waste water treatment works, etc. The problem in

many area is the east end of Glasgow and areas of Paisley and areas of Renfrewshire is that we can't get from the network to the ... because of the system of combined sewers with overflows to water courses which additional development is increasingly infringing the environmental SIPAs and environmental regulator. So it's the network issues we've got to resolve. And Scottish Water has only got limited contributions now to make to that, so the onus is on the developer to resolve ... to reinforce the network to solve these network issues. And the means of doing that is through the development process, through the planning process. But to do that effectively – that's where we want you know an integrated catchment approach, rather than just a one-off approach to produce the [****49.16] surface water [****49.18] to the water course would be appropriate cleansing mechanisms. We want to look at the, not just this site, but how this site, this site, this site on that network all relate to each other and create a planned integrated approach to dealing with that issue and so where this is where the [****49.40] constraints issue has emerged four or five years ago and sort of compliments in a way the ... or adds to a definition of the flooding issue. And it's really the same type of solution which is required for both. The issues of water quantity and flooding and water quality and development – they're all inter ... you know, we're finding that they're all inter-related. It's the same up and down the country.

RN: Sure.

RC02:   And we've discovered this incrementally over the ... looking back you think why didn't we know that then?

RN: Again, this seems to have sort of [****50.20] – it's absurdly complex isn't it, all this and it seems to kind of ... one thing that came out of this morning's meeting really – one conclusion I think – again, it's like you look back and think well it was obvious really but understanding the ... literally the physical nature of flooding, how the three types of flooding impact each other, how you can model it ... erm, and so on and so understanding that knowledge would be key to this situation and then you could make much more informed decisions. But obviously it's very difficult and it's costly ... I mean there's people in my department who are looking at this type of modelling and it's just, you know, it's very complicated. But really, I'm just trying to think while doing this trying to fit it into some sort of picture that actually would allow progression over generations or years to come.

GC08:   Well that's what it will take. There's not enough money in the bucket and there will never be enough money ...

RN: For a quick ...

GC08:   Well, you know, the stuff the (?) was talking about this morning – we tried to capture planning policies and guidance that would facilitate that across the whole city. That's what we've got in the city plan and it's out for consultation. Uhm, but that was predicated on the fact that this treated drainage plan would be rolled out across Glasgow, but what became apparent subsequently was, there's not the resources for it. It's never gonna be rolled out across Glasgow unless we can arrange it with a higher being so that different parts of Glasgow get flooded in sequence so we can move the priority around.

RN: Well, we say if we could flood London then in England it would ... I mean it's always worth going down there and flooding the place cos otherwise there's ... nothing's gonna happen and you talk and nothing comes of it.

GC08:   Well we understand the problem. We have a mechanism but we don't have the resources. We can't generate them ourselves. The only people with money are the development industry and the only way we can capture money from them is at the point of development. That's the only way that, you know, local authorities can get investment ... money for

investment in infrastructure is at that point of development. And they can add it to their own budgets. But their own budgets are miniscule. There is a part for dealing with flooding things, but as RC02's saying now, we're beyond flooding now. We're sorting out a problem that we've done bugger all about for 100 years and now we're having to try and deal with that.

RN: Well it's me .. I mean look at me here. You know, I cost nothing and I'm going on doing this in my department, you know. And it's an experience. The amount of money I get paid is just absurdly little, you know, it's fine for me but really it's like ... Christ how do you expect anything really to get done.

GC08:   Yes, well the intellect is out there, you know, but it's got to be studied and modelled and this is the thing that takes time.

RN: This is it. I mean, all the ideas are there aren't they – the knowledge and understanding but it's just how ...

RC02:   There are ... I mean it's not all hopeless ...

RN: No no ... I don't ...

RC02:   I don't know if you spoke to RC01 this morning and he might have told you about the, you know, just following the flooding events in December last year, the integrated responses from Scottish Water and the local authority to try and deal with certain of the sewerage flooding areas. You know, pursuing concepts of disconnection, you know, at the very local level. So, you know, the ideas are there but obviously we're only tinkering with ... we're only making ad-hoc response to severe weather situations and obviously there needs to be much more systematic approach to this which requires, as GC08 was pointing out, much more central funding than integrated approaches between development, road asset and renewal etc.

RN: Indeed.

RC02:   But they are ... it's not exactly ... there are just ... RC01 might have spoken to you this morning about the progress that's been made over the last 6 months resolving specific problems in a joint way between the local authority and Scottish Water and Scottish Water are beginning to get out of its SILO thinking about its networking ...

RN: I was gonna say ... exactly.

RC02:   ... the integration with the water courses and integrated modelling and looking at ideas of disconnection, so that's partly the result of groups such as the FLAGS – exchanging information about what we do, what we're responsible for, who can do what and seeing how we can contribute to each other. And that's very positive. And there have been a lot of positives. You know, incremental actions have come out of the FLAG system over the years. But again it comes back to ... coming back to your initial ... we discussing these kind of issues, it's really not the place to engage in a public consultation ...

RN: Indeed, sure yeah. I can see that clearly. I mean, the way I see it – it seems to be an arsenal of 20 some years of information explosion, we suddenly have access to a lot more information as people and organisations and so on and sort of, the need and desire maybe has arisen to try and start understanding these situations and I guess you get to a stage where you're thinking about it for 10 or 20 years and think Christ this is a real problem, but because of the history and legacy and all the rest of it, you suddenly realise you've got this huge problem and it's gonna be an enormous problem to deal with sort of thing, then I guess it

starts to feel depressing a little bit. This is maybe what you encountered a second or two ago. And there was something I was reading the other day that summed it up quite nicely and something I kind of thought erm ... actually studying the troubles in Northern Ireland ... I have a friend who is quite interested in that ... but it all seemed to me that it was gonna take a generation or so to solve these and there was a paper I was reading ... it was actually this ... this magazine here, it's quite interesting ... er transition for water sensitive urban design in Melbourne, Australia .. that at the kind of macro level that individuals, governments don't actually have any control over, it's kind of indirect action over years will change. So let's say how environmental issues and so on. So suggesting that these kind of changes in socio-technical systems, like big changes that this macro level can take up to three generations, you know, 50 to 100 years type thing ... but this is kind of what I was saying in the meeting earlier – OK, it's gonna take that. This is how long it's gonna take, but how can you sort of reassure people that, OK, it's gonna take that long but we're addressing it sort of thing or is that enough? Is that something is even worth contemplating. I think we ended up saying well it's best not to put a timescale on saying the process has started type thing.

RC02:   I think the ... I mean I don't think it's going to take generations to get the concepts there.

RN: No, but for it to provide a solution.

RC02:   To get the solution ... the solution ... it will be incremental all the time and to renew the 19th century drainage system will take 20 / 30 years overall. No disrespect to ... we've certainly made ... people are now becoming quite familiar with the drainage issue and the nature of the relationship between the sewers and the water courses etc and the interrelation with flooding. I mean obviously, this is post the recent events in England. You know, it's not even becoming a common definition of the problem on TV and radio. It wasn't there years ago. So in as much as you've got that, you're going to get this common understanding out there in the general public then, you know, there is the scope for political action. It allows them to ... given the problems that are widely understood, people are beginning to understand the need for that kind of investment. So that's progress.

RN: Sure. So in a sense we have to really ... well not sit and wait, but while like FLAGS and so on is rolling on, it's kind of fingers crossed that more events are gonna happen, just to kind of raise this awareness.

RC02, 17 Unfortunately that's seems to be the case. People have very short memories up here.

RN: Assisted memory was one of these responses ... it probably happens in all sorts of these disasters but we forget very quickly don't we what happens and once everything looks nice again then you forget that it ever happened.

GC08, 18 Well I think ... well we're getting off the subject of FLAGS but certainly down south people ... generally their experience was if they had a flood within a generation then that was ... most people couldn't even remember one. Now they're being flooded year after year and it focuses the mind much more because people get complacent and that's the issue, but up here it will be the same because what is tending to happen in terms of the weather is that events are much more intense. It's the intensity that overwhelms the infrastructure. The infrastructure's just not designed for this intensity within a small footprint. And that's big change in how weather's happening. And that intense event can fall anywhere on the city and it tends not to fall on the same place. So apart from the east end which has had a couple, you know within ... so that focuses the mind but of course it's directed resources ... we're not necessarily sure that it's the place where they most need it ... through the events that have happened, but we don't know if we'd have been better spending that money somewhere else to what broader effect. But that's just the way the things work out.

RN: So this, I mean, erm ... this is where modelling would come in wouldn't it? I mean, if you could have this ... the conurbation modelling and then just have a computer sit there throwing events at it and risk analysis scenarios and so on, then you've got ...

GC08: That might be nirvana for somebody but it would certainly inform the plans and the rest of it but ... it's several ... it's tens of millions of pounds that we don't have to model it. The models are required to do the kind of planning that's required but in their absence ... as I say we're having to come up with policies that require that on a side-by-side basis the principals that underlie what the model is about, like looking at issues of overland flow ... will have to be taken on board for the site. But it's not often the best way of dealing with the problem, because you need a broader context. But in the absence of that, there's no other strategy. You have to ... I mean these are new things coming into the consciousness. I mean, before – even with MPPG7 or overland flow didn't feature there but overland flow is critical.

RC02: I mean two positive things are obviously you see the EU flood directive now progressing. I mean that's putting pressure on the need for this kind of information. It's just development of information technology itself and, for example, RC01 will no doubt have mentioned to you this morning in Renfrewshire the LIDAR survey and the way in which that cuts costs tremendously in terms of the work that we've been trying to do in this kind of modelling – the availability of GIS, the increasing sophistication of it. I mean what seemed impossible ten years ago is now practically ...

RN: It's happening, yeah.

RC02: So I mean there are advances being made all the time and there is the increasing pressure from Europe in terms of the institutional responses. But I don't think it's entirely ... again, I think these are the positive aspects which we've got to focus on.

RN: It's snowballed hasn't it?

RC02: [talking together] again the inter [****63.09] project in Renfrewshire has allowed us to experiment. You know, it's given us that additional funding and you get these test bed projects that can deliver ... you know a focussed action over a 3 or 4 year period can really be pathfinders. And it's always the same, there are parts that are [****63.27] project, the same sort of ... but the value of these is tremendous. It's the value of this learning experience and spreading it out and gaining this knowledge. FLAGS is just a microcosm in that whole education.

GC08: It is important – I mean the new concepts that emerge and they have to be discussed, but for the people in the field again – again because they're subject to statutory process, we have to try and take on board these concepts and find a way to express them that is relevant in terms of what comes out of the department. And, as RC02 was saying, it's a moving feast. All the time, it's moving. And again one of the things that we experienced before for the FLAG, that's useful for the FLAG, is that local authorities ... we're not all working in-stat through the planning process, so the plans are in ... they're not in sequence. The structure plan comes out. Some local plans have been approved before and some will be approved after and then they're reviewed and so ... what it does mean is that people learn from the plan that went before and that plan encapsulated the total knowledge and the guidance at the point in time where it was set in concrete OK, and then from the problems that emerged from that, the next plan learns from that and it reflects the problems there and better expresses the concepts and the guides just moved on. Because things are changing so fast. So it's a quick way to learn. It's a much quicker way than waiting for the next plan to come out because the people involved in it explain the problems they had and explain ... and you can see what has worked well and not so well and they can tell you them because they're dealing with development proposals. That's another thing – some FLAGS discuss them more than others but some

discuss development applications and the problems they have and blah blah blah. So if you attend more than one, you're picking up a fair amount of knowledge and experience of working with the system, working with the tools you designed and finding what's good and finding what's bad and finding what you need. What's new that's needed. And seeing how the new stuff that comes along can be absorbed into the process. So a very very important structure I would say for doing that, because there is nothing else. The only other source of that is, you know, technical stuff that comes out from the professions and guidance from the Executive. But the guidance from the Executives ...

RN: .. are contradictory and possibly ...?

[loud sirens masking speech]

RC02:   I mean the SPPs are policy advice and they're augmented by PANS which give planning advice. But certainly as far as flooding is concerned, they don't go in for technical advice. You know, it's for each authority to develop within the parameters set for the policy to ... you know, its own technical knowledge, to take it forward.

GC08:   The Executive has recognised ... again, it's becoming more joined up ... but it has recognised that it needs to be informed by the people working in local authorities. That's why both Renfrew and Glasgow – I don't know about Perth and these other places – but certainly Renfrew and Glasgow are meeting with the Executive quite a lot to talk through the issues of strategic drainage plan and they're looking at changing ... updating the legislation, because the legislation is extremely unsatisfactory. But the only way they can do that is to talk to the people on the ground doing stuff. Everything they probably talked to you about this morning, they talk to the Executive about, probably in far more detail with the Executive. About the nuts and bolts and the limitations of the legislation and the problems and who's got a duty to do what. We have a major problem – again, it's not necessarily accepted into the FLAGS in that the duty laid upon us means that we have to deal ... if we think there's a risk of flooding, we're required to do something about it. Regardless of whether it's our land or not. Now this is a big problem where you have often properties in multiple ownership and they're not doing anything about ... because they're riparian (?) [**** 68.14] owners they're not doing anything about it but if there's a risk of flooding then the burden's falling on the public purse. Well that's essentially a subsidy from the public purse to these people. You know, and it's OK if it's 1 owner but when you're in the situation of multiple owners and all the rest of it and often it's a thing that the politicians will necessarily bite on because it's householders and premises and all the rest of it ...

RN: Well there's a section in that there's a small town in Yorkshire that's got a colvative (?) [****68.41] water course and it goes across 10 people's properties and it floods all the time and you've just got this Who's responsible for it, who's gonna pay for it? And they're all ... well it's not our fault and da da da.

GC08:   Well that came with the house. Most people don't expect those things to cost them money but they do. So I don't know if the legislation's gonna address that, but I think it will have to RC02. That would have said, wouldn't it? I don't know. One of the major dissatisfactions of the burden, but there are plenty of others. Also the wording of the legislation is ambiguous as to what and what is not a water course [laughs] and who has to spend money turns on an interpretation of what is a water course.

RC02:   And the maintenance responsible ...

GC08:   Yes, the whole thing about maintenance. Because that's the duty, isn't it?

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RC02: Whether the Act will go further and, you know the new Act, will go further. They are talking – Monday was the launch and they're talking about getting away from silo thinking. They've been saying all the buzz words – integration and soft approaches, so how far it goes, how far it takes on board sustainable flood management concepts etc, I really don't know at this stage. But certainly they were heralding that more than just a tidy up with regard to certain problems. You know they had specific problems with regard to the 61-97 Act. So we'll wait and see.

RN: Well I think – I've certainly got a lot of it – really good information today. And particularly now this meeting ... there's kind of different levels. There's what the Exec wants and looking in terms of just what we're getting paid to do, let's say, and he wants to see the opportunities and now the barriers and that's being highlighted very much, but also lots of information for our research ... our kind of future work that is for us, you know, because half of what we're doing is for our sustainable flood management research and also obviously my PHD. So I feel like I've taken a lot today. I can see where the constraints lie and I can see where the problems are and I can also see where the innovations are and how ... because it's an emerging field and there's lots of non-kind of areas that don't connect together, haven't got the plugs right sort of just yet but it's emerging, so I think its fine. And it's like you say, it's not ... it's easy to sort of look at it in a negative point of view but it's like you say, it is a positive because of all these new innovations coming in. And it's not something that can be resolved quickly I guess because say we're dealing in a sense of 100 year old legacy which was driven by collar academics and so on now we're in a very different time and space aren't we, so it's erm a problem of many different scales and all the rest of it. So yeah, I think unless you've got anything ...

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Transcript from forum at Shettlestone hall Wednesday 23rd January 2008-01-25 Glasgow (NSR) case study

Timetable;

19:25-19:30   Introduction and welcome

19:30-19:55   Presentations

19:30-19:40   David Drabble – Professional flooding stakeholder interaction and how this relates to you

19:45-19:55   Richard Newman - Flooding background and context appropriate solutions

20:00-20:50   Breakout into groups, discussions and feedback

20:50-21:00   Summary

21:00-21:10   Feedback forms collected

Since many attendees arrived in a state of high emotion, the schedule of the forum was somewhat different to that indicated above, however, all items were covered, just in a different order.

Dictaphone failed to record the first 25 minutes of the forum. What is below is taken from the Dictaphone recording for the remainder of the meeting. Although it was intended that we present some background and then have discussion groups, the strength of feeling brought by the dwellers meant that we just let the initial discussion run. After approximately 45 minutes we reverted to the themed discussions.

Part 1 dweller led discussion

G32 6XL; Glasgow district council came round after the floods, looked at all the properties in the area, but completely ignored the school, the boiler house was flooded and the boiler needed replacing, the room beneath the stage was ruined as it was made of wood. We were completely ignored. And I can tell you if (missed name) of the school up the road had the same thing happen to it would have been sorted cos the parents there have the money. It's disgusting.

G32 6XL; I have seen big tunnelling machines go to other areas and put tunnels in below ground to take away the water, why cant we have these? People like you came from Dundee university, took my photographs and my evidence of the flooding, went away and nothing has been done. What upsets me more than anything else is that this is all the people that are here (there are 7 attendees, one did not leave his name and postcode) out of all the people that were affected by the flooding. Tell me how did you advertise this?

RN: I address her comments about the tunnelling machine, i.e. you cannot just go tunnelling where you like. However, I say that maybe if she were informed by the professional stakeholders of what is feasible or appropriate in terms of solutions then they may have a better idea of what can realistically be expected.

G32 6XL; I am sorry for talking all the time folks but I have been working all the time to get my house back together, I have just got my extension built and got the builder to put concrete round my house, raise the drive up etc to prevent flood water from entering my house. I have paid £400-500 for a wall to be built round my house to stop my flood water entering my neighbours house. Why should I have to do this? This is costing me money. Now because of the flooding I cannot sell my house. And about the stress, let me tell you don't know the meaning of stress…If its raining I am up at 5 in the morning…we're not like France we just sit here and take everything. I have done everything in my power for the last 15 years. I had a herb garden covered in sewage – do you know what the man said (unspecified 'man') 'just wash it', and I said would you eat the stuff from this garden? Plus we have grandchildren there…at the

end of the day we have go that in our garden, and they just say hose it down...I tell you if anyone from the council came round here after those floods they would get lynched. I think its good you're here but...people wont get lynched if they are actually trying to do something about it...what happened to the previous researchers information. We never heard anything from that.

G32 7XR; can I say I am here from the Shettleston housing association, and I am here to(cannot hear tape but something like to represent the area in some context). I believe the study was (Dundee study previously mentioned) was paid for by Scottish water and Glasgow city council. Nobody tells you anything – there is never any feedback from these studies.

G32 6XL; most of the problem is caused by the fact that there is no drain cleaning, the schools over 50 years old, therefore the drains are too, and out of data. The water ran into the playground over that grass verge and straight onto the road. This has been happening for how long I have been there and I have been there 8 years. If they don't cut the grass regularly it gets too long and when it does get cut it blocks the drains. If the grass was cut regularly then it would be short and it would rot away quicker and wouldn't block the drains. Simple solutions. They don't seem to cotton onto the fact that this blocks the drains. Same is true for the trees – they are lovely in the summer, but in the winter when the leaves fall they just clog the drains. How do they solve this – aagh, the janitor will just sweep them away. The priority for my budget is not to clean the drains, it's the least priority, we have to think about the kids. This is a GCC problem, they don't invest money into the structure of the thing.

G32 6XL: I live in this area which is 5 mins across from your school and I asked why is this happening, when I got married in 1970, since then I have never seen this area flooded like this. Nobody has ever came back and said it was this cause of the drains or the Clyde or whatever, nobody ever came back and told us what the cause was. Nothing stops me waking up at 5 o'clock in the morning when there is rain on my roof, I cant sleep cos of the fear that I will flood again...

DD: would everyone welcome the professionals informing you of what they are doing?

G32 6XL; of course, but they never do.

G32 6XL: I sat and watched the England floods on the TV and cried for the people cos I knew what they were going through

G32 6XL; to be honest it is understandable that you cannot stop flooding from a river or what ever, but to get flooded from the drain outside your house is just galling, the council know we get flooded from their drain. Where is the tank we were promised?

G32 6XL; some kind of large storage tank was promised 5 years ago (possibly a politician promised it)

G32 6XL; that gave us a bit of hope. Is there no way a group can be formed? A pressure group.

RN: suggests an appropriate web site which will allow feedback to be added by dwellers and that would be acknowledged by the professionals. I show my prototype GIS system.

G32 6XL; that would tell the professional stakeholders where potential problems in my school.

RN: there is a further aspect, this system can also indicate to the stakeholders what are the available appropriate solutions are

G32 6XL; we would like a web site that people could add their comments, anybody could add then, some people may not like meeting therefore these folk would be left out otherwise

Part 2 – themed discussions

<u>Theme 1</u> – *'Firstly, what is on your mind here tonight in this flood forum, what is important to you, why did you come here?'*

- G32 6XL; Came here today to get them to spend money on maintenance (drains grass, cutting etc)
- G32 6XL; I am hear cos I get flooded from the burn and I get flooded from the sewage drains outside my house, I want to hear that something is going to get done, I had my hopes high put it that way that someone was taking interest
- G32 7XR this is the first time any of the stakeholders have spoken to the public since the event in 2002, from a personal point of view I know who the people who you have spoken to at GCC, and I know they are engineers, and I know they will find it difficult to speak to these folk, talking in terms of pressure
- G32 6XL in 5 years no one has told us what the causes of flooding are. I don't live in a flood plain, I have never been flooded before or since
- G32 6XL We are not informed of what is going on.
- G32 7XR the perception from us is that 'nothing is being done'
- G32 7XR the sewage system was overwhelmed, there was so much sewage going into the houses – this was a real shock to people that this could happen

<u>Theme 2</u> – *'What did you do to protect yourselves, family and property during flood events?'*

- G32 6XL absolutely nothing, nobody gave us any warning, it happened too quick. We all grabbed the most important thing, mine was the insurance policy and a bottle of whisky and go upstairs.
- G32 6XL water rose 3 feet in one hour
Generally insurance policy seems very important at the time of flooding

<u>Theme 3</u> – *'Who are the professionals and what do you expect from them professionals before, during after a flood?'*

- G32 7XR I think I speak for everyone – we don't expect much

RN: I step in and say, what I mean is what *should* you be able to expect

- G32 6XL flood guards would be a big help – we want to stay in our house and priority is stopping flood water entering rather than the market value
- G32 7XR fix drains, re-house people, emergency accommodation
- didn't come into the school which I thought was appalling
- G32 6XL would have helped if there was someone we could have talked to as opposed to just having their photograph taken stood beside the flood water.
Positive responses was given for a pressure group

<u>Theme 4</u> – *'What are your responsibilities before, during and after a flood event?'*

Ran out of time before this point could be addressed

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Scottish Water

Responsible for:

-The sewerage system

   -Cleaning drains/gullies

   -Building new sewers

-Action during floods:
   -Dealing with bursts
   -Cleaning drains

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Coordination Issues

-Sharing information
   -Each Council and branch of SEPA and Scottish water are localised
   -Organisation of regular meetings necessary

-Making decisions
   -Flooding management needs the involvement of all parties

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The Public

-The public are actually the biggest stakeholder and have most to lose

-Consultations in the past were often done after planning

-This forum will inform authorities of what dwellers can offer

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Slide 1

A look at alternatives to the 'traditional' approach to flood management

Richard Newman

Pennine Water Group:

Department of Civil & Structural Engineering

The University Of Sheffield.

Slide 2

What do we mean by traditional approaches?

Mainly structural solutions;

No adaptability or reversibility (climate change)

Widgets aplenty!

Professionals only; (GCC, SW & SEPA)

Capacity Building

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Slide 3

So, who *is* involved, and who *should* be?

As David has shown in his presentation previously...

The professional stakeholders; GCC, SW, SEPA etc

What's missing?

We feel dwellers are the professionals of *your* area;

Topography

Community

History

= Understanding

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Slide 4

What can alternative approaches provide?

Appropriate solutions;

-In a context of climate change

-Will most likely consist of a combination of 'soft' and 'hard engineering' solutions

-Cost efficiency

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Solutions to flooding?

There are two approaches to deal with urban flooding;

Resilient & Resistive

Resilient furnishings; concrete floor, raised electrical sockets.
Dweller action, cost implication, self-protection through understanding

Prevent flood water;
Structural implications (max. ~1m), not adaptable

Summary

WE NEED YOU!

By taking account of your views and experiences, decision makers will better understand the situation and therefore any solutions will be most appropriate in terms of the greater context

Any questions about either presentation?

2

Discussion group themes

In groups of 4 or 5, and with a spokesperson to record key points, and bearing in mind the 2 previous presentations, we would like you to discuss;

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Theme 1

Firstly, what is on your mind here tonight in this flood forum, what is important to you, why did you come here?

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Theme 2

What did you do to protect yourselves, family and property during flood events?

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Theme 3

Who are the professionals and what do you expect from them professionals before, during after a flood?

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Theme 4

What are your responsibilities before, during and after a flood event?

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Feedback!

Please fill in the feedback forum that will be handed to you – it will only take a minute and makes this research far more credible, and also protects you...

POSTCODE - If you give us your postcode we can link your comments directly to the area you live. This is very important for the validity of the final report to the Scottish Government. Your postcode data will never be used or seen by anyone. By signing the consent form you are protected by the 1998 data protection act and your identity will remain totally anonymous. Even we would not be able to trace your responses back to you.

EMPLOYMENT TYPE - If you can supply us with your occupation type, this will also benefit the credibility of this report.

HOW YOU HEARD - It is also very important that we know where you heard about this forum. This is because we need to know the most effective way of reaching people for future forums.

...and please give us any feedback on what you thought of this forum in the final box

THANK YOU!

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Future

Our outcomes will be:
-A report to the Council, SEPA, Scottish Government and Scottish Water
- Further Case studies in the East End of Glasgow
-More research on improving communication between flooding stakeholders (Dave)
-Taking ideas to Mumbai, India
(Richard)

THANK YOU!

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10 potential pitfalls in the establishment of LeAs for MARE (Butterworth 2009)

This list was presented to the MARE partners at the meeting on 22nd April 2009 by John Butterworth (IRC). The list was compiled as 'lessons learned' from the SWITCH project:

These 10 lessons have been learned in trying to implement action research within the stakeholder engagement approach known as 'learning alliances'.

Avoid:

1. **An unrepresentative management structure:** involve legitimate representation of learning alliances (as research users) within the project management structure and including involvement in budget allocation decision-making. Conflicts of interest between learning alliance representatives and research providers (e.g. where the learning alliance facilitator or coordinator comes from a research provider in the consortium) should be avoided or carefully managed.

2. **Unclear research priority setting processes:** there should be a transparent mechanism for the process of priority identification by learning alliances, approval of learning alliance recommendations, research team formation, action planning and budgeting with communication back to the learning alliance at all steps.

3. **No flexibility in resource allocation:** Don't allocate all resources on day 1, and don't allocate all resources to research that is not linked to clearly expressed learning alliance needs. A mix is usually best where some funds are allocated to research identified by the learning alliances (throughout the course of the project), and some to more researcher-led topics (may from the outset or later, and may be less action-orientated research). Learning alliances should also have some (even very limited) amount of flexible funding that is untied and can be used to address local needs as they emerge including additional research topics, additional documentation or communication activities etc.

4. **Misunderstanding stakeholders:** Do do stakeholder analysis probably. Allocate sufficient resources to the task, get support from a specialist with experience of institutional issues, and don't continue with (very pressing and exciting) activities until this is completed.

5. **Wasting the capacity of facilitators:** avoid overloading facilitators, but also avoid setting up a structure where facilitators don't have enough to do and are just sitting around for the next team of expatriate researchers to arrive and are restricted to working as logistics managers or translators. Encourage facilitators to become research managers and action researchers themselves.

6. **Action research teams composed of only 'researchers':** action research should be undertaken by teams selected and composed of learning alliance members: research by implementers supported by 'researchers'. Traditional 'researchers' then take a backstopping role playing key roles in planning, methodological development, training and supporting documentation. 'Researchers' often need a lot of support in adapting to this new but potentially challenging and rewarding role.

7. **Presenting research results at the end:** learning alliances will often require non-traditional scientific outputs (e.g. journal papers) and will require more frequent and regular sharing and discussion of results. Rapid and short cycles of action research and feedback are more desirable and more likely to lead to uptake than just sharing results at the end of a project. Providing appropriate and timely outputs for learning alliance members does introduce challenges for peer review and quality control, but can be compatible with also producing those precious scientific papers that researchers are often rewarded for by their institutions.

8. **Missing why changes occur:** develop a process documentation plan to ensure the capture of why things happen as well as what happens during the project. Process documentation needs specific skills (may require additional people) and consider taking time-out from other activities to focus on reporting (e.g. allocating every sixth month solely to reporting).

9. **Learning alliances on paper:** too often learning alliances may be included in a project as a means to secure funding for an attractive idea and way of working, without an adequate understanding and commitment (in management, funding etc) to really changing the balance stakeholder engagement in the research process.

10. **Underestimating the costs:** Unfortunately, multi-stakeholder research processes are expensive. Costs of promoting change are high and frequently underestimated. While many partners will readily contribute inputs in kind and their own time, the initial facilitation, training and capacity building inputs needed are considerable. It is difficult to secure additional funding later for such 'software elements' and since they are critical and needed at the start of a project especially, they should be fully funded from the main budget.

Minutes from MARE meetings

Managing Adaptive REsponses to changing flood risk in the north sea region
minutes

Meeting	Learning & Action Alliance teleconference
Date	02/04/09
Present	Richard Ashley (PWG), Stephen Kennedy (PWG), Richard Newman (PWG)
In Attendance	-
Present by invite	John Butterworth (IRC)
Apologies	-
Location	University of Sheffield

Item #	Description	Actions
1.1	Project introduced to JB	
	JB has experience in setting up Learning Alliances, and will share his experiences with the partners present in the meeting in Delft (the Netherlands) on 22/04/09. JB's experience is predominantly in developing countries.	
1.2	Meeting outcomes	
	The SWITCH project made mistakes early on in the project particularly with respect to the way the project was structured; not enough consideration was given to the whole life interactions of the project (i.e., future impacts from poor or not fully considered decisions made now). A leader or champion is an important aspect of a learning (and action) alliance, this has yet to be addressed in the MARE LAA's (DCLAA & YHLAA)	

Managing Adaptive REsponses to changing flood risk in the north sea region
minutes

Meeting	Setting up Learning Alliances meeting
Date	22/04/09
Present	Roger Nowell (Sheffield City Council), Marianne de Nooy (Province of Zuid Holland), Solve Sondby (Municipality of Bergen), Tony Poole (City of Bradford MDC), Erik Pasche (TU Hamburg), Berry Gersonius (UNESCO-IHE), Franz Zaalberg (Province of Zuid-Holland), Jeroen Rijke (UNESCO IHE), Martin Hulsebosch (Erasmus University), Paul Burkhard Schneider (City of Hannover), Richard Ashley (PWG), John Butterworth (IRC)
In Attendance	
Present by invite	
Apologies	
Location	TU Delft, the Netherlands

Item #	Description	Actions
3.1	**Introduction**	
	RA introduces the MARE project (some in attendance may not yet be fully aware of project's objectives etc). Important to include as wide a range of stakeholders as possible (land & water). INTERREG projects are a good opportunity to bridge the gap between academia and industry.	
3.2	**Yorkshire & Humber Learning (& Action) Alliance**	
	The YHLAA is the 'main' alliance, with the Don Catchment LAA being a subsidiary. Mixed background attendees to help address 'silo' thinking. Reduction in decisions 'made outside of area of expertise' by attempting to involve those with the expertise. Short, medium, and long term goals identified thus far that the alliance may be able to improve. The outcome of the first meeting was the need to deliver some 'quick wins' to retain interest from stakeholders.	
3.3	**Bergen Learning Alliance (Norway)**	
	Bergen has 250,000 inhabitants, 65 water courses with 2 main problem ones ('Nester' watercourse flooded in 2005). 2 upstream lakes have been bought by the municipality (or the right to regulate them was purchased). Involved in 3 projects. Basic stakeholder analysis has been done.	
3.4	**Dordrecht Learning Alliance (the Netherlands)**	
	The Dutch LA has continued from the Urban Flood Management project; stakeholders are very similar. No stakeholder analysis has been done.	
3.5	**Hannover Learning Alliance**	
	Start-up meeting for Hannover is scheduled for may 2009. key stakeholders are already included in the project proposal. It is important to get buy-in from the highest level stakeholders for progress with the LA.	

	Hannover representative is here today to see how the other partners are 'acting' in order to assess Hannover's potential involvement. Paul is interested in including the local press and schools (potentially as stakeholders of 'bodies' to engage)		
3.6	**John Butterworth's (IRC) perspective on setting up Learning Alliances**		
	JB brought a document (10 pitfalls to avoid when setting up LA) INTERREG projects focus on development as opposed to research, though research may occur as a secondary motive. John's experience is mainly in developing countries whose objective was piloting innovations in water supply and personal wealth development. Many small projects within these countries run by non-full time staff. Projects are driven by the need to find answers as opposed to knowledge discovery SWITCH project; The concept of the Learning Alliance 'sold' the idea of the SWITCH project Many mistakes were made; partners (or stakeholders?) were not selected carefully, no appropriate stakeholder analysis was performed. Governance and social inclusion were not addressed. Silos not identified in the early stages of the project were 'kept' or remained throughout. The project was managed by researchers which meant non-inclusion of certain groups. The LA was not properly funded from the outset (there was actually no funding at all initially for the LA, it was seen as an add-on and not important. Now the LA has significant budgets, and reports are available from 2008. Notwithstanding the poor start, the LA's have now started working properly and are exhibiting new innovations of the partnerships. However the LA is still not driving the main research in the project (they are still acting as disseminators). Being 'unburdened' with research obligations is very important for the success of the LA. To have any significant influence the LA's need to be taken seriously by top level decision makers. In terms of role responsibility, care must be taken when formalising roles since this can lead to bureaucratic problems. Key people need to be retained on order for continuity within the LA and its projects. A bottom up approach is preferable. Coordinators ('creative') and facilitators (administrative) do not have the same role. In terms of a 'champion', JB's experience was that no formal champion emerged, but there was an understanding that there were several champions within the group who performed certain roles. Capacity Building was not an explicit objective of the SWITCH project. Learning Alliance MUST be set up so that it runs after the MARE project has been completed; sustaining the characteristics of the learning alliance (i.e. partnerships and collaboration) is the ultimate end goal, at which point the LA itself is not necessarily required. An outcome of the SWITCH project was that there was collaboration between parties that previously had no communication channels set up		
3.7	**Some thoughts**		
	Need to develop a manner in which the benefits of the LA may be measured (incorporating base lining)		

Meeting	Stakeholder analysis questionnaire meeting 1
Date	05/08/09
Present	Louise Hurley (PWG), Simon Doncaster (PWG), Richard Newman (PWG)
In Attendance	-
Present by invite	
Apologies	
Location	University of Sheffield

Item #	Description	Actions
4.1	**Introduction**	
	The purpose of this meeting was to discuss the general feedback from the Melbourne (Australia) academics to our first attempt at the stakeholder analysis. Initially we were focusing primarily on the content of the analysis as opposed to the approach itself. General feedback from the Australians was that no-one would fill in our questionnaire because it was (i) too long (ii) too technical (iii) no feedback was given to the participants. It was felt generally that the questionnaire needed to focus more on respecting the time of the participants. Louise Hurley has had experience in the SKINT project with questionnaires involving professional participation. Simon Doncaster, a social scientist has had much experience of public engagement and consultation during his PhD research and subsequent activities.	
4.2	**Approach**	
	• In order to respect respondents' time, it has been proposed to send a single question at a time (on a currently undetermined return period, but likely monthly or bi-monthly). Each question will have to comply with a strict philosophy (max. word number, max. question length, language use restriction etc). Done through survey monkey (each question/page must be identical each time). • If the philosophy is adhered to strictly, this may encourage trust in the PWG questionnaires, i.e., every time one 'turns up' in the inbox, the respondent will *know* that it will only take a couple of seconds of their time, and will not require 'heavy ' thinking. • Some background to this thinking: When filling in a multi theme questionnaire, the mind has to 'reboot' to conceptualise each theme; example - Q1 may be on drainage Q2 may be on public engagement Q3 may be on water reuse: each time the new 'theme' appears, the mind has to clear itself and rethink about the new question. This can lead to answers that are given to just 'finish the questionnaire as quickly as possible'. This may be avoided by approaching one issue at a time. • To address the 'not being informed of the results' criticism each subsequent question will contain relevant results of the previous ('did you know that 56% replied that they would like to see a change in …). • Each individual question will form part of a greater 'theme' which will be teased out over the course of the questions, this will allow	

		modification of the questions/ question type/ tone etc to maximise information gathering while remaining respectful of respondents time etc.	
		• It has been proposed that a 'constitution' be written for the SA process to ensure the philosophy is adhered to	
		• It has been proposed that the questionnaire be tested on a group of academics who are aware of the issues mentioned above in order to foresee and prevent and obvious problems	
4.3	**Philosophy/ thinking behind new questionnaire**		
		• Respect for respondents time, users time should be thought of as 'costing' a high hourly rate.	
		• Trust must be cultivated in PWG by responders which must never be abused; each time a PWG email appears, they must know it will only take a small quantity of their time.	
4.4	**Action**		
	It has been decided to select a group of themes within which questions are to be asked to probe the issue. LH, SD & RN are to brainstorm an write a single A4 sheet and meet again on 20th august to bring the actual content together. This will then be presented to SMH for review, and upon approval the process can be started.		

Meeting	Stakeholder analysis questionnaire meeting 2
Date	18/08/09
Present	Richard Newman (PWG), Steve Kennedy
In Attendance	-
Present by invite	
Apologies	
Location	University of Sheffield

Item #	Description	Actions
5.1	**Introduction**	
	The purpose of this meeting was to discuss with Steve Kennedy the new approach being adopted by PWG for the stakeholder analysis (a slow release questionnaire – see minutes dated 5 august 2009)	
5.2	**Problems of a 'slow release' type questionnaire method**	
	• Generally seen by SK as an appropriate approach providing the following are acknowledged;	
	• Employee turnover during the process	
	• 'Forgetting' about the topics in-between 'questions'	

Managing Adaptive REsponses to changing flood risk in the north sea region
minutes

Meeting	Stakeholder analysis (SA) questionnaire meeting 3
Date	20/08/09
Present	Louise Hurley (PWG), Simon Doncaster (PWG), Richard Newman (PWG)
In Attendance	-
Present by invite	
Apologies	
Location	University of Sheffield

Item #	Description	Actions
6.1	**Introduction**	
	The purpose of this meeting was to solve issues preventing the stakeholder analysis from being 'rolled out'. These issues are primarily concerned with content and approach.	
6.2	**Primary barriers to stakeholder analysis 'roll out'**	
	• In order for a SA it is likely that that those identified in the Don Catchment LAA are termed partners, this will create 'buy-in' to the project.	
	• It has been proposed that the objectives of the MARE project be clarified; there may be, in addition to the 'higher' MARE objectives, some objectives suited to individual partners of the MARE project. It is thought that without identification of these objectives, that the buy-in mentioned above will be less successful.	
	• It may also be useful to clarify the position of MARE in relation to the DCLAA since there is some confusion as to the role of MARE within the DCLAA.	
	• There are still significant barriers to a SA from 'partners'. This is likely due to negative past experience the 'partners' have had dealing with questionnaires, but in addition there may be mistrust toward academics (PWG) who are facilitating this process (producing 'academic' outputs with little or no outputs for the members of the DCLAA/ MARE).	
6.3	**Actions**	
	• RN - Toward solving the problems associated with the questionnaire; Lit. review on the questionnaire process	
	• The above barriers are to be discussed again with LH and SD to enable roll out of the SA	

Managing Adaptive REsponses to changing flood risk in the north sea region

minutes

Meeting	- Part 1 - Work Package 1 – Stakeholder Analysis - Part 2 - COST C22 Conference Paris November 2009
Date	- 13th November 2009
Present	- Michelle Hendriks (Netherlands Ministry), Ellen Kelder (Municipality of Dordrecht), Richard Newman (Pennine Water Group)
In Attendance	-
Present by invite	-
Apologies	- Martin Hulsebosch
Location	- UNESCO IHE Delft, the Netherlands

Item #	Description	Actions
1.1	**Bringing innovation into practice**	
	It is important for Dordrecht to convert innovations identified during MARE into tangible outputs to reduce flood risk in Dordrecht. It is also important to have a small enough number of stakeholders that they feel like they *can* change something from an individual perspective.	
1.2	**Netherlands Learning & Action Alliance (Municipality of Dordrecht)**	
	Many relationships between stakeholders have already been established (around 10 years) on previous projects. In comparison with the Don Catchment Learning Alliance (DCLAA) approach, the Dutch approach is more 'personal' and the DCLAA is more academically driven. Care must be taken with an academically biased approach as it can 'drive' some stakeholders away.	
1.3	**Perspective on Norwegian and German LAA**	
	The current perspective on the Norwegian and German LAA's is that they desire predominantly technical outputs (namely rainfall data and similar). It was proposed that Norway and Germany could be seduced into a less technocratic approach by creation of a document detailing, in simple terms, the progress that has been made in the Netherlands and in the UK, and what the intended outputs are. This document has already been created in 'Dutch' and needs translating into English before sending to the Norwegians and Germans. The UK equivalent also needs to be produced and sent to the Germans and Norwegian partners.	MH/ EK RN
#.#	**Meeting conclusions (Part 1 - Stakeholder analysis)**	
	It was clear that the Dutch and the UK approach is very similar. This is likely due to the fact that the initial approach for both countries was developed together using the same theory in May 2009. Since then each partner has been interpreting the theory in the way they 'see fit'. The Dutch stakeholder analysis is already underway, and it is anticipated that the majority of the data will be gathered by Christmas 2009. It is anticipated that the UK stakeholder analysis will reach the equivalent data collection stage by February 2009. The primary reason for the delay in	

	the UK analysis centres on problems with encouraging partners of the DCLAA to commit to being or giving a 'stake' in the DCLAA.	MH/MH/ EK/RN
	When both the Dutch and UK analyses have finished the data collection stage, it is proposed that the 'stakeholder network analysis' be performed together, or at least we should meet again to discuss the results up to that point and adjust the approach if necessary. This meeting would be suitable placed in February 2010	
	Having Michelle Hendriks 'on board' as a policy stakeholder is an area where the Dutch are ahead of the UK.	
	It will be useful to incorporate the different cultural perspectives in the analysis, for example how common working practices and novelties which are accepted as 'normal' within each culture impacts the stakeholder interaction.	
	The role of the academics in MARE (in addition to the official roles) should help partners reflect on the process – translating findings and theory into a format where the stakeholders can function without becoming 'bogged-down' in theory.	
2.1	**COST C22 Conference – 25th November agenda**	
	Day one of the conference (INTERREG day), it is proposed that a joint presentation be given on Stakeholder Analysis at the beginning of the session as an 'ice-breaker'. The content will be: - Stakeholder Analysis – what is it, why would we want to do one? - Stakeholder Analysis in practice – Municipality of Dordrecht	RN EK

Updated Stakeholder Analysis - MARE

The University Of Sheffield. | MAR≅ | The Interreg IVB North Sea Region Programme | Don Catchment Learning & Action Alliance

Please answer the following 2 questions as part of the DCLAA partner engagement:

This questionnaire will take you less than 5 minutes to complete. Questions with an asterisk require a response. Feedback will given at the next DCLAA meeting on 11th December, so please reply by the 4th December if you can.

1. Please enter

your name

your organisation

✱2. The following are the objectives of the Don Catchment Learning and Action Alliance (DCLAA). We would like to know what you think about these objectives:

If you approve of the objectives as they are, then please simply rank them in order of importance as you see them for the DCLAA.

If you feel that a particular objective should be removed, please enter a '0' in the drop down menu at the end of that objective.

If you would like to add a new objective(s), please do so using the space at the end of the list.

Priority ranking (1 = highest, 0 = remove)

Assisting in the development of common approaches between stakeholders participating in flood risk and water management

Developing approaches for sharing information and integrating activity across local authority boundaries.

Assessment of resources in carrying out surface water management plans.

Reviewing Catchment Flood Management Plans and actions from those.

Improving the knowledge and experience base for the production of surface water management plans.

Developing and enhancing methodologies to carry out strategic land availability assessments as part of the local development framework process.

Supporting regeneration initiatives by developing a knowledge and experience base for innovative approaches to integrated land and water management.

Please add new objectives in the following space. If you have any comments you would like to leave, you may also leave them here.

Done

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Integrated Urban Drainage Pilots

WEST GARFORTH FLOODING

A project sponsored by the Department for Environment, Food and Rural Affairs (DEFRA)

In this Government sponsored study, Leeds City Council, Yorkshire Water, the Environment Agency and the Pennine Water Group (Bradford and Sheffield Universities) are working together to investigate the long-standing flooding problems of West Garforth.

Questionnaire concerning flooding

1. Your details

Name ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮

Address ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮

LS25 1AU

Telephone (daytime) ▮▮▮▮▮▮▮▮ (evening ▮▮▮▮▮▮▮▮▮▮▮▮

e-mail address ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮

2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting. **(YES)/ NO**

2.2 Please state a) how long have you lived in the area b) how many time you have experienced flooding
a) years 18
b) times 7

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1 What got flooded?

		If yes, where (what address)?
The inside of a house(s)	YES /(NO)	
The space beneath a house(s)	YES /(NO)	
A garage/shed	YES /(NO)	
A garden/drive/private footpath	(YES)/ NO	89, BARLEYHILL ROAD
A highway	YES /(NO)	
Fields/open land	YES /(NO)	

3.2 How deep was the flood? ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮

3.2 How often does the flooding occur?
Every ...1.. years / since 1997
More than .... times per year

3.3 Do you know any specific dates? If so, please list: 1/9/1997

3.4 Do you have any documentary evidence?
(Photos) / Press Cuttings / Videos /
Other
(please ring) already provided

4. Source of Flooding

4.1 At the time of the flooding, was it raining? **(YES)/ NO**

1

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Questionnaire concerning flooding

1. Your details:

Name:	
Address:	S25 1AU
Telephone (daytime)	
e-mail address:	

2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting.   YES / ~~NO~~

2.2 Please state a) how long have you lived in the area b) how many time you have experienced flooding

a) years 42
b) times 2

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1 What got flooded?

If yes, where (what address)?

The inside of a house(s)	YES / ~~NO~~
The space beneath a house(s)	YES / ~~NO~~
A garage/shed	YES / ~~NO~~
A garden/drive/private footpath	YES / ~~NO~~
A highway	YES / ~~NO~~
Fields/open land	YES / ~~NO~~

AS ABOVE

WAKEFIELD RD.

3.2 How deep was the flood?   2¹⁺

3.2 How often does the flooding occur? 5 YRS EXCESSIVE FLOOD. GARDENS ETC IN HEAVY STORMS

Every ...... years /
More than .... times per year

3.3 Do you know any specific dates? If so, please list:

3.4 Do you have any documentary evidence? UNFORTUNATELY NO DATES

Photos / ~~Press Cuttings~~ / ~~Videos~~ /
Other
(please ring)

4. Source of Flooding DRAINS TO REAR & SIDE OF OUR HOUSE UNABLE TO COPE THUNDERY STORM & HEAVY RAIN

4.1 At the time of the flooding, was it raining?   YES / ~~NO~~

WITH THE WATER COURSE!

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Questionnaire concerning flooding

3 0 MAY 2007

1. Your details:

Name: ▮▮▮▮▮▮▮▮▮▮▮▮▮▮

Address: ▮▮▮▮▮▮▮▮▮▮▮▮▮▮

le Number

LS25 2AR

Telephone (daytir ▮▮▮▮▮

e-mail address: ▮▮▮▮▮▮▮

2. History of Flooding

2.1   Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting.   **YES** / ~~NO~~

2.2   Please state a) how long have you lived in the area b) how many time you have experienced flooding   b) Inside house – 2 times | a) years 40 | b) times |
Outside – numerous   (1 or 2 times every year)

2.3   If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1   What got flooded?   *If yes, where (what address)?*

The inside of a house(s)	YES / ~~NO~~ ▮▮▮▮▮
The space beneath a house(s)	~~YES / NO~~ N/A
A garage/shed	YES / ~~NO~~
A garden/drive/private footpath	YES / ~~NO~~
A highway	YES / ~~NO~~
Fields/open land	~~YES~~ / NO

3.2   How deep was the flood?   INSIDE HOUSE   OUTSIDE up to 5ft" | 2 FEET |

3.2   How often does the flooding occur? | Every ...... years / More than .1.... times per year |

3.3   Do you know any specific dates? If so, please list: INSIDE HOUSE ONLY | 2/6/82 & 31/8/97 |

3.4   Do you have any documentary evidence? | Photos / Press Cuttings / Videos / Other (please ring) |

4. Source of Flooding

4.1   At the time of the flooding, was it raining?   **YES** / ~~NO~~

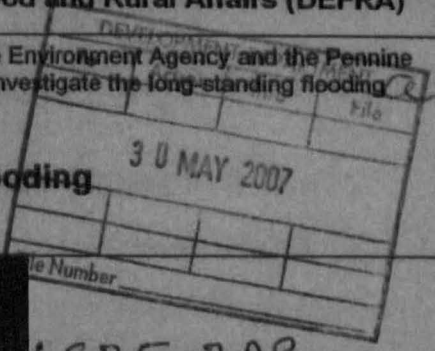1

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Questionnaire concerning flooding

1. Your details:

Name:
Address: CS25 1ES

Telephone (daytime)   (evening)
e-mail address:

2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting.   YES / NO

2.2 Please state a) how long have you lived in the area b) how many time you have experienced flooding
| a) years | 8 |
| b) times | 3 |

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1 What got flooded?   If yes, where (what address)?
- The inside of a house(s)   YES / NO
- The space beneath a house(s)   YES / NO
- A garage/shed   YES / NO
- A garden/drive/private footpath   YES / NO
- A highway   YES / NO
- Fields/open land   YES / NO

3.2 How deep was the flood?   ≈ 12 cm

3.2 How often does the flooding occur?   Every ...2..years /
More than .... times per year

3.3 Do you know any specific dates? If so, please list:

3.4 Do you have any documentary evidence?   Photos / Press Cuttings / Videos / Other
(please ring)

4. Source of Flooding

4.1 At the time of the flooding, was it raining?   YES / NO

1

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Questionnaire concerning flooding

1. Your details:

Name:
Address: LS25 1JJ.

Telephone (daytime   (evening)
e-mail address:

2. History of Flooding

2.1   Were you aware of any history of flooding from watercourses or drains in   YES / ~~NO~~
West Garforth prior to the public meeting.

2.2   Please state a) how long have you lived in the area b) how many time you | a) years 26
have experienced flooding | b) times 4

2.3   If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1   What got flooded?   If yes, where (what address)?
      The inside of a house(s)   ~~YES~~ / NO
      The space beneath a house(s)   YES / ~~NO~~
      A garage/shed   ~~YES~~ / NO
      A garden/drive/private footpath   YES / ~~NO~~
      A highway   YES / ~~NO~~
      Fields/open land   ~~YES~~ / NO

3.2   How deep was the flood?   1 foot.

3.2   How often does the flooding occur?   Every ...... year / ONCE A YEAR ✓
                                                       More than .... times per year

3.3   Do you know any specific dates? If so, please list: 7th Aug. 2002, 12th Aug. 2004, 28th July &
                                                            23rd Aug. 2006.

3.4   Do you have any documentary evidence?   Photos / Press Cuttings / Videos /
                                                       Other   No.
                                                       (please ring)

4. Source of Flooding

4.1   At the time of the flooding, was it raining?   YES / ~~NO~~

1

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Questionnaire concerning flooding

1. Your details:

Name
Addre

Telephone (dayti
e-mail address:

2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting. **YES** / NO

2.2 Please state a) how long have you lived in the area b) how many time you have experienced flooding

a) years *8*
b) times *3*

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1 What got flooded? | If yes, where (what address)?

The inside of a house(s)	YES / **NO**
The space beneath a house(s)	**YES** / NO
A garage/shed	**YES** / NO
A garden/drive/private footpath	**YES** / NO
A highway	**YES** / NO
Fields/open land	YES / NO

3.2 How deep was the flood? *60 cm*

3.2 How often does the flooding occur?
In the last 3 years its happened every year

Every ...... years /
More than .... times per year

3.3 Do you know any specific dates? If so, please list: *August*

3.4 Do you have any documentary evidence? **Photos** / Press Cuttings / **Videos** / Other (please ring)
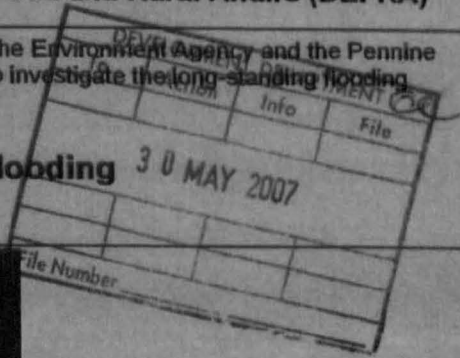
4. Source of Flooding

4.1 At the time of the flooding, was it raining? **YES** / NO

1

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Questionnaire concerning flooding   30 MAY 2007

1. Your details:

Name: ███████████████████████

Address: ███████████████████████

Telephone (day

e-mail address

2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting.   **YES / ~~NO~~**

2.2 Please state a) how long have you lived in the area b) how many time you have experienced flooding

| a) years 10 |
| b) times 2\|3 |

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1 What got flooded?

		If yes, where (what address)?
The inside of a house(s)	YES / ~~NO~~	
The space beneath a house(s)	YES / ~~NO~~	
A garage/shed	~~YES~~ / NO	
A garden/drive/private footpath	~~YES~~ / NO	
A highway	~~YES~~ / NO	
Fields/open land	~~YES~~ / NO	

3.2 How deep was the flood?   `Seven inches`

3.2 How often does the flooding occur?

Every ...... years /
More than ..2... times per year

3.3 Do you know any specific dates? If so, please list:

3.4 Do you have any documentary evidence?

Photos / Press Cuttings / Videos /
Other
(please ring)

4. Source of Flooding

4.1 At the time of the flooding, was it raining?   **YES / ~~NO~~**

1

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WEST GARFORTH FLOODING

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In this Government sponsored study, Leeds City Council, Yorkshire Water, the Environment Agency and the Pennine Water Group (Bradford and Sheffield Universities) are working together to investigate the long-standing flooding problems of West Garforth.

To			

25 MAY 2007

Questionnaire concerning flooding

File Number

1. Your details

Name
Address

LS25 1EH

Telephone (
e-mail addre

2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting.   YES / ~~NO~~

2.2 Please state a) how long have you lived in the area b) how many time you have experienced flooding

a) years 27
b) times @ 20

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1 What got flooded? | If yes, where (what address)?
The inside of a house(s)   ~~YES~~ /
The space beneath a house(s)   YES /
A garage/shed   YES /
A garden/drive/private footpath   YES /
A highway   YES /
Fields/open land   ~~YES~~ / NO

3.2 How deep was the flood?   up to 1 metre in cellar, 18" in back yard

3.2 How often does the flooding occur?   Sometimes   Every ..1... years / at least
More than ..1.... times per year

3.3 Do you know any specific dates? If so, please list: can only remember 1/9/96 exactly

3.4 Do you have any documentary evidence?   Photos / Press Cuttings / Videos / Other (please ring)   Not kept

4. Source of Flooding

4.1 At the time of the flooding, was it raining?   YES / ~~NO~~

1

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Questionnaire concerning flooding

1. Your details

Name: ███████████████

Address: ███████████████

LS25 1JQ

Telephone (daytime ███████████████

e-mail address: ███████████████

2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting. YES / ~~NO~~

2.2 Please state a) how long have you lived in the area b) how many time you have experienced flooding *BETWEEN JAN 07 - 22 MAY 06*
a) years *20*
b) times *13*

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below *ROAD FLOODED BETWEEN GARDEN WALLS OUTSIDE Nº13 LINDSAY RD, WATER BACKING UP FROM GULLET*

3. Description of Flooding *HOUSE DRIVE, OCCASIONALLY FROM FOUL SEWER. GULLY*

3.1 What got flooded? | If yes, where (what address)?
| |
The inside of a house(s) ~~YES~~ / NO
The space beneath a house(s) ~~YES~~ / NO
A garage/shed ~~YES~~ / NO
A garden/drive/private footpath YES / ~~NO~~
A highway YES / ~~NO~~
Fields/open land ~~YES~~ / NO

3.2 How deep was the flood? *150 MM.*

3.2 How often does the flooding occur? Every ...... years / More than *12* times per year

3.3 Do you know any specific dates? If so, please list: *10TH, 5, DEC 8TH NOV, 3, 20 OCT* *o.*

3.4 Do you have any documentary evidence? Photos / Press Cuttings / Videos / Other *NO.* (please ring)

4. Source of Flooding

4.1 At the time of the flooding, was it raining? YES / ~~NO~~

1

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Questionnaire concerning flooding

1. Your

Name:
Address

Telephone (daytime)   (evening)
e-mail address:

2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting.   **YES** / NO

2.2 Please state a) how long have you lived in the area b) how many time you have experienced flooding   a) years 30   b) times 6 per yr. approx.

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1 What got flooded?

		If yes, where (what address)?
The inside of a house(s)	YES / NO	
The space beneath a house(s)	YES / NO	
A garage/shed	YES / NO	
A garden/drive/private footpath	YES / NO	
A highway	YES / NO	
Fields/open land	YES / NO	

3.2 How deep was the flood?

3.2 How often does the flooding occur?   Every ...... year / More than ..6.. times per year

3.3 Do you know any specific dates? If so, please list:
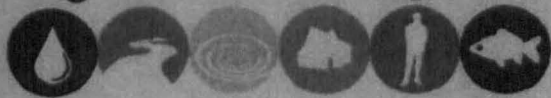
3.4 Do you have any documentary evidence?   Photos / Press Cuttings / Videos / Other (please ring)   emailed to David Sellers as requested

4. Source of Flooding

4.1 At the time of the flooding, was it raining?   **YES** / NO

1

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Questionnaire concerning flooding

1. Your details:

Name:
Address: LS 25 1EJ

Telephone (daytime) (evening)
e-mail address:
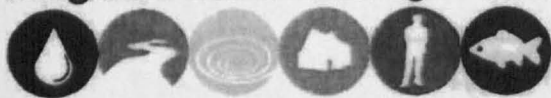
2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting. **YES / NO**

2.2 Please state a) how long have you lived in the area b) how many times you have experienced flooding

a) years 16
b) times 8+

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1 What got flooded?

		If yes, where (what address)?
The inside of a house(s)	YES /(NO)	
The space beneath a house(s)	(YES)/ NO	
A garage/shed	(YES)/ NO	
A garden/drive/private footpath	(YES)/ NO	
A highway	(YES)/NO	
Fields/open land	YES /(NO)	

3.2 How deep was the flood? 12" 30cm.

3.2 How often does the flooding occur? Every ...... years /
More than ..1.... times per year

3.3 Do you know any specific dates? If so, please list: ———

3.4 Do you have any documentary evidence? (Photos)/ Press Cuttings / Videos /
Other
(please ring)

4. Source of Flooding

4.1 At the time of the flooding, was it raining? (YES)/ NO

1

WEST GARFORTH FLOODING

A project sponsored by the Department for Environment, Food and Rural Affairs (DEFRA)

In this Government sponsored study, Leeds City Council, Yorkshire Water, the Environment Agency and the Pennine Water Group (Bradford and Sheffield Universities) are working together to investigate the long-standing flooding problems of West Garforth.

Questionnaire concerning flooding

1. Your details:

Name ██████████████████████████
Addre ████████████████████████ LS25 1EJ

████████████████████████████████

Telephone (da ███████████████████
e-mail address ████████████████████

2. History of Flooding

2.1   Were you aware of any history of flooding from watercourses or drains in   YES
West Garforth prior to the public meeting.

2.2   Please state a) how long have you lived in the area b) how many time you   a) 12years
have experienced flooding   b) maybe 15 times

2.3   If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1   What got flooded?

	Home address
The inside of a house(s)	NO
The space beneath a house(s)	YES
A garage/shed	NO
A garden/drive/private footpath	YES
A highway	NO
Fields/open land	NO

3.2   How deep was the flood?

In cellar I manage it at 1 foot. In garden, creeping water so hard to tell, certainly ankle deep!

3.2   How often does the flooding occur?

More than 2 times per year

3.3   Do you know any specific dates? If so, please list:

3.4   Do you have any documentary evidence?

Photos of garden flooding but may have chucked them as have ex husband on!

4. Source of Flooding

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Integrated Urban Drainage Pilots

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Questionnaire concerning flooding

1. Your details:

Name:
Address:

Telephone (daytime)
e-mail address:

2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting. **YES / NO**

2.2 Please state a) how long have you lived in the area b) how many time you have experienced flooding

a) years 35
b) times 33

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1 What got flooded?

		If yes, where (what address)?
The inside of a house(s)	YES / NO	
The space beneath a house(s)	YES / NO	Cellev, above
A garage/shed	YES / NO	
A garden/drive/private footpath	YES / NO	
A highway	YES / NO	
Fields/open land	YES / NO	

3.2 How deep was the flood?   varys

3.2 How often does the flooding occur?
Every ...... years / Most of the time
More than .... times per year
in the garden three twice a year

3.3 Do you know any specific dates? If so, please list:

3.4 Do you have any documentary evidence?
Photos / Press Cuttings / Videos / Other
(please ring)

4. Source of Flooding   don't know

4.1 At the time of the flooding, was it raining?   **YES / NO**

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Questionnaire concerning flooding

1. Your details:

Name:
Address:

S 2S 1EJ

Telephone (daytime)   ening)
e-mail address:

2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting.   YES / NO

2.2 Please state a) how long have you lived in the area b) how many time you have experienced flooding

| a) years | 8 |
| b) times | 16 |

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1 What got flooded?

		If yes, where (what address)?
The inside of a house(s)	YES / NO	
The space beneath a house(s)	YES / NO	Cellar e Garden.
A garage/shed	YES / NO	
A garden/drive/private footpath	YES / NO	
A highway	YES / NO	
Fields/open land	YES / NO	

3.2 How deep was the flood?   3ft

3.2 How often does the flooding occur?

Every ...... years /
More than ..2.. times per year

3.3 Do you know any specific dates? If so, please list: August

3.4 Do you have any documentary evidence?

Photos / Press Cuttings / Videos /
Other   No
(please ring)

4. Source of Flooding

4.1 At the time of the flooding, was it raining?   YES / NO

1

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Integrated Urban Drainage Pilots

WEST GARFORTH FLOODING

Questionnaire concerning flooding

1. Your details

Name:

Address:

Telephone (d

e-mail address

2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting.　　(YES) NO

2.2 Please state a) how long have you lived in the area b) how many time you have experienced flooding

| a) years $8\,6$ |
| b) times 3 |

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1 What got flooded?

		If yes, where (what address)?
The inside of a house(s)	(YES) NO	
The space beneath a house(s)	(YES) NO	
A garage/shed	YES / NO	
A garden/drive/private footpath	(YES) NO	
A highway	YES / NO	
Fields/open land	YES / NO	

3.2 How deep was the flood?　　BETWEEN 15cm & 40cm

3.2 How often does the flooding occur?　　Every ...... years / 3 TIMES IN TEN YR 1997-2002 2006　　More than .... times per year

3.3 Do you know any specific dates? If so, please list:　　AUG 97　AUG 02　AUG 06

3.4 Do you have any documentary evidence?　　(Photos)/ Press Cuttings /(Videos)　　Other DVD.　　(please ring)

4. Source of Flooding

4.1 At the time of the flooding, was it raining?　　(YES) NO

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Questionnaire concerning flooding

1. Your details:

Name
Addr   LS 25 1JS.

Telephone (daytime)   (evening)
e-mail address:

2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in West Garforth prior to the public meeting.   YES / ~~NO~~

2.2 Please state a) how long have you lived in the area b) how many time you have experienced flooding
| a) years 4+1 |
| b) times LOTS |

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1 What got flooded?		If yes, where (what address)?
The inside of a house(s)	YES / NO
The space beneath a house(s)	YES / ~~NO~~	ABOVE ADDRESS
A garage/shed	YES / ~~NO~~
A garden/drive/private footpath	YES / ~~NO~~
A highway	YES / ~~NO~~
Fields/open land	YES / NO

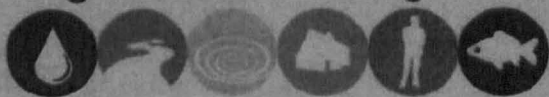3.2 How deep was the flood? | 12" OR MORE |

3.2 How often does the flooding occur? | Every ...... years / More than ..3.... times per year |

3.3 Do you know any specific dates? If so, please list: | |

3.4 Do you have any documentary evidence? | Photos / ~~Press Cuttings~~ / ~~Videos~~ / Other (please ring) |

4. Source of Flooding

4.1 At the time of the flooding, was it raining?   YES / ~~NO~~

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In this Government sponsored study, Leeds City Council, Yorkshire Water, the Environment Agency and the Pennine Water Group (Bradford and Sheffield Universities) are working together to investigate the long-standing flooding problems of West Garforth.

Questionnaire concerning flooding

1. Your details:

Name:
Address: ███████████████████ D, 'LS25· 1AT.

Telephone (daytime) ███████████ (evening)   SAME
e-mail address:

2. History of Flooding

2.1 Were you aware of any history of flooding from watercourses or drains in   (YES)/ NO
West Garforth prior to the public meeting.

2.2 Please state a) how long have you lived in the area b) how many time you   a) years 37
have experienced flooding   b) times 25+

2.3 If your answer to question 2.1 was yes and you have not completed a form similar to this previously, can you please provide further details and a sketch (if appropriate) in the spaces provided below

3. Description of Flooding

3.1 What got flooded?   If yes, where (what address)?
The inside of a house(s)   YES / (NO)
The space beneath a house(s)   YES / (NO)
A garage/shed   YES /(NO)
A garden/drive/private footpath   (YES / NO)
A highway   YES /(NO)
Fields/open land   (YES)/ NO   OPPOSITE OUR HOUSE.

3.2 How deep was the flood?   GARDEN 6ins. FIELD 12ins.

3.2 How often does the flooding occur?   Every ...... years / MOST YEARS
More than .... times per year

3.3 Do you know any specific dates? If so, please list:

3.4 Do you have any documentary evidence?   Photos / Press Cuttings / Videos /
Other
(please ring)

4. Source of Flooding

4.1 At the time of the flooding, was it raining?   YES / NO

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1 - Photographs – times from the digital watermark on digital camera

LS25 1AU 25th June 2007 at 11:50

LS25 1AU 25th June 2007 at 11:50

LS25 1AU 25th June 2007 at 15:10

LS25 1AU 25th June 2007 at 15:10

LS25 1AU 25th June 2007 at 18:10

128 /125

CITY SERVICES
1 2 JUN 2007
MIDDLETON

10/06/07

DAVID SELLERS,
PRINCIPAL ENGINEER,
LAND DRAINAGE
MIDDLETON RING ROAD
LEEDS
LS10 4AX
DEAR MR SELLARS,

We have been trying to think if there is anything that could be done to diminish the problems we have been having with water flooding into our back yard, and then into the cellar, off the road. We have come up with the following:

a) A rain channel along the crest of the join of the pavement with the back yard.

b) The pavement raised up towards the the rain channel.

c) The kerb raised.

d) An extra grate into the drain under the gutter by our back entrance.

e) The drains cleaned out regularly.

f) The gutters kept properly clean, ours are very bad. Despite a road sweeper coming quite regularly, it doesn't seem to do a very good job. Perhaps car owners who park out there could be warned when a sweeper is due and they could put their cars elsewhere for a while.

Another problem we have noticed is that the drain or drains on Lidgett Lane seem to be blocked. Whenever it rains we get a big puddle just outside our front gate and it is very difficult to get in and out of our garden without being drenched when cars go by.

We are very grateful for the attention being given to these problems. We attended the meeting, found it very useful and would be interested in keeping up with developments and in cooperating with whatever solutions are thought effective. I was particularly interested in the suggested examples of dealing with excess surface water and feel very strongly that everyone should be prepared to do their bit. We are looking into the possibility of installing water butts.

We look forward to hearing from you as to what you think may be feasible.
Yours sincerely,

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Email from resident 22nd May 2007

E-mail received 22/05/07

Hello Christine,

I'd like to give my apologies for not being able to attend tonight's meeting. As a single mum with 2 children and no access to babysitters it is impossible for me to arrange to be there but I would like to add my voice to any concern expressed over the flooding in Garforth.

I have lived in my property at Moorland Terrace for 12 years now and we regularly have standing water in our cellar. (The property is about 100 years old.) My experience is that it generally follws a dry spell then heavy or persistent rain. Each time I alert Yorkshire Water who tell me and my neighbours that they cannot find the source and that is is simply ground water and we have to put up with it. Over the years I have got used to it and pump it out when it reaches the top of the bottom step. However, my home is now on the market and it is not a great selling feature!

Anything you and your colleagues can do would have my fullest support. I would appreciate a copy of any Minutes taken or Actions proposed. Hopefully some of my neighbours will be there!

Good luck with the meeting.

LS25 1EJ

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LS25 1AZ 20th May 1986

7 - Photograph – times from the digital watermark on digital camera
8 - Photograph – date recorded in image title on digitally scan (LMBC)

LS25 1JG 8th September 1993

LS25 1JG 13th June 2003

LS25 1JG 13th June 2003