CONFRONTING CLIMATE: LINKING KNOWLEDGE, VALUES AND DECISION-MAKING TO VULNERABILITY AND ADAPTATION IN IRELAND’S COASTAL CITIES

By

JAMES MARTIN JEFFERS

A Dissertation submitted to the

Graduate School-New Brunswick
Rutgers, The State University of New Jersey

in partial fulfillment of the requirements

for the degree of

Doctor of Philosophy

Graduate Program in Geography

written under the direction of

James K. Mitchell

and approved by

________________________
________________________
________________________
________________________

New Brunswick, New Jersey

October 2011
ABSTRACT OF THE DISSERTATION

Confronting Climate: Linking Knowledge, values and decision-making to vulnerability and adaptation in Ireland’s coastal cities

By: James Martin Jeffers

Dissertation Director:
James K. Mitchell

In recent years geographers and other social scientists have highlighted several gaps in our understanding of climate change adaptation and decision-making responses to environmental hazards. These have included concerns regarding the use of knowledge in environmental decision-making, the need for more research on the ways in which hazards are conceptualized, framed and understood, and a concern that the high adaptive capacity present in many developed countries will not lead to successful adaptation.

Focusing on the cities of Cork, Dublin and Galway this research employed qualitative methods to examine decision-making by local officials, elected representatives and other stakeholders. The research methods used included semi structured interviews with a range of local decision-makers and a content analysis of the minutes of City Council meetings, the records of national parliament debates and available policy documents.

The results of this research illustrate that several factors influence local decision-making. The ways in which climate change is framed as a temporal and spatial
phenomenon shape the type and timing of adaptation decisions. Discourses of risk and vulnerability are another important influence. Decision-making is heavily influenced by a risk management paradigm that emphasises biophysical risk but does not extensively consider other drivers of vulnerability and resilience. This has led to an understanding of climate impacts that emphasises attempts to prevent hazards through a technological fix, while not exploring alternative strategies. Flood events and flood induced losses are viewed as identical, with the reduction of physical exposure becoming the central policy objective. Perhaps most influential are intersections between economic and environmental change. These have created the material and ideological conditions in which an economic development discourse dominates decision-making and policy. This further reinforces an emphasis on biophysical risk as hazard events are viewed as disruptions to the economic life of the city that must be prevented. These results suggest that current policy and practice may ultimately fail to reduce vulnerability and that there is a need for a more holistic understanding of climate hazards that draws on knowledge from the social and natural sciences to integrate strategies for vulnerability reduction into local policy and practice.
ACKNOWLEDGMENTS

The completion of this dissertation would have been a nearly impossible task were it not for the assistance, support and encouragement of my family, friends, mentors and colleagues to whom I am greatly indebted.

I would like to begin by thanking my advisor James K. Mitchell and my committee members Robin Leichenko and Trevor Birkenholtz for their assistance, support, feedback and encouragement throughout this process. Special thanks also to John Sweeney for his comments and feedback in the role of external committee member. I am also grateful to all of the faculty and staff of the Department of Geography at Rutgers. Together you all help to sustain an academically and professionally challenging graduate program while also maintaining a supportive and friendly atmosphere in the Department. All of you have contributed in some way to my professional development and I am grateful to each of you.

I am also thankful for the support of the numerous graduate students who I have shared my time in the program with. Many of you have contributed to my intellectual and personal journey over the last five years and I am truly thankful for that. There are simply too many of you to whom I owe thanks to begin listing names but a special mention must go to the cohort who have been present throughout this journey, Kari Burnett, Nate Gabriel and Nelun Fernando. I have also been blessed with a wonderful network of friends outside of the Geography Department. To my friends in New Jersey, those in Ireland and in other parts of the world, thank you for your support, encouragement and friendship.
This dissertation would also not have been possible without the generous financial support provided by Rutgers University (the Graduate School New Brunswick, the Department of Geography and the Department of Human Ecology), the Social Science Research Council and the PERISHIP Fellowship Program. It would also have been impossible without the willing participation of all of my interviewees in Cork, Dublin and Galway.

Finally but most importantly I would not be where I am today without the constant love, support and encouragement of my parents Christy and Philomena, and my sister Mary.
DEDICATION

To my parents Christy and Philomena and my sister Mary, for their unconditional love and support
TABLE OF CONTENTS

Abstract of the Dissertation ................................................................. ii
Acknowledgments............................................................................... iv
Dedication.......................................................................................... vi
Table of Contents............................................................................... vii
List of Tables ..................................................................................... x
List of Illustrations........................................................................... xii

**Chapter 1: Introduction and Literature Review**.............................. 1

Introduction ....................................................................................... 1
Structure of the dissertation ............................................................... 5
Climate projections and impacts ......................................................... 8
Vulnerability research ......................................................................... 12
Adaptation research ........................................................................... 21
Questions of scale in the study of vulnerability and adaptation .......... 31
Concluding thoughts on the literature ................................................. 33
Research questions ........................................................................... 35

**Chapter 2: Research Design and Methodology**............................. 38

Introduction ....................................................................................... 38
Qualitative social science research .................................................... 39
Research subjects ............................................................................. 40
Semi-structured interviews ................................................................. 42
Focus group workshops .................................................................... 52
Content analysis ................................................................................ 53
Vulnerability mapping ....................................................................... 58
Historical hazards research ............................................................... 59
Reflections on methods and research design .................................... 61
Conclusions ....................................................................................... 65

**Chapter 3: An Environmental History of Flood Hazards in Ireland’s Coastal Cities** ......................................................... 67

Introduction ....................................................................................... 67
Dublin ............................................................................................... 69
Flooding in Dublin ............................................................................ 75
Cork ................................................................................................. 84
Flooding in Cork ............................................................................... 89
Galway .............................................................................................. 94
Flooding in Galway .......................................................................... 97
Conclusions ..................................................................................... 100
LIST OF TABLES

Table 2.1. Interview recruitment and participation statistics............................................. 45
Table 2.2. Participants by sex .......................................................................................... 49
Table 2.3. Interviewees by city and tier ......................................................................... 49
Table 2.4. Elected representatives by political party ...................................................... 50
Table 2.5. City council minutes analysed ....................................................................... 54
Table 3.1. Notable recent floods in Dublin, Cork and Galway ....................................... 68
Table 3.2 Population of the Greater Dublin Region by Local Authority area............... 70
Table 4.1. Interviewee comments on climate change in other places............................ 113
Table 4.2. Factors suggested as positive or negative aspects of climate change ...... 119
Table 4.3. Comments where respondents identified unusual or surprising hazard events as evidence that climate change was already impacting their city .................. 122
Table 4.4. Comments where interviewees saw changes in seasons or weather patterns as evidence that climate change was already impacting their city ...................... 132
Table 4.5. A selection of Galway respondent’s views on coastal erosion ..................... 143
Tables 4.6. Interviewee comments on sources of information on climate change .... 148
Table 5.1. A selection of elected representatives’ views on the importance of the current economic crisis relative to the importance of climate change ..................... 195
Table 5.2. A selection of executive official’s views on the importance of the current economic crisis relative to the importance of climate change ............................... 196
Table 5.3. A selection of other interviewee’s views on the importance of the current economic crisis relative to the importance of climate change ............................ 197
Table 5.4. A sample of some of the issues other than climate change and economic recovery highlighted by interviewees .............................................................. 198
Table 5.5. Interviewee comments on the economic impacts of climate change ....... 199
Table 5.6. Funding as the main constraint on decision-making options .............. 200
Table 6.1. Risk assessment using the Source-Pathway-Receptor model .................. 224
Table 6.2. Definitions and descriptions of vulnerability in national flood policy .... 230
Table 6.3. Examples of discussions of flooding at City Council meetings .................. 231
Table 6.4. Comments on flood hazards from the records of Dáil Éireann ............. 233
Table 6.5. A selection of quotes from the records of the Committee on the Environment, Heritage and Local Government ....................................................... 237
Table 6.6. Quotes from the records of the Committee on the Environment, Heritage and Local Government................................................................. 238
Table 6.7. Interviewee’s views on engineering as the solution to flooding......... 242
Table 6.8. A selection of the individual preparations for flooding promoted by the flooding.ie website.......................................................... 256
Table 7.1. Public agencies and organisations with responsibilities related to flood hazards in Ireland........................................................................ 270
Table 7.2. The stages of recovery................................................................. 296
Table 7.3. Roles in the recovery process....................................................... 296
LIST OF ILLUSTRATIONS

Figure. 3.1. Ireland’s main cities and major river basins................................. 68
Figure 3.2. Local Authorities of the Greater Dublin Area................................. 70
Figure. 3.3. Dublin’s rivers and canals............................................................... 73
Figure 3.4. The River Poddle joining the main channel of the River Liffey......... 73
Figure 3.5. The River Tolka channeled between flood walls in Griffith Park...... 74
Figure 3.6. Flooding in the Ringsend area of Dublin City, February 1st 2002....... 82
Figure 3.7. Flooding in Ringsend, February 2002.............................................. 82
Figure 3.8. Waves overtopping the sea wall at Sandymount, February 2002...... 83
Figure. 3.9. Cork City......................................................................................... 86
Figure 3.10. Cork City in 1545............................................................................ 86
Figure 3.11. Cork City in 1759 with several channels still open....................... 87
Figure 3.12. Grand Parade viewed from across the South Channel of the Lee.... 87
Figure 3.13. Culvert joining the River Lee from beneath St. Patrick’s Street, Cork.. 88
Figure 3.14. Flooding in Cork City centre, November 2009............................... 93
Figure 3.15. Damage to the quay wall at Granville Place, Cork after the flood began to recede, November 2009................................................................. 93
Figure 3.16. Galway City.................................................................................... 95
Figure 3.17. The Spanish Arch area of Galway City during a spring tide......... 95
Figure 3.18. Galway Fire Station (grey tower) on the evening of a spring tide.... 96
Figure 3.19. New office building in Galway on the evening of a spring tide....... 96
Figure 4.1. Participants views on when climate change would impact their city..... 112
Figure 4.2. Informants views on the likely severity of climate change impacts.... 112
Figure 4.3. Views on whether climate change would be positive or negative for their city........................................................................................................... 112
Figure 4.4. Flood defences under construction on the River Dodder, Dublin...... 123
Figure 4.5. New flood defences on the estuary of the River Dodder.................. 123
Figure 4.6. Respondent’s views on whether drought, drier summer weather or water supply challenges would be an issue in their cities in the future............. 134
Figure 4.7. The eroding cliff face at Silver Strand, Galway............................... 142
Figure 4.8. Coastal defences at Salthill, Galway.................................................. 142
Figure 4.9. Sources or potential sources of information on climate change...... 149
Figure 5.1. Unemployment rate (%) in the Republic of Ireland, 1980-2009............ 178
Figure 5.2. National average house prices (€) for each quarter year, 1996-2010..... 178
Figure 5.3 Immigration and emigration (thousand people per year) 1987-2010...... 179
Figure 5.4. Estimated immigration (thousand people per year) by origin 1990-2010.

.................................................................................................................................... 179
Figure 5.5. Number of people on the live register (claiming unemployment benefits) in
County Dublin, March 2006 – September 2010............................................................. 180
Figure 5.6. Number of people on the live register (claiming unemployment benefits) in
Galway and Cork Cities, March 2006 – September 2010........................................ 180
Figure 5.7. Estimated emigration from Ireland by nationality and sex (thousand
people) 2006-2010. ....................................................................................................... 181
Figure 5.8. Ireland’s birth rate and natural increase in population, 1987-2010........... 181
Figure 5.9. Abandoned and unfinished houses, Bundoran, County Donegal......... 182
Figure 5.10. Dublin’s redeveloping Docklands. ...................................................... 182
Figure 5.11. Dublin’s Dockland’s with some the few remaining warehouses....... 183
Figure 5.12. House construction in the Republic of Ireland, 1992 – 2009 (total number
of new houses completed per year). ............................................................................ 183
Figure 6.1. The Source-Pathway-Receptor model...................................................... 224
Figure 6.2. Number of ministerial questions related to flooding raised in Dáil Éireann
(1985-2008). .................................................................................................................. 234
Figure 6.3. One of the proposals for a tidal barrier in Dublin Bay....................... 244
Figure 6.4. An alternative proposal for tidal barriers in Dublin Bay.................... 244
Chapter 1: Introduction and Literature Review

Introduction
On August 29th 2005, Hurricane Katrina made landfall on the coast of Louisiana. In the hours and days that followed, the resulting disaster revealed a great deal about the ways in which we prepare for and respond to natural hazards. While Hurricane Katrina will rightly be remembered for the ferocity of its winds and the severity of its storm surge, it will also be remembered for the ways in which the resulting human disaster was created. Even though there was much that was already known about the exposure of the city of New Orleans to flood risks and about the potential vulnerabilities of its population, that knowledge was not used effectively to avert disaster. Although Hurricane Katrina itself cannot be attributed to global environmental change the disaster that followed provides a concrete example of an issue that has become of increasing concern to geographers and other social scientists in recent years, that of better understanding the ways in which we make decisions about the management of environmental hazards and global environmental change. Writing in the aftermath of the Katrina disaster Mitchell (2006a, unpaginated) cautioned that when it comes to environmental hazards, “the gap between what we know and what we do is now yawning dangerously wide”. Similar concerns have been expressed in the context of global climatic change with several researchers warning that the high adaptive capacity present in many affluent countries of the global north would not automatically led to successful adaptation (Repetto, 2008; O’Brien, et. al., 2004). This dissertation emerges from these concerns and examines climate change adaptation and hazards loss mitigation in Ireland’s coastal cities, focusing in particular on the ways in which we make decisions about environmental hazards, and the information and knowledge we use in doing so. This study also
contributes to a growing literature that seeks to link the natural hazards and climate change research communities to address disaster loss reduction and climate change adaptation (Birkmann and von Teichman 2010; Romieu, et. al., 2010).

Urban coastal regions are the focus of particular concern in the context of climate change due to the confluence of environmental and social challenges currently being experienced there. Coastal regions are among the parts of the world thought most likely to be negatively impacted by climate change while over half the world’s population now resides in cities. Coastal regions face challenges presented by changes in storm frequency and intensity, sea level rise, increased erosion, flooding, inundation and saltwater intrusion. While there has rightly been a focus on the difficulties these impacts will present in the developing world, growing attention is now also being focused on more affluent countries. The latest reports from the Intergovernmental Panel on Climate Change (IPCC) have also reinforced the judgment that the greatest impacts of climate change are likely to be experienced in the mid latitudes, including many parts of Europe (Solomon, et. al., 2007). Globally, an increasing volume of research is now focusing on vulnerability in the coastal zone. It is clear that coastal ecosystems face significant burdens as they become squeezed between rising sea levels, flooding and erosion on one side, and the impacts of increasing urbanisation and development on the other (Gornitz, 2001). While the low elevation coastal zone (land below 10m above sea level) accounts for less than 2% of total land surface area, 10% of the global population reside in this zone (McGranahan et. al., 2007).
As an island nation with most of its major urban settlements located in the coastal zone Ireland represents an important case study for these issues. Approximately 34% of the population (1.4 million people) in the Republic of Ireland live within 2 km of the coast and the population of coastal cities continues to grow (Devoy, 2008; Devoy, 2000). The population of urban areas within 10 km of the coast increased by 10.8% between 1975 and 1990 (European Commission, 2004). The low elevation coastal zone accounts for 4% of the total land area of the Republic of Ireland but is home to 10% of the population (CIESIN, Columbia University). There has also been a trend of migration from rural areas in the west to urban areas on the east coast (Fealy, 2003). A significant proportion of the population resident outside of the low elevation zone also work, study or conduct other activities within the zone. An expanding population and continued economic growth have placed larger numbers of people and an increasing amount of financially valuable property and infrastructure in exposed locations. Exposed facilities of note include ports, water and waste water treatment systems, and transportation infrastructure (Mitchell, 2003).

While natural hazards exposure and vulnerabilities currently remain low relative to other countries in Europe and elsewhere, storms are a common feature of the climate of Ireland and flooding is also a frequent occurrence. Loss of life in storm events is usually very low but economic losses are significant with one storm in 1998 leading to insured losses of €127 million (Sweeney, 2000). When adjusted per capita these losses are similar in magnitude to the estimated total economic losses from the

---

1 The importance of storm and flood hazard impacts on infrastructure and property is also highlighted by the response of the Irish authorities to a questionnaire administered as part of a European Environment Agency study on climate change and water resources in Europe (Benzie, et. al. 2007).
impacts of Hurricane Floyd on the New York City region in 1999.\textsuperscript{2} Several notable floods have occurred in Ireland in recent years. In February 2002, Dublin City recorded its highest tide on record leading to severe flooding in several parts of the city. Fortunately no fatalities resulted but the floods damaged hundreds of homes causing substantial economic loss and shocked the population of the city. In November 2009, Cork City experienced some of its worst river flooding in modern times while severe river flooding was also experienced in many other parts of the country (Hickey, 2010a). Pluvial flooding\textsuperscript{3} has also been increasingly common striking Dublin city on a number of occasions and also impacting other parts of the country. Climate projections suggest that an increase in storm intensity is likely during the next fifty years while an increase in storm frequency is also possible (McGrath \textit{et.al.}, 2005; Lozano \textit{et. al.}, 2004). Relative sea levels have been rising for at least a century around most of the Irish coastline and this trend appears likely to continue (Devoy, 1990). Erosion is also common with around 20% of the coastline experiencing active erosion during 2001 (Hoepffner, 2004) and some research has predicted retreats of between 50m and 100m in some locations by 2100 (Lozano \textit{et.al.} 2004).

Ireland also represents an important case study for vulnerability and adaptation issues due to the social, economic and institutional change the country has witnessed in recent decades. During the 1980s and the early 1990s Ireland experienced high

\textsuperscript{2} Insured losses from the 1998 event adjusted per capita for the population of the Republic of Ireland in 1996 amount to approximately $48 per person. Estimated total economic losses from Floyd in the NYC metro region adjusted per capita to the population of the region amount to $50 per person. When the estimated total economic losses from Floyd for the all affected US areas is adjusted per capita to the national population of the US the result is approximately $19 per person, a significantly smaller impact than the 1998 event in Ireland. Based on data from Sweeney (2000), Central Statistics Office of Ireland (2007), Jacob (2001) and United States Census Bureau (2000).  

\textsuperscript{3} Pluvial flooding describes rapid onset flood events cause primarily by extreme rainfall experienced over a short time period.
unemployment, high emigration and economic stagnation (O’Hearn, 2001; Crotty, 1986). The late 1990s saw a dramatic transformation as Ireland proved to be an attractive destination for foreign direct investment, mainly by US multinationals. Rapid economic growth led to high employment and a reverse of previous migration patterns with high immigration replacing emigration. A second phase of economic growth based largely on a construction boom followed (Allen, 2009). However the combined impacts of the collapse of the domestic property bubble and the global financial crisis have produced an economic recession in Ireland. High unemployment and emigration have returned and the crisis has led to the national government requiring a joint International Monetary Fund (IMF) and European Union (EU) bailout package. It is likely that these dramatic socio-economic transformations have had important implications for vulnerability to hazards and climate impacts, as well as for the importance attached to climate change and environmental hazards by policy makers. Recent decades have also seen important changes in institutions and governance due to Ireland’s ongoing integration into the EU and the increased north-south (between Northern Ireland and the Republic of Ireland) and east-west (between the Republic of Ireland and the United Kingdom) co-operation resulting from the peace process in Northern Ireland. In summary, agents of environmental and societal change have produced new patterns of risk and vulnerability in Ireland. As these changes may be representative of trends in a wide range of developed countries, they deserve close attention by both researchers and policy makers.

Structure of the dissertation
The remainder of this chapter is devoted to a comprehensive review of the current literature on climate change, vulnerability, resilience and adaptation, particularly in urban contexts. This review will illustrate a number of gaps in the contemporary
literature and demonstrate how the research questions that have guided investigations for this dissertation contribute to addressing some of those gaps. Chapter 2, *Research Design and Methodology* provides an outline of the methodological techniques used to answer these questions and an account of how the data used in this project was collected and analysed. Chapter 3, *An Environmental History of Flooding in Ireland’s Coastal Cities* provides a description of the research sites for this project, the cities of Cork, Dublin and Galway. This includes a history of flood hazards in each city, illustrating how the historic development of each city has helped to produce the exposures and vulnerabilities experienced by their populations today. Chapter 4, *Ideas Matter: Conceptualising, framing and interpreting climate change* draws heavily on my interview data to evaluate how climate impacts and hazards are conceptualised, framed and understood by local decision-makers and other stakeholders in each of the case study cities. It illustrates that a range of factors shape their understanding. These include experience of past hazard events, perceptions of weather and climate, and the ways in which knowledge and information is disseminated and distributed across and between different levels of governance. This chapter also demonstrates how these framings and conceptualisations influence policy and practice, with important implications for the vulnerability of local populations. Chapter 5, *Intersecting Crises and Double Exposures* builds on Chapter 4 by focusing on the connections between environmental change and economic crisis in Ireland today. It illustrates how the intersection of these global processes has created the material and ideological conditions in which an economic development discourse dominates urban decision-making and public policy. Chapter 6, *Hazards Mitigation, Climate Change Adaptation and the Risk Society* draws on both my interview data and the results of an extensive content analysis of the minutes of City Council meetings and national
parliament debates, to illustrate how current policy and practice is dominated by a risk management paradigm that emphasises the prevention of hazards through technological fixes. Hazards events and the losses they induce are viewed as identical and the elimination of physical exposure is seen as the optimal means of reducing loss. Available evidence suggests this approach may ultimately fail to reduce loss or to facilitate effective climate change adaptation. Chapter 7, *Echoes of the Past and Challenges for the Future: Contemporary flood hazard policy in Ireland* examines how governance at national and European levels has influenced local policy and practice providing a picture of the overall state of flood hazards policy and decision-making in Ireland. It also examines why socio-economic drivers of vulnerability are not generally considered in local decision-making, despite an attempt to shift national policy away from structural and engineering approaches. The analysis demonstrates that a variety of factors shape current practices. These include institutional and decision-making structures, discourses of risk management and the challenges presented by attempting to engage in policy changing vulnerability research. Finally Chapter 8, *Concluding Thoughts and Future Research* summarises the conclusions of this research project and offers some suggestions for future research that emerges from this work.

In the review that follows I trace the literature in several subfields of geography and similar disciplines related to climate change, environmental hazards, vulnerability and adaptation. I begin with a brief evaluation of the scientific literature on climate change illustrating the likely impacts on coastal regions, the mid latitudes, and Ireland in particular. This is followed by an evaluation of contemporary vulnerability research illustrating its parallel emergence from the natural hazards and climate change
communities as well as recent attempts to merge these traditions. I then review the related field of adaptation research highlighting a number of areas of concern that are addressed in this dissertation. I conclude the review with a brief discussion of the literature on the importance of scale in vulnerability and adaptation research. The final portion of the chapter outlines the research questions that have guided this dissertation research, illustrating how they emerge from and contribute to contemporary research on the human dimensions of natural hazards and climate change in geography.

**Climate projections and impacts**

Published literature on the impacts of global environmental change and natural hazards has emerged from both human and physical geography as well as from a range of other disciplines. Research in physical geography and the natural sciences has focused on prediction and modelling of future changes to the physical climate and the implications of these changes for processes such as sea level rise, coastal erosion, and the frequency and intensity of storms. The volume of published literature leaves it beyond doubt that the kinds of global change that are happening will present a variety of challenges for all coastal communities in the years ahead. The most recent reports from the IPCC also make it clear that understandings of climate change have moved from considerable uncertainty to unequivocal evidence that changes outside of the normal range of variability are happening (Liverman, 2007).

It is clear that global sea levels are rising and seem likely to continue to do so (Fenoglio and Tel, 2010; Ranasinghe and Stive, 2009; Church, *et. al.*, 2008; Beckley, *et. al.*, 2007; Hay and Mimura, 2005). Sea level increased at an average rate of 1.8mm per annum between 1961 and 2003, but the rate between 1991 and 2003 was 3.1mm
per year (Solomon, et. al. 2007). Globally the effects of this rise will include increased erosion, inundation, flooding, increased landward reach of waves, and sea water intrusions into freshwater systems (Hay and Mimura, 2005). One study has concluded that increased sea level could result in erosion rates two orders of magnitude greater than the rate of sea level rise (Zhang, et. al., 2004). However this analysis has been criticised as simplistic by others who argue that this level of erosion occurs only in a situation where all factors other than sea level rise are constant (Stive, 2004).\(^4\) What is clear is that sea level rise and erosion are significant, even if the exact magnitude of their effects is difficult to quantify. While these and numerous other studies have focused attention on the global scale, others have sought to examine similar issues at the national, regional and local level. A variety of methodologies have been utilised including various modelling and prediction tools as well as GIS and other mapping techniques. An example of this work is the study of Cairns, Australia which models storm surge risks using statistical models of cyclone occurrence and storm surge inundation modelling (McInnes, et. al. 2003). The SLOSH (Sea, Lake and Overland Surges from Hurricanes) Models used by the National Hurricane Center in the US adopt a similar approach to estimating storm surge heights using data on pressure, storm size, track, forward speed and winds (Wu, et. al., 2002).

A number of modelling studies of the Irish climate and potential coastal impacts have also been carried out in recent years. Modelling studies (downscaling from global

\(^4\) The relationship between sea level rise and erosion is a complex and contested one. Many predictions of sea level rise have been based on the Bruun Rule (Bruun, 1962) an equation which is based on the principle that erosion rates are directly proportional to sea level rise. However this equation has been the subject of a long running academic debate regarding its value (Pilkey, et. al., 2000). Some studies have found evidence of accreting coastlines in areas known to be experiencing sea level rise (Stive, 2004) and some researchers have called for the abandonment of the Bruun Rule (Cooper and Pilkey, 2004).
models to national, regional and local scales) project that an increase in storm intensity is likely in the decades to come (McGrath et al. 2005; Lozano et al. 2004). IPCC projections suggest that average and extreme wind speeds across northern Europe will increase but the magnitude of these increases remains uncertain (Solomon, et. al., 2007). There is some uncertainty over whether this will be accompanied by a change in storm frequency. Lozano, et. al. (2004) project a decline in frequency while McGrath, et.al. (2005) predict an increase in frequency of up to 15% between 2021 and 2060. More recent modelling has suggested a decline in the number of storms making landfall over Ireland but a significant increase in their intensity (McGrath and Lynch, 2008; Semmler, et. al., 2008). The decline in storms making landfall is associated with a northward movement in storm tracks projected by the IPCC as well as recent Irish modelling research and already visible in Irish storm chronologies (Dunne, et. al., 2008; Semmler, et. al., 2008; Solomon, et. al., 2007; Bengtsson, et. al., 2006; Hickey, 2003;). The accuracy of modelling projections has been questioned by Hickey (2010b) as storm chronologies had failed to detect any significant changes in storm intensity or frequency from the instrumental record over the last thirty years (Hickey, 2003; Sweeney, 2000). Recent research indicates that a decline in storm frequency and intensity may have occurred along the west coast (Hickey, 2010b). Research has also suggested that trends in storminess and other features of the Irish climate may be linked to fluctuations in the North Atlantic Oscillation (NAO) and that climate change may be contributing to increasingly strong positive NAO signals (Dawson, et. al. 2004; Dawson, et. al. 2002).5 Changes in wave

5 The North Atlantic Oscillation (NAO) is a process associated with changes in the behaviour of westerly winds across the North Atlantic Ocean west of Europe. The NAO is dependent on the relationship between a low pressure air mass normally positioned close to Iceland and the high pressure air mass normally located around the Azores Islands. When lower than usual pressure over Iceland and higher pressure near the Azores leads to stronger than average westerly winds it is referred to as a
heights in the North Atlantic to the west of Ireland are also believed to be linked to changes in the NAO (European Commission, 2004).

In line with global research, studies of sea level rise in Ireland have concluded that relative sea levels on most of the Irish coastline have been rising for at least a century and that this trend is likely to continue (Devoy, 2008; Devoy, 1992; Devoy, 1990). Current estimates of sea level rise range from between around 1mm per year (Devoy, 2008) to 3.5mm per year (McGrath and Lynch, 2008). Sea level increases of between 13cm and 74cm have been predicted by 2050 (Dodds, et. al, 2010). Dramatic increases in risk have also been predicted with a 2.6m storm surge on the east coast, which is currently a one in one hundred year event, becoming a one in two year event by 2100 (McElwain and Sweeney, 2006). Recent modelling indicates that the event frequency for surges typically associated with coastal flooding in Ireland (50 – 100 cm) will increase by up to 30% in some locations by the period 2031 – 2060 (McGrath and Lynch, 2008; Wang, et. al., 2008). Significant changes in the heights of maximum surges and the increasing coincidence of large surges with high tides are also projected while extreme wave heights are expected to increase, especially during the winter months (McGrath and Lynch, 2008). Extreme wave heights are a significant aspect of Ireland’s exposure to storm hazards with waves of almost 30m in height having been recorded along the west coast (Hickey, 2010b). These waves have on occasion caused significant damage to shipping and to onshore properties (Hickey, 2010b).

---

positive NAO signal. The reversal of this scenario leads to weaker than average westerly winds and what is known as a negative NAO signal (Dawson, et. al., 2002).

6 These figures are based on calculations of likely average recurrence intervals. Consequently a one in one hundred year event may occur several years in succession, or even more than once in the same year, or may not occur for several hundred years.
Recent research has also focused on changes in precipitation patterns and their impacts on runoff and stream flow. Predictions of increased rainfall and runoff during the winter months, combined with likely increases in extreme rainfall events may have important impacts on the frequency and intensity of river flooding (McGrath and Lynch, 2008; Steele-Dunne, et al., 2008; Charlton, et al. 2006; Sweeney, et al., 2003). This is particularly important for coastal cities as all of Ireland’s major coastal settlements are located at river mouths and frequently experience their worst flooding when river and coastal flooding are combined (Devoy, 2008). While further research is required, the modelling and prediction research at both global and national levels clearly indicates the likely impacts resulting from global climate change, and provide a good basis for proceeding towards a discussion of the social dimensions of the issue.

Vulnerability research
Research on vulnerability has emerged from a number of different research traditions within geography and other disciplines, with each literature employing different theoretical perspectives and methodological approaches. Despite some synthesis and calls for greater integration, the field remains somewhat fragmented and it is not easy to clearly untangle its genealogy. Contemporary vulnerability research can be traced to several origins including the subfields of natural hazards, political ecology and global environmental change within geography, as well as to the fields of food security and resilience research (Birkmann and von Teichman 2010; Leichenko, et al., 2010; Romieu, et al., 2010; Berkes, 2007; Adger, 2006; Eakin and Leuers, 2006; Cutter, 1996). This diversity of origin has led to differing interpretations and understandings of vulnerability and the ways in which it should be evaluated. While all vulnerability researchers appear to agree that the concept focuses on the range of factors that make an individual, group, place or system more susceptible to disaster,
there is an assortment of perspectives regarding what those factors are, which are most important and how they should be measured. In recent years several reviews have attempted to synthesise the conceptions of vulnerability that have been employed while several researchers have sought to develop conceptions of vulnerability and its relationship to other concepts such as adaptation, adaptive capacity, sensitivity, exposure and resilience (Turner, 2010; McLaughlin and Dietz, 2007; Polsky, et. al. 2007; Yarnal, 2007; Adger, 2006; Cutter, 1996; Eakin and Luers, 2006; Gallopín, 2006; Smit and Wandel 2006; Polsky, et. al. 2003). The results of these efforts have not always assisted in the search for clarity and considerable confusion remains. Multiple interpretations of vulnerability continue to be employed by researchers across and within several disciplines.

Cutter’s (1996) review of vulnerability research emerging from the natural hazards literature identified three main conceptualisations of vulnerability. These were vulnerability as a pre-existing condition, vulnerability as a tempered response and vulnerability as hazardousness of a particular place. McLaughlin and Dietz’s (2007) review of vulnerability research categorises vulnerability as emerging from five distinct traditions; biophysical, human ecological, political ecological, constructionist and political economy. Critiquing each of these approaches and they argue for what they describe as an evolutionary approach, suggesting that this will avoid what they see as the main pitfalls of other perspectives. They also suggest that other perspectives are based on assumptions of essentialism and nominalism which render them less effective than their proposed approach. Eakin and Luers (2006) similarly characterise vulnerability research as having emerged from three traditions; risk-hazards, political economy/ecology and ecological resilience. Their review focuses on what they
perceive as emerging challenges for vulnerability research. These include dealing with multiple stressors, uncertainty and a concern for equity and social justice. Several other issues have also emerged from vulnerability research in recent years. Among these is the question of whether vulnerability should be characterised as a process or an outcome or a status (Adger, 2006; Pelling, 2003). Kuhlicke (2010) suggests that vulnerability has phenomenological and causal dimensions but that these are not always clear. For example, political or economic conditions may be an expression of vulnerability rather than its cause (Kuhlicke, 2010).

Vulnerability research within the global environmental change and climate change research communities has evolved from studies that focused on physical exposure and climate impacts to those that now include a much wider range of indicators of vulnerability. Earliest studies tended to focus on national and regional scales and were generally not full vulnerability assessments. For example, Paskoff’s (2003) evaluation of the potential implications of rising sea levels for France identifies a range of potential impacts and vulnerable locations. Similarly, Devoy (2000) conducts a general evaluation of important issues regarding the impacts of accelerated sea level rise on the coastline of Ireland and lists factors influencing physical vulnerability and the potential for resilience. Hickey, et. al., (2006) used the same list of factors to conduct a similar vulnerability analysis on the coastlines of three counties concluding that the coastlines of Mayo, Galway and Donegal have significant vulnerabilities to the impacts of climate change and that this vulnerability varies greatly from one location to another depending on local biophysical and social factors. While these types of impact based studies have made an important contribution to the knowledge base, it has also been recognised that their usefulness is limited, as impacts represent
only one facet of the problem (Leichenko, et. al., 2010; Burton, et. al., 2002). Over recent years the research emphasis has moved from impact studies towards a focus on vulnerability and adaptation (Burton, et. al., 2002). This change in emphasis has been accompanied by a movement from the national scale towards regional and local case studies offering a greater depth of analysis. To some extent this mirrors the earlier evolution of vulnerability research within the natural hazards community as it became increasingly influenced by political economy and political ecology perspectives.

Several studies of vulnerability have been conducted for coastal regions of the United States. Boruff, et.al., (2000) examined the vulnerability of US coastal counties to erosion. Viewing vulnerability as a composite of both physical and social factors, they developed an index of vulnerability that could be applied to each county. The results of the study indicated that in some cases, generally on the Atlantic and Pacific coasts, physical exposure was the most important influence on vulnerability. This is in contrast to counties along the Gulf coast where social factors had a greater influence on overall levels of vulnerability. While these national level studies provide a general overview of important issues, they also illustrate the need for more locally based studies due to the range of variations in vulnerability levels that can be experienced at local levels.

A comprehensive study of the New York Metropolitan Region has been carried out focusing on a number of different aspects of the region’s vulnerability to climate change (Rosenzweig and Solecki, 2001). A number of issues were highlighted including the pressure on coastal ecosystems squeezed between rising sea levels and erosion on one side, and increasing urbanisation and development on the other,
resulting in increasing flooding as well as loss of wetland habitats (Gornitz, et. al., 2001; Gornitz, 2001). Jacob (2001) concludes that sea level rise will create significant challenges for the New York Region due to its impacts on the frequency of flood events. Examining the risks and vulnerabilities from sea level rise facing important infrastructure in the region, Jacob focused on the importance of using not only worst case scenario assessments but also including probabilistic assessments of risk and vulnerability. The importance of climate impacts on infrastructure ‘lifelines’ and the challenges that these can create for populations that are otherwise unaffected by hazards has also been highlighted by several other researchers (Cutter, et. al. 2000; Platt, 1995). The potential impacts on such critical infrastructure may be a particularly important aspect of vulnerability in Ireland as many important infrastructures including roads, railways, airports, tunnels and electricity generating stations are located in low elevation coastal areas (The Irish Academy of Engineering, 2009).

A case study of Georgetown County, South Carolina (Cutter, et. al. 2000) employs a conception of vulnerability based on the idea of vulnerability of people and places. Similarly to the national study discussed above both physical and social factors are considered. A longitudinal record of biophysical risks was combined with an analysis of social vulnerability and the locations of critical infrastructures. It is worth noting that the results of this study revealed that the highest biophysical risks did not overlap with the locations of highest social vulnerability. Wu, et. al., (2002) adopt a similar approach to evaluating vulnerability of Cape May County, New Jersey. In this case a vulnerability index similar to that used in the Georgetown study was used to predict future vulnerability of Cape May County to the impacts of sea level rise. Kleinosky,

7 Jacob highlights the importance of carrying out both deterministic and probabilistic hazard assessments. Deterministic assessments focus on the question of “what if” a particular event occurs whereas probabilistic assessments ask “how often” a particular event might occur (Jacob, 2001).
et. al., (2007) and Rygel, et. al., (2006) also develop and apply a vulnerability index in order to assess the vulnerability of the Hampton Roads region of Virginia to storm surges and sea level rise. The usefulness of county level studies can be limited when dealing with large urban areas that straddle multiple counties or by smaller urban areas that are not representative of the remainder of the county.

These US focused studies illustrate the evolution of vulnerability research to include both biophysical and social drivers. All of these studies illustrate the value of combining an evaluation of physical risks with an examination of social factors to develop a more comprehensive understanding of the vulnerability of particular places and their populations. However this focus also misses some of the complexity involved in attempting to assess vulnerability as it excludes other dimensions such as ecosystem vulnerability and the roles of institutions, regulation, public policy and decision-making. Many of the influences that are missed in vulnerability indexes are not easily quantifiable and indexing is perhaps best used in conjunction with other methodologies. Some researchers have also expressed concerns regarding the selection of vulnerability indicators for vulnerability indexes. Adger and Vincent (2005) suggest that many studies of vulnerability have been based on intuitive assumptions about what the factors and processes affecting vulnerability may be. They also suggest that validation of indicators using data such as mortality outcomes can go some way towards confirming the usefulness of indicators. Other researchers have also questioned whether indicators used in vulnerability assessments should be weighted or not, and if so what weighting methodologies might be utilised. (Eakin and Bojorquez-Tapia, 2008).
In recent years another related approach to the study of vulnerability has emerged from research on global climatic and environmental change. Differing somewhat from the conception of vulnerability of people and place, this approach has focused on the vulnerability of the coupled human and environmental systems. Adger (2006) argues that this emphasis on systems emerges from the conceptualisation of vulnerability and adaptation used in IPCC reports (see also Adger and Vincent, 2005) and that this focus has led to some synthesis across the otherwise diverse approaches to vulnerability research. Adger (2006) also contends that distinguishing between natural and social systems creates an arbitrary division. This systems approach to vulnerability focuses on developing comprehensive vulnerability assessments that will include all aspects of the vulnerability of the coupled human environment system (Polsky, et. al. 2007; Polsky, et. al. 2003). This conceptualisation of vulnerability certainly appears to address some of the limitations of other studies as it attempts to integrate numerous drivers of vulnerability. Its focus on producing a methodology for vulnerability research that can be universally applied (Polsky, et. al. 2007) may be a positive contribution to vulnerability research, but this approach may also neglect the uniqueness of particular places. Its focus on quantifying vulnerability through the use of various metrics is also admirable but it seems likely that quantification of all of the elements contributing to vulnerability may be an almost impossible task. It is also likely that studies utilising this approach will prove to be both time consuming and expensive.

Some researchers have suggested that global environmental change and its effects cannot be evaluated in isolation and that a focus on global economic changes should also be included. Introducing the concept of double exposure, O’Brien and Leichenko
suggest that while climate change produces winners and losers in terms of its impacts, so too does globalisation and it is important to examine the combined impacts of both sets of processes. A method for assessing the concept of double exposure was tested in a case study of India where vulnerability to the impacts of climate change and vulnerability to globalisation was mapped (Leichenko and O’Brien, 2008; O’Brien, et. al., 2004). This study successfully developed a method of assessing vulnerability to multiple stressors based on a combination of vulnerability mapping and local level case studies. White, et. al. (2001) have also argued that natural hazards vulnerability cannot be considered in isolation from other influencing factors. In an attempt to evaluate why economic losses from hazards continue to increase despite an ever increasing knowledge base and a declining number of fatalities, they conclude that hazards research must be linked to issues of wider social concern such as sustainable development and global poverty. They identify four possible explanations for the continued increase in economic losses from hazards despite our increasing knowledge of risks and vulnerability. These are that (1) our knowledge is not yet sufficient and is hindered by gaps, (2) knowledge is sufficient but not used effectively, (3) knowledge is used effectively but takes a long time to be effective and (4) knowledge is used effectively but is overwhelmed by the influence of increasing populations, wealth and poverty on vulnerability (White, et.al., 2001). They argue that the next generation of hazards research must focus on linking our growing knowledge of vulnerability to the effects of these overarching issues. Kates, (2000) has also stressed the importance of global poverty in influencing adaptation to climate change. Factors such as economic growth linked to globalisation are likely to be playing an important role in influencing levels of vulnerability and adaptation policies in Ireland.
While the vulnerability literature diverges on the exact meaning of the concept, and the ways in which it should be evaluated, what is clear is that there are a wide variety of factors that influence the likelihood of loss or the susceptibility to disaster for human populations. These dynamic conditions influence whether an event is a nuisance or a disaster. However in recent years some critiques of contemporary vulnerability research have also begun to emerge. Kuhlicke (2010) suggests that rather than attempting to attribute vulnerability to particular groups we should adopt an actor based approach to examine how particular populations view and construct their own vulnerability. Perceptions of exposure and hazards among particular populations may be quite different to how they may be perceived by an external observer and this may have important implications for the ways in which those populations respond to environmental hazards or their vulnerabilities to them (Kuhlicke, 2010; Nathan, 2008). This developing area of the literature is one of the questions addressed by this dissertation through my focus on the ways in which one set of local actors (local officials and decision-makers in coastal cities) perceive and frame both the biophysical hazards to which their cities are exposed and the vulnerabilities of their cities’ populations. Kuhlicke (2010) also focuses on the ways in which surprises influence how vulnerability is perceived and framed by impacted populations. Chapter 4 of this dissertation includes an evaluation of how an event that was perceived as a surprise influenced perceptions and framings of climate change among local officials and other actors.

Several researchers have also begun to focus on linking vulnerability research to policy applications. Moser (2010) contends that the pressing and urgent challenges presented by climate change require that geographers engage in policy relevant and
applied research on both vulnerability and adaptation while Mustafa et al., (2010) propose an empirical method for vulnerability assessment that can be used to link vulnerability research to policy. This dissertation engages with a broader question related to any attempt to link vulnerability and adaptation research to public policy. I investigate the extent to which vulnerability and adaptation are considerations in current policy and practice and conclude that vulnerability is generally not considered in contemporary policy and practice. The lack of applied vulnerability research (Moser, 2010) and the inability to translate vulnerability research into usable formats (Mustafa, et. al., 2010) are undoubtedly important but there are additional influences that are central to the investigations for this project. These include the extent to which a risk and physical exposure paradigm shapes current decision-making and policy. While a vulnerability based approach integrates a range of both biophysical and social drivers of hazards loss, this risk based approach focuses almost exclusively on the prevention of physical exposure. The characteristics of vulnerability itself are also influential as its complex and dynamic nature make its integration into the policy making process somewhat challenging. The integration of vulnerability research into policy and decision-making is discussed in Chapter 7.

Adaptation research
While the concept of adaptation historically emerged from the discipline of anthropology (Head, 2010; Leichenko, et. al., 2010), it has become an increasingly central focus of discourses of climate change among academic researchers, policy-makers and other actors. In contrast to vulnerability which generally refers to a state that may or may not have been the result of direct human decision-making, adaptation has come to refer to any deliberate actions taken by human beings to adjust their behaviour in response to changing environmental conditions (Leichenko, et. al.,
As such it is similar to the concept of adjustment that became central to hazards research in geography for much of the twentieth century (see Kates, 1997). The similarities between adaptation and adjustment and their implications for contemporary research and policy are discussed in more detail in Chapter 6. Through its adoption as a central component of climate change research, adaptation has eclipsed and overshadowed the concept of loss mitigation, traditionally the focus of research among the natural hazards community. Loss mitigation referred to any actions taken to reduce the likely losses experienced as a result of exposure to environmental hazards. The emphasis on adaptation coupled with the rather different use of the term mitigation by the IPCC has led to the reduction in the use of the term loss mitigation among hazards researchers, although it continues to be used among hazards managers, particularly in the United States. However it is worth considering whether the subtle differences between adaptation (actions taken in reaction to an external environmental change) and loss mitigation (any steps taken to reduce the loss resulting from exposure to hazard) may have important implications for the ways in which environmental changes are framed and understood, as well as the types of actions that are taken.

Adaptation has become an area of increasing concern among geographers and other social scientists in recent years. Some have expressed a concern that climate change has been farmed as something that will present few significant challenges for affluent countries of the global north as the wealth and resources available there represent a high adaptive capacity that should facilitate easy adaptation. Focusing on Norway, O’Brien, et. al., (2004) have criticised this complacency and argued that high adaptive capacity linked to affluence does not guarantee that successful adaptation will
automatically follow. Repetto (2008) expresses similar concerns regarding the United States noting that while there is much potential for successful adaptation, this does not mean that it will automatically occur. Some researchers have also expressed concern that not enough research has focused on adaptation. Berrang-Ford, et. al. (2011) suggest that most climate change research to date has focused on impacts and vulnerability assessment while Moser (2010) believes that insufficient attention has been devoted to the study of adaptation in the United States and similar contexts. This dissertation addresses some of these concerns by examining adaptation in the context of an affluent country in the global north. Barnett (2010) suggests that adaptation research has been evaluated as a scientific and technical problem and that more social science research on adaptation is required. Adger and Barnett (2009) also outline several other concerns regarding contemporary climate change adaptation including that the window for adaptation may be small and that unsustainable practices currently in place may lead to maladaptation.

Researchers have increasingly focused on potential limits, obstacles or barriers to successful adaptation, while others have focused on concerns regarding what has been described as maladaptation, that is attempts at adaptation which may be unsuccessful or may make matters worse than might have been the case had no action been taken. Some researchers have distinguished between limits, which are seen as absolute obstacles to adaptation and barriers, which are seen as obstacles that can be overcome more easily (Moser and Ekstrom, 2010). Moser and Ekstrom (2010) divide barriers to adaptation into several categories based on stages in the adaptation process. In the “understanding phase”, barriers such as the availability and accessibility of information are among those identified (Moser and Ekstrom, 2010). Other barriers are
identified during the “planning phase” and the “management phase” including the absence of leadership and deficiencies in technology. Moser and Ekstrom suggest that successful adaptation is not simply a matter of increasing adaptive capacity but rather requires a better understanding of what the barriers to adaptation are and how they can be overcome. This research project addresses some of these questions by examining the factors that may shape adaptation practices and policy.

It is also increasingly recognised that successful or appropriate adaptation is not something that can be objectively assessed as it is contingent on the overall values and goals of the adaptation process (Adger and Barnett, 2009; Adger, et. al., 2009). Actions taken in response to climate change have ethical, moral, social and cultural dimensions (O’Brien and Wolf, 2010, Adger and Barnett, 2009; Adger, et. al., 2009; Hulme, 2009). Discussions of values in relation to climate change adaptation have often focused almost exclusively on monetary value and economic costs while broader ethics and values have not been considered (O’Brien and Wolf, 2010). What is considered to be successful or appropriate action in response to climate change is also heavily dependent on how the impacts of climate change are perceived and framed by those who are affected by it (O’Brien and Wolf, 2010). Mitchell (2006a) makes similar observations in relation to hazards and disasters noting that interpretations of hazard are “multiple, unstable, contested and often mutually incommensurable” and that advancing our knowledge about the ways in which decisions are made in response to hazards must take these complex interpretations into account. Whittle, et. al., (2010) reached similar conclusions based on examination of interpretations of flood hazards among residents the English city of Hull who had experienced major flooding in June 2007. They concluded that the ways
in which a disaster or hazard is framed and interpreted help to determine what decisions are made in response to it (Whittle, et. al., 2010). This dissertation contributes to this body of literature by evaluating how one important group (local officials and policymakers) frame and interpret and environmental hazards, and the influence this may have on the decisions they make.

Adaptation researchers have also begun to highlight a variety of other factors that may motivate adaptive actions. Experience of hazards or disasters in the recent past is one such influence. Amundsen, et. al., (2010) examine adaptive decision-making among municipality officials in Norway and conclude that direct personal experience of hazards is perhaps the most important influence on whether adaptation occurs or not. Harvatt, et. al., (2011) examine decision-making and perceptions of hazards among householders in England and reach similar conclusions. A lack of recent direct experience of hazards tended to attenuate concern and reduce the likelihood of adaptive or preparatory actions being taken (Harvatt, et. al., 2011). In a review of contemporary adaptation literature Berrang-Ford, et. al., (2011) conclude that extreme events are often an important catalyst for action although they may not be the most important influence. It has also been suggested that reactive decision-making, particularly in response to surprise events may not bring about new or radical changes in policy but surprise events can act as a catalyst for changes that were already likely (Penning-Rowsell, et. al., 2006; Johnson, et. al., 2005).

A number of other factors can also be an important influence on adaptation policy and practice. Social factors and the interactions between stakeholders can be particularly influential. The ways in which knowledge is shared and disseminated among officials
and stakeholders as well across different levels of governance helps to shape decision-making and policy (Carmin, et. al., 2009). Ultimately top down approaches or outside influences are often not the main driver of local change and international action may not led to local change (Anguelovski and Carmin, 2011). Attempts at top down policy can also be ineffective due to the slow rate of implementation at lower levels of governance (Tunstall, et. al., 2009). Group dynamics and social interaction are also an important influence on action. Among affected populations group bonding can perpetuate particular narratives of hazards or climate impacts, either attenuating or amplifying perceptions of risk or vulnerability (Wolf, et. al., 2010). Communication of information through the media and other sources can also amplify or attenuate perceptions of risk (Kasperson, et. al., 1996; Kasperson, et. al., 1988). Narratives and actions can also be heavily influenced by institutional structures or organisational cultures. Harries and Penning-Rowsell (2010) illustrate how institutional and organisational cultures that have traditionally emphasised structural and engineering approaches to flood risk management limit the success of attempts to implement alternative policies. The role of organisational cultures in shaping the outcomes of risk related decision-making has also been a research focus among sociologists (Vaughan, 1996).

Adger (2005, 2000) highlights the central role played by changing institutional structures in influencing vulnerability and adaptation of coastal populations to the impacts of climate change in Vietnam. He contends that changing institutional structures can reduce adaptive capacity resulting in increasing vulnerability, while strong institutions can have the opposite effect, building adaptive capacity and reducing overall vulnerability. Ireland provides an example of an advanced country
where considerable institutional change has occurred in recent years. These have included ongoing European integration, the long term impacts of the Northern Ireland peace agreement including greater co-operation between the governments of Ireland, Northern Ireland and the UK, as well as an increasing proliferation of autonomous or quasi autonomous regulatory and decision-making bodies. Zimmermann and Cusker (2001) also highlighted the importance of institutional structures, missions, jurisdictions, and areas of responsibility in influencing decision making on adaptation. Studies of adaptation, institutional networks and decision-making in South Africa have raised similar concerns (Koch, et. al., 2007). Koch, et. al. focused on the challenges presented when the roles and responsibilities of institutions or organisations are not clearly defined. Similar issues may play an important part in influencing decision-making processes in Ireland and these emerged as a major factor in the management of flooding in 2010 (Joint Committee on the Environment, Heritage and Local Government, 2010). Constraints on effective decision-making including available resources (time, knowledge, staff, finance etc.) and uncertainties in available scientific knowledge, have also been identified as important influences on the decision-making process (Koch, et. al. 2007; Penney and Wieditz, 2007; Zimmermann and Cusker, 2001).

While these challenges within the structures and operation of the decision-making process appear to present some difficulties for increasing adaptation and reducing vulnerability, they may also provide opportunities for improvements. As well as clarifying the roles of formal state actors, the roles of other stakeholders could be highlighted and enhanced. Pelling (2003) and Mitchell (1999) have emphasised the need for greater recognition of the roles of informal and non state actors in planning
for hazards and disasters. Liverman (2004) also highlights changes in environmental governance including the increasing power of multinational institutions and the emergence of new actors such as consumers at local scales. The European Environment Agency has called for research to advance understandings of “the roles, and responsibilities of individuals, communities, corporations, private and public institutions, governments and the EU” (European Environment Agency, 2006, p.43) while Koch, et. al. (2007) argue that the exclusion of some stakeholders from the decision-making process has been an impediment to effective adaptation in South Africa. Penney and Wieditz, (2007) have also called for greater cooperation across different levels of governance while Keskitalo (2004) also highlights the importance of examining the roles of stakeholders across different levels of governance. Others have emphasised the influence that new public management approaches to governance can erode adaptive capacity (Eakin, et. al., 2011). Political decentralisation and increased public consultation can also increase pressure for certain adaptation or hazards policies as decision-makers are more heavily influenced by the victims of disaster (Harries and Penning-Rowsell, 2010).

Power relations both within and between institutions have also been identified as an important influence on the decision-making process (Koch, et. al., 2007). It is also likely that the power of formal state actors may play a particularly important role in defining approaches to the issue, consequently influencing the actions of other state and non-state institutions and actors. Researchers have now begun to highlight a number of issues relating to the production of knowledge including the role of particular actors in conceptualising and constructing how the issue of climate change adaptation is defined. Koch, at. al. (2007) have emphasised the role of institutional
actors in South Africa in defining the problem and where it is ranked relative to other concerns such as economic growth, job creation or poverty reduction. How the problem is defined, whether it is considered a problem at all and how its importance is perceived relative to other issues will be among the key factors influencing the types of decisions that are subsequently taken (Koch, et. al. 2007; O’Riordan and Jordan, 1999). O’Connor’s (2001) discussion of poverty and knowledge in the US illustrates that problem conceptualisation can play a pivotal role in influencing subsequent public policy and academic research. In their ‘risk amplification’ model Kasperson, et. al. (1988) illustrate how some risks considered by experts to be relatively minor elicit a much stronger public concern. Beck’s (1992) ‘risk society’ thesis also illustrates the importance of risk perception in modern society and the central role played by experts and expert knowledge in risk related decision-making. Eakin, et. al., (2010) illustrate how different understandings and perceptions of hazard can emerge among various stakeholders. They demonstrate how changes in livelihood and land use have altered resident’s perceptions of risk and hazard but policy makers continue to view flooding as an agricultural problem despite the growing influence of urbanisation (Eakin, et. al., 2010). Vogel et. al. (2007) highlight the political context within which scientific knowledge on climate change is produced. Another issue they raise is the potential for contrasting views between scientists and policy makers regarding what constitutes ‘legitimate’ knowledge. Mitchell’s (2006a) suggestions for social science research post Hurricane Katrina also emphasises the importance of knowledge and how it is used. He identifies the conception of vulnerability employed by policy makers in the US as a key contributor to the failures associated with Katrina noting that “vulnerability has become conceived as a static attribute of urban
infrastructure systems rather than a process that pervades all aspects of society and is constantly being modified by human actions” (Mitchell, 2006a, unpaginated).

The problem definition adopted has many implications for the types of and the success of subsequent decision-making and public policy. O’Brien (2006) argues that examining global environmental change from a purely physical science perspective is failing to engage society and that it should be conceptualised as a human security issue. Birkland (2001) has argued that in the case of coastal hazards, scientists have failed to become sufficiently involved in the policy making process to the extent that has occurred for other hazards such as earthquakes while Moser (2010) makes a passionate plea for more applied geographical research on vulnerability and adaptation. Approaching the issues from different perspectives and conceptualisations can also raise unexpected challenges and questions. In the UK the decision of the Scottish Executive (Scotland’s devolved government) to develop sustainable flood management based on promoting “the maximum possible social and economic resilience against flooding” has proved a challenge due to the lack of social science research on the societal impacts of flooding in Scotland (Werritty, 2007). Similarly a change in approaches to flood management in England to policies emphasising sustainability and equity has led to questions of what constitutes fairness, fairness for whom (the tax payer funding the flood management programs or those directly affected by them) and whether the focus should be on fairness in the processes or in the outcomes of decision making (Johnson, et. al., 2007). Adger (2003) suggests that all decision-making privileges one set of interests over others and creates winners and losers. These issues link to the importance of the importance of the values, ethics and goals of adaptation discussed earlier.
Questions of scale in the study of vulnerability and adaptation

Issues relating to scale are a common concern to geographers and have often emerged in relation to vulnerability and adaptation research. Several authors have suggested that decision-making practices and policies required for adaptation will vary depending on the scale involved. Urwin and Jordan (2008) argue that national and international policies are often unhelpful when attempting to facilitate adaptation at local scales. O’Brien, et. al. (2004) have also suggested that climate impacts must be analysed at different scales and that impacts within each country will vary greatly between different regions and localities. Caution against a ‘one size fits all’ approach to adaptation has also been urged by the European Environment Agency as vulnerability is influenced by the unique characteristics of each location (European Environment Agency, 2006). Adger and Kelly (1999) also caution against aggregation across different scales of analysis. Some authors have argued that a misfit between the scales at which environmental challenges operate and the scales at which decision-making is conducted is a significant challenge for addressing environmental issues. It has been suggested that this mismatch not just a problem for managing the environmental or ecological challenges, it may be the cause of the problem to begin with (Wilbanks, 2006; Lebel and Wilbanks, 2001). The political nature of choosing scales has also been emphasised as particular scales may privilege certain groups, systems of knowledge or types of information over others (Lebel and Wilbanks, 2001).

While these questions of scale may be an important element in understanding the decision-making process and its relationship with environmental challenges, questions of scale also present challenges for research design. Selection of the appropriate scale or scales at which to conduct a particular study is one of the greatest challenges facing
The questions raised by Lebel and Wilbanks (2001) are particularly important for the conceptual approach of this study. While it is clear that the greatest physical exposure to hazards is likely to be felt in the coastal zone, decisions affecting vulnerability may be taken at many scales, including that of the coastal zone, at regional or at national levels. Focusing on one particular scale may neglect or even obscure decision making at other scales or in other spheres of public policy that may play an important role in influencing levels of relative vulnerability in the coastal zone.

Questions of scale also emerge in relation to determining the appropriate methodologies to be employed. Vulnerability assessment studies are often conducted at the scale of counties, municipalities or similar administrative districts. This is often a practical scale for such research as the required data on the social aspects of vulnerability is often available at this scale. However studies at this scale may also miss some aspects of vulnerability that can be more effectively captured at other scales. O’Brien, et. al., (2004) note that mapping vulnerability by district tends to illustrate sharp differences along district boundaries while the reality may be a more gradual change. Downscaling climate change projections from global or national models to local scales can also create additional uncertainties in the data (O’Brien, et. al., 2004). Other scales that may be useful for an analysis of climate change vulnerability include the metropolitan region such as that used in the Metropolitan East Coast Assessment (Rosenzweig and Solecki, 2001), or the city areas that have been used in a number of case studies of hazards in global megacities (Mitchell, 1999).
The scale chosen for a particular study must be appropriate to the processes being examined and multiscale approaches are often appropriate for global environmental change research as they bring together the advantages of large and small scale studies (Lebel and Wilbanks, 2001). The work of O’Brien, et. al., (2004) provides an example of how a national survey of vulnerability based on district data can be combined with a number of more in depth case studies. While focusing on the relevant scale for a particular project it is important to focus not only on geographical scales but also on temporal scales, and to extend these considerations of scale to the interrogation and analysis of all data sets utilised in the project (Wilbanks, 2006; Lebel and Wilbanks, 2001). It is clear from that questions of scale have numerous implications for the geographical researcher and these have been considered in the design of this project. This project has focused on local decision-making in cities but the research design (see Chapter 2) allows for the influence of factors that may operate outside of cities these cities or at the national or European level.

**Concluding thoughts on the literature**

It is clear that vulnerability and adaptation have become key concepts in global environmental change research that have advanced our understandings of the factors that increase the likelihood of loss among affected populations, and the issues that influence decision-making and policy responses. This synopsis of published literature highlights that while there is much that we already know about vulnerability and adaptation, there are also many areas that require further investigation and analysis. The biggest gaps in the literature and topics requiring further investigation include the following areas.

1. There is a need for a new research focus that moves beyond providing new knowledge on risks, potential impacts and vulnerabilities, to examining
questions relating to the production, dissemination, interpretation and utilisation of knowledge about environmental hazards.

(2) It is clear that there is much that remains unknown about the ways in which adaptation decisions are made and the factors that shape decision-making and policy at local levels. Further research that engages with decision-making and policy at in local places is needed.

(3) The literature suggests that the ways in which climate hazards are conceptualised, framed and understood may be an important influence on local policy and practice. However it is not clear how important this may be and what factors shape these framings. Advancing our understandings of how hazards are framed and understood, and how knowledge about the environment is produced and used in local policy and practice is vital to ensuring effective adaptation to the challenges presented by climate change.

(4) The literature also suggests that experience of past hazards events or disasters plays an important role in shaping policy and practice. However the extent of this influence remains unclear and further investigations are required.

(5) Further research is required to examine possible limits and barriers to adaptation. In particular the roles of information, knowledge, experience and values in shaping adaptation policy and practice, requires further investigation.

(6) The literature also highlights the need for further examination of the roles of a variety of stakeholders in the management of environmental hazards and climate change. Who makes decisions, who defines the ‘problem’ and on what basis they do so are likely to be an important influence on adaptation.

(7) Researchers have increasingly recognised how global environmental change interacts with other processes such as economic globalisation to produce
winners and losers, increasing the vulnerability of some groups while
decreasing it for others. Similar research is need on the ways in which these
interactions may shape adaptation decision-making and policy.

(8) Vulnerability has become a key concept in for both the natural hazards and
global change research communities. However the literature suggests that
vulnerability has not been integrated into decision-making and is not an issue
that attracts significant attention outside of the research community. There is a
pressing need to investigate whether this is the case, if so why vulnerability
has not been applied to policy and how this might be remedied.

(9) It is now clearly recognised that high adaptive capacity does not automatically
led to successful adaptation. Further research is needed to examine how high
adaptive capacity can be translated into effective adaptation. Such research is
particularly need in developed countries of the global north as the majority of
the literature to date has focused on developing world contexts.

By investigating these issues this project makes an important contribution to
advancing geographical research on the human dimensions of global environmental
change, natural hazards and climate change adaptation.

Research questions
The literature review outlines a number of issues of concern that are not fully
addressed by the current literature on climate change adaptation and vulnerability
including the factors that shape local policy and practice, particularly in cities in the
global north. This study addresses some of these concerns. This research was based
around the general hypothesis that for a variety of reasons (centred around; the
production, dissemination, interpretation and utilisation of environmental knowledge),
current public decision-making and resulting adaptation practices might not
successfully address the challenges presented by current and future environmental hazards in the coastal zone. The results of pre-dissertation fieldwork suggested that there is a willingness among local decision-makers in Ireland to address the challenges presented by the local impacts of climate variability and change. However, initial fieldwork also suggested that this willingness is often not transformed into effective adaptation practices. Decision-makers are only partially informed about the local dimensions of climate change impacts. This appeared to be an issue not only of incomplete or uncertain knowledge but also that the knowledge that is available, is incompletely known or underused by those involved in local decision-making. Initial fieldwork also suggested that local decision-making is heavily influenced by experiences of past hazard events, which may not be a reliable guide on which to base current or future decisions. It also suggested that surprises or unexpected events can cause shifts in policy and practice but that local policy and practice remained dominated by a risk based engineering approach to flood management. Based on the review of the contemporary literature on hazards, vulnerability, adaptation and urban environments, along with my initial fieldwork the following research questions were developed. These served as a guide for the investigations described in the chapters that follow.

(1) What are the key factors driving local decision-making and policy related to climate change adaptation and environmental hazards in Ireland’s coastal cities?

(2) How do local decision-makers conceptualise and frame the issue of local climate impacts?

(3) What factors shape these framings and what influence do they have on policy and practice?
(4) Does local decision-making with regard to climate impacts follow a model of
decision-making that is different from that which might explain decision-
making on other issues?

(5) What role does experience of past hazard events and surprises/unexpected
events play in shaping decision-making and its outcomes?

(6) Does decision-making and its outcomes evolve over time in response to recent
events, new knowledge, changing public perceptions or other influences?

(7) How does decision-making and policy related to climate change adaptation or
environmental hazards interact with other areas of public policy and what are
the implications of this for adaptation and patterns of vulnerability?

These questions guided the investigations for this dissertation. In the following
Chapter I outline how these questions shaped the research design for this project, the
selection of methodological techniques and the ways in which the research data was
collected and analysed.
Chapter 2: Research Design and Methodology

Introduction
In the preceding chapter I provided a broad introduction to the nature of this research project and its contributions to contemporary knowledge on the geography of environmental hazards and global environmental change, particularly in the context of coastal cities in the global north. I traced the evolution of current research in geography and other disciplines, illustrating some of the remaining gaps in the literature and how this project addresses some of them. The chapter culminated with a discussion of the research questions that have guided my investigations throughout this project. These research questions emerge from and contribute to the contemporary literature on hazards and global change, and also contribute to applied knowledge on environmental issues in Ireland’s cities. In this chapter, I turn my attention to the research design and methodologies that were utilised to answer these questions. I explain the methods that were used, the reasons why they were chosen, and the ways in which they were deployed in the field. The translation of a research plan from a hypothetical written proposal to the material reality of the field site is often far from smooth and this chapter documents both the success and the challenges experienced in doing so. I begin with some brief reflections on qualitative methods and their applicability to the questions posed by contemporary human-human environment geographers before outlining in more detail the techniques used, the project participants and their selection, and the experience of utilising each method in the field. I also explain some of the alterations in methodology from that first outlined in my dissertation proposal as the constraints imposed by challenges encountered in the field led to several departures from my original research design. I conclude this chapter with some reflection on additional methodological issues based on my
experience during this project, including the role of Institutional Review Board regulations in shaping research outcomes, the transferability of methods between different geographical contexts, and the role of interview locations and contexts in shaping research outcomes.

**Qualitative social science research**
In order to investigate the research questions outlined in Chapter 1, several techniques were deemed appropriate for this project. Methods were chosen based on two broad criteria. First and foremost, techniques were chosen based on their appropriateness to the task of comprehensively answering the research questions. Two qualitative techniques, semi-structured interviews and content analysis were utilised to collect the bulk of the data. While qualitative methods have grown increasingly prominent in the discipline of geography and the debate over their use has moved from questioning their acceptability to a greater level of self criticism and self confidence among qualitative researchers (Crang, 2003; Crang, 2002), it is worth reflecting on the appropriateness of these methods to the task of examining the human dimensions of global environmental change. As Shen (2010) notes, social science research, particularly in the field of human environment interactions frequently engages with new and complex social contexts in which it is virtually impossible to test existing theories in the manner proposed by the scientific method. This forces the social scientist to engage in the production of new theories rather than in the testing of old ones and qualitative methods are often the most fitting for this task (Shen, 2010). The overall goal of this research project has been to examine not only what various actors think and do in relation to environmental hazards and climate change but to illuminate why they do so. While quantitative methods can certainly reveal significant data on some of these questions, utilising qualitative techniques allows for a more in-depth
examination of the factors that may shape decision-making and policy. Qualitative methods allow for more open ended in depth investigations of ‘why’ particular patterns of policy and practice are evident, than would have been possible through the use of quantitative techniques.

While the first priority in the selection of methodological techniques must be their appropriateness to the task of providing valid answers to the research questions, the researcher’s choices are often constrained by the practicalities of what is achievable within the desired research timeframe and what is likely to be workable in the context of a particular field site. For this project these practical considerations included the limits imposed by the individual nature of a doctoral dissertation, the likely response from participants, and the time and resources required for data analysis. Had this project been conducted over a longer time period or as a group endeavour it is likely that a larger quantitative survey might have been combined with a smaller qualitative investigation in order to more completely answer both the ‘what’ and ‘why’ aspects of the research questions but the constraints imposed by the individual enterprise that is a doctoral dissertation necessitated a narrower focus. A smaller but more focused qualitative investigation provided the most appropriate means of answering my research questions.

**Research subjects**
This project is focused on actors within the local decision and policy making process in Ireland’s coastal cities. It explores how local officials and decision-makers conceptualise and frame climate change and its impacts, the types of decisions they make about climate change and why they choose these options rather than alternatives. Ireland’s cities are governed by City Councils which along with the
County and Town Councils that govern the remainder of the country are collectively referred to as local authorities. Within local authorities decision-making power is split between the elected branch (City Councillors) and an unelected executive branch (composed of a City Manager and a management team made up of his/her assistants and other officials). While much of the decision-making power has become increasingly centred in the executive branch of local government and considerable decision-making and policy powers are retained by the national government, the executive and elected branches of local authorities maintain significant influence over climate change and hazards policy at the local level. As a result these two groups form the main focus of this research project and most of my interviewees were drawn from among their ranks. These formed what I describe as Tier 1 of the interviewees who participated in the project. Tier 2 was composed of individuals who, while not occupying formal positions within the city government structure were likely to be actively involved in attempting to influence local policy and practice, or to have perspectives that would illuminate important aspects of local decision-making. This group included business leaders, members of environmental NGOs and representatives of other local community groups. Where possible individuals involved in emergency management and response were also included in Tier 2. While they occupied official positions these were in the day to day management of response rather than in the formation of overall policy for the city so they were a more appropriate fit in Tier 2 rather than Tier 1.

In my research design I focused on local decision-makers and officials who have responsibility for the administration and governance of coastal cities. Through their positions in city governance these individuals play an important role in the formation
and implementation of policies that influence the vulnerabilities of these cities and their populations. These decision-makers and officials also play an important direct role in influencing climate change adaptation and hazard mitigation policies in their cities. These are by no means the only decision-makers in these cities and an alternative framing of the project might well have focused on decision-making at the level of individuals, households or businesses. However the position of these officials and decision-makers as leaders in their respective cities allows them to play an important role in shaping overall adaptation policy, as well as spatial and temporal patterns of vulnerability in their cities.

Semi structured interviews were completed at three field sites, the cities of Dublin, Cork and Galway. The selection of these field sites is discussed in Chapter 3. In the subsection below I discuss in greater detail how these interviews were conducted, how respondents were selected, and response rates. This primary data collection through interviews was supplemented with a content analysis of the recorded minutes of City Council meetings in each city. These meetings, usually held monthly were attended by both the elected city councillors and many of the senior executive officials. While the records are often short summaries of longer and more detailed discussions they provide further evidence of the types of decisions taken and some of the motivations behind them.

**Semi-structured interviews**

Oral interviews are among the most widely used social science research methods as they provide an efficient means of gathering information directly from research subjects (Crang, 2003; Dunn, 2005; Longhorst, 2010). Semi-structured interviews were deemed most appropriate to this study due to their ability to allow for a basic
structure that would retain comparability across all interviews while allowing for open ended answers and the freedom to pursue new leads or avenues of exploration as they emerged within each interview (Dunn, 2005; Longhorst, 2010; Shen, 2010). They also allow the interview to be conducted in a relatively informal atmosphere (Longhorst, 2010; Shen, 2010) and provide the flexibility for the format of the interview to be varied in response to a variety of constraints encountered in the field. This flexibility proved to be essential as interviewees often explored new issues not within the original question design while interviews were also shaped by a variety of external factors. Interviews were sometimes constrained by the busy schedules of respondents and the semi-structured format allowed me to focus on a selection of key questions or to follow the most interesting leads. The semi-structured format often produced an informal conversational tone that made for easier management of the all too frequent interruptions which included phone calls, colleagues entering the office and on one occasion an unscheduled fire evacuation drill.

In preparation for these interviews two sets of interview questions were prepared. An initial list of questions was prepared for Tier 1 interviewees while a modified list of similar questions was prepared for Tier 2 interviewees. Both lists of questions are included in Appendix A. These questions were prepared based on my experience of informal discussions held with a number of officials and decision-makers in Dublin during a pre-dissertation field visit during the summer of 2008. These initial discussions combined with an examination of local and national policy documents allowed me to identify key topics and questions. The question selection was refined based on feedback from members of my doctoral dissertation committee and approved by the Rutgers University Institutional Review Board prior to the
commencement of fieldwork. In the early stages of the fieldwork some minor modifications to the questionnaire were made based on my experience of conducting initial interviews.

The process of selection and recruitment of participants began in advance of entering the field. Due to the public nature of their responsibilities it was possible to identify all of the potential participants in Tier 1 of my interviews prior to entering the field. The names and contact details for all of the elected City Councillors and all of the members of the senior management team in each city are freely available from online sources including the website of each local authority. This allowed me to establish a lengthy list of potential contacts in advance of commencing onsite fieldwork. Due to the relatively small number of people involved and anticipating a relatively low response rate, I decided to attempt to recruit as many of the potential interviewees in the Tier 1 category as possible rather than attempt to select a sample. This included all of the elected representatives in each city, the City Manager and any member of the executive management team whose area of responsibility was relevant to the goals of the project. These included officials with responsibility for planning, engineering, environmental issues, water supply, transportation and economic development. From the executive officials only those whose areas of responsibility clearly had no relevance to the research project were not considered for recruitment. It was also possible to establish an initial list of potential Tier 2 contacts from online sources.

The recruitment of participants proved to be somewhat challenging. Invitation letters were initially sent to ninety potential participants across all three cities (see Appendix B for a sample invitation letter). Response to the initial letters was low and this was
followed up with an attempt to contact each participant by phone, email or both (depending on the contact details available). These follow up emails and phone calls were usually between five and fourteen days after the original letter mailing. These follow up calls and emails were successful in recruiting some additional participants but in most cases calls were not returned and letters or emails were not replied to (for more information on recruitment and participation statistics, see Table 2.1 below).

Table 2.1. Interview recruitment and participation statistics

<table>
<thead>
<tr>
<th>City</th>
<th>Potential participants contacted</th>
<th>No response</th>
<th>Declined to participate</th>
<th>Agreeable but no date arranged</th>
<th>Interviews completed</th>
<th>Response rate(^8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cork</td>
<td>44</td>
<td>30</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>15.9%</td>
</tr>
<tr>
<td>Dublin</td>
<td>55</td>
<td>32</td>
<td>5</td>
<td>2</td>
<td>16</td>
<td>29%</td>
</tr>
<tr>
<td>Galway</td>
<td>31</td>
<td>11</td>
<td>6</td>
<td>2</td>
<td>12</td>
<td>38%</td>
</tr>
<tr>
<td>Total</td>
<td>130</td>
<td>73</td>
<td>15</td>
<td>7</td>
<td>35</td>
<td>26.9%</td>
</tr>
</tbody>
</table>

I attempted to recruit a total of one hundred and thirty potential interviewees utilising a mix of letters, emails, phone calls (all three in many cases) and personal contacts. It was ultimately unclear which method of reaching potential informants was the most effective as response rates to all approaches were quite low. While the overall response rate was lower than I had hoped the total number of interviews completed did exceed the target number outlined in my proposal. My initial goal was the completion of thirty interviews and I successfully conducted thirty five. My intention had been to complete at least ten interviews in each city, a goal I exceeded in both Dublin (sixteen interviews) and Galway (twelve interviews) but failed to reach in Cork (seven interviews) where participation levels were lowest.

\(^8\) Number of interviews completed as a percentage of total number of potential informants contacted.
A number of factors are likely to have influenced the low response rate including the timing of the research and the busy schedules of the potential informants. This research was conducted during the summer months of 2009. This combined with the fact that local government elections had taken place in June of 2009 meant that many potential Tier 1 interviewees were on holidays or attempting to take somewhat of a break from any activities related to their roles as local officials and representatives. Many City Councillors are part time elected representatives and have full time careers in addition to their responsibilities as local representatives. Many spent the time that was available for their work as Councillors dealing with inquiries from their constituents and attending a variety of meetings and events. Even when potential interviewees were willing to participate this made scheduling interviews very difficult. For some participants interviews were postponed and rescheduled several times before the meeting actually occurred. Seven others were willing to participate but it proved impossible to schedule a meeting. Due to the time constraints imposed by potential interviewees schedule’s it is unlikely that a significantly higher response rate would have been achieved by conducting the research at another time of year. Several interviewees commented that while they remained exceptionally busy during the summer months, this was a quiet period relative to most other times of the year and it may have been even more difficult to schedule interviews at other times.

In cases where negative responses were received from potential interviewees the reasons given were generally factors such as a busy schedule, holidays or other time constraints. In a small number of cases my attempts to contacted senior officials resulted in me being referred to their junior staff. If available those to whom I was delegated were interviewed instead but in most cases they proved even more elusive
than their superiors. In a handful of cases the reason given for declining to participate in my research was a lack of knowledge of climate change or environmental hazards. This touches on the issue of perception of my research and its goals, formed by participants in advance of interviews, a topic I discuss in further detail later in this chapter. During the course of on-site fieldwork some additional interviewees were added through a snowballing technique when they were suggested as potential interviewees by other respondents. I was also able to schedule a small number of interviews by enlisting the help of friends and colleagues who had personal or professional connections to potential interviewees. While this technique did allow me to add several additional interviews, it may also have influenced the interview itself as these participants made it clear that they were doing the interview because they ‘owed my friend a favour’. As such they were participating in the study out of a perceived obligation rather than a genuine willingness or interest in participating.

While any attempt to gauge why potential informants chose not to respond to my attempts to contact them is ultimately speculation, the small numbers who refused to participate based on a perceived lack of knowledge or expertise (despite my best efforts to assure them that no such expertise was required for participation), and the prevalence of a response such as “I’m no expert on those issues but I’m happy to talk with you anyway” suggests that a perceived lack of expertise may have influenced the willingness of some potential informants to participate in the study. This in itself is potentially illustrative of perceptions and framings of hazards and climate issues among decision-makers and other stakeholders. This issue was also a common theme in many of the interviews which I did complete. It was common for many interviewees to preface interview answers with statements indicating their fears that
they lacked sufficient knowledge or expertise to answer particular questions. A perception that I was seeking such knowledge and expertise and that there was a correct answer to my questions was not uncommon. This demonstrated that while many of my informants were aware of climate change and its potential impacts, they also viewed it as an issue on which they were not particularly well informed. They felt that there was knowledge and expertise available on the issue and that they were not sufficiently qualified to answer questions on the topic.

The participants were mostly male, reflecting the characteristics of the overall recruitment pool which was composed predominately of Irish men aged between thirty five and sixty five.9 Participation rates were lower among women with a total of only four women participating in the study representing just fourteen percent of the women that were invited to participate compared to a response rate of thirty percent for men (See Table 2.2). The reasons for the lower response rate among women are unknown. Approximately seventy five percent of participants were drawn from Tier 1 (elected representatives and unelected officials) while the remainder were Tier 2 interviewees (NGOs, community groups etc.). A selection of interviews from both Tiers was completed in all three field sites (See Table 2.3). Among the Tier 1 interviewees, their level of experience and time spent in their current jobs varied but most had a significant experience. Among the executive officials most had extensive experience in the current jobs or comparable roles. Some had held similar positions in several local authorities in Ireland while others had risen through the ranks within their current City Council. Their backgrounds were generally in fields such as engineering or planning but some were career bureaucrats who had entered the

9 Participant’s ages were not asked. Ages were estimated.
administration at junior levels and been promoted to higher ranks over time. Despite my best efforts I was not able to successfully recruit the City Manager in any of the cities as my requests for interviews were either declined or referred to colleagues. Among the elected representatives their experience ranged from those who were newly elected Councillors just a few weeks into their first term to those who were now in their third term on the City Council. Most had completed at least one full term on the Council. I was able to interview a selection of participants from across the political spectrum (See Table 2.4) although it is worth noting that with the exception of Independents who tended to be more forthright and passionate in their views, political affiliation did not appear to have a significant bearing on interviewee responses. While I succeeded in recruiting interviewees from across the political spectrum Independents and members of the Labour Party were most willing to participate while it proved impossible to secure an interview with any representative from Sinn Féin.

Table 2.2. Participants by sex

<table>
<thead>
<tr>
<th>Sex</th>
<th>Potential Participants Contacted</th>
<th>Interviews Completed</th>
<th>Response Rate¹¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>28</td>
<td>4</td>
<td>14%</td>
</tr>
<tr>
<td>Male</td>
<td>102</td>
<td>31</td>
<td>30%</td>
</tr>
</tbody>
</table>

Table 2.3. Interviewees by city and tier

<table>
<thead>
<tr>
<th>City</th>
<th>Tier 1 (Elected)</th>
<th>Tier 1 (Unelected)</th>
<th>Tier 1 (Total)</th>
<th>Tier 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cork</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Dublin</td>
<td>7</td>
<td>4</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Galway</td>
<td>7</td>
<td>3</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>9</td>
<td>26</td>
<td>9</td>
</tr>
</tbody>
</table>

¹⁰ City Council terms last five years.
¹¹ Number of interviews completed as a percentage of the total number of informants contacted.
Table 2.4. Elected representatives by political party

<table>
<thead>
<tr>
<th>Party</th>
<th>Total Number of Councillors</th>
<th>Number Invited to Participate</th>
<th>Number of Interviews Completed</th>
<th>Response Rate¹³</th>
<th>Representativeness¹⁴</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fianna Fáil</td>
<td>15</td>
<td>13</td>
<td>2</td>
<td>15.0%</td>
<td>13.0%</td>
</tr>
<tr>
<td>Fine Gael</td>
<td>23</td>
<td>20</td>
<td>3</td>
<td>15.3%</td>
<td>13.3%</td>
</tr>
<tr>
<td>Labour</td>
<td>32</td>
<td>23</td>
<td>5</td>
<td>21.7%</td>
<td>15.6%</td>
</tr>
<tr>
<td>Sinn Féin</td>
<td>9</td>
<td>7</td>
<td>0</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Others¹⁵</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Independents</td>
<td>15</td>
<td>13</td>
<td>7</td>
<td>53.8%</td>
<td>46.6%</td>
</tr>
</tbody>
</table>

The thirty-five interviews that were completed have proved to be a rich data-set providing illumination on the numerous ways in which hazard events and climatic changes are framed, conceptualised and understood by local decision-makers and other stakeholders. The interviews varied in length from the shortest at twenty two minutes (the interviewee arrived very late and was then forced to leave early due to a more pressing appointment) to several that were over an hour and a half in duration. Most interviews fell in a range of between thirty-five and seventy minutes. In total the interviews yielded over twenty six hours of audio recording producing over 360 pages¹⁶ of transcripts.

All interview transcripts were imported into the NVivo 8 software program for analysis. NVivo 8 provides a variety of tools for coding, sorting and retrieving interview data that enabled me to conduct a detailed analysis of the interview data.

---

¹² Combined total for Cork, Dublin and Galway City Councils.
¹³ Number of interviews completed as a percentage of the total number of informants contacted.
¹⁴ Number of interviews completed as a percentage of the total number of Councillors representing that party.
¹⁵ Includes the Socialist Party, the Workers Party & the People Before Profit Alliance.
¹⁶ Single space, Times New Roman, font size 12.
While both the transcription and coding of the interviews proved to be time consuming and tedious, the coding process was essential to answering the research questions. The coding structure was established in advance of the analysis based on the research questions, the questionnaire used to administer the interviews, and my initial reflections on the interview data recorded in field notes taken after each interview. However this original coding structure was modified during the coding processes based on issues that emerged from the interview content. The coding structure used was divided into four broad categories of investigation with these forming four main coding nodes. Node 1, ‘Assumptions’ focused on how respondents viewed, framed, thought about and understood climate hazards. Sub nodes included interviewees’ views on the types of climate impacts that were likely, the timing of impacts, the severity of impacts, risks, vulnerabilities and exposure as well as their views on other issues that shape policy including economic development. Node 2, ‘Alternatives’ focused on strategies for loss mitigation or climate change adaptation with sub nodes coding each response type discussed. Node 3, ‘Constraints’ coded the factors that constrained or shaped decision-making and policy including practical concerns (such as funding, human resource or knowledge) and ideological questions (such as their views on governance, sustainability and economic development). Finally Node 4, ‘Critiques’ coded instances where respondents were critical of current policies or of other actors and stakeholders. Each of these main nodes had numerous sub nodes. As additional nodes were adding during the coding process, the final coding structure contained over eighty nodes. The same text can also be assigned to multiple nodes and this was often the case in the coding for this project. The use of additional coding tools provided by NVivo 8 including case nodes, free nodes and matrix coding queries allowed for further organising and structuring of the data as
well as comparisons between the answers given by different categories of respondents. The full coding structure utilised in the analysis is included in Appendix D.

**Focus group workshops**
The original research design outlined in my dissertation proposal called for the use of focus group interviews in addition to the individual semi structured interviews outlined above. These were to take the form of a workshop where I would present some initial results from my research to a group of local decision-makers and other stakeholders. This short presentation would serve as a catalyst for a discussion which would further explore some of the issues that had emerged from the semi structured interviews. These workshops were intended to achieve a number of goals. By bringing together a variety of stakeholders and actors it was hoped that having different perspectives interact within the same discussion would reveal new insights into local policy and practice. It was also intended that the workshop format would allow me to observe the reactions of various stakeholders to information about local vulnerability and adaptation. Finally it was hoped that through the interactions during the focus group discussions these workshops could facilitate the creation of new links between the academic research community and local stakeholders. Upon commencement of onsite fieldwork it quickly became clear that the use of focus groups in addition to the semi structured interviews was likely to be impractical. Given the busy schedules of potential participants it became clear that it would be virtually impossible to schedule a workshop at a time that would be convenient for enough participants to allow it to run successfully. For this reason, focus groups were removed from my research design. While it was no longer possible to observe the interaction of different stakeholder perspectives or their reactions to the results of my research it is hoped that
it will still be possible to disseminate research results to participants through providing a short summary report on my research findings to each participant upon completion of the project. It is also worth nothing that three of my interviews became informal focus groups when several colleagues decided to join in the interview, a phenomenon that has also been experienced by other hazards researchers (Shen, 2010).

Content analysis
The data collected from the semi-structured interviews was supplemented by additional information collected from a qualitative content analysis of over three hundred and fifty city council meetings across the three cities (see Table 3.5). Due to the limited level of detail provided in the minutes these records cannot provide the type of in depth data afforded by the interviews but they do provide a useful insight into how often climate or hazards issues were discussed at city council meetings, how these issues were framed and the types of responses that were adopted. When combined with the data derived from the interviews and other available sources including policy documents and City Development Plans, it is possible to create a comprehensive picture of how hazard and climate events have been framed and conceptualised by decision-makers in each city, the types of adaptive policies that have been proposed and implemented, and the implications these may have for the vulnerabilities of each city. The minutes of City Council meetings were selected for analysis for a number of reasons. They were freely available online and provided an opportunity to add a more longitudinal dimension to my investigations. While the interviews provided a snap shot of decision-makers’ current views, these minutes allow for an examination of the types of decisions they had made over an extended time period. Minutes were available for the past four years for Dublin, five years for
Galway and eight years for Cork (see Table 3.5). As council meetings took place at least once a month each month (excluding August) and were generally attended by the elected members and senior executive officials, these minutes provided a comprehensive record of decision-making and policy over a number of years. It was also possible to observe the reactions of council members and executive officials to hazard events such as the November 2009 flooding in Cork City. All of these minutes were downloaded from the City Council websites and imported into NVivo 8. Their importation and analysis proved more difficult than anticipated as the files were in a mix of Microsoft Word and PDF formats. While the NVivo 8 software is designed to accommodate both formats there were a number of challenges importing the PDF files which formed the majority of the records. The time required to import the PDF files was substantially longer than that for Word files, significantly increasing the time required to complete this step. Once imported there were also issues with the formatting of the PDF files and with the operating speed of NVivo while coding these files. I attempted to convert some of the PDF files to other formats in advance of importing them to NVivo but these failed to resolve some of these issues while also creating new challenges. This phase of data collection took significantly longer than planned due to these difficulties.

<table>
<thead>
<tr>
<th>City</th>
<th>Beginning</th>
<th>Ending</th>
<th>Number of meetings analysed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cork</td>
<td>Jan 2001</td>
<td>Jan 2010</td>
<td>192</td>
</tr>
<tr>
<td>Dublin</td>
<td>Jan 2006</td>
<td>Jan 2010</td>
<td>61</td>
</tr>
<tr>
<td>Galway</td>
<td>Jan 2005</td>
<td>Jan 2010</td>
<td>117</td>
</tr>
</tbody>
</table>
Due to the large volume of records contained in these minutes, it became clear that reading and manually coding each in the same way as the interview transcripts would be impractical. In order to expedite the process a list of key words and phrases were complied (see Appendix F). A query was then run for each set of records (each city was analysed separately) allowing for the identification of each instance in which issues relevant to this project were recorded in the minutes. Relevant results were then coded manually using a simple coding structure developed as the coding proceeded. Hazards events or climate issues were coded according to the type of event being discussed while also being coded according to the context within which the discussion took place (i.e. in response to a recent event or as part of a discussion of future policy). Due to this technique of developing the coding structure during coding rather than at the outset the codes used vary somewhat between the three cities but still allowed for comparability between the three field sites (see Appendix E). The coding structure used was ultimately much simpler and easier to implement than that used in the interviews, largely due to the shorter and less detailed nature of the data records involved. This content analysis allowed for a simple quantitative investigation of how often climate and hazards issues were discussed but more importantly it allowed for an examination of the types of issues that were discussed, the contexts within which those discussions took place and the types of arguments that were advanced in support of particular decisions.

Following completion of the analysis of local City Council meetings it was decided to examine two further potential datasets of decision-making at a national level. All of the records of debates in Dáil Éireann (the principle chamber of the national parliament) are freely available online. Due to the important role that national policy
may play in shaping policy and practice at the local level it was felt that an examination of this data might also provide important insights. This dataset (available at http://debates.oireachtas.ie) contains records of all national parliament debates from the foundation of the State (1919) through to the present day. Unlike the minutes of City Council meetings which provide only summaries of comments made, these records provide a complete transcript of all discussions and debates. Due to the large volume of material included a detailed analysis of these records could potentially provide data for multiple research projects. It was decided to narrow the focus to the relatively recent past and to search for relevant debates and discussions between 1985 and 2010. Covering this still substantial period would allow for any examination of the ways in which national policy and decision-making may have changed or evolved over an extended time period. The search functions provided by the online database were used to identify relevant records. In a similar manner to the content analysis of City Council minutes a list of search terms was compiled (see Appendix F) and these were used to locate relevant records. Due to large volume of data involved records were not downloaded and imported into NVivo 8. I manually recorded the frequency with which issues such as flooding were debated and also recorded the context within which these discussions took place. As these discussions were often very similar (see Chapter 6 for a discussion of how debates frequently focused on flood prevention in a particular locality) only records that were a particularly good example of the types of discussions that commonly took place, or were significantly different were downloaded. As I discuss in Chapter 6 this analysis provided important insights into how national policy and local decision-making have been linked, and the way in which hazards and climate policy have evolved over time.
In addition to this analysis of national parliament debates, a further content analysis was also included in the project. The same database that includes records of all national parliament debates also includes records from the sittings of National Parliamentary Committees in recent years. Between December 1st 2009 and March 23rd 2010 the Joint Oireachtas Committee on the Environment met on seven occasions to conduct an investigation into the severe flooding that occurred in several parts of Ireland including Cork City in November 2009 and the severe winter weather that was felt across the country in December 2009 and January 2010. The Committee composed of members of both houses of the Oireachtas (parliament) heard testimony from a wide range of stakeholders (see Appendix G) in order to examine Ireland’s preparedness for and response to weather emergencies. They considered a range of issues including preparedness, emergency response, hazard prediction, expertise, knowledge, governance and decision-making structures. Given the relevance of their investigations and their final report to the aims of this research project a content analysis of all of the records of the Committee’s meetings and their final report was completed. Like the records of national parliament debates the records of these meetings contain the full transcripts of their proceedings and so provide a rich dataset of over 165 pages of transcripts. All of these were downloaded and imported into NVivo 8. A coding structure was not developed in advance but an ‘open coding’ process was used to develop codes during the analysis (see Appendix 4). This analysis provided important insights into the ways in which the hazard events of 2009 were perceived by a variety of stakeholders and the implications this may have for future hazards and climate policy at both local and national levels.
Vulnerability mapping

The original research design for this project included the production of vulnerability maps that combined metrics of physical exposure to hazards with indicators of socio-economic vulnerability. This was to apply methodologies developed elsewhere (Boruff, et. al., 2005; Cutter, et. al., 2000; Rygel, et. al., 2006; Wu, et. al., 2002) to Ireland for the first time and to provide new information on spatial patterns of vulnerability in Ireland’s cities. This information was to be presented at the focus group workshops and to form the basis for the discussions that would take place during those workshops. While maps of socio economic vulnerability for each city have been compiled they no longer form a central part of the methodology for several reasons. The elimination of the planned focus group workshops made the information provided by these maps less important to the overall research design as it would no longer be possible to use them for a discussion with local officials and decision-makers. The constraints imposed by the realities of what it is possible for one researcher to achieve in a reasonable time frame also necessitated some narrowing of the focus of the project. As the vulnerability maps were not essential to answering the core research questions regarding knowledge, local decision-making and adaptation they were not included in this dissertation. The rapid pace of social and economic change witnessed in Ireland in recent years may also have rendered the data contained in the maps outdated to such an extent that it is likely that they no longer provided an accurate representation of the socio-economic contributors to vulnerability. The metrics of socio-economic vulnerability developed were based on data collected during the 2006 census. The recent economic crisis has resulted in a range of social changes which may render this data largely obsolete.
While I have not utilised this data in this dissertation I plan to integrate it into a future research project that will use Ireland as a test of the extent to which changing socio-economic conditions modify vulnerability and the degree to which this influences the usefulness of the concept of vulnerability as a tool for policy makers. If vulnerability is constantly modified by fluctuating socio-economic conditions this may limit its utility as a policy making tool, although its usefulness as an analytic concept would remain. As I mentioned in the literature review in Chapter 1 the applicability of vulnerability research to policy is an area garnering increasing attention (see Moser, 2010; Mustafa, et. al., 2010) and I discuss the issue of its usefulness as a policy tool in further detail in Chapter 7. Combined with data from Census conducted in 1996, 2002, and a forthcoming Census in 2011, the results of the 2006 Census can be used for an analysis of changing vulnerability over time. This will allow for an investigation of how Ireland’s embrace of economic globalisation, economic boom and subsequent economic crisis may have reshaped patterns of vulnerability and the relative importance of bio-physical and socio-economic drivers of vulnerability. This will provide a unique insight into how patterns of vulnerability are modified across both space and time by a range of local, national and global factors. This research would also include interviews to examine how local stakeholders perceive their own vulnerability, contrasting this with contemporary research techniques for vulnerability assessment (see Kuhlicke, 2010 for a call for an actor centred approach to vulnerability research). My plans for future research projects that emerge from this dissertation are discussed in more detail in Chapter 8.

**Historical hazards research**
While the semi structured interviews and content analysis described above provided the majority of the data for this research, an investigation of historic patterns of
hazards at each field site has also been completed. While at least some historic analysis was likely to be necessary to complete the descriptions of each field site contained in Chapter 3, the need for a more detailed investigation became clear once the analysis of interview transcripts was completed. As many interviewees described recent hazards such as the coastal flooding experienced in Dublin in 2002 as unprecedented it became necessary to place these events in their historical context. An investigation of historical records of hazards and disasters was conducted for each case study city. An initial search of academic literature and policy documents provided information on numerous events. In order to provide a more complete record a search of the archives of *The Irish Times* newspaper was completed. This Dublin based daily newspaper is recognised as Ireland’s ‘paper of record’ and its online arrive contains searchable digital records of its publications from 1859 to the present. Other national newspapers or local sources in each city were not included in this study due to the fact that they were not available in digital format and time constraints precluded archival research. The combination of the Irish Times archive and a range of other academic and policy publications has allowed for the compilation of a detailed list of flood hazard events in each city stretching from the 1600s though to the present day. While it is unlikely to be a complete list of all hazards events and disasters experienced, it provides a detailed overview of numerous events indication the types of flooding that occurred, the areas affected and the impacts on local populations. This allows contemporary events to be placed in their historical context. The results of this investigation are discussed in detail in Chapter 3. Like the vulnerability mapping discussed above, this historical hazards research represents an area for potential future research. A more detailed investigation of past events in each city might allow for an investigation of whether patterns of hazards exposure and
vulnerability are changing and for lessons from past experience to inform current policy and practice.

**Reflections on methods and research design**

In the remainder of this chapter I reflect on a number of methodological issues that emerged in the course of the fieldwork research for this project. These include the influence that Institutional Review Board (IRB) requirements may have on research outcomes, the transferability of social science research methods from one geographical context to another, the role that the location and context of the interview may play in research results, and the importance of power relationships between the researcher and the interviewee. I begin with some reflections on the regulation of human subject research and the implications this may have for research in human geography. This subject has begun to attract increased attention as geographers (Dyer and Demeritt, 2009) and researchers from numerous other disciplinary backgrounds (Barke, 2009; Bernhard and Young, 2009; Gunsalus, *et al.*, 2007; Halse and Honey, 2007; Halse and Honey, 2005; Sieber, *et al.*, 2002; Taylor and Patterson, 2010; Wilson and Hunter, 2010) have outlined both personal experiences and more systematic research examining the influence of ethical regulation on the ethics and practice of social science research. Dyer and Demeritt (2009) focus on particular concerns surrounding the regulation of human geography research including whether ethical review influences research methods as much as research ethics. Among the greatest challenge for social science researchers can be the acquisition of informed consent which can create numerous challenges depending on the type and context of the research. Evidence collected during my interviews for this project suggests that in at least a significant minority of my interviews, the informed consent requirements stipulated by the IRB combined with elements of my recruitment techniques may
have influenced research outcomes. Informed consent requires that subjects be made fully aware of the aims of the study in advance of their participation unless prior permission is obtained to engage in deception. In order to comply with informed consent requirements, information about the aims of the research project was provided both in recruitment letters and emails, as well as in the written consent form that interviewees were required to sign prior to the commencement of interviews.

Evidence from my interviews suggests that providing this information in advance of meeting or at the start of the interview shapes interviewees perceptions of the research and its goals in ways that had important implications for the answers they gave. It became clear that at least some of the respondents had prepared for the interview in some way. In one case before the interview commenced, the interviewee confessed that thirty minutes prior to the interview he had engaged in online research about climate change issues in order to prepare for the interview. Another commented “I actually did have a look at the national one [climate change policy] today in preparation for this”. In other cases interviewees answered questions in ways that suggested they had engaged in similar preparation. Interviewees engaging in advance preparation for interviews can shape research outcomes and it is difficult to see how avoiding this can be married with the requirements of informed consent.

The requirement to obtain written informed consent at the commencement of each interview had a variety of impacts on the research process. It was clear in several cases that the consent form created concerns among the interviewees and led them to become more reluctant participants. What had previously appeared to them to be a relatively straightforward and informal processes, became more serious and threatening when framed in the language of risks and danger contained in the consent
form (a sample consent form is included in Appendix C). Several interviewees were initially unwilling to sign the consent form and did so only on further explanation of its purpose. Participants appeared to view the consent form as a legal document which seemed to change their perceptions of the interview, the interviewer and the nature of the research. It is worth noting that while such reactions were common, some interviewees appeared to view the consent form as nothing more than an amusing formality. What is clear is that in almost all cases, the consent form played an important role in defining the relationship between the interviewer and the interviewee, either by lightening the mood through inducing humour or by having quite the opposite effect and creating a much more formal atmosphere.

The relationship between the interviewer and the interviewee are clearly an important factor in social science research and are likely to be influenced by a wide variety of factors. Several different types of relationships were evident during my fieldwork. Perhaps most common was the perception that the researcher possessed particular expertise and that I knew the ‘right’ answers to the questions I was asking. It is not clear if this was also a product of the informed consent processes or of interviewees’ perceptions of academic research but several interviewees exhibited signs that they believed they were being tested on their knowledge of climate issues. In one case, after several questions the interviewee asked “are these answers alright?” while after the completion of another interview, the respondent asked “did I do okay?”.

Interviewees appeared anxious to give the correct answers and to appear to be proactively engaged in climate and hazards issues.
The context and location in which interviews take place can also shape the results in several ways (Elwood and Martin, 2000). During this research most interviews took place on ‘neutral territory’ such as coffee shops and restaurants and in some cases this was advantageous to the discussion. Several interviews in Galway took place in an area of the city that is prone the flooding. This often allowed interviewees to describe events that had impacted that location, aiding the flow of the discussion. However for many of the executive officials the interviews took place in their offices at a time of their choosing. Probably influenced both by the location and the nature of the positions held by the interviewees these interviews tended to illustrate a rather different relationship between the researcher and the interviewee. While many other interviewees appeared to view the researcher as an ‘expert’ and believed there were correct answers to the interview questions, some executive officials appeared anxious to illustrate their expertise and their powerful positions. In one case the interviewee spend several minutes vigorously questioning me about my background and credentials before then outlining his knowledge and experience of the issues at hand. These interviewees also appeared to believe that there were correct answers to the interview questions, but in this case they were confident they knew all the right answers.

In conclusion I wish to reflect briefly on the transferability of social science research methods from one geographical context to another. To what extent are the some of the issues described above and others earlier in the chapter (recruitment challenges and the abandonment of focus groups) a function of doing research in Ireland? While it is ultimately impossible to say it is likely that the context provided by the social and political culture of Ireland played at least some role. Regarding attempts to recruit
participants, it is likely that the culture of Irish local government politics influenced
the willingness of potential interviewees to participate. Irish local representatives
generally have to devote very large quantities of time to meeting constituents and
attempting to resolve a variety of issues for them. Even national politicians devote
vast amounts of time to ‘constituency clinics’ as their success at the next election may
depend as much on the electorate’s perception of whether they were ‘good for the
local area’ as on their policy platform. In this context it is likely that at least some of
the elected representatives may have viewed the time spent completing an interview
for this project as better spent meeting with another constituent as that time may lead
to an additional vote, something I could not provide. More generally it is worth
reflecting on the extent to which recorded oral interviews are an effective research
technique in Ireland even when confidentiality is assured. Local officials whether they
are elected or not, tend to be reluctant to put their views ‘on the record’. Even though
confidentiality was assured several of my interviewees were very reluctant to allow
the interview to be recorded. In most cases this concern was alleviated by repeated
assurances of confidentiality and a promise that the interview would proceed more
quickly if answers were recorded rather than written down. It is possible that a written
questionnaire may have made respondents more comfortable and elicited a higher
response rate, although this is by no means certain. It is ultimately impossible to say
with any certainty what influence any of these factors may have had on the data
produced during this research.

Conclusions
This chapter outlined in detail the methods used throughout this research project. I
summarised why these techniques were selected and the objectives of the research
design. I also explained how these methods were deployed in the field including the
successes and failures that resulted. Finally I reflected on a number of issues related both to the research design and external factors that may have influenced the conduct and outcomes of this research project. Chapter 3 focuses on where this research took place providing a detailed picture of each field site and the reasons why they represented important case studies for this research.
Chapter 3: An Environmental History of Flood Hazards in Ireland’s Coastal Cities

Introduction

This chapter has two broad aims. The first is to introduce the cities that served as the field sites for this research project. I outline the physical, social and economic characteristics of each city illustrating why they represent important case studies and how they lessons they provide can serve as an example for similar cities in other countries. The second aim of this chapter is to provide an environmental history of flood hazards in these cities. In the chapters that follow I will illustrate how some recent floods have been framed as shocking or unusual. This chapter illustrates that these events may not be as unusual as they have been portrayed and that each of these cities has a long history of exposure to flood hazards. I also challenge the perception of flood hazards as external risks (see Chapter 6), illustrating that the exposure of each city to flooding is the product of human-environment interactions over an extended time period.

Before examining flooding in each city, it is necessary to briefly outline why Ireland was chosen as the case study for this research. Ireland represents an important and interesting case study to examine the research questions set out in Chapter 1 for three main reasons: (1) its worsening exposure to coastal hazards; (2) the extent to which its major population and investment centres are located on vulnerable coasts; and (3) its status as a model for other places that have recently undergone sociocultural and political-economic shocks and destabilising transformations. Ireland’s physical exposure to coastal and flood hazards, and the likely increases in this exposure due to climate change are discussed in detail in the literature review portion of Chapter 1. Many of Ireland’s largest urban settlements are located on the coast and on the
Figure. 3.1. Ireland’s main cities and major river basins.

Table 3.1. Notable recent floods in Dublin, Cork and Galway

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 20th 2009</td>
<td>Cork</td>
<td>Severe river flooding, property damage</td>
</tr>
<tr>
<td>August 9th 2008</td>
<td>Dublin</td>
<td>Pluvial flooding, property damage</td>
</tr>
<tr>
<td>July 21st 2008</td>
<td>Galway</td>
<td>Pluvial flooding</td>
</tr>
<tr>
<td>November 27th 2002</td>
<td>Cork</td>
<td>Pluvial flooding, property damage estimated at €1m</td>
</tr>
<tr>
<td>November 14th 2002</td>
<td>Dublin</td>
<td>Largest recorded flow on the Tolka River</td>
</tr>
<tr>
<td>February 1st 2002</td>
<td>Dublin, Cork and Galway</td>
<td>Coastal flood, hundreds of homes flooded</td>
</tr>
</tbody>
</table>

For a more detailed list of flood events, see Appendices H, I & J.
estuaries of rivers, creating multiple exposures to flood hazards. However the strength of these cities as case studies is not limited to their physical exposure. Ireland’s membership in the European Union and the recent global economic crisis have propelled the country into a suite of societal transformations (economic, cultural, demographic) that have destabilised primary institutions and impacted their capacity for resilience in the face of environmental changes. As such it may be a bellwether for a range of relatively privileged states that have been similarly challenged elsewhere. These social, economic, cultural and demographic changes are discussed in detail in Chapter 5.

**Dublin**
Dublin is the capital of the Republic of Ireland and the largest city on the island. With a population of over 1.5 million people the Greater Dublin Area is home to almost 40% of the population of the Republic of Ireland and the city is the centre of economic and political activity in the country. The Greater Dublin Area includes all of County Dublin and the surrounding counties of Wicklow, Kildare and Meath (see Fig. 3.2). County Dublin is divided into four local government areas. County Councils govern Fingal to the north, South Dublin to the south west and Dun Laoghaire-Rathdown to the south east while the city centre is governed by Dublin City Council. This project focused on the City Council area which is home to a population of 500,000. The City Council area covers the heart of the city, its historic core and most of the parts of the city that are exposed to river and coastal flood hazards.
Figure 3.2. Local Authorities of the Greater Dublin Area

Table 3.2 Population of the Greater Dublin Region by Local Authority area.

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dublin City</td>
<td>506,211</td>
</tr>
<tr>
<td>Dub Laoghaire/Rathdown</td>
<td>194,038</td>
</tr>
<tr>
<td>Fingal</td>
<td>239,992</td>
</tr>
<tr>
<td>South Dublin</td>
<td>246,935</td>
</tr>
<tr>
<td><strong>Total Dublin</strong></td>
<td><strong>1,187,176</strong></td>
</tr>
<tr>
<td>Kildare</td>
<td>186,335</td>
</tr>
<tr>
<td>Meath</td>
<td>162,831</td>
</tr>
<tr>
<td>Wicklow</td>
<td>126,194</td>
</tr>
<tr>
<td><strong>Total Greater Dublin Region</strong></td>
<td><strong>1,662,536</strong></td>
</tr>
</tbody>
</table>

The population of Dublin has grown steadily throughout the history of the city. In recent years the growth of Dublin has mirrored population trends in the country as a whole but significant internal migration from western areas to the Dublin region also boosted the city’s expansion (Fealy, 2003). Dublin has developed steadily from a population of 300,000 in the entire county in 1841 to over 1.1 million today (Central Statistics Office Ireland, 2006). The history of Dublin as a human settlement extends to over one thousand years (Simms, 2001) and throughout its history, its proximity to water has been essential to its development and growth (Gilligan, 1988). While the importance of its port functions to the economic and social life of the city has diminished over time Dublin was historically a city port (Moore, 2008). However the story of Dublin’s development is not just about its proximity to water, it is a story of human-environment interactions including numerous attempts to manage and tame the waters that surround the city. The construction of quay walls, modification of river channels, and land reclamations have been a feature of the city’s development for centuries (Moore, 2008). Many of these engineering features were necessary to create a successful port as Dublin’s location was not the most ideal of natural harbours (Moore, 2008). The River Liffey is believed to have had numerous small pools, inlets and bays while Dublin Bay itself contained numerous sand bars and other obstacles to shipping (Moore, 2008; DeCourcey, 2000). These obstacles were removed by large scale engineering works completed over an extended period of time. These changes modified the geomorphology of the local rivers and coastline creating the landscape of modern Dublin.

The city of Dublin is situated on a low lying coastal plain at the confluence of five major waterways (see Fig. 3.3). The Rivers Liffey, Tolka and Dodder all converge on
the city centre while two man-made additions, the Royal Canal and the Grand Canal, link Dublin city to Ireland’s longest river, the Shannon located over 100km to the west. The city is also traversed by numerous smaller streams and rivers, most of which have been culverted for most or all of their length (see Fig. 3.4) Each of the three major rivers flowing through Dublin city has been extensively modified by human activity. In the case of the Tolka this has mainly been in the form of small weirs and flood defences which channelise the river (see Fig. 3.5). However both the Dodder and the Liffey have been more extensively modified through the construction of large dams. Three dams on the Liffey built between 1937 and 1949 were designed primarily for the production of hydroelectricity but have also been used to regulate the discharge of flood waters following periods of heavy rainfall (Fitzpatrick and Bree, 2001). Two earthen dams on the Dodder create water supply reservoirs for Dublin City Council. Concerns regarding the possible overtopping and failure of these dams during periods of heavy rainfall led to the construction of new spillways completed in 2006 (Dublin City Council, 2008a). The large number of ‘underground’ rivers in Dublin has also become an increasing source of concern in recent years with flooding emerging from rivers that had historically been culverted. As the city developed its port gradually moved eastwards downriver from the city centre. This has led to significant land reclamation and large portions of the current port and docklands are located on land reclaimed from the Irish Sea during the Eighteenth Century (Dublin Docklands Development Authority, 2008).
Figure 3.3. Dublin’s rivers and canals.

Figure 3.4. The River Poddle joining the main channel of the River Liffey.

Photo: James M. Jeffers, July 2009.
As a case study for this research project Dublin can serve as a model for similar sized cities in both Europe and North America that are likely to experience increase exposure and vulnerability to flood hazards in the years ahead. Dublin’s history of development closely linked to its proximity to water is similar to the development of many other cities in Ireland, Europe and around the world. Its history of engineering works that significantly modify the local hydrological and tidal conditions is also similar to that of many other cities. Dublin has also witnessed similar trends to other port cities in the separation of the port from the rest of the city, the decline of the importance of the port to the economic life of the city and the redevelopment of dockland areas for other uses (See Chapter 5). This separation may also act to diminish awareness of the importance of water in the life of the city, leading to changing perceptions of hazards risk and vulnerability. As I discuss in the chapters
that follow, recent flood events have been perceived as unusual or shocking despite the city’s proximity to water and the importance of this proximity in the city’s development. In the paragraphs that follow I illustrate how floods are far from unusual on Dublin and that human interactions with flood hazards have been a feature of life the city for centuries. Floods are an unavoidable characteristic of the human environment interactions that have helped to produce the city of Dublin that we see today.

**Flooding in Dublin**

In order to examine historic patterns of flood hazards exposure and vulnerability at each of my field sites several sources were used to establish a historical record of flood events in each city. This included a search for any available academic literature on flood hazards in Ireland, a search of the flood event database www.floodmaps.ie maintained by the Office of Public Works (OPW), and a search of the archives of *The Irish Times* newspaper. These archives which are available online (for a fee) provided complete access to the newspaper from 1859 to the present17. It is likely that the record produced from this analysis does not include every flood event experienced in each city as some events may not have been reported, may not be included in the www.floodmaps.ie database or may not have been returned by the search function of *The Irish Times* databases. However it nonetheless provides a record of major events, an indicator of the types of flooding experienced in each city, the frequency of flood events, the types of impacts experienced and the responses of the residents of each city. It was not possible to gather all of this information for each event as some reports focused more on the characteristics of the event itself while others focus on its

---

17 The content of The Irish Times Archives is used and reproduced with the permission of the copyright owners, The Irish Times, Dublin, Ireland.
impacts, providing little information on flood depths or extents. Despite these limitations this information provides important contextual data for the discussion of contemporary flood hazards and their human dimensions that follow in subsequent chapters. The record of flood events in Dublin clearly illustrates that flooding is neither unusual nor surprising and has been a consistent feature of the life of the city. Appendix H provides the complete results of my historical analysis of flooding in Dublin.

Like many other parts of Ireland Dublin has a long history of experiencing flood events. River flooding has been a frequent hazard throughout the history of the city while coastal and pluvial flooding have also occurred periodically. Historical records dating from as early as the year 693 describe severe river flooding in eastern regions of Ireland but the first record specific to Dublin is of an event in 1385 when a bridge is believed to have fallen into the river during a flood (Dixon, 1953). Flooding from the Rivers Liffey, Poddle and Dodder appear to have been most common during the 1700s and 1800s with numerous reports of bridges being damaged or destroyed during floods as well as the flooding of homes and businesses, particularly the cellars of buildings close to the Liffey (Cawley, et. al., 2005; Dixon, 1953). While some of these bridge collapses are undoubtedly related to the nature of the bridges themselves which would have been neither as large nor as strong as their modern replacements, the city seems to have experienced some very large floods during its history. Despite the frequency and extent of flooding loss of life in flood events has generally been low. For example a flood on the Liffey, Dodder and Poddle in 1802 was described as one of the worst in the history of the city but only one death was recorded (Cawley, et. al., 2005; Dixon, 1953). This flood appears to have been exceptionally severe.
75mm of rain fell in a period of 30 hours while flood levels of 3 m were recorded in some parts of the city (Met Éireann, 2002). Several stone bridges over the Liffey were damaged or destroyed while many of the city’s residents had to be rescued by boat (Met Éireann, 2002). In contrast to the low death toll reported in this event a flood on the Liffey in 1807 is believed to have resulted in the drowning of at least nineteen people (Dixon, 1953).

While the Liffey, Dodder and Poddle rivers dominate the records from the 1700s and the 1800s, floods emerging from other sources were also experienced. A flood on the River Tolka in 1880 is believed to be the fourth largest flow recorded on that River (Dublin City Council, 2008b). Localised flooding caused by extreme rainfall occurred in 1750 and is recorded as having led to the drowning of many sparrows (Dixon, 1953). This record combined with that of a pluvial flood that impacted many parts of the city in 1963 may suggest that the pluvial rains experienced in recent years are not as unusual as they have been perceived by officials and decision-makers in the city (See Chapter 4).

The academic literature does not record any significant coastal flooding but beginning around 1870 The Irish Times newspaper contains several reports of coastal flooding ranging from apparently minor events where waves overtopped sea walls to much more significant flooding along much of the city’s coastline. During the late 1800s The Irish Times Reports coastal floods in 1877, 1880, 1884, 1893, 1898 and 1899. The 1877 appears to have been the most severe and is described as follows by The Irish Times reporter,

“The extremely high tides of Tuesday night and Wednesday morning, driven by the force of the storm, have effected a very serious amount of damage on the
coasts to the North and South of Dublin. For some hours that portion of the Dublin and Kingstown Railway which lies between Blackrock and Booterstown was flooded two feet deep. The water occasionally reached the engine flares while sheets of spray dashed over the carriages and for some hours the traffic was suspended. The Dodder overflowed its banks and the culverts constructed under the railway bridge altogether failed to carry off the water. The sea wall at Sandymount Strand has suffered much injury. Huge boulders were cast up like gravel upon the tramways and for some time traffic was at an end. The waves, rushing over the sea wall, deluged the gardens in the fore of the houses, sweeping away plants, shrubs and earth together. The spray washed over the cottage houses in foaming sheets and until long after the tide ebbed the residents were prisoners. The sea at times rose far higher than the Poolbeg Lighthouse”. (The Irish Times, January 4th 1877).

The reporter goes on to describe impacts across the city including the River Liffey rising to an “unprecedented height” flooding numerous houses and businesses along its banks. The description of the flooding along the coastline and on the lower reaches of the Liffey, Dodder and Tolka rivers suggests that the flooding was associated with the passage of a storm system that brought a storm surge and high winds driving the tide far above average levels. It appears that this combination of a storm surge and wind driven waves produced flooding in several parts of the city. This widespread flooding produced by the passage of a storm system suggests that this event may be comparable to the coastal flooding experienced in the city in February 2002. As I discuss later in this chapter and in greater detail in Chapter 4, the 2002 event has been perceived as unprecedented but similar floods appear to have struck the city in the past. The 2002 event is framed as unprecedented in part because it is the highest tide in the city’s instrumental record of tidal extremes but this record extends less than one hundred years. An analysis of flood return periods based solely on the city’s tidal gauge record might lead to the conclusion that large coastal floods are a less frequent occurrence than is actually the case. The framing of the February 2002 coastal flood may also be shaped by an apparent decrease in frequency in the occurrence of coastal flooding in the latter half of the twentieth century. The reporting of The Irish Times
suggests that during the end of the nineteenth century and the first half of the twentieth century, coastal floods were a more frequent occurrence in Dublin than was the case during the second half of the twentieth century. As I mentioned earlier coastal floods were common in the late 1800s and further coastal floods were recorded in 1916, 1924, 1930 and 1945. However between 1945 and 2002 no significant coastal floods are recorded.

Throughout the Twentieth Century, the city continued to experience river flooding in the Liffey, Tolka, Dodder, Puddle and Camac basins. Flooding on the Liffey appears to have become less common. This is like to be a result of the construction of several hydroelectric dams upstream which have regulated the rivers flow. Flooding on the Tolka and Dodder has remained a common feature of the city’s exposure to hazards throughout the Twentieth Century although the weather conditions required to produce flooding on each river are quite different. As a result it is unusual for flooding to be experienced in both basins at the same time. The Tolka tends to rise slowly with floods occurring when heavy rainfall is experienced over several days throughout its catchment which extends through the north of Dublin City and into County Meath to the west. One of the most severe floods experienced on the Tolka occurred in December 1954 when the flood waters undermined the foundations of a railway bridge in the Fairview area of Dublin. When the bridge collapsed into the river it partially blocked its flow causing the flood the spill across a wide area. It is estimated that the flood affected at least 1,500 houses and over 2000 families, hundreds of whom were forced to evacuate (Met Éireann, date unknown).
In contrast to the Tolka, the River Dodder is more prone to rapid onset floods produced when heavy rainfall occurs in the upper portions of its catchment in the mountains south of the city. The river falls 751 metres its 27km journey from its source to the sea resulting in floods that travel quickly down river into the city. The Dodder is known for being the source of some of the most severe and damaging floods to have struck the city. Prior to the 2002 coastal flood the most notable flood within living memory occurred in 1986 during the passage of a storm known erroneously as Hurricane Charlie.\footnote{Two spellings for the storm name appear in media reports and academic literature. The storm is referred to as both Hurricane Charlie and Hurricane Charley.} This was an extra-tropical cyclone that originated off the southeast coast of the United States and passed just south of Ireland. The storm produced heavy rainfall across the southern half of Ireland shattering the previous records for the greatest one day rainfall recorded in the country. It is estimated that between 150mm and 200mm of rain fell on parts of the Dodder basin (Met Éireann, 1986). This resulted in a flood over 2.5m deep in some locations (Met Éireann, 1986). The flooding affected at least 340 properties in the Dodder catchment while a further 85 properties were flooded by the River Poddle and 30 properties were flooded by the Camac (Cawley, et. al., 2005).

From 1986 until 2000 the city experienced few floods and those that did occur appear to have been relatively minor. A pluvial flood in 1996 caused some flooding across the city but this appears to have resulted largely from blocked drains. Flooding was reported on both the Liffey and the Poddle in the year 2000 but this was minor compared to what was to come. In 2002 the city experienced severe coastal and river flooding in separate events occurring in February and November. These events were followed by a less severe flood on the Dodder in 2003, a less serious coastal flood in
2004 and pluvial floods in 2004, 2008 and 2009. The February 2002 coastal flood occurred when the passage of a deep depression off the northwest coast coincided with the timing of high spring tides. The storm surge formed by the passage of the depression produced tide levels much higher than had been predicted, leading to flooding in Dublin and other parts of the country including Cork and Galway. The coastal flooding experienced in Dublin was the worst since Hurricane Charlie in 1986 and was the worst coastal flood in living memory. The peak tide height of 5.46 LAT broke the previous record for the highest tide recorded in the city of 5.1m LAT recorded in 1924 (Office of Public Works, 2002). Although no fatalities were reported during the event this appears to have been due to a combination of good fortune, the rapid response of the emergency services in some areas and the efforts of local residents to assist their neighbours in others. The flood was over 1.5m deep in some parts of the city and it inundated 800 houses (Barry and Partners, 2002; Dublin City Council, 2002; O’Connell, and Coe, 2003; Royal Haskoning, 2005). The flood struck several different areas of the city. Sea walls and coastal defences were overtopped along the coastline both north and south of the city centre. The storm surge increased water levels in the lower reaches of all the city’s rivers and canals. Minor flooding occurred along the River Liffey while more severe flooding occurred when the Royal Canal overflowed into the East Wall neighbourhood on the City’s north side and the River Dodder burst its banks flooding the Ringsend area of the south side (See Fig. 3.6, Fig. 3.7, and Fig. 3.8).
Figure 3.6. Flooding in the Ringsend area of Dublin City, February 1st 2002.

Figure 3.7. Flooding in Ringsend, February 2002.

Photo: Dublin City Council, February 2002 – reproduced with permission.
As I discuss in greater detail in Chapter 4, this event and subsequent pluvial floods in 2004, 2008 and 2009 have been framed by local decision-makers and officials as unusual and surprising events, and as evidence of the local impacts of global climatic change. These events appear to have played a key role in pushing flood hazards close to the top of the policy making agenda in Dublin City and increasing its importance as a national policy issue. These events may well be the first evidence of a new trend in hazards exposure in Dublin but as the evidence presented in this chapter illustrates similar events have occurred in the past. While this analysis cannot provide the precise data of an instrumental record it does provide evidence of the types of events that have occurred in the past and might occur again in the future. The 2002 coastal flood was certainly unusual but based on the record of past events it is impossible to say whether it is an event with a long return period or if it is the first of a new type of flood likely to become more common in a future of rising sea levels and potentially
more severe storms. What is clear is that it has been conceptualised and framed as evidence of a change and this has had important implications for local policy and decision-making. The frequency of pluvial flooding in recent years has also been presented as evidence of climate change but as this analysis demonstrates floods caused by extreme rainfall have occurred in the past although they do appear to have been infrequent.

The ways in which these events are framed by decision-makers and local officials emphasizes the physical exposure that these events create as it focuses on global climatic change and its local impacts. However it is important to place contemporary flood events in their historical context and this is one of the goals of this chapter. This review clearly illustrates that river and coastal floods have been a feature of life in Dublin throughout the history of the city and that pluvial floods while unusual are certainly not unprecedented events. The development of the city and the risks and vulnerabilities faced by its inhabitants must be understood in this context. The cities growth and its exposure to hazards are both linked to the human-environment interactions that have helped to produce the city we see in Dublin today.

**Cork**

With a population of 119,000 within the city boundary, Cork is the second largest city in the Republic of Ireland and the third largest city on the island after Dublin and Belfast. Due to its physical setting the city has a long history of exposure to flood hazards and this exposure has played a more prominent role in the history of the city than has been the case in Dublin and Galway. As I discuss in greater detail in Chapter 4, stakeholders in Cork appear to view flooding as an integral part of the experience
of living in Cork, leading to a somewhat different framing of hazards and climate impacts than in my other two case study cities.

Cork City is located on the south coast of Ireland at the estuary of the River Lee. Much of the city centre is built on what is now an island between two channels of the River Lee, both of which are tidal. These two channels are the last remaining visible features from a previously much more extensive network of channels that crossed the city centre. What is now the centre of Cork City was originally constructed on a series of islands in what was then a large swamp. This history is illustrated in the name of the city in Irish, Corcaigh translates as swamp or marshland. As the historic maps illustrated in Fig. 3.10 and Fig. 3.11 illustrate, the city first developed on several islands in the centre of the swamp. As the city expanded, neighbouring islands were included and the channels in between were filled in or culverted over. This process continued for several centuries until almost all of the channels were either filled or covered. As the channels were filled or covered they often became part of the city’s street network preserving the former channels in the contemporary geography of the city. Major arteries such as St. Patrick’s Street and the Grand Parade remained open channels until the middle of the Eighteenth Century when they were partially filled and culverted creating the street pattern visible today (see Fig. 3.12 and Fig. 3.13). Much of the modern city centre island lies at elevations that are just above the level of the highest spring tides experienced in the city. As a result the city centre is exposed to flooding of both river and tidal origin on a regular basis. Historically the city’s exposure to flooding was exacerbated by runoff from the steep hills on the city’s north side but this problem has been reduced by changes to the engineering of the city’s drainage network.
Figure 3.9. Cork City.

Figure 3.10. Cork City in 1545.

Map: Cork City Libraries – reproduced with permission.
Figure 3.11. Cork City in 1759 with several channels still open.

Map: Cork City Libraries – reproduced with permission.

Figure 3.12. Grand Parade viewed from across the South Channel of the Lee.

Photo: James M. Jeffers, August 2009.
Figure 3.13. Culvert joining the River Lee from beneath St. Patrick’s Street, Cork.

Photo: James M. Jeffers, August 2009.

The city’s exposure to flooding is not confined to the city centre island. On the western side of the city, lands on both sides of the river form part of the flood plain of the River Lee and have often experienced severe flooding. On the eastern side of the city centre, much of what is now the docklands area is situated on land reclaimed from the estuary of the Lee between 1774 and 1841 (Coughlan, 2009). This area remains liable to flooding due to its low elevation and poor drainage but despite its exposure, this portion of the city has been primed for extensive redevelopment. With the relocation of all of the city’s port functions to locations further downstream, the long term plans for this area include large scale residential and commercial property development (Cork City Council, 2009; Cork City Council, 2008; Cork City Council 2001). The hydrology of the River Lee has also been modified by the construction to two upstream dams. The dams at Inniscarra and Carrigadrohid were completed during
the 1950s and were built primarily for the production of hydroelectricity, not as flood control measures. However they have been operated to successfully control floods in the past (Fitzpatrick and Bree, 2001). Like Dublin, Cork represents an excellent case study for this project as its exposure and vulnerability to flooding is a product of a combination of biophysical and socio-economic drivers. The historic development of the city is a story of human-environment interaction played out over several centuries that has produced the vulnerabilities and exposures faced by the residents of the city today. The site first provided defence against human attack and then facilitated the establishment of a trading port.

**Flooding in Cork**

As the description of its physical setting would suggest Cork City has a long history of flooding. For many residents of Cork, flooding has been accepted as an accompaniment to living in the city. Published research reveals that two hundred and ninety floods were recorded in the city between 1841 and 1988 (Tyrrell and Hickey 1991) while my analysis of more recent records indicates that at least eleven additional floods have occurred between 1988 and 2011 (See Appendix I for a full listing of flood events). There have been numerous relatively minor events but the city’s record of flooding also includes a number of very large floods leading to loss of life and substantial economic losses. The physical geography of the city leaves its population exposed to several types of flooding including river flooding experienced when the River Lee overflows its banks, coastal flooding caused by high tides and storm surges, occasional pluvial floods caused by a heavy rain and numerous floods caused by some combination of these drivers. Tyrrell and Hickey (1991) suggest that the types of floods experienced may be changing over time with tidal flooding becoming increasingly common.
The earliest documented reports of flooding in Cork date from 1633 when several bridges are believed to have been swept away by a flood on the River Lee. Several very large floods leading to fatalities have been recorded in the city. In 1789 a river flood described as being between 5 and 7 feet (1.5m to 2.1m) deep in some parts of the city killed at least one resident (Hickey, 2010a; Cawley, et. al., 2005). One of the most severe floods in the history of the city struck in November 1853 when another river flood produced water levels that are believed to have been between 2m and 3m deep in some parts of the city. 12 people were killed in the flood, with several of these deaths occurring when St. Patrick’s Bridge was partially swept away. This flood is recorded as having caused severe damage across the city resulting in a long slow recovery process (Hickey, 2010a). Several other large floods were also recorded in the late 1880s, often leaving the city flooded to between 2 and 5 feet (0.6m and 1.5m). Flooding continued to be a common feature of the life of the city throughout the Twentieth Century. River floods in 1916 were among the worst experienced and were described as comparable to the 1853 event (Cawley, et. al., 2005). The Irish Times reported flood waters over 6 feet (1.8m) deep in areas to the west of the city centre and up to 5 feet (1.5m) in the city centre itself. The Irish Times reporter describes the flood as follows.

“To the west of the city the River Lee overflowed its banks to a depth in some places of six feet, and sweeping with great force over the grazing lands which lie on either bank carried away horses, cattle and sheep, notwithstanding the efforts of the owners to save them. University College Cork football grounds were covered with four feet of water, and here a number of sheep are stated to have been lost. The caretaker’s house was severely flooded. Indeed, the valley of the Lee extending westwards was one huge lake. The Cork and Muskerry Railway, which traverses this district was inundated to a depth of several feet and train services had to be suspended yesterday, with great inconvenience to the public”. (The Irish Times, November 18th 1916).
The history of flooding in the city suggests that the most severe flooding was usually caused by river floods although tidal surges frequently left the city centre flooded to depths of between a few centimetres and up to 1 m. It is worth nothing that for some of these tidal flood events such as the relatively minor flooding experienced in February 1967, the residents and business owners of the city appear to have been very well prepared. *The Irish Times* records that few losses were experienced in this flood as business owners had prepared by moving stock off exposed ground floors. *The Irish Times* of May 3rd 1962 also reports that the city began tests on a flood warning system during 1960. It is not clear how the warnings were to be produced but they were to be disseminated to the population of the city by means of a loud speaker mounted on a van that would drive around the city centre. These reports of a well prepared city contrast sharply with more recent events which appear to have caught a largely unprepared population by surprise. It is not clear if the flood warning system being tested in 1960 was ever implemented but the city does not currently have a flood warning system or a clear means of disseminating such a warning to its population.

Cork has experienced several noteworthy floods in recent years. In February 2002 the city experienced coastal flooding on the same day that Dublin and Galway were also affected by tidal surges. However unlike in Dublin, this event was not perceived as being particularly unusual in Cork and seems to have had little or no impact on policy and decision-making (See Chapter 4). *The Irish Times* reports that floods several feet deep were experienced in many parts of the city centre. The tidal surge in February was not the only flooding to strike Cork in 2002 as a pluvial flood affected some parts of the city in November. In the Blackrock area of the city floods of up to 5 feet (1.5m)
were reported (The Irish Times, November 28\textsuperscript{th} 2002). The year 2002 is just one of several years in the record when the city was flooded on more than one occasion. In 2004 another tidal surge led to floods several feet deep in the city centre.

The most severe flooding experienced in recent years occurred in November 2009 (see Fig. 3.14 and Fig. 3.15). Heavy rainfall leading to an inflow in excess of the reservoir’s capacity forced the operators of the dam at Inniscarra to release large volumes of water downstream in order to ensure that dam safety was not compromised. Much of the city centre and the city’s western suburbs experienced heavy flooding. Floods up to 1m deep covered many parts of the city in the early hours of the morning. Fortunately no fatalities occurred during the event but economic losses and disruption to the life of the city was considerable. The flood severely damaged the city’s water treatment plant leaving many of the City’s residents without water for several days, during a time of heightened sanitation concerns due to the global H1N1 flu pandemic. Classes at University College Cork were cancelled after a large portion of the campus was flooded. As I discuss in greater detail in Chapter 4 several of my interviewees in Cork were not concerned about river flooding as they believed the upstream dams had established control over river flooding. They were confident that the presence of the dams could protect the city and were anxious to extend this same control to tidal surges. My interviews were completed less than two months before this flood. Their belief that the city was protected by the presence of the dams is all the more remarkable as the 2009 event was not the first time the city was flooded by the release of water from the dam. The dams were designed for the purposes of hydroelectricity generation rather than flood relief and several dam
Figure 3.14. Flooding in Cork City centre, November 2009.

Figure 3.15. Damage to the quay wall at Granville Place, Cork after the flood began to recede, November 2009.

Photo: Courtesy of Rob Fisher – reproduced with permission.

Photo: David Hegarty – reproduced under Creative Commons Licence: CC BY-NC 2.0.
releases have led to flooding in the city in the past (Hickey, 2010a). These issues are discussed in more detail in subsequent chapters.

It is clear from this brief overview that floods have occurred throughout the history of Cork City. They are an unavoidable feature of the city’s geography and will continue to be experienced in the future. However it is also clear that city’s socio-economic vulnerability has varied over time. It appears that residents of the city may have been better prepared for flooding in the past than they are today. The reasons for this change are not clear although they may be linked to changing perceptions of flood hazards or to changes in how knowledge about flood hazards is produced and shared.

**Galway**

Galway is a city of 72,000 located on the northern shore of Galway Bay, at the mouth of the River Corrib. Due to its location on Ireland’s exposed west coast, Galway faces the greatest exposure to severe storms of the three case study cities. Like Cork and Dublin, its development owes much to the physical characteristics of its location which provided freshwater, an easily defendable site and trading opportunities for its inhabitants. Galway’s growth and development is similar to that of Cork and Dublin in many ways, including significant modifications to the local hydrology. River flooding has rarely been an issue in the city in modern times as the river has been extensively modified. The River Corrib is a short river flowing just a few kilometres from Lough Corrib, which lies just north of the city, to the sea (See Fig. 3.17). The water level in the river is controlled by the famous Salmon Weir while water is also diverted into numerous canals. The city’s exposure to coastal flooding has increased throughout its history as the city expanded westwards along the coastline eventually including the once separate village of Salthill. Parts of the city’s docklands, the South
Figure 3.16. Galway City.

Figure 3.17. The Spanish Arch area of Galway City during a spring tide.

Photo: James M. Jeffers, July 2009.
Figure 3.18. Galway Fire Station (grey tower) on the evening of a spring tide.

Photo: James M. Jeffers, July 2009.

Figure 3.19. New office building in Galway on the evening of a spring tide.

Photo: James M. Jeffers, July 2009.
Park area of the Claddagh and parts of Salthill are all constructed on lands that were reclaimed from the sea. Further reclamations are likely as part of a plan to develop a new port in deeper water. Many residential properties, businesses premises and important infrastructures are located at low elevations potentially exposed to coastal flooding. The Spanish Arch and Claddagh areas are particularly exposed to coastal flood hazards. These areas have been flooded in the past and their exposure is clearly visible during the highest spring tides, when even in calm conditions water levels are just centimetres below the quay walls (see Fig. 3.17). Flooding in this area of the city also has implications for the city’s emergency response to flooding as the city’s only Fire Station is located in an area that is prone to flooding (see Fig. 3.18). Portions of Salthill are also exposed to flooding. In this area properties are generally set back some distance from the shoreline and storm surges often floods roads rather than houses. However, flooding of properties has occurred during larger events.

**Floodling in Galway**

River flooding has not been a significant issue in Galway although it was raised as a possibility by some of my interviews and concerns regarding river flooding have made it more difficult for some businesses to procure insurance coverage. However my analysis of available records did not find any major river flooding in the city’s history. This sits in contrast to coastal flooding which has occurred frequently throughout the history of the city (see Appendix J). These coastal floods have ranged from minor events where unusually high tides allowed a few centimetres to flood city streets to large storm surges pushing up to a metre of water into the city. Reports on the ‘Night of the Big Wind’ in January 1839, reputed to be the among the worst storms ever experienced in Ireland describe Salthill has having been impacted by the storm but it is not clear if the damage was caused by the wind itself, coastal flooding
or some combination of the two (Carr, 1993). The earliest flood reported by *The Irish Times* was in 1887 when the sea is described as having come up onto the land in the city. Further flooding is recorded by *The Irish Times* in 1883 when flooding impacted the fish market and the construction of the new docks. The report also notes a concern that the floods might “break in on the town as happened on former occasions”, indicating that significant floods had occurred in the past. In December 1912 another storm caused flooding in Salthill although it is not clear whether any properties were flooded.

What appears to have been one of the most severe floods to impact the city occurred in January 1995 when a storm producing gusts of over 100 mph brought flooding to Galway City and other parts of the west coast. The depression which tracked off the northwest coast was one of the deepest ever recorded in Ireland and it produced a storm surge that increased water levels by over 0.5m above predicted levels (Met Éireann, 1995). This combined with high waves produced flooding in several parts of the city including close to the docks and in Salthill. At least 25 homes and businesses were flooded to a depth of over 1 ft while numerous motorists abandoned their cars on flooded streets. One person was killed in the village of Spiddal west of Galway City but no fatalities occurred in the city itself. *The Irish Times* describes this storm as follows:

“Over 25 houses and businesses in Galway city docks and Salthill were seriously flooded as 10-foot waves buffeted the coastline at high tide. Wind speeds of over 100 miles an hour were recorded, making this the worst storm in the area for 20 years. Flood water was still a foot deep yesterday in some homes in Grattan Road, Lower Salthill, which had been evacuated on Tuesday. A surging sea damaged large sections of the promenade at Salthill and threw large boulders and huge volumes of seaweed onto roads in the area, making them impassable. Walls were flattened and stone seats ripped asunder. In the Spanish Arch area, the sea floods advanced over 100 yards up Quay Street flooding a theatre used by the Punchbag Theatre Company”. (The Irish Times, January 19th 1995)
In February 2002, Galway experienced coastal flooding on the same day that a storm surge also flooded Cork and Dublin. The Claddagh, Spanish Arch, the Docks and Salthill were all flooded. 12 motorists had to be rescued when their cars were immobilised in the flood (The Irish Times, February 2nd 2002). A small number of properties were also flooded. Galway appears to be similar to Cork in that this event has not acquired the same prominence as floods on the same day in Dublin. The 2002 flood was not mentioned by any of my interviewees and there is no evidence that it has had any impact on local policy or decision-making. Like Dublin and Cork, Galway has also experienced pluvial flood events in recent years. In July 2003, 1.5 inches (38mm) fell in less than five hours leading to floods in several parts of the city (The Irish Times, July 22nd 2003). Similar events also occurred in August 2006 and July 2008. The 2008 event appears to have been the most severe, causing flooding across the city. This flood also impacted a number of events in the city that were not directly affected by flooding. At an outdoor pop music concert in Salthill, several people had to be treated for hypothermia after being caught in the rainstorm (The Irish Times, July 23rd 2008).

This review of flood events in Galway paints a similar picture to that for Dublin and Cork, although floods in Galway appear to have been generally less frequent and less damaging. Galway’s exposure to flooding is also less complex as the river flooding has not been a common occurrence. The floods experienced in the city are usually of coastal origin and occurs when the passage of strong storms coincides with high tides. However, as is the case in Dublin and Cork, it is clear that floods have occurred throughout the history of the city. Several of these floods have been large events that have caused significant economic losses. It is clear that flooding is a key feature of
Galway’s exposure to hazards and this flooding is likely to increase in the future if rising sea level trends continue.

**Conclusions**

This chapter had two main objectives. First, it introduced each of the field sites for this research, illustrating why each represents and interesting and important case study. Each city illustrates a different combination of biophysical and socio-economic drivers of exposure and vulnerability to flood hazards. As I illustrated in the first portion of the literature review in Chapter 1, each city also faces changes in physical exposure to hazards in the years ahead due to the projected impacts of climate change. Each city can serve as a case study for similar cities in Ireland and other European countries. As smaller urban settlements Cork and Galway in particular can serve as case studies that may provide lessons for similar sized cities throughout western Europe. Much of the climate and hazards literature focused on cities of the global north to date has focused on global megacities such as London and New York (see for example: Rosenzweig, *et. al.*, 2011; Rosenzweig and Solecki, 2010; Rosenzweig and Solecki, 2001; Parker, 1999). By focusing on smaller cities this study represents an important contribution to addressing one of the gaps in the contemporary literature. While Dublin is less typical of these smaller cities, sharing some of the characteristics of larger global cities, its status as a smaller capital city also allows it to serve as a case study for similar cities in other European countries. The lessons derived from Dublin may be applicable to other small (relative to global mega cities) capitals such as Copenhagen, Oslo and Lisbon.

The second aim of this chapter was to provide a historical context for understanding contemporary discussions of flood hazards exposure and vulnerability in each city.
Recent flood events particularly in Dublin have been conceptualised and framed as unusual or unprecedented. This chapter challenges that framing by illustrating that floods have been a common occurrence in each city and that they are an inevitable result of the complex human-environment interactions that have helped to produce the cities that we see today. This review also challenges the framing of flood hazards that emphasises the biophysical aspects of floods and views them as something external to society. It is clear that contemporary vulnerability and exposure to flooding is the product of a combination of physical exposure to hazards and human decision-making both historically and today. In Dublin in particular recent floods have been viewed as evidence of climate change but it is not clear whether these events are within the norms for hazards in Ireland, a re-emergence of past hazards or evidence of a new trend. Events such as the 2002 coastal flood may be evidence of climate change trends but they may also be within the range of normal variability. A climate change trend is not yet clear. What is clear is that they have been viewed as evidence of such a trend and it is to that conceptualisation and framing that I now turn my attention in Chapter 4.
Chapter 4: Ideas Matter: Conceptualising, framing and interpreting climate change

“I suppose it is fair to say, without exaggeration that climate change came to Dublin on the 1st of February 2002. That was our first wake-up call”

Introduction
For the city official quoted above, the evening of Friday February 1st 2002 was the point at which the impacts of climate change were transformed from a somewhat abstract concern situated in a distant and uncertain future, to a concrete reality in the Dublin of today. On that afternoon, the city of Dublin and surrounding regions experienced the highest tide since recording began at Dublin Port in the early 1920s (Barry & Partners, 2002; Dublin City Council, 2002; O’Connell and Coe, 2003; Royal Haskoning, 2005). A tidal surge produced by a combination of gale force south to south-westerly winds and low atmospheric pressure, coincided with an already high spring tide to produce sea levels over one metre higher than had originally been predicted (Dublin City Council, 2002; Royal Haskoning, 2005). The result was an unexpected and unpredicted, rapid onset flood event which came as a shock to all who experienced it. Many of those directly impacted described how “it all came in twenty minutes” (The Irish Red Cross, 2002, p.13). While flooding was experienced in several parts of Ireland including Meath, Louth, Waterford, Kerry, Limerick, Cork, and Galway (Irish Red Cross, 2002; Office of Public Works, 2002), several neighbourhoods in Dublin city experienced the most severe impacts. Communities close to the lower tidal reaches of the River Dodder on the city’s south side and along the banks of the Royal Canal on the north side were inundated by floodwaters ranging in depth from just a few centimetres to over one and a half metres (Barry & Partners, 2002; Dublin City Council, 2002; O’Connell and Coe, 2003; Royal Haskoning, 2005). Fortunately this flood did not result in any fatalities but economic losses were
substantial and the psychological impact of the surprise event on those directly affected is impossible to quantify. Almost eight hundred houses were flooded with many of these requiring expensive repairs and renovations (Dublin City Council, 2002). It is estimated that as many as forty percent of these homes may not have had insurance coverage\(^{19}\) (Dublin City Council, 2002).

The flooding of February 1\(^{st}\) 2002 illustrates how direct experience of an unexpected hazard or disaster event can transform conceptualisations of hazard and climate change. Prior to the events of that day most decision-makers at the level of city government in Dublin (the City Council) did not consider climate or hazard impacts to be a serious concern for the city today. There was some awareness that climate change would make flooding and other hazards a concern in the future but this was viewed as a long term issue not requiring immediate action. It was very much an attitude of “no worries” as one official put it. The events of February 2002 transformed attitudes to flooding and climate change. More importantly that transformation has led to changes in flood hazard and climate policy at local and national levels that may not have occurred without the shift in attitudes created by this event.

In this chapter I contend that the reduction of uncertainties in our scientific knowledge coupled with better communication and dissemination of that knowledge will not automatically facilitate more effective hazards mitigation\(^{20}\) or climate change

\(^{19}\) Property insurance coverage in Ireland generally includes flood insurance.

\(^{20}\) The term “mitigation” as originally utilised in natural hazards literature refers to steps taken to reduce losses from hazards events. In the discourse of climate change research “mitigation” has come to refer to actions to reduce the drivers of global climatic change, particularly efforts to reduce concentrations of atmospheric greenhouse gases. Both uses of the term appear in this chapter. To avoid confusion the
adaptation. I suggest that the ways in which we think about, conceptualise and comprehend climate change and its impacts or effects are a key influence on the types of decisions that we make. Whether climate change is viewed as a current issue or a potential future challenge, whether we see it as something that affects us or others, whether we see its consequences as potentially serious or relatively minor, and how we view the interaction between climate change and other social, economic and cultural factors, all influence the types of decisions that we make. These decisions in turn play a role in shaping the dynamic patterns of vulnerability of people and places to environmental hazards.

I begin below with a brief examination of the contemporary literature on framings and conceptions of climate. This is followed by an examination of the spatial and temporal conceptions of climate change employed by local decision-makers and other stakeholders. Drawing on the results of my fieldwork, I illustrate how decision-makers in Irish cities have framed climate change as temporally proximate but spatially distant, in part due to a combination of personal experience of extreme events, lived experiences of weather and climate, and the interactions between climate change and other policy issues. This discussion of spatial and temporal framings of climate is followed by a discussion of respondent’s views on the likely severity of future climate impacts. The remainder of the chapter is devoted to an analysis of four factors that appear to shape these framings of climate and influence the type and timing of adaptation decisions. First, the role of extreme events that are viewed as shocking or unusual is examined. Climate change becomes the means of explaining why these events occurred and the framing of these events as evidence of climate

word mitigation does not appear unless preceded by either ‘hazards’ or ‘climate change’ indicating which meaning applies.
change seems to motivate adaptive decisions that would not have been made otherwise. However this leads to a reactive decision-making process that may not facilitate effective adaptation in the longer term. Second, the importance of the relationship between experience of weather and climate, and local stakeholder’s sense of place plays a key role. Experience of local weather and expectations for future climate help to determine which hazards are considered likely and which are rejected as improbable, leading to the adoption of some adaptation policies and the rejection of others. Third, ongoing hazards and other policy challenges influence the priority attached to climate change, where it is ranked relative to other issues and how that ranking changes over time. This is influenced not only by the practicalities of decision-making but also by ethical and ideological influences. Finally the production and dissemination of knowledge plays a key role in how climate change is framed and the types of decisions that are taken. The types of information used in decision-making and where it is obtained, influences the nature of adaptation decisions that are made. Obtaining locally relevant information is a particular challenge for local officials while a reliance on knowledge obtained from colleagues can reinforce particular perspectives while excluding others. A focus on climate impacts can reinforce an understanding of climate change as a physical phenomenon, external to society leading to an emphasis on technological fixes. These conclusions have important implications for adaptation to climate change and disaster loss mitigation as they suggest that contemporary approaches may not facilitate effective decision-making and that alternative ways of understanding climate change and facilitating societal responses to it are required.
Conceptions and framings of climate hazards
While uncertainties in our existing knowledge and the ways in which that knowledge is used are undoubtedly important factors influencing human responses to hazards (Possekel, 1999; White, et. al., 2001) more complete information used more effectively will not automatically lead to better decision-making (Lorenzoni, et. al., 2007; Ryghuag, et. al., 2010). The ‘deficit model’ has been increasingly critiqued by researchers who argue that the provision of more or better information does not guarantee that any particular behaviour will follow (Chess and Johnson, 2007) and that perceptions of scientific knowledge and environmental hazards are influenced by a range of contextual factors including culture, values, attitudes, beliefs, ideologies, discourses and experiences (Brace and Geoghegan, 2010; Carvalho, 2010; Demeritt, 2006; Leiserowitz, 2006; Lorenzoni, et. al., 2007; O’Brien and Wolf, 2010; Shwom, et. al., 2010; Shen, 2010; Weber, 2010; Whitmarsh and Lorenzoni, 2010). The framing and conceptualisation of the challenges we face is also not simply a matter of risk perception and communication, a topic which has been the subject of its own extensive literature (see for example Kasperson et. al., 1988; Pidgeon, et. al., 2003). While exposure to risk and our perceptions of it are certainly one aspect of our understanding of climate hazards, our conceptualisation of climate change and its impacts has as much if not more to do with what Hulme describes as “the things we believe”, “the things we fear” and “the endowment of value” (Hulme, 2009). It is shaped not only by ideas about climate change but by beliefs about society, culture and economy. Hulme notes that “not only are the physical climates of the world everywhere changing, but just as importantly the idea of climate change is now to be found active across the full parade of human endeavours, institutions, practices and stories” (Hulme, 2009, p.322). Our ideas about climate change, our ideas about our exposures and vulnerabilities to them, and our ideas about how best to address those
exposures and vulnerabilities are just as important as the physical exposure we may actually face. Jasanoff (2010) has also focused on the ways in which we understand and experience climate change, suggesting that the way in which science abstracts knowledge and creates facts, divorces knowledge from meaning. She suggests that this presents particular challenges for our attempts to address climate change as science is “not the only or even the only medium through which people experience climate” (Jasanoff, 2010 p.235). We associate climate with lived experiences of weather and seasons at the local level rather than as a global process understood in scientific terms (Brace and Geoghegan, 2010). The abstract facts of scientific climate change may not motivate the same types of responses as knowledges that are attached to meaning.

How we respond to hazard events has long been a central concern among hazards researchers, particularly within the discipline of geography. Since the foundational work of Gilbert White suggested that while flood events themselves may be natural, the losses they caused were very much the product of human decision-making (White, 1945), geographers have considered social responses to hazards and the factors that influence or constrain those responses to be central to our understandings of the impacts of hazards and disasters on society (Burton, et. al., 1993; Mitchell, 2008a; Mustafa, 2005; Platt, 1999; Pelling, 2003; Robbins, et. al., 2008; Wisner, et. al., 2004). In recent years events such as Hurricane Katrina and a growing unease regarding our preparations for the likely impacts of global environmental change have amplified these concerns. Writing in the aftermath of the devastating impacts of Hurricane Katrina on New Orleans, Mitchell (2006a, unpaginated) contends that the results of the disaster and responses to it indicated a worrying trend, suggesting that
when it comes to environmental hazards “the gap between what we know and what we do is now yawning dangerously wide”. Mitchell was not simply arguing for a better application of the existing knowledge on environmental hazards and disasters, although this would undoubtedly be a positive step. Rather he argues for a broader social science research agenda that addresses not only uncertainty regarding the impacts of future hazard events but also “that interpretations of hazard are multiple, unstable, contested and often mutually incommensurable” (Mitchell 2006a, unpaginated).

This concern about our ability to respond effectively to hazards in ways that reduce our overall vulnerability has been matched by a growing concern about our ability to adapt to the impacts of global climate change. Citing Norway as an example of an affluent state that it is assumed will have little difficulty in adapting, O’Brien, et. al., (2006) express a concern that high adaptive capacity may not automatically lead to successful adaptation. Similarly Repetto (2008) observes “to say that the United States can adapt to climate change does not imply that the United States will adapt” (p.20, emphasis in the original). Adger and Barnett (2009, p.2804) suggest that there has been an assumption that adaptation will be “smooth, cheap and easy to implement” but that in reality it may be “punctuated, messy and more costly than we are willing to pay”. Researchers have also begun to focus on how knowledge and information about climate change is diffused across different levels of governance and decision making (Carmin, et. al., 2009). Later in this chapter I will suggest that this diffusion interacts with local experience and a range of other factors to influence the ways in which climate impacts are understood and the types of adaptive actions that are taken. Defining ethics as how and what we value, knowledge as how and what we
know, risk as how and what we perceive and culture as how and why we live, Adger, et. al. (2009) suggest that each of these spheres interact with the realities and constraints imposed by the biophysical world to influence adaptation practices. These four ‘limits’ are central to the ways in which we think about climate change and its impacts on society, and play a fundamental role in shaping the decisions that we make about adapting to the impacts of climate change.

**Conceptualising climate change in space and time**
There are numerous dimensions to the processes of global climatic change and these can be framed in a multitude of different, contrasting and perhaps even contradictory ways. Climate change has both spatial and temporal dimensions and the framings of these dimensions adopted by local decision-makers are likely to play an important role influencing the types of decisions they ultimately make in the field of climate change adaptation and in other areas of policy that may influence vulnerability. If climate hazards are not thought of as an immediate concern, then it appears unlikely that climate adaptation will move to the top of the policy making agenda. If the effects of climate change are seen as something that happens somewhere else (whether that somewhere else is the other side of the world or a neighbouring city), it seems unlikely that climate adaptation will be a priority. Of course, even if decision-makers’ framing of the temporal and spatial dimensions of climate impacts leads them to conclude that it is an important pressing issue today, it does not following that they will take adaptation actions as a variety of other factors may influence their decision-making.

From my interview data, it was possible to evaluate how participants framed and conceptualised climate change as a temporal phenomenon. In other words it was
possible to test whether interviewees were focused on climate change as a current phenomenon requiring immediate action or climate change part of a long term trend which would require responses at some future point. Somewhat surprisingly, the majority viewed climate change as an issue that was already a pressing challenge in their city today (See Fig. 4.1).

For many respondents particularly those in Dublin the belief that climate change was a current reality appeared to be informed by their direct personal experience of hazard events in the recent past, particularly when those events were thought of as surprising or unexpected. Experience of unusual weather and how it interacted with respondent’s sense of place and expectations for local weather and climate also appeared to be important influences on both temporal and spatial conceptions of climate change. The sharing and diffusion of knowledge across different levels of government and among agencies in Ireland and those in other European countries was also an important influence although this appeared to be an extension of the response to unusual hazard events. These influences on conceptions and framings of climate are discussed in more detail later in this chapter. Finally the interaction between climate change and other unusual events or crises including economic challenges (see Chapter 5) and other environmental problems was also influential.

The issue of climate change and time has received relatively little attention in the literature to date (Brace and Geoghegan, 2010). However the temporality of conceptions of climate change may play a vital role in the types of adaptation (and mitigation) decisions that are made. As I illustrate later in this chapter decision-makers who view climate change as a contemporary reality rather than a future
challenge appear more likely to pursue some form of adaptation. The switch from viewing climate change as a somewhat vague future problem to a concrete challenge today (in the case of Dublin precipitated by a hazard event) is illustrative of the challenges associated with the influence of temporal understandings of climate change on human decision-making. When framed in the discourses of climate change science, climate changes narratives focus on decadal scales while human decision-making invariably operates in much shorter timescales (Brace and Geoghegan, 2010; Hulme, 2009). It is also unclear what the decadal timescales used in natural science climate models mean to non scientists and how the dates mentioned are understood (Brace and Geoghegan, 2010). The concept of climate itself is temporally problematic as it is based on a thirty year average whereas human experience of weather operates on scales of hours to days (Brace and Geoghegan, 2010). This gap between the short-term lived experience of everyday weather and the long term projections for climate change limits the likelihood of adaptation or mitigation responses. As my results illustrate, when climate change is framed in the scientific narratives of climate model results on decadal timescales, this is incongruent with lived experiences and everyday realities. The scientific narrative may not facilitate effective adaptation actions as action was taken only after lived experience of an extreme event made concrete the previously abstract predictions of change. If the experience of a hazard event is required in order to transform climate change from an abstract issue in an indeterminate future to a pressing challenge today, this does not bode well for the likelihood of proactive adaptation.

While temporal framings of climate change shape ideas about how soon climate change will impact a particular location, understandings of the spatial dimensions of
Figure 4.1. Participants views on when climate change would impact their city.

![Bar chart showing opinions on when climate change would become a pressing issue](chart1)

Opinions on when climate change would become a pressing issue
- Cork
- Galway
- Dublin

Figure 4.2. Informants views on the likely severity of climate change impacts.

![Bar chart showing the severity of climate change impacts](chart2)

Figure 4.3. Views on whether climate change would be positive or negative for their city.

![Bar chart showing views on the impact of climate change](chart3)
those impacts are no less important. If local decision-makers with responsibility for public policy in a particular city do not view climate change as an issue that impacts that city directly then the adoption of adaptation measures appears unlikely. Similarly if they conceptualise climate impacts as affecting only a part of their city rather than all of it this may influence the types of decisions that are made. This may also have

<table>
<thead>
<tr>
<th>Table 4.1. Interviewee comments on climate change in other places.</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>I think probably we would be less affected than some parts of Europe. I’m thinking particularly of the east coast of England which is going to be more affected than we would be. (Engineer – Cork)</em></td>
</tr>
<tr>
<td>I have a very strong visual image of I think from Concern or Trocarie* or something like that, of a family in sub Sahara in Africa being directly affected and the affects of famine or potential famine. We’re probably a lot better off than some places because of our temperate climate. I suppose we wouldn’t obviously be as badly affected as countries like Bangladesh with terrible flooding or countries like Sub Saharan Africa with terrible dryness. (City Councillor – Dublin)*</td>
</tr>
<tr>
<td>My view is I suppose is that we would be better off than certain places, well obviously the worse type of scenario for global warming are those Pacific Islands that you think of and with the water level rising that they are just going to be wiped out. (City Councillor – Dublin)*</td>
</tr>
<tr>
<td>One would be the changing climatic conditions in the developing world and how it would predominately affect rural areas and also coastal rural areas. The sea going areas where they would traditionally have saved mangrove and that type of stuff so issues related to flooding and erosion and salinisation of water supplies and that, those aspects are very severe. (NGO Representative – Dublin)*</td>
</tr>
<tr>
<td>It depends on the way you look at these things. I think it will be major if you are living in Ireland, but looking at the global sense it could be quite minor, so like if you look at the likes of Pakistan and the flood plains there and you look at the possibility of certain parts of Dublin being flooded on a regular basis so yes major in the Irish sense but looking at it on the global issue probably quite minor. (City Councillor – Dublin)*</td>
</tr>
<tr>
<td>I suppose when you look at some of the experiences they have had in continental Europe with the large river system that can cause huge havoc across a number of countries in that sense we are not as bad. (Planner – Dublin)*</td>
</tr>
<tr>
<td>I look at places like Bangladesh and the horrific consequences for those peoples and part of China which are very low lying areas on the sea coast but I know Bangladesh in particular. I mean the place is one of the most densely populated places in the world; they don’t have the opportunity to move to higher lands because they don’t exist, so those countries are going to find it very difficult. (City Councillor – Dublin)*</td>
</tr>
</tbody>
</table>

* Irish charities known for their work in the developing world.
environmental and social justice implications depending on the types of communities or environments likely to be impacted and the criteria used for policy decisions.

For many respondents (including those who viewed climate change as an important contemporary issue in their city) conceptions of where climate change impacts would be most significant frequently focused on other places often distant from their own city (See Table 4.1). In their view, the most serious impacts of climate change would happen somewhere else. For one engineer in Cork that somewhere else was other parts of Europe “I think probably we would be less affected than some parts of Europe. I’m thinking particularly of the east coast of England which is going to be more affected than we would be”. For others their image of climate change focused on more distant locations. One newly elected City Councillor in Dublin remarked “I suppose we wouldn’t be as badly affected as countries like Bangladesh with terrible flooding or countries like in sub-Saharan Africa with terrible dryness”. Another Dublin Councillor made similar observations stating “I look at places like Bangladesh and the horrific consequences for those people and parts of China which are very low lying areas on the sea coast”. Others focused on the plight of small island nations with another Dublin Councillor commenting “the worst type of scenario for global warming are those Pacific Islands that you think of and with the water level rising that they are just going to be wiped out”. Many respondents also viewed climate change as something that might impact only parts of their city, focusing on particular neighbourhoods that might experience particular impacts but not mentioning others that might be affected in different ways.
For most interviewees it was not that Ireland or their particular city would be unaffected by the impacts of climate change, but rather that other places would experience much greater impacts. Most respondents illustrated a belief that Ireland was fortunate to have a relatively limited exposure to climate hazards and that other parts of the world were not so lucky. These responses also illuminate a tendency to view potential climate impacts purely in terms of exposure to biophysical risks while the sensitivity of the city or the vulnerabilities of its people was rarely considered (See Chapter 6).

While most interviewee’s spatial conceptions did include climate impacts in their own cities, even if more severe impacts occurred in other places, a notable divergence of views on what those impacts might be was evident. The greatest diversity of views emerged over whether drier summer weather was likely in their cities and whether this might lead to droughts and water supply shortages in the future. Climate researchers have projected a potential decline in summer rainfall and summer stream flow with potential consequences for water supplies (McGrath and Lynch, 2008). The views of interviewees on the spatial aspects of future summer weather varied greatly from those who found it almost impossible to imagine such a scenario in Ireland to those who thought it likely to happen in Ireland but not in their city. For many their views on the potential for impacts such as summer drought appeared to vary depending on their own perceptions of weather and hazards, and on the links between this and their sense of place in their city.

These spatial dimensions of framings and understandings of climate change have not been extensively considered in the contemporary literature. The scientific narrative
focuses on climate change as a universal global problem but this divorces it from the social and material production of both the human drivers of climatic change and its effects on human society (Brace and Geoghegan, 2010; Demeritt, 2001). It is clear that for effective decision-making to occur environmental knowledge must be understood at the local scale (Brace and Geoghegan, 2010). The narrative of climate change as a global problem had led to little concern in Dublin prior to 2002 and continues to lead to a lack of concern among decision-makers in Cork and Galway. It is only when experience of extreme events changed local perceptions and knowledge that changes in policy and practice followed.

**Framings of climate impact severity**

Framings of impact severity were another important aspect of respondent’s conceptions of climate and hazard impacts. If local decision-makers believe that the effects of climate change are likely to be severe and largely negative for their city this may elicit a very different set of policy responses than if climate impacts are seen as relatively slight or as potentially positive for their city. The majority of respondents considered the current and future impacts of climate change in their city and in Ireland as a whole to be moderate (See Fig. 4.2). However there were a small number of interviewees who viewed climate impacts as extreme while among those who viewed them as moderate, some suggested that they may become extreme at some point in the future. Several also pointed to events such as the February 2002 coastal flooding in Dublin as an example of events that they would describe as extreme but suggested that in general the impacts would be moderate. A small number of informants suggested that the impacts of climate change would be slight or not particularly significant but no respondents suggested that the impacts would be non-existent. Across all respondents indications of uncertainty were quite common. Several
admitted to being unsure and unable to give a firm answer while among those who did give a firm answer expressions of uncertainty were also common.

These expressions of uncertainty were common in the answers to many interview questions not just those relating to potential impact severity. It was not unusual for respondents to preface their answers with statements such as “again, not being fully informed” and “I wouldn’t be an expert but” before giving their opinion on a particular issue. Such responses were most common among elected representatives and least common among executive officials with professional trainings such as engineering or planning. However even these respondents sometimes referred to uncertainties or limitations in their own knowledge. This may have important implications for the decision-making process if decision-makers see limitations in their own knowledge but have strong views on which types of expertise or knowledge are most relevant to responding to climatic change or hazards impacts (see Chapter 6).

When it came to whether climate change would have positive or negative consequences for their city, most informants tended to see the potential for both. In cases where respondents focused on one of these options, those who foresaw mostly negative consequences outnumbered those who foresaw only positives or opportunities (See Fig. 4.3). When describing the potential negative implications of climate change for their cities, interviewees focused on the physical phenomenon of climate change itself. The potential climate related hazards such as extreme weather events, flooding and erosion caused by sea level rise were cited as potential negative consequences. Several respondents also cited the likely financial costs of adaptation as a negative for their city (See Table 4.2). However when focusing on potential
positive implications of climate change interviewees focused not only on the biophysical impacts of climate change but also on the potential influence of discourses of climate change. Several respondents suggested that a collective focus on climate change would help to drive the development and implementation of renewable energy technologies and improved energy efficiencies. They suggested that this would have environmental and economic benefits for their cities and for Ireland as a whole. Others focused on the potential ancillary benefits that might emerge from the implementation of engineering or technological adaptation measures, suggesting that these might help to create jobs during their construction and to create amenities and other benefits once they were implemented. Some respondents also focused on potential benefits to the tourism industry in Ireland, through future warmer summer weather, or through negative impacts in other places encouraging people to visit Ireland. A focus on economic costs and benefits was common throughout most interviews. For most informants climate change and its impacts appeared to be viewed through an economic lens (see Chapter 5). Understandings of climate change as both positive and negative sits somewhat in contrast to the scientific narrative which tends to focus almost exclusively on the potential negative implications for society. However as a growing body of literature has acknowledged, global environmental changes produce both winners and losers (Leichenko and O’Brien, 2008; O’Brien and Leichenko, 2003; O’Brien and Leichenko, 2000). Whether a decision-maker regards themselves or those on whose behalf they make decisions as a winner or loser is likely to play a key role in shaping the types of decisions they take.

Understanding climate change in terms of impacts is also likely to be an important influence on adaptation practices and policies. A focus on impacts appears
Table 4.2. Factors suggested as positive or negative aspects of climate change.

<table>
<thead>
<tr>
<th>Potential Negatives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hazards impacts</strong></td>
</tr>
<tr>
<td>If the water level rises to such a degree that it takes away a certain amount of the land bank, then that’s a huge negative. (City Councillor – Cork)</td>
</tr>
<tr>
<td><strong>Financial costs of adaptation</strong></td>
</tr>
<tr>
<td>I would have to see it as a negative impact initially because of the need to adopt a lot of the existing infrastructure to conform to new requirements, initially negative potentially from a financial point of view. (City Councillor – Cork)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potential Positives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Increased tourism</strong></td>
</tr>
<tr>
<td>Maybe there’s tourism areas over fifty or one hundred years that we might have that we wouldn’t dream of now. (NGO Representative – Cork)</td>
</tr>
<tr>
<td>If you are getting a very hot Europe, then Ireland with changing weather, a lot of people like that so from the tourism point of view offer a slightly different experience (Engineer – Dublin)</td>
</tr>
<tr>
<td><strong>Ancillary benefits of engineering responses</strong></td>
</tr>
<tr>
<td>If there was a barrier across the harbour and you could maintain a body of water. When the tide is out it’s not very attractive so if you could maintain the water level for boating and river recreation that could be quite beneficial. (Engineer – Cork)</td>
</tr>
<tr>
<td>We are now waiting for government funding which would put ramparts in to protect the sea shore while at the same time provide a much needed, much sought after amenity walkway (City Councillor – Galway)</td>
</tr>
<tr>
<td><strong>Climate change as a challenge to be embraced</strong></td>
</tr>
<tr>
<td>I have never been negative in my life and as an engineer to me it is just pure challenge. (Engineer – Dublin)</td>
</tr>
<tr>
<td><strong>Opportunities to encourage renewable energy and improved energy efficiency</strong></td>
</tr>
<tr>
<td>I would certainly like to think that from the energy and sustainability point of view that we have major opportunities now. (Engineer – Dublin)</td>
</tr>
<tr>
<td>I think the debate is good because anything that makes people be more efficient, burn less fuel and waste less and do the right thing is a positive spin off. (Unelected official – Galway)</td>
</tr>
<tr>
<td>Well the opportunities are there in wind energy and the tidal energy. (City Councillor – Galway)</td>
</tr>
<tr>
<td><strong>Job creation and other economic benefits</strong></td>
</tr>
<tr>
<td>There is obviously employment potential that can develop from having to put in flood relief and having to do all the other things. (City Councillor – Dublin)</td>
</tr>
</tbody>
</table>
unidirectional, imaging climatic change as an external force impacting society. The impacts based narrative is likely to favour a particular set of adaptation practices and policies, particularly those that focus on utilising engineering and technological fixes to reduce physical exposure (see Chapter 6). The impacts based narrative also frames climate as a means of explanation rather than a phenomenon to be understood in its own right (Brace and Geoghegan, 2010). In other words climate change understood through the medium of science becomes the explanation for a range of related issues such as environmental hazards and disasters. Researchers are increasingly suggesting that to facilitate more effective decision-making climate change must be understood in a more relational context that includes “place, personal history, daily life, culture and values” (Brace and Geoghegan, 2010, p. 6). I now turn my attention to the roles that some of these factors play in shaping conceptions of climate change among my interviewees. The results presented to date clearly illustrate how the spatiality, temporality and consequences of climate change are conceptualised and framed. I now turn to an examination of four factors that may explain why climate change has been framed in this manner, and illustrate why these framings facilitate particular adaptation choices. I begin with an examination of events that are framed as unusual or surprising. This is followed by an examination of the relationships between place, weather and experience of climate, as well as a discussion of how climate change intersects with other challenges. Finally I conclude with an evaluation of the role of the production and dissemination of knowledge in shaping local decision-making.

**Extreme events and reactive decision-making**

A variety of factors were given by respondents as influencing their conceptions of the spatiality, temporality and intensity of climate change. Among the most frequently cited influences on temporal framings in particular, was direct personal experience of
events that were perceived to be evidence of climate change. These included hazard events that were thought of as shocking or surprising, and other events that were cited as evidence of changing weather patterns or seasons. Across all three case study cities the majority of executive officials, elected representatives and other stakeholders expressed the view that the impacts of climate change were already being felt in their city today. This was not the temporal framing that one might readily expect to find among a group of local decision-makers and certainly was not what I had anticipated at the outset of my research. Despite the fact that no one event can be directly attributed to climate change, which can only be observed through changing climate averages over an extended period, most interviewees attributed particular events that they had experienced to processes of global climate change (See Table 4.3).

Often losses experienced by their constituents during flooding or other hazard events prompted elected decision-makers to view climate change as a pressing issue today, requiring action to prevent future losses. Referring to whether the impacts of climate change were already being felt in the city, one City Councillor in Dublin observed “they are already, without a shadow of a doubt, like from sitting on Dublin City Council, there were local representatives from the areas that were flooded, they were very vociferous in what needed to be done. There were residents groups from the areas came in; people’s homes were literally destroyed”. The frequency of events that were perceived as extreme or unusual also helped to shape the idea that climate change impacts are a pressing issue today with the same Councillor commenting “the annoying thing [for local residents] is that around eighteen months ago or two years ago the same thing happened”. Another Councillor pointed to a recent flood event caused by unusually heavy rainfall as evidence that climate change impacts are
Table 4.3. Comments where respondents identified unusual or surprising hazard events as evidence that climate change was already impacting their city.

I suppose it is fair to say without exaggerating that climate change came to Dublin on the 1st of February 2002, that was our first wake up call. It was the highest tide in over a century (Engineer – Dublin)

They are already, without a shadow of a doubt, like from sitting on Dublin city council, there were local representatives for the areas that were flooded, they were very vociferous in what needed to be done, there were residents groups from the areas that came in, people’s houses were literally destroyed and the annoying thing is that around eighteen months or two years ago the same thing happened, and everyone thought that the system was going to be changed to ensure that it didn’t happen again and it has happened again. (City Councillor - Dublin)

Flooding is becoming more and more prevalent because according to some of the residents who were interviewed on radio today this happened in the same place less than a year ago. (City Councillor – Galway)

It already is, it is an issue, I mean we as a city council have already started the process of bringing in climate change policies looking at how you contain your drainage systems, we have carried out flood assessment we have carried out flood protection in areas affected in 2002, but I mean you move on to the next stage which I mean we all know that has been this issue of pluvial rain has caused a big problem for us, so we have identified areas where there is risk through the river system. (Planner – Dublin)

Well in terms of my own immediate area which borders Sandymount Strand and Dublin Bay impact immediately on my area and the area has been flooded that would be the local impact of climate change that would most comes to mind. (City Councillor – Dublin)

I think we are already starting to see the affects we only had to look at two weeks ago to see that*, and I think those kind of events will become a more regular occurrence and it is when the impact with the tidal surge low pressure they could turn into a major event. (City Councillor - Dublin)

I have to say that it got over an hour and twenty minutes of the last city council meeting. A lot of people spoke about their own situation, because some of the councillors live in those areas, and some of those who represent them were down with constituents and looking at peoples life time possessions destroyed and everything else like that, really difficult for people. (City Councillor – Dublin)

We recently had floods and we have had more floods than we were ever told we would have so I think the more that happens the more people will find it a pressing issue. (City Councillor – Dublin)

Even things like very sudden torrential downpours of rain cause flooding where people don’t remember flooding happening previously. (City Councillor – Cork)

*Referring to a flood event caused by intense rainfall in a short period of time.
Figure 4.4. Flood defences under construction on the River Dodder, Dublin.

Photo: James M. Jeffers, August 2008.

Figure 4.5. New flood defences on the estuary of the River Dodder.

Photos: James M. Jeffers, August 2008.
already being felt “I think we are already starting to see the effects, we only have to
look at two weeks ago to see that”. Another Dublin City Councillor observed how
climate impacts there have become an increasingly common topic of discussion at
City Council meetings. He commented

“it got over one hour and twenty minutes of the last City Council meeting....... a
lot of people spoke about their own situation because some of the Councillors live
in those areas, and some of those who represent them were down with constituents
and looking at people’s lifetime possessions destroyed and everything else like
that, really difficult for people”.

For City Councillors in Dublin, having first-hand experience of visiting flood
damaged homes appears to have reinforced the idea that climate change is a reality in
Dublin today. The emotional distress caused by recent experience of hazard events
appears to have played an important role in shaping their conceptualisations.

Similar responses from executive officials and other stakeholders illustrate that in
Dublin at least, the experience of flooding events in recent years appears to play an
important role in influencing temporal framings of climate change impacts employed
by most respondents. As the quote used at the opening of this chapter clearly
illustrates, for many officials in Dublin the coastal flood event in February 2002 was
the day “that climate change came to Dublin”. Executive officials frequently pointed
to the 2002 event and more recent pluvial flooding as evidence that climate change
impacts were already occurring in the city. They also frequently referred to the 2002
coastal flood as something that changed their perceptions of the importance of climate
change impacts, and the likelihood that they would impact Dublin city directly in the
near future. The 2002 event transformed climate change from an abstract future
possibility to a concrete reality today. It is clear that “how flood is understood and the
meanings attached to flood inevitably shape people’s responses to it” (Whittle, 2010).
Such a willing acceptance of the climate change as an urgent challenge is not what one might readily expect to find when surveying the attitudes of a sample of local officials. It appears that the conceptions and framings of climate change and its potential impacts among local officials and decision-makers in Dublin were radically shaken by the extreme and unexpected nature of the 2002 flooding event. It appears that this event and its impact on the affected communities has left a lasting impression on those who experienced it directly. One official described how “it was a week I will never forget, it was really, really bad and all of the problems associated with it. It was disastrous for the community”. This event appears to have come as such a complete and total shock that it literally transformed their image and perception of climate change overnight. Although the flood itself may not have been truly unusual (see Chapter 3), those who experienced it saw it as shocking. This shaped the meanings they attached to the flood and the actions they have subsequently taken.

The importance of direct personal experience of extreme events in influencing decision-making has also emerged in research conducted in other European countries. Amundsen, et. al. (2010) utilised quantitative methods to survey municipal decision-makers in Norway and found that the respondents most likely to implement adaptation policies were those who had direct experience of extreme events. Other researchers have also suggested that disaster events can be an important influence on when a hazard becomes a policy priority (Tobin and Montz, 1997). Researchers examining policy responses to flood hazards in the UK have suggested that major events can act as a catalyst for more rapid change in what is usually an incremental policy making process but that this change is unlikely to represent a significant departure from existing policy. Existing discourses and institutions generally remain intact while it is
that speed of policy implementation that changes rather than the nature of the policies themselves (Johnson, *et al.*, 2005).

It is clear that the ways in which the 2002 event was framed and conceptualised has been an important influence on the speed of policy and decision making both locally and nationally. However it’s influence on the types of decisions that are made is less clear. A series of largely structural responses including the construction of flood defences (See Fig. 4.3 and Fig. 4.4) and the development of an early warning system have since been implemented in Dublin while changes in national flood policy have also occurred. Given the “no worries” view adopted by most local decision-makers prior to the 2002 event it seems unlikely that these decisions would have been taken without the 2002 event to acts as a trigger. However while some new responses were implemented (partnerships with local communities and warning systems) the predominant response (flood defences) was not a significant change from past practice. While the influence of other factors is important, the ways in which extreme events are framed, and the influence of this on conceptions of climate change is an important trigger for action. This may have profound implications for proponents of early adaptation to climate change or proactive hazards loss mitigation planning. The emphasis placed on the 2002 event by respondents in Dublin suggests a very reactive decision-making process, something that has also been highlighted by research in other European countries (Amundsen, *et al.* 2010; Penning-Rowsell, *et al.*, 2006).

The reactive nature of the decision-making process was also highlighted by some of my respondents some of whom suggested that a reactive decision-making process was inescapable. One interviewee suggested “it’s almost unavoidable that decision-
making will be a bit reactive in the sense that something will happen and then something will be done”. The dominance of a reactive decision-making processes is undoubtedly an impediment to the effective reduction of vulnerability and loss from hazards events, if such events have to happen before steps are taken to reduce future losses. This reactive decision-making process also stems from and emphasises a conceptualisation of climate change that is focused on physical impacts rather than recognising the social, cultural, economic and political contexts which shape the vulnerabilities of human populations.

While the decision-making processes appears highly reactive and several decision-makers expressed this view themselves, one interviewee who has been actively involved in formulating flood policy at the national level suggested that the 2002 event was actually a catalyst for a shift from a reactive to a proactive flood risk management policy. He suggested that the coast flood event experienced in Dublin in February 2002 highlighted the “reactive and piecemeal” nature of flood hazard policy in Ireland and that the subsequent review of national flood policies has moved national policies towards a more proactive approach. There is some evidence that such a policy shift is occurring at the national level with efforts to produce the first national flood risk maps currently underway while a new emphasis on spatial planning as a tool for flood loss prevention is also evident. These changes appear to have been a response to the 2002 event but have also been influenced by developments at the EU level. These steps were mandated by the EU Floods Directive\textsuperscript{21} of 2007, a legislative instrument that is itself arguably an example of reactive decision-making as it emerged following river flooding experienced in

\textsuperscript{21} A Directive is a legislative instrument of the European Union which requires Member States to achieve a particular goal but allows them some flexibility regarding the mechanisms through which that goal can be achieved.
Central and Eastern Europe during 2002 and 2005. While a shift from a previously reactive process to an increasingly proactive one may be underway this remains somewhat of a reactive decision itself as it required the 2002 event to occur before the limitations of previous decision-making and policy became apparent. It appears that flood events that were perceived as shocking or unusual have played an important role in shaping flood risk management policies in the European Union, and at local and national levels in Ireland. (See Chapter 7).

Mitchell (2004, 1996) and Kates (1985) have emphasised the importance of surprises and unexpected events in shaping decision-making with Mitchell (1996) describing several types of surprises including one of a kind, first of a kind and worst of a kind event types. The 2002 coastal flooding in Dublin and more recent pluvial flooding were presented by my interviewees as unprecedented first of a kind surprises, the first occurrence of events that they had expected would occur in distance future. As the analysis present in Chapter 3 illustrates, these events may not be such first of a kind events as similar floods have occurred in the past. Climate change is used to explain extreme events that are perceived as unusual (Brace and Geoghegan, 2010). This illustrates that the conceptualisation of any event as a surprise arises not just from the characteristics of the event itself but also from how it is understood by those who experience it and the metaphors and concepts they use in doing so (Mitchell, 1996). Whether these events were truly unusual or not, they were framed as surprises by decision-makers and that framing seems to have played a key role in shaping subsequent decision-making and policy.
Before proceeding further it is worth emphasising that the suggestion that experience of hazards events may play an important role in shaping local decision-making and policy is not a form of modern day environmental determinism. It is not the events themselves that drive decision-making but the reactions of decision-makers to them, the ways in which they are conceptualised and framed, and the ways in which these framings are linked to other issues, events and experiences. Hazard events occur within the context of a variety of social, economic, cultural and political contexts that are also an important influence on the types of decisions that are made (Mitchell, et. al., 1989). They also occur within the context of more frequent and sometimes less dramatic weather events. Perceived changes in weather and seasons can also be an important influence on how climate change is framed and understood.

Weather, climate and sense of place

While extreme events may be an important influence on conceptions of climate change and subsequent decision-making in some cases, there is also evidence that such experience sometimes has little impact on subsequent decision-making (Whitmarsh, 2008). Experience of extreme events is only one factor among many that may interact with experience of other weather events and with expectations for weather and climate to influence how climate change and local weather are conceptualised. The 2002 coastal flood in Dublin and subsequent pluvial floods in August 2004, August 2008 and July 2009 appear to have become part of a narrative of climate change among local decision-makers. For decision-makers in Dublin in particular they have been framed as first of a kind surprise events that were caused by climate change. Climate change has become the explanation for why these events occurred. This raises the question of why some events are attributed to climate change while others are not. The results of my interviews indicated that most respondents
were very willing to attribute certain events they had experienced (usually floods or extreme rainfall) to climate change but were less likely to view other types of events (such as drier weather and droughts) as potential climate change impacts in Ireland.

The results of my interviews suggest that the interaction between information about climate change, lived experiences of local weather and extreme events, and expectations for current and future climate may be an important influence on the ways that climate change is conceptualised and framed by local decision-makers. Respondents pointed to floods and perceived changes in rainfall as evidence of climate change but most did not foresee droughts or drier summer weather as a likely climate change impact in Ireland, although such impacts have been projected in some climate modelling studies (McGrath and Lynch 2008). While the fact that floods and rainfall events have actually been experienced whereas droughts have not occurred in recent years was undoubtedly an important influence on these conceptions, respondent’s comments suggested that flooding had always been considered a possibility whereas for many the idea of drought in Ireland seemed difficult to imagine. Respondents were asked whether they saw particular impacts as likely to be experienced in their city or in Ireland in general as a result of climatic changes. In general respondents answered affirmatively to types of weather or hazards that they had experienced directly or that are commonly viewed as part of the climate of Ireland whereas they answered negatively for hazards or weather events not commonly associated with the Irish climate. Their responses may be an example of what has been described as “the prison of experience” (Kates, 1962 p.140), where decision-making is heavily shaped by the direct personal experience of local officials. Events that have been experienced are viewed as the worst that can happen leading to the
exclusion of more extreme events or different event types from consideration and a narrowing of the range of responses that are considered (Kates, 1962). This also points to the unique challenges presented by the phenomenon of climate change. As I mentioned earlier the divergence between the aggregated global scientific data on climate change and local lived experiences make decision-making about climate change a significant challenge (Jasanoff, 2010).

Many interviewees pointed to perceived changes in rainfall patterns and seasonal weather as evidence that climate change was already happening and that these impacts would continue to be felt in the future (see Table 4.4). For some this belief was based on their personal experience and their memory of past weather. One Galway City Councillor suggested that summer weather in the past was generally warmer and sunnier than at present, “the colour you would have, I remember great summers”. Others pointed to weather experienced in recent years as evidence that weather patterns were changing. One Cork Councillor observed that Ireland was experiencing “all this rainfall in the summer months”, something which was viewed as a change from summers experienced in the past. Another respondent in Cork focused on seasonal changes and unusual weather events as evidence that climate change was already impacting the city and surrounding regions. Referring to wet summer weather he commented “in the last three or four years we’ve seen huge changes in the summer climatic conditions. Look at what’s happened there over July this year. That’s been the same for the last three or four years now”.

For other interviewees, there was also evidence to suggest changing weather patterns. Several respondents pointed to rain-gauge records or other data to support the view
Table 4.4 Comments where interviewees saw changes in seasons or weather patterns as evidence that climate change was already impacting their city.

I remember even looking at photographs recently of when we were younger the colour you would have I remember great summers we had great summers for a number of years, it definitely has changed, the seasons have changed there is no question about that. (City Councillor – Galway)

I think we already are. I think it’s very very clear that we are. I think there are two aspects to that. We’re obviously seeing an increase and a change. I suspect we are seeing a change in rainfall and while I haven’t seen any long term empirical studies around Ireland as a whole that seems to be happening. There are two impacts. One is the climate change side of things. The other is the actual way in which we manage river basins and the way in which we deal with things like using flood plains for building. (NGO Representative – Dublin)

I know for a fact that rainfall in Galway particularly is increasing twenty percent every decade I think that is significant. We get enough rain in the city without it continuing, but if you look at the stats, and I have seen them from some students from the university have shown them to me, and I believe them, that the rainfall here is just increasing so much. (Official – Galway)

I suppose there are two things, if I look at our long term weather, the weather patterns in Ireland in the 1960’s were extremely stable whatever weather you got in New York you got it here seven days later, very predictable. We have had a lot in infrastructure investment over the last one hundred to one hundred and fifty years and we have very reliable rain gauges down in Wicklow which record weather patterns over about one hundred and twenty five years and we find the average rain fall is about 870mm and hasn’t changed but since the 1970’s the intensity with which it falls on a monthly basis has risen dramatically so you get much more intense periods during the month punctuated by much longer drier periods and the increases of up 400% in some cases so exceptionally dramatic. (Engineer – Dublin)

Weather patterns in the last 10 years in particular with summer pluvial rains have been really spectacularly different and that is something that is a cause of concern, the more recent floods out in Donnycarney for instance got a lot of attention. They are things that are happening more frequently, you have these huge downpours in such a short period of time, the system is just not able to cope with that. (Planner – Dublin)

There has been a massive seasonal change, I am 43 years of age, I have seen even over my own life time the way the differences have happened, summers are not summers any more as I knew them like twenty, twenty five years ago. You don’t get the regularity of sunshine, in the winter you don’t get the extremes of cold either that we had in the past. It is very mild, an awful lot of people like it from that point of view but I find it very annoying. I love the idea that every summer you are guaranteed a few weeks of nice sunshine, not for the sake of sunshine in itself, but just the nice bright skies, I love the long evenings of the summer here in Ireland and I love those mornings you wake up when the sky is blue that is why I even love the frosty mornings, because you get them lovely blue mornings as well in the sky, and the whole issue of what is happening from the point of view of the polar caps. That is what climatic change means to me. (City Councillor – Dublin)

I think we have already seen climate change in the very short number of years, look at the summers we are having in the northern hemisphere northern Europe, Ireland, England, and they even cross over into the United States and into Canada, you find the same, summers have changed quite dramatically and that is scary. In every respect, it is becoming less predictable and being less predictable is not a good thing. If you get floods in July and last year we had no summer at all that has tremendous effects both for the country economically and socially. (NGO Representative – Galway)
that changes were already occurring. Participants in all three cities suggested that the total amount of rainfall being experienced might not be changing but that the temporal distribution of rainfall had changed significantly. More extreme events where large amounts of rainfall are experienced in a short period of time were thought to have become increasingly common. When asked if they felt such a trend was likely to continue into the future most respondents replied in the affirmative. There was strong support for the idea that climate change would bring increased extremes of rainfall in the future. When asked what climate change might mean for the future of their cities one Cork Councillor simply answered “more rain” while one Dublin official succinctly replied “flooding”. The only exception to the widespread predictions of increased rainfall came from one official in Galway who declined to give permission to be quoted directly. He suggested that while increased rainfall was certainly possible and the experience of recent years suggested an increased frequency of extreme rainfall events, it was still too early to confirm whether this was evidence of a significant climate shift or simply a period of unusual weather within the range of current climate variability.

This strong belief that climate change would bring increased rainfall, flooding and seasonal change contrasts sharply with respondents views on the likelihood of drought, drier summer weather or water supply challenges. For some the possibility seemed remote. “I think in Ireland it’s extremely difficult to imagine that” commented one Cork City Councillor. “No, not here” remarked an executive official also in Cork when asked about the possibility of drought. Another Cork Councillor observed, “just given the rain that we’ve had this July it’s hard to imagine”. For some participants in Galway summer drought and water shortages certainly seemed possible but not in
Galway. One Councillor commented “it has become an issue in Dublin” while another commented that it was an issue for eastern regions but was not likely in the west. These comments suggest that spatial conceptions of the types of impacts climate change might bring are closely linked to interviewee’s sense of place and to the experiences of weather and climate they associate with their home cities. In contrast to interviewees in Cork and Galway, when asked about the potential for future droughts respondents in Dublin frequently mentioned a concern regarding future water supplies for the city (see Fig. 4.6).

Figure 4.6. Respondent’s views on whether drought, drier summer weather or water supply challenges would be an issue in their cities in the future.

However, most interviewees believe that this was the result of the rapid expansion of the city’s population and the limitations of existing infrastructure rather than a likely consequence of climate change. While their direct experience of rainfall and flooding is undoubtedly an important factor influencing their conceptions, the contrasting views of respondents regarding drier weather and droughts also appears to be linked
to their sense of place and their expectations for weather and climate associated with this. After all, for many Irish people as well as for visitors, an image of a rainy climate is seen as an integral aspect of their sense of place in Ireland. Interviewee comments that it was difficult to imagine a drought occurring in Ireland illustrate how the potential for such an impact contrasted with their experience and expectations. For many interviewees the thought of droughts or water shortages induced by dry summer weather is totally incongruent with their experiences and expectations for Irish weather.

Several interviewees suggested that rain, storms and flooding were to be expected and were already part of the fabric of life in their city. This view was particularly common in Cork where one councillor observed that flooding was “just part of the way of life of the city” Flooding was viewed as a phenomenon that occurs occasionally but that caused relatively minor losses as the city has adapted to it. The same interviewee suggested that in order for the City to take action to prepare for the impacts of climate change, an awareness of what that would mean for the city and its future would also have to become a part of daily life for its inhabitants. In his view it was only then that effective responses would be implemented. The interaction between information about climate change and local experience is also illustrated in the comments of one interviewee in Galway who suggested that changes in storm patterns were possible but not something to be concerned about as “we are well used to storms and we get a fair bit of that”.

This comment touches on one of the key ways in which respondent’s views on climate change seemed to be influenced by their personal experiences and by their
sense of place in their home cities. Where particular types of weather or hazard were seen as an integral part of their sense of place, of the experience of living in that city, respondents generally seemed more willing to view increasing frequency of such events as a likely consequence of climate change, whereas events that were not part of their sense of place were more likely to be rejected. The exceptions to this were hazards like coastal flooding in Dublin which shocked those who experienced it, rapidly changing their conceptions of climate impacts. However events that were already part of their lived experience or weather and climate also seemed less likely to elicit major concern. As already mentioned interviewees in Cork saw flooding as a fact of life in the city. Similarly in Galway several respondents suggested that the city has experienced flooding in the past and might do so again, although these floods were generally not thought to have been influenced by climate change to date. A number of respondents pointed to a location in the city known as Flood Street as evidence of the importance of flooding in the city’s past. An official in the city’s planning department commented “flooding events have occurred on Flood Street which by its very name has had historical links and flooding associated with high tides. People wouldn’t necessarily have put that down to climate change” while one of the City Councillors noted “it wasn’t named Flood Street for nothing”.

The results of my interviews suggest that information about the potential impacts of climate change may interact with local decision-makers sense of place (and particularly the role played by weather and climate in this) in complex ways leading to some impacts being viewed as more likely than others but also perhaps leading those same respondents to be less concerned about these impacts. Experience of weather and extreme events plays an important role in shaping local decision-makers’
conceptions and framings of climate change but their pre-existing expectations for local weather and climate are also important. Relph (2008, p.32) suggests that effectively addressing the local implications of global environmental challenges requires a “pragmatic approach to place” that “lays the groundwork for finding locally appropriate ways to cope with the uncertain effects of emerging social and environmental challenges”. This may have important implications for societal responses to the impacts of climate change. The model of climate change science centred on the Intergovernmental Panel for Climate Change (IPCC) reports focuses on the global nature of the climate change issues whereas all effects of climate change are ultimately felt in local places. Decisions about how to respond to those effects are also most likely to be taken at the local level. This creates a mismatch between the global nature of the challenge and the local scale at which it is encountered by decision-makers. Mismatches between the scales at which environmental challenges occur and the scales at which decisions are made are an important challenge for human dimensions of global environmental change research and climate change research in particular (Wilbanks, 2006). Strategies to address the impacts of climate change must recognise the complex ways in which climatic changes are conceptualised and understood at local level.

**Ongoing hazards and intersecting crises**

In each of the case study cities, decision-makers often focused on one particular issue more than others. In the case of Dublin this was flooding events such as the 2002 coastal flood and the more recent pluvial floods. However for decision-makers in Galway concerns about coastal erosion were the most frequently mentioned. A popular local beach, amenity and conservation area at Silver Strand and Knocknagoneen Hill on the city’s western edge has been experiencing ongoing
erosion and shoreline retreat for a number of years (see Fig. 4.7). For some this issue was identified as the main environmental hazard facing the city while for others this erosion was directly linked to the impacts of climate change (see Box 4.8). For this later group climate change fulfilled the same explanatory role for erosion as it does for floods in Dublin. Several interviewees commented that erosion was a serious concern in this part of the city and that coastal protection works were planned to prevent future erosion. One Councillor commented “I think we are faced already with problems of coastal erosion and we as a council have taken steps in relation to that. We are very aware that coastal erosion is taking place all the time”. Another councillor linked the ongoing erosion directly to climate change commenting “coastal erosion because of climate change has become a bigger issue”.

This focus on coastal erosion is somewhat remarkable as it impacts only a small portion of the city’s coastline and much of the city’s waterfront is already protected by extensive rock armour and other engineering defences (see Fig. 4.8). This focus is perhaps even more surprising given that no houses or businesses are likely to be impacted by this erosion and economic impacts were often central to interviewee’s concerns in all three cities (See Chapter 5). The focus on coastal erosion rather than coastal flooding which has also impacted the city is further evidence of the complex ways in which climate impacts are framed and prioritised in local places. It also suggests that highly visible and ongoing hazards that attract public attention may be seen as of greater importance than infrequent and less visible hazards even if this might have more negative consequences for the city’s population. Flooding in the city to date has impacted only a small number of homes and businesses on an infrequent basis whereas the erosion of the cliff face at Silver Strand has been ongoing and
highly visible. The focus on erosion instead of potential flood exposure was highlighted by a representative of an environmental Non Governmental Organisation (NGO) in Galway who suggested that the money might be better spent on flood mitigation measures in other parts of the city.

The evidence from Galway provides a particular illustration of the challenges associated with decision-making under uncertainty. Possekel (1999) suggests that humans will always try to reduce or avoid uncertainty as much as possible. Tversky and Kahneman (1974) contend that as all information is never available, humans always employ a simplified version of the reality of their environment through devices such as heuristics strategies. The concept of the ‘availability heuristic’ (Tversky and Kahneman 1982; Tversky and Kahneman, 1974) may help to explain some of the responses provided by Irish decision-makers. The ‘availability heuristic’ is used as a means of assessing the likelihood of a particular event occurring by calling to mind similar instances of which the person has experienced or is aware of (Tversky and Kahneman, 1974) but can result in the substitution of what is already known for that which is uncertain or unknown. This response combined with the concept of ‘the prison of experience’ (Kates, 1962) could account for the emphasis on erosion in Galway. The known hazard of erosion is emphasised and is the focus of decision-making while more uncertain hazards such as coastal flooding are largely ignored. Similarly across all three cities, the known phenomenon of rainfall, floods and storms are thought of as plausible concerns while droughts are excluded as they have not formed part of the recent experience of hazards in Ireland. Such conception of hazard may also lead to what Alexander (2000, p.78) describes as the “syndrome of personal invulnerability” which leads people to assume that disasters do not happen to
them. For respondents in Galway, severe floods happen somewhere else while for all respondents droughts happen in other places but not in Ireland.

The results of my interviews in Galway also illustrated how the intersection between two or more crises may shape conceptions of both and the types of responses that follow. Decision-makers across all three cities frequently spoke about the impacts of the current economic crisis in Ireland and how environmental issues were now perceived as less important than they had been previously. Economic recovery and growth was now the number one priority. While I will return to this issue in greater detail in Chapter 5 it is worth mentioning that in some interviews, respondents suggested that interest in climate change as a local and national policy issue had already peaked and that it was no longer as much of a priority issue. It was suggested that climate change had been a top policy making priority one to two years previously but that it had now been superseded by several other issues, most notably economic recovery. One Galway City Councillor observed that “climate change was a huge issue about twelve months ago”. He suggested that it had been a popular issue among his constituents as well as among both local and national policy makers but that this was no longer the case. This change might be explained by the ‘issue attention cycle’ (Downs, 1972) which posits that many policy issues rise to prominence after particular events or other triggers but then slowly come to be seen as less important once the full costs of addressing them are realised and other issues become more pressing. Downs’ model assumes that a limited number of issues can remain a policy priority at any one time but he suggests that new policies can be enacted or new institutions established during the peak of interest in the topic and these can have positive impacts long after attention has moved elsewhere (Downs 1972). The issue
attention cycle has been critiqued as an overly simplistic approach that cannot adequately capture the role of factors like the mass media in influencing perceptions of a particular issue (Boykoff and Boykoff, 2007). However the Down’s model does highlight that most issues may remain a policy priority for a limited period of time before being replaced by other concerns. The complexity of perceptions of risk and the variety of reasons why some hazards come to be viewed as particularly serious when others are not, has also been explored by the proponents of ‘social amplification of risk’ framework (Kasperson, et. al., 2003; Kasper and Kasperson, 1996; Kasperson, 1992; Kasperson, et. al., 1988; Pidgeon, et. al., 2003). This framework seeks to integrate a variety of factors that may lead to the amplification of some risks and the attenuation of others, including the ways in which risks are communicated and conceptualised. Particular importance is placed on ‘signals’ that can play an important role in how risks are perceived and conceptualised. These signals can be hazards events themselves or any messages about risk and hazard that affect perceptions of the seriousness or manageability of the hazard (Kasperson, et. al., 2003; Kasperson, et. al., 1992; Slovic, 1987). For decision-makers in Ireland events such as coastal and pluvial flooding in Dublin combined with media coverage of concerns regarding global climatic change may have served as the signals for an increasing concern regarding flood hazards.

In more recent times signals related to the emerging economic crisis may have lead to the amplification of concern regarding economic change and the associated decline in anxiety about environmental hazards. While the influence of the economic difficulties experienced in Ireland were cited as the main reason for climate change no longer attracting the same priority, it is worth reflecting on whether the ‘peak’ in interest in
Figure 4.7. The eroding cliff face at Silver Strand, Galway.

Photo: James M. Jeffers, August 2009.

Figure 4.8. Coastal defences at Salthill, Galway.

Photo: James M. Jeffers, July 2009.
Table 4.5. A selection of Galway respondent’s views on coastal erosion.

<table>
<thead>
<tr>
<th>Coastal erosion is a big issue here we are going to have to spend an awful lot of euro in the next number of years to protect the area out here between Barna and Silver Strand, there is a provision there to provide coastal protection. It would also form an amenity as well in terms of a walk way. There are big financial implications in doing that. That is an issue here as well for the council. (City Councillor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think we are faced already with problems with coastal erosion and as a council we have taken some steps in relation to that. We are very aware that coastal erosion is taking place all of the time. It is a serious problem at Silver Strand so as a council and as elected members we have agreed with the officials that this is a serious problem and we have taken steps in the sense that we employed consultants to do up a report, we got a presentation of that report. They presented to us what their recommendations were and as a re-elected councillor going back that will be one of my first motions as to where the status of that is at. It was a very good report and very good recommendations. The report was really in relation to coastal erosion and preventing that and a side issue then we were getting recreational facilities as well so I will be asking where is that. We gave our thumbs up to that and we were certainly fully behind it, to implement it now. (City Councillor)</td>
</tr>
<tr>
<td>Not at all there is no money and it won’t happen, and the thing about is, it is such a slow process, they adopted a plan which is to create some coastal protection underneath the cliffs and not further out, they are not going to put in any groynes or anything like that. When they put this coastal protection underneath the cliff and they are going to use that as the foundation for putting in a coastal path, a walk way along it, an amenity, which would be a nice thing to consider, but when there is no money it aint going to happen anyway. They are talking in the reports that it is going to be 25 years before there is any real need for it because they reckon it will be at least 25 years of constant erosion before any house is wrecked. It is not a priority and what we have said in expending that kind of money is a waste of resources and really they should be a better use put to that kind of money, because of immediate interest to everybody in Galway is if sea levels do rise you have got the houses in the Claddagh, French Ville, and the houses down around the Long Walk and the city centre itself. (NGO Representative)</td>
</tr>
<tr>
<td>Part of the sea shore is gradually eroding away at Lough Rusheen and if something isn’t done within the next 15 years it will be gone forever. It’s a beautiful local amenity and I’m very interested in it from that point of view. While it may not be linked to global warming it is certainly part and parcel of what I believe may be on the way here in the future here and in other parts of the country as well. (City Councillor)</td>
</tr>
</tbody>
</table>

climate change has happened and whether its decline may be influenced by a range of other influences, not just the current economic crisis. Identifying whether such a ‘peak’ in interest and concern regarding climate change would require a new set of data collection perhaps involving new interviews with a range of decision-makers and other stakeholders and an analysis of climate change discourses portrayed in the
media and other information sources. This may represent an interesting and important area for further study as it may have profound implications for the current climate change policy process primarily lead at the global level by the IPCC. The IPCC process currently appears to proceed on the assumption that more and better information disseminated in a top down manner will lead to effective action to mitigate the drivers and adapt to the impacts of global climatic change. It also assumes that climate change will remain an issue of concern among decision-makers. If it does not remain high on the policy making agenda then the IPCC process may have already failed in its objectives and future discourse and narratives of climate change may be very different from those we have witnessed to date. It is possible that at the local level we will continue to see a reactive decision-making processes where individual hazard events are seen as external shocks and responses to these individual events do not promote reductions in overall vulnerability or reduce losses experienced by local populations.

The economic crisis is just one example of a national and global crisis that may influence local conceptions of climate hazards. As mentioned earlier surprises and they ways in which they are framed and understood can have an important influence on decision-making and its outcomes (Kates, 1985; Mitchell 2004; Mitchell 1996). This is illustrated by recent experiences in Ireland. In Dublin the surprising and unexpected events came in the form of floods and in recent years appear to have led local officials and decision-makers to frame climate change impacts as a contemporary challenge for the city. In Galway it appears that other surprise events may well have been responsible for focusing the attention of decision-makers and the city’s population elsewhere. One City Councillor commented
“I have been aware of the problems arising as a result of climate change and the rise in the water, but as a City Councillor over the last year we have been very busy. It is not an excuse, more an explanation, extremely busy and we have had a number of crises with our drinking water from cryptosporidium to lead, so we haven’t had a chance”.

The crises referred to include a serious outbreak of cryptosporidium in the city’s water supply in 2007 and the discovery of high concentrations of lead in the water supply in several parts of the city water supply due to the use of lead piping in the water mains system. The replacement of these pipes with newer less hazardous alternatives, at a time of financial constraint due to the economic crisis is likely to be a significant challenge for the city. It seems likely that not only have surprise hazards or climate impacts shaped some conceptions and understanding of hazards, but other surprise events not directly related to climate impacts may be equally important as they may influence where climate impacts are ranked relative to other concerns facing the city.

**Knowledge and information**

Another factor that may play an important role in the ways in which climate change and hazards are conceptualised in local places are the types of information local decision-makers may have about these issues and where that information is obtained. There is some evidence that experience of hazard events may trigger a new interest in hazards exposure and vulnerability leading to new research and knowledge. In Dublin, the 2002 coastal flooding triggered a new research focus on the local implications of climate change. Research studies commissioned by Dublin City Council revealed that the city’s exposure to coastal flooding was much higher than officials had previously thought and as one executive official observed “we came very close to that flooding in previous years without knowing it”.
In addition to this new knowledge about the local exposure of the city to flooding, decision-makers in Dublin began to co-operate with agencies in a number of other European countries sharing knowledge and experience on flood preparedness and responses. Diffusion and dissemination of knowledge about climate change has been identified as an important influence on the ideas city officials may have about how climate change may impact them (Carmin, et. al. 2009). The Dublin Coastal Flooding Protection Project established in direct response to the 2002 coastal flood became part of the EU funded SAFER (Strategies and Actions for Flood Emergency Risk Management) Project which involved collaboration between Dublin City Council and agencies in the United Kingdom, Germany and Switzerland. In more recent years Dublin City Council has also formed a partnership with agencies in France, Germany, Belgium and the United Kingdom as part of the Flood Resilient Cities Project which is also funded by the EU. It is likely that the knowledge and experience shared through these projects helped to reinforce the impact of the 2002 event and shape framings of climate change as an immediate concern. Several interviewees spoke of the knowledge and information they had gained as a result of these partnerships with one official commenting “I think a lot of the networking that has been created by European Union projects is very helpful. We have now identified links with other projects where you can get reliable information”. While the dissemination of knowledge and information through these sources has been an important influence on local conceptions and constructions of climate impacts, it is doubtful that such diffusion would have occurred without the 2002 event to act as an initial trigger for action.
Conceptions of climate impacts as an issue requiring immediate action are also likely to have been shaped by ongoing changes in flood management and climate adaptation policies at both national government level in the Republic of Ireland and within the European Union. A significant shift in national flood policy including an increased emphasis on including flood prevention as an aspect of land use planning has occurred in recent years. This policy change was itself heavily influenced by the impacts of the 2002 coastal flood in Dublin. In addition to this dissemination of knowledge in Dublin in recent years, respondents across all three cities sought information about climate change from a variety of sources. Interviewees were asked where they had (or would in the future) obtained information on climate change and its local impacts in Ireland or in their city. Where informants obtained information about climate change and the types of information they obtained is likely to play an important role in shaping their conceptions and framings of climate change and on the types of decisions they subsequently take. While a variety of information sources were mentioned three in particular were frequently cited; the internet, colleagues or other professional contacts, and national government sources or publications. Virtually all interviewees commented that the internet is or would be their first source. Even among engineers, planners and others who might be thought of as having particular expertise, the internet was often the first source they mentioned (see Fig. 4.9 and Table 4.6). Colleagues or other professional and personal contacts were also a frequently cited source of information, particularly when those colleagues were thought of as having a particularly relevant set of expertise or training. “I suppose it’s a very Irish thing but I would go to somebody I know who knows something about it” commented one interviewee in Dublin while another commented “I would go to [naming an official with a background in engineering] as he’s our expert”. National
**Tables 4.6. Interviewee comments on sources of information on climate change.**

Well obviously the internet, probably the Dept. of the Environment, or just simply Google it, obviously with an Irish link to it, to keep it local. The first thing that springs to my mind is SEI, Sustainable Energy Ireland, I don’t know why I think that but I suppose it is clean energy so it has to be good for the environment springs to mind but the internet is where I would go. (Unelected Official – Galway)

I would have looked at the internet and spoken to people in the Department of the Environment about flooding issue but it was very difficult to get specific information (City Councillor – Galway)

I suppose it depends on which part of the subject I am looking at, if it is the environmental issues I look to the U.K. and the U.S. most of the time and mainly on the web, well it is all on the web really because it is changing so fast. (Engineer – Dublin)

I suppose obviously the web is an important one when you’re looking for any kind of information now. I would also look to those who are charged with responsibility for it like the Office of Public Works. University College Cork obviously would have certain information. They would be the sources. The Institute of Engineers of Ireland would have conferences as well. (Engineer – Cork)

I suppose I’d look at national policies, national government policies maybe. I actually did have a look at the national one today in preparation for this. The net. Web search has made things so much easier now. That would be my first port of call. (City Councillor – Cork)

I would go to the internet, I would try and go to the United Nations ones and I would look for the stuff from academia as well as much as possible. I find that the government web sites in Ireland and even the European web sites that they would have is very basic information. (City Councillor – Galway)

I would go to [naming an engineer], he’s our expert. (Planner – Dublin)

I’d start with the internet, let’s be honest about it. On the local level then it would be back into the engineers and people in the environment section in the City Council here. It would be about trying to find sources, primarily from the internet. I’m fortunate maybe as well in that I would have access to academic journals and that I could do a more robust scientific research rather than just the Google search. The difficulty with the internet is that you have to be a skilled reader. You have to know what you’re reading and who has posted it. Whether it has been peer reviewed or evaluated. You have to question what type of scientific validity it has. I think the internet is the first port of call and then known experts that you could contact. (City Councillor – Cork)

I suppose it is a very Irish thing. I would go to somebody I know that knows about it (City Councillor – Dublin)

I’d probably Google. After that I might try using some personal contacts to link into UCC or something like that. I’d perhaps expect to find something from the City Council. I’d imagine they’d have access to various reports. It’s information I’d imagine that should be accessible, maybe not specific to Cork but the general issues, the key factors I’d imagine are fairly readily available. For example I imagine the Lee Study will provide a lot of information and a lot of reference documents as well so I imagine that will be a fairly core document when it comes out. (Business Representative – Cork)
Figure 4.9. Sources or potential sources of information on climate change.

<table>
<thead>
<tr>
<th>Information Sources</th>
<th>No. of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet</td>
<td>20</td>
</tr>
<tr>
<td>Media</td>
<td>10</td>
</tr>
<tr>
<td>Colleagues</td>
<td>10</td>
</tr>
<tr>
<td>Nat. Gov. Publications</td>
<td>15</td>
</tr>
<tr>
<td>EU Publications</td>
<td>15</td>
</tr>
<tr>
<td>Met Éireann</td>
<td>5</td>
</tr>
<tr>
<td>Universities</td>
<td>5</td>
</tr>
<tr>
<td>Conferences</td>
<td>5</td>
</tr>
<tr>
<td>Local Libraries</td>
<td>5</td>
</tr>
<tr>
<td>NGO Publications</td>
<td>5</td>
</tr>
</tbody>
</table>

government departments and their publications, particularly those of the Department of the Environment were also frequently mentioned as a source of information that respondents had utilised in the past and may use in the future. While these three sources were the most commonly cited, a range of others were also mentioned including print media, radio and television documentaries, Met Éireann\textsuperscript{22}, universities, conferences, local libraries and NGO publications. The dominance of the internet as an information source is perhaps unsurprising but it has a variety of potential implications. The most obvious is a concern regarding the reliability of the information obtained; something that was alluded to by a number of respondents. A number of interviewees also expressed some frustration at their inability to source locally relevant information that was sufficiently detailed and specific to assist in their decision-making. One City Councillor in Galway complained that the information available was often “very basic” and that it was “very difficult to get specific information”. Many respondents also commented that they had not sought such

\textsuperscript{22} The Irish Meteorological Service
information frequently and had done so only in response to specific hazards such as flooding in their local area. The availability of locally relevant information is certainly a challenge for effective decision-making around climate change. Local physical, social, economic and cultural characteristics often play an important role in shaping both exposure and vulnerability to environmental hazards but information on these factors may not be readily available at the local scale. This is by no means a new challenge but it is one that may become increasingly problematic as local decision-makers engage with climate change in their areas of responsibility. Reliance on internet sources may limit the types of information obtained and emphasise some framings of hazards and climate over others. However the opposite may also apply as the internet increases the open availability of types of information and datasets that were previously held only by specific experts.

The importance of colleagues and other contacts, as well as national government departments as a source of information may also have important implications for framings of climate change and hazards, as well as for local decision-making. Where interviewees named the colleagues they had sought information from these were almost always engineers. These engineers were often referred to as having expertise that would be relevant to climate change and hazards, and that this expertise would leave them best placed to advise on appropriate policies and responses. This reliance on engineering illustrates the dominance of a particular discourse of hazards responses and ensures that this dominance is likely to continue. The reliance on engineering also emphasises a particular set of potential responses to hazards and privileges some types of expertise and knowledge over others. It assures that hazards continue to be viewed as biophysical events that can be prevented through appropriate
management interventions (See Chapter 6).

The view that particular forms of expertise are the most suited to addressing hazards and climate issues is also illustrated in the ways in which many interviewees answered questions during my research. Many elected representatives and some executive officials with backgrounds in fields other than engineering suggested that their own knowledge was very limited and that they were not experts. Answers to questions were frequently prefaced with comments such as “I’m not an expert on this but”. Several suggested that they would have to be advised by experts when making decisions related to climate change or environmental hazards. In contrast executive officials, particularly those with an engineering background generally appeared more confident in their own knowledge and expertise and did not preface their answers with any qualifications. Of course it is fair to say that the executive officials do possess expertise and training that many of the elected representatives and other stakeholders do not, and that this expertise will assist in some decision-making and policy formation. However the focus on engineers as the appropriate experts on climate change is likely to privilege one type of expertise and one set of responses to hazard over others, potentially limiting the range of alternatives that may be considered in the decision-making process and ultimately leading to the adoption of policies that may not effectively reduce vulnerability and hazards losses (see Chapters 6 and 7).

The results of one interview in Galway also illustrated how a perception of information sources and expertise can evolve in unexpected and unique ways due to local circumstances. In Galway it appears that the local harbour master has found himself in a situation where he has been perceived as an expert on the exposure of the
city to coastal flooding. This perception appears to be based on assumption that his job requires an awareness of tidal and weather conditions and that this knowledge allows him to predict flooding. An unofficial alert system has emerged where city council officials will rely on his guidance and assistance in determining whether a particular confluence of tidal and weather conditions is likely to produce flooding in the city or not. Based on his opinion warnings may then be disseminated through local broadcast media if flooding is thought likely. This warning system has emerged on an ad-hoc basis and has not been replicated in other Irish cities. Dublin City Council has developed its own warning system in response to the 2002 event, while there is currently no warning system in operation in Cork\textsuperscript{23}. This example from Galway illustrates how local circumstances, personal relationships and other factors may combine to shape decision-making processes and informal institutional arrangements may develop in unexpected ways. This combined with the reliance on particular colleagues for information and expertise, also suggests that for a variety of reasons key individuals may come to play a central role in the types of decisions that are taken.

Before concluding this section it is worth reflecting on the motivations of decision-makers. Researchers have often assumed that decision-makers are rational actors and that in the case of local officials the interests of the citizens of their city are at the forefront of their concerns. Alexander (2000, p.17) strongly cautions against assuming “that the desire to do the right thing underlies human action” and suggests that more research is needed on issues such as the potential influences of organised crime on vulnerability. In the Irish context it is possible that political corruption in the planning

\textsuperscript{23} The flooding experienced in November 2009 may act as a catalyst for the implementation of a warning system in Cork.
process may have played an important role in shaping exposure and vulnerability to flood hazards. Allegations of corruption in the planning processes in a number of locations have lead to a long running Tribunal of Inquiry into planning matters particularly in Dublin. It seems plausible that motivations other than the common good could have led to inappropriate development in flood prone locations or in areas where the development would contribute to significant increases in runoff. The regulation of planning and development and its implications for flood exposure and vulnerability in Ireland may represent an area for further research.

Contrary responses and scepticism
Before concluding my discussion of conceptions and framings of climate change, I now turn to those respondents who expressed scepticism or opinions contrary to those of most interviewees. Perhaps their answers can illuminate other factors that may shape local discourses of climate change. As mentioned earlier in this chapter almost all interviewees viewed climate change as a serious issue already affecting their city. Only two interviewees, one City Councillor and one executive official (both from Cork) viewed climate change impacts as an issue likely to emerge more than twenty years in the future. Both responded that they believed it would be at least a number of decades before climate change become a pressing issue in Cork. For the elected representative, his framing appeared to be influenced by conversations with friends, colleagues and constituents as well as through some knowledge of climate data. He remarked “I personally don’t see it being a major problem for decades. I don’t see it as an imminent issue and very few people I talk to see it in imminent terms”. He also commented “My superficial reading of the records would suggest that we’re not experiencing anything totally unusual and it’s more the systematic pattern over time”. For the executive official the impacts of climate change were likely to be felt mainly
in terms of sea level rise and its impacts on the frequency and intensity of coastal flooding. He anticipated this being of minor concern until at least twenty years from now when the increasing level of exposure might require the construction of a large scale engineering solution such as a tidal barrier across the estuary of the River Lee. It is worth noting that this same official was one of a minority of respondents who expressed doubt about whether climate change was happening at all.

Uncertainty about whether global climate change was happening at all was not a common response. It is clear from the earlier discussion of temporal and spatial conceptions of climate impacts that most interviewees saw climate change as a reality that was already impacting their cities. No one who participated in the study expressed complete scepticism that climate change was happening. It seems likely that if potential participants had such views, they may be among those who declined to participate in the study. While no interviewees completely rejected the idea that climate change was happening, there were a small number who expressed concern regarding whether there was currently sufficient evidence of its scope and extent. One executive official in Cork appeared accepting of the idea that climate change was happening but sceptical of its extent and of arguments suggesting that immediate responses were required. Expressing some scepticism regarding the available scientific evidence he remarked “I have heard it said that most of the monitors they have to monitor climate change are in the northern hemisphere. There are very few in the southern hemisphere. People go on crusades about the extent of climate change. Whatever decisions we make should be well founded rather than going on crusades”. A city employee in Galway also expressed doubt regarding the evidence for local impacts of climate change noting “there hasn’t been any evidence in Galway to date
of rising sea levels so it is very hard to start making policy decisions on the basis of no information, but it crosses people’s minds but there is a lot of scepticism as well about climate change and whether it is going to affect Galway”. This comment suggests that decision-makers are aware of what impacts might be expected from climate change but that in the absence of direct evidence or experience they may not see it as an issue likely to impact their city or their area of responsibility. In the absence of lived experiences of unusual events, climate change impacts did not fit with their sense of place and with their experiences and expectations for weather and climate in their city. Some informants admitted to being sceptical of the importance or even the reality of climate change in the past but to having changed their opinions due to a combination of increased information and experience of climate impacts. One Dublin City Councillor commented “I suppose I would have been sceptical of it years ago and now I am sceptical of those who are sceptical of it”. He also remarked “my views have changed. I would have become more accepting of it as a serious problem”. Had my research been conducted in the aftermath of the controversy regarding email exchanges between climate scientists it is possible that greater scepticism regarding the validity of climate change science might have been encountered.

Conclusions
In this chapter I set out to examine the ways in which local decision-makers in Ireland’s coastal cities conceptualise and frame climate change and environmental hazards, as I suggested that these framings may be an important influence on the type of timing of adaptation decisions. More importantly I aimed to examine why they conceptualise and frame these issues in the way that they do, in order to advance our understandings of how we individually and collectively make decisions about environmental hazards and our vulnerabilities to them. The results of my research
present a complex and multifaceted picture, both of discourses and narratives of climate change and of the factors that help to shape them. Most of my interviewees clearly viewed climate change as a phenomenon that was already influencing life in their cities in a variety of ways. Yet at the same time they tended to emphasise that its impacts would be more keenly felt in other distant parts of the world. They also tended to view climate change as something that would have both negative consequences for their city, and offer some opportunities.

It is clear that several factors played an important role in shaping both how climate change was framed and understood, and the types of adaptation decisions that were taken. These factors may have important implications for practical decision-making in relation to hazards losses and climate change impacts, as well as for our understanding of human-environment relationships more generally. Extreme events that were perceived as shocking or unusual played an important role in shaping subsequent policy. If experience of extreme events is required in order to motivate adaptation this clearly presents serious challenges for both climate change adaptation and hazards loss mitigation. It creates a reactive decision-making process in which action is taken only in response to past losses. However this past experience may not be a reliable guide to future hazards and may not facilitate the types of actions that will successfully mitigate future losses.

The mismatch between the scientific narrative of global climate change and local experience and decision-making is also problematic. Local decision-making is heavily influenced by local experience. This is leading decision-makers to consider some climate hazards and ignore others based on their expectations for future climate. As
with the experience of extreme events this experience may not be a reliable guide to future climate. Scientific narratives of climate change are understood by local stakeholders in the context of their sense of place and experience of local weather. A means of integrating these narratives is required to ensure more effective decision-making.

There are also challenges related to the production and dissemination of knowledge. The limited availability of locally relevant information is seen as a constraint by many decision-makers. The reliance on the internet and colleagues as sources of information also presents a range of challenges. While the internet may offer multiple perspectives and extensive information, there are concerns regarding the accuracy and usefulness of the information decision-makers may obtain. Relying on colleagues may privilege particular perspectives and sets of expertise over others, leading to an emphasis on particular adaptation options and the exclusion of others. Chapter 6 provides a more detailed discussion of this concern.

The intersections between climate change and a range of other challenges are also influential. Experience of other ongoing hazards or surprise events can lead to them becoming the decision-making propriety while climate change is not extensively considered. Values, ethics and ideological influences are also important. In Chapter 5 I illustrate how the intersections between economic crisis and environmental change have created the material and ideological conditions in which economic development becomes a policy priority. Under these conditions, all other decision-making is viewed through an economic lens with important implications for the types of decisions that are made.
Chapter 5: Intersecting Crises and Double Exposures

Introduction
In the preceding chapter I examined a number of factors that play an important role in shaping the types of decisions that are made by local policy makers in relation to environmental hazards and climate change impacts, when those decisions are taken and how they are made. I illustrated how spatial and temporal conceptions of climate change and its impacts play a crucial role in decision-making. Drawing on my empirical research I outlined how those framings are shaped by a variety of influences including the diffusion of knowledge among policy makers, experience of past hazard events and the role of weather and climate in decision-makers’ sense of place. Perhaps most influential was experience of unexpected or surprise events as these had the potential to transform perceptions and understandings of hazards and climate change with important consequences for the types of policies that were enacted in coastal cities. In this chapter I turn my attention to another form of surprise and crisis, and its influence on local hazards and climate policy. In the eyes of many observers we live at a time of unusual and unprecedented crisis as the impacts of economic and financial difficulties are felt around the world. At the same time global environmental change and particularly climatic change has been framed as an unprecedented challenge that we must take immediate steps to address. Failure to do so, it is suggested, will lead to a range of impacts including increased disasters and extreme weather events (Solomon, et. al., 2007). While these two crises are rarely analysed in unison, they interact in complex ways that may have profound implications for the outcomes of both (Leichenko, et. al., 2010; Leichenko and O’Brien, 2008).
In this chapter I examine how climatic and economic change have interacted in Ireland, reshaping patterns of vulnerability and transforming the contexts within which all local policy formation and decision-making take place. I begin by utilising the double exposure framework (Leichenko, et. al., 2010; Leichenko and O’Brien, 2008; O’Brien and Leichenko, 2000; O’Brien, et. al., 2004) to examine the interactions between environmental and economic change in Ireland’s coastal cities. I contend that the economic policies that produced the economic success known as the ‘Celtic Tiger’ also sowed the seeds of Ireland’s current economic collapse and that interactions between environmental and economic change are enhancing the vulnerabilities of local residents to environmental and economic stressors. This analysis provides the context for the second portion of the chapter which draws on my empirical research to examine how the economic crisis is shaping local policy and practice in the cities of Dublin, Cork and Galway. I suggest that a ‘growth mentality’ that become embedded in public policy during the years of economic success, combined with the current economic crisis has created the material and ideological conditions in which an economic discourse dominates all areas of decision-making. While an economic perspective is always likely to be an important influence on decision-making, in the contemporary crisis it has become a hegemonic narrative that stakeholders are unwilling or unable to escape. The results of my interviews suggest that local decision-makers view almost all of the issue they face through an economic lens. This was evident not only in the ways in which local decision-makers viewed climate change and hazards but in the ways in which they described Ireland, their cities and their role as local decision-makers. An economic framing of hazards shapes policy and practice in ways that have profound implications for the vulnerabilities of
coastal cities to ongoing and future changes in both environmental and economic conditions.

**Double exposures in Ireland’s coastal cities**

The exposure of cities to environmental hazards and the vulnerabilities of their populations to disaster has been the subject of a growing body of literature focused on cities in both developing and developed world contexts (Chatterjee, 2010; Kahn and Mustafa, 2007; Lopez Marrero and Yarnal, 2010; Mitchell, 1999; Pelling, 2003, Pelling and Wisner, 2009). This has coincided with a more general focus on the factors that influence and shape the vulnerability and resilience of individuals, households and communities to environmental hazards in both urban and rural contexts (Adger, 2000; Cutter, *et. al.*, 2000; Cutter and Finch, 2008; Eakin, *et. al.*, 2010; Eakin, *et. al.* 2009; Kleinosky, *et. al.*, 2006; Klinenberg, 2002; Wilhelmi and Hayden, 2010; Wolf, *et. al.*, 2010). A largely separate body of literature has focused on globalisation and its consequences, often examining its links with neoliberal ideologies (Chang, 2008; England and Ward, 2007; Harvey, 2005; Held, 2005; Held *et. al.*, 1999; Stiglitz 2007; Stiglitz 2002). The factors that influence the impacts of globalisation at national, regional and local scales, and the uneven nature of its outcomes have also been highlighted (Held and Kay, 2007; Leichenko and Silva, 2004; Silva, 2007; Silva and Leichenko, 2004). Most recently several authors have focused attention on the causes and consequences of the current global and financial crisis (Bellamy and Magdoff, 2009; Harvey, 2010; Schwartz, 2010; Stiglitz, 2010; Stiglitz, 2009; Wolff, 2009).

which to examine the complex interactions between processes of globalisation and processes of global environmental change and to analyse the ways in which these processes modify the vulnerabilities of individuals, households or communities to stressors and shocks. Leichenko and O’Brien (2008) use the term double exposure as a metaphor to illustrate how a particular place, population or environment is simultaneously subjected to the processes of globalisation and global environmental change, and their outcomes. Both processes operate at the global scale but interact in multifaceted ways to produce different outcomes in diverse local places. These outcomes may be experienced as ongoing stresses or less frequently but more dramatically as shocks or perturbations. These processes have frequently been viewed as separate issues, a framing that is illustrated locally in Irish cities by some of the results of my interview research discussed below. Leichenko and O’Brien (2008) illustrate how there are multiple discourses associated with each process and suggest that these multiple discourses obscure the bigger picture of how the two processes interact to produce what can be described as winners and losers.

Leichenko and O’Brien (2008) identify three pathways of double exposure or ways in which the two processes may interact to shape vulnerability. Outcome double exposure, context double exposure and feedback double exposure, each focus on different aspects of the ways in which globalisation and global environmental change interact to influence particular units of analysis ranging from individuals or households to cities, regions and entire countries. To date the double exposure framework has been employed mainly in developing world contexts in South Asia and Africa (Leichenko and O’Brien, 2008; O’Brien, et. al. 2009; O’Brien, et. al. 2004; Silva, et. al., 2010). However Leichenko and O’Brien (2008) also illustrate its
applicability to urban contexts in more affluent nations through an examination of context double exposure in the city of New Orleans. They illustrate how the multiple exposures created by biophysical, socio-economic and institutional changes help to explain why the city of New Orleans and its population was so vulnerable to the impacts of Hurricane Katrina. I now use this framework to examine some of the factors that shape the shifting vulnerabilities of the cities of Dublin, Cork and Galway to environmental hazards such as flooding and to the stresses experienced as part of the current economic crisis. I also illustrate how feedbacks between these two processes may enhance vulnerabilities and reduce resilience.

**The biophysical context**
As I outlined in detail in Chapter 3, the biophysical context for exposure to hazards in the cities of Dublin, Cork and Galway is a product of the physical topography and hydrology of each of these cities as well as a long history of human settlement which has included extensive modifications to that local hydrology and geomorphology. Historical evidence suggests that each of these cities has been the site of human settlement for an extended period of time. A settlement has been present in the vicinity of what is now Galway City for at least nine hundred years while the history’s of Cork and Dublin date back well over one thousand years (Hurley, 2005; Simms, 2001). The geographical factors that were an important influence on the establishment of those early settlements remain an important part of the characteristics of these cities today and continue to play an important role in shaping their exposure to environmental hazards. Each of these cities is built in a low lying coastal location on the estuary of at least one major river. The access to water and trade, as well as the defensive strengths of these sites ensured that the original settlements grew into the modern cities we see today. However this same proximity to water and the extensive
modifications to the local hydrology carried out over several centuries create a unique set of hazard exposures in each city.

The city of Dublin is situated on a low lying coastal plain at the confluence of several rivers and canals. This proximity to water has exposed the city to flood hazards throughout its history but in recent years flooding has come to be viewed as a more significant threat, in part as result of the experience of several large floods in recent years. Historically most of the major floods experienced in the city have occurred on the Dodder, Tolka and Liffey rivers as significant portions of the city are built on the flood plains of these three rivers, leaving little space for natural floodplains. Each of these rivers has been the subject of at least some human modification ranging from the straightening of channels to the construction of large dams. While the larger hydroelectric dams on the Liffey have been successfully controlled flood flows in the past to prevent major flooding (Fitzpatrick and Bree, 2001) the flooding experienced in Cork City in November 2009 suggests that the presence of dams does not guarantee that flood waters can or will be successfully regulated. It also raises questions regarding potential conflicts between the role of the Electricity Supply Board (ESB) as an electricity supplier and as a river management agency during times of flood. The large number of ‘underground’ rivers in Dublin has also become an increasing source of concern in recent years with flooding emerging from rivers that had historically been culverted. While these floods have frequently been attributed to climate change by local decision-makers and others (Black, 2009), it is difficult to say for certain that this is the case. As with the river flooding that has impacted other parts of Europe in recent years, the rainfall events leading to these floods may be part of current climate variability while human drivers such as increased run-off due to development may be
influencing the level of flooding experienced (Mitchell, 2003). As the 2002 coastal floods also illustrate, Dublin faces significant exposure to coastal floods. While the city’s east coast location means that storms are generally less frequent and less severe than those experienced on Ireland’s west and north coasts, significant storm surges can still occur. Dublin’s exposure to coastal flooding is also influenced by the fact that large portions of the city’s Port and Docklands are located on land reclaimed from the Irish Sea during the Eighteenth Century (Dublin Docklands Development Authority, 2008a).

Cork’s physical location is also an important element in its exposure to environmental hazards. The city centre is located on a virtually flat island between two channels of the River Lee. These two channels are the last clearly visible remains of a much more extensive system of channels that have been filled in or culverted over as the city developed (See Chapter 3). What is now the city centre island was originally a series of thirteen smaller islands in an area of marshland, which was once traversed by numerous channels of the River Lee (Hickey, 2005). Some of the street patterns still visible today follow the outline of former channels of the river, with some such as the city’s main artery St. Patrick’s Street having channels of the river flowing in culverts beneath the street. Much of the city centre island lies at elevations of less than five metres and is exposed to both river and coastal floods (Hickey, 2005; Tyrrell and Hickey, 1991). In addition to this filling in and culverting of river channels in the city centre, much of what is now the city’s South Docklands, an area primed for extensive redevelopment was reclaimed from the estuary of the River Lee between 1774 and 1841 (Coughlan, 2009).
The river flooding experienced in Cork in November 2009 was the worst experienced in the city since the construction of dams at Inniscarra and Carrigadrohid in the 1950s which helped to significantly reduce river flooding in the city (Hickey and Devoy, 2005). These dams, constructed primarily for the generation of hydroelectricity have been used to regulate the flow of the river during flood events (Fitzpatrick and Bree, 2001). During my research in the summer of 2009 many respondents expressed confidence that river flooding was a less significant issue than coastal flooding due to the presence of these dams. This belief is no doubt less certain in the aftermath of the events of November 2009 and a ‘blame game’ remains ongoing between the ESB and Cork City Council regarding who is responsible for the flooding and a perceived failure to give adequate warnings to the City’s residents. Implicit in much of the reaction to the November flood is the perception that the dams could or should have prevented the flood from occurring. This event raises concerns about the extensive reliance on technological solutions to flooding and the consequences when these fail to prevent flood events from occurring (See Chapter 6).

Like both Cork and Dublin, Galway City is also located at the confluence of a river and the sea. The city is built on the banks of the Corrib, a short river which runs from Lough Corrib, just a few kilometres north of the city to Galway Bay. As is the case in Dublin and Cork, the local hydrology has also been extensively altered. The flow of the river was modified by the construction of the famous Salmon Weir and the Eglington Canal completed in the 1840s (The Institution of Engineers of Ireland, 2000). The city has not experienced significant river flooding in its recent history but concerns over the potential for river flooding in some parts of the city have led to difficulties for some businesses in obtaining insurance, an issue that was raised in my
interviews with local decision-makers. The coastline of Galway City has also been modified by land reclamation throughout its history and further land reclamations are planned as part of the development of a new port. The city is exposed to coastal flooding due to its low lying elevation and its location on Ireland’s west coast which experiences frequent north Atlantic storms particularly during the winter months.

All three cities are exposed to river and coastal flooding due to their locations. In some cases these exposures are modified by the history of human activity that has included land reclamations as well as the construction of dams, weirs, canals and other structures that modify the local hydrology. The development of each city has also enhanced flood potential through increased runoff from paved surfaces. While all of these local factors influence the biophysical context of these three cities, the process of global climate change is likely to have a significant impact on the exposure of each of these cities to flooding (see Chapter 1). Projections for Ireland’s future climate include increased sea levels, changing patterns of storms and changes in rainfall and stream-flow patterns, all of which will influence the exposure of these cities to flooding and other hazards such as wind damage during storms. Climate modelling studies have projected that an increase in storm intensity in Ireland is likely in the decades to come (McGrath et. al. 2005; Lozano et. al. 2004). Recent IPCC projections suggest that average and extreme wind speeds across northern Europe will increase but the magnitude of these increases remains uncertain (Solomon, et. al., 2007). Recent modelling has suggested a decline in the number of storms making landfall over Ireland but a significant increase in their intensity (McGrath and Lynch, 2008; Semmler, et. al., 2007).
In line with global research, studies of sea level rise in Ireland have concluded that relative sea levels on most of the Irish coastline have been rising for at least a century and that this trend is likely to continue (Devoy, 2008; Devoy, 2000; Devoy, 1992). Current estimates of sea level rise range from between around 1mm per year (Devoy, 2008) to 3.5mm per year (McGrath and Lynch, 2008). The event frequency for surges typically associated with coastal flooding in Ireland (50 – 100 cm) is expected to increase by up to 30% in some locations by the period 2031 – 2060 (McGrath and Lynch, 2008; Wang, et. al., 2008). Significant changes in the heights of maximum surges and the increasing coincidence of large surges with high tides are also projected (McGrath and Lynch, 2008). Recent research has also focused on possible changes in precipitation patterns and their impacts on runoff and stream flow patterns. Predictions of increased rainfall and runoff during the winter months, combined with likely increases in extreme rainfall events may have important impacts on the frequency and intensity of river flooding events (McGrath and Lynch, 2008; Steele-Dunne, et. al., 2008; Charlton, et. al. 2006; Sweeney, et. al. 2003; Sweeney, et. al. 2007).

**Fluctuating socio-economic contexts**

Biophysical exposure is only one aspect of the contexts that may shape the exposures and vulnerabilities of Ireland’s coastal cities. Equally important are the complex and variable socio-economic contexts which help to shape the vulnerability of the population of each city. Changes in both the biophysical and socio-economic contexts can act to increase or decrease exposures and vulnerabilities. Such changes can also act to reshape who is most vulnerable, constantly remodelling the spatial and temporal patterns of vulnerability within each city. Within the last twenty years, Ireland has seen dramatic social and economic transformations that have included the ending of
the violent struggle in Northern Ireland, the ongoing integration of the EU, the emergence of the economic boom known as the ‘Celtic Tiger’, dramatic demographic shifts and changes in migration patterns, and most recently a new financial and economic crisis. All of these processes, heavily influenced by changes at European and global scales as well as those occurring at the national level within Ireland, have continually reshaped the exposure of Ireland’s coastal cities to economic and environmental shocks and stressors.

Despite modestly successful economic development in the 1960s and the early 1970s (O’Hearn, 2001), the 1980s were a time of “bleak depression, even despair” in Ireland (McDonald, 2000 p.10). Unemployment was high and rising (see Fig. 5.1) while the historic trend of high emigration was reaching new heights. Emigration had been high for decades and it is estimated that between 1911 and 1964 the net emigration rate was equivalent to 45% of the population born during that time period (Crotty, 1986). By the late 1980s the Irish economy was stagnant and the country was among the most indebted in the world (O’Hearn, 2001). Unemployment peaked at over 17% in 1985 (Central Statistics Office Ireland, 2010a; International Monetary Fund, 2010) and some even suggested that Ireland’s economic failures had more in common with the development patterns of former colonies in the developing world than it did with its neighbours in Europe (Crotty, 1986). The effects of these economic difficulties were clearly visible in the country’s cities, most notably in Dublin which was described as “littered with derelict sites and dilapidated buildings” (McDonald, 2000 p.10).
The mid to late 1990s saw a dramatic transformation in economic fortunes as Ireland embraced the growing tide of globalisation and an economic boom known as the ‘Celtic Tiger’ developed. High levels of Foreign Direct Investment (FDI) encouraged by corporation tax rates retained at levels much lower than any other Member State of the European Union, a well educated English speaking workforce and generally low costs of doing business ensured that the Republic of Ireland became a popular base for many (mostly US based) multinational corporations seeking to establish production bases within the European Union. These factors combined with limited regulation helped to make Ireland “probably the most pro-business location in the EU” (O’Hearn, 2001 p.171). Job creation grew rapidly and unemployment fell to less than 3.8% in 2001 (Central Statistics Office Ireland, 2010a; International Monetary Fund, 2010). Ireland “jumped with both feet into the brave new world of unsupervised global markets” (Krugman, 2009) and its economic success was frequently highlighted as an example of the profits to be made by embracing globalisation and neoliberalisation. Ireland was proclaimed as an example of what could be achieved by embracing “economic freedom” (Powell, 2008), although doubts regarding the true extent of Ireland’s globalisation and the sustainability of its success also began to emerge (Smith, 2005). As would become painfully clear some years later the embrace of globalisation and neoliberalism that helped to create the economic success of this period, also created the exposures that would leave Ireland and its people so vulnerable to the economic shocks and stresses created by the current global financial crisis. Ireland’s success in attracting FDI was followed by a second phase of economic growth based mainly on financial services and a construction boom (Allen, 2009). A proliferation of new houses, apartments, office buildings and motorways quickly transformed the country. Property prices rose rapidly, (see Fig. 5.2) quickly
leaving the purchase of a first home beyond the reach of many young families (Keohane and Kuhling, 2004).

Dramatic social and demographic shifts followed from the changing economic landscape. As more women joined the workforce and the national birth rate began to decline (Keohane and Kuhling, 2004; O’Connor, 1998), Ireland’s migration patterns flipped with large scale emigration suddenly replaced with large scale immigration (see Fig. 5.3). Economic migrants from eastern Europe were joined by asylum seekers from Nigeria and other parts of Africa, rapidly transforming Ireland’s previously largely homogenous population into an ethnically and culturally diverse blend. The influx of immigrants also included substantial numbers of returning Irish emigrants (see Fig. 5.4). These dramatic shifts had significant implications for patterns of vulnerability to environmental shocks and hazards in Ireland’s cities. Immigrant communities may be more vulnerable as they may not have the connections to institutional structures and support systems that long time residents may have but at the same time may have a strong sense of community with fellow migrants which may enhance resilience. While economic growth and accumulation of wealth may have decreased vulnerability for some, increased wealth may actually have increased the potential for economic losses in some areas. In Dublin in particular, some of the most expensive property in the city is located along the coastline of the city’s south side, an area potentially exposed to coastal flooding and storm surges. While vulnerability research often focuses on the poorest and marginalised sections of society who are often most vulnerable, it is also worth noting that while the poor are often the most vulnerable this is not always the case (Pelling, 1999). The new affluence may also have increased polarisation between rich and poor in Ireland.
(Keohane and Kuhling, 2004), potentially increasing the marginalisation and vulnerability of those who benefited least from the economic boom. The declining influence of once central institutions such as the Catholic Church and changing patterns of social and family organisation through changes such as increased participation of women in the work force and increased suburbanisation, are also likely to have reshaped vulnerability in complex ways. Evidence from the 2002 coastal floods in Dublin suggests that elderly and retired residents may have been among the most vulnerable to flood events, but also that they were able to rely on some support networks among their local communities. However these supports may be diminishing over time, a trend that has been observed in other countries, as younger families increasingly live at significant distance from elderly relatives (Leichenko and O’Brien, 2008). This trend was identified in Dublin by one of my interviewees who commented

“Dublin is a city that is aging, by that I mean the City Council area, everybody keeps talking about the families and the kids and all that but they tend to be shifted out, if you look at your population maps, Dublin is an old city, the areas that are prone to flooding are even older, because of house prices to a large extent”.

These trends may be amplified if current emigration trends continue and many of Ireland’s younger population emigrate. Older people, particularly older women have been identified as being at high risk of experiencing poverty as Irish pensions are among the lowest in the developed world as a proportion of final earnings (Hughes, et. al., 2007). Only fifty two percent of the population have an occupational pension, and pensions are often the only source of income for those who have retired from employment (Hughes, et. al., 2007). Within the last two years further dramatic socio-economic transformations have occurred as Ireland experienced the shocks and stresses of the collapse of the domestic property bubble and the current global financial crisis, with the coincidence of these two events forcing the Irish economy
into what has been described as the worst economic crash witnesses in a western
country since the Great Depression (Allen, 2009). Unemployment has risen rapidly,
reaching levels not seen since the early 1990s and the national rise in unemployment
has impacted all three of my case study cities (see Fig. 5.5 and Fig. 5.6). Net
emigration has returned beginning with residents of other EU states who had moved
to Ireland during the Celtic Tiger era returning home. This has been followed by
increased emigration of Irish citizens particularly young men (see Fig. 5.3 and Fig.
5.7). Somewhat surprisingly this has not led to overall population decline as the birth
rate which had declined in the early years of economic growth has now risen
significantly (See Fig.5.8).

Ireland’s pursuit of neoliberal economic policies led to very limited regulation of the
country’s banking and financial sector during the Celtic Tiger era. Ultimately “fiscal
policy, bank governance and financial supervision left the economy vulnerable to a
deep crisis, with costly and extended social fallout” (Regling and Watson, 2010 p.5).
Failure to sufficiently regulate the banking and financial sector was central to the
banking crisis that followed (Honohan, 2010). As the financial integration of the EU
advanced, Irish banks had increased access to cross border funding while increased
competition in lending markets due to the entry of foreign owned banks into Ireland
also fuelled the willingness to lend (Regling and Watson, 2010). Banks loaned vast
sums to developers who are now unable to repay them due to the bursting of the
property bubble. A vast oversupply of housing has led to the creation of ‘Ghost
Estates’ composed of a mix of partially completed and unoccupied homes along with
some completed and occupied dwellings which are now a common sight in many Irish
towns and cities (see Fig. 5.9). It is estimated that there may be in excess of six
hundred such estates containing at least eleven thousand unoccupied houses (Kitchin et. al., 2010). A policy of lowering taxes on other sectors of the economy left the national government finances particularly dependent on the success of the construction industry leading to the collapse of government revenue once the construction industry went into decline (Krugman, 2009). Several bank guarantees and bailouts have followed, while the controversial National Asset Management Agency has been established to allow the State to purchase bad debts from the banks in an attempt to save several of banks from collapse. This policy of linking bank debt to sovereign national debt worsened the problems in the national economy, ultimately necessitated Ireland’s acceptance of an aid package from the International Monetary Fund (IMF) and the EU in late 2010. The long term impacts of these events on the exposure of Irish cities and their populations to economic and environmental stresses remains to be seen but they are likely to be significant. As local governments rely heavily on the national government for funding, local government programs are likely be significantly curtailed. This will undoubtedly have implications for a range of their functions and services including their roles in hazards mitigation and climate change adaptation.

Development and planning policies during the years of economic growth have also created feedbacks that have enhanced exposure and vulnerability to economic and environmental shocks. Feedbacks within and between global environmental change and economic globalisation can have important implications for exposures to the potential negative consequences of both (Leichenko and O’Brien, 2008). The lack of regulation during the construction boom allowed property prices to escalate to such an extent that following its collapse many home owners are now in a state of negative
equity, forced to pay off mortgages that are significantly higher than the current value of their homes. There is increasing evidence that many households are now struggling to pay for basic services such as utilities, even in neighbourhoods that would have been considered relatively affluent (RTE News, 2010). It has also been claimed that employment practices implemented in the construction industry during the boom years forced large numbers of workers to declare themselves as ‘self employed’ leaving them ineligible for social welfare support once they became unemployed (Allen, 2009). Attempts by the national government to reduce spending are likely to include reductions in social welfare supports and increases in taxation. The challenges of unemployment, reduced incomes and increased taxation may make it very difficult for some to afford insurance coverage, potentially increasing their vulnerability to hazards. This is coinciding with increasing premiums or declined coverage in areas perceived to be at risk of flooding. Businesses believed to be in flood prone locations are also finding it increasingly difficult to procure or afford insurance due to the reluctance of insurance companies to provide coverage for potentially at risk properties. Increasing premiums and a reluctance on the part of insurance companies to provide any coverage in areas deemed at high risk of flooding will become an increasing challenge following the flooding of November 2009 which have led to insurance claims totalling € 245 million (US$ 297 million) (Madden, 2010). It has also been suggested that some form of government program may have to be developed to support those refused or unable to afford insurance coverage (Madden, 2010) although it is not clear how such a program would operate or how it could be financed given the current state of the national exchequer.
Development practices pursued during the construction boom and in some cases continuing today have also created feedbacks that will enhance physical exposure to environmental hazards. All three of my case study cities have pursued urban redevelopment policies in their docklands and waterfront areas, similar to those implemented in numerous other cities including London, New York, Manchester, Toronto, Baltimore, Sydney, Cape Town and Amsterdam (Marshall, 2001; Mitchell, 2003; Moore, 2008). While these redevelopment strategies have often been controversial due to their reproduction of urban space (O’Callaghan, 2007), their impacts on urban politics and governance (Bartley and Treadwell Shine, 2003; Oakley, 2007; Swyngedouw, et. al., 2002) and their impacts on local communities and cultures (Wonneberger, 2008), their implications for exposure and vulnerability to hazards and climate change have rarely been considered. In Dublin substantial redevelopment of the docklands has already taken place while plans have been made for similar redevelopments in Cork and Galway. In Galway these include plans for significant land reclamation in order to facilitate the relocation of existing port facilities (Galway Harbour Company, 2010). These waterfront developments enhance vulnerability and exposure to global environmental change in several ways. They frequently involve huge financial investments and land use changes in areas of the city that are low lying and in close proximity to rivers and coastlines. Parts of Dublin, Cork and Galway that were previously the sites of warehouses and other port facilities have already or will be transformed into a mix of land uses included retail and residential properties (See Fig. 5.10 and Fig. 5.11). These changes have important implications for potential economic losses due to hazards and for vulnerability of human populations. For example, as Dublin’s Docklands were redeveloped, between 1996 and 2006 the population of the Docklands increased by 26.8%, a much faster
rate than almost anywhere else in Ireland (Dublin Docklands Development Authority, 2008b). This population increase puts more people in potentially exposed locations. While the plans for the redevelopment of Cork’s Dockland’s include flood mitigation measures such as raised ground floors and flood defences (Coughlan, 2009), the vast financial investment involved (through the public private partnerships funding these developments), seems likely to fuel demands for more expensive engineering defences to prevent any flooding. As I discuss in the second portion of this chapter, for some of my interviewees flooding is seen as a disruption to the economic life of the city through the inconvenience and disruption to transport it causes, even if losses are not substantial. The drive to prevent any flooding in these flagship redevelopment projects is likely to lead to further infrastructural attempts to prevent flooding. It seems almost inevitable that the costs of such measures will fall on the State and it is difficult to foresee how such projects will be funded without cuts in other areas of spending. As mentioned earlier in this chapter the lack of regulation of the construction boom during the 1990s and the early years of this century is also likely to have enhanced river and pluvial flooding through increased urban and suburban development, including development on floodplains. While stricter planning regulations are now in place, the construction that has already taken place has significantly increased runoff, potentially increasing the magnitude and onset speed of future floods. It has also placed an increasing amount of valuable property and people in flood prone locations, a factor that seems to have influenced the level of loss experienced during the November 2009 floods which impacted many recently constructed homes.
Changing institutional contexts

While the 1990s and the early years of the twenty-first century brought dramatic social and economic changes, similarly dramatic changes have been occurring in institutional structures, governance and decision-making that have helped to shape Ireland’s exposures to environmental and economic shocks. The Peace Process in Northern Ireland has played a part in reshaping some aspects of governance through the establishment of increased North-South (between Northern Ireland and the Republic of Ireland) and East-West (between Ireland and the UK) co-operation. Several new all-Ireland decision-making bodies have been established including most notably Waterways Ireland which has responsibility for all inland waterway navigation on Ireland’s lakes, rivers and canals. These bodies have taken their place among an increasing number of agencies, bodies and organisations to which regulatory and decision-making functions of the government and civil service have been outsourced (Clancy and Murphy, 2006, Hughes, et. al. 2007). The increased proliferation of these public bodies has created a decentralised system of decision-making and governance which may make establishing who is actually responsible for a particular issue quite difficult particularly during hazard events.

This became clear during the flooding experienced on the River Shannon and its tributaries in November 2009 as multiple agencies including numerous County, City and Town Councils, Waterways Ireland, The Office of Public Works, the Electricity Supply Board, the National Parks and Wildlife Service, and the Shannon River Basin Authority all play some role in the regulation and management of the river basin (Joint Committee on the Environment, Heritage and Local Government, 2010). The increasing number of agencies involved is particularly important in areas of decision-making related to environmental hazards due to the potential for overlapping or
Figure 5.1. Unemployment rate (%) in the Republic of Ireland, 1980-2009.

Data Source: International Monetary Fund, (2010).

Figure 5.2. National average house prices (€) for each quarter year, 1996 -2010.

Data Source: Economic and Social Research Institute, (2010).
Figure 5.3 Immigration and emigration (thousand people per year) 1987-2010.

Data Source: Central Statistics Office Ireland, (2010b).

Figure 5.4. Estimated immigration (thousand people per year) by origin 1990-2010.

Data Source: Central Statistics Office Ireland, (2010d).
Figure 5.5. Number of people on the live register (claiming unemployment benefits) in County Dublin, March 2006 – September 2010.

Data Source: Central Statistics Office Ireland, (2010e).*

Figure 5.6. Number of people on the live register (claiming unemployment benefits) in Galway and Cork Cities, March 2006 – September 2010.

Data Source: Central Statistics Office Ireland (2010e)*

*As the Live Register includes some part time employees these numbers may not correspond exactly with unemployment levels.
Figure 5.7. Estimated emigration from Ireland by nationality and sex (thousand people) 2006-2010.


Figure 5.8. Ireland’s birth rate and natural increase in population, 1987-2010.

Source: Central Statistics Office Ireland, (2010g).
Figure 5.9. Abandoned and unfinished houses, Bundoran, County Donegal.

Photo: James M. Jeffers, January 2010.

Figure 5.10. Dublin’s redeveloping Docklands.

Photo: James M. Jeffers, July 2008.
Figure 5.11. Dublin’s Dockland’s with some the few remaining warehouses.

Photo: James M. Jeffers, July 2008.

Figure 5.12. House construction in the Republic of Ireland, 1992 – 2009 (total number of new houses completed per year).

Data Source: Central Statistics Office Ireland, (2010c).
competing mandates and different approaches based on areas of responsibility. For example, the Office of Public Works which is designated as the lead agency for flood risk management in Ireland has traditionally focused on the construction of flood defences and other engineering works (see Chapters 6 and 7). This approach may contrast with the aims of other agencies such as the National Parks and Wildlife Service which is charged with ecosystem protection and preservation. As many of these agencies act with some degree of independence from elected representatives, the increased devolution of decision-making to such agencies may have important implications for the ability of local communities to have a voice in the decision-making process. Even where a smaller number of bodies and agencies are involved the challenges created can become clearly evident, as in the dispute between Cork City Council and the ESB over responsibility for the flooding experienced in Cork City in November 2009.

Even more important in driving changes in institutions and governance has been the ongoing expansion and integration of the EU. As the Union has been given increased competences by the Member States, EU institutions are playing an increasing role in a wide variety of decision-making and policy. Several of my interviewees in Dublin were quick to highlight the role of the EU funded SAFER (Strategies and Actions for Flood Emergency Risk Management) and Flood Resilient Cities Projects in allowing for the dissemination of information and knowledge between local governments and other agencies across several European countries (see Chapter 4). The enactment of the EU *Floods Directive* is also reshaping flood risk management strategies and policies in Ireland. However it remains to be seen how effective an instrument
designed in the context of widespread transnational floods in continental river basins such as the Rhine and the Danube will be when applied in the very different geographical and institutional contexts of Ireland’s coastal cities (see Chapter 7).

Ireland’s embrace of neoliberalism and its emphasis on free markets and privatisation has also begun to transform the operation of national and local government. These effects and its implications for the roles of local governments and their relationships with their citizens is clearly illustrated by the fact that the City Councils in Dublin, Cork and Galway along with all other local authorities are now required by national legislation to publish a ‘Corporate Plan’. While the name of the document itself is illustrative of the commercialisation of local government, the content of these plans is even more revealing. A content analysis of the Corporate Plans for the City Councils in Cork, Dublin and Galway illustrates how a business model now permeates the organisation and decision-making of local government. The City Council is seen as a business providing a variety of services to its ‘customers’. The characterisation of local government as a business like entity providing services to its customers is clearly an important shift in governance but it is one that was rarely questioned or even acknowledged by my interviewees. While the impacts of these transformations on vulnerability and exposure in Irish cities is difficult to quantify the impacts of such neoliberalisation of city government has been implicated in a number of urban disasters in recent years including the Paris heat wave of 2003, the Chicago heat wave of 1995 and Hurricane Katrina in 2005 (Klinenberg, 2002; Leichenko and O’Brien, 2008). A business model of local government where services are received only when asked for, limits the ability of local government to respond effectively to hazards as
those most in need may not actively seek these services (Klinenberg, 2002; O’Brien and Leichenko, 2008).

These biophysical, socioeconomic and institutional contexts illustrate how environmental and economic change are interacting to shape patterns of exposure, vulnerability and resilience in Ireland’s coastal cities. This provides the context for current policy and decision-making and it is to these issues that I now return. The remainder of this chapter draws on my empirical research to examine how the context of economic crisis is influencing policy and decision-making and the implications of this for climate change adaptation and hazards vulnerability. It is clear that a ‘growth mentality’ now dominates all areas of decision-making. While an emphasis on economic growth is hardly surprising, particularly during the contemporary crisis, it has important implications for adaptation and vulnerability. The promotion of economic development without due consideration of its social and environmental implications often increases vulnerability to hazards (Wisner, et. al., 2004). The influence of political economy can be key driver of vulnerability (Watts, 1983; Wisner 2001; Wisner, 2000a; Wisner, 2000b) while economic interests can be a major influence on environmental policy (O’Neill, 2006). The dominance of an economic framing of hazards and climate impacts in Ireland is shaping local policy and practice in ways that will impact the vulnerability of local populations to hazard events and their ability to adapt to climate change.

**Local decision-making priorities – the economy is king!**

“Jobs, jobs, jobs” exclaimed one Cork City Councillor when asked to describe the biggest challenge facing his city today. His response echoes a common theme across virtually all of the interviews that I conducted during this research. For almost all of
my respondents economic recovery preferable followed by sustained economic
growth was their first wish for the future of their city. Most appeared to exhibit a
strong belief that their first duty and responsibility to their citizens was the
achievement of this goal, despite the limited influence local government may have on
the overall fate of the national economy. During my interviews, respondents were
asked to rank the issues that they saw as most pressing for their city today and to
compare these to other challenges including climate change. There are a number of
reasons why this may have an important influence on the types of climate
adaptation/hazards mitigation decisions that are taken. From a practical policymaking
standpoint any decision-maker inevitably faces a wide range of decisions that they
must make on a daily, weekly or yearly basis. Depending on their area of
responsibility and expertise they may be responsible for a wide range of challenges
that may interact in a variety of complex ways. For each of these, there may be a wide
menu of possible decisions or policy options. Where they rank climate and hazard
issues relative to other issues and how they view climate as linked to and interacting
with other issues will be an important influence on the types of policy responses they
may adopt. This brings together the practical aspect of how decision-makers faced
with a potentially long and complex list of policy challenges prioritise and direct
resources, and the more conceptual and ideological question of how this is influenced
by their beliefs, values and conceptualisations of the challenges they face.

For most interviewees in the cities of Dublin, Cork and Galway the current economic
recession and its impact on employment levels in their city was ranked as the most
important concern facing their city today (see Table 5.1, Table 5.2 and Table 5.3).
This view was particularly strong among elected decision-makers (City Councillors)
in all three cities, some of whom described their experiences of hearing the views of
their constituents during their campaign for the local government elections that had
occurred just weeks before my interviews were conducted. One Cork City Councillor
commented that “as someone who has canvassed extensively for the last ten years, I
can tell you, you might get one in a thousand who will bring climate change up on the
doorsteps”. Another observed

“There are twenty thousand people in my area and I met maybe forty five percent
of them [during the campaign]. The older people are worried about the younger
generation and jobs. You meet the parents who are worried about their children.
The parents are out looking for opportunities for their children for the future.
That’s probably not new but jobs, jobs, jobs is the major thing now”.

Economic recovery was almost always ranked as the number one priority by City
Councillors. The rising rate of unemployment in their cities and in the country
generally was a particular concern as this was the most visible negative impact of the
current economic crisis. Another City Councillor in Dublin commented “the change in
fortunes of the economy, employment and the maintenance of employment are the
two highest levels of priority” while another noted “I would see unemployment as the
biggest issue at the moment”. Unsurprisingly similar views were evident among
businesses representatives and among executive officials including spatial planners
and engineers. “Everybody is making the economy a priority. It is all about job
creation, it is all about where your next phase of economic development is coming
from” commented a planner in Dublin. An engineer in Cork suggested that the city
was already planning for a future that would include economic recovery and growth
“Obviously we are in a recession at the moment but in terms of planning we take a
longer term view. We don’t just look at the recession we’re in now. We have to
position the city for the upturn whenever it comes”. 
Views on climate change varied from those who saw it as one important issue among many, those who saw it as one of the most pressing after the current economic crisis, and those who viewed it as being “a long way down the list”. For business representatives climate change is not currently a priority issue (see Table 5.3). One business representative in Cork suggested that if a list of priority issues for business interests in the city were compiled, climate change would currently be found at the very bottom of the list. Similarly a business representative in Galway commented that the “biggest issue is economic down turn by a long shot, things are immediate, people are losing their jobs because businesses are not selling as much as they have, people are down-sizing which means they are letting people go”. Respondents frequently described the economic crisis as the most pressing issue because it was something that the population of the city experienced directly every day. They often described how people felt it directly through reduced income levels or through experiencing unemployment. This was seen as contrasting with climate change and hazards which were seen as more distant and less relevant to everyday life. This emphasis on the economic crisis as more immediately relevant is discussed in greater detail below.

In contrast to business representatives who viewed climate change as not being a high priority until economic recovery was achieved, the views of City Councillors on the relative importance of climate change was more variable. Some ranked climate change and hazards as the most important issues facing their city after economic recovery while for others it was less of a priority. Others suggested a variety of other issues that they viewed as important including; local government reform, transportation, housing, poverty, crime, and public health (see Table 5.4). Views on the interactions and potential linkages between climate hazards and economic
development also varied with some viewing them as separate issues and others seeing them as inherently interlinked. For some climate change came second after economic recovery; “I would rank it second” commented a Dublin City Councillor. For others climate change was a high priority but still fell behind several other issues in their estimation of its importance. “I think the economic situation is the big one at the moment and after that reliable health facilities and then social housing” suggested a Cork City Councillor. Many respondents considered climate change and environmental hazards to be among the top five issues facing their city but with economic recovery always ranked number one. A newly elected City Councillor in Dublin commented

“I would see it up about third or fourth but I would see unemployment as the biggest issue at the moment. There are not enough opportunities for young people and old people. Old people have been treated poorly and young people don’t have enough to do. Anti social behaviour, drink that type of thing. They would be the bigger issues.”

Among planners, engineers and other officials, climate change and environmental hazards tended to be ranked highly but economic recovery was consistently considered to be the most pressing issue facing their city. These executive officials also appeared the most likely to view the two issues as being interlinked. They suggested that responding appropriately to climate impacts and hazards was an important element in ensuring that Ireland would experience economic recovery and growth. Their comments implied a view that their city was in direct competition with others to attract financial investment and job creation and that interruptions to the life of the city such as those caused by hazard events were likely to have a negative impact on efforts to attract such investment. A planner in Dublin suggested that infrastructural solutions to flooding were required to ensure that the city remained economically competitive
“one of the key things in terms of our global competitiveness and economy is the type of city that you have. You have to have good infrastructure whether it is drainage, water, or transport. If you have a risk of flooding or if you don’t have access to a port or proper infrastructure as a result of flooding, then you are not at the races”.

An engineer in Dublin made similar comments “if you allow things to drag on in your capital city it gives an indication to foreign investment that you don’t care and you don’t know what is going on and you are not being proactive in managing the situation.” Another official in Dublin made similar observations noting that he “would put the climate change impacts as third [in the list of pressing issues facing the city] because they are changing the way we view our city and they are changing the way we are going to have to adapt our city”. Another Dublin official also made similar comments but suggested that maintaining a successful economy in the city required maintaining a high quality of life for its residents. Climate change and hazards such as flooding would impact negatively on that quality of life and might cause people to move elsewhere resulting in economic decline. He commented “For a city to survive you need water, you need people and you need commerce, and climate change is right there with that, because in order for people to live here it has to be attractive to them”.

Emphasising the links between climate change and economic development was common among executive officials but rarely mentioned by elected decision-makers. When asked whether climate change and hazards should be viewed as a separate issue or whether they should be integrated with other challenges facing the city, most elected representatives responded by stating that all of these issue were interconnected. However this was rarely the subject of significant elaboration and many respondents did not express any opinions on exactly how these issues were linked or what the implications of those linkages might be for their city and its
population. One Galway City Councillor did acknowledge a direct link between the economic impacts of hazards and the functioning of city government and its operations, as much of the funding for local government is derived from commercial rates paid by businesses. He suggested that businesses that experienced flood losses would experience difficulties in paying, commenting

“a lot of these business here are rate payers and that is what finances the operation of the city and I know that at certain times of the year when this area outside is flooded it has an impact on the rate payers. They are slow to pay, and they have difficulties with the council and I know certain business have not paid rates for a number of years because of the damage that was done to their properties”.

This direct link between the fortunes of the city’s businesses and the finances of the local government may be an important influence on local decision-making as it may led to the prioritisation of business interests over other groups. However, this also makes the views of the business representatives who emphasised economic recovery and did not prioritise climate change and hazards somewhat surprising.

Some distinctions can be drawn between the responses given by elected politicians and those of executive officials, and these differences may help to illuminate the factors influencing their decision-making (See Table 5.1 and Table 5.2). In general, elected decision-makers focused more on the current economic crisis, illustrating a somewhat shorter term focus. They prioritised a quick recovery from the current economic crisis. Climate change and environmental hazards were labelled as a luxury issue, something that could be addressed in better times but could not be a priority right now. As one City Councillor in Galway commented

“Climate change is well down the bottom because that is the future, or people see it as the future. Even though we are in the middle of it at the moment people are trying to get there houses in order, people are interested about getting their jobs,

---

24 Commercial rates are charged on all businesses and are one of the main sources of funding for local government in Ireland as property taxes are not applied to domestic homes.
abut survival today, that is what people are interested in at the moment, and unfortunately that is how it is”.

Another observed “There or four years ago environmental issues were more important as we had the green wave here in this country where it was nice to talk about climate change whereas now because of the economic downtown the focus has changed to just putting the bread and butter on the table”. Hazards researchers have highlighted how particular events can reshape policy or research while the same events can also be interpreted in diverse ways by different constituencies such as policy makers and researchers (Mitchell, 2009a). The economic crisis may be an example of this among Irish decision-makers. While the economic crash trumps climate change as a decision-making priority for elected politicians, for executive officials it appears to reinforce the significance of the linkages between economic and environmental issues. Perhaps shaped by a neoliberal perspective that sees providing a supportive environment for business as the central role of government, and that views their cities as being situated within a competitive battle to attract geographically mobile capital and investment (Harvey, 2005; Phelps, et. al., 2007), they viewed the elimination of flooding as an essential aspect of their efforts to develop their cities. This suggests that all decision-makers are operating within a discourse that places economic development at the core of their policy priorities but for elected representatives this is more of a short term response to the current crisis while for executive officials it is part of a longer term strategy.

Among several other stakeholders, including representatives of an environmental non-governmental organisation (NGO), economic development, climatic change and environmental hazards were described as being linked in important ways. However in highlighting these linkages NGO representatives were critical of policies pursued
during the years of economic prosperity experienced during the late 1990s and the early years of this century. In the view of these respondents, some of the planning and development decisions taken during this time had exacerbated the challenges presented by environmental hazards, either by increasing the exposure of the population through development on floodplains or through increasing runoff from new urban and suburban expansion. These respondents were also critical of the failure to strive for types of development that they viewed as more sustainable and more likely to have reduced impacts on the drivers of global climate change. An NGO representative in Galway linked his concerns regarding sustainability to development in recent years commenting

“you can’t separate them [climate change and economic development], and I don’t think you should separate them. Just because we have gone through a Celtic Tiger and we have had so much money generated in terms of jobs, if we had done things slightly differently there could still be jobs, but we might have ended up with a better environment and a better transport system”.

An NGO representative in Dublin was particularly critical of planning and development policies in recent years suggesting that these were responsible for increasing the challenges presented by flood hazards. He commented;

“the other is the actual way in which we manage river basins and the way in which we deal with things like using flood plains for building. We have repeatedly seen instances where housing should never have been built. It just doesn’t fit with what we are trying to do in terms of reducing run-off. Some horrendous planning decisions have been made. Supermarkets for example with vast acreage of car parking. Put those together and we’re actually compounding the problem”.

The issue of increased runoff due to development was a factor that was also mentioned by a number of officials. One official in Cork commented “obviously development is going to have an impact. You see where quicker runoff can add to flooding”. Officials in Dublin and Galway were keen to emphasise that their planning and development policies now incorporated Sustainable Urban Drainage Systems
Table 5.1. A selection of elected representatives’ views on the importance of the current economic crisis relative to the importance of climate change.

<table>
<thead>
<tr>
<th>City Councillor – Cork</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think the economic situation is the big one at the moment and after that reliable health facilities and then social housing. I genuinely don’t get a sense that people are talking about climate change or the effects of climate change but we do get reports from the City Council. They are aware of it, they have certain things in place around it. Even like the height of the quay walls here for example. No money has gone into the protection of quay walls. So the priority that’s given to the protection of the city is low. There are other things first.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City Councillor – Cork</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs, Jobs, Jobs! I can tell you that because of canvassing and meeting so many people over four months at the doors. There are twenty thousand people in my area and I met maybe forty five percent of them. The older people are worried about the younger generation and jobs. You meet the parents who are worried about their children. The parents are out looking for opportunities for their children for the future. That’s probably not new now but jobs, jobs, jobs is the major thing now.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City Councillor – Galway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfortunately it [climate change] is not top of the list whereas a number of years ago it would have been higher up. People are concerned, in Galway here obviously the economy is a big thing. Galway is regarded as a tourist city, numbers are down, the big focus is that we are in a difficult recession at the moment, but we will come out of it no doubt, and at that stage you will see that climate change will emerge again as a high priority but at the moment people are concerned about living expenses, will they have their jobs, can they pay their mortgages.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City Councillor – Galway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate change is well down the bottom because that is the future, or people see it as the future. Even though we are in the middle of it at the moment people are trying to get their houses in order, people are interested about getting their jobs, about survival today, that is what people are interested in at the moment, and unfortunately that is how it is.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City Councillor – Galway</th>
</tr>
</thead>
<tbody>
<tr>
<td>At this moment that’s the number propriety, way up there [the economy]. There or four years ago environmental issues were more important as we had the green wave here in this country where it was nice to talk about climate change whereas now because of the economic downtown the focus has changed to just putting the bread and butter on the table.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City Councillor – Dublin</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would probably rank it [climate change] second. The first major issue for the city is to generate the economy again in this city, but I think the two of them are interlinked.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City Councillor – Dublin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well in my own personal estimation obviously the change in fortunes of the economy, employment and the maintenance of employment are the two highest levels of priority that I think should be afforded at this present time, that is not in any way saying that this whole issue [climate change] is not as important. They are all very important but in the short term I would feel that the whole issue about employment retention and employment generating potential are the two areas that I would say, needless to say the issues of crime and vandalism are always at the forefront of everything because they are the daily issues that affect you as a local public representative, listening to the needs of your constituencies and the issues, but I have to say climatic change ten years ago wouldn’t have been in on a scale of one and fifty of my own worries but genuinely it is most definitely in the top ten now, probably in the top five, around the five mark if you were to use a scale of one been the most serious, i.e. unemployment.</td>
</tr>
</tbody>
</table>
Table 5.2. A selection of executive official’s views on the importance of the current economic crisis relative to the importance of climate change.

<table>
<thead>
<tr>
<th>Official</th>
<th>Views</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planner – Dublin</td>
<td>Everybody is making the economy a priority. It is all about job creation. It is all about where your next phase of economic development is coming from. Bearing that in mind one of the key things in terms of our global competitiveness and economy is the type of city that you have. You have to have good infrastructure whether it is drainage, water, or transport. If you have a risk of flooding, if you don’t have access to a port or proper infrastructure as a result of flooding, then you are not at the races.</td>
</tr>
<tr>
<td>Engineer – Dublin</td>
<td>I would probably put it [climate change] at number three. I would think, now that is three in an extremely long list. I suppose the issues that we are facing as a community would be first of all economic, the issues of job creation, the economy sits up at the very top. I would put the second at managing our energy infrastructure in terms of our vulnerability and exposure the lack of head room that we have and our vulnerability because we haven’t invested significantly in renewable energy. I think energy would come second and it would put the climate change impacts as third because they are changing the way we view our city and they are changing the way we are going to have to adapt our city, as we speak now it is raining outside there it is the middle of the summer that is not what people expect.</td>
</tr>
<tr>
<td>City Council Official – Galway</td>
<td>We have a few major industries medical, technology and research and say NUIG and the health board would be major employers and it is just to retain those and maintain the competitiveness of the city. We are designated as a gateway under the spatial strategy so we would expect that investment would be targeted here to kind of maintain the critical mass.</td>
</tr>
<tr>
<td>Engineer – Dublin</td>
<td>For a city to survive you need water, you need people and you need commerce, and climate change is right there with that, because in order for people to live here it has to be attractive to them. The economics of it is one of the things that will help people to say but over all because of the capacity and the capability to travel any place you want now around the world and live there, and if we want people to live in Dublin we have to have an attractive environment and that means your public spaces and what you do with your own time and just the quality of life issues. Climate change is a major part of that.</td>
</tr>
<tr>
<td>Engineer – Cork</td>
<td>Obviously we are in a recession at the moment but in terms of planning we take a longer term view. We don’t just look at the recession we’re in now. We have to position the city for the upturn whenever it comes. Obviously we work very closely with the County and it’s the city region really, metropolitan Cork that’s important. It has to be an attractive place for investment, job creation and various other things.</td>
</tr>
</tbody>
</table>
Table 5.3. A selection of other interviewee’s views on the importance of the current economic crisis relative to the importance of climate change.

<table>
<thead>
<tr>
<th>Business Representative – Cork</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well in the current economic climate, it [climate change] wouldn’t be up there that highly. If you were to put the general business environment, access to finance, generating new business, and a whole range of others and include climate change on that I’ve no doubt that climate change would be at the bottom of that list, at the moment.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Business Representative – Galway</th>
</tr>
</thead>
<tbody>
<tr>
<td>The biggest issue is economic down turn by a long shot, things are immediate, people are losing their jobs because businesses are not selling as much as they have, people are down-sizing which means they are letting people go. If a particular firm doesn’t get the money in to pay its bills it is slowing down the amount of money it is paying its creditors and suppliers which is a further disincentive and more and more people are very worried. If you were living in Limerick and you had DeBeers going and a few others, we are lucky at the moment here we have Boston Scientific and we have more of the med care business which is not as seriously under threat but lots of people have lost their jobs so the reality is where are you going to get the next few euro to survive, and the next bill coming through the door, climate change doesn’t enter into it.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NGO Representative – Galway</th>
</tr>
</thead>
<tbody>
<tr>
<td>You can’t separate them, and I don’t think you should separate them [economic and environmental change]. I think you have to weave them in. Just because we have gone through a Celtic Tiger and we have had so much money generated in terms of jobs, and there has been lots of jobs there, if we had done things slightly differently there could still be jobs, but we might have ended up with a better environment and a better transport system.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NGO Representative – Dublin</th>
</tr>
</thead>
<tbody>
<tr>
<td>We’re in the process of developing a new development plan for Dublin which will be published next year, or towards the end of this year for consultation. It’s essential that, that has some aspect of sustainability within it. Obviously we’re pushing for the strongest measures. It was traditionally seen that this was economic development. The Special Policy Committee that looks at planning as a city is also called the Economic Development Committee. I would see that as being the wrong focus. Yes economic development is important. But the point surely is sustainable development. Without that essence of sustainability within the development plan ultimately you end up. Where are we at the minute, sixteen thousand unsold apartments in Dublin as a consequence of the planning decisions that were taken. Things ran wild and we’re now bearing the economic consequences of that. Unless we get that under control in terms of sustainable development we’re going to end up in a situation where, the economic development is probably going to stall for at least the next five years and we find that we’re still making matters worse. We don’t actually have control of sustainable and appropriate growth for the city.</td>
</tr>
</tbody>
</table>
### Table 5.4. A sample of some of the issues other than climate change and economic recovery highlighted by interviewees.

#### Local Government Reform

My first and immediate step would be to reform local government because I think the reform of local government has an impact on everything else and has an impact on climate change, and transport systems and omissions which all have an impact on each other, so it is not a question of a priority it is a question of the time scale of actions more than things being one priority rather than another. (City Councillor – Dublin)

#### Transportation

Well one of the big issues here in Cork is transport. In terms of parking congestion in the city areas, people moving out to more suburban areas and then trying to get in to work. (City Councillor – Cork)

Well I suppose transportation is a major issue and problem of congestion and lack of alternatives to the car. (City Official – Galway)

I think we have a number of problems and difficulties in this city, we are an expanding city but we are grid locked. We are an old medieval city built probably for the horse and cart or the coach. We are trying to have an integrated transport system put in place, that I think needs a lot of investment and good planning. (City Councillor – Galway)

#### Housing and Crime

I think social housing or public housing is a huge issue because it is an immediate issue and people need housing, that is the biggest request I have from people, people trying to get housing from Dublin city council so on an immediate basis I would have thought that is the most important issue and then there is obviously crime and the general economy and how it is affecting Dublin. (City Councillor – Dublin)

#### Regional Development

I don’t want to get into lobbying mode here but I suppose the view that Cork would have with regard to government policy and investment policy would be that Dublin and the east coast region has seen huge development over the last ten to fifteen years and government has produced a whole range of things, I’m sure you’re familiar with the national spatial strategy and all of that. That set out a very good plan in theory of regional development, balanced regional development, growing other population centres and taking some of the pressure off Dublin. (Business Representative – Cork)

#### Quality of Life and Other Issues

I suppose the issues I would see as been more pressing would be housing, green spaces which I suppose would help to alleviative climate change to a certain extent by more green lungs in the city, they are going to be of limited affect, traffic congestion would be high, provision for new communities, for non Irish communities would be high, housing, poverty, crime related issues would be high so I suppose I would personally rank social economic issues higher than environmental issues but I know that that is probably the wrong thing to do but I would instinctively put people before environmental issues and of course people are going to be affected by environmental issues. (City Councillor – Dublin)
Table 5.5. Interviewee comments on the economic impacts of climate change

<table>
<thead>
<tr>
<th>Comment</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think we’ve obviously got a threat to one of our core economic activities which is agriculture. In the long term it threatens the security of the economy, particularly food production within Ireland. (NGO Representative – Dublin)</td>
<td></td>
</tr>
<tr>
<td>If you get floods in July and last year we had no summer at all that has tremendous effects both for the country economically and socially. (Business Representative – Galway)</td>
<td></td>
</tr>
<tr>
<td>Business needs a certainty of water, a certainty of security and everything else and flooding is an area of damage and cost, so business…. it is a competitive world out there, so if you are liable to uncertainty like flood damage, storms then you are very precise where you locate. (City Councillor – Galway)</td>
<td></td>
</tr>
<tr>
<td>I think most of the essential infrastructure is protected, the one big issue you would have if something happened down in Poolbeg where you have a huge amount of infrastructure whether that is electricity or waste water systems and the port of course. If something happened there from an economic prospective and even getting imports into the system and from the whole economic side of it, it would be a disaster. I think that is a risk area and I think the idea of protecting that by way of barrage into the future is something that you can’t ignore if sea levels are going to rise if this continues to be a trend then you have to look at protecting the city. (Planner – Dublin)</td>
<td></td>
</tr>
<tr>
<td>The most obvious one that people talk about is well look there are rising sea levels and you’ve all of this and obviously we’re a port city and the harbour and all of that is hugely important to the economy of the whole region here. It has an impact on the national economy as well. Cork port would be the second largest port. (Business Representative – Cork)</td>
<td></td>
</tr>
<tr>
<td>It means changes with regard to the way we live, where we build, what kind of economic future we have because farming patterns are going to have to change if weather patterns change, the kind of crops we grow you know all of those things enter my head. (NGO Representative – Dublin)</td>
<td></td>
</tr>
<tr>
<td>The other way it impacts even if people aren’t directly affected by flooding this time but if they have been in the past and the area has been designated a flood risk area people are finding it impossible to get house insurance so they are then stuck with a property that they may or may not want to be stuck with because they can’t sell it on so that is directly impacting on people as well. (City Councillor – Dublin)</td>
<td></td>
</tr>
<tr>
<td>Some of the business in the city not immediately adjacent to the coast but close to the river Corrib, they were finding it difficult to get certain types of insurance because the insurance companies have identified potential flooding from the River Corrib. (City Councillor – Galway)</td>
<td></td>
</tr>
</tbody>
</table>
Table 5.6. Funding as the main constraint on decision-making options.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obviously cost benefit analysis will be done and that will determine what will happen.</td>
<td>Engineer – Cork</td>
</tr>
<tr>
<td>I think it’s going to be based on cost benefit analysis.</td>
<td>City Councillor – Cork</td>
</tr>
<tr>
<td>I know there was talk of a Thames like barrier being built out closer to the sea. I suppose that’s one option that can be looked at. The problem at the moment of course is funding. We can’t afford to do something like that. It would be so expensive. They already spent an awful lot on the main drainage scheme maybe three or four years ago. They spent multi millions on that. It was to improve the water quality in both channels of the river enabling people in boats and swimming to start using them again. Up to ten years ago that couldn’t be done [due to lack of funding].</td>
<td>City Councillor – Cork</td>
</tr>
<tr>
<td>I think cost obviously, especially in the current climate. If you had come at this maybe ten or fifteen years ago the main factor would have been what was the best result for the city but now it has to be all down to cost and cost priorities.</td>
<td>City Councillor – Cork</td>
</tr>
<tr>
<td>There is going to have to be a cost benefit analysis. I think there have been some very recent silly mistakes, now that they are made they are going to have to be protected.</td>
<td>City Councillor – Dublin</td>
</tr>
<tr>
<td>The availability of funding determines everything then it is a matter of how much you do with that funding and I think that is it going forward. In times of plenty you can achieve a lot more and build in a lot more resilience in times of say low economic growth like what we have at the moment.</td>
<td>Engineer – Dublin</td>
</tr>
<tr>
<td>We can see a situation where we have to spend very substantial amounts of tax payers’ money, to try to ensure that Dublin at least reduces the potential impact from climatic change over the next fifty to one hundred years. They have done it with the Thames flood relief scheme there fifteen to twenty years ago, the cost at that stage was one and a half billion. I know we wouldn’t need a system as elaborate as that but I would say with inflation it is going to be very costly as well, but it is one of those costs that you can’t not provide for because your city and your community and industry and commerce they all depend on having a city that is safe to operate and transact business in.</td>
<td>Engineer – Dublin</td>
</tr>
<tr>
<td>Coastal erosion is a big issue here we are going to have to spend an awful lot of euro in the next number of years.</td>
<td>City Councillor – Galway</td>
</tr>
<tr>
<td>There is no money and it [the coastal protection project] won’t happen.</td>
<td>NGO Representative – Galway</td>
</tr>
<tr>
<td>Of course there is because at this moment in time everything is geared towards getting the economy back on track. We have the bailout of the banks which is taking a considerable amount of money. The jury is out on that and whether the tax payer is going to be exposed for years to come. NAMA* another area where people are very very worried about the consequences of that down the road. So these are areas where the government have committed substantial amounts of money and they can’t afford to have any further areas where there are going to be leakages.</td>
<td>City Councillor – Galway</td>
</tr>
<tr>
<td>Cost would be a major factor, we would be relying on central government for a lot of funding</td>
<td>Planner – Galway</td>
</tr>
</tbody>
</table>
(SuDS) plans that included reducing runoff both as a flood reduction and pollution control measure. In Dublin this approach to drainage was first recommended by the Greater Dublin Strategic Drainage Study produced in 2005 and is now encouraged as a part of national flood risk management strategies (Department of the Environment, Heritage and Local Government, 2008). One engineer in Dublin suggested that this SuDS approach would form an important part of future integrated flood prevention and climate change adaptation strategies for the city commenting “we looked at the whole issue of sustainable urban drainage systems, SuDS, how they may be integrated and I have no doubt that these SuDS type of approaches will be integrated in our adaptation strategies”. While this may be an example of integrated planning and decision-making, a case could also be made that this is an example of reactive decision-making, something that has been a common theme throughout this research project (see Chapters 4 and 6).

This emphasis on reducing runoff resulting from development emerged in recent years after some flood events had been experienced and after construction and development had already peaked (see Fig. 5.12). The emphasis of the SuDS framework on utilising technological solutions in an attempt to regulate runoff, rather than evaluating the appropriateness of some of the development to begin with may also fail to address some of the underlying causes of increased flood hazard. Another example of reactive decision-making is the publication of draft guidelines on planning and flood risk management (Department of the Environment, Heritage and Local Government, 2008). While these guidelines may help to regulate future development in floodplains and other exposed locations their publication in draft format in 2008 came after much of the development of the boom years of the ‘Celtic Tiger’ was
already over, meaning that significant levels of development likely to increase flood hazards had already taken place.

**The economic framing of hazard and its implications**

It is clear that for the vast majority of decision-makers in Ireland’s coastal cities, economic development was viewed as the first priority on the list of policy issues they face. While this is undoubtedly a function of having to prioritise some issues over others it also indicates the dominance of a hegemonic narrative of economic development that shapes all areas of policy and decision-making. This was evident not only in the ways in which local decision-makers viewed climate change and hazards but in the ways in which they described their city, Ireland as a whole and their role as local decision-makers. This framing has implications not only for the types of decisions that are made but also the ways in which they are made.

A number of interviewees made this perspective quite explicit by describing either their city or the country as a whole in primarily economic terms. Several interviewees described Ireland as an “island economy” while one official commented “we are a small economy”. Envisioning Ireland as a whole or their own city primarily as an economic entity is an example of an economic narrative that undoubtedly shapes the way in which all other issues are viewed. For a planner in Dublin, the future needs of the city and the country had to be viewed through an economic lens. Emphasising that the national government must make Dublin City its priority, he suggests that sustained economic growth is vital to the future of the country. He commented

“I will always bat for the Dublin region but we are the only global city in the country and if we are not protected, if government doesn’t wake up to the fact that infrastructure in the Dublin region has to be a priority then we are going down the tubes as a country. If we can’t sustain growth in what the OECD and the National Competitive Council have agreed is the only place where you are going to have
this global city, the growth of Dublin as a global city, whether it is in relation to climate change, or whether it is in relation to drainage or water they have to be dealt with”.

As mentioned earlier this economic framing leads some officials to see climate change and hazards primarily in economic terms, focusing on ways in which hazard impacts might influence the economic competitiveness of their city. The importance of Ireland being an island was something that was also frequently alluded to in my discussions with informants. For some this was undoubtedly a negative, seeing Ireland as isolated and potentially exposed to more severe challenges than other places. For others the experience of living and doing business on an island was a positive, allowing Irish people to bring their pre-existing experience to the new challenges presented by climatic change. Identifying the potential for both positive and negative outcomes, a business representative in Cork observed

“we’re an island economy as well so maybe we’re more prepared to deal with the environment that’s around us and that sort of thing. The other end of that then of course is that because we are an island economy if you are dealing with areas like sea level rises we have an awful lot more of our country which potentially is impacted by it”.

Focusing on the potential negative impacts of sea level rise one Cork City Councillor observed “the fact that we’re an island nation and we’re surrounded by water means it is going to have a more negative impact on us, if there are rising sea levels” while a Galway City Councillor commented “I think we are particularly vulnerable because we are an island community and we are subject to storms and very wet weather anyway so any changes to make those patterns worse will have a huge impact on us”.

This emphasis on Ireland as an “island economy” and the way in which local decision-makers describe their roles clearly illustrates the extent to which a neoliberal growth centred economic perspective has become the narrative that dominates all areas of public policy and decision-making at local and national levels in Ireland. This
perspective appears to have become embedded during the years of economic success and been reinforced by the current crisis. It has been embraced by local decision-makers who now seem unwilling or unable to consider alternative strategies that deviate from this narrative in any way. The focus on the conception of Ireland as an island economy is remarkable given that the economic strategy pursued in Ireland since the 1990s is anything but an island mentality, which would suggest isolation from the global economy. The opposite has been the case as Ireland as sought to utilise its geographical location (being physically close to the European continent and both politically and economically integrated into the EU) to assimilate as far as possible into global flows of capital. This aspect of Ireland’s embrace of globalisation challenges us to reflect on questions of scale in our application of the double exposure framework. Ireland’s coastal cities illustrate how the processes of environmental and economic change are simultaneously global, regional, national and local. Globalisation and global environmental change cannot be thought of simply as global processes impacting local places and producing new exposures and vulnerabilities. These processes operate across and between multiple scales simultaneously adding further complexity to any attempt to untangle them or to suggest alternative policies and strategies that could reduce vulnerability and increase resilience to shocks and stressors of all types.

As already mentioned in the first portion of the chapter the economic development strategies pursued by the Irish government since the mid 1990s embraced the idea of national competition for capital and sought to establish Ireland as a premier destination for foreign direct investment (Allen, 2009; Phelps, et. al., 2007). It became so successful at doing so that Ireland’s Industrial Development Authority began
offering consultancy services to similar agencies in other countries (Phelps, et. al., 2007). The potential dangers inherent in this competition for capital have been highlighted by numerous authors due to its potential to create a ‘race to the bottom’ (Phelps, et. al., 2007). The influence of a ‘growth mentality’ that dominates all other areas of policy on hazards vulnerabilities and exposures has also been emphasised by numerous hazards researchers. The drive for export oriented development in some developing countries has led to attempts to exploit natural resources to the fullest extent possible, resulting in land use changes that had profound implications for vulnerability (Wisner, et. al., 2004). In Ireland the economic strategy of fully embracing globalisation, the failure to regulate a property bubble and to control irresponsible bank lending practices may have fuelled economic growth but these same policies are responsible for the current economic crisis. As mentioned earlier in this chapter these events are reshaping vulnerability in Ireland’s coastal cities in complex ways and strategies implemented by the national government are likely to enhance vulnerability. Despite evidence that a shift away from the globalisation consensus may be emerging and that contemporary economic and environmental crisis is fundamentally grounded in neoliberal practices (Castree, 2010; Wade, 2010), the strategy of the Irish government is to continue current practice while attempting to reign in the national deficit through cuts in welfare supports and public services. Policies implemented as a result of the financial aid package from the EU and the IMF in late 2010 are likely to further enhance vulnerability as they appear to have the greatest negative impacts for many of the already vulnerable members of society.

As the results of my interview research illustrate, this conception of Ireland and its cities as competitors in the race to attract global capital has fully permeated local
decision-making. Economic growth through the attraction of external investment is seen as the overarching goal of public policy. This impacts hazards and climate policy as preventing climate impacts and hazards losses are seen as important only in so far as they impact on the ability to compete with other cities and countries in the global circuits of capital. This reinforces particular adaptation strategies and hazards mitigation policies as hazards such as flooding are seen as damaging to the image of the city and the country and their ability to compete for capital. Therefore strategies that control or eliminate the physical drives of hazard are preferred over those that might reduce the vulnerability of the population and enhance resilience. As I discuss in greater detail in Chapters 6 and 7, local policy in Ireland has traditionally emphasised engineering fixes to flood hazards and this policy remains dominant despite an official policy shift to alternative strategies. The emphasis on engineering continues despite the huge economic costs involved and the difficulties of funding such projects in the current economic climate. This emphasis on engineering appears to be tied to the idea that hazard events themselves must be prevented (rather than preventing the losses they produce) and this approach is supported by the focus on economic growth through competition for capital.

An economic framing of the issues and challenges faced by their city also influenced interviewee’s views on how decisions about future hazards mitigation or climate adaptation options will be made. Interviewees frequently emphasised engineering and technological solutions to flood hazards while other options were not considered. Such engineering solutions are often among the most expensive hazards mitigation options and the availability of finance was often cited as the most significant constraint on decision-making across all areas of public policy, including climate
change and environmental hazards (see Table 5.6). As engineering solutions were often the only policy options discussed, financial constraints were seen not only as limitations on those particular options, but on all decision-making regarding hazards and climate change. Several interviewees commented that all decisions would have to be made on the basis of cost benefit analysis. “Obviously cost benefit analysis will be done and that will determine what will happen” commented an engineer in Cork City while a Cork City Councillor commented that it was likely that all decisions are “going to be based on cost benefit analysis”. This emphasis on cost benefit analysis may limit the types of policy responses that are considered as it emphasises projects that deliver a very clear return on investment in terms of their benefits for the economy of the city. The economic value of hazards mitigation policies that focus on steps to reduce social vulnerability or other non structural responses may be less immediate and less likely to successfully pass a cost benefit analysis.

Other interviewees suggested that in the current economic climate it was going to be very difficult to justify spending what limited funds are available on climate change or hazards related policies. As mentioned earlier in this chapter policies that supported economic recovery and future growth are viewed as the number one priority by virtually all local decision-makers and environmental issues are often seen as separate from these economic concerns. The comments of some respondents even implied that environmental issues including climate change might be considered somewhat of a discretionary expense, to be afforded funding during times of plenty but to be among those issues not receiving funding when finances are more constrained. One Dublin official commented “In times of plenty you can achieve a lot more and build in a lot more resilience than in times of say low economic growth like what we have at the
moment”. A Cork City Councillor suggested “If you had come at this maybe ten or fifteen years ago the main factor would have been what was the best result for the city but now it has to be all down to cost and cost priorities”. This view of climate change adaptation or hazards mitigation as an expense that cannot currently be justified is further evidence of the dominance of a particular economic discourse that emphasises some approaches to economic recovery and development but not others. Despite the potential economic costs of future climate change that were recognised by some respondents, this view of the current economic crisis and its relationship to policy making priorities was rarely questioned by local decision-makers.

Conclusions
This chapter has linked the twin crises of economic recession and global climatic change in Ireland. I began by utilising the double exposure framework (Leichenko, et. al., 2010; Leichenko and O’Brien, 2008; O’Brien and Leichenko, 2000; O’Brien, et. al., 2004) to illustrate how the interactions and feedbacks between economic and environmental change are altering patterns of vulnerability and resilience to shocks and stressors in Ireland’s coastal cities. Ireland’s embrace of neoliberal economic globalisation supported an economic boom that produced some winners, particularly in the construction and financial services sectors. However it also sowed the seeds of the current economic crisis which is enhancing the vulnerabilities of several sectors of society including the poor, the unemployed and the elderly. Feedbacks between economic and environmental change are further increasing vulnerability as rising looses from hazard events lead insurance companies to increase premium costs or to withdraw coverage altogether in high risk locations, further escalating the challenges for those who are already most vulnerable.
The interactions and feedbacks between global environmental and economic change, simultaneously operating at scales from global to local provides the context for contemporary decision-making and policy. My empirical research illustrates how this context is producing the material and ideological conditions in which a particular discourse of economic development dominates all areas of public policy, and local decision-makers are unable or unwilling to consider alternative strategies. As optimising the position of their cities in the competitive battle for capital has become their primary objective, hazards events are often viewed primarily as potential disruptions to that goal. This leads to an emphasis on climate adaptation and hazards mitigation strategies that target the drivers of physical exposure to hazard but do not generally consider the socio-economic aspects of vulnerability. Prevention of the hazard itself rather than the prevention of the losses it may induce becomes the goal of risk management strategies. This particular economic framing of hazard also shapes the way in which decisions are made, emphasising cost-benefit analysis as the optimal tool for decision-making. This further reinforces an emphasis on costly engineering fixes as the utility of alternative strategies for vulnerability reduction is hard to quantify.

In the chapter that follows I evaluate current climate change adaptation and flood hazard mitigation policies in Ireland. In doing so I examine more closely several issues that I have already mentioned briefly in this chapter. I consider how flood hazards policy in Ireland has often been characterised by a reactive decision-making process in which flood events are followed by attempts to deploy engineering solutions to ensure the flood event itself is prevented from reoccurring. Floods and flood losses are seen as essentially identical and alternative strategies that focus on
loss mitigation rather than flood control are not considered. Drawing on my empirical research I illustrate how and why this approach remains the dominant practice despite an official shift in national policy that emphasises proactive flood hazard assessment and the deployment of non-structural measures for hazard mitigation.
Chapter 6: Hazards mitigation, climate change adaptation and the risk society

Introduction
In the preceding chapter, I examined the intersections and interactions between the processes of global environmental and economic change in Ireland’s cities. I outlined how the links between these processes have created the conditions in which an economic development narrative dominates contemporary decision-making and policy with important implications for all areas of decision-making including the management of environmental risks and hazards. I illustrated how this perspective has reinforced approaches to flood risk management and climate adaptation that emphasises technological fixes that seek to eliminate flood hazards through the reduction of physical exposure.

In this chapter I examine the types of flood hazard mitigation and climate change adaptations that have been implemented in Ireland’s coastal cities and I seek to further illuminate why certain responses have been adopted rather than others. The economic development discourse that I describe in Chapter 5 is certainly influential but it is not the only influence on local policy and practice. Based on the results of semi-structured interviews with a selection of local decision-makers in the cities of Galway, Cork and Dublin, as well as an examination of the minutes of City Council meetings in each of these cities, national flood risk management policies, and the records of national parliamentary debates, I conclude that current hazards mitigation and climate change adaptation policies are dominated by a risk management paradigm that emphasises engineering and technological responses and that may not be the most effective means of addressing current or future flood hazards in coastal cities.
Drawing on insights from two distinct literatures, previous hazards research in geography and sociologist Ulrich Beck’s risk society thesis, I suggest that there are several interrelated reasons for concern about current flood hazard policies in Ireland and their ability to address current and future hazards. (1) Despite a policy shift the level of national and EU that has attempted to move from an approach of defending against floods to a flood risk management paradigm (De Bruijn, et. al., 2007), flood hazards are viewed largely as natural events external to society that can be systematically studied in an objective manner. They are viewed as a drainage problem than can be quantified, measured and assessed through natural science research methods. It is assumed that this research will allow for the accurate calculation of return periods and the likelihood of future flood events. This assumption may prove to be inaccurate in the context of global climate change as the retrospective analysis of past events becomes a less reliable guide to the future. Recent research in Ireland has already expressed concern that analysis of past climate is no longer a reliable guide for future events (Kiely, et. al., 2010). (2) Probabilistic thinking which often dominates risk assessment (Wilkinson, 2010) focuses solely on the question of how often a particular event may occur. Such probabilistic thinking alone may not be an effective means of preparing for future hazards as it neglects to consider deterministic thinking that asks ‘what if?’ a particular scenario unfolds (Jacob, et. al., 2001). (3) Closely associated with this probabilistic approach is the assumption that risks can be controlled. Risk based approaches often imply a level of “control, manageability and accountability” that may be inappropriate in the context of the complex challenges presented by flood hazards particularly in the context of global climatic change (Pidgeon and Butler, 2009). This belief in control, combined with the probabilistic approach allows little scope for consideration of unusual or surprise events that do not
fit within its predictions. Such surprises are often the source of greatest catastrophe precisely because the fall outside our expectations (Beck, 2009). (4) Risk management approaches often assume that such control can be achieved through the application of appropriate technological or engineering innovations. This assumption has been critiqued by social theorists such as Ulrich Beck (2009, 1999, 1998, 1992) and Bruno Latour (2003, 1993) who have questioned the belief that the liner progression of modernity can eliminate the risks and hazards we face today. Beck suggests that many of the risks we face today are actually the results of the unintended consequences of modernisation while Latour suggests that we have actually never been truly modern and that our attempts to control and separate ourselves from the hazards of the past have only served to create more complex entanglements. Hazards geographers have also extensively critiqued the application of an engineering fix to flood hazards (Changnon, 2005; Kahn and Mustafa, 2007; Lopez-Marrero and Yarnal, 2010; Penning-Rowsell, 2000; Penning-Rowsell, et. al., 1998; Platt, 1982; White, 1945; Wisner, et. al., 2003). These critiques have highlighted the potential for failure of engineering fixes and the likelihood of increased losses when events occur that exceed the design capacity of an engineering project (Changnon, 2005; Lopez and Yarnal, 2010; Wisner, et. al., 2003; Wong and Zhao, 2001). When such events occur the disaster is often much worse than might have been the case had the engineering project never been implemented, due to the false sense of security created by the presence of flood defences (Lopez-Marrero, 2010; Wisner, et. al., 2004). Engineering and technological fixes also tend to focus on the immediate cause of hazards rather than addressing their underlying drivers (Penning-Rowsell, 2000; Penning-Rowsell, et. al., 1998). (5) Risk management approaches to flood hazards frequently focus on the physical event. Floods are not distinguished from the losses they induce and flood
prevention through engineering is seen as the optimal means of managing floods. By focusing on the physical event and emphasizing an engineering solution the risk management paradigm often fails to consider the underlying causes of social-economic vulnerability to hazards, and the role these play in influencing the losses experienced during disasters (Mustafa, 1998; Lopez-Marrero and Yarnal, 2010; Wisner, et. al., 2004). Risk based approaches that focus solely on engineering solutions to particular flood problems often fail to consider the variety of factors and contexts which have been found to influence hazards losses (Cutter and Finch, 2008; Eakin, et. al., 2010; Lopez-Marrero and Yarnal, 2010; Mitchell, 1999; Pelling 1999; Whittle, et. al., 2010; Wolf, et. al. 2010). (6) A focus on the physical event also excludes considerations of institutional and decision-making structures that can reduce or enhance social vulnerability to disaster. Changing institutional structures can dramatically reshape social vulnerability (Adger, 2000) while the challenges presented by global risks such as climate change may exceed the ability of institutions to cope with them, leading to what Beck describes as organised irresponsibility (Beck, 2009). (7) Risk management based approaches also privilege certain types of knowledge and certain practices or responses over others. Risk management gives a privileged position to some experts (scientists and engineers) relative to lay persons (Beck, 2009; Beck 1992). By placing responsibility for flood hazards in the hands of a small group of experts the range of alternative responses (Mitchell, 2008a) is narrowed and a limited range of potential responses to hazards are considered. The role of expertise in environmental governance has been the subject of an extensive literature in geography and other social sciences with researchers increasingly recognising the complexity that the relationships between groups and individuals with
various degrees of expertise and knowledge brings to environmental decision-making (Birkenholtz, 2008; Prince, 2010).

This chapter focuses heavily on what has been described as the hatchet of critique (Robbins, 2004) as I point out a number of potential problems with current flood hazards mitigation policies in Ireland’s coastal cities and express concern regarding their application to future challenges. However, in the applied tradition of hazards research in geography (Montz and Tobin, 2011) my intention is to provide a constructive critique that may sow the seeds of a more effective alternative. I now turn to Ulrich Beck’s risk society thesis to reflect on the role of the concept of risk in contemporary society, particularly in the area of global environmental change. As the risk society thesis has increasingly been applied to environmental change by Beck and others, I examine whether Beck’s work can advance our understanding of global environmental change and social responses to it. I illustrate how Beck’s work can help to illuminate our understandings but it also includes a number of weaknesses that limit its applicability to environmental change. I then present an overview of critiques from within hazards research in geography that can also help to highlight some of the flaws in current policy and practice. This is followed by an analysis of current flood hazards policies and decision-making in Ireland. Using the example of the floods experienced in Cork City in November 2009 I illustrate some of the potential flaws in the risk management paradigm. Finally I conclude by reflecting on the contrasting intellectual approaches of hazards mitigation and climate change adaptation and ask whether a focus on loss mitigation rather than climate adaptation might prove to be a more beneficial means of addressing the challenges presented by global climatic change.
Climate change and flood hazards in the risk society

The topic of risk has attracted significant attention across the social sciences. Particularly influential is the work of German Sociologist Ulrich Beck (see: Beck 2010, 2009, 1999, 1998, 1992) who has attempted to untangle the complex relationships between modernity and risk in contemporary society. Beck’s central thesis is that many of the risks existing in contemporary society present new and complex challenges because they emerge not from an external nature but from the unintended consequences of modernisation. Beck argues that we are now living in a global risk society (Beck, 2009, 1992) in which the distribution and regulation of risk assumes a central place in social organisation. In this way goods or capital are being replaced by risk or to use Beck’s own words “the commonality of anxiety takes the place of the commonality of need” (Beck, 1992, p.49). Beck’s central argument is that the risks we face today are fundamentally different from the hazards of the past. He suggests that present day risks are no longer bounded in space and time in the way that past ‘natural hazards’ were. Fundamental to Beck’s argument and to a similar thesis advance by Giddens (1990) is the idea that modern risks are no longer exogenous to society in the way that he argues past hazards were. Today’s risks are a seen as a direct consequence of the processes of modernity. As such Beck’s risk society thesis can be read as a critique of ecological modernisation theory which advocates technological development (ongoing and enhanced modernity) as the solution to current social, economic and environmental challenges. This faith in modernity held by proponents of ecological modernisation contrasts sharply with Beck’s analysis as well as that of Giddens (1990) and Latour (1993) who have also questioned assumptions that modernisation automatically leads to linear progress. Beck also views modern risks as fundamentally different from past hazards in a number of other ways including our inability to perceive many of them directly with
our senses and the manner in which they can potentially impact everyone including those responsible for their production, a process he termed the boomerang effect (Beck, 1992).

Before proceeding further it is necessary to critically reflect on Beck’s thesis and to evaluate whether climate change and environmental hazards can fit into the risk society model he proposes. In his 2009 book *World at Risk* Beck devotes considerable attention to two risks that have taken centre stage in the two decades since his original *Risk Society: Towards a New Modernity* was published. Writing in the aftermath of the Chernobyl disaster it seemed clear that the threat of nuclear catastrophe loomed ominously over Beck’s original work. However the twin threats of global terrorism and global environmental change are the explicit focus of his more recent writings. Central to Beck’s analysis is the contention that the risks we face today are fundamentally different from past hazards. Even though much of the world is considered safer than at many times in its history, contemporary society is a risk society due to the changing role of risk in social organisation. Beck sees modern risks as fundamentally different from past hazards due to their endogenous characteristics relative to society. For Beck, past environmental hazards were natural. They were exogenous to society and were spatially and temporally contained.

However several aspects of this contention are open to critique. Few geographers would accept the assertion that past hazards were exogenous to society. Geographers have consistently analysed hazards from a human ecology perspective that sees environmental hazards as the product of a combination of human and non-human contributors (Burton, *et al.*, 1993; Mitchell, 2009b; Palm, 1990; Pfister, 2009; White,
Similarly the contention that contemporary risks are entirely the product of human decision-making and the unintended consequences of modernisation is also open to critique. While this position could be applied to technological hazards such as nuclear accidents it breaks down when applied to contemporary global environmental change. In the same way that past hazards cannot be said to be completely non-human, contemporary hazards contain both human and non-human elements. Some have even suggested that contemporary global change opens the possibility of viewing human environment interaction primarily in terms of the non-human world impacting human society rather than the reverse (Pfister, 2009).

Several writers (see Beck 2010, 2009; Bulkeley, 2001) have sought to place global climate change within the risk society paradigm and in some ways it rests rather easily there. Anthropogenic climate change is clearly one of the new risks that concern Beck. It is driven by the massive increase in atmospheric carbon dioxide since the industrial revolution and as such is clearly a product of the unintended consequences of modernity. Its implications are global and are likely to be felt for centuries so it is temporally and spatially unbounded. Another key characteristic associated with new risks by Beck is the inability of human senses to perceive them directly, something that is certainly true of climate change, which unlike weather can only be detected through a long term analysis of climate trends. Climate change is also a classic example of an issue where the question of “what counts as proof in a world where knowledge and lack of knowledge of risks are inextricably fused and all knowledge is contested and probabilistic” becomes increasingly important (Beck, 2009, p.32).
In many ways climate change is a textbook example of the types of new risk that are central to the risk society thesis. However a case can also be made that Beck has simplified or ignored several import characteristics of anthropogenic climate change that do not fit easily within his paradigm. In many ways climate change is not new. While the drivers and the speed of onset of this particular epoch of climate change are fundamentally different from anything previously experienced in human history, its manifestations and impacts come in the form of hazards that humans have coexisted with for millennia. While they will occur in new places, with greater frequency and less predictability the impacts of climate change are likely to occur in the form of environmental hazards that are quite familiar including floods, storms and droughts. While the global climate can no longer be viewed as a purely natural system external to society it also cannot be viewed purely as a social phenomenon. Beck emphasises the spatially and temporal limitlessness of current risks and their exogenous characteristics relative to society. However in doing so he fails to consider that environmental hazards have always been the product of drivers that are both endogenous and exogenous to society (Pfister, 2009). Beck’s original work *Risk Society: Towards a New Modernity* (1992) made no allowance for the social, economic, cultural and institutional factors that make some populations more vulnerable to the negative consequences of particular risks, influences that have frequently concerned hazards researchers (see: Cutter, *et. al.*, 2000; Eakin, *et. al.*, 2010; Eakin, *et. al.*, 2009; Klinenberg, 2002; Polsky, *et. al.* 2007; Polsky, *et. al.* 2003; Wisner, *et. al.*, 2004). Apparently heavily influenced by risks such as nuclear radiation, Beck suggested that one of the characteristic features of the risk society was the egalitarian nature of new risks. Everyone, including the producers of those risks could be impacted. Nobody was safe. As we were now in a risk society rather than a
capitalist society, access to capital could no longer guarantee safety. This analysis missed the myriad of factors that hazards geographers have identified as shaping vulnerability to the negative consequences that may be felt when a particular risk is realised in the form of a hazard event. Beck has addressed these concerns somewhat in his most recent work by including a focus on global inequality and vulnerability (Beck, 2009). However he still describes global climate change as egalitarian and declares that it brings to an end “all of our carefully cultivated opportunities for distancing ourselves” from risk and hazard (Beck, 2009, p.37). In many ways nothing could be further from the truth. Differential access to capital, political power, knowledge and institutions all help create inequalities in the way in which global environmental change interacts with human society. Global environmental change produces winners and losers (Leichenko and O’Brien, 2008; O’Brien and Leichenko, 2003; O’Brien and Leichenko, 2000) and who wins and who loses is heavily influenced by factors that often have little to do with the risk itself. The suggestion that risk has become the central organising principle of society is also questionable. It is far from clear that we have transitioned from a capitalist society to a risk society or that such a transition is imminent. Beck’s contention that climate change is among a new brand of risks that are unique because of the inability of human senses to detect them is also problematic. While this analysis holds true for technological hazards such as radiation, there were many historic hazards that human senses would be slow to perceive, particularly slow moving mass movement hazards which may become visible only when they reach critical stages. There are numerous flaws in the application of Beck’s risk society thesis to environmental change but it may still offer a useful lens through which to critique current flood risk management and adaptation
practices in Ireland. However I also draw on hazards research in geography which also offers a critique of technological focused risk management approaches.

In contrast to Beck, hazards researchers in geography and similar disciplines have adopted a human ecological perspective that has emphasised that hazards are the product of both human and non-human influences (Mitchell, 2009b; Pfister, 2009). While the importance placed on each has varied throughout the development of the subfield, the importance of human environment interactions has been central to hazards research since the seminal work of Gilbert White (1945) first identified that floods were a profoundly human problem. White’s work illustrated that “the traditional distinction of those things natural from those things social is rendered particularly difficult when viewing the environment as hazard” (Robbins, 2004, p. 27, emphasis in original). This recognition of the complex interactions between human and non-human actors is largely absent from Beck’s work and limits its application to contemporary global environmental change. Beck’s risk society thesis largely ignores the non human contribution to disaster. However, hazards geographers and Beck share a common object of critique in that both have criticised the structural and engineering approaches that continue to dominate flood hazards and climate adaptation policies. Hazards geographers have criticised a reliance on technological and engineering fixes for a several reasons including their financial costs, the false sense of security they create, their focus on floods rather than the losses they produce and the dangers presented by engineering failures (Burton, et. al., 1993; Changnon, 2005; Changnon, 2000; Kahn and Mustafa, 2007; Lopez-Marrero and Yarnal, 2010; Penning-Rowsell, 2000; Penning-Rowsell, et. al., 1998; Platt, 1982; White, 1945; Wisner, et. al., 2004). Despite the ongoing critique of the technological fix,
engineering and technological approaches have remained widely used in flood hazards policy for several reasons including the constraints imposed by institutional cultures, public pressure and governance practices (Harries and Borrows, 2007; Harries and Penning-Roswell, 2011). This has important implications for flood policies and climate change adaptation in Ireland and it is to those concerns that I now return.

The flood risk management paradigm in Ireland

Current flood hazards policies at local and national levels in the Republic of Ireland are based on a risk management paradigm. This risk centred approach to hazards mitigation and climate change adaptation is by no means unique to Ireland and similar approaches have been adopted in other locations including global cities such as New York (Rosenzweig, et. al., 2011; Rosenzweig and Solecki, 2010; Yohe and Leichenko, 2010). Ireland’s national flood hazards policies are outlined in the Report of the Flood Policy Review Group (2004) and more recent policies such as The Planning System and Flood Risk Management: Guidelines for planning authorities (2009). An examination of these documents indicates that national flood policy is founded on the assumption that floods and flood losses are essentially interchangeable terms and can be understood as identical. While hazards geographers have long recognised that floods may be natural events but the losses they induce are not (White, 1945) this distinction is not evident in contemporary policy in Ireland. These documents set out a national flood risk management policy that is based on the ‘source-pathway-receptor’ model (See Fig. 6.1). In this model the ‘sources’ refer to the drivers of floods included increased sea levels or prolonged periods of rainfall. ‘Pathways’ describes features such as flood plains, while the term ‘receptors’ describes people or property impacted by flooding. While this approach correctly
identifies the importance of considering all of the factors that influence the physical characteristics of flood events there is reason for concern that it does not adequately consider all of the other factors that influence flood losses. Human populations seem to be regulated to the role of largely passive ‘receptors’ of the impacts a flood may bring them. This unidirectional view of flood hazards in which an external events impacts a passive receptor fails to consider the range of social, cultural, economic and institutional factors that may shape the vulnerability of populations to flood events (Adger, 2006; Cutter, et. al., 2000; Eakin, et. al., 2010; Eakin, et. al., 2009; Klinenberg, 2002; Pelling, 2003; Pelling, 1999; Polsky, et. al. 2007; Polsky, et. al. 2003; Wisner, et. al., 2004). It fails to consider that all ‘receptors’ are not equal and that some people may be more vulnerable to the impacts of flood events than others. This model also fails to acknowledge the agency of human populations to influence their own vulnerability or to understand, frame and perceive risk and vulnerability in different ways and respond accordingly (Pidgeon, et. al., 2003; Kasperson, 1992; Kasperson and Kasperson, 1996; Renn, 2011). The source-pathway-receptor model promotes an approach to flood risk management that emphasises physical exposure and neglects other influences on flood losses. As human populations are not extensively considered in the risk analysis advocated under this model (see Table 6.1) the risk assessment focuses almost exclusively on the physical causes of flooding and on structural interventions designed to prevent the flood from reaching the ‘receptors’.

While vulnerability is mentioned in national flood policies, the definition of vulnerability employed is somewhat narrow and static focusing mainly on discrete sectors of the population such as the elderly or the disabled who it is assumed will always be more vulnerable (see Table 6.2). While vulnerability is mentioned as
Table 6.1. Risk assessment using the Source-Pathway-Receptor model.

The Technical Appendices to *The Planning System and Flood Risk Management* (2009, p.3) illustrate how the Source-Pathway-Receptor Model focuses on flooding as a natural event and does not consider the social, cultural, economic and institutional factors which may shape flood losses. It is worth noting how all future changes to be considered are factors that might influence the characteristics of the physical event (climate change or drainage schemes) while future changes in economic and social conditions or institutional structures that might reshape vulnerability are not mentioned.

The assessment of flood risk requires a thorough understanding of the sources of flood water (e.g. high sea levels, intense or prolonged rainfall leading to runoff and increased flow in rivers and sewers), the people and assets affected by flooding (known as the receptors) and the pathways by which the flood water reaches those receptors (e.g. river channels, river and coastal floodplains, drains, sewers and overland flow).

Flood risk assessments require identification and assessment of all three components:

- The probability and magnitude of the source(s) (e.g. high river levels, sea levels and wave heights);
- The performance and response of pathways and barriers to pathways such as floodplain areas and flood defence systems; and
- The consequences to receptors such as people, properties and the environment.

The ultimate aim of a flood risk assessment is to combine these components and map or describe the risks on a spatial scale, so that the consequences can then be analysed. FRAs need to consider the situation both as it is now and also how it might change in the future. Such consideration should include changes in climate (which impact largely on sources), the construction of flood protection or drainage schemes within the locality by others, the deterioration of existing and proposed defences, the operational performance of screens and pumps over time both locally and provided by development (which all modify the pathways) and the introduction, through development, of receptors into areas at risk of flooding.
something that should be included in a risk analysis it is not clearly indicated how this is to be done, in contrast to the assessment of physical risk for which clear steps are outlined. Physical risk is to be quantified through techniques such as hydrological modelling but no suggestions are provided for how vulnerability should be assessed. The technical appendices to the national guidelines on flood risk and planning describe how a risk assessment should consider “the consequences to receptors such as people, properties and the environment” (The Planning System and Flood Risk Management: Technical Appendices, 2009 p. 3) but does not consider how the vulnerability of people or the sensitivity of environments may vary across space and time. This broad approach to vulnerability may reduce the vulnerability of populations in new developments as all residential developments are placed within a broad category of highly vulnerable development which is not to be permitted in flood prone locations. However this does little to address the vulnerability of existing populations in already developed cities. Where differential vulnerabilities are recognised this tends to be in the context of emergency management rather than in other aspects of flood loss mitigation. For example elderly populations are singled out as most vulnerable as they may have greater difficulty during an evacuation. This focus on vulnerability as an issue in the context of emergency management was also evident in the results of my interviews. While this approach to flood risk and planning may well reduce vulnerable in future developments, existing vulnerable populations are not extensively considered in the Report of the Flood Policy Review Group (2004) and it seems clear that vulnerability as defined by hazards researchers is rarely considered. In fact the definition of vulnerability employed suggests little consideration was given to defining the concept. In the planning guidelines it is described as related to the
resilience of the population, yet in the same document resilience is defined as an attribute of the built environment (see Table 6.2).

Another reason to be concerned about the risk management approach to flood hazards is its assumption that current and future flood risk can be accurately quantified and that this information can then be used for decision-making. Beck (1992, 2009) identifies the belief that risk can be objectively quantified and assessed as a defining characteristic of the risk society. This approach clearly proceeds on the assumption that the acquisition of more knowledge will ultimately reduce uncertainties and allow for clear steps to be taken to reduce and eliminate flood risk. The Technical Appendices to the planning system and flood risk guidelines notes that “Flood risk assessments (FRAs) aim to identify, quantify and communicate to decision-makers and other stakeholders the risk of flooding to land, property and people. The purpose is to provide sufficient information to determine whether particular actions (such as zoning of land for development, approving applications for proposed development, the construction of a flood protection scheme or the installation of a flood warning scheme) are appropriate” (The Planning System and Flood Risk Management: Guidelines for planning authorities – Technical Appendices, 2009 p. 1).

It is far from clear that this assumption can be safely made in the context of climate change (Pidgeon, et. al., 2009). Climate change creates challenges for this risk assessment approach due to the uncertain, probabilistic and contested nature of knowledge about future climate and hazards (Beck, 2010). The risk assessments advocated by this approach are heavily dependent on hydrological modelling which relies on an analysis of previous events and past climate in order to determine current
flood risk. The extent to which these models can account for future climatic change is unclear when the extent to which rainfall patterns or sea levels are likely to change remains highly uncertain. Probabilistic forecasting may eliminate from consideration large or unusual events that could create disasters. Some researchers have suggested that a combination of a probabilistic (how often?) and a deterministic (what if?) approach may be most appropriate in the context of climatic change (Jacob, et. al., 2001). As Beck (2009) notes some of the greatest catastrophes emerge from surprise events that were not thought possible. An approach that includes the potential for surprise events might also include considerations of changes in social, economic and institutional contexts which may transform vulnerability, something that is currently not included in considerations of how risk may change in the future (see Table 6.1). The focus on objective quantification of risk also ignores the values and meanings we attach to human life, property and possessions. Risk implies the threat of loss or damage to something we consider to be valuable. What we deem valuable and the criteria we use in doing so are influenced by ethical and moral considerations (Adger, et. al., 2009; Hulme, 2009) that are ignored, excluded or obscured by allegedly objective risk assessments.

It is evident from an examination of policy documents, my interview data, minutes of City Council meetings in Dublin, Cork and Galway, and records from Oireachtas (national parliament) debates that the risk based approach to flood hazards mitigation is leading to an emphasis on engineering fixes, particularly for existing exposed populations. While the new planning guidelines are a first step towards the inclusion of alternative strategies, structural and technological approaches remain dominant. 

The Planning System and Flood Risk Management guidelines note that better
planning of future development forms part of a suite of flood mitigation measures including “risk evaluation, flood forecasting and warning, emergency response systems and capital projects of an engineering nature” (The Planning System and Flood Risk Management: Guidelines for planning authorities, 2009 p. 3) and while the Report of the Flood Policy Review Group (2004) advocated an increased use of non-structural solutions it is clear that engineering projects remain the preferred means of managing floods. An examination of records from Dáil Éireann (lower house of the national parliament), Seanad Éireann (the upper house) and their joint committees, as well as the minutes of City Council meetings in Dublin, Cork and Galway illustrates the emphasis on engineering is both a product of the dominance of a particular discourse of hazards, and an institutional structure that has traditionally placed responsibility for flooding in the hands of drainage and engineering experts (the historic evolution of current flood hazards policies is discussed in Chapter 7). The dominant discourse sees floods and flood losses as identical, views flood prevention as the optimal means of reducing flood losses, and sees engineering as the means to achieve this goal. This approach is clearly illustrated in the question raised by one Cork City Councillor at a meeting in March 2009 when she asked “Could the (City) Manager advise if Cork City Council intends to construct a storm barrage to protect inland areas from surges at sea. And if not, what he expects will protect the city from flooding”.

Decision-making at local and national levels is dominated by a perspective that views floods as controllable and manageable through the application of expert knowledge, usually that of engineers. When floods occur it is considered to be a failure of these experts to properly apply their expertise to the challenge. Beck (2009, 1992) suggests
that this is typical of the approach to risk management in a risk society. Floods regardless of their size, origin or impact are often treated in the same way at local City Council meetings. Typically a City Councillor will raise the issue at a Council meeting by asking that the City Manager (who heads the unelected executive branch of the local government) direct the engineering or drainage department to conduct an investigation into the flooding problem and to find a solution that prevents the flood from occurring again. The approach is similar regardless of whether the flood is simply an accumulation of water on an individual street creating a traffic hazard, or a larger scale event flooding multiple homes or businesses (see Table 6.3). In almost all cases floods are seen as preventable given the appropriate level of engineering expertise and the availability of sufficient funding. The comments of elected City Councillors emphasise the “prevention” and “elimination” of floods and the “protection” of local residents as their goal. This appears to be largely supported by the City Managers whose replies often focus on the availability of funding and other resources to provide for engineering solutions rather than the wisdom of the engineering solutions themselves. Flood hazards are seen primarily as a maintenance and drainage issue. When floods occur it is often seen as an indication that the City’s artificial drainage network has failed to function adequately as it is assumed that it should be possible to virtually eliminate flooding in a modern city. This illustrates how local decision-making is the product of both a dominant discourse and related institutional structures in a similar manner to the national policy discussed earlier. The dominant discourse views floods as something that can be managed and controlled and conceptualises them as a drainage issue. Make the water go away and the problems it creates goes with it. This links to the institutional structure of local government in Ireland which almost always assigns responsibility for flood hazards to
While vulnerability is mentioned in ways that suggest taking into account the variety of factors that shape patterns of social vulnerability, the main focus is on a broad category of vulnerability that does not consider many of the factors that may shape vulnerability.

The vulnerability of development to flooding depends on the nature of the development, its occupation and the construction methods used. For example, a sheltered housing complex would be more vulnerable than a retail unit. A broad classification of vulnerability has been developed. The classification of different land uses and types of development as highly vulnerable, less vulnerable and water-compatible is influenced primarily by the ability to manage the safety of people in flood events and the long-term implications for recovery of the function and structure of buildings. (The Planning System and Flood Risk Management, 2009 p.13)

The principal sources are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets. The receptors can include people, their property and the environment. All three elements must be examined as part of the flood risk assessment including the vulnerability and exposure of receptors to determine its potential consequences. (The Planning System and Flood Risk Management, 2009 p.14)

Transport and strategic utilities infrastructure can be particularly vulnerable to flooding because interruption of their function can have widespread effects well beyond the area that is flooded. (The Planning System and Flood Risk Management, 2009 p.13)

Vulnerability is the resilience of a particular group of people or types of property or habitats, ecosystems or species to flood risk, and their ability to respond to a hazardous condition and the damage or degree of impact they are likely to suffer in the event of a flood. For example, elderly people may be more likely to suffer injury, and be less able to evacuate, in the event of a rapid flood than younger people. (The Planning System and Flood Risk Management, 2009 p.64)

While vulnerability is defined in terms of resilience, the definition of resilience focuses on the construction of buildings.

Sometimes known as “wet-proofing”, resilience relates to how a building is constructed in such a way that, although flood water may enter the building, its impact is minimised, structural integrity is maintained, and repair, drying & cleaning and subsequent reoccupation are facilitated. (The Planning System and Flood Risk Management, 2009 p.62)
Table 6.3. Examples of discussions of flooding at City Council meetings.

To ask the City Manager for a detailed engineers report as to why the following areas constantly flood at, (details not included in minutes), and when the appropriate work can be carried out in these areas to prevent flooding in the future. (Dublin City Council meeting, September 2009)

The bad weather and flooding in the South and West has highlighted the need for the fast tracking of urgently required flood prevention measures. Ringsend and Sandymount have been flooded recently and residents, many of whom are elderly, are living in fear that their homes will be flooded once again unless Dublin City Council speeds the process up. There is no point in waiting until their homes are flooded again. The new City Manager could make a real impression on the lives of Dublin citizens. The problem isn’t one of funding but was caused by inordinate delays in administration. There is funding available to the Council. However, bureaucracy and administration are severely hampering the necessary procedures to fast-track the measures. It is just not acceptable and there is no excuse for it. The dogs in the street can tell you where the danger points are. The required work must be done now, not in 3 years time. (Dublin City Council meeting, February 2007)

In light of recent flooding around Dublin such as Donnycarney and the Council’s mention of flood management on page 59 (of the development plan), can the Council outline the methods by which they will ensure that flooding in the very prone areas will be drastically reduced or eliminated altogether. (Dublin City Council meeting, October 2009)

To ask the (City) Manager what measures will be taken to reduce the risk of flooding on St. Margaret’s road and parallel roads. (Dublin City Council meeting, January 2006)

To ask the (City) Manager to outline the status and timetable of plans to protect the residents on Beach Road, Newgrove Avenue and Gilford Road from any future flooding. (Dublin City Council meeting, September 2009)

To ask the (City) Manager to investigate The Gheel Autism unit at Griffith Court, Dublin 3 in relation to its flood prevention and to investigate if Dublin City Council can undertake any improvements in Griffith Court or in The Gheel that will prevent any flooding occurring again. (Dublin City Council meeting, September 2008)

In response to question submitted by Comhairleoir L. Burke a written reply was circulated which stated that the Mile Stream, Blarney Road, is in the county area and is the responsibility of Cork County Council. Arising from flooding problems approx. 12 months ago, the Council office in Blarney carried out maintenance works on the Mile Stream. I will have the matter referred to Cork County Council and request them to urgently carry out maintenance works to alleviate the flooding problems. (Cork City Council, November 2002)

Could the (City) Manager advise if Cork City Council intends to construct a storm barrage to protect inland areas from surges at sea. And if not, what he expects will protect the city from flooding. (Cork City Council, March 2009)

That this council install proper drainage in Barry Avenue, Mervue, to deal with the ongoing flooding that has been occurring there for a considerable numbers of years now. (Motion proposed at Galway City Council, February 2008)
the engineering or drainage department of the local authority (county or city council). A loop is created where engineering is considered the optimal solution in part because engineers are given responsibility for floods, but that responsibility is given because floods are viewed as a problem engineers can fix. There are historical reasons for this emphasis in Ireland (see Chapter 7) and institutional cultures formed when engineering was the preferred flood mitigation policy can continue to shape local practice long after national policies have advocated alternative approaches (Harries and Penning-Rowsell, 2011). This focus on engineering can also act to exclude other perspectives and knowledges which might offer alternative perspectives on how best to manage flood losses. The issue of expertise, knowledge and the role of a variety of stakeholders in decision-making and governance are discussed in greater detail below in the context of recent flooding in Cork.

A similar process to the local practice I have just described is visible in the discussion of flood hazards in the national parliament. An examination of the records of Dáil Éireann from 1985 through to 2009 illustrate that flooding is an issue that is raised with increasing frequency in parliament (see Fig. 6.2). However discussions and debates on the overall direction of hazard policy are rare. Much like the minutes of City Council meetings, a pattern is evident in which local TDs (Members of Parliament) frequently raise questions regarding flooding in a particular location within their constituency that has been brought to their attention by their constituents. The TD will typically request that the relevant Government Minister direct the attention of the OPW (the national agency charged with managing flood risks) to the flooding in this location. The expectation is that the OPW will conduct an engineering investigation of flooding in this location and if funding is available provide an
Table 6.4. Comments on flood hazards from the records of Dáil Éireann.

<table>
<thead>
<tr>
<th>Date</th>
<th>Deputy/Minister</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>February 8th, 2005</td>
<td>Mr. McCormack</td>
<td>asked the Minister for Finance if he will accept responsibility for the flooding of the home and farmyard of a person (details not included in the record) in County Galway on 7 and 8 January 2005 caused for the third time in 10 years by the overflowing of the Ovenshree River at Roxboro, Kilchreest, County Galway; and if he will make a statement on the matter. (February 8th, 2005)</td>
</tr>
<tr>
<td>February 1st, 2005</td>
<td>Deputy Joe Costello</td>
<td>asked the Minister for Finance his plans for dealing with the threat of flooding on the north side of Dublin; if the anti-flooding measures for the final stretch of the River Tolka at Distillery Road will be put in place; and if he will make a statement on the matter. (September 24th, 2008)</td>
</tr>
<tr>
<td>February 14th, 2007</td>
<td>Deputy Thomas P. Broughan</td>
<td>asked the Minister for Finance his plans to introduce national anti-flooding measures in view of the recent floods in Riverside Estate, Dublin 17 and in Kinsealy and Balgriffin in Fingal County and across the country. (September 24th, 2008)</td>
</tr>
<tr>
<td>October 28th, 2004</td>
<td>I wish to ask the Minister for Finance if he is satisfied with the measures taken to avoid flooding following the latest incidents in Dublin and along the south and east coast yesterday; and the steps, if any, to compensate those who have been adversely affected. (October 28th, 2004)</td>
<td></td>
</tr>
</tbody>
</table>
engineering solution in an attempt to ensure that flooding does not occur there again (see Table 6.4). Such questions were raised often but flooding appears to have become an increasing topic of concern in recent years. In the late 1980s such questions do not appear often in the parliamentary record but in 2006 and 2007, over eighty questions about flooding are recorded (see Fig. 6.2). In a similar manner to the discussions of flood at the level of local government, the focus is often on preventing a reoccurrence of particular flood events. Flood prevention is viewed as the optimal means of ensuring that flood losses are reduced or eliminated. Comments focused on flood “elimination” and “anti-flooding” measures. Questions are often phrased in a manner that criticises the “failure” of the government to take “action” in cases where flooding has occurred. There is an expectation that flooding can almost always be prevented through the development of the appropriate engineering project. In many cases the answers from the Government Ministers indicated that the OPW does
undertake engineering investigations in relation to these requests and engineering works are often carried out. In most cases these requests were refused only if the OPW did not have responsibility for the particular flooding event in question. This can occur if the water body from which the flood originates is in private ownership or is the responsibility of some other government agency. On rare occasions the request was refused because the losses experienced were deemed too small to make the financial investment worthwhile or on environmental grounds but such a negative responses seem to be unusual. Discussions often focus on the financial cost of engineering options for flood prevention but alternative forms of flood response other than those that aim for complete prevention were rarely discussed.

In a similar manner to the picture of flood hazards policy and decision-making at the local government level, these records from the national parliament suggest that current practices are partly the result of the dominance of a particular understanding and conceptualisation of flooding, and of an institutional structure which places the OPW as the lead agency for flood management. The role of the OPW was traditionally limited to that of improving drainage, particularly of agricultural land (see Chapter 7). While its remit is now broader, the traditional assumption that it provides engineering solutions to drainage problems remains. It is also fair to say that much of the expertise of the OPW lies in the fields of engineering and flood defences and not in alternative options for flood loss mitigation.

The dominance of a discourse that views floods as natural events that can be controlled and managed through the appropriate application of engineering and technological fixes was particularly evident in the recent inquiry of a parliamentary
committee into the floods that were experienced across many parts of Ireland in November 2009. The public records of the committee’s investigation provide over twenty hours of transcripts that including testimony from many of the local and national stakeholders involved in the November flood events. It is clear that many of the elected representatives and other stakeholders attending the inquiry viewed the 2009 floods as avoidable and were seeking ways of ensuring that they were prevented from ever occurring again. Preventing the floods from reoccurring was seen as the only way of ensuring that the losses and disruption experienced in Cork City and in many communities in the River Shannon basin in particular was not repeated. Central to this prevention of future events was establishing who was responsible for the flooding that had occurred. It is assumed that someone must be responsible for the fact that the flooding was not prevented or at least lessened. As one TD observed during a meeting of the Committee on February 23rd 2010 “Nobody is here other than for the purpose of trying to ensure that whatever went wrong, these things will never happen again. Something went wrong because the level of water that arrived into Cork city was far greater than expected or than the city authorities had been warned about”. On the same day another suggested “I welcome our visitors from the ESB, but with no disrespect, I have heard the same history and geography lessons in previous presentations relating to rainfall, etc. What the people in the midlands and people in Cork and throughout the country want is not history lessons but a solution to the problem”. Another commented “Much of this flooding could have been avoided and it caused unnecessary damage. If proper management and structure had been in place, businesses and farmers and householders would not have suffered as much as they did at Christmas”. These comments and many others made during the deliberations of this committee (see Table 6.5 and Table 6.6) are illustrative of the dominance of a
Table 6.5. A selection of quotes from the records of the Committee on the Environment, Heritage and Local Government.

If a River Shannon authority was established and given the necessary legislative measures to manage and develop the River Shannon, it might attract EU funds to develop and erect the protection barriers necessary in towns such as Athlone. There has been devastation in Athlone and I have visited many of the areas affected. The Minister of State with responsibility for the OPW also visited Athlone. There has been much talk since then, but little action. The situation that occurred in 2009 was not a first. We have had a lesson from the ESB on the history of flooding. Throughout my lifetime I have listened to stories of flooding and have attended flood meetings in Athlone. I am aware Mr. Browne was at a meeting with the IFA in Ballinasloe recently. We have heard it all before. People are fed up of all the talk and no action. The Dutch had a serious problem with flooding, but they dealt with it comprehensively over the years. We do not hear much about serious flooding in the Netherlands and they do not seem to have a problem to the same extent as we have here, although I am sure they have as much or more rainfall than us.  

(Elected Representative, February 23rd 2010)

Nobody is here other than for the purpose of trying to ensure that whatever went wrong, these things will never happen again. Something went wrong because the level of water that arrived into Cork city was far greater than expected or than the city authorities had been warned about.

(Elected Representative, February 23rd 2010)

Five eminent people from the ESB are here today and we have been given a first-class episode of spin for which I congratulate them. I am making a serious point. The spin is over. The reality is there are people in the Visitors Gallery and at home in Cork and in other parts of Ireland, who are not back in their homes, who are waking up in the middle of the night afraid of being flooded. There are others who do not know if they will ever get back into their homes and then they are faced with the cost of the insurance bill.  

(Elected Representative, February 23rd 2010)

I am very impressed with the line, “We are but one input into this system”. Can somebody tell me why did Cork City flood on 19 and 20 November? Has the ESB any responsibility for what happened in Cork? I have heard no apology to the people of Cork from anybody here today. Nobody has said, “Sorry”.  

(Elected Representative, February 23rd 2010)

Flood defences will be installed in those areas where they can be. The Minister of State, Deputy Mansergh, is ensuring investment in flood protection and I made it a priority in the renewed programme for Government. The OPW has spent almost €190 million in capital projects since 1996 with more than €100 million being spent in the past five years. We have profiled expenditure on approximately 15 major capital schemes running up to 2014. The total capital spending on flood relief activities in 2010 will be in the order of €50 million. That is considerably more than was ever spent previously. Deputy Tuffy made the important point that sometimes hard engineering is not the only solution. A combination of hard engineering and flood prevention must be put in place and we must also allow natural flood plains to absorb waters. We must not lose sight of that fact because if we continue to build on flood plains we will cause huge problems downstream. Likewise, if we only put in place the hard engineering solution we will often push the wall of water downstream to flood areas of population. That has been the experience in the UK. We have to bring the best experts, including hydrologists, around the table to ensure we do not create these problems.  

(Minister for the Environment, Heritage and Local Government, March 2nd 2010)
Table 6.6. Quotes from the records of the Committee on the Environment, Heritage and Local Government.

<table>
<thead>
<tr>
<th>Quote</th>
<th>Source</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>A semi-State organisation has stated it has no responsibility and is not accountable for what happened during the flooding. However, something caused the flooding in Cork to happen and it cannot simply be rainfall. How will an answer be found?</td>
<td>(Elected Representative, March 2\textsuperscript{nd} 2010)</td>
<td></td>
</tr>
<tr>
<td>Essential maintenance work has not been done, despite the fact that various reports over many decades indicated that remedial work in key areas along the River Shannon would have a massive beneficial effect for farmers, the wider community and the protection of our globally threatened wildlife. The consequences of the failure to maintain the river since the foundation of the State has also had serious impact on the tributaries into the Shannon, particularly the River Suck.</td>
<td>(Representative of the Irish Farmers Association, March 9\textsuperscript{th} 2010)</td>
<td></td>
</tr>
<tr>
<td>In Athenry in south Galway people have not been able to get back into their houses. If they do get back, will work be carried out by the OPW to ensure that flooding does not occur again?</td>
<td>(Elected Representative, March 9\textsuperscript{th} 2010)</td>
<td></td>
</tr>
<tr>
<td>The people in the upper Shannon catchment area feel they have been ignored by the ESB and by other bodies who are responsible for the seriousness of the flooding. Much of this flooding could have been avoided and it caused unnecessary damage. If proper management and structure had been in place, businesses and farmers and householders would not have suffered as much as they did at Christmas.</td>
<td>(Elected Representative, February 23\textsuperscript{rd} 2010)</td>
<td></td>
</tr>
<tr>
<td>I hope flooding that occurred all over the country will become a thing of the past.</td>
<td>(Elected Representative, February 23\textsuperscript{rd} 2010)</td>
<td></td>
</tr>
<tr>
<td>We have invested in flood prevention measures. Senator Buttimer may dispute this but it is a fact. That budget has been increased and is set to increase even further despite the cutbacks. We are determined to make that investment because it is not acceptable that certain areas continue to be flooded. It is a very traumatic experience for people to see their shops flooded and to know it could happen again. We want to ensure that increased investment continues.</td>
<td>(Minister for the Environment, Heritage and Local Government, March 2\textsuperscript{nd} 2010)</td>
<td></td>
</tr>
</tbody>
</table>

The conception of flood hazards that assumes that flooding can be prevented or at least dramatically reduced through a combination of dams, weirs and flood defences that allow for almost complete management and control of the water levels. This view of floods as a risk that can and should be eliminated through management and control of rivers was particularly dominant among elected representatives but was generally not disputed by other witnesses. Representatives from the ESB which maintains dams on several Irish rivers for the generation of hydroelectricity, did contend that they were
unable contend that they were unable to control water levels once floods of a particular magnitude occurred. However they were alone in providing this argument and appeared to do so in order to deflect the blame that was being placed on them, rather than to advocate alternative strategies. The Minister for the Environment also noted that responses other than engineering had to be considered but seemed to suggest that flood prevention through engineering remained the preferred response (see Table 6.5).

A conception of flood hazards that sees floods as a risk largely external to society and views flood prevention as the centre piece of any flood hazards mitigation efforts was also evident throughout my interview research in Dublin, Cork and Galway. Engineering interventions appeared to be viewed as the ideal option both for the management of current flood hazards and for any future hazards due to the impacts of climate change. City Councillors, executive officials and other stakeholders all seemed to exhibit a strong belief that in a modern city, particularly a capital city such as Dublin, flooding should be eliminated through the adoption of appropriate engineering solutions. Initially this could take the form of flood defences in particularly exposed locations but for some the ultimate solution would the construction of a large tidal barrier to permanently eliminate any threat from coastal flooding.

As I mentioned in Chapter 5 this view that flooding must be prevented from occurring is influenced by an understanding of hazards that places their economic impacts at the centre of analysis, even if those impacts are in the form of disruption to the daily life of the city, rather than through extensive economic losses due to flood damage. For
executive officials in particular, their cities are viewed as being in competition with other cities throughout Europe and the rest of the world. In order to be successful a particular image of the city must be portrayed, and that image includes a demonstration of mastery and control over the natural environment. The city must be modern and efficient while disruptive ‘natural’ events such as flooding must be eliminated. Flood events indicated a failure to achieve the control and mastery over the environment that is expected in a modern city. As one planner in Dublin commented

“one of the key things in terms of our global competitiveness and economy is the type of city that you have. You have to have good infrastructure whether it is drainage, water, or transport. If you have a risk of flooding or if you don’t have access to a port or proper infrastructure as a result of flooding, then you are not at the races”.

Throughout my interviews almost all respondents viewed the prevention of flooding through engineering as the optimal means of addressing flood hazards (see Table 6.7). Just as is clear from the minutes of City Council meetings and from the records of the national parliament, floods and the losses they may cause are rarely thought of separately. Flood prevention is seen as the ultimate goal.

The views of a business representative in Cork are a typical example of the dominant viewpoint. He observed “It’s all about prevention. It’s fine to say with developments like the docklands that it needs to engineer out the potential problems but the real solution possibly is having some form of barrages or something like that in the outer harbour. Clearly that’s the prevention and that’s the solution”. A City Councillor in Dublin commented

“I think prevention has to be emphasised more, we would hope that it would not come to a situation where people would need to be evacuated or that emergency services would find themselves ill equipped to deal with the situation so if you are
going to prioritize funding for example well then I would have thought prevention in terms of flood defences”.

Most respondents were confident that not only was engineering the preferred option for the future, but that current engineering was providing protection against current flood exposure. Several respondents in Cork were confident that the hydroelectric dams on the River Lee allowed for control and management of the river that would prevent river flooding. They focused on coastal flooding as this was viewed as lacking the same control. An engineer in Cork commented “there was a hydroelectric scheme built on the Lee and obviously that has been beneficial in terms of controlling our river flooding. If there are heavy rainfall events or adverse conditions and we know about them in advance then the ESB can deal with the river water coming down”. He contrasted this perceived control over river flooding with the exposure to coastal flooding, commenting “but we’ve no control at the other end”. A City Councillor made similar observations,

“I suppose the city and county did to an extent in the 1950s when they built the dam out at Inniscarra to regulate the flow of water from the origins of the river in. The danger then is that we’re in a kind of an estuary scenario here then so obviously we are facing it coming in the other way then. I know there was talk of a Thames like barrier being built out closer to the sea. I suppose that’s one option that can be looked at”.

These comments were made less than three months before this perceived control failed and the city experienced extensive river flooding. Respondents in other cities also expressed confidence that engineering was the most appropriate means of managing floods both now and in the future with one engineer commenting “I would say that I have a very good handle on the coastal, we know what the risks are, we know where they might happen or not so we have an investment programme in place to address the current risks”. Respondents in Cork and Dublin in particular saw flood defences for particularly exposed areas of the city as the solution to current exposure and large scale flood barriers as the solution to future coastal flood exposure due to
Table 6.7. Interviewee’s views on engineering as the solution to flooding.

It’s all about prevention. It’s fine to say with developments like the docklands that it needs to engineer out the potential problems but the real solution possibly is having some form of barrages or something like that in the outer harbour. (Business Representative – Cork)

I think prevention has to be emphasised more, we would hope that it would not come to a situation where people would need to be evacuated or that emergency services would find themselves ill equipped to deal with the situation so if you are going to prioritise funding for example well then I would have thought prevention in terms of flood defences and land use for the future, they would be the two that should be prioritised. (City Councillor – Dublin).

I would say that I have a very good handle on the coastal, we know what the risks are, we know where they might happen or not so we have an investment programme in place to address the current risks. We also have a rather interesting project called project 20/30 and 20/50 which I have just coined which is 20/30 is looking at the issue of tidal barrages feasibility study says yes they are possible. Project 20/50 is more interesting and it is looking to the future whereby the stormy seas off shore are going to have to be dissipated energy wise before they come on shore, if they come on shore I don’t think we can resist them at the shore line, so looking at the possibility of underwater islands off shore linked in with wave energy generation we believe the technology by 2050 or I believe will have advanced to a point where it is possible to harness that. The technology is not there yet except in pilot form but it will be in the future, and the idea of the underwater islands is to try to maintain the visuals that you have there without destroying what is a very pretty visual. (Engineer – Dublin)

There was a hydro electric scheme built on the Lee and obviously that has been beneficial in terms of controlling our river flooding. If there are heavy rainfall events or adverse conditions and we know about them in advance then the ESB can deal with the river water coming down, but we’ve no control at the other end. (Engineer – Cork)

I suppose the city and county did to an extent in the 1950s when they built the dam out at Inniscarra to regulate the flow of water from the origins of the river in. The danger then is that we’re in a kind of an estuary scenario here then so obviously we are facing it coming in the other way then. I know there was talk of a Thames like barrier being built out closer to the sea. I suppose that’s one option that can be looked at. The problem at the moment of course is funding. We can’t afford to do something like that. It would be so expensive. (City Councillor – Cork)

I think the idea of protecting that by way of barrage into the future is something that you can’t ignore if sea levels are going to rise if this continues to be a trend then you have to look at protecting the city. (Planner – Dublin)

I’m not a hydrologist. I have a concern at significant interventions. I used to dive and Bray beach is a very good example. It was seen as a coastal defence project. I’ve seen from beneath the water the impact that had in terms of the absolute radical change in the habitat. It basically made very very little sense. I can sympathise with those who have lived there for years and have had access to the beach and I can sympathise with the vulnerability they now feel, but I think the danger is it’s looking at engineering solutions to systems and by and large those engineers are looking at it from a short term engineering point of view. I think the long term mechanism of hydrological systems means you tend to get some unexpected impacts and changes which is very difficult to model. I don’t have an alternative to those types of interventions but I have a reservation and I think they need to be very very carefully thought through. (NGO Representative – Dublin)
sea level rise and any changes in storm patterns that may occur. Funding was seen as virtually the only limitation to these projects. As one City Councillor in Cork commented “The problem at the moment of course is funding. We can’t afford to do something like that. It would be so expensive”. However many respondents appeared to view the construction of such barriers as inevitable as they saw them as the only viable option, regardless of cost. It is worth noting that the recently published *Draft Catchment Flood Risk Management Plan* for the Lee Catchment noted that such a coastal flood barrier for Cork currently fails to pass a cost benefit analysis but may do so in the future (Office of Public Works, *et. al.*, 2010). Similar large scale flood barriers have been proposed for Dublin Bay (See Fig. 6.3 and Fig. 6.4) (Dublin City Council, 2007).

The responses of my interviewees illustrated that flooding was viewed primarily as an external risk. For most respondents the primary means of reducing flood losses was to eliminate the flood waters themselves. Divergence from this dominant view was unusual although one NGO representative did question the dominance of engineering projects and their environmental impacts, commenting

“I can sympathise with those who have lived there for years and have had access to the beach and I can sympathise with the vulnerability they now feel, but I think the danger is it’s looking at engineering solutions to systems and by and large those engineers are looking at it from a short term engineering point of view. I think the long term mechanism of hydrological systems means you tend to get some unexpected impacts and changes which is very difficult to model”.

However it is worth noting that even though he had concerns regarding the impacts of engineering schemes on the environment, he also appeared to view them as inevitable commenting “I don’t have an alternative to those types of interventions but I have a reservation”. The belief that flooding must be prevented through engineering is so dominant that even those who oppose it on environmental grounds have not
Figure 6.3. One of the proposals for a tidal barrier in Dublin Bay.

Source: Dublin City Council (2007, p. 29).

Figure 6.4. An alternative proposal for tidal barriers in Dublin Bay.

Source: Dublin City Council (2007, p.29).
considered alternative flood hazards mitigation strategies. It is clear that decision-makers and policy makers in Ireland appear to be largely unaware of much of the social science research on the drivers of hazards losses. A risk based perspective that views the flood events themselves as the primary driver of loss is dominant. Other factors contributing to the losses and disruption causes by hazards are rarely considered. This was also evident in the views of respondents regarding social vulnerability. When asked to consider the socio-economic aspects of vulnerability most interviewees admitted to never having considered this aspect of flood hazards. A small minority of respondents dismissed the usefulness of conceptualising hazards in this way, suggesting that everyone who experiences a flood is affected equally. The most common response was to see vulnerability as primarily an emergency management concern. This understanding of vulnerability is also evident in flood policy documents and emergency management frameworks. Broad categories of the population such as the elderly are seen as being vulnerable purely because they are thought of as having greater difficult in the event of an evacuation. Many respondents viewed this type of vulnerability as being adequately addressed through current emergency planning. One official in Cork commented “that would be part of our emergency plan to deal with that, with vulnerable places or if you have homes where there are elderly people or those who didn’t have their own means of getting out of the flooded areas”. A City Councillor in Galway commented “Obviously there should be a plan there but I can’t see it being a huge issue”. In general considerations of the role vulnerability might play in influencing flood losses was not considered. “It’s not at the top of our agenda at the moment” commented one Dublin based official.
The minutes of City Council meetings, the records of Dáil Éireann and the results of my interviews are also illustrative of a dominant view regarding the appropriate role of the State in relation to floods and other hazards. It is clear that in the eyes of most elected representatives (and one assumes the constituents they represent) and most officials, the role of the State is in so far as possible to ensure that flood losses do not occur. As this is currently achieved through a policy of flood prevention and elimination, the role of the State is to ensure that this policy is pursued in so far as there are finances available to do so. Flood losses are often portrayed in terms of human distress and suffering (something the government should prevent on humanitarian grounds) and on economic grounds (as discussed in greater detail in Chapter 5). Preventing floods and other hazards is seen as imperative to economic success although compensation is often seen as appropriate on humanitarian grounds. This clear perception that the role of the state includes providing protection against hazards contrasts somewhat with neoliberal governance strategies that have become increasingly important in other areas of governance in Ireland. Beck (2009) suggests that the challenges presented by global risks such as climate change highlight the failures of the neoliberal state by illustrating that individual action cannot address such challenges and that the state must become involved. As I discuss in more detail below in relation to the Cork flood of November 2009, a case can be made that recent events in Ireland illustrate that a policy which attempted to shift much of the responsibility for flood preparedness away from the state and on to individuals through an extensive public awareness campaign has failed. Future increased exposure due to the impacts of climate change may force a re-examination of the role of the state as it is called on to carry an increased financial burden due to hazards losses. For example, as insurance companies withdraw from providing coverage in
flood prone areas the state is likely to be expected to pick up this burden. The shifting roles of the state and other actors, and the changing institutional structures this may create, are likely to play an important role in shaping future vulnerability. An effective hazards mitigation and climate change adaptation strategy for coastal cities is likely to require a central role for the state as well as other actors.

There are also environmental justice implications to current flood policy in Ireland that have not have been considered by decision-makers to date. Despite the continued emphasis on engineering fixes, it is recognised in current flood policies that not all areas can be protected through engineering and technological fixes. As decision-making is conducted on the basis of cost benefit analysis it is likely that the areas to be protected will be those where the highest financial losses are likely to be felt (Johnson, et. al., 2007). Decisions may also be influenced by public opinion and political considerations (Harries and Penning-Rowsell, 2011). The areas chosen for protection may not be the areas of greatest vulnerability and some vulnerable populations may be left unprotected. This process may be seen within urban areas but also between them as the largest cities are the focus of protection and prevention efforts, while smaller towns or less economically developed areas may not receive similar support. In the aftermath of flooding in the Shannon basin in November 2009 representatives from farmers unions were quick to criticise the protection of urban areas and the failure to provide similar protection to neighbouring rural communities. In this context who gets to decide what is and is not at risk, which risks can be mitigated and which ones cannot, and on what basis those decisions are made becomes increasingly important. Beck (2009) describes this process as the relations of definition which he considers analogous to Marx’s relations of production. He...
suggests that in this context, particular forms of expertise, particularly those relating to technology and the natural sciences come to assume a central role in risk decision-making, something that is certainly evident in the context of flood risk management. He argues that the relations of definition can become the relations of domination as some experts become powerful decision-makers in the risk society, deciding who is and who is not subjected to particular risks. The importance of expertise and knowledge in the exercise of decision-making power has also been the subject of an extensive literature in geography and other social sciences that recognises the complex roles expertise and knowledge can play in shaping environmental governance (Agrawal, 2005; Birkenholtz, 2008; Mitchell, 2002; Prince, 2010).

**The strengths and weakness of the risk based approach: the case of Cork city**
Cork City’s unique geography and history combine to create an unusual suite of environmental hazards (see Chapter 3). The city developed on a number of islands that were originally located in the centre of a large swamp in the estuary of the River Lee. As the city expanded the channels between these islands were filled in or culverted over. Eventually only two main channels of the river remained visible and the city centre occupied an island between these two channels (Hickey, 2005). Due to its unique setting the city has faced flooding of both river and coastal origin while the high water table of the city centre island and the rapid run off from the hills on the city’s north side added to these challenges (Hickey, 2005; Tyrrell and Hickey, 1991).

Throughout its history the residents of Cork have addressed these flood risks in a variety of ways. Human activity has also helped to shape exposure to flooding as large parts of the city including the docklands area that has been earmarked for
extensive redevelopment are located on land reclaimed from the estuary of the River Lee (see Chapter 3 and Chapter 5). In recent decades engineering and technological adaptation have come to play an increasingly important role in the city’s efforts to prevent flood losses. The attempts to prevent flooding fit within the paradigm of flood risk management I have outlined in this chapter. While there is certainly an awareness that flooding is a part of the history of Cork and floods were viewed by many of my interviewees as an integral part of life in the city (see Chapter 4), flood policy is characterised by the belief that flood control is the best means of reducing flood losses. Two hydroelectric dams constructed on the River Lee upriver of the city centre were thought to provide control over river flooding. As I mentioned earlier several of my interviewees contrasted the control over the river that these dams provided with the current lack of control over coastal flooding. This illustrates some of the greatest strengths and weakness of engineering as a solution to flood risk. Engineering solutions and dams in particular often prevent smaller more frequent events but the false sense of security this can create often increases vulnerability to much larger but less frequent floods (Lopez and Yarnal, 2010; Wisner, et. al., 2003).

Engineering solutions certainly work in some cases. Flood defences can prevent floods of a particular size from occurring. Dams can and often do provide protection against floods through a technique known as flood attenuation. Assuming sufficient capacity is available in the reservoir flood waters can be retained behind the dam during a flood event and released slowly over an extended period. This technique has been used successfully on several Irish rivers including the Lee and the Liffey (Fitzpatrick and Bree, 2001). During one flood event in 1986 it is estimated that the attenuation provided by the two dams on the River Lee helped to retain the water
levels in Cork City at almost 1m lower than would have been the case had the dams not been present (Fitzpatrick and Bree, 2001). However this false sense of security may have helped to increase the vulnerability of Cork City to larger floods like that experienced in November 2009. Despite some forewarning of the potential for this false sense of security to develop (Fitzpatrick and Bree, 2001), Cork City appears to have been largely unprepared for larger flooding events. While it was fortunate that no fatalities occurred in November 2009 this appears to have been down to luck and a prompt response from the emergency services in the City, rather than to the City’s overall level of preparedness. My qualitative interview research, conducted in Cork just three months before this event, indicated that local decision-makers did not view river flooding as a major concern for the City. The two dams to the west of the City were seen as providing an effective means of preventing river flooding. While the City had an emergency plan for dealing with hazards of various kinds, no dedicated flood warning system was in place. Despite media coverage of the potential for flooding that night many of the city residents were awoken in the early hours of the morning to find their homes quickly filling with water. It is clear that the illusion of control described by Beck (2009, 1992) and the false sense of security highlighted by numerous hazards geographers (Lopez and Yarnal, 2010; Wisner, et. al., 2003) had well and truly set in.

Two additional key features of the Cork event and reactions to it and to flooding in the Shannon basin are worth noting. The first is the response of the various state agencies involved in these events in some capacity. As I mentioned earlier, in testimony before the Oireachtas Committee on the Environment each of the State agencies involved seemed to support the idea that much of the flooding could and
should have been prevented. However each was keen to suggest that someone was responsible but it was not them. Similar responses were evident in relation to the emergency response once the flooding had occurred, particularly in Cork City. This is most noticeable in the blame game that has taken place between Cork City Council and the ESB which operates the two dams on the River Lee regarding whose responsibility it was to warn the public of the impending flood threat. The Report of the investigation conducted by the Oireachtas Committee on the Environment notes “Throughout our deliberations we repeatedly encountered a tendency on the part of various relevant State bodies to define their responsibilities more in terms of what they do not include rather than what they do” (Houses of the Oireachtas, 2010).

The tendency to avoid responsibility may be comparable to a phenomenon Beck describes as organised irresponsibility (Beck 2009). While Beck focuses on national and international institutions and their inability to cope with global risks the term can also be applied to local and institutional structures and decision-making. Beck suggests that this organised irresponsibility can lead to the rationalisation and denial of the existence of particular risks. In the context of environmental hazards in local cities, a type of organised irresponsibility may lead to acknowledgment that some risks exist (they are hard to deny after they have been realised as a flood disaster) but to a denial of responsibility for their occurrence or for the emergency management response to them. The notion of organised irresponsibility suggests a deliberate and planned attempt to avoid responsibility for hazards management. It is more likely that the appearance of organised irresponsibility is the result of a mismatch between institutional structures designed with a clear area of responsibility, a defined geographic jurisdiction, and a clear area of expertise are forced to confront emerging
environmental hazards which emerge quickly, cross institutional borders, have impacts at a distance from their source, combine human and non human elements or actors, and require cross disciplinary knowledge and expertise (Robbins, et. al., 2008). These characteristics of the hazards produced by contemporary global change limit the ability of contemporary institutions and organisations to respond effectively (Robbins, et. al., 2008). Focusing on the challenges presented by West Nile Virus in Arizona, Robbins et. al., (2008, p.96) demonstrate how government institutions and bureaucracies are constrained by “their specific geographic practices and boundary limits, as well as by the distinctive training, education, competences and governance capacities” available to them. Similar challenges are present in managing flood hazards in Ireland. While floods are not new they challenges they create cross institutional boundaries (see Chapter 7), have both human and non human drivers, and require knowledge or expertise that may not be available to the institutions and organisations faced with managing flood hazards. Flood hazards may fall between the cracks to some extent as agencies or organisations are unable or unwilling to take responsibility for them. Current institutions and governance structures have also evolved over time in response to a variety of influences (Dodds, et. al., 2010) and in ways that may not have optimised their ability to manage current challenges (see Chapter 7). The intermittent nature of hazard events may add to this effect as they do not fall within the day to day experience of most government organisations. Strict adherence to the prescribed missions and responsibilities of each agency is likely to create both overlaps and gaps in the decision-making structure that may explain the appearance of irresponsibility. It may be less the organised irresponsibility that Beck suggests and more of an unintended consequences of the interactions between environmental variability or change and bureaucratic governance institutions ill suited
to the dynamic challenges they face. The occasional nature of floods also places them in a category of policy issue that is less likely to be the clear responsibility of any one agency. Regardless of the exact cause of the irresponsibility it is clear that events such as the Cork floods create numerous challenges for contemporary institutional and decision-making structures and future flood hazards policies will need to take this into account if they are to successfully address both contemporary flood hazards and future environmental change.

The second notable aspect of the reaction to the Cork event is the apparent lack of preparedness among the city’s population. It seems clear that the residents of the city were largely unprepared for the flooding that occurred. While this was compounded by the failure to give adequate warning that a large flood event was imminent, it is not clear that the population were well prepared even if such a warning was given. This raises questions regarding the role of individuals, households and businesses in their own preparedness for hazards, relative to the role of the state. As I mentioned earlier there appears to be a strong perception among all stakeholders that the state can and should play a strong role in hazards management and response. This perception is present despite the increasing encroachment of neoliberal governance strategies that have attempted to decrease the role of the state in many areas of life including the provision of a variety of public services. This understanding of the role of the state in flood hazards mitigation is likely to be the result of the historic evolution of flood hazards policy in Ireland (see Chapter 7). The role of the state and other stakeholders can be influenced by a variety of factors including economic and political factors (Platt, 1999; O’Neill, 2006). Pressure from victims who feel the state should protect them from flood losses can also help to shape decision-making and to slow the
implementation of policies that advocate alternatives to engineering and technological fixes (Harries and Penning Rowsell, 2011).

The lack of preparedness for flooding in Cork City may also illustrate that a strategy that had been attempting to switch much of the responsibility for hazards preparedness away from the state and on to individuals has failed. A national public information campaign including the establishment of the www.flooding.ie and www.floodmaps.ie websites had attempted to encourage the public to individually prepare for flood events. Residents were encouraged to undertake a range of actions to prepare for flooding (see Table 6.8) but available evidence from the November floods in Cork and other parts of the country provides an illustration of a largely unprepared population. It appears that many of the suggested actions were not taken by exposed populations. There are a number of possible explanations for this failure and these raise important questions about the roles of various stakeholders, and their access to knowledge and expertise in influencing the preparedness of cities and their populations for floods and other climate hazards. Successful environmental governance often hinges on the interactions of the state and its agents with other local stakeholders (Birkenholtz, 2008) while these relationships and their roles in environmental governance are being recognised as increasingly complex (Prince, 2010). The experience of Cork City in November 2009 may be an illustration of a need for better communication of the need for individual preparedness for hazard events, an indication of competing visions of the role of the state and the role of local stakeholders, or evidence of shifts in knowledge and expertise over time. There is some evidence that the environmental knowledge held by local residents and the role of government expertise has changed over time. There is some evidence that floods
during the 1960s caused less damage than might have been expected as local business owners and residents had moved vulnerable stock and personal property to higher floors in advance of flood events (see Chapter 3). Such preparedness appears to have been largely absent in 2009 suggesting that this local environmental knowledge of floods and how to prepare for them has been lost in the intervening years. There is evidence that when confronted with complex hazards local populations are often willing to defer to scientists or government officials who are perceived as having greater expertise (Barberi, et. al., 2008; Gregg, et. al., 2004; Haynes, et. al., 2009; Njome, et. al., 2010). However it is still unclear why the local population appear willing to defer to experts now if they were more self reliant in the past. It is also not clear whether the preparedness mentioned during the 1960s is evidence of an ongoing level of community preparedness that has since declined or whether this preparedness was unusual and was not common practice. What is clear is that the shifting roles of expertise and knowledge, and the changing visions of the role of the state and local stakeholders will continue to have important implications for future flood hazards and their consequences. These challenges are evident across a range of environmental resource and hazards concerns including groundwater governance (Birkenholtz, 2008) and the success of future flood hazards and climate adaptation policies depends on successfully negotiating potentially divergent visions that stakeholders may have regarding the appropriate role of the state, individuals, households, businesses and other actors. I discuss the evolution of the roles of various stakeholders further in Chapter 7.

Investigations into this event and policy making for future hazards could now proceed in several different directions. Local officials might view the flood purely as a failure
in the process of human decision-making within the river management system. The operators of the dam might be accused of failing to control the flood. A second avenue of investigation might question whether the dam itself was sufficiently large to retain the flood. If it is found not to be sufficient, a range of other scenarios are then available. Modifications to the dam might allow more water to be retained behind it. Additional flood defences could be constructed in the city centre to provide protection closer to those likely to be affected. Alternatively local decision-makers might wish to switch emphasis away from engineering to a focus on other mitigation options. A more effective warning system might be developed and combined with evacuation planning and public education to help to city to prepare for future floods. Sandbags or

**Table 6.8. A selection of the individual preparations for flooding promoted by the flooding.ie website.**

<table>
<thead>
<tr>
<th>Advance Preparations:</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Sandbags</td>
</tr>
<tr>
<td>➢ Floodboards or flood barriers</td>
</tr>
<tr>
<td>➢ Wrapping (installing plastic wrap around buildings)</td>
</tr>
<tr>
<td>➢ Installing water proof membranes (new buildings only)</td>
</tr>
<tr>
<td>➢ Preparation of a flood emergency kit</td>
</tr>
<tr>
<td>➢ Preparation of a family evacuation plan</td>
</tr>
<tr>
<td>➢ Planning for elderly family members</td>
</tr>
<tr>
<td>➢ Preparing for what to do with pets</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In the Event of an Imminent Flood</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Monitoring weather forecasts, tide tables or local conditions to determine if a flood is likely</td>
</tr>
<tr>
<td>➢ Moving valuables to higher floors or other safe locations</td>
</tr>
<tr>
<td>➢ Moving furniture and carpets</td>
</tr>
<tr>
<td>➢ Raising furniture that cannot be moved</td>
</tr>
<tr>
<td>➢ Removing curtains</td>
</tr>
<tr>
<td>➢ Having warm clothes and wellingtons easily accessible</td>
</tr>
<tr>
<td>➢ Moving vehicles to higher ground</td>
</tr>
<tr>
<td>➢ Disconnecting major electrical appliances</td>
</tr>
<tr>
<td>➢ Turning off electricity</td>
</tr>
</tbody>
</table>
other forms of demountable defences could be made available to home and business owners. Residents and business owners in the city centre island could be encouraged to ‘flood proof’ their ground floors and perhaps provided with some financial assistance for doing so. Numerous other loss mitigation strategies might be pursued some of which require action by state entities while others place responsibility on individual home and business owners.

Unfortunately the indications to date are that only the first option has become the focus of attention. The investigation of the Oireachtas Committee on the Environment, the Minutes of Cork City Council and media coverage indicate that the focus on decision-makers and other stakeholders has been on the Inniscarra Dam and its operation during the flood event. The assumption remains that this flood should have been prevented and that the ESB failed to correctly manage water levels at the dam. The report of the Oireachtas Committee on the Environment has called for a more detailed inquiry into events in Cork noting

“The Joint Committee regards such an investigation as essential in order to understand the causes leading to the November 19th / 20th flood and to identify the appropriate immediate steps that can be taken in order to eliminate or minimise the prospect of similar circumstances arising in future, and if and when they occur, to ensure as far as possible that they do not result in such catastrophic consequences for people in Cork, their homes and businesses” (Houses of the Oireachtas, 2010, p. 39).

The Committee also calls for such a committee to “retain appropriate technical expertise” deemed necessary to complete such an investigation (Houses of the Oireachtas, 2010, p. 39). A secondary concern has focused on the failure to give adequate warning to the city’s population. Little attention has focused on the vulnerability or preparedness of the city’s population and what might have occurred even if an effective warning system had being in operation. The aftermath of the
flooding indicates that many homeowners, business owners and other stakeholders in the affected areas would not have been well prepared for the flooding that occurred even if adequate warnings had been given.

The case of Cork is illustrative of the challenges that many of the world’s cities, particularly those in coastal regions are likely to face in a future of climatic change. As increasing sea levels combine with changes in rainfall and storm patterns, exposure to flooding may increase significantly. Somewhat ironically, increasing development and those same changing rainfall patterns may make water supply a challenge at other times of the year. While steps such as an increased awareness of the relationship between land use planning and flood risk are welcome and are likely to be beneficial for new developments, these do little to address increased exposure in the already developed city centre core. The experience of flood hazards mitigation in the United States also illustrates that switching from structural to non-structural responses alone is not sufficient to reduce flood losses (Changon, 2000). While development may be limited in other places due to flood risk, cities like Cork strive to redevelop exposed dockland locations as this is seen as vital to the city’s economic future (see Chapter 5). Retreat is unfeasible due to the economic value of the property and infrastructure already in place so engineering and technology come to be viewed as the only option. However these present numerous challenges some of which are often ignored. The chief objections to engineering projects are often their financial costs and potential impacts on the natural environment. Both of these are often justified based on the perceived financial costs of not proceeding with the engineering project and allowing parts of the city to flood. Engineering is an attractive solution as it is usually project based. This project based model fits easily with the cost-benefit
analysis model of decision-making as it is relatively easy to quantify what an engineering project is and what it will achieve. Disaster loss reduction programs on the other hand may be harder much harder to justify using a cost-benefit methodology. Their results are often less clear and may take longer to become visible. Other challenges and difficulties presented by engineering projects are often given little consideration. I have already described the problem created by a false sense of security (Lopez-Marrero, 2010; Wisner, et. al., 2004). The city’s population may be unprepared for larger floods and may have placed more people and property in exposed locations than might have been the case had the engineering fix not been in place (Lopez-Marrero, 2010; White, 1945; Wisner, et. al., 2004). An additional, if hopefully much smaller concern is that of failure of the engineering defence itself (Wong and Zhao, 2001). This has been mentioned briefly in response to the November floods in Cork with ESB representatives defending their decision to release large quantities of water from behind the dam by stating that the consequences could have been much worse if the dam itself had failed. Engineering solutions can also be unsightly, particularly in historic city centres. Flood walls have not been considered in Cork City centre as their impact on the visual appearance of the city is thought to be largely unacceptable and they would not provide complete protection as gaps would have to be left for bridges and other low lying infrastructure. The visual impact of flood defences was listed as a concern by several elected representatives in Dublin, one of whom commented “I wish it wasn’t so concrete symmetric lines, I just don’t like that you know”. All of these concerns are issues that many cities in Ireland and around the world are already facing and these issues are likely to become increasingly important in the future.
The November 2009 flooding in Cork offers an opportunity to reflect on current approaches to floods and other hazards in Ireland, particularly in the context of ongoing environmental, social and economic change. Current approaches are dominated by a risk management perspective that views flood prevention as the primary means of flood loss mitigation. The pursuit of this approach is likely to be financially costly and its success is far from guaranteed. The Cork flooding of November 2009 illustrates how this approach will be tested by surprises and unexpected events. An alternative flood policy should recognise the distinction between flood waters and the losses they may create, including all of the drivers of flood losses, not just physical risk. The potential for such an alternative is discussed in the second half of Chapter 7. In the remainder of this chapter I briefly reflect on the concepts of hazards mitigation and climate adaptation, suggesting that a loss mitigation approach might prove to be a more fruitful means of addressing future climate change than the current adaptation centred paradigm.

Climate change adaptation versus hazards loss mitigation
Throughout this chapter one of the key concerns I have raised regarding the contemporary risk based approach to flood hazards in Ireland is that it adopts a unidirectional understanding of environmental hazards that focuses on floods as events that are external to society and that includes human populations as largely passive “receptors”. It excludes the human contribution to disasters and largely ignores the role of human agency in human environment interactions. While Ireland has yet to publish its national climate change adaptation strategy and adaptation received little attention in the last National Climate Change Strategy (2007), it seems likely that adaptation strategies will follow the same risk centred approach utilised by current flood hazards policy. The discourses of climate change led by the IPCC have
created a new mitigation/adaptation binary where both of these terms have come to be used in ways that are significantly different from their previous use in several disciplines and subfields. Mitigation has now come to be associated with measures that aim to reduce the drivers of anthropogenic climate change while adaptation has come to describe actions taken to respond to the impacts of climate change. Prior to the development of this binary the term mitigation had a very different meaning in the natural hazards research community as it was used to describe any actions taken to reduce the losses experienced during hazards and disasters and encompassed a wide range of alternative policies and practices. This usage has been retained to some extent by flood risk management practitioners in the US. The new definition of adaptation is also a departure from how that term had come to be used in several disciplines, particularly anthropology (Head, 2010). The emphasis on adaptation as a new action, required in the face of the external stimulus of global climate change suggests a strong emphasis on climate and hazards as external to society. This emphasis may have more in common with past traditions of environmental determinism than with contemporary understandings of human environment interaction, particular among researchers in the natural hazards and political ecology communities.

It is also worth reflecting on the development of the concept of adaptation in comparison to the concept of adjustment to hazard that dominated the human ecology tradition of hazards research for decades. Both concepts share a focus on human decision-making in response to environmental variability and change which may have negative consequences for lives, property and other items valued by human society. Both place a strong emphasis on individual decision-making responses to
environmental stimuli. However, hazards research has evolved over several decades of research and has also been the subject of extensive critique (particularly from the political ecology subfield of geography) that have helped to reform hazards research. As a result of these developments, geographers have come to recognise the role of political, economic and cultural factors in human-environment interaction. Human-environment relationships are the product of both human and non-human influences and an understanding of both is required.

The focus of adaptation on responding to external climatic change risks obscuring much of what we already know about human-environment interactions and social responses to hazards and disasters. By focusing on risk-based adaptation to external climate and hazards events, policy and decision-makers may fail to utilise social science research on the complex social cultural, economic and institutional factors that shape hazards losses. Attempts to integrate the hazards and climate change research communities have met with limited success due to a variety of challenges ranging from different understandings of particular terminology through to fundamental differences in understandings of scale, assessment methods and processes of vulnerability (Birkmann and Teichman, 2010; Romieu, et. al. 2010). One means of overcoming the focus on hazards as external events and to begin to consider a broader range of alternative strategies for addressing hazards would be to focus on loss reduction rather than climate adaptation. This requires that the link between physical events and the losses they produce must be broken to allow for the inclusion of all drivers of loss, not just physical exposure. This would allow for a reconceptualisation of hazards and climatic changes as part of a process of human environment interaction, rather than as external events impacting human receptors.
Conclusions
Flood hazards policies and practices in Ireland’s coastal cities are based on a risk management paradigm that is becoming increasingly common in hazards and climate change adaptation policies. While this approach to both hazards and climate change remains common there are reasons for grave concern that this paradigm may not successfully address current or future flood exposures and vulnerabilities. This risk management approach has remained dominant despite sustained critique from hazards researchers. In this chapter I utilised Ulrich Beck’s risk society thesis and geographic research on environmental hazards to critique this risk management paradigm. While Beck’s risk society thesis cannot be applied to climate change and environmental hazards as easily as Beck and other authors have suggested, his work offers a useful lens through which to examine these issues. In many ways risk is becoming an increasingly important factors in decision-making and decisions about what is considered a risk, who gets protected from them and on what basis thesis decisions are made, is becoming an increasingly important aspect of environmental governance. However they do not occupy the central position in decision-making and governance that Beck suggests. We do not live in the type of risk society that Beck assumes and there are clear limits to the applicability of Beck’s thesis to global environmental change. As I demonstrate in this and other chapters a number of other factors including institutional and decision-making structures, discourses of economic development and framings and conceptions of environmental hazards are also an important influence on decision-making.

In this chapter I have illustrated how recent flooding in Ireland has highlighted many of the potential flaws in the risk management paradigm. They have illustrated the limits of the risk based approach and demonstrated how unexpected events are likely
to continue to challenge this approach. They also demonstrate how this approach may fail to reduce losses from hazards events. These floods have also raised important questions about the role of knowledge, expertise and institutional structures in shaping the preparedness of Ireland’s cities for both contemporary hazards and future environmental change. In the chapter that follows I will illustrate how current policy and practice have evolved over several decades. I will demonstrate how the role of events such as the 2002 coastal flood in Dublin have combined with influences such as changes in EU flood policy have helped to reshape local and national policy in Ireland. This illustrates how decision-making and policy is not a simple top down processes but results from interactions across multiple levels of governance. The second portion of Chapter 7 will reflect on how flood hazards policy might be reshaped to integrate a broader conceptualisation of environmental hazards that includes a greater consideration of human influences on hazards losses.
Chapter 7: Echoes of the Past and Challenges for the Future: Contemporary Flood Hazard Policy in Ireland

Introduction
In the previous chapter I illustrated how a risk management paradigm focused on physical exposure to hazards dominates flood management policy and practice in Ireland’s coastal cities. I outlined the challenges this approach is likely to encounter in addressing future climatic change and the limits of its failure to consider the social drivers of vulnerability. This followed from Chapter 5 where I illustrated how the intersections between economic crisis and environmental change have created the material and ideological conditions in which an economic development discourse dominates local decision-making and policy, and Chapter 4 in which I illustrated how conceptions and framings of climate change and environmental hazards among local decision-makers shape policy and practice. Previous chapters have focused on local policy and practice in coastal cities. In this chapter I trace the historic evolution of national flood hazards policy in Ireland and demonstrate how this continues to influence policy in ways that may limit the effectiveness of both current hazards mitigation and future adaptation. I introduce some of the main institutions and actors in flood hazards management in the Republic of Ireland today illustrating how they have come to occupy their current positions in the hazards mitigation and response system. This chapter provides an overview of current decision-making, illustrates who the main actors in the decision-making process are, and highlights several challenges for contemporary hazards mitigation and future climate adaptation.

I begin by providing a brief overview of the flood hazards management in the United States. This serves both to orient North American readers and to provide a comparative example to contrast with the evolution of flood hazards management in
Ireland. Following this introduction to US flood policy, I begin the Irish discussion by exploring the historical context for flooding and drainage policies in Ireland, focusing in particular on the role of the Office of Public Works (OPW) which now sits as the lead agency in national flood risk management. I suggest that the historical functions of the OPW which focused on arterial drainage aimed at reclaiming and improving agricultural land continue to shape current flood policy and practice in important ways. National flood policies have historically focused on the elimination of flooding for the purposes of economic development and have emphasised the reduction of physical risk, institutionalising a technological risk management discourse that continues to dominate decision-making today. I then turn to an analysis of cross scale governance and the interactions between decision-making at local, national and EU levels. I examine the challenges of implementing policies designed in other contexts in Ireland and suggest that some of these policies promote a continuing emphasis on engineering solutions while simultaneously neglecting the contribution of socio-economic drivers to hazards losses and adaptive capacity. I examine the role of local decision-making and suggest that while local decision-makers appear to enjoy a significant degree of autonomy in both flood hazards management and planning regulation this is constrained by a dependence on the national exchequer for funding. I then examine emergency response and disaster relief, issues that have attracted increasing attention particularly in the aftermath of the flooding experienced in several parts of Ireland in 2009. I suggest that the experience of the successes and failures of flood hazards policies in the United States may offer lessons for Ireland and that an emphasis on creating strong sustainable partnerships between all stakeholders may offer a means of surmounting contemporary and future challenges. Finally I consider why alternative approaches to hazards mitigation and climate
adaptation have not been adopted to date. I examine the challenges of integrating understandings of vulnerability into local policy and suggest ways in which this might be achieved.

**Flood hazards policy in the United States**

Although only a small portion of its landmass sits on floodplains the United States possesses one of the most extensive and expensive flood control systems in the world (O’Neill, 2006). Its development has been influenced by several factors including past disaster losses and political lobbying by communities affected by flooding (Godschalk et. al., 1999; Platt, 1999; O’Neill, 2006). As hazards and disaster policies have evolved, the roles of various stakeholders have changed significantly. In particular the role of the federal government has developed from having virtually no involvement in flood hazards to a playing a central role in determining policy and providing extensive funding for both hazards mitigation and disaster relief (Godschalk et. al., 1999; Platt, 1999; O’Neill, 2006). The changing relationships between the federal, state and local governments, and other stakeholders in the US may offer lessons for Ireland and Europe as the EU becomes increasingly involved in hazards policy. Historically the federal government was reluctant to become involved in hazards and disasters but was persuaded to intervene in part due to the lobbying of groups seeking to advance the economic development of outlying regions (O’Neill). Initial flood hazards management at federal and local levels focused almost exclusively on structural and engineering measures designed to prevent flooding (Changon, 2000; Godschalk et. al., 1999; Myers and Passerini, 2000; O’Neill, 2006).

Despite critiques of the policy of relying solely on structural responses (White, 1945), these continued to dominate until the 1960s when an increased emphasis on non
structural measures began to emerge (Changnon, 2000; Godschalk, et. al., 1999). Land use planning became a particularly important plank in new policies. However this often failed to reduce losses and relief payments to flood victims continued to increase (Changnon, 2000; Godschalk et. al., 1999). Disaster events often help to reshape policy and the record flooding experienced in the Mississippi basin in 1993 led to further reform (Changnon, 2000). The impacts of this event illustrated that there were limits to both structural and non-structural responses to flooding and that alternative strategies were needed (Changnon, 2000). Many commentators concluded that increasing financial relief for disaster victims was encouraging development in hazardous areas and leading to increased losses from floods and other disasters (Changnon, 2000). The aftermath of the 1993 floods led to calls for an increased role for local and state actors in hazards mitigation and for reductions in the financial burden placed on the federal government (Changnon, 2000).

The evolution of hazards policy and practice in the US during the latter half of the twentieth century had created a decision-making system that increasingly favoured partnerships across levels of government, between centralised and decentralised decision-makers, and between experts and lay persons (Mitchell, 2006b). Policy making has also begun to focus on both hazard events and their contexts, risk and vulnerability, behavioural and technological fixes, and both emergency management and hazards mitigation (Mitchell, 2006b). This approach changed dramatically following the terrorist attacks of September 11th 2001 as hazards and disaster preparedness became caught up in a new risk and security focused paradigm. Partnership was often replaced with centralised decision-making, risk focused technological fixes become the preferred policy while context, vulnerability, and
hazards mitigation were largely ignored or reframed in ways that failed to promote loss reduction (Mitchell, 2006b). The aftermath of Hurricane Katrina led to calls for increased centralisation and more efficient decision-making, particularly during the emergency management response to disasters but Mitchell (2006b) cautions that such an approach is unlikely to be successful and that increased partnerships may offer the optimal means of reducing losses from hazards and disasters. It is clear that hazards policies in the United States, particularly those pertaining to flooding have evolved significantly over an extended period and have endured many successes and failures along the way. These may offer many lessons for other countries including Ireland and the EU as they address both hazards mitigation and climate change adaptation in the years ahead.

The evolution of national flood hazards mitigation policies in Ireland
The roles and responsibilities of various actors in flood hazards management in Ireland have evolved over a period of more than sixty years but the main public agencies with responsibility for flooding remain the OPW and the local authorities (City and Council Councils). In the aftermath of the Report of the Flood Policy Review Group in 2004, the OPW was designated as the national lead agency for flood risk management for both river and coastal flooding. The local authorities remained responsible for storm water and road surface drainage, for some coastal protection works and for the regulation of planning and development in all areas including flood plains. This division of responsibility represented a realignment of responsibilities in response to the flooding events experienced in 2002, particularly in Dublin. Prior to the Report of the Flood Policy Review Group, responsibility for flooding was more diffused with the OPW having some responsibility for river flooding, although this had historically focused on the drainage of agricultural lands. Some powers to address
river flooding were also vested in the local authorities while responsibility for coastal flooding lay with the Department of Communications, Marine and Natural Resources. The result of the restructuring of responsibilities following this review report is a somewhat more streamlined and centralised system of flood hazard management (See Table 7.1).

Table 7.1. Public agencies and organisations with responsibilities related to flood hazards in Ireland

<table>
<thead>
<tr>
<th></th>
<th>River Flooding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National Lead Agency</strong></td>
<td>Office of Public Works (an agency of the Department of Finance)</td>
</tr>
<tr>
<td><strong>Local</strong></td>
<td>Local Authorities (City and County Councils)</td>
</tr>
<tr>
<td><strong>Coastal Flooding</strong></td>
<td>National Lead Agency: Office of Public Works</td>
</tr>
<tr>
<td><strong>Other Flooding, Storm Water and Road Surface Drainage</strong></td>
<td>Local Authorities</td>
</tr>
<tr>
<td><strong>Regulation of Planning and Development</strong></td>
<td>Local Authorities</td>
</tr>
<tr>
<td><strong>An Bord Pleanála</strong></td>
<td>(National planning appeals board)</td>
</tr>
<tr>
<td><strong>Overall Planning and Development Policy</strong></td>
<td>Department of the Environment, Community and Local Government</td>
</tr>
<tr>
<td><strong>Climate Change Policy</strong></td>
<td>Department of the Environment, Community and Local Government</td>
</tr>
<tr>
<td><strong>Emergency Management</strong></td>
<td>Local Authorities (lead agency for weather emergencies including flooding)</td>
</tr>
</tbody>
</table>

While the role of the OPW is now clearly described as one of flood risk management, historically its role had as much to do with economic and agricultural policy as it did with environmental hazards. Until recently the role of the OPW focused mainly on its powers and responsibilities under the Arterial Drainage Acts 1945-1995. These laws were originally established not as flood hazards mitigation mechanisms but as a

25 Prior to the change of government in March 2011 this was known as the Department of the Environment, Heritage, and Local Government.
framework for the drainage and improvement of agricultural land. This focus on the drainage of agricultural lands remained central to the mission of the OPW until the mid 1990s when an increased emphasis was placed on urban flooding for the first time. The economic benefits that might accrue from the drainage of agricultural land were central to the passage of the *Arterial Drainage Act* in 1945 and this is evident in the records of parliamentary debates from the time. The enactment of the *Arterial Drainage Act* and the policy debates that surrounded it are illustrative of an important factor in understanding hazards policies that I have already touched on in the Chapter 5. Hazards policy and decision-making rarely occurs in isolation from a variety of other social and economic contexts that shape both the formation of policy and the vulnerability of human populations (Mitchell, *et. al.*, 1989; Mustafa 1998; O’Neill 2006; Platt 1999; Watts, 1989). The parliamentary debates prior to the passing of the *Arterial Drainage Act* in 1945 echo many of the contemporary debates and challenges that continue to surround flood hazards management in Ireland and elsewhere.

It is clear that for many of the parliamentarians present in 1945, arterial drainage was not seen primarily as a means of reducing the losses experienced through flood hazards. Rather it was a national strategy for the improvement of agricultural land in order to increase employment and agricultural production. As one TD (member of parliament) commented “bear in mind that there is an agricultural aspect to this problem of national drainage…. Great Britain has undertaken large scale agricultural drainage schemes during the war. They claim to have reclaimed about 6,000,000 acres, a huge achievement in a short time” (Dáil Éireann Debates, Vol. 95, 1st Dec 1944). Another commented that the passage of this law would give Ireland “a national drainage board” which “will enrich the national estate by improving our lands and
improving our lives” (Dáil Éireann Debates, Vol. 92, 2nd March 1944). This emphasis on the link between drainage and the economic fortunes of the country echoes the continuing prominence of an economic development narrative within Irish cities today that is evident in the results of my interviews (see Chapter 5). In addition to the emphasis on agricultural land improvement, many proponents of a national drainage policy saw it as an opportunity to provide direct employment during the construction and maintenance of drainage projects. One TD commented that the new drainage strategy would “provide our people in rural areas with a fruitful source of employment” (Dáil Éireann Debates, Vol. 92, 2nd March 1944). This emphasis on job creation followed from previous efforts at drainage such as the Drainage Act of 1924 which were enacted primarily as employment schemes. Some TDs were strong proponents of the employment generating potential of a national drainage scheme with one arguing “this is a kind of work that will give useful and very valuable employment, employment of a kind which contains a very high labour content” (Dáil Éireann Debates, Vol. 92, 2nd March 1944). However this emphasis on employment as a key consideration in the development of a national drainage strategy was not universally supported. Another TD observed

“I have heard Deputies describe, with passion in their voices, the glorious prospect that this code holds for the employment of unskilled labour. I see a growing tendency to impress on the Parliamentary Secretary responsible for this scheme, the desirability of converting the whole thing into an immense relief work. I want to say to him from the word ‘go’, he should dismiss from his mind absolutely the labour content of this Bill as a matter of prime concern” (Dáil Éireann Debates, Vol. 92, 2nd March 1944).

The same TD also observed “the purpose of the Bill is to drain the land of Ireland and to do that properly” (Dáil Éireann Debates, Vol. 92, 2nd March 1944). These discussions clearly illustrate that policy and decision-making about hazards cannot be isolated from decision-making and policy in other areas. A full understanding of the
social and policy dimensions of environmental hazards must be linked to other areas of society, economy and culture. This is an important lesson for any attempts to better understand contemporary environmental and climate policies. The factors that influenced decision-making about drainage and flood hazards in the 1940s remain influential in Ireland today although in recent years the emphasis of national policies has shifted towards urban flood problems.

While in the 1940s, economic concerns focused on the drainage of rural agricultural lands with the goal of increasing production and employment, it is worth noting that debates did occur over the appropriateness of this strategy, with some representatives claiming that the economic development of rural areas was being prioritised over the health and safety of urban dwellers. This echoes contemporary concerns that these positions have been reversed and that the interests of urban populations are being prioritised over those of rural dwellers. During the 1940s some TDs expressed concern that urban areas were being neglected with one representative from Kilkenny focusing on the plight of residents of Kilkenny City. He observed “urban flooding causes very serious damage, not only to property but to health. The areas in the City of Kilkenny subject to periodic flooding and dampness are places in which tuberculosis is prevalent” (Dáil Éireann Debates, Vol. 95, 29th November 1944). His frustration with the dominant goal of agricultural land improvement is evident in his comments that

“public health should at least receive as much consideration in connection with the policy underlying this Bill as the improvement of agricultural land. It is to get some undertaking that, that aspect will not be overlooked when they come to implement the scheme that I have put down this amendment, because this matter fizzled out in 1931 and again in 1934” (Dáil Éireann Debates, Vol. 95, 29th November 1944).
Similar issues have emerged in recent years although policy priorities have reversed with urban areas now the focus of flood relief efforts. Farmer’s unions have accused the national government and local authorities of prioritising urban areas while neglecting rural populations and agricultural land (RTE News, 2009). The prioritisation of urban flood risk management began with a change to the *Arterial Drainage Acts* in 1995 but has been particularly evident in more recent years since the reorganisation of national flood policy following the *Report of the Flood Policy Review Group* in 2004. The focus on urban areas was defended by several of my interviewees, particularly executive officials in cities who argued that prioritising the economic development of cities is the optimal means of ensuring that the best interests of the country as a whole are advanced. They argued that flood prevention in urban areas was essential to ensuring that their cities remained competitive in the battle to attract geographically mobile capital and investment (See Chapter 5).

The *Arterial Drainage Acts* were the key stone of Ireland’s flood hazard policy from 1945 until the mid 1990s when the emphasis began to shift towards flood prevention in urban areas. Despite this policy shift to the urban context, the emphasis on drainage has continued to influence how flood hazards are conceptualised and understood, and the types of responses that are adopted. Institutional cultures formed when engineering and technological approaches were the norm can remain dominant even after alternative policies have become the favoured option (Harries and Penning Rowsell, 2011). Flooding continues to be viewed fundamentally as a problem of drainage and the reasons for addressing them in this way are seen primarily as economic. As I explored in greater detail in Chapter 6 this conceptualisation of hazards is central to a discourse of flood risk management that emphasis technological
and engineering fixes to almost all flooding, even though national policy has officially shifted to alternative approaches.

While the assumption that floods are best addressed through engineering appears to dominate policy today, it is worth noting that questions regarding the appropriate role of expertise and the importance of democratic decision-making did emerge during the discussion prior to the enactment of the *Arterial Drainage Act* in 1945. Some parliamentarians questioned why so much decision-making power was being placed in the hands of an unelected commission while others questioned why engineers were the only experts being considered for making these decisions. One TD critically commented that during similar land drainage schemes in the UK “it was necessary for their chartered surveyors to have agricultural qualifications because this whole problem of drainage and water levels has a very important agricultural aspect…… I feel that the ordinary engineer trained to deal only with water does not know enough about that aspect” (Dáil Éireann Debates, Vol. 95, 1st December. 1944). The question of expertise remains important today as decision-making remains dominated by an engineering perspective. While engineering is obviously an integral part of flood hazards it should not be the only voice at the table. As I discussed in Chapter 6 the dominance of an engineering, risk management paradigm ensures that range of strategies considered is relatively narrow and alternative options are excluded (see Mitchell 2008a for a discussion of the range of alternatives concept used by Gilbert White).
Questions about the role of the state and democracy also emerged in debates about the Arterial Drainage Acts. Some representatives were particularly strong in their critique with one observing

“the parliament of the country should not surrender the authority of the people to a bureaucratic institution or hand over complete and absolute control of the arterial drainage of the country to an institution constituted as the Office of Public Works is. We feel that along with the authority that was envisaged by the Drainage Commission in its report, there should be another authority elected and in some way as a representative of the people” (Dáil Éireann Debates, Vol. 95, 1st December 1944).

Another commented “we have been sent here to represent and maintain a democracy but here we are handing over to a subservient body, the Board of Works, power to override the wishes of common citizens who will be affected by arterial drainage schemes” (Dáil Éireann Debates, Vol. 95, 1st December 1944). These discussions of democracy and appropriate expertise raise questions concerning the roles for the state, the community, individuals and other actors, and questions of whose interests are best served by particular policies and strategies. As I have already illustrated in Chapter 5, contemporary decision-making practices in Ireland have been heavily influenced by a neoliberal governance perspective that emphasises the role of the state as a supporter of free market economic development. However this seems to coexist with a public perception that the state is duty bound to protect all of its citizens from flooding as is illustrated by reactions to the November 2009 floods which focused on the failure of public agencies to prevent the floods from occurring.

These questions echo similar issues that have been central to the evolution of flood hazards policies in the United States. Agreeing on the appropriate roles of all stakeholders appears to be one of the key challenges that must be addressed in order to achieve better hazards loss reduction and climate change adaptation in Ireland. As I
mentioned earlier, partnership has become an increasingly important aspect of hazards policy in the United States and other countries, enabling a range of stakeholders to be involved in the decision-making process (Mitchell, 2006b). Partnerships between the state at European, national and local levels, and the variety of other stakeholders and interest groups may offer a means of strengthening Ireland’s hazards policies and reducing the losses from events such as the flooding experienced across the country during 2009. However such partnership is likely to be difficult to achieve and to sustain. Partnerships are often most successful when all stakeholders involved share similar interests and goals but can dissolve quickly once that shared interest is lost (Mitchell, 2006b). Initial attempts at partnerships to address flood hazards have been made through the ‘flood partnerships’ created in Dublin City following the 2002 coastal flooding. These partnerships have involved regular dialogue between officials and local communities, bringing together decision-makers, experts and lay persons. The results of my interviews suggest that these partnerships are viewed positively by both officials and local communities. However this success may be dependent on the common pursuit of the same goal, engineering and technological fixes that aim to eliminate future flooding. It remains to be seen whether such partnerships would be as successful if there was a divergence of views regarding the overall goal of hazards policy. Evidence from the UK suggests that pressure from the victims of flood losses often encourages officials to continue to pursue technological fixes even when other approaches are advocated by policy (Harries and Penning-Rowsell, 2011). Outside of the partnerships formed in Dublin in the aftermath of the 2002 event there is little evidence of similar cooperation elsewhere in Ireland. While public consultations have been part of the Lee Catchment Flood Risk Assessment and Management Study (see below for a discussion of Catchment Flood Risk Assessment and Management
Studies), this appears to have been a largely expert led exercise rather than a partnership involving all stakeholders.

Recent years have seen the expansion of the role of the OPW from its traditional function as a land drainage agency to a more comprehensive but urban focused flood risk management authority. Its role now includes its former role as a land drainage and reclamation agency and its new responsibilities in urban and rural flood risk management. This evolution from a single purpose pursued through a single means (land drainage through engineering) to multiple goals pursued through multiple means is similar to the evolution of the roles and responsibilities of the Corp of Engineers in US flood policy (White, 1969). The Corps of Engineers was often slow to adapt to changing policy environments as its traditional approach remained dominant. Institutional and organisational cultures are often slow to change (Harries and Penning-Rowsell, 2011) and the discourse that traditionally emphasised the application of a technological fix to flooding remains influential in Ireland today.

There are several reasons why the historical role of the OPW continues to shape and define flood hazards policy. The OPW’s core expertise remains hydrological engineering and there is a clear expectation among many stakeholders that the OPW should act to prevent flooding. Even the name the Office of Public Works implies that its core mission lies in engineering and construction. The interaction between various agencies charged with different responsibilities can also create challenges. As I discussed in Chapter 6 one of the central features of the aftermath of the 2009 flood was confusion regarding the roles of multiple organisations potentially involved in the management of Ireland’s rivers. The evolution of a system of governance where multiple organisations pursuing multiple goals by multiple means can make achieving
effective policy and decision-making almost impossible (White, 1969). Some form of partnership between these agencies and other stakeholders is essential to ensuring more effective hazards mitigation in the future but there is little evidence to date that this is likely to emerge.

**Cross scale governance and decision-making**

Policy and decision-making about environmental hazards crosses three levels with the EU, national government and local authorities all playing important roles. The role of the EU in flood hazards policy has increased significantly in recent years, particularly through the implementation of the EU *Floods Directive* enacted in 2007. At first glance it might appear that since the implementation of the Directive, a top down decision-making process has been enforced as local and national governments take steps to comply with the stipulations of the Directive. Ireland is currently implementing the requirements of the Directive which requires the adoption of a catchment based approach to flood risk management. However this approach had already become part of the OPW’s flood risk policies prior to the enactment of the *Floods Directive* as it was recommended by the *Report of the Flood Policy Review Group* in 2004. During my fieldwork several interviewees sought to portray this as evidence that Ireland was leading the way by being ahead of developments at the EU level. However the river basin model had already been adopted by the EU in the *Water Framework Directive* of 2000, legislation which focused on the prevention of water pollution. This river basin model has several strengths but its origins lie in transnational flooding experienced in large continental river basins such as those experienced across Europe in 2002 and consequently its application to the Irish context may not be as smooth as its proponents would hope.
There are several reasons for the adoption of a river basin approach to managing flood risk. It allows for long term planning for the whole of a river catchment with the goal of preventing decisions made in one location from adversely impacting other areas. It also allows for more co-ordinated decision-making that cuts across existing administrative and political boundaries. For example a river basin may include multiple city and council councils as well as several national agencies or government departments who may also have responsibilities within the catchment. The river basin approach enables the bringing together of all stakeholders to consider the catchment as a whole and to achieve the types of partnerships I discussed earlier. In Ireland this approach to flood risk is being implemented through Catchment Flood Risk Assessment and Management Studies (CFRAMSs) and their outputs Catchment Flood Risk Management Plans (CFRMPs). The first of these studies was piloted in the Lee Catchment in Cork with others now ongoing on the Dodder in Dublin, the Suir in the south west of the country and in the Fingal East Meath region. While the CFRAMS model has the advantages mentioned above, particularly when compared to past approaches that were described by my interviewees as “piecemeal” and “reactive”, there are also several challenges that have not been extensively considered by policy makers.

By adopting the geophysical boundaries of a river basin as its unit of analysis, the CFRAMSs model may further institutionalise a conception of flooding that emphasises the physical drivers of flood events but does not sufficiently consider the human contributors to flood losses. This focus on the physical event is likely to reinforce the emphasis on engineering and technological attempts to prevent flooding. This could prove financially costly at a time of economic difficulty and as experience
from other parts of the world has shown the engineering fix often brings its own set of unintended challenges (Kahn and Mustafa, 2007; López-Marrero, 2010; López-Marrero and Yarnal 2010; Penning-Rowsell, 2000; Wisner, et. al., 2003; White, 1945). In Ireland the experience of flooding in Cork City in 2009 also illustrates the potential pitfalls of assuming the flooding can be controlled through a technological fix.

The river basin model of flood risk management is unlikely to give significant consideration to the factors that shape social vulnerability as these may cut across the biophysical boundaries of the river catchment. This is evident in the Draft CFRMP for the Lee Catchment published in February 2010. As the first of its kind this draft plan provides an early indication of how the CFRAMSs model will influence future flood hazards mitigation strategies in Ireland. The draft report focuses heavily on modelling physical exposure to flooding while the social drivers of vulnerability are not a significant portion of the analysis. While it emphasises that national policy now promotes moving towards the increased use of non-structural solutions to flooding (Office of Public Works, et. al., 2010) the Lee CFRMP focuses heavily on the potential development of flood defences. Considerable attention is also given to other options such as flood warning systems but other influences on flood losses such as social vulnerability are given little weight. As I discussed in Chapter 6, floods are conceptualised within the Source-Pathway-Receptor model which focuses on the physical drivers of flood events. The draft CFRMP for the Lee Catchment does contain a short section on what is described as “social flood risk”. However this aspect of the analysis simply quantifies the numbers of properties within flood risk zones. Social vulnerability is measured simply by counting the number of people
present in a particular geographic area. In this assessment higher population density is equated to higher vulnerability. Using such an analysis it is hardly surprising that the largest urban centres in the catchment (including Cork City) are identified as having the highest levels of vulnerability. The analysis does not include any attempt to differentiate between residents of flood prone areas. Vulnerability is defined solely as a unit of exposure. Those who are exposed are vulnerable, those who are not exposed are not vulnerable. Differences in adaptive capacity and vulnerability that shape the ability of some individuals or groups to prepare for and respond to flood hazards are absent from the analysis. This absence may prove to be a critical flaw in the design of CFRMPs that may only become clear during future disasters when some groups may suffer greater losses than others. Later in this chapter I reflect on why vulnerability and adaptive capacity may be absent from the analysis of flood hazards used in the Lee CFRMP and I suggest ways in which they might be integrated into hazards policies.

While economic losses revive some consideration in the analysis of flood hazards, the definition of economic loss employed is also rather narrow. The draft CFRMP states that economic loss occurs when “floodwater gets above the threshold level of a building, for example an entrance door to a building” (Office of Public Works, et. al., 2010, p. 40). This narrow interpretation of economic loss excludes several forms of loss and further narrows the population who are considered to be exposed or vulnerable to flood losses. Economic loss is tied to the ownership of fixed property and only where water is seen entering the internal rooms. Damage to vehicles, gardens, driveways and the eternal fittings of buildings are apparently not considered as economic loss. This definition of economic loss also assumes that it is easy to
identify which properties have been flooded and which have not. However recent research following the flooding experienced in the UK city of Hull in 2007 shows that this division is not as straightforward as it might seem (Whittle, et. al., 2010). A phenomenon that has become known as “secondary flooding” has been identified where water enters homes beneath the level of the floorboards. Homeowners initially assume that they have been spared from any flood losses but in the months that follow rising dampness and condensation emerge to cause the same level of damage to the structure as if visible flooding had actually occurred. In such cases the expert judgment of insurance assessors becomes contested as disputes emerge over whether the losses were caused by the flood or not (Whittle, et. al., 2010). The apparently straightforward question of the spatial extent of a flood becomes increasingly complex and contested. However the definition of economic loss employed in the draft Lee CFRMP would excludes all such losses from consideration as economic loss is deemed to occur only if water visible enters a building. If such an interpretation is employed in official policy and embraced by the insurance industry there is a clear potential for increased hardship for some flood victims who may be officially declared to not have experienced flooding at all. Who determines when loss has been suffered and on what basis they do so may become increasingly important in determining the course of recovery in the aftermath of flood events.

One of the strengths of the river basin model may be its ability to cut across the boundaries of existing decision-making and institutional structures to form partnerships involving all stakeholders in a river basin but this may also present some challenges. For example Dublin City includes within its boundaries three separate river basins, each of which may potentially have its own CFRAM study and separate
flood hazards strategies. There are also portions of the city that do not fall within any of these catchments but that are exposed to coastal flooding. This may ultimately result in multiple different flood hazards strategies being pursued within the same city, with the primary differentiation between them being the physical characteristics of particular flood events.

The EU *Floods Directive* was also criticised by some of my interviewees for its emphasis on river flooding and its consequent limitations when applied to other forms of flooding, particularly pluvial flooding caused by extreme rainfall events. The catchment based approach outlined in both the *Floods Directive* and the CRFAMSs model assumes that it is possible to objective quantify flood risk and to clearly identify different exposure units. This is potentially achievable for river and coastal flooding but for pluvial flooding this is virtually impossible as flash flood events can impact almost any location. As one official in Dublin City observed

“the European flood experience has been river based. The Floods Directive does mention pluvial and other forms of flooding but really it is talking about rivers. There is a fundamental logical flaw in the Floods Directive. It is not a fatal flaw, but they mention that when you are looking at a city you should identify the areas at high risk, medium risk and low risk. Then you move to identify how you might deal with the highest risks, but when you have pluvial flooding there is no such thing as no risk. I think the concept that there is an area that is at risk and the rest is ok is logically flawed”.

As I mentioned earlier the enactment of the Floods Directive was heavily influenced by the transnational river basin flooding experienced on the European Continent and its application to other forms of flooding in different geographical contexts may continue to prove problematic. Policies designed in one context are often ill suited to the contexts of other places. Flooding in large transnational river basins differs in its spatial and temporal extents from that typically experienced in Irish rivers. Flooding in very large river basins often covers a very large spatial extent and the duration of
the event can range from days to weeks or even months. With the notable exception of the Shannon, almost all other Irish rivers are relative short and any flooding is likely to last no more than a several days (although its effects may be felt for much longer). Coastal and pluvial floods also tend to be of shorter duration that typical European river floods. The duration of a coastal flood is typically a number of hours as the flooding will generally recede once tide levels begin to drop, although flooding may occur over several tide cycles. Similarly pluvial floods tend to be short duration rapid onset events. These characteristics are fundamentally different from the continental European flood experience that has helped to shape the Floods Directive. While pan European flood strategies may encourage action at the local level and the catchment model has the potential to facilitate the types of partnerships I discussed earlier, the ultimate success of EU policies may depend on their ability to leave space for the uniqueness of local places and contexts.

Another influential aspect of governance structures in the Republic of Ireland is the relationship between local and national government and the role that each plays in a variety of areas of policy that pertain to hazards and climate impacts. Compared to other countries local government in Ireland often appears to have a “lesser status” particularly when contrasted with some other European countries (Callanan, 2003, p.375). Irish local authorities have responsibility for significantly fewer areas of governance than their counterparts in other European countries (Tierney, 2003). Despite this, local governments in Ireland do have responsibility for several areas that are of particular relevance to hazards mitigation and climate adaptation. City and County Councils are the primary regulators of planning and development within their territories (Grist, 2003). While the OPW is now the lead agency for national flood risk
management, local authorities can implement flood relief works under the terms of the Local Authorities (Works) Act 1949 (O’Riordan, 2003). Local authorities are also responsible for emergency management when hazards events occur as they are usually the provider of local fire services and they are designated as the lead agency for managing weather emergencies (including flooding) under the *National Framework for Emergency Management* (Department of the Environment, Heritage and Local Government, 2006). Emergency management and post disaster relief and recovery is discussed in more detail below.

While local authorities retain these functions their decision-making is often curtailed by their limited ability to raise local revenue. While the ability to levy local taxes might seem essential to the autonomy of local government, since the abolition of domestic rates in 1978, Irish local authorities have had a very limited ability to raise funds locally and are heavily dependent on grants from the national government. In 2002 almost 50% of local government funding came directly from central government with the remainder split almost evenly between commercial rates and other sources such as service charges (Dollard, 2003). This leaves local government particularly dependent on businesses as their commercial rates are the chief source of locally generated revenue. This dependence may play an important role in shaping policy decisions as local authorities are keen to protect this revenue stream. This has directly influenced decision-making around flood hazards as one city councillor in Galway illustrated in his comments “from the City Council’s point of view a lot of these businesses here are rate payers and that is what finances the operation of the city and I know that are certain times of the year when this area outside is flooded it has an impact on the rate payers”. This councillor was one of several of my interviewees
who stated that protecting businesses from flood losses was a primary concern as the
damage inflicted by flooding could limit the ability of businesses to pay rates, thereby
directly hurting the finances of city government. The challenges of funding local
government was a concern raised frequently in interviews by both elected and
executive officials. Most saw it as the greatest challenge currently facing local
government in Ireland and an important constraint on policy making in all areas
including hazards and climate.

The increased emphasis on land use planning and the regulation of development as a
flood risk management tool highlighted by the publication of the *The Planning System
and Flood Risk Management: Guidelines for Planning Authorities* in 2009 places
local government in a key position to effect reductions in future flood losses. This
new emphasis on considering flood hazards in planning and development is
undoubtedly a major step forward from past practice. However there are also a
number of potential limits to its effectiveness and several challenges may lie ahead.
The emphasis on land use planning mirrors similar trends in US hazards policy.
However as the US experience illustrates, the shift from engineering to planning may
not be enough to substantially reduce losses (Changnon, 2000). Many of the most
significant floods experienced in Ireland in recent years have occurred in already
developed city centres and towns. As a result the impact of land use planning on flood
losses may be limited to the role that decreasing development on flood plains may
play in avoiding additional increases in runoff from impermeable surfaces. Its impact
in reducing the level of new development placed in flood prone locations is likely to
be limited by a number of factors. Substantial development (including on flood
plains) took place during the years of economic growth and most of these
development was completed before the 2009 guidelines were published. Substantial new development appears unlikely for the foreseeable future due to the state of the national economy. When permission for new developments are sought there is no guarantee that the flood risk guidelines will prevent inappropriate development on flood plains. It is not clear how closely the guidelines will be followed and the evidence presented in Chapter 5 illustrates, economic development is likely to be the primary consideration influencing the decision-making of local authorities. In addition to the potential economic developments stimulated by development, the incentives for local authorities to allow development even in potentially inappropriate locations include potential future revenue from commercial rates. Political corruption in the planning system has also been the subject of extensive investigation in Ireland in recent years (Flood 2002; Mahon, 2004) and it is not clear that this problem has been eradicated. Corruption and crime can be an important influence on all areas of policy and practice including the management of natural hazards and disasters (Alexander, 2000). All of these factors may limit the effectiveness of land use planning in flood loss reduction and the effectiveness of local government in fulfilling this role.

There are several other aspects of the relationship between local and national governance in Ireland that may help to shape hazards policy. Local governments in Ireland have very limited responsibilities for the provision of social services, with the exception of housing where they play an important role (Tierney, 2003). As a result almost none of the agencies and organisations responsible for flooding and other hazards have any substantial role in the provision of social services and their expertise lies in areas such as planning, engineering and emergency management. This institutional structure may help to reinforce the discourse that technological and
engineering approaches are the first choice response when addressing flood risks at local or national levels. Social vulnerability may not be considered because the decision-makers who are most likely to be aware of the social drivers of vulnerability are not included in the hazards decision-making process. The weakness of local government in Ireland may also limit the potential for partnerships across all levels of government to address environmental hazards. The weakness of Irish local government sits in contrast to other countries where partnerships across levels of government and between stakeholders have been most successful.

The local emphasis of national politics in Ireland also plays a role in shaping many areas of policy and this is no doubt true of hazards and climate policy as well as other areas. One of the criticisms of national politicians in Ireland is that they focus on local issues too much and neglect national priorities (Gallagher and Komito, 1999). As I discussed in greater detail in Chapter 6 an examination of the records of Dáil Éireann illustrates that discussions of flood hazards in the national parliament have often taken the format of a representative from a particular constituency making the case for the OPW resolving a local flooding problem through some type of flood relief work. This local emphasis of national politics may shape flood hazards policy as ensuring that action is taken to prevent flooding may enhance the prospects for re-election for some representatives. Flood defences are a visual manifestation of action even if they are not always the optimal solution. Their physical presence and their ability to make flood waters disappear, at least in the short term ensures they remain the central focus of flood hazards policies. There is anecdotal evidence that the General Election of 2011 marked a departure from the traditional dominance of local issues in national politics as voters focused on primarily on national issues. It remains to be seen
whether this was a temporary change precipitated by current economic conditions or the first steps in a new trend in Irish political and governance.

**Emergency management, relief and recovery**
To this point this chapter has focused on an overview of preparedness and hazard mitigation identify gaps in current policy and practice. I now turn to an examination of emergency management during flood events, post disaster relief and recovery, and opportunities for learning from past disasters. These issues have attracted increased attention in the aftermath of the 2009 flooding in Cork and other areas but there is little evidence of changes in policy or practice to date. While the OPW is the national lead agency for flood risk management, under the *National Framework for Emergency Management* (Department of the Environment, Heritage and Local Government, 2006), local authorities are designated as the lead agency for coordinating emergency responses to weather emergencies including floods. The OPW has no role in emergency management during the event or while its role in any post disaster recovery is limited to any steps that may be taken to address future flood risks.

Emergency management during weather events was a key issue during the investigation of the Join Oireachtas Committee on the Environment into both the flooding experienced in November 2009 and the severe cold weather that followed in December 2009 and January 2010. Media coverage of these events and the report of the Joint Oireachtas Committee mirrors some of the discussions that occurred in the aftermath of Hurricane Katrina and other disasters which included calls for a more centralised decision-making process (Mitchell, 2006b). Concerns that decision-making in Ireland was not sufficiently clear and efficient have led to similar support
for a more centralised management of both preparedness and emergency management but the potential limits of this approach have also been recognised (Joint Committee on the Environment, Heritage and Local Government, 2010).

Cross scale governance and the need for effective partnership and co-operation are as important in emergency management as they are in flood hazards preparedness and mitigation. While local authorities are designated as the lead agency for weather emergencies including floods, in the aftermath of the 2009 floods, attention was focused both on the relationship between local authorities and the National Emergency Response Co-ordination Committee, and the relationships between local authorities and other agencies operating at the local level. The National Emergency Response Co-ordination Committee whose membership is made up of representatives from several government departments and other national agencies appears to be limited to a co-ordinating role and to the dissemination of information to the public, as overall responsibility rests with local agencies. At the local level emergency management is to be co-ordinated through local emergency plans. Each local authority, Garda Síochána (Police) division and Health Service Executive area has adopted an emergency plan to be activated for emergencies for which that body is the lead agency. In the case of flooding this will always be the local authority, leading to the activation of their emergency plan. The overall goal of these local emergency plans is to facilitate effective co-operation and co-ordination between all agencies involved in the response to an emergency. However the flood events of November 2009 seem to have highlighted several flaws in the existing system of emergency management.
An apparent lack of communication between several agencies, most notably the ESB (managers of the Inniscarra Dam) and Cork City Council was highlighted in the aftermath of the November 2009 floods. As I discussed in greater detail in Chapter 6, the issue of communication of information about the volume and timing of the flood has led to a dispute between these two agencies regarding responsibility for providing flood warnings. The investigation of the Joint Committee on the Environment has revealed that the ESB were not included in the emergency plan for Cork City and were not aware of its existence (Joint Committee on the Environment, Heritage and Local Government, 2010). The ESB was also not aware of or included in the *National Framework for Emergency Management* (Joint Committee on the Environment, Heritage and Local Government, 2010). However, even if the ESB had been included in the plan, the flooding in November 2009 did not lead to the activation of the plan and the city’s response to the floods proceeded without a formal declaration of a major emergency. The exclusion of the agency that manages dams on several of Ireland’s most flood prone rivers illustrates the need for increased partnership between all stakeholders involved in emergency management in Ireland.

The flaws in current policy and practice may reflect issues relating to boundaries, jurisdictions and areas of responsibility. Earlier in this chapter I highlighted some of the potential pitfalls of the catchment based approach to flood risk management advocated by the EU floods directive. This adoption of this catchment based approach has left flood risk management being conducted at the level of river catchments but flood emergency management at the level of local authority areas. While the catchment approach to flood risk management has its disadvantages, a catchment based approach to emergency management might have avoided some of the mistakes
made during the November 2009 floods. Emergency response to flood events in Cork City is co-ordinated by Cork City Council. However the flooding did not originate in the City and occurred both within the boundaries of the City Council area and in the Cork County Council area. The ESB dams are also located in the Cork County Council area, several miles upriver from the City Council’s geographic boundaries. An approach to emergency planning that facilitate better co-operation across these administrative boundaries might have facilitated a more effective emergency response during these floods. Emergency planning to date in Ireland has been based on an all hazards approach where emergency plans do not make specific provisions for individual hazards but focus on principles that are common to all hazards and emergencies. It seems likely that in the aftermath of the floods and severe winter weather of recent years some local authorities and other agencies may begin to draft specific plans for particular event types such as flooding (Joint Committee on the Environment, Heritage and Local Government, 2010). There are advantages and disadvantages to both approaches but the drafting of multiple different plans may further fragment the decision-making process rather than securing more effective co-operation. While it is difficult to identify the optimal types of co-ordination and the scale at which they should operate, it is clear that both flood hazards mitigation and flood emergency management require increased partnership between all of the stakeholders involved.

Before concluding this discussion of emergency management, it is worth briefly reflecting on the criticisms that have been directed at the emergency response to the 2009 floods, the overall goals of emergency management and the implications of these goals for future practice. The response to the 2009 floods was widely perceived
as inadequate. The report of the Joint Oireachtas Committee suggests that “many people’s lives were negatively affected by the weather events and to extents that could and should have been avoided” (Joint Committee on the Environment, Heritage and Local Government, 2010, p. 38). Despite their extent and duration, and the failure to deliver effective warnings to affected populations particularly in Cork, no fatalities were recorded during the 2009 floods. Similarly no fatalities were recorded in other notable flood events during the last decade such as the 2002 coastal floods in Dublin, although some injuries were recorded. These results suggest that the emergency response has been effective in ensuring no loss of life and minimising serious injury during several large floods. While this success is acknowledged by the report of the Joint Oireachtas Committee, their conclusions suggest that their understanding and conceptualisation of the goals of emergency management goes beyond the prevention of death and injury, to include minimising all forms of disruption and loss to the greatest extent possible. This echoes the conceptualisation of flood risk management that strives to minimise or eliminate all flood events and the disruptions they produce. While this goal is admirable it is also impossible and places on the emergency management system burdens which it will prove impossible to achieve. There are certainly lessons for emergency management in Ireland from the events of November 2009. It may be unwise to assume that the lack of deaths can be attributed purely to successful emergency response as some good fortune may also have played a role. Interviews with local community representatives in Dublin also suggested that the City’s emergency services were overstretched and slow to respond during the 2002 coastal floods. Concerns were expressed about the ability of the emergency services to respond to similar or more severe events. It is clear that emergency management in general, and responses to flood hazards in particular may need to be re-evaluated.
This re-evaluation must begin with a reflection on the goals of emergency management and how they might be achieved. This may require a reconceptualisation of what can be practically achieved through emergency management and an acceptance that some losses and disruptions are unavoidable.

**Relief and recovery**

In contrast to flood risk management and emergency management, post disaster relief and recovery have received comparatively little attention from decision-makers at the local or national level in Ireland. While recovery is mentioned as the final phase of emergency management in the *Framework for Major Emergency Management*, there is comparatively little discussion of what the goals of recovery might be, how it might be achieved or how it might include learning from the experience of disaster and apply those lessons to future hazards preparedness and emergency management. The discussion of recovery in the *Framework for Major Emergency Management* focuses heavily on the immediate aftermath of the event and less attention is paid to the longer term consequences of disaster. Little attention is paid to the goals of recovery although a return to ‘normal’ conditions appears to be the implied objective. Recovery is outlined as a series of steps (See Table 7.2) with responsibility for these steps being divided between three agencies, An Garda Síochána, the Health Service Executive and the local authorities (see Table 7.3), the same three agencies who are given overall responsibility for other aspects of emergency management.

While it is too early to tell how affected communities will recover from the floods of 2009, the recovery of communities in Dublin following the 2002 coastal flood may offer some insights. In the immediate aftermath of the event, financial assistance was provided to the victims through a Government Flood Relief Scheme administered on
Table 7.2. The stages of recovery.

- Assisting the physical and emotional recovery of victims;
- Providing support and services to persons affected by the emergency;
- Clean-up of damaged areas;
- Restoration of infrastructure and public services;
- Supporting the recovery of affected communities;
- Planning and managing community events related to the emergency;
- Investigations/inquiries into the events and/or the response;
- Restoring normal functioning to the principal response agencies; and
- Managing economic consequences.


Table 7.3. Roles in the recovery process.

<table>
<thead>
<tr>
<th>An Garda Síochána (Police)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Identification of fatalities;</td>
</tr>
<tr>
<td>• Preservation and gathering of evidence;</td>
</tr>
<tr>
<td>• Investigation and criminal issues;</td>
</tr>
<tr>
<td>• Dealing with survivors;</td>
</tr>
<tr>
<td>• Dealing with relatives of the deceased and survivors; and</td>
</tr>
<tr>
<td>• Provision of an appropriate response to the immediate public need.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health Service Executive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provision of health care and support for casualties and survivors;</td>
</tr>
<tr>
<td>• Support for relatives of casualties and survivors;</td>
</tr>
<tr>
<td>• Responding to community welfare needs; and</td>
</tr>
<tr>
<td>• Restoration of health services.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local Authority (City and County Councils)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Clean-up;</td>
</tr>
<tr>
<td>• Rebuilding the community and infrastructure;</td>
</tr>
<tr>
<td>• Responding to community welfare needs (e.g. housing); and</td>
</tr>
<tr>
<td>• Restoration of services.</td>
</tr>
</tbody>
</table>


behalf of the Department of Finance by the Irish Red Cross (The Irish Red Cross, 2002). Similar government support has been provided to victims of the 2009 flooding. The role of central government in providing assistance in the aftermath of flooding and other hazard events seems likely to continue if increased losses lead to increased difficulty for home and business owners in securing insurance. Increased difficulty in securing coverage and increased premiums have been reported in areas that have experienced flooding and in locations that have not yet experienced severe floods but
that are believed to be exposed to flood risks. As I discussed in Chapter 5 the ability of the national government to provide post disaster relief is likely to be constrained by the current government deficit and measures taken to address it. The experience of US hazards policy suggests that in the long term such post disaster relief projects can become increasingly costly while failing to reduce losses from future hazard events (Changnon, 2000). Similar trends may become visible in Ireland if as seems likely, the national government is asked to bear an increasing burden of the costs of floods and other hazard events. The pressure on national government finances may be reduced by an increased role for the EU which established a solidarity fund in the aftermath of major European river flooding in 2002 (Ventere Arellano, et. al., 2007). However how the funds are used is likely to be central to its chances of success. As already mentioned lessons from the US experience where federal government funds spent on post flood relief continued to increase suggest that the output from this fund may also increase over time, if it is used in ways that do not facilitate decreases in exposure and vulnerability.

Little information is readily available on other aspects of post disaster recovery from recent flooding in Ireland. It is not clear what disaster relief funds were spent on or how recovery has progressed. Since the 2002 coastal floods in Dublin, much of the focus has been on the prevention of the recurrence of similar events through the construction of flood defences, and on the development of an effective early warning system. Little attention appears to have been focused on affected communities or their recovery. Despite a substantial international literature on post disaster recovery (see for example: Bankoff and Hilhorst, 2004; Mitchell 2008b; Mitchell 2004; Mitchell, 1996; Monday, 2002) recovery has received little attention among researchers or
policy makers in Ireland. This is certainly an aspect of hazards research in Ireland that deserves further attention as the recovery may shape future hazards mitigation and climate change adaptation in important ways.

**Integrating vulnerability into hazards and climate policy**

Several researchers have recently focused attention on the application of vulnerability research to hazards and climate policy (Moser, 2010; Mustafa, *et al.*, 2010). As I mentioned in the literature review in Chapter 1, Moser (2010) contends that the pressing and urgent challenges presented by climate change require that geographers engage in policy relevant and applied research on both vulnerability and adaptation while Mustafa *et al.*, (2010) propose an empirical method for vulnerability assessment that can be used to link vulnerability research to policy. This new focus on applied vulnerability research seeks to address the growing recognition that while vulnerability has become a key analytical concept among geographers and other researchers engaging with natural hazards and environmental change, it is rarely considered by policy makers. When it is considered, it is generally used in ways that differ significantly from understandings of vulnerability employed by hazards and global change researchers.

In this and previous chapters I have illustrated how hazards and climate policy and practice in Ireland’s cities is focused on physical risk and exposure. Vulnerability is rarely part of the discussion. As I mentioned earlier in this chapter the draft Lee CFRMP, the first such plan to be completed in Ireland characteristics vulnerability as a simple metric of exposure. Residents who live in flood prone locations are vulnerable, those who live in other areas are not. Similar limited framings of vulnerability were evident in the results of my interviews. It was clear from the nature
of the answers given when asked about vulnerability or adaptive capacity that local officials and decision-makers have rarely considered factors other than physical exposure which may influence the vulnerability or adaptive capacity of particular groups or individuals and differentiate their ability to prepare for, respond to and recover from hazards events. As I have illustrated throughout the proceeding chapters, environmental hazards and climate change are understood almost universally as physical events that impact largely passive human populations. One elected representative who declined permission to be quoted directly went as far as to dismiss the notion of differences in vulnerability or adaptive capacity. He suggested that flooding affects everyone in a similar way and that the only means of reducing loss was to prevent flood events. He argued against any measures targeted at specific groups and suggested that flood policies should focus on actions that could reduce flood losses for all residents through flood prevention. Other interviewees tended to focus on particular social groups such as the elderly but tended to assume that this was purely an issue of emergency management. They suggested that special steps for groups such as the disabled or the elderly should be integrated into emergency planning if it did not already form part of local emergency plans. With a few exceptions local officials and decision-makers generally appeared sceptical of the importance of vulnerability and viewed reducing physical exposure as the first priority. One elected representative in Galway commented “obviously there should be a plan there but I can’t see it being a huge issue”. An unelected official in Dublin acknowledged that socio-economic contributors to differences in vulnerability might be worth considering but that risk management was the first priority. He commented “It’s an area that we will be looking at most likely but it’s not at the top of our agenda at the moment” before going on to explain that he saw quantifying and mapping
physical exposure as the key to successful flood risk management. Differences in vulnerability or adaptive capacity shaped by non physical drivers might be considered at some future point but were not a priority. Several elected representatives acknowledged that vulnerability was an important consideration but suggested that addressing it would require large financial investments that would be impossible in the current economic crisis.

Moser (2010) and Mustafa, et. al., (2010) suggest a number of reasons why vulnerability is not currently considered in hazards and climate policy. Moser (2010) calls for more applied and policy relevant vulnerability and adaptation research. She highlights several challenges that will have to be overcome to achieve this including the need to improve the availability and usability of data on key drivers of vulnerability, the need to improve our knowledge of the drivers of vulnerability and the need to improve our knowledge of the interactions between multiple stressors (Moser, 2010). Mustafa, et. al., (2010) suggest that vulnerability can be integrated into policy if it is presented in quantitative values are easily translated into policy recommendations. They suggest that vulnerability research has focused on narratives which do not translate easily to policy whereas numbers fit the needs and goals of the policy community and facilitate integrating vulnerability into policy. Narratives have certainly played an important role in developing our understandings of vulnerability. Vulnerability narratives especially those produced in the aftermath of particular disasters have often produced powerful evidence of the drivers and consequences of the socio economic contributors to vulnerability. It is also true that narratives fit the goals and needs of academic researchers but not those of policy makers (Mustafa, et. al., 2010).
However, attempts to provide policy relevant vulnerability and adaptation research through quantitative methods are likely to encounter several challenges. One of the central reasons that narratives have become an important element of vulnerability research is precisely because quantification of vulnerability has proven difficult. In order to quantify vulnerability, the researcher must decide which drivers to include, must decide whether to attach weights to those drivers, and how to assign those weights. The researcher must also attempt to decipher the relative importance of biophysical and socio-economic drivers. Often these decisions have been heavily constrained by the availability, usability and compatibility of appropriate datasets. This has led to the adoption of several different vulnerability indices utilising different drivers and indices (Cutter, 2003; Mustafa, et. al., 2010; Rygel, 2006). Others have proposed methods for vulnerability analysis that would allow for comparability between multiple case studies (Polsky, et. al., 2003). Often these methodologies present snapshots of vulnerability at a particular time but obscure the dynamic and fluid nature of vulnerability. The nature of data available also often creates challenges as socio economic and biophysical data may not be available for comparable spatial units. Socio economic data is also often available only for units such as census districts or counties. When vulnerability outputs are mapped the results may suggests sharp differences along administrative boundaries, obscuring a more complex reality (O’Brien, et. al., 2004).

It is clear that attempts to quantify and map vulnerability face many challenges but there may be greater difficulties to integrating vulnerability research and policy that may be even more difficult to overcome. The vulnerability literature to date suggests that vulnerability is a highly dynamic concept, changing in response to numerous
biophysical and socio-economic drivers. One of the limits of quantification lies in its ability to capture this dynamism. However if vulnerability is a phenomenon that is constantly changing this may limit its application to policy regardless of our ability to translate vulnerability knowledge into applied and policy relevant formats. Vulnerability may prove to be a useful and important concept for academic researchers but one that is of limited applicability as a policy tool. Further research on the drivers of vulnerability is needed to determine the extent of its dynamism and the extent to which changes in individual drivers shape overall vulnerability.

While all of the factors discussed above are undoubtedly an important influence on the use of vulnerability in policy-making, the results of this research project suggest that integrating vulnerability into policy and practice faces more fundamental challenges than those presented by data availability and methodology. The results of my research discussed throughout this dissertation suggest that the framings and conceptions of environmental hazards and climatic changes employed by a variety of stakeholders largely exclude vulnerability from consideration as they focus on a almost exclusively on physical risk. Physical exposure is seen as the primary driver of loss and the reduction of physical exposure is seen as the principal means of decreasing loss and disruption from hazards. Integrating vulnerability and adaptive capacity in local policy and practice may require a fundamental shift in the way most stakeholders conceptualise and frame environmental hazards. Such a reframing is unlikely to be achieved simply through translating vulnerability research into formats that are more easily understood by policy-makers, although this might prove to be appositive step. Integrating vulnerability research into policy is likely to require partnerships and engagement between social science researchers and local
stakeholders. However the success of such partnerships would depend on a genuine willingness to engage with multiple perspectives and an openness to having previously held assumptions challenged by alternative viewpoints. Such partnerships may be difficult to create and even more difficult to sustain. However it is clear that current policies that focus solely on physical exposure are unlikely to achieve their goals and that some alternatives are required. A new paradigm of hazards and climate change adaptation that focuses on human-environment interaction rather than biophysical exposure may offer a more successful means of addressing these pressing challenges.

Conclusions
It is clear that flood hazards policies in Ireland have evolved over an extended time period influenced by a variety of factors including experience of hazards and disasters as well as several other factors including goals such as the drainage of land for agricultural production and economic development objectives. It is also clear that there are many stakeholders who are or could be actively involved in some aspect of flood hazards policy at local or national level, and the decisions taken at the European level are an increasingly important influence on local policy and practice. The experience of recent events, including the floods experienced throughout Ireland in November 2009 also illustrate that there are numerous challenges for flood hazards policy and practice in Ireland. Numerous government agencies and other stakeholders play a role in flood hazards management. This has sometimes led to confusion over areas of responsibility and jurisdiction and gaps in both flood hazards mitigation and emergency management. Increased partnership between all stakeholders involved may offer a means of addressing these difficulties. However, while partnership is a noble goal, implementing and sustaining such partnerships is likely to prove difficult.
While difficulties lie ahead, the formation of sustainable partnerships between all stakeholders may be the only way of successfully managing current flood hazards and future climatic change in a way that can reduce losses. An integral component of the development of such partnerships should include reflection on the roles of all stakeholders, particularly focusing on the duties and responsibilities of government at all levels relative to those of local residents and business owners. It is clear that the EU is likely to play an increasingly important role in hazards policy. This is likely to bring many positive improvements to current practice but caution is also advisable. European policies designed in different geographical contexts may not translate smoothly to Ireland (or similar countries like the UK) and different biophysical, socio-economic and institutional contexts must be considered when forming policy. Current policy and practice is focused on flood prevention and emergency management. There are several reasons for concern regarding the flood prevention approach and I have discussed these in more detail in Chapter 6. Experience of recent events suggests that the emergency management protocols in place worked well in many cases but some serious flaws were also revealed. In the same way that addressing flood hazards mitigation is likely to require reflection the appropriate roles of all stakeholders, any re-evaluation of emergency management should reflect on the overall goals of emergency management before deciding on how these can best be achieved. Finally post disaster recovery has received comparatively little attention from both the policy making and research communities in Ireland. This is an area that requires further consideration and further research, including deliberation on the goals of recovery and how these might be achieved. The limited evidence available suggests that recovery from hazard events in Ireland has preceded on a largely unplanned basis, with a return to pre disaster conditions being the primary goal. Further research on
recovery in Ireland may confirm this and suggest alternative approaches that allow for greater integration of the lessons of past disaster losses in future hazards policy.
Concluding thoughts and research implications
This dissertation has examined decision-making and policy responses to environmental hazards and climate change adaptation in Ireland’s coastal cities. In doing so it makes important contributions to human environment geography, particularly the subfields of natural hazards and global environmental change. It also represents a significant contribution to geographic knowledge on Ireland and to applied knowledge on hazards loss mitigation and climate change adaptation. In this concluding chapter I outline the overall results of this research and their implications for geographic knowledge and policy applications. This is followed by a brief outline of several areas for potential future research that emerge from this project.

The overall goal of this research was to advance our understandings of the ways in which decisions about environmental hazards are made in coastal cities, the reasons why particular options are chosen over others, and the implications of this for vulnerability to current and future hazards, and for the success of climate change adaptation. It is clear that there are a variety of factors that influence the actions of stakeholders and that these factors may interact to produce diverse results in local places. This research has demonstrated that several factors are particularly important influences on the type and timing of adaptation decisions. The key findings are as follows:

(1) Climate change and environmental hazards are conceptualised, framed, understood and interpreted in complex, contested and contradictory ways by local stakeholders. These interpretations and framings are shaped by several factors including experience of past hazard events, other lived experiences,
sense of place and the availability of information or knowledge. These framings and conceptualisations have important implications for the type and timing of adaptation decisions.

(2) Current policy and practice is dominated by a reactive risk management approach to hazards that focuses almost exclusively on physical exposure. Floods and the losses they produce are viewed as interchangeable. Flood losses are viewed as of paramount concern and not differentiated from other effects or properties of flooding and flood prevention is viewed as the optimal means of reducing losses. This approach emphasises technological fixes and is ultimately unlikely to succeed in reducing current losses or in facilitating effective climate change adaptation. An alternative approach that recognises the roles of human and non human contributions to hazards losses is required.

(3) A powerful economic development narrative plays an important role in shaping all areas of policy and practice including environmental hazards and climate change. Intersections between economic and environmental change have the potential to increase vulnerability. The economic development discourse is reinforcing technological and engineering fixes as hazards are seen as disruptions to the life of the city that negatively impact its ability to compete to attract capital.

In Chapter 4 I demonstrated the importance of the ways in which climate change and environmental hazards are conceptualised, framed and understood by local stakeholders in shaping the decisions that they make. Climate change is framed by local officials and decision-makers as temporally proximate but spatially distant. In other words they believe that climate change is happening now but that its most
serious effects will be felt somewhere else. Most local stakeholders also believe that climatic change will have a mix of both positive and negative consequences for their cities and their citizens. These conceptions and framings are complex, sometimes contradictory and influenced by a variety of factors including the availability of information or knowledge and the experiences of individual stakeholders. Experience of past hazard events plays a key role in shaping these conceptualisations when those events are viewed as shocking or unusual. What matters is not whether the event itself is truly unusual or unexpected but whether it is framed as such by those who experience it. This is often shaped by the lived experiences and sense of place employed by local stakeholders and by the ways in which this influences their expectations for local weather and climate. Weather hazards that have come to be accepted as a normal part of life in a particular place produce very different reactions from those that are not viewed as common. Events outside of the normal experience of respondents are viewed as impossible or extremely unlikely, while more of the same types of events with which they are already familiar are thought most likely. Where local stakeholders obtain information about hazards and climate change is also influential. In particular a reliance on colleagues may reinforce certain perspectives and response options. A reliance on the internet raises concerns about the reliability of information obtained but also raises the possibility that decision-makers may be exposed to multiple perspectives and alternative responses that they had not previously considered.

These results have important implications for climate change policy at local and international levels. They demonstrate that there is a mismatch between the global scientific narrative of climate change and the ways in which climatic changes are
understood at local levels. The ways in which local decision-makers frame and understand climate leads them to focus on some hazards while excluding others from consideration, despite scientific evidence that suggests they should be concerned about some of the hazards they exclude. The current scientific narrative promoted through the institutional structure of the IPCC has achieved remarkable success in pushing climate change on to global, national and local policy-making agendas. However, the results of my research suggest that it is now time to reflect on whether alternative approaches are now needed. The scientific narrative may have reached the limits of what it can achieve and alternative approaches may need to be developed. While it is not clear yet what form such an alternative might take, it should allow for the multiple, contested and contradictory ways in which we understand and interpret climate change and environmental hazards and consider that the meanings we attach to climate and hazards are often a more powerful influence on action than scientific evidence (Brace and Geoghegan, 2010; Jasanoff, 2010; Mitchell, 2006a).

The conceptions and framings of hazard employed by local stakeholders are an important influence on local policy and practice. It is clear that the importance of past experience reinforces a largely reactive decision-making process. There are reasons for concern that this may not facilitate effective adaptation as in the context of global change the past may prove to be an unreliable guide to the future. Current policies are also heavily focused on the biophysical exposure to risk while socio-economic vulnerability is generally not considered in local policy or practice. Climate change and environmental hazards are understood largely as physical events that impact society. I outlined in detail in Chapters 6 and 7 how this focus on biophysical risk dominates current policy and practice. This is the result of the dominance of a risk
management discourse in local and national policy but is also influenced by the historic evolution of flood hazards policy in Ireland. Institutional and organisational cultures formed when engineering was the dominant response to flooding remain influential, as does the public perception that floods can be solved through engineering. Floods and the losses they create are viewed as identical. As a result flood prevention comes to be viewed as the optimal public policy. This policy continues despite the extensive critique of such approaches that has been advanced by geographers and other social scientists. Successfully reducing losses from current and future hazards is likely to require that the assumption that floods and the losses they induce are interchangeable be broken. While this distinction has long been recognised by geographers who view hazards and disasters as the result of the interaction between human and non human drivers, this recognition has largely failed to penetrate policy and practice in Ireland. Effective response to hazards and climate change will require an alternative approach that recognises the role of non human and human drivers and actors. A focus on adaptation may continue to reinforce the emphasis on biophysical risk and an alternative conceptual framework that refocuses attention on loss mitigation may offer opportunities for a more integrated approach. This integrated approach might include an increased emphasis on socio-economic vulnerability and its contribution to hazards losses. While a new research focus that calls for applied vulnerability research is a welcome development, the results of my research indicate that the greatest challenges to integrating vulnerability research into practice may not lie in issues such as presenting vulnerability in quantitative formats that are more easily understood by policy makers. The greatest challenges are more fundamental as integrating vulnerability research into practice may require that
policy-makers adopt a new framing and understanding of hazards that moves away from or significantly reconceives contemporary risk management approaches.

This research has also highlighted the importance of the intersections between economic crisis and environmental change in shaping local decision-making and policy. While previous research has demonstrated the importance of the multiple exposures creating by these intersections in creating winners and losers (Leichenko & O'Brien, 2008), this dissertation demonstrates how those same interactions also shape policy and practice. These intersections have helped to create a discourse of economic development that has become a hegemonic narrative that local actors are unwilling or unable to escape. This economic development narrative reinforces technological and engineering fixes as the disruption caused by hazards must be prevented. Failure to prevent hazards is seen as having negative consequences for the ability of the city to compete for capital and investment. Economic development becomes the overarching goal while costs and potential economic returns become the primary influence on decision-making. In this context non physical drivers of vulnerability are rarely considered by policy makers and changes from current policy or practice appear unlikely.

In conclusion it is clear that there are a variety of factors that influence local policy and practice in the fields of environmental hazards and climate change adaptation. It is also clear that there are numerous reasons for concern that current practices may not reduce losses or facilitate effective adaptation. These conclusions have important implications for social scientists, for policy makers and for the relationships between these groups and other stakeholders. Facilitating more effective loss mitigation and
climate change adaptation policies requires renewed engagement from social scientists and policy makers as well as partnerships between all stakeholders.

**Future research**
The results of this research project highlight several areas for further research on environmental hazards and global change in general as well as for geographers in Ireland. The following areas merit further investigation and analysis.

(1) Among the motivations for this research was a concern that current policy and practice might not facilitate effective climate change adaptation. The notion of effective adaptation requires further investigation and unpacking, as what is deemed effective, who gets to decide what is effective and on what basis they do, so are questions that are likely to be complex and contested. More research is required on what local stakeholders deem to be effective adaptation and on what basis those judgments are formed.

(2) During the fieldwork research for this project, numerous respondents suggested that interest in climate change as a policy priority had peaked and was now in decline. Whether this is the case and its implications for global environmental change research deserve further study. Moreover, the results of this project have suggested that the scientific narrative of climate change may have reached its limits in terms of facilitating effective social responses to climate change. Further study is needed both to advance geographic knowledge on the topic and to address to policy implications.

(3) This project has demonstrated that climate change has been understood mainly as a physical phenomenon but further research is required on how scientific knowledge is framed and understood. For example, what do climate models and the time periods used in their predictive outputs mean to non-scientists?
How do stakeholders understand the probabilities of particular climate changes and how does this influence the decisions that they take?

(4) This research has highlighted the importance of interactions between stakeholders and across levels of governance. As the European Union assumes an increasingly important role in all areas of environmental policy, further research is required on the roles of various stakeholders, the views of those stakeholders regarding their roles and responsibilities, and the implications of increased EU involvement, both for hazards and climate policy as well as for the development of the EU itself. A comparative analysis that explores parallels and divergences from the US experience may provide important lessons for Europe.

(5) While vulnerability has been the subject of a broad literature in geography the roles of various drivers and the policy applications of vulnerability research remain comparatively unexplored. For example, the relative important of socio-economic and bio-physical influences remains unclear. If socio-economic factors are the primary driver of vulnerability and these change quickly in times of socio-economic change, such as those Ireland has experienced in recent years, this may limit the potential application of vulnerability perspectives to policy. Longitudinal studies of vulnerability over several years or decades could help to address some of these questions as most vulnerability research to date has focused on its spatial dimensions neglecting its temporal aspects.

(6) Vulnerability research to date has also tended to focus on using census data and other sources to index and map vulnerability. Recent calls for an actor centred approach to vulnerability research have highlighted the need for
research that focuses on how potentially vulnerability populations understand and interpret their own vulnerability. The results of my study demonstrate the importance of the way in which local stakeholders conceptualise and frame hazards in shaping the types of decisions that they take. Similar research could examine how vulnerability is conceptualised and understood.

(7) While it has received significant attention in international research post disaster recovery has been largely ignored by researchers and policy-makers in Ireland. Investigations are required to examine how recovery has occurred in the past, what lessons from past disasters can be incorporated into recovery and what the overall goals of recovery are.
Appendix A: Questionnaire used in semi-structured interviews

(1) Will you briefly describe your professional background and your current job?

(2) When you think about climate change, what topics come to mind?

If the initial answer is not detailed, interviewees will be asked to select from the following list whether they associate each of these with climate change:

- Greenhouse gas emissions
- Carbon taxes/carbon trading schemes
- Kyoto Protocol/UNFCCC
- Sea Level Rise
- Coastal Flooding
- River/Rainfall induced flooding
- Drought/water shortages
- Melting Ice Caps
- Storms
- Others they may suggest at this point

(3) Which climate change impacts are likely to occur in Ireland?

If the initial answer is short, interviewees will be asked to select from the following list whether they regard any of the following as likely or potential impacts:

- Sea level rise
- Increased coastal erosion
- Increased coastal flooding
- Increased river flooding
- Increased frequency of extreme rainfall events
- More intense storms
- More frequent storms
- Milder winters
- Warmer summers
- Droughts/water shortages
- Wetter winters
- Drier summers

(4) Compared to other parts of Europe/the world do you think these impacts will generally be more severe in Ireland, less severe or about the same?

(5) How serious do you think each of these impacts will be for this city?

Interviewees may be asked to select from the following scale:
(a) extreme   (b) moderate   (c) slight   (d) non-existent

---

Due to the semi structured nature of the interviews, all questions were not used in all interviews.
(6) How soon do you think these impacts will become pressing here?

Interviewees may be asked to select from the following scale

(a) now (they are already pressing)  (b) within the next year  (c) within the next 5 years  (d) within the next 10 years  (e) within the next 20 years  (d) more than 50 years from now

(7) For this city, how does the importance of climate change impacts compare with the importance of other public issues?

If answer is not detailed, interviewees will be asked to rank climate impacts in importance relative to other issues including:

- Economic development
- Provision of transport infrastructure and traffic management
- Waste management
- Waste water treatment
- Water supply and quality
- Air quality
- Provision of green space and other amenities
- Transportation safety
- Crime
- Poverty and homelessness

(8) Do you see climate change as something that will have only negative consequences for this city, only positive impacts or a mix of both? Will it present any opportunities for the city?

(9) Should responsibility for the management of climate change impacts be vested in one organization or should it be shared among many institutions?

(10) Which organization(s) do you think is best suited to this role and why?

(11) Do you see climate change impacts as a stand alone issue that must be managed independently or as a cross cutting theme that will impact upon decision-making in a variety of other areas?

(12) Do you think that mitigation of climate change drivers (green house gases) should be managed separately from adaptation (responses to impacts) or should they be addressed together?

(13) Of the climate impacts we discussed earlier, which (if any) have a direct impact on your job/area of responsibility (in the past, currently or in the future)?

(14) If there have already been occasions on which a hazard event/climate impact has come within your area of responsibility can you describe any decision you made or actions you took:

(i) Before the event/in preparation for it
(ii) During the event
(iii) After the event
(iv) In preparation/planning for similar events in the future

(15) What actions did you/this office take in response to the 2002 flood event? (for other cities a similar flood scenario will be used as an example)

(16) In preparing for such events in the future which of the following options might you consider employing? Why/why not?

Flood defences and other engineering techniques
Early warning systems and forecasting
Evacuation planning
More resources for rescue services
Land use planning/zoning (limiting development in exposed locations)
Education/provision of information and training
Special planning for assisting vulnerable populations such as the elderly, those without transportation etc.
Strategies to reduce the vulnerability of such populations
Retreat of development/changes of land use for exposed locations

(17) Do you think different strategies may be appropriate for different parts of the city and if so why?

What options might you consider for?
(a) an affluent residential area with high property values
(b) a less affluent residential area with lower property values
(c) a residential area with many historic homes
(d) an industrial area
(e) open/park/amenity spaces
(f) a retail/commercial area
(g) transportation infrastructure
(i) utilities or other infrastructure
(j) schools or other educational facilities
(k) hospitals or other health care facilities
(l) nursing homes, retirement centres or other elder care facilities

(18) Some researchers have predicted that within 100 years a storm surge of 2.6m which is currently a one in one hundred year event on the east coast could become a one in two year event. Others have predicted a 30% increase in storm surge flooding within the next fifty years. If such increases in flooding occur, would it lead you to change your opinion on the appropriate responses? If so what strategies do you think might be best in such a situation?

(19) Recent flood events have been felt mainly in terms of economic losses and disruption to daily life in the city. If future events lead to (or appear likely to lead to) loss of life would this change your perceptions of the most appropriate responses?

(20) If you require information on climate change impacts, where would you look to for information? What type of sources would you use or have you used in the past?
This question examines where information is obtained as well as the types of information/knowledge that are used.

Interviewees may be asked to select from the following list of sources:

- National government publications
- Met Eireann (The Irish Meteorological Service)
- European Union publications
- Publications by the governments of other countries
- Publications by the UK climate impacts program
- The internet
- News media, television, radio
- Colleagues or other professional contacts
- City council publications
- Publications by other local authorities (other city/county councils)
- Academic Journals
- Books
- Popular Magazines/Publications (including publications such as National Geographic or Scientific American)
- NGOs
- Others they may suggest at this point

(21) Which of these sources do you consider the most reliable?

(22) Which of them provided the information that you found most relevant/applicable to your needs?

(23) Have your views on climate change and the importance of the impacts it may bring changed over time? If so what factors changed your opinion?

If answer is not detailed, interviewees will be asked about the items listed below. They will also be asked to elaborate on any they answer positively to (for example how did a disaster elsewhere change their opinion and why)

(a) Direct experience of hazard events
(b) Hazard events/disasters elsewhere
(c) New information
(d) Media coverage
(e) Other

(24) Other than which may provide the best ‘solution’ to the challenges presented by climate impacts, what factors constrain or otherwise influence your decision-making?

(a) Costs/Funding
(b) Information/Knowledge
(c) Public opinion (if so how is this assessed)
(d) Lack of responsibility
(e) Not clear area of responsibility
(f) Directions or lack of support/direction from other areas of government
(25) In making decisions about climate impacts are you provided with/do you seek guidance, support, information or resources from national government departments or agencies or the European Union? Do you talk with colleagues/contacts in national government or the EU about these issues?

(26) Are there formal/informal mechanisms for sharing information/experience between local authorities? Between national and local government? Between the European Union and local government? If yes do you find these useful and do you use them regularly? If such mechanisms do not exist, would you find it helpful if they did?

(27) Are there any mechanisms for collaborative decision-making between different levels of government or between adjoining local authorities?

(28) Do you discuss climate impacts with local colleagues?

(29) Do you share information/knowledge with NGOs, local community groups, business groups or other stakeholders or interested groups or individuals? Do formal/informal mechanisms exist for this?

(30) Would more direction from national government or the EU regarding possible options be helpful in supporting your decision-making regarding climate change impacts?
Appendix B: Sample Recruitment Letter

Dear ____________________.

I am a Ph.D. student in Geography at Rutgers, the State University of New Jersey and I am currently conducting research for my dissertation on adaptation to climate impacts in Ireland’s coastal cities. The aim of my research is to examine local adaptation in response to impacts such as sea level rise and flooding.

As part of my research project, I am conducting interviews with a wide range of officials and stakeholders in Dublin City not just those directly responsible for issues such as flooding.

It would be most helpful if you would be willing to participate in an interview as part of the project. The interview would involve a discussion on a variety of issues such as flooding in Dublin and your views on this in your role with the City Council.

The interview would be confidential and you would not be directly identified in my dissertation or in any academic publications that may result from my research. I expect the interview would take around one hour of your time and I would be happy to conduct it at a time and location convenient for you.

If you are willing to participate please respond by email to inish@eden.rutgers.edu or by phone to 087-9268310.

Yours sincerely,
Jim Jeffers
Appendix C: Interview Consent Form

Project Title: Confronting Climate Impacts: Local decision-making, adaptation and vulnerability to climate change in Ireland’s coastal cities.

Project Description: You are invited to participate in a research study that is being conducted by James Jeffers, who is a student in the Department of Geography at Rutgers who is under the direction of Professor James K. Mitchell. The purpose of this project is to examine local decision-making in response to the impacts of climate change and natural hazards on three coastal cities in Ireland (Dublin, Cork and Galway). The aim of the project is to better understand local decision-making and adaptation practices in response to impacts such as sea level rise, coastal storms and flooding.

The initial phase of the project involves an examination of policy documents and other publications relating to climate change and natural hazards in Ireland to evaluate the way in which these challenges have been framed, as well as how available scientific knowledge is used in local adaptation. A series of interviews and workshops will then be used to ‘flesh out’ these issues in order to better understand local decision-making practices. An assessment of patterns of vulnerability in each city will also form part of the project.

The project will produce a study of local decision-making and adaptation in response to climate change. It is anticipated that it will help to support effective adaptation practices and decision-making as well as addressing larger question of societal response to climate extremes and natural hazards.

Interview: In this interview you will be asked a series of questions about the impacts of climate change on coastal cities in Ireland and the types of decisions taken in response to those impacts. The format of the interview is semi-structured so you are free to talk about any issues you feel are relevant even if these do not relate directly to the questions asked.

Your participation is voluntary and there is no penalty for refusing to participate. You may also choose not to answer any question if you wish. You may terminate your participation at any time without penalty. You will not be compensated for your time.

Anything said during the interview is confidential. All data (tapes, transcripts, notes) will be coded such that they cannot be linked to the identity of any individual participant. Quotations from the audiotaped sessions will only be used in reports or publications anonymously and only with your permission (see below). All interview data will be destroyed following completion of the project.

The interview will take less than one (1) hour of your time. With your consent it will be recorded and notes of your answers may also be taken. You may also be invited to participate in a follow up workshop (focus group). Consent to participate in this interview does not constitute a commitment on your part to participate in such a workshop, or a commitment on my part that you will be invited to do so. This project will involve between 40 and 60 participants in total.

The final report for this project can be provided to you at your request.

I (the researcher on this project) am available for any questions or comments.

James Jeffers
Department of Geography,
Rutgers, the State University of New Jersey,
My advisor Dr. James K. Mitchell the supervisor of this project can be contacted at the following address.

Professor James K. Mitchell,
Department of Geography,
Rutgers the State University of New Jersey,
54 Joyce Kilmer Avenue,
Piscataway, NJ 08854-8045
U.S.A.
Tel: +1 732-445-4082
Email: jmitchel@rci.rutgers.edu

If you have any questions about your rights as a research subject, you may contact the IRB Administrator at Rutgers University at:
Rutgers, the State University of New Jersey
Institutional Review Board for the Protection of Human Subjects
Office of Research and Sponsored Programs
3 Rutgers Plaza
New Brunswick, NJ 08901-8559
U.S.A.
Tel: +1 732-932-0150 ext. 2104
Email: humansubjects@orsp.rutgers.edu

Consent to be interviewed:
By signing this document, you are consenting to participate in an interview.

Participant's name (printed)___________________________ Date______________
Signature of participant________________________________

Interviewer: James Jeffers      Signature __________________________
Date _______________    Start time _______________

Consent to be audio taped:
By signing this document, you are consenting to be audio taped during this interview.

Participant's name (printed)___________________________ Date______________
Signature of participant________________________________

Consent to be quoted anonymously:
By signing this document, you are allowing the researcher to use anonymous quotes from your interview in resulting reports and publications. Your name cannot be linked to this information. Also, any other information that might divulge your identity will not be reported or published.

Participant's name (Printed)___________________________ Date______________
Signature of participant________________________________
Appendix D: Coding Structure for Analysis of Semi-Structured Interviews

<table>
<thead>
<tr>
<th>(1) Assumptions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Issues associated with climate change</td>
<td></td>
</tr>
<tr>
<td>Impacts for Ireland</td>
<td></td>
</tr>
<tr>
<td>Severity of Impacts</td>
<td></td>
</tr>
<tr>
<td>Timeline for climate change becoming a pressing issue</td>
<td></td>
</tr>
<tr>
<td>Importance of climate relative to other issues</td>
<td></td>
</tr>
<tr>
<td>Other Assumptions</td>
<td></td>
</tr>
<tr>
<td>Factors that may influence conceptualizations</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(2) Alternatives</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Addressing vulnerability</td>
<td></td>
</tr>
<tr>
<td>Do nothing or action not required</td>
<td></td>
</tr>
<tr>
<td>Emergency planning and response</td>
<td></td>
</tr>
<tr>
<td>Engineering solutions</td>
<td></td>
</tr>
<tr>
<td>Expert decision-making</td>
<td></td>
</tr>
<tr>
<td>Flood Prevention</td>
<td></td>
</tr>
<tr>
<td>Land use planning</td>
<td></td>
</tr>
<tr>
<td>Local knowledge or experience</td>
<td></td>
</tr>
<tr>
<td>Long term planning</td>
<td></td>
</tr>
<tr>
<td>Other responses</td>
<td></td>
</tr>
<tr>
<td>Other technological fix</td>
<td></td>
</tr>
<tr>
<td>Risk management</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(3) Constraints</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Effecting Change</td>
<td></td>
</tr>
<tr>
<td>Examples of current responses</td>
<td></td>
</tr>
<tr>
<td>Examples of reactive decision-making</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td></td>
</tr>
<tr>
<td>Human resources</td>
<td></td>
</tr>
<tr>
<td>Inter agency co-operation</td>
<td></td>
</tr>
<tr>
<td>Knowledge or information</td>
<td></td>
</tr>
<tr>
<td>Internet as a source</td>
<td></td>
</tr>
<tr>
<td>Role of universities and researchers</td>
<td></td>
</tr>
<tr>
<td>Multi level governance</td>
<td></td>
</tr>
<tr>
<td>Neoliberal Governance</td>
<td></td>
</tr>
<tr>
<td>Other resources</td>
<td></td>
</tr>
<tr>
<td>Roles and responsibilities of different agencies or actors</td>
<td></td>
</tr>
<tr>
<td>Sustainability</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(4) Critiques</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Critique of elected reps</td>
<td></td>
</tr>
<tr>
<td>Critique of executive</td>
<td></td>
</tr>
<tr>
<td>Critique of structures or policies</td>
<td></td>
</tr>
</tbody>
</table>
Appendix E: Coding Structure for Content Analysis

**Codes Used for City Council Minutes**

<table>
<thead>
<tr>
<th>Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>River floods</td>
</tr>
<tr>
<td>Coastal Floods</td>
</tr>
<tr>
<td>Rain Induced Floods</td>
</tr>
<tr>
<td>Coastal Erosion</td>
</tr>
<tr>
<td>Storms</td>
</tr>
<tr>
<td>Frost and Snow</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Climate Change</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Development Plan</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Impact of Economic Crisis on Vulnerability and Emergency Response</th>
</tr>
</thead>
</table>

**Codes Used for Minutes of Joint Oireachtas Committee on the Environment**

<table>
<thead>
<tr>
<th>Conceptions and views of flooding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blame and Responsibility</td>
</tr>
<tr>
<td>Floods as Controllable</td>
</tr>
<tr>
<td>Social Vulnerability</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergency Management and Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interagency Co-operation during floods</td>
</tr>
<tr>
<td>Policies</td>
</tr>
<tr>
<td>Structures</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evidence for climate extremes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flooding Impacts</td>
</tr>
<tr>
<td>Regulation and Governance Structures</td>
</tr>
<tr>
<td>Winter Weather</td>
</tr>
</tbody>
</table>
Appendix F: Search Terms for Content Analysis

Search Terms for City Council Minutes:

- Weather
- Climate
- Climatic
- Flood
- Floods
- Flooding
- Erosion
- Coast
- Coastal
- Sea Level
- Tide
- Tidal
- River
- Stream
- Storm
- Wind
- Rainfall
- Vulnerability
- Risk
- Hazard

Search Terms for National Parliament Debates

- Floods
- Flood
- Flooding
- Climate
- Hazard
- Risk
- Storm
- Storms
### Appendix G: Witnesses who Appeared Before the Joint Oireachtas Committee on the Environment (investigation into severe weather and emergency response)

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Des Dowling</td>
<td>Assistant Secretary at the Department of the Environment and Local Government</td>
</tr>
<tr>
<td>John Hogan</td>
<td>Chairman of the national Emergency Response Coordination Committee</td>
</tr>
<tr>
<td>Liam Campbell</td>
<td>Director, Met Éireann</td>
</tr>
<tr>
<td>Gerald Fleming</td>
<td>Head of Forecasting Division, Met Éireann</td>
</tr>
<tr>
<td>Liam Keegan</td>
<td>Head of Climatology and Observations Division, Met Éireann</td>
</tr>
<tr>
<td>Ray McGrath</td>
<td>Head of Research and Applications Division, Met Éireann</td>
</tr>
<tr>
<td>Paudie Barry</td>
<td>Engineer, Baseline Surveys (Independent Company)</td>
</tr>
<tr>
<td>Padraic McManus</td>
<td>Chief Executive, Electricity Supply Board</td>
</tr>
<tr>
<td>Pat O’Doherty</td>
<td>Executive Director, ESB Energy International</td>
</tr>
<tr>
<td>Nicholas Tarrant</td>
<td>Manager, ESB Operations and Maintenance business</td>
</tr>
<tr>
<td>Glenn Pope</td>
<td>ESB Hydro Power Manager</td>
</tr>
<tr>
<td>Tom Browne</td>
<td>ESB Engineering and Technical Risk Manager</td>
</tr>
<tr>
<td>John Gormley</td>
<td>Minister for the Environment</td>
</tr>
<tr>
<td>Conor Ó Raghallaigh</td>
<td>National Parks &amp; Wildlife Service</td>
</tr>
<tr>
<td>Elizabeth Slides</td>
<td>National Parks &amp; Wildlife Service</td>
</tr>
<tr>
<td>Jim Ryan</td>
<td>National Parks &amp; Wildlife Service</td>
</tr>
<tr>
<td>Clare McGrath</td>
<td>Office of Public Works</td>
</tr>
<tr>
<td>John Curtin</td>
<td>Office of Public Works</td>
</tr>
<tr>
<td>Les Lennox</td>
<td>Office of Public Works</td>
</tr>
<tr>
<td>Neil Ryan</td>
<td>Office of Public Works</td>
</tr>
<tr>
<td>Michael Starrett</td>
<td>Heritage Council</td>
</tr>
<tr>
<td>Beatrice Kelly</td>
<td>Heritage Council</td>
</tr>
<tr>
<td>Michael Silke</td>
<td>Irish Farmers Association</td>
</tr>
<tr>
<td>Gerry Gunning</td>
<td>Irish Farmers Association</td>
</tr>
<tr>
<td>Elaine Farrell</td>
<td>Irish Farmers Association</td>
</tr>
<tr>
<td>Ciaran Byrne</td>
<td>Central Fisheries Board</td>
</tr>
<tr>
<td>Name</td>
<td>Organization</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Eamon Cusack</td>
<td>Central Fisheries Board</td>
</tr>
<tr>
<td>Cathal Gallagher</td>
<td>Central Fisheries Board</td>
</tr>
<tr>
<td>Lorraine O’Donnell</td>
<td>Central Fisheries Board</td>
</tr>
<tr>
<td>Brian D’Arcy</td>
<td>Waterways Ireland</td>
</tr>
<tr>
<td>Martin Dennany</td>
<td>Waterways Ireland</td>
</tr>
<tr>
<td>Gabriel Darcy</td>
<td>Bord na Móna</td>
</tr>
<tr>
<td>Gerry Ryan</td>
<td>Bord na Móna</td>
</tr>
<tr>
<td>Paul Riordan</td>
<td>Bord na Móna</td>
</tr>
<tr>
<td>Gerry McNally</td>
<td>Bord na Móna</td>
</tr>
</tbody>
</table>
## Appendix H: Flooding in Dublin

<table>
<thead>
<tr>
<th>Year</th>
<th>Date</th>
<th>Type</th>
<th>Impacts</th>
<th>Info Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>2nd Jul</td>
<td>Pluvial Flooding</td>
<td>Significant property damage, mostly in areas with no flooding within living memory</td>
<td>O’Connell (2009), floodmaps.ie</td>
</tr>
<tr>
<td>2008</td>
<td>9th Jul</td>
<td>Pluvial Flooding</td>
<td>Significant property damage, mostly in areas with no flooding within living memory</td>
<td>O’Connell (2009)</td>
</tr>
<tr>
<td>2004</td>
<td>27th Nov</td>
<td>Coastal Flooding</td>
<td>Third highest tide ever recorded, Some property damage</td>
<td>floodmaps.ie</td>
</tr>
<tr>
<td>2004</td>
<td>23rd Aug</td>
<td>Pluvial Flooding</td>
<td>Some property damage</td>
<td>floodmaps.ie</td>
</tr>
<tr>
<td>2003</td>
<td>2nd Dec</td>
<td>Dodder River Flooding</td>
<td>7th largest flow recorded</td>
<td>Cawley, et. al., (2005)</td>
</tr>
<tr>
<td>2000</td>
<td>6th Nov</td>
<td>Tolka River Flooding</td>
<td>3rd largest flow, evacuations, road and park flooding but only 4 houses flooded</td>
<td>River Tolka Flooding Study, Final Report, 2001, floodmaps.ie</td>
</tr>
<tr>
<td>2000</td>
<td>5th Nov</td>
<td>Dodder River Flooding</td>
<td>3rd largest recorded flow</td>
<td>Cawley, et. al. (2005), floodmaps.ie</td>
</tr>
<tr>
<td>2000</td>
<td>4th Nov</td>
<td>Poddle River Flooding</td>
<td>No property damage but some close calls</td>
<td>floodmaps.ie</td>
</tr>
<tr>
<td>2000</td>
<td>4th Nov</td>
<td>Liffey River Flooding</td>
<td>River reached very high level, one house flooded</td>
<td>floodmaps.ie</td>
</tr>
<tr>
<td>1996</td>
<td>24th Oct</td>
<td>Pluvial Flooding</td>
<td>Heavy rainfall combined with leaves blocking drains led to flooding all across city</td>
<td>The Irish Times 25/10/1996</td>
</tr>
<tr>
<td>1993</td>
<td>11th June</td>
<td>Dodder River Flooding</td>
<td>9th largest flow</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>Year</td>
<td>Date</td>
<td>Location</td>
<td>Details</td>
<td>Source/Media</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>----------</td>
<td>-------------------------------------------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>1978</td>
<td>8 Dec</td>
<td>Dodder &amp; Puddle Flooding</td>
<td>Houses flooded in Rathgar, Rathfarnham, Dundrum and Tempelogue.</td>
<td>The Irish Times 9/12/1978</td>
</tr>
<tr>
<td>1969</td>
<td>17 Jan</td>
<td>Coastal Flooding</td>
<td>Roads and some houses flooded after waves overtopped sea wall</td>
<td>The Irish Times 18/1/1969</td>
</tr>
<tr>
<td>1965</td>
<td>17 Nov</td>
<td>Dodder River Flooding</td>
<td>5th largest flow recorded</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1963</td>
<td>11 June</td>
<td>Pluvial Flooding</td>
<td>Property damage</td>
<td>floodmaps.ie</td>
</tr>
<tr>
<td>1960</td>
<td>2 Oct</td>
<td>Pluvial and River</td>
<td>Dodder and other rivers burst banks</td>
<td>The Irish Times, 3/10/1960</td>
</tr>
<tr>
<td>1958</td>
<td>19 Dec</td>
<td>Dodder River Flooding</td>
<td>6th largest flow recorded</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1957</td>
<td>25 Sept</td>
<td>Dodder River Flooding</td>
<td>Impacts Unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1954</td>
<td>December, Exact date Unknown</td>
<td>Naniken River Flooding</td>
<td>Property Damage</td>
<td>floodmaps.ie</td>
</tr>
<tr>
<td>Year</td>
<td>Date</td>
<td>Location</td>
<td>Event</td>
<td>Source</td>
</tr>
<tr>
<td>-------</td>
<td>------------</td>
<td>------------------</td>
<td>-------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1946</td>
<td>12&lt;sup&gt;th&lt;/sup&gt; Aug</td>
<td>Dodder River Flooding</td>
<td>Impacts Unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1945</td>
<td>18&lt;sup&gt;th&lt;/sup&gt; Dec</td>
<td>Coastal Flooding</td>
<td>Tide over tops the pier at Dun Laoghaire and waves damages train platform at Booterstown</td>
<td>The Irish Times 19/12/1945</td>
</tr>
<tr>
<td>1931</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Sept</td>
<td>Tolka River Flooding</td>
<td>8th largest flow</td>
<td>River Tolka Flooding Study, Final Report, (2001)</td>
</tr>
<tr>
<td>1931</td>
<td>September, exact date unknown</td>
<td>Poddle River Flooding</td>
<td>Largest flood before 1986</td>
<td>floodmaps.ie</td>
</tr>
<tr>
<td>1931</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Sept</td>
<td>Dodder River Flooding</td>
<td>4th largest flow recorded, £20,000 in damage</td>
<td>Cawley, et. al. (2005), Dixon (1953)</td>
</tr>
<tr>
<td>1930</td>
<td>7&lt;sup&gt;th&lt;/sup&gt; Feb</td>
<td>Coastal Flooding</td>
<td>20 feet of sea wall on the Clontarf road demolished</td>
<td>The Irish Times 8/2/1930</td>
</tr>
<tr>
<td>1930</td>
<td>15&lt;sup&gt;th&lt;/sup&gt; Mar</td>
<td>Coastal Flooding</td>
<td>Railway flooded to four feet and service suspended</td>
<td>The Irish Times, 17/3/1931</td>
</tr>
<tr>
<td>1924</td>
<td>27&lt;sup&gt;th&lt;/sup&gt; Dec</td>
<td>Coastal Flooding</td>
<td>Property damage and animal deaths</td>
<td>The Irish Times, 29/12/24 and 30/12/24</td>
</tr>
<tr>
<td>1924</td>
<td>25&lt;sup&gt;th&lt;/sup&gt; Feb</td>
<td>Coastal Flooding</td>
<td>Flooding in Clontarf</td>
<td>The Irish Times, 22/2/1924</td>
</tr>
<tr>
<td>1916</td>
<td>29&lt;sup&gt;th&lt;/sup&gt; Dec</td>
<td>Liffey River Flooding</td>
<td>Also a very high tide, cellars flooded, quays flooded</td>
<td>The Irish Times, 30/12/1916</td>
</tr>
<tr>
<td>1916</td>
<td>27&lt;sup&gt;th&lt;/sup&gt; Oct</td>
<td>Coastal Flooding</td>
<td>Floods in Blackrock and other coastal areas</td>
<td>The Irish Times 18/10/1916</td>
</tr>
<tr>
<td>1915</td>
<td>12&lt;sup&gt;th&lt;/sup&gt; Nov</td>
<td>Tolka River Flooding</td>
<td>12th largest flow recorded</td>
<td>River Tolka Flooding Study, Final Report, (2001)</td>
</tr>
<tr>
<td>1912</td>
<td>26&lt;sup&gt;th&lt;/sup&gt; Aug</td>
<td>Dodder River Flooding</td>
<td>Impacts unknown</td>
<td>Cawley, et. al., (2005)</td>
</tr>
<tr>
<td>1909</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; April</td>
<td>Tolka River Flooding</td>
<td>13th largest flow recorded</td>
<td>River Tolka Flooding Study, Final Report, 2001</td>
</tr>
<tr>
<td>Year</td>
<td>Date</td>
<td>Location</td>
<td>Description</td>
<td>Source</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
<td>-------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1877</td>
<td>2nd Jan</td>
<td>Coastal Flooding</td>
<td>Houses flooded in Sandymount &amp; businesses flooded along the quays, no deaths reported but several dramatic rescues.</td>
<td>The Irish Times, 4/1/1877</td>
</tr>
<tr>
<td>1880</td>
<td>29th Oct</td>
<td>Liffey River Flooding</td>
<td>Some properties flooded</td>
<td>Irish Times, 30/10/1880</td>
</tr>
<tr>
<td>1880</td>
<td>27th Oct</td>
<td>Coastal Flooding</td>
<td>Worst seen by residents</td>
<td>The Irish Times, 29/10/1880</td>
</tr>
<tr>
<td>1880</td>
<td>22nd Oct</td>
<td>Tolka River Flooding</td>
<td>4th largest flow, 50 families forced to evacuate their homes.</td>
<td>River Tolka Flooding Study, Final Report, (2001), Irish Times, 29/10/1880</td>
</tr>
<tr>
<td>1880</td>
<td>4th Oct</td>
<td>Liffey River Flooding</td>
<td>Cellars flooded</td>
<td>The Irish Times, 6/10/1880</td>
</tr>
<tr>
<td>1883</td>
<td>16th Nov</td>
<td>Dodder River Flooding</td>
<td>Impacts unknown</td>
<td>Mac Cartaigh (2005)</td>
</tr>
<tr>
<td>1884</td>
<td>12th Feb</td>
<td>Coastal Flooding</td>
<td>Roadways along the quays flooded by a high tide</td>
<td>The Irish Times, 16/2/1884</td>
</tr>
<tr>
<td>1880</td>
<td>10th Dec</td>
<td>Coastal Flooding</td>
<td>Part of sea wall swept away allowing floods onto roads and tram tracks</td>
<td>The Irish Times 11/12/1893</td>
</tr>
<tr>
<td>1880</td>
<td>15th Oct</td>
<td>Coastal Flooding</td>
<td>Blackrock and Merrion areas, railway line closed due to flooding</td>
<td>The Irish Times, 17/10/1888</td>
</tr>
<tr>
<td>1899</td>
<td>12th Feb</td>
<td>Coastal Flooding</td>
<td>Roads and tram lines flooded to a much greater extent than any previous flood</td>
<td>The Irish Times, 13/2/1899</td>
</tr>
<tr>
<td>1898</td>
<td>15th Oct</td>
<td>Coastal Flooding</td>
<td>Impacts unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1898</td>
<td>19th Oct</td>
<td>Dodder River Flooding</td>
<td>Impacts unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1891</td>
<td>1891</td>
<td>Coastal Flooding</td>
<td>Impacts unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1880</td>
<td>4th Oct</td>
<td>Liffey River Flooding</td>
<td>Impacts unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1877</td>
<td>2nd Jan</td>
<td>Coastal Flooding</td>
<td>Impacts unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1880</td>
<td>17th Dec</td>
<td>Tolka River Flooding</td>
<td>11th largest flow recorded</td>
<td>River Tolka Flooding Study, Final Report, (2001)</td>
</tr>
<tr>
<td>1891</td>
<td>19th Oct</td>
<td>Dodder River Flooding</td>
<td>Impacts unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1898</td>
<td>15th Oct</td>
<td>Coastal Flooding</td>
<td>Blackrock and Merrion areas, railway line closed due to flooding</td>
<td>The Irish Times, 17/10/1888</td>
</tr>
<tr>
<td>1899</td>
<td>12th Feb</td>
<td>Coastal Flooding</td>
<td>Roads and tram lines flooded to a much greater extent than any previous flood</td>
<td>The Irish Times, 13/2/1899</td>
</tr>
<tr>
<td>1898</td>
<td>19th Oct</td>
<td>Coastal Flooding</td>
<td>Impacts unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1891</td>
<td>19th Oct</td>
<td>Dodder River Flooding</td>
<td>Impacts unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1880</td>
<td>17th Dec</td>
<td>Tolka River Flooding</td>
<td>11th largest flow recorded</td>
<td>River Tolka Flooding Study, Final Report, (2001)</td>
</tr>
<tr>
<td>1898</td>
<td>15th Oct</td>
<td>Coastal Flooding</td>
<td>Blackrock and Merrion areas, railway line closed due to flooding</td>
<td>The Irish Times, 17/10/1888</td>
</tr>
<tr>
<td>1899</td>
<td>12th Feb</td>
<td>Coastal Flooding</td>
<td>Roads and tram lines flooded to a much greater extent than any previous flood</td>
<td>The Irish Times, 13/2/1899</td>
</tr>
<tr>
<td>1898</td>
<td>19th Oct</td>
<td>Coastal Flooding</td>
<td>Impacts unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1891</td>
<td>19th Oct</td>
<td>Dodder River Flooding</td>
<td>Impacts unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>Year</td>
<td>Date</td>
<td>River/Location</td>
<td>Event Description</td>
<td>Source(s)</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
<td>---------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>1851</td>
<td>Jan, exact date unknown</td>
<td>Dodder River Flooding</td>
<td>Bridge destroyed</td>
<td>Cawley, et. al. (2005), Dixon (1953)</td>
</tr>
<tr>
<td>1839</td>
<td>6th Jan</td>
<td>Coastal Flooding</td>
<td>The night of the Big Wind, storm surge caused flooding along the Liffey</td>
<td>Shields &amp; Fitzgerald 1989</td>
</tr>
<tr>
<td>1807</td>
<td>September, exact date unknown</td>
<td>Liffey River Flooding</td>
<td>At least 19 deaths</td>
<td>Dixon (1953)</td>
</tr>
<tr>
<td>1807</td>
<td>September, exact date unknown</td>
<td>Dodder River Flooding</td>
<td>Impacts unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1802</td>
<td>2nd Dec</td>
<td>Liffey &amp; Dodder River Flooding</td>
<td>Bridges swept away, property damage, some fatalities.</td>
<td>Dixon (1953), Cawley, et. al. (2005),</td>
</tr>
<tr>
<td>1794</td>
<td>November, exact date unknown</td>
<td>Poddle River Flooding</td>
<td>Flooding in the castle yard</td>
<td>Dixon (1953)</td>
</tr>
<tr>
<td>1794</td>
<td>November, exact date unknown</td>
<td>Dodder River Flooding</td>
<td>Impacts unknown</td>
<td>Cawley, et. al. (2005)</td>
</tr>
<tr>
<td>1787</td>
<td>September, exact date unknown</td>
<td>Dodder River Flooding</td>
<td>Ringsend bridge damaged</td>
<td>Cawley, et. al. (2005), Dixon (1953)</td>
</tr>
<tr>
<td>1750</td>
<td>Date unknown</td>
<td>Pluvial Flooding</td>
<td>Heavy rain leads to drowning of many sparrows</td>
<td>Dixon (1953)</td>
</tr>
<tr>
<td>1749</td>
<td>March, exact date unknown</td>
<td>Poddle River Flooding</td>
<td>St. Patrick's Cathedral flooded, mills swept away</td>
<td>Dixon (1953)</td>
</tr>
<tr>
<td>1739</td>
<td>Date unknown</td>
<td>Dodder River Flooding</td>
<td>Bridges swept away</td>
<td>Dixon (1953)</td>
</tr>
<tr>
<td>1728</td>
<td>Date unknown</td>
<td>Poddle River Flooding</td>
<td>Bridges washed away, lots of property damaged</td>
<td>Dixon (1953)</td>
</tr>
<tr>
<td>1726</td>
<td>Date unknown</td>
<td>Poddle River Flooding</td>
<td>Floods up to 7 feet deep in some places</td>
<td>Dixon (1953)</td>
</tr>
<tr>
<td>1687</td>
<td>Date unknown</td>
<td>Liffey River Flooding</td>
<td>Essex Bridge damaged and a lot of property damage, small number of deaths</td>
<td>Dixon (1953)</td>
</tr>
<tr>
<td>1646</td>
<td>Date unknown</td>
<td>Liffey River Flooding</td>
<td>Bridges damaged</td>
<td>Dixon (1953)</td>
</tr>
<tr>
<td>1358</td>
<td>Date unknown</td>
<td>Liffey River Flooding</td>
<td>Bridges damaged</td>
<td>Dixon (1953)</td>
</tr>
</tbody>
</table>
Appendix I: Flooding in Cork

<table>
<thead>
<tr>
<th>Year</th>
<th>Date</th>
<th>Type</th>
<th>Impacts</th>
<th>Info Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>27th Oct</td>
<td>Coastal</td>
<td>3 feet deep in city centre</td>
<td>The Irish Times 28/10/2004</td>
</tr>
<tr>
<td>2002</td>
<td>1st Feb</td>
<td>Coastal</td>
<td>2-3 feet deep in parts of city centre</td>
<td>The Irish Times 2/2/2002</td>
</tr>
<tr>
<td>2002</td>
<td>27th Nov</td>
<td>Coastal &amp; Pluvial</td>
<td>Rainfall and coastal combined</td>
<td>The Irish Times 22/11/2002</td>
</tr>
<tr>
<td>2002</td>
<td>27th Nov</td>
<td>Pluvial</td>
<td>5 ft deep in parts of Backpool, €1m property damage</td>
<td>The Irish Times, 28/11/2002</td>
</tr>
<tr>
<td>1998</td>
<td>29th Dec</td>
<td>River</td>
<td>Minor flooding</td>
<td>The Irish Times 30/12/1998</td>
</tr>
<tr>
<td>1996</td>
<td>24th Oct</td>
<td>Coastal</td>
<td>Minor flooding on the quays</td>
<td>The Irish Times 24/10/1996</td>
</tr>
<tr>
<td>1994</td>
<td>3rd Nov</td>
<td>Coastal</td>
<td>Minor flooding at high tide, some roads closed</td>
<td>The Irish Times, 3/1/1994</td>
</tr>
<tr>
<td>1989</td>
<td>13 Dec</td>
<td>Coastal &amp; River</td>
<td>No damage, dropped just in time</td>
<td>The Irish Times 14/12/1989</td>
</tr>
<tr>
<td>1989</td>
<td>17th Dec</td>
<td>Coastal</td>
<td>3 feet deep in city centre, shop owners unprepared, all roads into city centre closed for a time, one motorcyclist killed in a collision with a car on a flooded road</td>
<td>The Irish Times, 18/12/1989</td>
</tr>
<tr>
<td>1988</td>
<td>12th Jan</td>
<td>Coastal &amp; River</td>
<td>Seems to have been minor in city centre</td>
<td>The Irish Times 13/1/1988</td>
</tr>
<tr>
<td>1988</td>
<td>11th Oct</td>
<td>Pluvial</td>
<td>1.5 inches of rain recorded in 3 hours</td>
<td>The Irish Times 12/10/1988</td>
</tr>
<tr>
<td>1983</td>
<td>18th July</td>
<td>Pluvial</td>
<td>Floods caused by thunderstorms, sewers overflowed and roads blocked</td>
<td>The Irish Times 19/7/1983</td>
</tr>
<tr>
<td>1974</td>
<td>11th Jan</td>
<td>Coastal and River</td>
<td>Described as the worst flooding in a number of years, especially on the South Mall and Grand Parade</td>
<td>The Irish Times 12/1/1974</td>
</tr>
<tr>
<td>1974</td>
<td>8th Feb</td>
<td>Coastal</td>
<td>Seems to have been minor in city centre</td>
<td>The Irish Times 9/2/1974</td>
</tr>
<tr>
<td>1969</td>
<td>17th Jan</td>
<td>River</td>
<td>Described as severe</td>
<td>The Irish Times 18/1/1969</td>
</tr>
<tr>
<td>1969</td>
<td>18th Feb</td>
<td>Not clear</td>
<td>Flooding in Oliver Plunkett Street, source not clear on cause but occurred on the same day as snow and ice</td>
<td>The Irish Times 19/2/1969</td>
</tr>
<tr>
<td>1968</td>
<td>23rd Oct</td>
<td>Coastal</td>
<td>Minor flooding, shopkeepers were prepared so little damage to businesses recorded</td>
<td>The Irish Times 24/10/1968</td>
</tr>
<tr>
<td>1967</td>
<td>15th Feb</td>
<td>Coastal</td>
<td>Relatively minor flooding, winds gusting to 80 mph</td>
<td>The Irish Times 16/2/1967</td>
</tr>
<tr>
<td>Year</td>
<td>Date</td>
<td>Type</td>
<td>Description</td>
<td>Source</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
<td>-----------</td>
<td>------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>1967</td>
<td>27th Feb</td>
<td>Coastal</td>
<td>6 inches deep across much of the city centre, city well prepared so little loss</td>
<td>The Irish Times, 28/2/1967</td>
</tr>
<tr>
<td>1967</td>
<td>5th Oct</td>
<td>Coastal</td>
<td>Minor flooding in city centre</td>
<td>The Irish Times 6/10/1967</td>
</tr>
<tr>
<td>1966</td>
<td>10th Jan</td>
<td>Coastal &amp; River</td>
<td>Minor flooding in city</td>
<td>The Irish Times 11/1/1966</td>
</tr>
<tr>
<td>1966</td>
<td>15th Feb</td>
<td>River</td>
<td>2-3 feet on Lee road, minor in other areas</td>
<td>The Irish Times 16/2/1966</td>
</tr>
<tr>
<td>1966</td>
<td>17th Oct</td>
<td>Coastal</td>
<td>Minor flooding in city centre</td>
<td>The Irish Times 18/10/1966</td>
</tr>
<tr>
<td>1963</td>
<td>1st Nov</td>
<td>Coastal</td>
<td>Minor flooding in city centre, 6 inches deep</td>
<td>The Irish Times 2/11/1963</td>
</tr>
<tr>
<td>1963</td>
<td>30th Oct</td>
<td>Coastal</td>
<td>Minor flooding in Blackrock</td>
<td>The Irish Times 31/10/1963</td>
</tr>
<tr>
<td>1962</td>
<td>9th March</td>
<td>Coastal</td>
<td>2 ft deep</td>
<td>The Irish Times, 10/3/1962</td>
</tr>
<tr>
<td>1961</td>
<td>22nd Oct</td>
<td>Coastal</td>
<td>3 ft deep - winds of 93 mph recorded on south coast</td>
<td>The Irish Times 23/10/1961</td>
</tr>
<tr>
<td>1960</td>
<td>4th Dec</td>
<td>River</td>
<td>1m deep</td>
<td>Hickey, (2010)</td>
</tr>
<tr>
<td>1960</td>
<td>5th Oct</td>
<td>Coastal</td>
<td>Worst in some times, two cars towed</td>
<td>The Irish Times, 6/10/1960</td>
</tr>
<tr>
<td>1954</td>
<td>12th Nov</td>
<td>Coastal</td>
<td>Minor flooding in city centre</td>
<td>The Irish Times, 13/11/1954</td>
</tr>
<tr>
<td>1948</td>
<td>6th Dec</td>
<td>River</td>
<td>People had to be rescued through the roofs of cottages</td>
<td>The Irish Times 8/12/1948</td>
</tr>
<tr>
<td>1945</td>
<td>1th Dec</td>
<td>Coastal</td>
<td>Most of city centre flooded up to 1foot, people stranded (seems to have been unexpected), property damage, loss to businesses</td>
<td>The Irish Times, 19/12/1945, Hickey (2010)</td>
</tr>
<tr>
<td>1941</td>
<td>10/11/1941</td>
<td>River</td>
<td>6 ft deep in some areas west of city</td>
<td>The Irish Times, 11/11/1941</td>
</tr>
<tr>
<td>1937</td>
<td>20th March</td>
<td>Coastal &amp; River</td>
<td>3-4 feet in much of city, caused by snow melt, high tide and strong winds</td>
<td>The Irish Times, 21/3/1937</td>
</tr>
<tr>
<td>1928</td>
<td>27th Dec</td>
<td>Pluvial</td>
<td>Minor flooding in city centre</td>
<td>The Irish Times, 27/12/1928</td>
</tr>
<tr>
<td>1924</td>
<td>25th Feb</td>
<td>Coastal</td>
<td>Some flooding in city centre</td>
<td>The Irish Times 26/2/1924</td>
</tr>
<tr>
<td>1921</td>
<td>2nd Oct</td>
<td>Coastal</td>
<td>1foot deep on George Street and Grand Parade</td>
<td>The Irish Times, 3/10/1921</td>
</tr>
<tr>
<td>1916</td>
<td>27th Nov</td>
<td>River</td>
<td>Comparable to 1853, floods six feet deep west of the city, and five feet deep in the city centre</td>
<td>Cawley et. al., (2005), The Irish Times, 18/11/1916</td>
</tr>
<tr>
<td>1907</td>
<td>26th Dec</td>
<td>River</td>
<td>Poorer residents worst affected</td>
<td>The Irish Times, 28/12/1907</td>
</tr>
<tr>
<td>1892</td>
<td>21st Nov</td>
<td>River</td>
<td>2-3 ft deep, possible loss of life</td>
<td>The Irish Times, 22/11/1892</td>
</tr>
<tr>
<td>1881</td>
<td>3rd March</td>
<td>Coastal &amp; River</td>
<td>Western road flooded by the river, much of the city centre flooded by high tides, flooded to a depth of three feet</td>
<td>The Irish Times, 4/3/1881</td>
</tr>
<tr>
<td>Year</td>
<td>Date</td>
<td>Type</td>
<td>Event Description</td>
<td>Source</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>1877</td>
<td>3rd Jan</td>
<td>Coastal</td>
<td>Much of city centre under 3/4 feet of water, boats used for rescues</td>
<td>The Irish Times, 6/1/1877</td>
</tr>
<tr>
<td>1875</td>
<td>26th Dec</td>
<td>Coastal &amp; River</td>
<td>Major flood</td>
<td>Hickey, (2010)</td>
</tr>
<tr>
<td>1853</td>
<td>2nd Nov</td>
<td>River</td>
<td>12 deaths, St. Patrick's Bridge swept away, water 2-3 m deep, long recovery</td>
<td>Cawley. et. al. (2005), Hickey, (2010), Tyrrell and Hickey (1991),</td>
</tr>
<tr>
<td>1789</td>
<td>17th Jan</td>
<td>River</td>
<td>(Heavy rainfall &amp; snow melt) 5-7 feet deep in some places, 1-2m, 1 fatality</td>
<td>Cawley, et. al. (2005), Hickey, (2010)</td>
</tr>
<tr>
<td>1633</td>
<td>Exact date unknown</td>
<td>River</td>
<td>Bridges swept away</td>
<td>Hickey, (2010)</td>
</tr>
</tbody>
</table>
## Appendix J: Flooding in Galway

<table>
<thead>
<tr>
<th>Year</th>
<th>Date</th>
<th>Type</th>
<th>Impacts</th>
<th>Info Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>21&lt;sup&gt;st&lt;/sup&gt; July</td>
<td>Pluvial</td>
<td>Flash flooding, especially around the Docks &amp; Spanish Arch</td>
<td>The Irish Times 23/7/2008</td>
</tr>
<tr>
<td>2006</td>
<td>26&lt;sup&gt;th&lt;/sup&gt; Nov</td>
<td>Pluvial &amp; Coastal</td>
<td>Spanish Arch area flooded</td>
<td>Irish Independent 26/10/2006</td>
</tr>
<tr>
<td>2006</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Dec</td>
<td>Coastal</td>
<td>Minor flooding in Salthill</td>
<td>The Irish Times, 3/12/2006</td>
</tr>
<tr>
<td>2005</td>
<td>9&lt;sup&gt;th&lt;/sup&gt; Jan</td>
<td>Coastal</td>
<td>Drivers rescued from cars swamped in Salthill</td>
<td>The Irish Times, 10/1/2005</td>
</tr>
<tr>
<td>2003</td>
<td>20&lt;sup&gt;th&lt;/sup&gt; July</td>
<td>Pluvial</td>
<td>The Docks &amp; Spanish Arch areas flooded</td>
<td>The Irish Times 21/7/2003</td>
</tr>
<tr>
<td>2002</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Feb</td>
<td>Coastal</td>
<td>Claddagh, Spanish Arch, Salthill, 12 motorists rescued from cars stuck in flood, some properties flooded in Salthill.</td>
<td>The Irish Times 2/2/2002</td>
</tr>
<tr>
<td>1995</td>
<td>17&lt;sup&gt;th&lt;/sup&gt; Jan</td>
<td>Coastal</td>
<td>Severe flooding around the Docks and Salthill, houses flooded</td>
<td>The Irish Times, 18/1/1995</td>
</tr>
<tr>
<td>1977</td>
<td>11&lt;sup&gt;th&lt;/sup&gt; Nov</td>
<td>Coastal</td>
<td>Serious flooding across the city, cars abandoned, 2 feet deep in Salthill</td>
<td>The Irish Times, 12/11/1977</td>
</tr>
<tr>
<td>1974</td>
<td>10&lt;sup&gt;th&lt;/sup&gt; Jan</td>
<td>Coastal</td>
<td>Spanish Arch, to 1 ft, a few inches around the docks, roads closes in Salthill</td>
<td>The Irish Times, 11/1/1974</td>
</tr>
<tr>
<td>1963</td>
<td>18&lt;sup&gt;th&lt;/sup&gt; Nov</td>
<td>Coastal</td>
<td>Road flooding</td>
<td>The Irish Times 19/11/1963</td>
</tr>
<tr>
<td>1930</td>
<td>Date unknown</td>
<td>coastal</td>
<td>Several feet deep near the Docks</td>
<td>Described by an interviewee</td>
</tr>
<tr>
<td>1912</td>
<td>24&lt;sup&gt;th&lt;/sup&gt; Dec</td>
<td>Coastal</td>
<td>Salthill flooded</td>
<td>The Irish Times, 27/12/1912</td>
</tr>
<tr>
<td>1883</td>
<td>18&lt;sup&gt;th&lt;/sup&gt; Oct</td>
<td>Coastal</td>
<td>New docks flooded, fears of much worse damage</td>
<td>The Irish Times, 19/10/1883</td>
</tr>
<tr>
<td>1877</td>
<td>7&lt;sup&gt;th&lt;/sup&gt; Jan</td>
<td>Coastal</td>
<td>Storm described as having blown the sea onto the land</td>
<td>The Irish Times 8/1/1877</td>
</tr>
<tr>
<td>1839</td>
<td>6&lt;sup&gt;th&lt;/sup&gt; Jan</td>
<td>Coastal</td>
<td>Salthill badly hit by the Night of the Big Wind</td>
<td>Carr, (1993)</td>
</tr>
</tbody>
</table>
Bibliography


Beck, U. 2009, World at Risk, English edn, Polity, Cambridge, UK; Malden, MA.


Central Statistics Office Ireland 2010a, Seasonally Adjusted Standardised Unemployment Rate (%) by Month – Quarterly National Household Survey http://www.cso.ie/px/pixeirestat/Dialog/varval.asp?ma=LRM03&ti=Seasonally+Adjusted+Standardised+Unemployment+Rate+by+Month&path=../Database/Eirestat/Live%20Register/&lang=1 (Downloaded, on October 2nd 2010).


Dublin City Council 2008b, River Tolka Flooding Study: Final Report, Dublin City Council, Dublin.


Dublin Docklands Development Authority 2008a, Draft Poolbeg Planning Scheme, Dublin Docklands Development Authority, Dublin.


European Environment Agency 2006, *Vulnerability and Adaptation to Climate Change in Europe*, European Environment Agency, Copenhagen, Denmark.


International Monetary Fund 2010, *World Economic Outlook Database, April 2010*, International Monetary Fund, Washington, D.C.


Pelling, M., & Wisner, B. 2009, Disaster Risk Reduction: Cases from urban Africa, Earthscan, London; Sterling, VA.


Relph, E.C. 2008, "Coping with Social and Environmental Challenges through a Pragmatic Approach to Place" in *Sense of Place, Health, and Quality of Life*, eds. J. Eyles & A. Williams, Ashgate, Aldershot, UK, 31-44.


CURRICULUM VITAE
James M. Jeffers

Education
2011 Doctor of Philosophy (Ph.D.) in Geography: Rutgers, the State University of New Jersey

2009 Master of Philosophy (M.Phil.) in Geography: Rutgers, the State University of New Jersey

2006 Master of Laws (LL.M.) in Public Law: National University of Ireland, Galway.

2005 Bachelor of Laws (LL.B.): National University of Ireland, Galway.

2004 Bachelor of Arts (B.A.) in Geography and Legal Science: National University of Ireland, Galway.

Professional Experience
2010-2011 Teaching Assistant, Department of Human Ecology, Rutgers University.

2009-2010 Teaching Assistant, Department of Geography, Rutgers University.

2008-2009 Teaching Assistant, Department of Geography, Rutgers University.

Publications
2011 (Forthcoming) Jeffers, J.M. ‘The Cork City Flood of November 2009: Lessons for flood risk management and climate change adaptation at the urban scale’ Irish Geography


