



**Maynooth
University**

National University
of Ireland Maynooth

Challenges of Transformative Adaptation: Insights from Flood Risk Management

Darren Clarke

Thesis submitted for the degree of Doctor of Philosophy

Irish Climate Analysis and Research Units (*ICARUS*),
Department of Geography, Maynooth University

April 2018

Head of Department

Prof. Gerry Kearns

Research Supervisor

Dr. Conor Murphy

ICARUS

Irish Climate Analysis and Research Units



Table of contents

1	Introduction	1
1.1	Background and problem outline.....	1
1.2	Research aim and questions.....	5
1.3	Irish flood risk management policy	7
1.3.1	Historical background to flood risk management	7
1.3.2	Administrative structure of flood risk management decision-making	8
1.3.3	Flood risk adaptation strategies.....	10
1.4	Flooding and potential climate change impacts	11
1.5	Case study selection	14
1.5.1	Skibbereen, County Cork.....	15
1.5.2	Clontarf, County Dublin.....	17
1.5.2.1	Clontarf promenade	17
1.5.2.2	Dollymount promenade.....	19
1.6	Research methods and data collection	20
1.6.1	Ethical considerations	21
1.7	Thesis structure	23
2	Literature Review	26
2.1	Introduction.....	26
2.2	Conceptualising adaptation.....	26
2.2.1	Incremental adaptation	28
2.2.2	Transformative adaptation	29
2.2.3	The mutual relationship between incremental and transformative adaptation.....	32
2.3	Barriers to adaptation	35
2.4	Frequently reported barriers.....	37

2.4.1	Social and cultural barriers	39
2.4.1.1	Conceptualising place-related values	40
2.4.1.2	Place disruption as a barrier to adaptation	43
2.4.2	Governance and institutional barriers	45
2.4.3	Resource-based barriers	49
2.4.4	Physical barriers	51
2.5	Conceptual frameworks for analysing barriers to adaptation	52
2.5.1	Time-sensitive studies exploring barriers to adaptation	58
2.5.1.1	Time-sensitive studies exploring place disruption	60
2.6	Conclusion	61
3	Barriers to transformative adaptation: Responses to flood risk in Ireland.....	64
3.1	Introduction.....	64
3.2	Methods	66
3.2.1	Background and case studies	66
3.2.1.1	Skibbereen	67
3.2.1.2	Clontarf promenade	68
3.2.2	Conceptual framework.....	71
3.2.3	Data collection and analysis.....	72
3.3	Results	74
3.3.1	Socio-cultural barriers: Place attachment in Clontarf.....	75
3.3.2	Institutional barriers	77
3.3.2.1	Technical expertise reliance – insights at a national level	77
3.3.2.2	Regulatory practices from Clontarf	82
3.4	Discussion	85
3.4.1	Place attachment as a barrier to transformation	85

3.4.2	Technical expertise as a barrier to transformation	87
3.4.3	Regulatory practices as a barrier to transformation	90
3.5	Conclusion	91
4	Place attachment, disruption and transformative adaptation	94
4.1	Introduction.....	94
4.1.1	Place disruption.....	94
4.2	Methods	97
4.2.1	Background to study	97
4.2.2	Participants and sample	99
4.2.3	Measures.....	102
4.2.3.1	Place attachment.....	102
4.2.3.2	Symbolic place-related meanings.....	103
4.2.3.3	Place protective interpretative responses	104
4.2.3.4	Attitudes towards flood defences and place disruption	104
4.2.3.5	Quantifying residential location	105
4.2.3.6	Perceived effectiveness of governance and stakeholder groups	106
4.3	Results	108
4.3.1	Place-related meanings, interpretations and place attachment	108
4.3.2	Relating place disruption to support for flood defences.....	109
4.3.3	Role of governance on perceptions of disruptive change ...	110
4.3.4	Effects of i) flood experience and; ii) flood risk on place attachment, attitudes towards flood defences and perceptions of governance processes.....	112
4.4	Discussion	113
4.4.1	Future research	116

4.5	Conclusion	117
5	Attempting incremental adaptation when transformation fails: Evidence from flood risk management	119
5.1	Introduction.....	119
5.1.1	Significance of learning for adaptation planning.....	119
5.1.2	Incremental and transformative adaptation challenges	121
5.1.3	Disruptive place change related to adaptation	122
5.2	Methods	124
5.2.1	Background to study	124
5.2.2	Data triangulation	126
5.2.3	Questionnaire participants and sample.....	127
5.2.4	Measures.....	129
5.3	Results	130
5.3.1	Understanding place-related values and support for incremental adaptation	133
5.3.2	Integrating past governance learnings into adaptation planning	135
5.4	Discussion	139
5.4.1	Future work and limitations.....	142
5.5	Conclusion	142
6	Discussion and conclusions	144
6.1	Introduction.....	144
6.2	Summary of research findings.....	144
6.2.1	RQ 1: Barriers to transformative adaptation (Chapter 3)....	146
6.2.2	RQ 2: Place disruption in response to transformation (Chapter 4)	147
6.2.3	RQ 3: Incremental adaptation when transformation fails (Chapter 5).....	149

6.3	Contribution to knowledge	150
6.3.1	Barriers to transformation and incremental adaptation do not differ	150
6.3.2	Social capital and adaptation	152
6.3.3	Place attachment in adaptation governance and planning.	155
6.4	Cross-cutting themes and policy implications.....	157
6.4.1	Experiencing loss and context-specific adaptation.....	157
6.4.2	Knowledge diversity and learning for transformative adaptation.....	159
6.4.3	Technological transformations for adaptation	162
6.5	Research limitations	164
6.5.1	Distinguishing incremental and transformative adaptation	164
6.5.2	Case study research	167
6.6	Future research directions	168
6.6.1	Relationship between place attachment and perceptions of governance processes.....	169
6.6.2	Place attachment and support for transformation.....	170
6.7	Concluding remarks.....	171
7	References.....	174
8	Appendices.....	207

Abstract

Growing evidence suggests that adaptation will form a key component of successfully responding to climate change risks. Discussions surrounding adaptation have, until recently, placed emphasis on incremental change as a means of dealing with climate risks. However, increased attention is now being paid to transformative adaptation given the current scale of climate change impacts. Owing to its recent introduction into adaptation discussions however, little is known about the challenges associated with attempting transformative change. This thesis addresses this shortcoming. Specifically, it examines i) how and why barriers to transformative adaptation emerge; ii) how place disruption, place attachment and perceptions of governance processes are understood in response to transformative change and; iii) how incremental adaptation proceeds when transformation fails, using two case study locations of flood risk management in Ireland as examples of adaptation in practice (Clontarf, County Dublin and Skibbereen, County Cork).

Employing in-depth qualitative and quantitative research methods, this thesis finds that i) barriers to transformative adaptation do not differ from those associated with incremental adaptation; ii) place attachment is strongest in individuals who perceive governance processes as inadequate, and neither flood experience nor flood risk affect strength of place attachment, support for flood defences or perceptions of governance processes, and; iii) even relatively modest incremental adaptation measures can prove extremely contentious and difficult to implement where transformation fails, particularly when past learnings are not embedded into governance practices.

The findings have important implications for adaptation policy and planning. First, climate change threatens both tangible and intangible assets. Whilst current adaptation policies account for tangible assets in assessing the merits of adaptation strategies (e.g. economic damages from flooding), there exists a prevailing need to also explicitly consider intangible assets (e.g. cultural values). Second, knowledge co-production is likely to prove crucial as single actors rarely possess the knowledge, resources or legitimacy to address complex global environmental challenges. And finally, there is substantial merit in integrating virtual technologies to enhance information management between stakeholders in adaptation planning, helping to assist in eliciting emotional responses from individuals and making an abstract concept like climate change locally relevant. Moreover, they highlight the need for broad societal transformations to mitigate future climate change, helping to reduce risk and the need for adaptation in the first instance. The findings emphasize the interconnected and compounding nature of many barriers associated with both incremental and transformative adaptation, and some of the primary issues which decision-makers and communities are likely to have to contend with unless fundamental changes are made to both societal and governance practices concerning climate change and adaptation planning.

Acknowledgements

Being afforded the opportunity to conduct this research is something I am truly grateful for, and I am indebted to many people who have been involved in the research process. I would like to express my sincere gratitude to my PhD supervisor, Dr. Conor Murphy, for providing me with the opportunity to undertake this research. From the outset, you took a chance on my research abilities. I hope in some way I have repaid that risk. Your support, generosity of time and ability to make me see the bigger picture so that this thesis could happen is something I am extremely grateful to you for. I would also like to sincerely acknowledge the help and support of Dr. Irene Lorenzoni at University of East Anglia, Norwich who provided invaluable input throughout the research process. Thank you for the Skype calls and meetings, which helped guide this thesis. Thanks also to the staff in the Department of Geography in Maynooth. Through your teaching and guidance, many of you are the reason I have an interest in research in the first instance. I would also like to express gratitude to Professors Jan Rigby and Karen O'Brien who examined this thesis, and whose comments helped to improve the manuscript.

I am sincerely grateful to the residents of Clontarf and Skibbereen, and to officials from the Office of Public Works and Dublin City Council, who agreed to partake in this research and who gave of their time so generously. Thanks also to Gerard Weafer, Dr. Stephanie Gregorius, Martha Coleman, Podge Flattery, Ciara Ryan and Iria Insua-González for helping to distribute questionnaires in Clontarf, and to Dr. Fionnuala Ní Mhordha for providing advice with analysis of questionnaires.

I'd also like to thank the JPI Climate programme through the Irish Environmental Protection Agency for providing funding for this PhD. To my colleagues in Austria, the Netherlands and France; it has been a pleasure working on the *TRANS-ADAPT* project with each of you.

To my friends and family who always provided encouragement and support during this thesis. Also, my friends and colleagues in ICARUS; each of you have in some way shaped this thesis or me as a person in the last three years, and I cannot thank you enough. Finally, to Iria. You might never understand how grateful I am to you. Thank you for always understanding me, for believing in me, and for your patience over the last three years. I hope I can repay your kindness, love and support in some way in the future.

List of Figures

Figure 1.1: Location map of Skibbereen and Clontarf case studies.....	17
Figure 1.2: Clontarf flood defence locations.....	20
Figure 1.3: Structure of thesis.....	25
Figure 2.1: Established framework for understanding the nature of barriers to adaptation.....	57
Figure 2.2: Schematic diagram used to understand the challenges of transformative adaptation.....	63
Figure 3.1: Location map of Skibbereen and Clontarf case studies.....	68
Figure 3.2: Timeline of developments in the Skibbereen case study	68
Figure 3.3: View of Clontarf promenade.....	70
Figure 3.4: Timeline of developments in the Clontarf promenade case study	71
Figure 4.1: View of Clontarf promenade.....	99
Figure 4.2: Location map of Clontarf questionnaire distribution	101
Figure 5.1: View of Dollymount promenade.....	125
Figure 5.2: Clontarf flood defence locations.....	126
Figure 5.3: Location map of Clontarf questionnaire distribution	128

List of Tables

Table 1.1: Overview of empirical case studies, research questions and methods	23
Table 3.1: Details of interviewees for both case studies including pseudonyms	73
Table 3.2: Temporal and spatial-jurisdictional barriers to transformative adaptation in Clontarf and Skibbereen	75
Table 4.1: Socio-demographic characteristics for Clontarf promenade questionnaire respondents compared with census data	102
Table 4.2: Descriptive statistics for disruptive place change measures for Clontarf promenade.....	107
Table 4.3: Response proportions for free association of place-related symbolic meanings for Clontarf promenade	109
Table 4.4: (a) Bivariate correlation between place attachment (one composite item, see Table 4.2) and both place-protective interpretative responses and perceptions of governance processes; (b) Bivariate correlations between opposition to proposed flood defences and perceptions of governance processes for Clontarf promenade	111
Table 5.1: Socio-demographic characteristics for Dollymount promenade questionnaire respondents compared with census data	129

Table 5.2: Descriptive statistics for place attachment, attitudes to place change, place-protective interpretative responses and perceptions of the governance process for Clontarf promenade and Dollymount promenade questionnaires.....	132
Table 5.3: Response proportions for free association of place-related symbolic meanings for Clontarf promenade and Dollymount promenade questionnaires.....	133
Table 5.4: Bivariate correlations between place attachment and a) attitudes to place change and; b) place-protective interpretative responses for Clontarf promenade and Dollymount promenade questionnaires	135
Table 5.5: Bivariate correlations between opposition to proposed flood defences and perceptions of the governance process for Clontarf promenade and Dollymount promenade	136

Appendices

Appendix A: Participant consent form (interview)	207
Appendix B: Participant information sheet (interview)	209
Appendix C: Semi-structured interview guide	211
Appendix D: Overview of documentary and grey literature sources consulted.....	214
Appendix E: Place attachment questionnaire for Clontarf promenade	216
Appendix F: Coding template for free associations of place-related symbolic meanings for Clontarf promenade and Dollymount promenade.....	226
Appendix G: Place attachment questionnaire for Dollymount promenade	227

1 Introduction

1.1 Background and problem outline

Despite efforts to mitigate the impacts of climate change by reducing greenhouse gas emissions, climate change is already occurring. Even if anthropogenic emissions of greenhouse gases cease immediately, many aspects of climate change and its associated impacts will continue for centuries (IPCC, 2014a). For instance, it is widely acknowledged that climate change will increase the frequency and intensity of many weather-related hazards, including heatwaves, droughts and flooding (IPCC, 2014a). Given its potential impacts, mitigation in isolation no longer suffices (Klein *et al.*, 2005). To respond to risks arising from such hazards, adaptation is also recognised as necessary. Broadly defined, adaptation here describes the process or action of responding to change or perturbations when a system is displaced from equilibrium (Chapin III *et al.*, 2002).

In the context of climate change, several adaptation definitions exist. For example, the European Commission distinguishes climate change adaptation as anticipating the adverse effects of climate change and taking suitable actions to prevent or reduce damages, or to take advantage of potential windows of opportunity (European Commission, 2014). Similarly, the Organisation for Economic Co-operation and Development (OECD) denotes climate change adaptation as those measures that increase resilience to the impacts of climate change (Dinshaw *et al.*, 2014). However, one of the most commonly utilised definitions is that of the Intergovernmental Panel on Climate Change (IPCC), which defines adaptation as *“the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects”* (IPCC, 2014b: 118). Climate change adaptation is the focus of this thesis, specifically transformative adaptation.

One area that has gained prominence in the last decade is that of transformative adaptation. Recognising that the dominant incremental approaches that have defined adaptation planning to-date may be insufficient to deal with the large-scale challenges posed by a changing climate, transformative adaptation is now being advocated as one potential solution, particularly as climate change risks and vulnerabilities increase (Pelling, 2011; Smith *et al.*, 2011; Kates *et al.*, 2012; Termeer *et al.*, 2016). Incremental adaptation implies that *“adjustments are aimed at enabling the decision-maker to continue to meet current objectives under changed conditions”* (Smith *et al.*, 2011: 199). However, it has been critiqued because it typically seeks to maintain existing systems, development trajectories and practices (Revi *et al.*, 2014), which is not deemed as commensurate with the rate at which climate change is now occurring (IPCC, 2012).

Transformative adaptation is deemed to differ from incremental change in that it generally denotes non-linear changes or significant departure from the status quo in how adaptation is typically advanced (O’Brien, 2012; Pelling *et al.*, 2015; Marshall *et al.*, 2016). Yet, there is currently considerable confusion in the literature of both transformative adaptations taken in response to climate change impacts, and societal transformations that minimise risks and the subsequent need for climate change adaptations in the first instance. For instance, O’Brien and Sygna (2013) focus on the latter concept, whereby transformation towards sustainability is seen as the preferred response to minimise future climate warming, thereby reducing the need for transformative adaptation in response to climate change impacts. Others, however, provide examples of transformation taken as a response to climate change impacts (e.g. water-efficient maize production in Africa) (Kates *et al.*, 2012), acceding that a significantly warmer world is now inevitable.

In the context of this thesis, transformation is characterised as *“a fundamental qualitative change . . . that often involves a change in paradigm and may include shifts in perception and meaning, changes in*

underlying norms and values, reconfiguration of social networks and patterns of interaction, changes in power structures, and the introduction of new institutional arrangements and regulatory frameworks” (IPCC, 2012: 465). It thus seeks broader and systemic changes to social and political practices related to adaptation (Wise *et al.*, 2014). Examples of transformative adaptation have been identified in the literature and include innovative policy alternatives to manage or avoid climate risks (Wise *et al.*, 2014), changes in land use or location (Park *et al.*, 2012; Fenton *et al.*, 2017), diversification of income streams (Marshall *et al.*, 2016), or change in the scale at which systems function (Park *et al.*, 2012). As some form of adaptation is inevitable, this thesis thus considers both societal transformations to minimise future climate change (e.g. O’Brien and Sygna, 2013), and transformative adaptation in response to climate impacts (e.g. Kates *et al.*, 2012) as equally relevant for adaptation purposes.

Yet, distinguishing between incremental and transformative change is difficult in practice (O’Brien and Sygna, 2013; Patterson *et al.*, 2015), which may be attributable to a lack of successful transformative change to date (Revi *et al.*, 2014), the lack of conceptual clarity associated with transformation (Feola, 2015), or the relatively recent introduction of the term within the adaptation literature. As noted by the IPCC however, understanding the challenges of transformative change is crucial because it ultimately determines how adaptation is managed and integrated into policy, and how resources are subsequently invested (Noble *et al.*, 2014). To address these concerns and provide a more detailed understanding of the challenges of transformative adaptation, empirical examples of transformative adaptation are required.

Growing acceptance of the need to adapt has also resulted in greater enquiry into the potential barriers that prevent adaptation from occurring (Moser and Ekstrom, 2010; Biesbroek, 2014; Gifford and Chen, 2016). Widespread agreement now exists that barriers will prove the greatest obstacle to successfully progressing adaptation (Biesbroek *et al.*, 2013). For

transformative adaptation to be successful, researchers have advocated for a transformation of social systems and wider governance practices (Termeer *et al.*, 2016); socio-cultural and governance issues are often the primary factors that constrain adaptation (Ekstrom and Moser, 2014). For instance, the often localised nature of adaptation planning and implementation has resulted in increased scholarly attention on place-specific adaptation, and the potential threats to social values that might arise where adaptation disrupts place-related values (Adger *et al.*, 2013; Marshall and Stokes, 2014). Where extensive change to place occurs or is proposed, negative social and psychological outcomes can result (Devine-Wright, 2013). In many cases, such bonds between people and places are typically latent in nature, only emerging in reaction to proposed place change and often resulting in resistance to change (e.g. adaptation) (Devine-Wright, 2009). Research has demonstrated how identities embedded in specific places influence motivation and support for adaptation (Marshall *et al.*, 2013; Fleming *et al.*, 2015). Moving beyond an examination of attitudes and mental models and integrating cultural dimensions into adaptation discussions (e.g. considering how changes impact social identity and cultural values) is therefore necessary for an understanding of transformative change (Olsson *et al.*, 2010; Béné *et al.*, 2012), something which the adaptation literature has largely ignored to date.

Disruption to place is typically characterised by its extent, rapidity and control (Devine-Wright, 2009). As adaptation is an inherently social process, individuals expected to benefit from such measures are therefore likely to want some control over how potential disruption to place arising from adaptation planning is implemented (Carter *et al.*, 2015). Evidence suggests that for adaptation to be managed appropriately, incorporating place disruption and place-related values into decision-making is paramount (Fresque-Baxter and Armitage, 2012). In this regard, studies have highlighted the role of trust and transparency between stakeholders for successful transformation (Marshall *et al.*, 2016). Weak governance

surrounding public participation however has been identified as a barrier to transformation (Gibson *et al.*, 2016). Governance processes that are inclusive and transparent can reduce the disruptive effect of change and may instead positively impact place-related values (von Wirth *et al.*, 2016), helping to facilitate effective adaptation planning. Yet, to-date the adaptation literature has failed to examine the relationship between place-related values and perceptions of governance processes related to planned adaptation, constraining our understanding of how successful adaptation can be facilitated where social values and governance processes are concerned.

Using empirical examples from adaptation planning, this thesis focuses on advancing understanding of the challenges of transformative adaptation, specifically examining what barriers transformative adaptation encounters and why, the specific role of place disruption in determining local responses to transformative adaptation, and how incremental adaptation proceeds in the aftermath of failed transformative change. The growing importance of transformation as a necessary adaptive response to climate change, and the recognition that if transformation is not voluntarily chosen through proactive measures, forced transformative change is likely (IPCC, 2012), suggests that a greater understanding of the challenges transformative adaptation encounters is required.

1.2 Research aim and questions

The principal aim of this thesis is to:

- Investigate the challenges associated with transformative climate change adaptation using the case of flood risk adaptation in Ireland

With respect to the research aim, three research questions will be addressed:

1. How and why might barriers to transformative adaptation emerge, and how might these be overcome?
2. In what ways are place disruption and place attachment understood in response to transformative change, and does flood risk or flood

experience impact attitudes towards adaptation, place attachment or perceptions of governance processes?

3. How does incremental adaptation proceed when transformation fails?

In so doing, this thesis aims to make a scientific contribution to the literature across several disciplines outlined below. First, the research primarily aims to advance understanding of climate change adaptation, with specific reference to transformative change, to examine what challenges communities, policymakers and decision-makers face as attempts are made to implement such change. It does so by examining multiple empirical examples of transformative and incremental change in the Irish flood risk management sector. Within this, it also seeks to contribute to the literature on environmental and adaptation governance given that a consideration of the governance context is essential to understand transformative adaptation (IPCC, 2012).

Second, it adds to the environmental psychology literature by examining the influence place disruption, place-related values and governance processes play where transformative adaptation is proposed. Few studies to-date have examined these issues where (transformative) adaptation is concerned. Moreover, this thesis examines how place disruption, place-related values and perceptions of governance evolve over time using a repeated cross-sectional study design. The integration of such time-sensitive methods allows for a deeper understanding of trajectories of change over time, specifically how place-related values and governance practices respond to incremental adaptation in the aftermath of failed transformative change. The lack of time-sensitive studies exploring these issues is widely acknowledged by researchers (Devine-Wright, 2009; von Wirth *et al.*, 2016).

Finally, the research seeks to be of practical relevance to policymakers, practitioners and communities where adaptation planning is concerned. Specifically, the outputs of this research are expected to help inform

national flood risk management policy given that the project through which this research is being conducted is funded through the Joint Programming Initiative (JPI) Climate (Section 1.5), an initiative by European states and associated countries to integrate national programmes by collaborating on climate research and funding transnational research programmes.

1.3 Irish flood risk management policy

1.3.1 Historical background to flood risk management

Flood risk management in Ireland has been a major issue for several centuries as recognised by the passing of various Drainage Acts in 1842, 1867, 1925, 1928, 1945 and 1995. Until 1995 however, the approach to flood risk management was centred on improving the productivity of agricultural land with little attention given to the need to address the wider impacts of flooding.

Flood risk management in Ireland is typically reactive in nature, responding to the need for flood risk management strategies only when areas have experienced significant flooding in the past (Office of Public Works, 2004). Following extensive flooding in the late 1980s and early 1990s an amendment to the Drainage Act was passed in 1995 (Office of the Attorney General, 1995). This amendment led to a change to managing flood risks such that flood risk management in residential and urban areas became a key priority at a national level. However, the issue of flooding as a strategic concern only gained prominence in 2004 after the publication of a government report on flood risk management. This led to the Office of Public Works (OPW), the state's primary engineering body, assuming responsibility for developing and delivering a national flood risk management strategy (Office of Public Works, 2004). However, tidal flooding was not integrated into its responsibilities until 2009, weakening the streamlining of flood risk management processes nationally until this time.

1.3.2 Administrative structure of flood risk management decision-making

Political governance in Ireland is characterised by a high degree of centralisation in comparison to other EU member states (Boyle, 2000; Pape *et al.*, 2011; Kitchin *et al.*, 2012; Callanan and Tatham, 2014). Because of the Flood Policy Review in 2004, flood risk management is also more centralised, with the OPW largely assuming direct responsibility for the issue. Whilst the OPW is the lead agency nationally with respect to advising on and implementing government flood policy, several other bodies have responsibility for particular aspects of flooding. The range of agencies responsible for flood risk management nationally includes local authorities, a national road and rail authority and a national water utility company amongst others. This makes the process of managing flood risks a difficult and disjointed activity as exemplified by the management of flood events in recent years (Joint Committee on the Environment, Heritage and Local Government, 2010).

Coastal and fluvial flooding is managed by the OPW. The OPW also works in partnership with local authorities when designing, executing and maintaining flood defence schemes. Whilst most relief works for coastal and fluvial flooding are undertaken by the OPW, in certain circumstances it may confer responsibility to some local authorities for major flood relief schemes if it believes the authority has sufficient capacities to deliver the project to the required standard. In such instances the OPW provides financial resources to the local authority to complete the necessary works but assumes ownership for maintenance of the scheme post-completion.

Supplementary to this, other flood risks are managed by various government authorities or agencies. Local authorities are required to deal with pluvial and groundwater flooding at a municipal level and are the primary government authority with responsibility for preparing for and responding to imminent flooding from coastal, fluvial, pluvial and groundwater sources. A government agency comprising the national rail and road authority (Transport Infrastructure Ireland) is accountable for

flood risks pertaining to railways and roads, particularly following a flood event where road or railway infrastructure becomes flooded. Responsibility for prevention of, and response to, combined sewerage flooding has been designated to Irish Water since 2014, a semi-State water utility entity, having been previously managed by local authorities. The number of relevant bodies with specific duties in the field of flood risk management is therefore considerable and has increased since 2014 with the establishment and subsequent transfer of certain flood risks to Irish Water.

The prevailing flood risk management discourse is closely aligned to decision-making that promotes cost-benefit metrics and a neoliberal growth agenda centred on economic development that pervades all levels of decision-making (Jeffers, 2013a). Structural flood defences are a visual expression of political action even though they might not be the optimal approach. Their ability to reduce the risk of flooding in the short term at least, ensures they remain central to flood hazards' policies nationally (Jeffers, 2011). Moreover, a significant barrier to the implementation of non-structural flood strategies is the lack of a national flood forecasting and early warning system. Although the OPW maintains a small number of flood forecasting systems on some rivers there remains no national flood monitoring or early warning system, despite a review in 2011 detailing the need for such a facility (Office of Public Works, 2015a).

Centralised governance structures and associated power asymmetries continue to limit the ability of the general public to influence either policy formation or decision-making in Ireland (Skillington, 1997; Ó Broin and Waters, 2007; Rau, 2007). Moreover, with respect to environmental decision-making practices, planning regulations have been heavily criticised for failing to meet conditions necessary for satisfactory public engagement and participation defined under statutory European laws i.e. the Aarhus Convention (Ewing *et al.*, 2011), which establishes rights of EU citizens regarding access to environmental information, legislates for public participation in environmental decision-making and ensures access to justice with respect to environmental decisions. Specifically, Ewing *et al.*

(2011) identified that current public consultation processes with regard to environmental decision-making in Ireland are less than inclusive or participatory, and are based more on decision-making processes that disseminate information to the public rather than those that promote constructive dialogue.

Currently, the OPW's stated approach to flood risk management is based on a dual-strategy which prioritises non-structural measures where possible, supplementing these with structural flood relief solutions where necessary (Office of Public Works, 2004). Despite recognition by the OPW that non-structural measures are necessary to deal with flood risks and that they should be considered as the primary mechanism for addressing such risks, the dominant strategy for dealing with fluvial and coastal flood risks is currently centred on structural defences, as is evident by flood relief capital investment programmes developed in recent years. Despite recognition of the risks posed by flooding however, investment in flood relief works in recent decades has been relatively modest in comparison to EU standards, with only €410m invested over the last 20 years. Capital investment in flood relief works however is expected to increase significantly during the period 2016-2021, with €430m allocated for such works (Houses of the Oireachtas, 2015).

1.3.3 Flood risk adaptation strategies

Adaptation as a policy issue is an emerging strategy in Ireland. Until 2012, national efforts to deal with climate change were primarily centred on mitigation practices (Department of the Environment, Community and Local Government, 2012). Following the identification of potential socio-economic impacts and national vulnerability to climate change however, sectoral and local authority adaptation plans are now being developed to respond to the impacts of climate change. Sectoral plans comprise 12 areas including water resources, emergency planning, marine, agriculture, forestry, biodiversity, heritage, transport, energy, communications, health and flood risk management (Office of Public Works, 2015a).

Since 2004, the OPW has been charged with completing a thorough review of fluvial flood risks at a national level under the Catchment Flood Risk Assessment and Management (CFRAM) programme. In 2009, it later assumed responsibility for managing coastal flood risks. This approach to managing flood risks is now aligned with the EU Floods Directive (Council Directive 2007/60/EC) and EU Water Framework Directive (Council Directive 2000/60/EC). The existing approach for all flood relief assessments and works is now focused at a river basin scale as defined under the EU Water Framework Directive and the EU Floods Directive and replaces the previous ad hoc process of implementing individual flood relief schemes without considering wider catchment needs.

As the lead agency for flood risk management in Ireland, the OPW is responsible for co-ordinating, and in many instances, implementing the National Flood Policy and EU Floods Directive. These obligations are largely met through the national CFRAM programme. The CFRAM programme is centred on reducing and managing flood risks nationally in the medium to long-term and was developed as the strategy through which climate change adaptation policies would be executed, with a primary emphasis on flood defences. It subsequently acts as the basis of the climate change adaptation plan developed for the flood risk management sector (Office of Public Works, 2015a).

1.4 Flooding and potential climate change impacts

Climate change is likely to have considerable impacts on flood risks in many regions globally. For instance, under a warmer climate extreme precipitation events are likely to become more intense and frequent in many mid-latitude locations (IPCC, 2014a). Similarly, global mean sea levels are also expected to rise, compounding flood risks in coastal locations. Specifically, with respect to coastal flooding considerable evidence exists that if humans continue on a business-as-usual pathway in terms of greenhouse gas emissions, sea-levels may rise by up to 1 m by the end of this century, with many mid-latitude locations becoming increasingly exposed to the upper end of this 1 m increase (IPCC, 2014a). Like many

mid-latitude, maritime countries, Ireland has already experienced sea level rise and is projected to continue to do so in the future, increasing risks to coastal communities and assets (Office of Public Works, 2015a; Vousdoukas *et al.*, 2017). For instance, current scenario planning for flooding suggests that coastal flooding that occurred in Dublin in 2002, which had a return period of 1-in-50 to 1-in-100 years, could increase to a 1-in-2 year event where a 0.5m rise in mean sea levels occurs; this being the lower end of IPCC sea-level rise projections over the coming century (Church *et al.*, 2013). These return periods are likely to be altered even further where sea levels rise beyond this.

Climate change is also predicted to increase the frequency and intensity of fluvial and pluvial flooding by the end of this century, with fluvial flood damages alone across Europe expected to amount to approximately €11 billion per annum (Ciscar *et al.*, 2014). Whilst changes in extreme precipitation vary by region, there is mounting evidence that extreme precipitation will disproportionately affect large parts of northern Europe under a warming climate (Kovats *et al.*, 2014; Donnelly *et al.*, 2017). Some of the largest increases in fluvial flooding are expected to occur over the UK and Ireland and southern Central Europe regions (Ciscar *et al.*, 2014; Office of Public Works, 2015a). Specifically, in an Irish context projected rainfall increases in winter are likely to lead to an increase in fluvial flood risks nationally (Dunne *et al.*, 2008), which is likely to result in heightened demands for adaptation.

In terms of scale and extent, rainfall that affected many parts of Ireland during winter 2015-16 caused some of the worst flooding in Ireland's history; current flood records date back to 1763 (Office of Public Works, 2015a). Rainfall totals over that period were 189% of normal, contributing to the wettest winter on record (National Directorate for Fire and Emergency Management, 2016). The longevity of the flooding was particularly severe, with flooding continuing in some regions into March 2016. Flooding in winter 2015-16 superseded that which occurred in November 2009, which was, until then, considered as the worst flooding in

recorded history. Infrastructural damages arising from the 2015-16 flooding amounted to approximately €106m, with over 1,100 properties flooded (National Directorate for Fire and Emergency Management, 2016). Similarly, extensive fluvial and pluvial flooding in June 2012 resulted in damage to approximately 170 properties in the south-west of the country. The effects of pluvial and fluvial flooding have also been felt in large urban centres in the east of the country. For instance, in October 2011, approximately 1,700 properties were flooded as a result of fluvial and pluvial flooding, causing €130m in economic losses and contributing to two fatalities in the Dublin region (Office of Public Works, 2015a).

Coastal flooding has also been particularly severe in recent decades in Ireland. Specifically, in February 2002 flooding along the east coast of the country, and in the Dublin region in particular, resulted in approximately 1,250 properties being flooded and was estimated to have resulted in €60m in economic damages (Office of Public Works, 2015a). The issue of coastal flooding has also affected other areas of the country. In 2013-14, winter coastal flooding led to extensive flood damage in two of Ireland's largest cities (Cork and Limerick), with damages estimated at €70m, and two individuals losing their lives (National Directorate for Fire and Emergency Management, 2014; Office of Public Works, 2015a).

One of the defining features of historical flooding in Ireland has been the clustering of extreme flood events over the last two decades, which has resulted in increased risks to properties and other assets located in flood-affected areas (Office of Public Works, 2015a). Flooding is now considered as the most significant natural hazard which the country faces in terms of likelihood and impacts (Office of Emergency Planning, 2012), as evidenced by the scale of flood events in recent years. Fluvial and coastal flood risks are recognised as the two most significant types of flooding nationally in terms of hazard and risk (Office of Public Works, 2015a). Nationally, approximately 85,000 properties are considered at risk from flooding, 70,000 of which are residential properties (Office of Public Works, 2015a).

1.5 Case study selection

This thesis is concerned with advancing conceptual understanding of the challenges associated with attempting transformative adaptation by using empirical case studies where transformation was proposed but did not progress to completion. It forms part of a wider JPI Climate research project entitled '*Societal transformation and adaptation necessary to manage dynamics in flood hazard and risk mitigation (TRANS-ADAPT)*'. *TRANS-ADAPT's* core objectives include; i) identifying indicators and parameters necessary for strategies to increase societal resilience; ii) analysing the institutional settings needed for societal transformation and; iii) assessing the perspectives of changing divisions of responsibilities between public and private actors necessary to arrive at more resilient societies.

TRANS-ADAPT is centred on case studies in Austria, France, Ireland and the Netherlands. In these countries flood risk management has been institutionalised for decades but within different institutional settings. In each country, 2-3 case studies were identified for the purpose of the project. Skibbereen, County Cork and Clontarf, County Dublin were subsequently chosen as suitable empirical case studies in Ireland. Both Irish case studies were selected based on the following criteria:

- They are considered as transformative in the context of existing definitions of the term;
- They represent transformative flood risk management strategies that were not implemented. These cases were explicitly chosen to understand the challenges that emerge in the context of transformative change;
- They exhibit a relatively distinct urban-rural divide and differ in terms of type of flood risks posed, further augmenting the comparative elements of this thesis;
- They represent both positive and negative transformative change. Specifically, in Skibbereen transformation was presented by an

environmental group as a positive alternative to business-as-usual flood risk adaptation in Ireland (Section 1.5.1), whilst transformation in Clontarf was considered as being imposed and was viewed as negative (Section 1.5.2.1);

- One of the case studies (Clontarf) offers an opportunity of examining incremental adaptation in the aftermath of failed transformation (Section 1.5.2.2).

The Irish case studies differ from those chosen in Austria, France and the Netherlands where proposed transformative adaptation strategies were successfully implemented in each of the case studies. They therefore offer a unique perspective on the challenges associated with attempting transformative adaptation. Given the similarity in objectives of the *TRANS-ADAPT* research project and this thesis it was deemed practical to utilise the same case studies across both bodies of work.

1.5.1 Skibbereen, County Cork

Skibbereen, County Cork in the south-west of the country is Ireland's most southerly town and has a population of 2,500 people (Figure 1.1). The town is situated on the River Ilen and is the primary residential settlement on the river. The area serves as a gateway to the south-west of the country, one of Ireland's largest tourist regions. The town is primarily exposed to fluvial flooding, but tidal flooding has also occurred in the past, sometimes in combination with fluvial floods. Flooding in recent decades has been particularly severe, with extensive flooding occurring in 1986, 2000, 2009, 2010, 2012 and 2013.

Following flooding in November and December 2009 a local environmental group drafted a proposal to develop an environmental park in a marsh area on the town's outskirts. The environmental park was to serve as a multi-functional facility and incorporate woodlands, waterbodies, valleys, hills, numerous habitats and enclosures. These landscapes were envisaged to provide opportunities for walking, and recreational and cultural activities, as well as serving as a wetland storage system to protect the town from

fluvial and tidal flooding. The amenities proposed within the park in terms of natural and constructed features were to provide a potential communal recreational resource and tourist attraction for the town. The park was to be the first of its kind in Ireland in terms of its multi-functionality in integrating both flood relief measures and recreational features. The marsh area was owned by the county council who were considering constructing a car park to accommodate 200 parking spaces at the same time as the development of the environmental park proposal (Eolas, 2009; Skibbereen Town Council, 2009). Based on IPCC definitions of transformation (IPCC, 2014b), this case study is considered transformative to the extent that its development required a fundamental qualitative change to embedded value systems and institutional procedures that define the management of flood risks nationally, which heavily utilise structural defences to manage flood risks.

Prior to and in conjunction with the timing of the environmental park proposal, a flood committee within the community was advocating for flood relief works to alleviate historic problems of flooding in the town. The local flood committee represented the flooded community of 230 residents and businesses in the town and were keen to ensure that flood relief works would be sufficient to protect the community into the future. Following the 2009 floods, the committee established the Irish National Flood Forum, a national body to represent and advocate the interests of flooded communities with flood authorities, policymakers and elected representatives. They were subsequently involved in lobbying flood authorities for flood relief works both nationally and in Skibbereen. Whilst the local environmental group presented the environmental park proposal to various community organisations, the town council, local politicians and the OPW amongst others, the proposal failed to gain the necessary traction and structural flood defences are instead being advanced through a €14m capital investment.

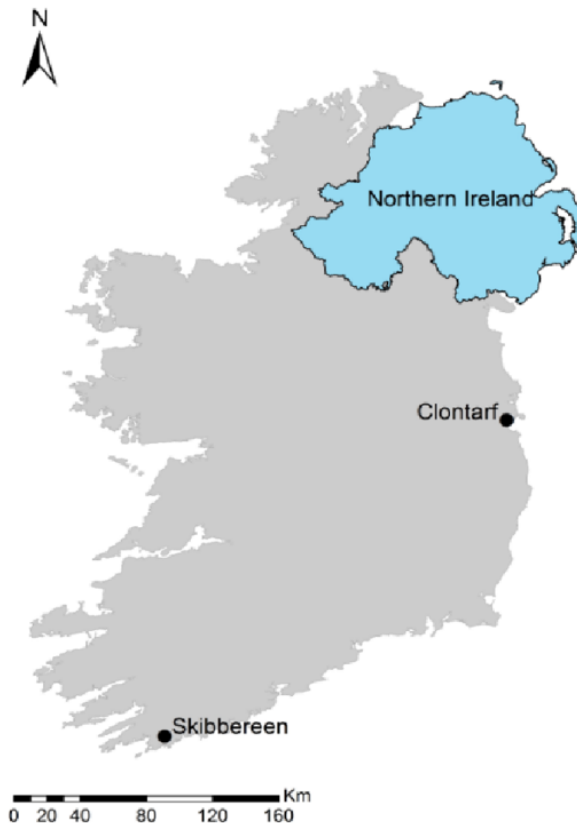


Figure 1.1: Location map of Skibbereen and Clontarf case studies

1.5.2 Clontarf, County Dublin

This section describes two separate flood defences proposed within the community of Clontarf, County Dublin between 2007-2016 along different sections of the coast. Clontarf, County Dublin is a coastal suburban town located approximately 6 km to the north of Dublin city centre (Figure 1.1), with a population of 31,000 people. The town is bordered to the east by the Irish Sea and to the south by the River Tolka, one of Dublin’s three main rivers. The area is characterised by its scenic qualities and recreational opportunities given its location overlooking Dublin Bay to the east and the Wicklow Mountains to the south.

1.5.2.1 Clontarf promenade

A 3 km promenade runs along the coast in Clontarf and serves as a recreational area for walkers, joggers, exercise enthusiasts and bird watchers. The promenade is unique in terms of the presence of green space in proximity to the sea and the city centre, with large sections of the

3 km stretch consisting of a 30 m wide green space. The area is also connected to Bull Island to the east, a UNESCO Biosphere Reserve.

Clontarf has been subject to significant flood events in recent decades. Following a major flood event in 2002, Dublin City Council (DCC) proposed to develop flood defences along the promenade to protect residential and commercial premises from future coastal flood occurrences (Figure 1.2). The proposals involved the development of an earth mound or bund through the centre of the green space, and where a mound was not practical at certain locations, a flood wall was chosen. The proposed height of the defences ranged from 0.85 m - 2.75 m along the 3 km course. In this instance, the OPW was not responsible for the development of the flood protection scheme, instead agreeing with DCC that the city council would be the lead agent for the project. Whilst such a transfer of responsibility from the OPW to a local authority is possible with respect to flood defence planning, it is relatively rare in an Irish context and is usually only considered where large local authorities have sufficient capacities to deliver flood defence projects.

Upon completion of the works it was expected that maintenance of the flood alleviation element of the scheme would then be transferred to the OPW. The project also consisted of combining flood relief works with the laying of an arterial water main within the finished bund to service the water demands of communities in north Dublin. Planning permission for the proposal was granted in 2008. However, initiation of works was delayed for several years. In 2011, local community groups became aware of proposals and opposed the planned flood defences on several grounds. Within a period of two months, those community groups successfully mobilised community resources and gained public and political support to compel DCC to revisit the planned proposals. Based on IPCC definitions of transformation (2014b), the flood defences are classified as transformative from a community perspective given that their realisation would have fundamentally changed existing social values associated with the promenade and its functionality as a focal communal space.

Both the residents and the business association in the community have since formed a working group in partnership with DCC discussing how to progress flood relief efforts for Clontarf promenade. The arterial water main project has since been separated from the original integrated plan and works are currently progressing on this element in isolation of the flood relief scheme. Construction works on flood alleviation are not expected to begin until 2018 at the earliest, over ten years after planning permission was granted for the original flood relief scheme.

1.5.2.2 Dollymount promenade

In 2009, DCC initiated a second flood defence project in the community along a different section of the coast to the aforementioned Clontarf promenade flood defence proposals (Figure 1.2). This involved the integration of flood defence measures, the installation of a new water main for the area and a 2 km cycle track that formed part of a 22 km cycle track around Dublin Bay. The scope of the flood defence measures included improvements to existing sea wall defences and construction of two new retaining wall sections. These included increasing the height of the existing sea wall to ensure a statutory minimum requirement of flood defences, along with an allowance for sea level rise during the 21st century (0.4 m) and resultant wave overtopping, details of which were included in the original planning application (Dublin City Council, 2009; Dublin City Council, 2017).

Public consultation pertaining to the scheme was undertaken in 2012-2013. Subsequent to this, planning permission was approved in February 2013. However, when works began in 2015 concerns began to emanate within the community relating to some sections of the flood defences. In 2015, community groups subsequently mounted a campaign to oppose the proposed seawall development (Clontarf.ie, 2015c). Following discussions between community groups and the local authority in 2015-2016 a liaison committee was established and a compromise solution reached, resulting in changes to the proposed defences.

The proposed defences are classified herein as incremental based on IPCC SREX definitions of incremental adaptation, whereby adaptation measures seek to maintain existing systems and development practices (IPCC, 2012: 20). Specifically, in contrast to the issues which emerged with respect to Clontarf promenade, no fundamental changes to the function of the space was planned. Conversely, existing walkways were to be expanded, increasing the space's amenity value. Additionally, the defences involved maintaining existing national flood defence practices by moderately increasing the height of existing seawall defences.



Figure 1.2: Clontarf flood defence locations. Orange line relates to proposed flood defences for Clontarf promenade. Black line relates to proposed flood defences for Dollymount promenade.

1.6 Research methods and data collection

The use of mixed methods or data triangulation, which incorporates multiple techniques, has gained prominence in the social sciences (Devine-Wright and Howes, 2010; Weitzman *et al.*, 2010; Bryan *et al.*, 2013; Ekstrom and Moser, 2014; Formanowicz and Sczesny, 2016). Several scholars have highlighted the efficacy of mixed methods to better understand particular phenomena and to validate findings (Jick, 1979; Creswell, 2013). The approach counteracts the limitations of one method

alone, improving the richness of data, increasing robustness of findings and facilitating the advancement of theoretical knowledge (Jick, 1979; Johnson and Onwuegbuzie, 2004; Driscoll *et al.*, 2007; Johnson *et al.*, 2007; Creswell, 2013). The following mixed methods were therefore employed within this research (Table 1.1):

- **Interviews:** In-depth semi-structured interviews were conducted with fourteen key stakeholders deemed central to both case studies. Interviews were used to inform discussions in Chapter 3.
- **Desk research:** A detailed content analysis of policy documents, literature, websites, reports, social media activity, digital media resources etc. were examined for both case studies. As others have noted, this involved examining, identifying and then extracting specific themes from secondary data sources that were relevant to the research (Bryman, 2012). This analysis forms a core part of the findings in Chapters 3 and 5. Specifically, content analysis of grey literature was conducted to compare data with those themes identified from primary data sources in each of these chapters (i.e. interviews in Chapter 3 and questionnaires in Chapter 5).
- **Questionnaires:** Questionnaire implementation was undertaken on two separate occasions with residents in Clontarf. The questionnaires were designed to measure place-related values and perceptions of governance processes for two separate flood defence strategies proposed in recent years; one transformative measure in 2014 (Clontarf promenade) and one incremental strategy in 2016 (Dollymount promenade). Questionnaire findings are reported in Chapters 4 and 5.

1.6.1 Ethical considerations

An application for ethical approval for this research was granted by Maynooth University Social Research Ethics Sub-Committee. Guidelines on anonymisation of research participants were followed in line with Irish Qualitative Data Archive (IQDA) practices. Specifically, interview participants were given pseudonyms in the coding of interview data, with

comments that identified specific individuals not utilised for the purposes of this research to ensure anonymity. Additionally, with respect to interview data participants were provided with a transcribed copy of the meeting and were given the opportunity to amend/remove statements which they believed did not reflect their opinion. A copy of a Participant Consent Form (Appendix A) and an Interviewee Information Sheet (Appendix B) are provided in the appendices of this thesis. These documents highlighted important details related to the research topic, including a description of the project, details of the researcher's background and contact information, the rights of participants to withdraw from the research, and details on anonymisation. All interview participants gave informed consent. Anonymisation with respect to secondary data sources was not possible, particularly as much of the data is openly available on social media and through online forums. However, to preserve identity in so far as possible, individuals have not been explicitly identified in this thesis.

In relation to questionnaire administration for Clontarf, participants were notified that all responses would be strictly confidential and would only be reported in an anonymised format. Whilst respondents were asked to provide their specific address for the purposes of delineating whether they were exposed to flood risks, this data was subsequently coded to ensure anonymisation for reporting research outputs (Table 1.1).

	Skibbereen, County Cork	Clontarf, County Dublin
Flood risks	Fluvial and tidal	Tidal and pluvial
Location	Rural town in south-west of Ireland	Suburban community 6 km from Dublin city centre
Research questions	<p>RQ1 How and why might barriers emerge in response to transformative adaptation, and how might these be overcome?</p> <p>RQ2 In what ways are place disruption and place attachment understood in response to transformative change, and does flood risk or flood experience impact attitudes towards adaptation, place attachment or perceptions of governance processes?</p> <p>RQ3 How does incremental adaptation proceed when transformation fails?</p>	
Data collection methods	Semi-structured interviews: - Stakeholders (<i>n</i> = 5) - Experts (<i>n</i> = 1) Policy documents and grey literature content analysis	Semi-structured interviews: - Stakeholders (<i>n</i> = 8) Policy documents, grey literature and social media content analysis Questionnaire implementation in 2014 (Clontarf promenade) - Residents (<i>n</i> = 280) Repeated questionnaire implementation in 2016 (Dollymount promenade) - Residents (<i>n</i> = 242)

Table 1.1: Overview of empirical case studies, research questions and methods. Note: RQ1 focuses on both Skibbereen and Clontarf (Clontarf promenade). RQ2 draws on Clontarf (Clontarf promenade) based on the findings identified from RQ1. Finally, RQ3 builds on RQ1 and RQ2 findings to answer the final research question using both Clontarf case studies (Clontarf promenade and Dollymount promenade)

1.7 Thesis structure

Each of the three research questions outlined in Table 1.1 relate to a core thesis chapter (Chapters 3-5). Figure 1.3 provides an overview of the chapters and how they relate to the research questions. Additionally, within each core chapter more specific chapter questions are addressed based on research gaps identified in the literature. Chapter 2 provides a literature review that sets out the context of the thesis in addition to highlighting the reasoning behind the above research questions. The first

of the core chapters is introduced in Chapter 3. This primarily focuses on identifying barriers to transformative adaptation and on highlighting potential intervention strategies to overcome such challenges drawing on both case studies. Chapters 4 and 5 are specific to Clontarf. Chapter 3 highlights the specific relevance of place disruption in response to transformative adaptation in Clontarf. Chapter 4 therefore builds on the findings identified in Chapter 3 and examines in greater detail the role of place disruption and governance processes in creating barriers to transformative change for flood defences proposed along Clontarf promenade. The ongoing nature of flood defence planning along Dollymount promenade in Clontarf as this research was in progress allowed for emergent insights to be drawn into the challenges with attempting incremental adaptation when transformation fails (Chapter 5). Finally, the thesis concludes in Chapter 6 with a synthesis of the cross-cutting themes, policy implications, and overall contribution to knowledge of this research. It also discusses limitations and directions which future research might benefit from pursuing.

Note: Chapters 3 and 4 are published scientific articles. Whilst repetition has been minimised in so far as possible, there are nonetheless some unavoidable overlaps between chapters. Details of these publications are as follows:

- Clarke, D., Murphy, C., Lorenzoni, I. (2016) Barriers to Transformative Adaptation: Responses to Flood Risk in Ireland. *Journal of Extreme Events*. 3(2), 1650010.
- Clarke, D., Murphy, C., Lorenzoni, I. (2018) Place attachment, disruption and transformative adaptation. *Journal of Environmental Psychology*. 55, 81-89.

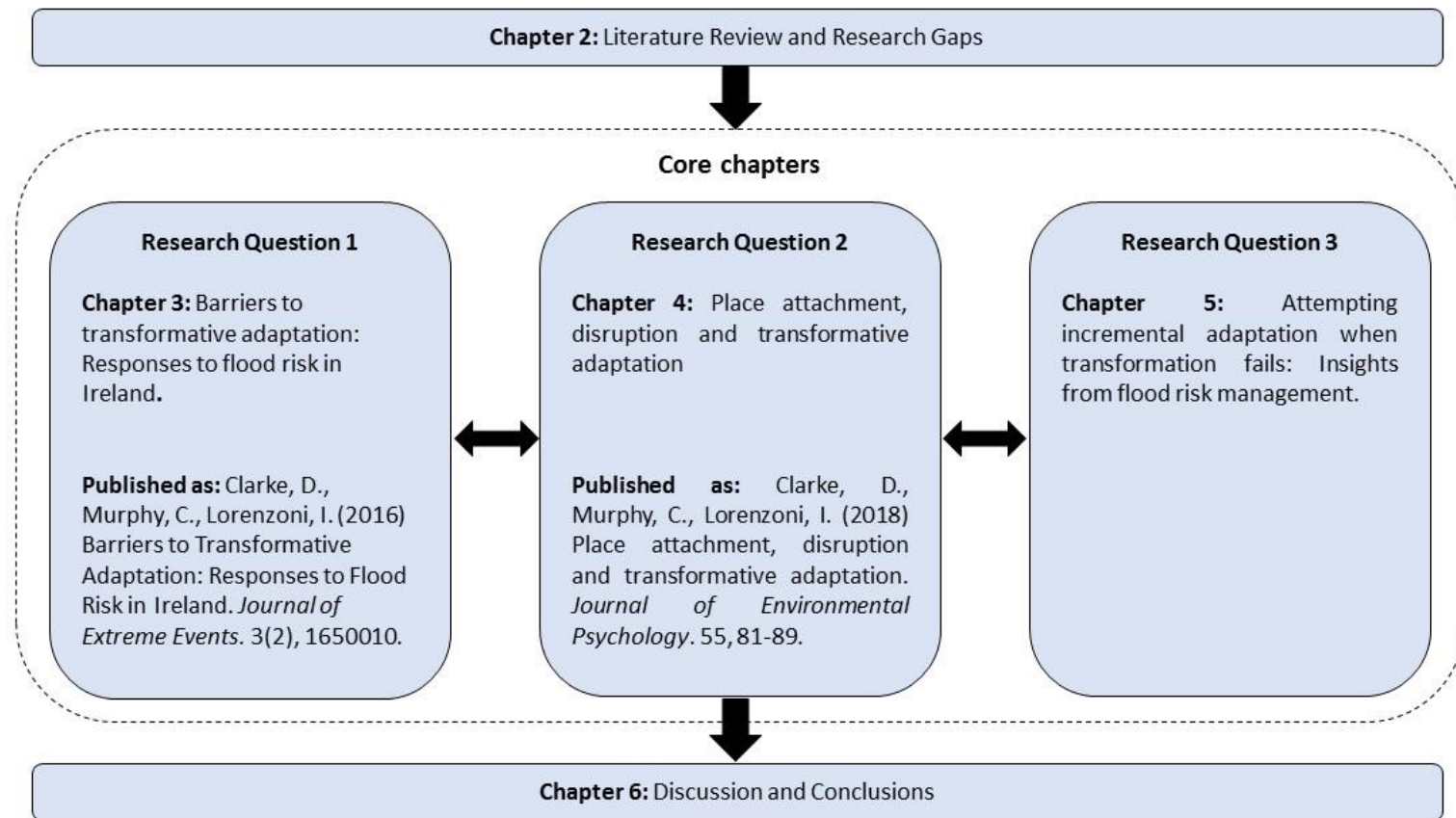


Figure 1.3: Structure of thesis

2 Literature Review

2.1 Introduction

This chapter reviews existing literature surrounding the three research questions of this thesis. First, in Section 2.2 it details the way in which climate change adaptation is currently conceptualised and investigated, specifically describing two broad adaptation typologies i.e. incremental or transformative change. The chapter proceeds by highlighting the barriers associated with adaptation in Section 2.3. In Section 2.4, barriers to adaptation are categorised drawing on a review of existing literature. In so doing, it details how socio-cultural, governance, resource-based and physical barriers can impede adaptation. Within this section, it examines in detail how specific socio-cultural values and governance processes may disrupt place and impede change, two core components of this thesis. The current conceptual frameworks used to understand the nature of such barriers are examined in Section 2.5, before the chapter concludes in Section 2.6 by re-capping the core research questions.

2.2 Conceptualising adaptation

It is increasingly recognised that socio-ecological systems are reaching critical limits in response to anthropogenic climate change (Bardsley, 2015). Research on the importance of societal responses to changes in climate have been well documented (Adger *et al.*, 2009; Wilby and Dessai, 2010; IPCC, 2014a; Wise *et al.*, 2014; Chornesky *et al.*, 2015), with researchers now subsequently debating whether adaptation should be considered as a distinct discipline (Patt, 2013; Massey *et al.*, 2014; Swart *et al.*, 2014; Massey and Huiteima, 2016). In recognition of increased attention surrounding the concept, it is unsurprising that numerous definitions of adaptation exist. Most pertinent perhaps in the context of climate change is the definition provided by the IPCC, whereby adaptation is characterised as *“the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human*

intervention may facilitate adjustment to expected climate” (IPCC, 2012: 556).

To date, adaptation research has predominately focused on developing conceptual frameworks, pathways, tools and typologies (Smit and Skinner, 2002; Füssel, 2007; Simpson *et al.*, 2008 Wise *et al.*, 2014). For example, researchers have explored how adaptation may be facilitated across scales (Adger *et al.*, 2005; Urwin and Jordan, 2008; Juhola and Westerhoff, 2011; Juhola *et al.*, 2011), or the various forms adaptation may take, including behavioural, technological or governance measures (Klein *et al.*, 2001; Termeer *et al.*, 2012; Adger *et al.*, 2013; Huitema *et al.*, 2016). Some have discussed adaptation as both an outcome and as an ongoing process (Adger *et al.*, 2009; Hamin and Gurran, 2009), whilst others have assessed the merits of anticipatory compared to reactive adaptation strategies (Smit *et al.*, 2000; Armitage and Plummer, 2010; Rickards and Howden, 2012; Clément and Rivera, 2016). These studies have subsequently helped to frame how adaptation is understood and what it encompasses, providing insights into how it might be successfully facilitated. Recent discussions have also focused on the scale, scope and intensity of adaptation (Kates *et al.*, 2012; Termeer *et al.*, 2016), classifying adaptation as fitting within one of two primary categories; incremental or transformative change.

Researchers argue that responses to environmental problems including climate change can be operationalised along a continuum from resistance to incremental change through to transformative adaptation (Handmer and Dovers, 1996; Béné *et al.*, 2012; Rickards and Howden, 2012). Whilst resistance to the impacts of climate change is an option, some form of adaptation is inevitable under a changing climate (Parry *et al.*, 1998; Stern, 2007; Agrawal, 2010). Indeed, adaptation is already occurring in response to the effects of climate change. For example, Fenton *et al.* (2017) demonstrated how farmers in Bangladesh are adapting existing livelihood practices in reaction to and in anticipation of climate change. Equally, adaptation to flood and heat risks is occurring across many cities in Europe and North America (Mees, 2016). Recognising that adaptation will play a

crucial part in how the impacts of climate change are understood, felt and acted upon, this thesis explicitly focuses on incremental and transformative adaptation.

2.2.1 Incremental adaptation

Debates amongst scholars have until recently placed a significant emphasis on how to address the problem of a changing climate without altering present day regimes that societies have become accustomed to (Smith *et al.*, 2011; Kates *et al.*, 2012; Mustelin and Handmer, 2012). Where such adaptations are occurring, they are typically incremental in nature and tend to involve only minor adjustments to the trajectories of public, private and social institutions (Termeer *et al.*, 2016). Incremental adaptation seeks to maintain existing systems, development pathways and practices (Revi *et al.*, 2014). In this context, it *“generally implies that adjustments are aimed at enabling the decision-maker to continue to meet current objectives under changed circumstances (e.g. changing cultivars to continue farming)”* (Smith *et al.*, 2011: 199).

Incremental adaptation has gained prominence for several reasons. First, by focusing on adaptation as a continuous and incremental process, adaptation strategies become more palatable with individuals. Selling adaptation strategies to citizens is easier, and the capacities for dealing with future decisions can be formulated in the process (Smith *et al.*, 2011). Second, societies are exposed to multiple stresses including economic, health, social and security issues, which often take priority over environmental concerns such as climate change (Norton and Leaman, 2004; Ratter *et al.*, 2012) given that it is considered to be a distant issue both temporally and spatially (Lorenzoni *et al.*, 2007; Adger *et al.*, 2009). Where adaptation is incremental in nature, individuals are subsequently more likely to have the ability to adapt (Rickards and Howden, 2012), particularly when multiple stresses are accounted for. Finally, policymakers are adept at implementing policies and strategies that have proved successful in other jurisdictions that they feel culturally close to (Devine-Wright and Howes, 2010). Where incremental adaptation strategies are the

norm in particular jurisdictions, these may be replicated in similar jurisdictions. In supporting business-as-usual however, incremental adaptation raises ethical concerns. Not least, it may potentially lead to path dependency and lock-in to existing adaptation pathways, creating a positive feedback and self-fuelling further incremental adaptations. This, it is argued may lead to maladaptation in the long-term (Wise *et al.*, 2014). The issue of maladaptation is particularly likely to arise if we continue to invest in activities and adaptive responses that, at best, are costly and futile if a 4°C warmer world transpires, and at worst prevent more transformative change (Adger and Barnett, 2009).

2.2.2 Transformative adaptation

To appropriately respond to current and projected climate risks researchers have recently concentrated on transformative adaptation, recognising that incremental adaptation in isolation will be insufficient to deal with these threats (Olsson *et al.*, 2004; Pelling, 2011; IPCC, 2012; O'Neill and Handmer, 2012; Kates *et al.*, 2012; IPCC, 2014a; Noble *et al.*, 2014; Colloff *et al.*, 2016; Marshall *et al.*, 2016; Termeer *et al.*, 2016; Juhola *et al.*, 2017; Satyal *et al.*, 2017). Transformation is typified by nonlinear change or deviation from the status quo (O'Brien, 2012; Pelling *et al.*, 2015; Marshall *et al.*, 2016), and is subsequently considered to have a long lead time (Hallegatte, 2009; Smith *et al.*, 2011; Bahadur and Tanner, 2012; Aall *et al.*, 2015; Termeer *et al.*, 2016). Certain theories denote that it is characterised by innovation e.g. in governance through challenging embedded assumptions and practices, including questioning technical or institutional processes or social values (Loorbach *et al.*, 2008; Hedrén and Linnér, 2009; IPCC, 2012; Brand *et al.*, 2013; IPCC 2014b). Whilst transformative adaptation is often assumed to be technological in nature, supportive social settings and the presence of acceptable options and resources are nonetheless crucial enabling components (Kates *et al.*, 2012). Scholars have therefore repeatedly highlighted the need for transformation of both social systems and wider governance systems for transformations to succeed. For example, this can include behavioural

transformations at the individual scale to broader transformations of power relations or social and cultural norms within society (Olsson *et al.*, 2004; Olsson *et al.*, 2006; O'Brien and Barnett, 2013; Termeer *et al.*, 2016). In this context, transformation can be defined as *“a fundamental qualitative change . . . that often involves a change in paradigm and may include shifts in perception and meaning, changes in underlying norms and values, reconfiguration of social networks and patterns of interaction, changes in power structures, and the introduction of new institutional arrangements and regulatory frameworks”* (IPCC, 2012: 465).

In line with the theory of adaptation, transformative change may be planned or occur in reaction to an event. Reactive transformation occurs when significant change is forced on individuals through changed environmental or socio-economic circumstances (Folke *et al.*, 2010), and is a consequence of insufficient system resilience (Nelson *et al.*, 2007). For example, the onset of wildfires or extreme flooding may reduce individual resilience to particular settings and result in forced relocation. Conversely, for planned transformative change, focal events may operate to create a window of opportunity that encourages individuals to plan transformative adaptation actions in anticipation of a crisis (Olsson *et al.*, 2004; Kates *et al.*, 2012; Fazey *et al.*, 2017), when enough individuals challenge the dysfunctionality of existing systems (Chapin III *et al.*, 2010; Gibson *et al.*, 2016). To this end, Chapin III *et al.* (2010) suggest that crises can create opportunities in several ways: i) deliberately initiating change, thereby managing crises; ii) highlighting system failures, which illustrates the salience of change; and iii) learning from past experience of crises management. Equally, others suggest that decision-making taken in response to crisis events may not produce innovative or transformative outcomes, but may instead act as a stimulus for changes that were already the subject of extensive professional and public knowledge (Johnson *et al.*, 2005; Penning-Rowsell *et al.*, 2006).

Vested interests rarely support transformation, particularly where there is much to lose from change (Chapin III *et al.*, 2010; IPCC, 2012). Researchers subsequently argue that even where a window of opportunity arises, structural changes to embedded practices, systems and leadership are required to facilitate transformation (O'Brien, 2012; Tanner and Bahadur, 2013). Encouraging individuals and communities to take proactive adaptive measures requires identifying the underlying values influencing preferences and decisions (Adger *et al.*, 2009; Jones and Boyd, 2011). Pro-social, pro-environmental and pro-active adaptation measures are therefore often found where place-related values are strong as citizens have a greater incentive to take action when valued places become threatened (Whitmarsh, 2008; Mishra *et al.*, 2010; Moser, 2014).

There is also considerable debate about different types of transformations i.e. transformative change taken in response to climate change impacts, and societal transformations that minimise risks and the subsequent need for climate change adaptations in the first instance. For example, O'Brien and Sygna (2013) emphasise the latter concept, whereby transformation towards sustainability is seen as a more practical response to minimise future climate warming, helping to reduce the need for transformative adaptation in response to climate change impacts. Others, however, illustrate transformative actions taken in response to climate change impacts (e.g. flood risk management in the Netherlands) (Kates *et al.*, 2012), acceding that a significantly warmer world is now inevitable.

Considerable agreement within the international community exists that *“adapting to climate and weather extremes associated with rapid and severe climate change, such as a warming beyond 4°C within this century, without transformational policy and social change will be difficult: if not chosen through proactive policies, forced transformations and crises are likely to result”* (IPCC, 2012: 466). Kates *et al.* (2012) argue that the primary reasons for failing to implement transformative adaptation are centred on uncertainties surrounding climate change risks and transformative adaptation benefits, the perceived costs of transformations which are likely

to place a burden on current resources to protect against future unknown change, and a range of institutional and behavioural constraints that seek to maintain existing practices and policies. Many socio-ecological systems therefore fail to seize opportunities for deliberate transformative adaptation (Olsson *et al.*, 2006). Indeed, in a study of transformation amongst Nordic farmers, Juhola *et al.* (2017) found that whilst transformative adaptation was evident, the dominant means of adapting to climate change was centred on incremental adaptation. Moreover, transformative adaptation is not necessarily desirable (IPCC, 2012; Mustelin and Handmer, 2012; Park *et al.*, 2012), and may inadvertently lead to maladaptation by weakening existing structures or systems (Handmer and Dovers, 1996; Matyas and Pelling, 2015). Consequently, researchers attest that transformations should not develop perpetually. Continuously implementing transformations can have unintended consequences by weakening the social fabric of a community (Matyas and Pelling, 2015).

2.2.3 The mutual relationship between incremental and transformative adaptation

The implicit subjectivity denoted by the terms incremental and transformative adaptation makes differentiation between the two difficult in a practical sense (Nelson *et al.*, 2007; Kates *et al.*, 2012; O'Brien, 2012; Rickards and Howden, 2012; O'Brien and Sygna, 2013; Patterson *et al.*, 2015; Fenton *et al.*, 2016). Furthermore, transformation need not always be radical or monumental – sometimes, a simple questioning of assumptions or viewing a problem from a new perspective is all that is required (IPCC, 2012), further underlying the subjective dimension associated with the term.

For Marshall *et al.* (2016), identifying and distinguishing transformative adaptation depends on being explicit about scale. For example, extensive seawall construction might not be construed as transformative in all instances. However, where it fundamentally alters coastal land uses,

transformation can result (Kates *et al.*, 2012). Conversely, at an individual scale transformation may not be explicitly expressed, but instead may be signalled by major changes in occupational identity, place attachment, values, capacities, networks and vulnerabilities as demonstrated by Marshall and colleagues' examination of transformative capacity within the Australian peanut industry (Marshall *et al.*, 2012).

For others, transformation is identifiable from incremental change by its extent. Where incrementalism facilitates the continuation of incumbent systems, transformation creates the conditions for a fundamentally new trajectory or process (Park *et al.*, 2012). Yet for others still, transformation is characterised by adaptation at a much larger intensity, change that is new or innovative within a particular system, or adaptation that transforms places and shift locations (Kates *et al.*, 2012).

Repeated microlevel incremental changes can lead to transformation over time (Kates *et al.*, 2012; Pelling *et al.*, 2015; Termeer *et al.*, 2016). For example, in the UK, proposals detailed under the Thames Estuary Plan highlighted the need for incremental measures to reduce flood risks during the first 25 years (i.e. preserving the current system and adjusting defences incrementally), after which transformative responses may be necessary depending on the degree of climate change experienced (i.e. relocation of development along floodplain) (Kates *et al.*, 2012). Some adaptation measures subsequently straddle the boundaries between both incremental and transformative adaptation (Park *et al.*, 2012), thereby representing an intermediate class e.g. incremental adaptation that is sustained over a prolonged period and which culminates into transformative change as in the case of the Thames Estuary Plan, or changes in institutional practices and thinking that enhance the capacity to undertake transformation (Kates *et al.*, 2012). Given its subjective dimensions, Termeer *et al.* (2016) draw on organisational theory to highlight the efficacy of “*continuous transformational change*”, emphasizing how transformation can be achieved through a series of small in-depth steps that occur organically as individuals, organisations and networks adjust social practices in response

to dynamically changing environmental conditions (Termeer *et al.*, 2016: 7). This process of continuous transformation draws on both incremental and transformative adaptation concurrently (Smith *et al.*, 2011), recognising that where incremental adaptation (e.g. policy change) is designed with a transformative long-term agenda, transformation can succeed (Patterson *et al.*, 2015; Clément and Rivera, 2016; Termeer *et al.*, 2016).

Equally, Matyas and Pelling (2015) maintain that both forms of adaptation can occur simultaneously within a system, either complementing or contradicting one another, as has been demonstrated by Park *et al.* in an Australian agricultural context. Specifically, their research found that transformation was typically so disruptive that it was generally short-lived or isolated, often reverting to incremental change once the transformation had occurred. For instance, their research identified that some Australian wine companies were transforming in response to climate change by purchasing wineries in cool-climate grape producing areas of Tasmania to facilitate potential future relocation, whilst also continuing to incrementally adapt by harvesting in long-standing grape producing locations (Park *et al.*, 2012).

Despite the difficulties in delineating adaptation, the IPCC has called for conceptual clarity in differentiating between incremental and transformative adaptation because it affects how adaptation is managed, how it is integrated into policy and how financial resources are allocated (Noble *et al.*, 2014). Whilst cognisant of the concerns raised by Termeer *et al.* where *“attempts to delineate incremental and transformative adaptation as different strategies impedes the development of practical governance interventions to adapt to climate change”* (Termeer *et al.*, 2016: 7), delineating incremental and transformative adaptation is crucial if the nature of adaptation, and the challenges it encounters, are to be understood. To date however, few studies have empirically explored the relationship between incremental and transformative adaptation, perhaps

in part constrained by the low frequency with which successful transformation occurs (Chapin III *et al.*, 2010; Revi *et al.*, 2014).

2.3 Barriers to adaptation

As acceptance of the necessity to adapt increases, studies have started to embrace questions surrounding the social factors that constrain the ability to proactively adapt to current and future climate change challenges. The literature surrounding this topic has characterised these restricting or constraining factors as ‘barriers to adaptation’ (e.g. Meijerink *et al.*, 2008; Jantasami *et al.*, 2010; Nielsen and Reenberg, 2010; Biesbroek *et al.*, 2013; Biesbroek, 2014; Gifford and Chen, 2016). This increased attention has been attributed to several factors (Biesbroek *et al.*, 2013). First, recent impacts of climate change and catastrophic events worldwide have presented questions of whether societies exhibit sufficient capacity to adapt to climate change (Grothmann and Patt, 2005; Adger *et al.*, 2009). Second, discussions have moved away from if there is a need to adapt to how to adapt and what could curtail adaptation (King, 2004; Hallegatte, 2009; Berrang-Ford *et al.*, 2011). Third, the IPCC’s fifth assessment report detailed the need for improved understanding of adaptation constraints (Klein *et al.*, 2014), heightening scholarly interest in the topic. Fourth, climate change adaptation crosses multiple disciplines and has resulted in an expansion of knowledge within the fields of public administration, geography, sociology, political science and psychology, amongst others. These areas have contributed to developments in theory, offer different perspectives, and utilise a variety of methods to advance discussions (Biesbroek *et al.*, 2013). And finally, the implementation of adaptation policy initiatives in recent years has contributed to the availability of a growing body of empirical studies analysing barriers to adaptation in practice (Tompkins *et al.*, 2010; Lehmann *et al.*, 2013).

Significant agreement now exists that the primary challenge associated with successfully implementing adaptation will be the ability to negotiate the myriad barriers that occur in the face of adaptation (Adger *et al.*, 2009; Amundsen *et al.*, 2010; Moser and Ekstrom, 2010). A barrier to adaptation

is considered as an obstacle to specified actions, for specific actors in a particular context, emerging from a condition or set of conditions. Different actors may experience barriers differently, and they can therefore be overcome or reduced in principle (Eisenack *et al.*, 2014; Patterson *et al.*, 2015). They are distinct from adaptation limits i.e., thresholds after which system features cannot be maintained even in a modified form (Moser and Ekstrom, 2010; Barnett *et al.*, 2015).

In the context of barriers one significant issue that has received increased attention in recent years is that of capacity, particularly the concept of adaptive capacity (Mortreux and Barnett, 2017). Adaptive capacities include, but are not limited to; financial, economic, institutional, social, human, physical and technological capacities (Yohe and Tol, 2002; Smit and Pilifosova, 2003; Grothmann and Patt, 2005; Burch, 2010b; Engle and Lemos, 2010; Jones and Boyd, 2011; Major and Juhola, 2016). There is therefore an implicit assumption that barriers to adaptation and adaptive capacity are inversely related (Moser and Ekstrom, 2010; Ekstrom *et al.*, 2011). This leads to the belief that developed states, communities and sectors of the economy which are considered as resourceful and as having high levels of adaptive capacity are less vulnerable to climate change impacts, which is often not mirrored in reality (Moser, 2009; Mortreux and Barnett, 2017). The presence of adaptive capacity represents only the potential to obtain a particular adaptation goal and barriers can occur outside of the realm of adaptive capacities, as is evident in the 'adaptation deficit' within developed nations (Burton, 2009; Burch, 2010b). For instance, in the context of municipal planning in Canada, Burch (2010b) argued that utilising existing capacities effectively was more likely to overcome barriers to adaptation than investing more technical, financial or human resources at the problem. Similar findings on the mobilisation of existing adaptive capacities rather than the generation of new capacities have also been identified in the context of Dutch climate change adaptation. For instance, Biesbroek *et al.* (2011) found that efforts to increase adaptive capacity in the Netherlands by providing more resources

to various actors was insufficient to support adaptation. Moser and Ekstrom (2010) therefore argue that given the context specific nature of many barriers to adaptation, developing a prescriptive set of capacities to overcome such barriers is not wise. However, to progress discussions on challenges associated with adaptation, scholars have discerned that several broad typologies of barriers exist, which are now discussed.

2.4 Frequently reported barriers

The growing body of research on the adaptive challenges associated with climate change has produced a substantial collection of reported barriers (Lorenzoni *et al.*, 2007; Amundsen *et al.*, 2010; Burch, 2010a; Burch *et al.*, 2010; Jones and Boyd, 2011; Ekstrom and Moser, 2014; Hamin *et al.*, 2014; Matasci *et al.*, 2014; Spires *et al.*, 2014; Wilson *et al.*, 2014; Reckien *et al.*, 2015; Uittenbroek, 2016; Simões *et al.*, 2017). For example, studies from developing countries have identified high vulnerability of individuals to climate change, weak adaptive capacity, inadequate institutional environments and low priority assigned to adaptation as key factors constraining adaptation (Biesbroek *et al.*, 2013). Specifically, socio-economic issues such as poverty, inequality and religious factors are frequently cited as increasing vulnerability and reducing individuals' capacity to adapt in these countries, creating barriers to adaptation (Nielsen and Reenberg, 2010; Jones and Boyd, 2011; Islam *et al.*, 2014; Murphy *et al.*, 2016). For developed countries where assumed adaptive capacity is often considered higher relative to developing countries (Ekstrom *et al.*, 2011; Jeffers, 2014), institutional and social factors have been identified as preventing the *mobilisation* of adaptive capacity, thereby creating barriers to adaptation (Håkon Inderberg, 2011; Ekstrom and Moser, 2014).

The expanding body of research has resulted in a variety of barriers that are both context and actor specific. For example, a financial barrier may be attributable to either a failure to mobilise financial resources appropriately (Burch, 2010b), or to a systemic financial crisis (Ekstrom and Moser, 2014). Similarly, political barriers can arise under different circumstances. Vine

(2012) suggests that political constraints can arise where elected officials prioritise other policy areas ahead of climate change adaptation, whilst political barriers are related to rivalry, territoriality, ulterior motives and lack of political will for Ekstrom and Moser (2014). Some scholars attest however, that there are barriers that are specific to the adaptation process (e.g. lack of guidance, lack of feasible adaptation solutions, reliance on uncertain scientific evidence to identify solutions, conflicting timescales and ambiguities associated with climate change) (Biesbroek *et al.*, 2011; Biesbroek *et al.*, 2013; Ekstrom and Moser, 2014). Outside of these however, research suggests that most barriers are not specific to the governance of adaptation, but are encountered across a range of policy and management processes (Biesbroek *et al.*, 2013; Eisenack *et al.*, 2014).

For some, barriers to transformative adaptation are likely to be different and more challenging than those related to incremental strategies (Moser and Ekstrom, 2010). Similarly, incremental adaptation is also implicitly considered as a relatively pain free process in comparison to transformative change (Adger *et al.*, 2009). Others attest that barriers to transformation do not differ substantially from incremental change, with ambiguities concerning risks and benefits, perceived costs of change, and institutional and behavioural inertia characterising both incremental (Biesbroek *et al.*, 2013; Wilson, 2014) and transformative change (Olsson *et al.*, 2010; Rickards and Howden, 2012; Kates *et al.*, 2012; O'Brien and Sygna, 2013). Consequently, the literature has tended to implicitly view barriers to transformation as an extension of incremental adaptation and has largely ignored how and why barriers to transformation emerge or how these may be overcome.

Overcoming specific barriers is not viewed as an inherent requirement. Depending on an actor's viewpoint, barriers to adaptation can be viewed either positively or negatively. Framing a problem in a particular way may serve some interests but not others. For example, institutional authorities might possess a lack of expertise to implement certain adaptive actions, which may be deemed an impediment to those in favour, but fortunate for

those opposed (Ekstrom *et al.*, 2011). This thesis takes the view that adaptation is a necessary facet of responding to climate change, where barriers must be successfully negotiated and overcome to increase resilience and to progress towards more sustainable pathways.

Whilst numerous attempts have been made to categorise barriers (e.g. Biesbroek *et al.*, 2011; Archie, 2014; Ekstrom and Moser, 2014), a clearer appreciation of their general nature is necessary to advance our understanding of the adaptation process, to evaluate climate change adaptation policies and processes (Biesbroek *et al.*, 2013), and to identify appropriate intervention strategies where adaptation fails. In this regard, barriers to adaptation are assumed to arise from multiple and sometimes interrelated aspects and are generally categorised into four primary categories described below: (i) social and cultural; (ii) institutional and governance; (iii) resource; and (iv) physical or natural barriers (Arnell and Charlton, 2009; Moser and Ekstrom, 2010; Jones and Boyd, 2011; Adger *et al.*, 2013; Biesbroek *et al.*, 2013; Klein *et al.*, 2014; Barnett *et al.*, 2015; Lawrence *et al.*, 2015; Juhola, 2016; Keskitalo *et al.*, 2016). Although each of the categories is distinct, as the proceeding sections demonstrate (Sections 2.4.1 – 2.4.4) they are often interconnected, resulting in interaction between, and reinforcement of, particular barriers (Eisenack *et al.*, 2014).

2.4.1 Social and cultural barriers

Social and cultural barriers can arise in response to antecedent worldviews, risk perceptions, beliefs, cultural values or preferences that determine the ways individuals and societies experience, understand and behave in response to climate change (Lorenzoni and Hulme, 2009; Klein *et al.*, 2014; Armah *et al.*, 2015). Where individuals have a desire to avoid uncertainty, they typically have a strong intolerance to change, and may be unwilling to compromise where traditional beliefs and worldviews are at stake (Esterhuysen, 2003). These social and cultural characteristics can however affect vulnerability and the adaptive capacities of individuals (Grothmann and Patt, 2005; Nielsen and Reenberg, 2010; Jones and Boyd, 2011). Such

traits, it is argued, may become engrained and reinforce internal community structures to resist undesired adaptation (Jones and Boyd, 2011). Case studies from the developing world demonstrate the role of religious beliefs in constraining adaptation. For example, many studies indicate that climate change is perceived as an act of God, a supernatural force, or as not amenable to modification by humans, with negative consequences for individuals taking adaptive actions (Mortreux and Barnett, 2009; Kuruppu and Liverman, 2011; Artur and Hilhorst, 2012; Murphy *et al.*, 2016).

The inherently localised nature of adaptation in terms of its impacts at the individual and the aggregate level (e.g. communities), has resulted in greater attention in the literature on the place-specific nature of adaptation, and the potential barriers that emerge as a result (e.g. Adger *et al.*, 2013; Marshall and Stokes, 2014). For instance, research from Mexico suggests that individuals are unlikely to support transformative change where it does not enhance individual or familial life quality (Pelling and Manuel-Navarrete, 2011). Researchers have thus called for greater emphasis on understanding transformative change beyond an examination of attitudes and mental models to incorporate cultural dimensions of transformations such as alterations to social identity (Olsson *et al.*, 2010), and culture and cognition (Béné *et al.*, 2012). The merits of integrating context-specific, local place-related values into decision-making and planning is now widely acknowledged if adaptation measures are to receive societal support (Agyeman *et al.*, 2009; Devine-Wright, 2011; Fresque-Baxter and Armitage, 2012). However, Marshall and Stokes (2014) attest that because social thresholds are difficult to observe and are context-specific, they are problematic to measure and even more challenging to predict.

2.4.1.1 Conceptualising place-related values

Discourse exploring place-related values has used a variety of distinct but related terms including; sense of place (Relph, 1976; Ellis and Albrecht, 2017); sense of community (McMillan and Chavis, 1986); community

attachment (Kasarda and Janowitz, 1974); topophilia (Tuan, 1974); insideness (Rowles, 1983); place attachment (Altman and Low, 1992); and place identity (Proshansky *et al.*, 1983; Breakwell, 1993) amongst others. Whilst scholars have attempted to distinguish these facets of place from one another, similar features characterise many of the concepts such as emotional bonds, membership, behavioural actions, satisfaction and belonging (Pretty *et al.*, 2003).

Recent discussions surrounding place-related values have focused significant attention on the concept of place attachment (Williams and Vaske, 2003; Brown and Raymond, 2007; Devine-Wright, 2013). Place attachment describes a usually positive emotional connection to certain locations or to particular landscapes, typically encompassing both physical and social elements (Hidalgo and Hernández, 2001; Manzo, 2003; Knez, 2005; Hernández *et al.*, 2007; Lewicka, 2011; Devine-Wright, 2013), which leads to individual and collective actions (Manzo and Perkins, 2006; Devine-Wright, 2009). At the individual level, place attachment often emerges through personal experience with the physical environment (Proshansky *et al.*, 1983). Attributes such as natural environmental qualities, cultural values, mobility, length of residence and recreational opportunities, amongst others, have all been shown to affect the development of attachment (Fried, 1982; Low and Altman, 1992; Kaltenborn, 1997; Kaltenborn and Bjerke, 2002; Hernández *et al.*, 2007; Beery and Jönsson, 2017). Whilst attachment has been measured using factors including involvement, satisfaction, rootedness and social bonding (Kaltenborn and Bjerke, 2002; Kyle *et al.*, 2004; Devine-Wright, 2012; Wynveen *et al.*, 2012), the most widely utilised concept consists of two related dimensions; place dependence and place identity (e.g. Moore and Graefe, 1994; Vaske and Kobrin, 2001; Williams and Vaske, 2003; Brown and Raymond, 2007; White *et al.*, 2008; Anton and Lawrence, 2014; Anton and Lawrence, 2016).

Place dependence refers to the functional features of a place that facilitate certain activities and illustrates the importance of a place in providing

facilities necessary for desired activities (Williams and Roggenbuck, 1989; Moore and Graefe, 1994; Vaske and Kobrin, 2001; Brown and Raymond, 2007). Dependence focuses on the perceived advantages offered by a particular place relative to alternative settings (Jorgensen and Stedman, 2001). This functional attachment is captured through a place's physical characteristics and often increases where proximity to the place enables frequent visitation (Moore and Graefe, 1994; Vaske and Kobrin, 2001). Place dependence is based on an on-going, continuous connection with a place. Natural resource settings (e.g. communal parks, mountains, rivers, coastal areas, forests) are therefore ideal for creating this functional attachment (Vaske and Kobrin, 2001).

Place identity details how physical and symbolic features of certain places are embodied in an individual's sense of self or identity (Proshansky, 1978; Fresque-Baxter and Armitage, 2012; Devine-Wright, 2013). Place identity is considered a long-term, complex process (Moore and Graefe, 1994; Hernández *et al.*, 2007), where place becomes a feature of a person (Lewicka, 2008). Psychological investment in a place is likely to increase in response to length of time spent in that place, with homes and other community features often befitting part of peoples' identities (Anton and Lawrence, 2016). Twigger-Ross *et al.* (2003) demonstrated how places can become part of an individual's identity using Breakwell's Identity Process Theory. Accordingly, anything that provides self-esteem, self-distinctiveness, self-continuity or self-efficacy can form part of an individual's identity (Breakwell, 1993).

Researchers argue that repeated visitation to a place due to place dependence enhances place identity (Moore and Graefe, 1994; Vaske and Kobrin, 2001). Others attest that the relative significance an individual attributes to a place through place dependence determines their extent of attachment and can also shape their identity (Korpela, 2002; Chow and Healey, 2008). In a study of attachment to recreational features however, Moore and Graefe (1994) demonstrated that when particular socio-demographic variables (e.g. age) and situational variables (e.g. distance of

a recreational setting from home) are considered, similar socio-demographic variables correlated in similar ways to both place dependence and place identity, suggesting strong association between place identity and dependence. The literature is replete with examples where both physical and social attributes of place are interconnected and mutually reinforce place attachment processes (Stedman *et al.*, 2004; Brehm, 2007). Consequently, researchers examining place attachment have frequently combined dimensions of place dependence and place identity (Kaltenborn and Bjerke, 2002), sometimes including additional aspects related to involvement and satisfaction to form a uni-dimensional measure of place attachment (Kaltenborn and Williams, 2002).

2.4.1.2 Place disruption as a barrier to adaptation

Continuity of place may become disrupted for individuals in response to perceived threats to place (Brown and Perkins, 1992; Chow and Healey, 2008; Devine-Wright and Howes, 2010; Anton and Lawrence, 2016; Cretney and Bond, 2017), threatening place attachment processes (Brown and Perkins, 1992; Devine-Wright, 2009; Cheng and Chou, 2015). Disruptions to place may include relocation, physical landscape change, changes to the legal or symbolic designation of a place (Devine-Wright and Howes, 2010), or potential changes (Mihaylov and Perkins, 2014), which often result in negative social and psychological consequences (Devine-Wright, 2013). Individuals subjected to such processes may deploy coping mechanisms in the interim period (e.g. resisting undesired change, re-establishing place meanings or questioning powerful interests) to reduce threats of disruptions and protect their sense of attachment (Chow and Healey, 2008; Fresque-Baxter and Armitage, 2012; Anton and Lawrence, 2016). Equally, studies have shown that when self or collective efficacy is weak, behavioural resistance is less likely. Individuals may feel powerless to influence decision-making, *“having no alternative but to accept change or detach themselves from the place”* (Devine-Wright, 2009: 435).

Place disruption has been found to be negatively associated with project acceptance and strength of place attachment for both climate change

mitigation (Devine-Wright and Howes, 2010) and environmental planning (Vorkinn and Riese, 2001), and is recognised as a strong predictor of landscape management preferences (Kaltenborn and Williams, 2002; Stedman, 2003). Whilst it is increasingly accepted that climate change adaptation may lead to potential disruption to place (Hess *et al.*, 2008), this has not resulted in a corresponding increase in the number of studies exploring barriers to adaptation as a result of disruptive place change.

Where strong attachment to place exists, individuals are likely to assess transformation as a threat to place identity and may resist unwanted change (Devine-Wright, 2009; Anton and Lawrence, 2016). Where place-related values are at stake, transformative adaptation is subsequently assumed more difficult to implement than incremental change as demonstrated by Marshall and colleagues across several Australian agricultural industries, including wine, peanut, mixed enterprise, cropping and livestock production (Marshall *et al.*, 2012; Marshall *et al.*, 2013; Fleming *et al.*, 2015; Marshall *et al.*, 2016). Moreover, as transformation involves passing thresholds, a transformation for one individual might not be transformative for others. Those with stronger levels of place attachment are likely to interpret changes in place attachment as transformative since they are passing social thresholds (Marshall *et al.*, 2012). Researchers have therefore advocated for the necessity of deliberate social transformations to achieve sustainable and equitable adaptive outcomes (Olsson *et al.*, 2004; O'Brien, 2017). Illustrating this point, Park *et al.* (2012) demonstrated that psychological transformations to personal identity were more likely to succeed at smaller scales where wine enterprises were willing to adapt their practices in anticipation of future climatic change (e.g. switching from wine production to tourism activities or relocating wine activities to a more agro-climatically suitable region). Similar results were reported by Gibson *et al.* (2016) who found that where transformations are occurring, they are typically local in nature, occurring at the household scale or within organisational decision-making.

In the context of adaptation planning and potential place disruption, societal acceptance of adaptation strategies may increase when climate change becomes tangible for individuals (Adger, 2016). Research suggests that people who experience extreme events are likely to be significantly more concerned than those without such experience, or than those indirectly engaged with such risks solely through public participation (Vasileiadou and Botzen, 2014). Where place attachment is concerned, Carroll *et al.* (2009) illustrated that experience of flooding in the UK resulted in a severing of attachment for those individuals who were flooded. Conversely however, De Dominicis *et al.* (2015) demonstrated that although higher levels of risk perception may exert a positive effect on individuals' willingness to adapt, this effect was weaker when it was associated with strong place attachment.

Researchers to date have examined the issue of disruption to communities through purposive questionnaire sampling of residents with direct experience of, or those specifically at-risk from, weather-related hazards e.g. property flooding (Mishra *et al.*, 2010; De Dominicis *et al.*, 2015), ignoring the views of community members without such experience. Experience of extreme events is important for framing adaptation measures in relation to personal circumstances and emotions, and may help to increase societal support for adaptation (Vasileiadou and Botzen, 2014). Nonetheless, these approaches disregard the views of a cohort of residents who may be unaffected by hazardous events but for whom adaptation planning and place-related values may be no less relevant. Planned adaptation involving changes to the physical fabric of a community has the potential to create disruption for all those who inhabit a place regardless of their prior experience of weather-related hazards.

2.4.2 Governance and institutional barriers

It is widely acknowledged that institutions play a key role in facilitating or preventing adaptation through legal and regulatory responsibilities and authorities (Klein *et al.*, 2014). Measham *et al.* (2011) suggest that institutional factors such as competing agendas and leadership can

constrain adaptation depending on how each is applied. Such barriers are not solely confined to climate adaptation, with lack of political will, public apathy, incompetent leadership, and conflicting policy demands typified across a range of complex issues and processes (Biesbroek *et al.*, 2011). Institutional inertia means that decisions are often influenced by historical actions (Burch, 2010a; Ekstrom and Moser, 2014; Klein *et al.*, 2014; Wilson, 2014; Barnett *et al.*, 2015), thereby impeding transformation (Craig, 2010).

Perceived fairness, equity and transparency of governance processes influences the legitimacy and acceptability of such outcomes (Paavola and Adger, 2006; Gross, 2007). Research by Marshall *et al.* (2016) illustrates that where high levels of trust exist between individuals and formal and informal organisations, transformative adaptation can succeed. Specifically, where a lack of resources such as time and knowledge constrains individuals from engaging in decision-making, trusting relevant organisations and government agencies to make informed and effective decisions can facilitate transformation (Marshall *et al.*, 2016). Several scholars therefore contend that greater perceived procedural equity may be required for transformative adaptation (Bahadur and Tanner, 2012; Mustelin and Handmer, 2012). This may demand re-structuring historical path-dependent institutional structures, organisational cultures and policy-making procedures (Burch, 2010b). This calls for leadership from key decision-makers, adopting practices that are fair and transparent to overcome challenges in adaptation processes and to subsequently achieve acceptable outcomes (Burch, 2010a; Adger *et al.*, 2016).

In these processes, the significance of various knowledges and expertise is therefore becoming increasingly important within adaptation planning. To this end, Satyal *et al.* (2017) identified over-reliance on technical knowledge and responses, where strategies place priority on biophysical analyses of problems, as a primary barrier to facilitating political transformation in the Himalayas. Freire (2000) proposes that meaningful engagement is crucial in any process requiring transformative change. However, including an extensive range of ideas in decision-making raises

significant challenges where power relations can constrain meaningful participatory processes (Few *et al.*, 2007; Wise *et al.*, 2014). In the context of transformative change, achieving this balance may be particularly difficult owing to diverse views, and the greater significance typically ascribed to scientific and technical knowledge forms in decision-making in comparison to local knowledge (Kristjanson *et al.*, 2009).

For adaptation, how change is perceived and interpreted is also predicated on individuals becoming aware of potential disruption (Devine-Wright and Howes, 2010), which is a function of procedural justice associated with public participation and engagement (Devine-Wright, 2009). The relevance of participation, fairness, transparency, accountability and responsiveness have all been documented as fundamental to effective adaptation governance (Engle and Lemos, 2010; Biermann and Gupta, 2011; Mees *et al.*, 2014). Cooper and McKenna (2008) advocate that the argument for inclusion of public involvement in the decision-making process significantly depends on spatial and temporal scales, with the justification for public involvement greater at smaller spatial and shorter temporal scales. However, Harries and Penning-Rowsell (2011) contend that public authorities need to be wary over the degree to which they renounce control of adaptation policies with respect to flood risk management. Scholars have also critiqued the effectiveness of bottom-up, local involvement due to conflicting priorities between communities (Carter *et al.*, 2015), which may seek to undermine broader strategic goals at a larger spatial scale (Cooper and McKenna, 2008).

Nonetheless, public participation in decision-making has long been advocated for as a successful strategy in responding to the impacts of climate change (McDaniels *et al.*, 1999; Bulkeley and Mol, 2003; Few *et al.*, 2007; McEvoy *et al.*, 2010; Wehn *et al.*, 2015), and reducing potential adaptation barriers. Participation can increase the legitimacy of decision-making (Adger, 2003), engender trust between parties (Carter *et al.*, 2015), and can lead to acceptance of decisions even where disagreement exists with those views of decision-makers (Burgess and Williams-Jones, 2004;

Milligan *et al.*, 2009; Adger, 2013). To overcome potential adaptation barriers, recognition of local citizen concerns must move beyond tokenistic gestures from decision-makers. Tokenism does not equate with principles of fairness (Fraser, 1998), and raises issues of public authority accountability. In this regard, stakeholder participation need not suggest that everyone be involved in the process, but rather only those who are concerned (Huntjens *et al.*, 2012), whereby the process of decision-making and the subsequent outcomes are deemed fair and transparent by those who are at-risk of injustice. There is therefore a role for governmental intervention in providing a transparent and fair system in determining who those at-risk of injustice are for the purposes of participatory governance processes (Huntjens *et al.*, 2012).

Weak governance surrounding public participation has been persistently identified as a barrier to transformation (Gibson *et al.*, 2016). Research suggests that where consultation is inadequate, individuals' feelings of self-efficacy and control could become threatened, negatively impacting on place attachment processes (Brown *et al.*, 2003; Anton and Lawrence, 2016). Inclusive and participatory governance processes can reduce the disruptive effect of change and may instead have a positive influence on place-related values (Long and Perkins, 2007; Von Wirth *et al.*, 2016), facilitating effective adaptation planning in the process. The growing body of research on place attachment suggests that for disruptions to be minimised or overcome, place-related identities and meanings should be incorporated into policy and planning processes (Agyeman *et al.*, 2009; Devine-Wright, 2011; Fresque-Baxter and Armitage, 2012). Moreover, recent findings from Schlosberg *et al.* (2017) suggest that where adaptation planning is concerned, placing due regard on deliberative governance processes can address issues of justice and facilitate transformative change.

There is also growing attention on the influential role of social capital as a means of participatory decision-making in adaptation (Jones and Boyd, 2011). Social capital broadly describes the formal and informal networks

that exist between families, community groups and governments. These social networks can be a force for collaborative local action and public participation in decision-making, and can therefore potentially influence adaptation processes and outcomes (Matasci *et al.*, 2014).

Several categorisations of social capital have been identified in the literature. Bonding social capital denotes strong ties at a community level related to shared social identity. Bridging social capital highlights an ability to create links with individuals across different socio-demographic backgrounds, whilst linking social capital focuses on the creation of alliances with those in influential positions of power (Szreter and Woolcock, 2004; Harrison *et al.*, 2016). Despite linking social capital signifying a weak social relationship, it is considered the most effective means for those that seek to derive benefit from its application (Hawkins and Maurer, 2009). Thus, in this context linking social capital potentially offers the greatest potential for communities to achieve desired outcomes with respect to adaptation governance. Research has illustrated how low levels of linking social capital can increase the vulnerability of a population and reduce the likelihood of adaptation where individuals are excluded from access to resources or decision-making during adaptation (Huang *et al.*, 2011). Equally, high levels of linking social capital can highlight the importance of shared community identity, bonds and networks between residents by enabling individuals to unite towards a common goal in resisting change (Norris and Hearne, 2016). Conversely, familial and community connections (bonding and bridging social capital) have been shown to support the creation of local, communal networks that people depend on in times of environmental crises (Fresque-Baxter and Armitage, 2012).

2.4.3 Resource-based barriers

Resource-based barriers concern technological, human and financial constraints (Moser and Ekstrom, 2010). Such barriers can arise for example from the different temporal and spatial uncertainties related to forecast modelling or insufficient expertise, awareness or information amongst

policymakers of the impacts of climate change (Jones and Boyd, 2011; Runhaar *et al.*, 2012). To facilitate transformative change, research suggests that resource-based barriers (e.g. uncertainties associated with future climate change projections) could be overcome by integrating greater flexibility into adaptation planning. For example, risk-hedging across different spatial settings, including the development of context-specific strategies for different locations, could be undertaken by ensuring that strategies are sufficiently robust and flexible to deal with multiple and uncertain climate change scenarios (Smith *et al.*, 2011). Where flexibility exists, resources could be appropriated to whichever future scenario emerges. Risks can be minimised where reversibility and soft adaptation measures are in-built into adaptation planning, and strategies abandoned if the future climate that individuals were hedging against does not emerge. However, such an approach demands early consideration of transformative adaptation in the governance of adaptation planning because initial responses need to be congruent with future eventualities (Smith *et al.*, 2011).

Despite their comparatively high adaptive capacity, institutions in developed countries also face challenges in funding adaptation strategies (Klein *et al.*, 2014). For example, Archie (2014) reported that barriers to planning and implementing adaptation measures in the Rocky Mountains for federal public land managers were centred on financial constraints and lack of information. Moreover, Bierbaum *et al.* (2012) contest that at all scales of governance in the US funding is a major constraint to adaptation. Consequently, few regional councils of government, federal states, municipalities or resource managers have dedicated funding streams for adaptation; instead, available funding often involves a single capital investment rather than sustained investment in adaptation (Bierbaum *et al.*, 2012). Similarly, studies from across Europe, including the UK, the Netherlands and Germany, have highlighted that a lack of available financial resources can act as a significant impediment to adaptation at local scales of governance (Uittenbroek *et al.*, 2012; Lehmann *et al.*, 2013;

Wilson *et al.*, 2014). Equally, financial resources may be curtailed owing to economic crises that limit the availability of funding to institutions engaging in adaptation planning (Ekstrom and Moser, 2014).

Whilst resource barriers are considered a significant hindrance to adaptation generally, Ekstrom and Moser (2014) highlight that resource barriers to adaptation are less dominant than typically assumed. Furthermore, a lack of financial, technical or human resources does not necessarily infer a need to build greater adaptive capacity but demands that such resources are better utilised to overcome barriers (Burch, 2010a; Biesbroek *et al.*, 2011). For instance, whether or not resources are invested in specific adaptation measures is dependent on whether the problem identified is directly considered an area of concern, and whether it is subsequently deemed worthy of investment by those who control those resources e.g. deployment of finance, staff, skills, technology (Ekstrom *et al.*, 2011). Consequently, whilst transformative change demands significant resource investment (Rickards and Howden, 2012), studies argue that resource-based barriers hindering transformation should be more critically examined in light of social and institutional barriers that may require support to facilitate undergoing changes (Grothmann and Patt, 2005; Jantarasami *et al.*, 2010; Lehmann *et al.*, 2013; Ekstrom and Moser, 2014).

2.4.4 Physical barriers

Physical barriers can be related to both non-climatic (e.g. geology or land availability/topography) and climatic factors (e.g. effects of temperature rise). Barriers emerging from physical features of the environment are considered difficult to overcome in practice; although technological innovations may assist in these endeavours (Ekstrom *et al.*, 2011). Physical barriers have significant implications for human adaptation. For example, the distribution and availability of water resources is a characteristic of the physical environment that is affected by climate. Human consumption of freshwater resources in certain regions is now reaching a critical threshold due to over-extraction of groundwater and surface water supplies (Shah, 2009). Regions dependent on water supplies may have reduced capacity to

cope with short or long-term fluctuations. This in turn limits the selection of adaptation measures available to manage water security, and has direct consequences for a range of sectors, influencing both agricultural yields and food security (Hanjra and Qureshi, 2010), and energy security (Dale *et al.*, 2011).

Similarly, path dependency linked to historical modification of the physical environment, including the siting of past infrastructural developments, may potentially constrain the range of future options available (Klein *et al.*, 2014). Human alteration of the physical environment is particularly evident in urban locations, where the siting and design of infrastructure influences vulnerability to climate change (Klein *et al.*, 2014). For instance, water infrastructure developed in western US states in the 19th and 20th centuries has constrained the range of management choices regarding water allocation at present (Libecap, 2011). Proposed adaptive measures can also be constrained owing to the geographical location of existing communities, which results in lock-in to existing infrastructure and path-dependent trajectories, stifling the emergence of alternative solutions (Wilson, 2014). For example, spatial constraints in urbanised areas may limit available options for future proofing cities against climate change e.g. heatwave or flood defence planning.

2.5 Conceptual frameworks for analysing barriers to adaptation

To conceptually examine barriers across specific case studies, researchers have drafted their own categorisations of constraints. For example, Burch (2010a) classified barriers into categories consisting of structural/operational, regulatory/legislative and cultural/behavioural to examine how municipalities across three Canadian cities were adapting to climate change. Similarly, Jones and Boyd (2011) developed a framework focusing on social barriers to adaptation in Nepal in which they assessed cognitive, normative behaviour and institutional constraints to adaptation, whilst Falaleeva *et al.* (2011) explored barriers that arose in the

implementation of coastal zone management in Ireland through four principles of Earth System Governance, namely credibility, stability, adaptiveness and inclusiveness. Each of the aforementioned studies detail the importance of cataloguing barriers to examine where concerted effort may be required to facilitate adaptation. However, used in isolation, categorisation alone is a rather arbitrary process given the context-specific nature of many barriers (Biesbroek *et al.*, 2013; Lehmann *et al.*, 2013). In an attempt to overcome this constraint, scholars have shifted their efforts to examine the nature of barriers i.e. moving beyond describing barriers to diagnosing how and why they emerge. Utilising conceptual frameworks these scholars have attempted to connect conceptual ideas and steer scientific inquiry in analysing barriers. This type of research is crucial for improving our awareness of how and why barriers arise so that intervention strategies for overcoming them are successful.

Recognising that adaptation is both a process and an outcome, others have attempted to map both the process (barriers/drivers) and outcomes (success/failure) of adaptation along two overlapping continuums (Biesbroek *et al.*, 2013). In this context, barriers increase the risk of failure and reduce the likelihood of successful outcomes. Conversely, drivers are those which positively enhance the process by increasing the chance of success and reducing the chances of failure. The interacting nature of barriers and drivers implies that the influence of barriers on specific outcomes can be neutralised by the influence of opportunities at the opposite end of the spectrum and vice versa. Considering barriers in such a way, it is argued, allows researchers to move beyond categorisation to examining causation (Biesbroek *et al.*, 2013). To this end, researchers have identified six primary factors which denote adaptation success in practice, namely; i) effective communication and public engagement; ii) deliberate goal setting and decision-making; iii) improved fit with other climate and non-climate policy goals; iv) justification of adaptation expenditures; v) creating a culture of accountability to increase transparency and resource-use efficiency; and vi) support for learning and adaptive management.

Taken together, they highlight the need for adaptation that is both forward-looking and reflexive, and that is cognisant of both adaptation processes and outcomes in equal measures (Moser and Boykoff, 2013).

The framework developed by Eisenack and Stecker (2012) focuses on barriers to adaptation by examining the relationship between receptors (i.e. the system or actor that is the focus of adaptation), operators (i.e. individuals or collective actors that initiate adaptation actions) and the means of adapting (i.e. resources or knowledge). Using an empirical case study of the Rhine river catchment, they maintain that four primary barriers impede adaptation, namely complex actor relations, missing operators, missing means and unemployed means. Others have extended the work of Eisenack and Stecker (2012) by examining both barriers and opportunities to adaptation. For example, Lehmann *et al.*'s (2013) framework in understanding how and why barriers emerge draws on the interconnected nature of barriers. Specifically, they highlight that whilst core, first-tier variables such as the availability of information, resources or incentives can act either as barriers or opportunities to adaptation, these are often a function of second-tier variables related to actor-specific characteristics, institutions and natural and socio-economic conditions.

Noting the limitations associated with solely categorising barriers and the use of individual case studies in assessing adaptation barriers, researchers have called for comparative approaches using an actor-centred perspective that incorporates a time-sensitive dimension (Eisenack *et al.*, 2014). To this end, the framework developed by Moser and Ekstrom (2010) shown in Figure 2.1 is particularly useful. First, the model draws on the three phases through which adaptation is deemed to progress (understanding, planning and managing). Second, the authors categorise common barriers across each stage of the adaptation process and highlight those barriers that are repeatedly encountered across each of the three phases (leadership, resources, communication and information, and embedded values and beliefs). To facilitate the identification of barriers a series of diagnostic questions is subsequently provided. The final stage of the framework is

concerned with mapping both the spatial and temporal sources of identified barriers to provide a starting point for interventions (Moser and Ekstrom, 2010).

Given its systematic approach in examining the nature of barriers, the framework has subsequently been adopted to meet the needs of a variety of studies (Uittenbroek *et al.*, 2012; Mukheibir *et al.*, 2013; Archie, 2014; Ekstrom and Moser, 2014; Devisscher *et al.*, 2016). For instance, the case of climate change adaptation in Dutch urban planning was utilised by Uittenbroek *et al.* (2012) in identifying adaptation barriers and opportunities for mainstreaming climate adaptation into urban planning. In an analysis of the barriers associated with multi-scale adaptation challenges, Mukheibir *et al.* (2013) identified seven primary supporting actions for overcoming barriers in Australian local government settings to facilitate climate change adaptation. These included i) building shared community and government consensus on the seriousness of climate change; ii) agreeing on roles and responsibilities at all levels of government for addressing climate risks; iii) enhancing the national adaptation framework; iv) utilising effective regional supports to deliver regional priorities for climate change adaptation; v) supporting local government to develop their own adaptation plans; vi) developing a central repository for data management and sharing, and; vii) making effective use of existing government funds and developing new adaptation funds to support adaptation efforts. Archie (2014) investigated barriers associated with climate change adaptation planning in the Rocky Mountains in the US and identified several issues associated with improving climate change adaptation planning and implementation. Conversely, Ekstrom and Moser (2014) examined barriers to adaptation in San Francisco Bay and found that institutional and governance issues and socio-cultural concerns associated with attitudes, values and motivations were the two primary barriers inhibiting urban adaptation. Finally, Devisscher *et al.* (2016) adapted the framework by using a participatory approach where research questions and analysis were conducted in partnership with civil society organisations.

The implementation of Moser's and Ekstrom's (2010) framework across varied case studies, each of which apply it to different stages of the adaptation process, subsequently suggests that it offers flexibility and rigour in advancing knowledge on the nature of adaptation barriers and in developing successful intervention strategies to overcome barriers. This framework is subsequently applied as the methodology for the first research question of this thesis that examines the nature of barriers to transformative adaptation.

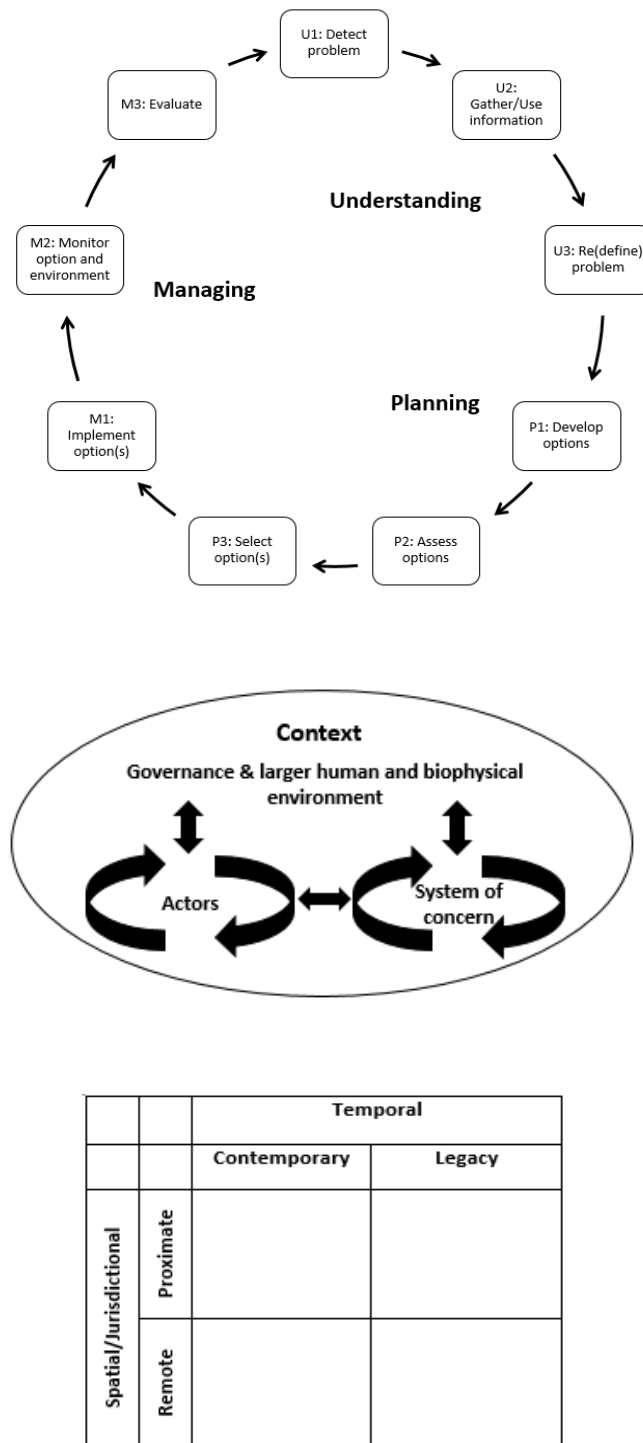


Figure 2.1: Established framework for understanding the nature of barriers to adaptation
 Top: Adaptation planning phases.
 Middle: Structural components of the diagnostic framework including the interaction amongst stakeholders, the system of concern that requires adaptation in response to climate change and the larger governance, biophysical and social contexts.
 Bottom: Opportunities to intervene to overcome barriers categorised by the temporal and spatial nature of barriers.
 Source: Moser and Ekstrom (2010)

2.5.1 Time-sensitive studies exploring barriers to adaptation

Many barriers evolve over time (especially social ones), are amenable to change, and may be overcome with sufficient social and political support, resources and effort (Adger *et al.*, 2009; Biesbroek *et al.*, 2013), leadership, creative management, innovative thinking, prioritisation, alterations in resource allocation, land use planning and facilitative institutional structures (Moser and Ekstrom, 2010). Understanding how and why barriers arise and evolve over time, it is argued, is important for facilitating both incremental and transformative adaptation (Moser and Ekstrom, 2010; Olsson *et al.*, 2010).

To date, much empirical research on adaptation barriers has occurred at the case study level (Jones and Boyd, 2011; Marshall and Stokes, 2014; Wilson *et al.*, 2014), which if used in isolation may create problems for generalising findings and advancing theoretical knowledge on adaptation theory. To overcome such challenges, researchers have engaged in both comparative case-study analysis (Burch, 2010a; Lehmann *et al.*, 2013), and cross-sectional comparisons to increase sample size (Engle and Lemos, 2010; Berrang-Ford *et al.*, 2014). Scholars have critiqued the efficacy of such approaches however, particularly in relation to a lack of consistency applied by researchers in what is compared between cases, the utilisation of inadequate research designs and use of ambiguous measures to compare cases (Dupuis and Biesbroek, 2013). Moving beyond these challenges to increase methodological soundness requires the use of clear, consistent and measurable indicators to identify repeated patterns across cases and to advance theoretical understanding of the adaptation process (Porter *et al.*, 2015). This, it is argued, requires comparative approaches that are actor-centred and that incorporate a time-sensitive dimension (Biesbroek *et al.*, 2013; Eisenack *et al.*, 2014; Porter *et al.*, 2015).

Longitudinal study designs are established methods that can assist in analysing change over time (Devine-Wright, 2009; Porter *et al.*, 2015), heightening our understanding of barriers and enabling the identification of suitable intervention strategies (Biesbroek *et al.*, 2013; Eisenack *et al.*,

2014). For example, Porter *et al.* (2015) demonstrated the fluidity of adaptation barriers by examining the adaptation progress of local authorities in Britain between 2003-2013. Technical-cognitive barriers of local authority officials diminished over the study period in response to increased Government investment in research and improved reliability and accessibility of climate information. However, this was superseded by financial barriers associated with local authority budget cuts in the intervening period, subsequently constraining the implementation of adaptive measures.

Others have longitudinally assessed social and financial barriers to population mobility in response to climate-related natural disasters. Using a 15-year study (1994-2010), Gray and Mueller (2012) found that exposure to disasters in Bangladesh did not increase the likelihood of individuals engaging in migratory practices, and instead potentially reduced mobility by increasing labour demands in the location affected and by diminishing resources necessary to migrate. Moreover, no significant difference in mobility patterns were prevalent between rich and poor households in the aftermath of natural disasters, underscoring the significant challenges and inter-connected nature of barriers associated with migration (Gray and Mueller, 2012).

Similarly, in a study of mobility patterns in Pakistan to responses to extreme weather events, Mueller *et al.* (2014) drew on a 21-year longitudinal survey from 1991-2012 to examine if financial constraints acted as a barrier to migration decisions. The results revealed that extreme heat was related to increased migration regardless of land ownership, but migration was more pronounced for those who were land or asset poor. In such instances, the poor were assumed to have greater mobility flexibility attributed to a lack of financial or tangible assets which would otherwise require disposal of prior to migration. Time-sensitive studies are therefore particularly beneficial in assessing patterns of change over time and can provide useful insights to better facilitate adaptation planning.

2.5.1.1 *Time-sensitive studies exploring place disruption*

Longitudinal studies of place-related values remain rare despite calls for further research on the topic (Devine-Wright, 2009; von Wirth *et al.*, 2016). Where research exists, results primarily indicate that place attachment remains stable over time where place remains undisrupted (Korpela *et al.*, 2009; Cox *et al.*, 2014; Anton and Lawrence, 2016). For example, Cox *et al.* (2014) found that place attachment remained stable over a two-year period because of strong social relationships with friends and family and attractive physical landscape qualities. Where negative place disruption is evident however, place attachment may weaken over time (Speller, 2000; Cheng and Chou, 2015). For instance, in a six-year longitudinal study, aspects of place identity including self-esteem, self-efficacy and self-continuity diminished over time where disruption occurred as a result of forced relocation (Speller, 2000). Studies have however demonstrated that continuity of place attachment is possible where individuals successfully prevent planned disruptive change (Anton and Lawrence, 2016).

Similar to longitudinal studies, repeated cross-sectional studies conducted on different samples have the ability to chart *population* or *group* change over time (Steele, 2008; Bryman, 2012). Specifically, cross-sectional studies seek to estimate the prevalence of a particular phenomenon of interest within a given population (Bryman, 2012). In particular, where adaptation occurs at a scale greater than the individual level e.g. community, district, national or international scales, repeated cross-sectional studies may offer a more appropriate means of analysing how barriers evolve over time at a group level. However, excluding those time-sensitive studies previously discussed, the dearth of research on adaptation barriers suggests that there is still much to learn concerning their nature, and specifically, how they evolve over time. Further empirical studies employing clear, consistent and measurable variables that incorporate a temporal dimension are therefore required if theoretical advancements are to be realised and appropriate intervention strategies are to succeed.

2.6 Conclusion

This chapter first detailed the way in which adaptation is currently conceptualised and examined, specifically describing the two primary pathways which it might follow – incremental and transformative adaptation. It was subsequently noted that distinguishing incremental and transformative adaptation from one another is often difficult to achieve in practice, an issue which is compounded by a lack of empirical examples assessing both forms of adaptation. In so doing, it demonstrated that barriers to (incremental) adaptation typically span four interrelated dimensions: socio-cultural, governance, resource and physical constraints. This led to a discussion surrounding the barriers that might arise in the context of transformative adaptation and raised the question whether such barriers differ from incremental adaptation constraints. It was subsequently argued that categorisation of barriers alone does little to advance our understanding of how and why they emerge in the first instance, thereby limiting our ability to identify successful intervention strategies. Instead, comparative approaches that are actor-centric and that integrate a time-sensitive dimension offer a more useful approach (Eisenack *et al.*, 2014). To address such challenges, the framework of Moser and Ekstrom (2010) was identified as particularly useful, as was the application of temporal studies exploring barriers to adaptation in greater detail.

As noted in Chapter 1, the primary aim of this thesis is to:

- Investigate the challenges associated with transformative climate change adaptation using the case of flood risk adaptation in Ireland

With respect to this aim, this thesis is guided by three research questions:

1. How and why might barriers to transformative adaptation emerge, and how might these be overcome?

The first research question of this thesis examines how and why barriers emerge in response to transformative adaptation using insights from both Clontarf (Clontarf promenade) and Skibbereen. To date, there are few

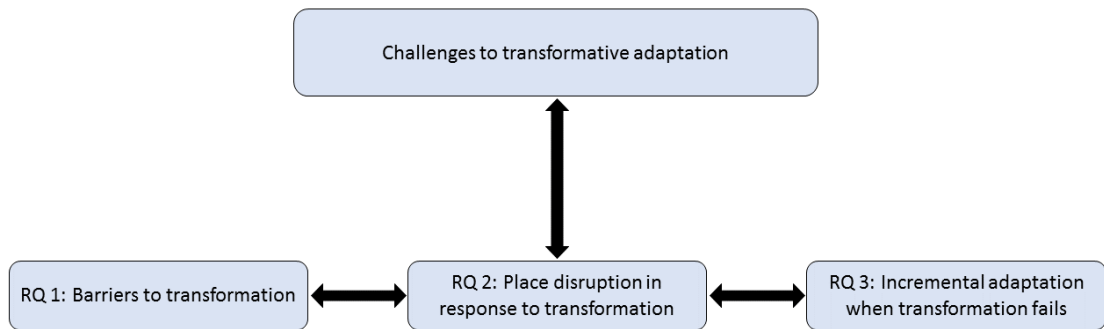
empirical examples that explore this issue as was noted in Section 2.4. Moreover, even fewer studies provide potential strategies for intervening where such barriers arise. This research question addresses this issue by examining barriers to transformation and identifies potential intervention strategies using Moser and Ekstrom's (2010) established conceptual framework (Chapter 3).

2. In what ways are place disruption and place attachment understood in response to transformative change, and does flood risk or flood experience impact attitudes towards adaptation, place attachment or perceptions of governance processes?

As detailed in Figure 2.2, the second research question of this study is to examine proposed place-related values and place disruption in response to transformative adaptation using an in-depth case study approach. This question specifically examines place attachment, place-related symbolic meanings, place-protective interpretative responses, attitudinal responses, and subsequent evaluation of the governance process surrounding public participation where transformative adaptation is contested using in-depth insights from one case study (Clontarf promenade) (Chapter 4).

3. How does incremental adaptation proceed when transformation fails?

The final research question builds on the work undertaken from the second research question by drawing on proposed incremental adaptation in the same community. It therefore purposively adds a temporal dimension to the thesis. In so doing, it explicitly explores how attempts at incremental adaptation proceed when transformation fails. The time-sensitive dimension provides a more detailed understanding of how social and cultural values and perceptions of governance processes might change over time in response to potential learnings and different adaptation measures within the same social setting (Clontarf promenade and Dollymount promenade) (Chapter 5).



RQ denotes 'Research question'. RQ1 adopts framework of Moser and Ekstrom (2010). RQ1 used to inform RQ2 for one case study. RQ3 utilises repeated cross-sectional study design.

Figure 2.2: Schematic diagram used to understand the challenges of transformative adaptation

3 Barriers to transformative adaptation: Responses to flood risk in Ireland

3.1 Introduction

Chapter 2 discussed the need for a greater understanding of how successful transformation can be facilitated. One of the core research questions of this thesis is to understand the barriers that arise where transformative adaptation is attempted but fails so that lessons can be learned to overcome these challenges in the future. This chapter therefore addresses the first research question of this thesis, specifically how and why might barriers emerge in response to transformative adaptation, and how these might be potentially overcome in such instances.

The literature review in Chapter 2 suggested that to appropriately manage current and projected climate risks, incremental approaches to adaptation may need to be supplemented with transformative strategies (Kates *et al.*, 2012; O'Brien, 2012; Pelling *et al.*, 2015). Transformation is often characterised by *“a fundamental qualitative change . . . that often involves a change in paradigm and may include shifts in perception and meaning, changes in underlying norms and values, reconfiguration of social networks and patterns of interaction, changes in power structures, and the introduction of new institutional arrangements and regulatory frameworks”* (IPCC, 2012: 465).

It is generally purported that transformational change differs from, or may even be the opposite of, incremental change in terms of depth, scope and speed of change (Termeer *et al.*, 2016); certain conceptualisations of transformation indicate that it is underpinned by innovation e.g. in governance, encouraging a questioning of assumptions or consideration of a problem from a different perspective, including challenging embedded technical or institutional practices or social values (Loorbach *et al.*, 2008; Hedrén and Linnér, 2009; Pelling, 2011; IPCC, 2012; IPCC, 2014b). However, it has also been argued that this dichotomy may be unfruitful and

conceptually as well as practically unhelpful. Termeer *et al.* (2016) for instance maintain that those elements characterise both forms of adaptation and vary in relation to circumstances and context. Thus, distinguishing between incremental and transformative change can prove difficult in practice (Kates *et al.*, 2012).

Research has recently focused on barriers that may hinder progress towards adaptation, with much work focused on climate change. A barrier to adaptation is defined as an obstacle to specified actions, for specific actors in a particular context, emerging from a condition or a set of conditions. Barriers can be experienced differently by different actors and can be overcome in principle, and are distinct from adaptation limits (Eisenack *et al.*, 2014) i.e. thresholds beyond which features of a system cannot be maintained even in a modified fashion (Moser and Ekstrom, 2010; Barnett *et al.*, 2015).

Some scholars suggest that barriers to transformative adaptation are likely to be different and more challenging than those relating to incremental strategies (Moser and Ekstrom, 2010). Others attest that barriers to transformation do not differ substantially from (incremental) adaptation barriers, with ambiguities concerning risks and benefits, perceived costs of change, and institutional and behavioural inertia characterising both incremental (Biesbroek *et al.*, 2013; Moser, 2014; Wilson, 2014) and transformative change (Rickards and Howden, 2012; Kates *et al.*, 2012). Consequently, the literature has tended to view barriers to transformation as an extension of incremental adaptation and has largely ignored how and why barriers to transformations emerge and how these may be overcome. These are the foci of this chapter.

Barriers to (incremental) adaptation arise from multiple and sometimes inter-related aspects and are generally classified into four broad categories outlined in detail in Chapter 2: i) social and cultural; ii) institutional and governance; iii) resource; and iv) physical or natural barriers (Arnell and Charlton, 2009; Moser and Ekstrom, 2010; Jones and Boyd, 2011; Adger *et al.*, 2013; Biesbroek *et al.*, 2013; Klein *et al.*, 2014; Barnett *et al.*, 2015;

Lawrence *et al.*, 2015; Juhola, 2016; Keskitalo *et al.*, 2016). Although each of the aforementioned barriers is distinct, barriers often occur interdependently rather than in isolation of one another, leading to interaction between, and reinforcement of, particular barriers (Eisenack *et al.*, 2014). Many barriers evolve over time (especially social ones), are amenable to change, and may be overcome with sufficient social and political support, resources and effort, leadership, creative management, innovative thinking, prioritisation, alterations in resource allocation, land use planning and facilitative institutional structures (Adger *et al.*, 2009; Moser and Ekstrom, 2010; Biesbroek *et al.*, 2013).

To date, there remains little empirical evidence revealing how and why barriers emerge in the context of transformative adaptation or if barriers to transformative change are similar to those associated with incremental adaptation. This chapter addresses these questions by analysing barriers to transformative change using two Irish case studies. In both, transformative flood risk management strategies were proposed but were not implemented. It systematically investigates barriers that arose within the context of each case study and suggests strategies that may help to circumvent these barriers in the future. The remainder of the chapter is structured as follows: Section 3.2 details the case studies and methods employed. Section 3.3 presents the primary findings of the research. A discussion of these is provided in Section 3.4, with conclusions presented in Section 3.5.

3.2 Methods

3.2.1 Background and case studies

Focusing on flood risk management in Ireland, this chapter explores barriers that ultimately led to the failure of different transformative strategies in two communities. The two case studies presented, namely Clontarf promenade, County Dublin, and Skibbereen, County Cork, offer contrasting perspectives regarding the notion of transformative adaptation and illustrate how transformation is perceived and acted upon in different

circumstances. Both case studies are situated within the wider landscape of flood risk management in Ireland, which is highly centralised, with the national flood authority, the Office of Public Works (OPW), the lead agency responsible for coordinating and executing government flood risk policy. The dominant approach to addressing flood risks nationally remains centred on technocratic, structural relief measures (Jeffers, 2013a; Devitt and O'Neill, 2016), despite State recognition over a decade ago that continued reliance on structural measures alone was unsustainable and a shift to non-structural solutions was necessary (e.g. land use planning, early warning systems, potential wetland restoration and recreation) (Office of Public Works, 2004).

3.2.1.1 Skibbereen

Skibbereen is located in south-west Ireland and has a population of approximately 2,500 inhabitants. The town is a gateway to the south-west of the country, one of Ireland's largest tourist regions and is situated in the environs of the river Ilen (Figure 3.1). Following extensive flooding in 2009 a local environmental group proposed the construction of a multi-functional environmental park on public land on the town's periphery to alleviate flooding. The group proposed that the park's design and development would integrate both structural (including flood embankments) and non-structural measures (including storage retention features such as marshlands, wetlands and flood attenuation ponds). The concept was also developed to provide significant recreational and environmental benefits linked with tourism in the region and was to be the first park of its kind in Ireland in terms of its multi-functionality in integrating both structural and non-structural flood measures, and recreational facilities. Drawing on IPCC definitions of transformation (IPCC 2012; IPCC, 2014b), the case study is transformative on the basis that its realisation required a fundamental change to the value systems and the institutional practices that have heretofore defined how flood risks are managed in Ireland. Several barriers to its development emerged during the design process and structural flood defences are now being pursued to

protect the town from flooding. A chronology of the main events related to flood risk management in this case study is provided in Figure 3.2.



Figure 3.1: Location map of Skibbereen and Clontarf case studies. Image top-right: Clontarf promenade. Image bottom-right: River Ilen, Skibbereen

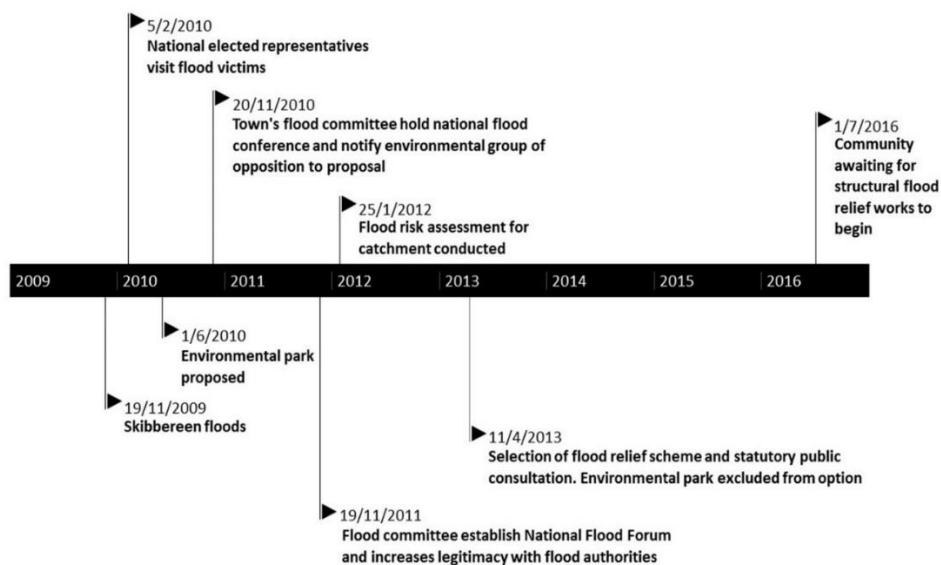


Figure 3.2: Timeline of developments in the Skibbereen case study

3.2.1.2 Clontarf promenade

Clontarf is a suburban coastal community located approximately 6 km from Dublin city centre with a population of approximately 31,000 inhabitants. The town is bordered to the east by the Irish Sea and to the south by the River Tolka (Figure 3.1). The area is noted for its scenic qualities and recreational opportunities. A 3 km coastal promenade is highly utilised as a

recreational area and attracts a large number of visitors daily. Following coastal flooding in 2002 a detailed analysis was undertaken to determine areas of the city exposed to tidal flood risks, in which Clontarf was identified as particularly vulnerable (Royal Haskoning, 2005). In response, the local authority, Dublin City Council (DCC), proposed constructing an earthen mound through the centre of the promenade and erecting flood walls at several locations along its course. The proposed height of the defences ranged from 0.85 m - 2.75 m (Figure 3.3). In 2011, community groups raised significant objections to the scheme and were influential in compelling DCC to revisit proposals, organising a public protest to illustrate opposition which was attended by approximately 5,000 people. In the context of IPCC classifications of transformation (IPCC 2012; IPCC, 2014b), the proposal is deemed transformative in that its completion would fundamentally alter existing social values and norms ascribed to the promenade and its functionality from a community perspective. A detailed timeline of events is provided in Figure 3.4.



Figure 3.3: View of Clontarf promenade. Top - existing view. Bottom - virtual depiction of proposed flood defences along Clontarf promenade. Source: Dublin City Council (2011b)

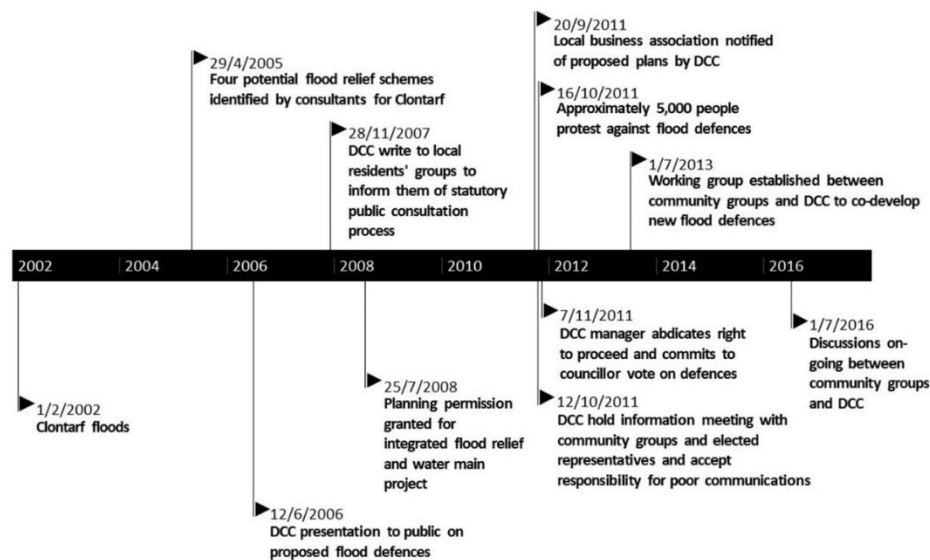


Figure 3.4: Timeline of developments in the Clontarf promenade case study

3.2.2 Conceptual framework

There is no single accepted conceptual framework through which barriers to adaptation are either categorised or assessed. Instead, most authors develop case-appropriate frameworks to understand barriers to adaptation (Jones and Boyd, 2011; Lehmann *et al.*, 2013; Mersha and Laerhoven, 2016; Uittenbroek, 2016). This thesis adopts the framework of Moser and Ekstrom (2010) to assess barriers to transformation. This diagnostic framework provides indicative steps to identify barriers that may hinder adaptation processes and includes a matrix that encourages classification of barriers according to their origins relative to the location of the actor(s), with a view to considering how they may be overcome. The temporal dimension enables differentiation between contemporary and legacy barriers, although this can be difficult in practice given their interrelatedness (Ekstrom *et al.*, 2011). The spatial/jurisdictional dimension helps distinguish proximate versus remote barriers. Taken together, they provide a means to assess where and what type of intervention is required and who is best positioned to address a given barrier (Mukheibir *et al.*, 2013).

This framework has been adapted and applied to assess barriers in varied studies (Uittenbroek *et al.*, 2012; Mukheibir *et al.*, 2013; Archie, 2014; Ekstrom and Moser, 2014) as a systematic way to identify, focus and reflect

upon barriers and adaptation processes, and create opportunities for deeper consideration of key aspects related to facilitating adaptation. Despite suggestions that transformation may encounter different and more challenging barriers than incremental adaptation (Moser and Ekstrom, 2010), where research on transformative adaptation exists barriers have not deviated from those identified in the literature for adaptation more generally (Olsson *et al.*, 2010; Kates *et al.*, 2012; Marshall *et al.*, 2012; Marshall *et al.*, 2013). Consequently, this chapter tests whether this framework offers a useful approach to diagnose barriers to transformative adaptation to identify interventions for how these could be overcome.

3.2.3 Data collection and analysis

Semi-structured interviews were conducted with fourteen key stakeholders between July and November 2015. This comprised interviews with five stakeholders in Skibbereen, eight in Clontarf and one interviewee employed with the OPW. Participants were purposively selected based on their involvement in the proposed strategies or their knowledge of flood risk management practices nationally. Interviews lasted between 1 and 2.5 hours, were recorded with participants' permission and transcribed verbatim. A copy of the semi-structured interview guide is provided in Appendix C. In reporting results, gender appropriate pseudonyms are used to preserve participants' anonymity (Table 3.1). Two interviewee transcripts from the Skibbereen case study were not utilised in the results of this research owing to both interviewees frequently diverging off-topic from questions asked (Table 3.1).

Skibbereen 5 interviewees	Clontarf promenade 8 interviewees	National 1 interviewee
<ul style="list-style-type: none"> • Former local authority elected representative – interview not drawn upon for this chapter • Flood committee members – Barry, Colm, Matthew • Previously flooded residents and business owners – Barry, Colm, Matthew • Environmental group representative – interview not drawn upon for this chapter 	<ul style="list-style-type: none"> • Local authority elected representatives – David, Julie • Residents exposed to flood risks – Alice, Elaine • Business association member – Gabriel • Residents association members – Alice, Dorothy, Elaine, Keith • Local authority official with responsibility for flood risk management - Gareth 	<ul style="list-style-type: none"> • National flood authority representative – Martin

Table 3.1: Details of interviewees for both case studies including pseudonyms

Interview transcripts were coded using MAXQDA 12 software to examine dominant themes between and within transcripts. Themes were created using an iterative approach, which was cognisant of prior themes, whilst also drawing on analysis grounded in the transcript data, thus combining both inductive and theoretical thematic analysis (e.g. Braun and Clarke, 2006). Thematic analysis involved coding of the transcript data according to the four categories of barriers identified in the literature review (social/cultural, governance/institutional, resource and physical). Based on the work of Glaser and Strauss (2009) a grounded theory approach was utilised to take account of additional information emerging during interviews following the assumption of Moser and Ekstrom (2010) that barriers to transformation are likely to differ from those identified in the adaptation literature more generally. Barriers were then independently assessed by a second researcher to ensure inter-rater reliability and rigour of the initial coding. An in-depth review of policy documents pertaining to flood risk management nationally was also conducted in addition to a detailed assessment of grey literature and publicly available material for both case studies to help interpret findings within a broader context (Appendix D).

3.3 Results

Data analysis primarily highlight social/cultural and institutional barriers in both case studies which emerged at different times within the adaptation process (Table 3.2). These relate to emotional attachment to place and historic care for the environment (social/cultural - Section 3.3.1), reliance on technical expertise (institutional – Section 3.3.2.1), and regulatory procedures (institutional – Section 3.3.2.2). Notably, across both cases some resource-based constraints were associated with institutional dependence on technical expertise (Section 3.3.2.1).

In Skibbereen, barriers emerged during the planning phase, whilst in Clontarf they emerged during the managing phase, specifically during implementation (and are of the three types identified above). Drawing on the Moser and Ekstrom (2010) framework, institutional barriers can be categorised as remote/legacy having occurred as a result of historic decisions, some of which were outside the control or influence of current actors. By contrast, social/cultural barriers can be characterised as proximate/contemporary-legacy issues, being within reach of an actor's sphere of control and therefore potentially malleable to change but stemming from past actions and decisions. Each of the three groupings of identified barriers is now discussed with reference to the specific case study context.

		Temporal	
		Contemporary	Legacy
Spatial/Jurisdictional	Proximate	<ul style="list-style-type: none"> Concern with attachment to place and historic care for environment (C) 	
	Remote		<ul style="list-style-type: none"> Inertia within flood risk management decision-making nationally: strategies constrained to technical solutions (C, S) National regulations regarding planning process deemed non-transparent regarding public participation (C)

Table 3.2: Temporal and spatial-jurisdictional barriers to transformative adaptation in Clontarf and Skibbereen. Based on Moser and Ekstrom (2010) framework. Note: C = Clontarf; S = Skibbereen

3.3.1 Socio-cultural barriers: Place attachment in Clontarf

In Clontarf, barriers emerged when community groups became aware of the flood defence proposals in 2011, four years after public consultation had been completed (Figure 3.4). Proposals by the local authority to significantly alter the promenade to incorporate flood defences were vehemently resisted by local community groups representing residents and businesses and by elected representatives. Emotional connection to the promenade, its value as a recreational amenity and its proximity to the coast were frequently suggested as key reasons for this attachment:

Julie: *“The first thing that you have to know about people from Clontarf is that they firmly believe that they live in the best place in the world. Everybody who lives in Clontarf thinks that they live in the best place in the world, which is a lovely thing. They are very attached to that prom and rightly so because it’s a great amenity.”*

Elaine: *“You have this beautiful natural setting, and when you’re down on the prom here you could put so many things out on the water.”*

Keith: *“If you come down here at the weekends or any day of the week you will see people out walking, you see people out jogging. It’s a lovely promenade.”*

Alice: *“I think what another wonderful outcome was that, and as if we needed it, we all fell in love with the prom even more . . . I think it needs just tiny little touches to make it that much more of a wonderful place.”*

The promenade, its recreational features and the natural coastal setting were considered to epitomise people’s understanding of what Clontarf meant and how people identified with the place (Clontarf.ie, 2011b; Dublin City Council, 2011a; O’Carroll, 2011). The proposed flood defences were deemed to create a physical barrier between the community and the coast, which it was suggested would result in a decline in usage of the promenade. This would serve to “sterilis[e] the prom” as one interviewee commented, thereby limiting its uses. Severing the community’s connection with the promenade was deemed to threaten place attachment and sense of belonging in the process:

Alice: *“It is a magic place and when we walked with [. . .] and his colleagues along the prom and it was a lovely day and we have the working group there . . . it was lovely that they [Dublin City Council officials] were doing a field trip and appreciating what we love about it. I wouldn’t want to change it too much more.”*

Julie: *“In many ways it’s [the promenade] a better amenity than the equivalent in Dun Laoghaire or other coastal parks because it is such a large grassy facility . . . parts of it are iconic. Those green structures [on the promenade], the ones that are ionised, if you put them somewhere else there would probably be a protest, but they’ve become iconic, they have become Clontarf and it’s the same for the prom. It’s intrinsically wedded in peoples’ minds in . . . their idea of where they come from.”*

Historic community opposition against unwanted developments in Dublin Bay that were perceived as impacting the community’s connection to the landscape (Clontarf.ie, 2011b; Department of Housing, Planning,

Community and Local Government, 2015) was noted as a key reason for the community's opposition by an elected representative:

David: *"The port company were going to fill in 52 acres of land and there has been a big fight down there – it's been going on for the last 20 years or so, so there has been a tradition of fighting for that bay down there."*

Illustrating the desire to preserve intra and inter-generational attachment, the promenade's importance as an amenity was deemed to extend beyond the environs of the community (Anon., 2011; Clontarf.ie, 2011a), with several interviewees describing the community as its "gatekeepers":

David: *"The people that live on the [sea]front, even they would see themselves as keepers of the environment there."*

Keith: *"This amenity [promenade] is for everybody, not just Clontarf."*

Elaine: *"The way people responded in terms of how they saw the value of the amenity . . . as a national and city amenity, but they did not necessarily see it as a local amenity."*

Despite ongoing flood risks, the interviews highlight that protection of the form and functionality of the promenade was of primary importance, whereby the community did not wish changes to interfere with their attachment to the landscape nor impinge on their sense of connection to the area. The significance of place attachment served to solidify the community's position in opposing flood defences which would transform the landscape and threaten their connection to it.

3.3.2 Institutional barriers

3.3.2.1 *Technical expertise reliance – insights at a national level*

Despite a Flood Policy Review over a decade ago recognising that a move to non-structural approaches was needed (Office of Public Works, 2004), Irish national discourse remains focused on hard engineering solutions to flood risk. Difficulties with implementing non-structural flood relief

measures were evident in the context of budgetary resources allocated for both structural and non-structural flood relief measures following the Flood Policy Review in 2004, with an investment of €26m recommended for non-structural measures over a 6-year period compared to €440m for structural flood relief projects over a 10-15 year period (Office of Public Works, 2004). Current practices continue to favour structural flood defence measures with the national government allocating a further €430m for structural flood defences for the period 2016-2021 (Office of Public Works, 2015b).

This institutional mind-set was evident in Skibbereen in the context of the local flood committee's support for structural measures as the only practical means of responding to flood risks in the town. The influential role of the flood committee in representing the flooded community, and committee members' direct experience of flooding, served to solidify these practices. Structural flood defences were described as a *"total solution"* to the flooding problem by one flood committee member and the failure to consider alternatives signified their overriding preference for engineered flood relief measures:

Colm: *"Even if you're talking about putting in whatever type of water park you were putting in there, you can't do that until such time as the flood defence solutions are put in to protect the town and you can't have any half flood defence systems to blend in with a water park. The water has to be stopped going into the town full stop."*

Barry: *"We haven't got . . . a definitive plan of where every wall and where every embankment and where every pumping station and where every non-return valve is going to be [for the approved defences], so . . . the point I'm making is that [environmental park] wouldn't stand the fool proof test. The fool proof plan is huge."*

Preference for structural solutions was directly linked to concerns relating to non-availability of flood insurance. A Memorandum of Understanding

between the OPW and the representative national insurance body, in which permanent flood defences were deemed a fundamental prerequisite by the insurance industry in providing flood insurance, appear to have influenced the flood committee's position (Office of Public Works, 2014; Insurance Ireland, 2015; Hilliard, 2016). Whilst demountable flood defences are deployed in limited circumstances nationally, flood authorities are reluctant to utilise this option owing to risks associated with human intervention each time a flood risk occurs and the exclusion of flood insurance for properties in areas where demountable defences exist (Insurance Ireland, 2015). Subsequently, committee members argued that structural flood defences were the most effective way of increasing the likelihood of insurance companies re-instating flood insurance:

Matthew: *"Because we don't have flood insurance the value of our properties are worth nothing."*

Barry: *"The big concern for communities like us is the restoration of insurance. It's an issue at government level with the insurance federation that they are very slow to restore full or even partial cover until such time as the risk is gone. What really copper fastens our mandate from the 230 businesses and residents is that practically none of them [can] get insurance so that's what's driving us."*

Moving to a system which integrates even relatively small-scale non-structural approaches to flood risk management practices was deemed to be a significant challenge at an institutional level. Whilst support for greater integration of non-structural solutions exists, the lack of familiarity with these measures in comparison to traditional solutions makes such strategies increasingly difficult to evaluate and justify as was exemplified by an official from the national flood authority:

Martin: *"If the situation arose that we could create a storage area that could be used as some kind of an amenity or create some biodiversity value and that storage area would provide flood risk*

reduction that we need, then that's fine, we can put that forward as a measure. It's just that the cases that arises in would be few. We haven't really come across it to date."

Separately, but to a lesser extent, one interviewee critiqued the leadership style adopted by a prominent individual within the group which proposed the environmental park, which was considered forceful, persistent and uncondusive to facilitating community support for the proposed environmental park. Thus, the results from Skibbereen demonstrate that rather than perceiving non-structural strategies as the default strategy around which structural flood relief measures could be designed, the opposite appears to be true.

In Clontarf, elements surrounding technical barriers to change were also evident. The institutional practices and the mind-set of those with responsibility for flood risk management in Dublin City Council have failed to adapt to Flood Policy Review recommendations from 2004, which recommended prioritisation of non-structural measures:

Gareth: *"I don't see any point in putting something in that has to be removed in 40 or 50 years. If it's not designed that you can put something else in front of it and make it higher, it's very difficult to retrofit it. Also, the OPW . . . don't want to go back because it's much more costly to do it twice . . . they just want to go in and do something once that's going to last the design life of the structure."*

Those with a strong technical background were deemed to be responsible for designing the proposed flood defences (Clontarf.ie, 2011c; Dublin City Council, 2011a), a point which was re-iterated by interviewees. This resulted in a solution which, whilst the community acknowledged would be effective at preventing flood risks, did not consider other concerns and knowledge:

Elaine: *"We asked for a multidisciplinary team. We said that we did not consider this as an engineering project and even if something is engineering led . . . it should never be just the engineers."*

Dorothy: *“It was definitely an engineering job with no other department involved.”*

Institutional practices of prioritising engineering knowledge and approaches in decision-making were heavily criticised by the community (Clontarf.ie, 2011c; Dublin City Council, 2011a; McGrath, 2011). One interviewee contended that this practice was no longer legitimate in its own right given the increasing complexities associated with climate change and the potentially adverse implications adaptation strategies may have on society:

Gabriel: *“As my engineer friend said, “it is a personality trait of engineers. Look you asked for a solution. We have given you one” and that’s perfectly understandable. It’s a logical brain . . . but we live in a different time now – we live in a time where we have to be sympathetic to the environment and it’s a very serious issue, flooding and climate change . . . that engineer would have left a disaster behind him in our eyes.”*

An elected representative suggested that engineers were less likely to be connected to, and therefore understand, the concerns of local communities when designing flood relief schemes compared to politicians who could be held publicly accountable, with another stating that this compartmentalised thinking was no longer justified and that genuine engagement with affected communities was needed for adaptation strategies to be considered legitimate:

Julie: *“Engineers are not politicians. They don’t understand the political sensitivities of messing with a promenade like the one in Clontarf . . . it’s because I suppose they are not politicians, they don’t have to go back to people, they are not going to be personally emailed and they think that in the end when the finished product is there that people will be happy with it.”*

David: *“The engineers in my opinion, they really have to buy into it [consultation]. It’s a feeling that you get that these people are really*

listening to you and that they are really taking on board what you are saying.”

The importance of integrating local knowledge and viewpoints emerged as a key priority at a local level, resulting in the local authority abandoning plans to proceed with the flood relief scheme in Clontarf in 2011. Following extensive discussions between the local authority and community groups in the aftermath of this decision the community negotiated the inclusion of two of its representative bodies in a multi-disciplinary consultation group established to identify alternative flood relief options for the promenade; discussions are ongoing (Figure 3.4).

3.3.2.2 Regulatory practices from Clontarf

A significant barrier to adaptation in Clontarf centred on planning regulations, specifically those regulations detailing how the public is notified of major infrastructural projects being undertaken by local authorities. Under EU Directives regarding public participation in environmental decision-making (Council Directive 2003/35/EC) and Part 8 of the Planning and Development Regulations (2001) in Ireland, local authorities are required to place a notification of major infrastructural projects in an approved newspaper and to erect notices on the land on which the proposed development is to be sited. Julie, an elected official, described these methods as “stone age” and as not reflecting modern means of communication. This, it was suggested, acted as a primary reason for a lack of community awareness and engagement with the issue until 2011, four years after public consultation under the scheme had passed:

Julie: *“I think the whole Part 8 process should be looked at. We have social media now. We have an awful lot of different ways that we didn’t have in the past of getting the message across to people to avoid these kinds of things happening. We need to use that better and we need to update the Part 8 process and take account of new technologies. I think the barriers to having people engaged is rooted in the outdated communication process for the whole Part 8 procedure.”*

Effective communication strategies and the means of disseminating information about proposed flood relief schemes were also highlighted as a primary concern by officials with responsibility for flood risk management:

Gareth: *“I think communications is the big element of it. A scheme is proposed . . . but getting the message to people who it’s going to affect, and you don’t really know who they are. With flooding you know the people that have been flooded but then you have the people who use a certain facility and they may be miles away or they might drive by there every day. How do you tell all of them what’s proposed? . . . It’s really communication I feel is the toughest thing to achieve.”*

Martin: *“Some communities . . . have active flood groups. They may have a flood and some residents and businesses would have come together . . . and they would be quite proactive about that engagement. I think that would be more the exception than the rule.”*

The governance process and how decisions were arrived at in relation to the proposed defences in Clontarf were highlighted as a significant concern by the community. David, an elected official, commented that the public consultation process was merely *“ticking a box”* to the extent that the local authority was not considered to be genuinely interested in community engagement. The community expressed concerns with a number of issues pertaining to public consultation and suggested that it was illegitimate having taken place in areas distant from Clontarf (Clontarf.ie, 2011a; Ó Ríordáin, 2011), which subsequently contributed to a lack of local awareness until after the consultation process had ended. This breakdown in communication ultimately led to a loss of trust between parties as was noted by several interviewees:

Gabriel: *“The public consultation was done at a big remove from this area. It was done in libraries in Marino and places like that a number of kilometres away, and that immediately gave us*

ammunition to say, "you're hiding something". The real failing . . . was that the information that they [Dublin City Council] gave to the residents of Clontarf . . . was not properly communicated . . . and Dublin City Council today would freely accept that that was the case."

David: *"They [Dublin City Council] never really bought into the public consultation."*

Keith: *They [Dublin City Council] deliberately ignored us and tried to ram it through. People were shocked at the arrogance of the council that this was pushed through without any consultation."*

Despite repeated concerns from some interviewees that the local authority was not transparent in notifying the public of the flood relief scheme in Clontarf, it met all statutory requirements relating to public notification and consultation under EU directives (Council Directive 2003/35/EC; Council Directive 2007/60/EC). Statutory methods of communication used for notifying the public of such infrastructural projects do not appear to have been conducive to effective public engagement and had consequential impacts on community perceptions of the governance process. Results highlight that historic institutional practices associated with planning regulations were one of the main causes of residents' opposition and created a lack of trust over how the governance process was managed.

The results point to the context-specific challenges of implementing transformative adaptation. As demonstrated in Clontarf latent social values surfaced in response to perceived threats to a valued place and created resentment towards the authority imposing these changes. Furthermore, processes associated with public engagement and communication practices led to these being perceived as mismanaged and illegitimate by the community. Additionally, in both locations barriers to transformation arose from historically-embedded practices prioritising technical

experience and decision-making processes at the expense of other forms of knowledge.

3.4 Discussion

The analysis suggests three primary factors played a role in creating barriers to transformative change across both case studies, namely threats to emotional place attachment, use of technical expertise and regulatory procedures. Within those institutional barriers that emerged, resource-based constraints to transformation were also identified. Whilst physical barriers to adaptation can also emerge, there was little evidence of such barriers prohibiting transformation in both case studies. In the context of this research at least, physical barriers were overshadowed by more prevalent social and institutional constraints.

These barriers do not differ substantially from those already identified in the literature more generally, despite suggestions that transformative adaptation barriers may differ to those of incremental adaptation (Moser and Ekstrom, 2010). Moreover, the Moser and Ekstrom (2010) framework was found to be particularly useful in classifying these barriers, enabling further reflection on their origins and potential ways of overcoming them. A discussion of each of the identified barriers is now provided, in addition to an overview of potential strategies to move towards transformative pathways based on the spatio-temporal origin of each of the barriers (Table 3.2).

3.4.1 Place attachment as a barrier to transformation

Connection to the natural landscape is related to societies' proximity to the physical environment (Adger *et al.*, 2009), and may act as a barrier to transformative change where sense of place is threatened (Marshall *et al.*, 2012). Findings for Clontarf exemplify this point. Although it has been argued that cultural values change as societies react and adjust to changing conditions (Adger *et al.*, 2009), demands for large-scale transformations are likely to pose a significant challenge in terms of societies' ability and willingness to adapt (O'Brien, 2009). This appeared to be particularly

evident in Clontarf given historic community values concerned with protecting the local environment, and supports the contention that socially embedded values strengthen internal community structures to oppose unwanted adaptation (Jones and Boyd, 2011).

Recent research argues that communities will continue to pursue incremental low-regrets strategies until they experience significant extreme events that increase the salience of climate change impacts (Markell, 2016). Specific events have the potential to turn incremental adaptation into transformative change when social thresholds are passed (Adger *et al.*, 2013). This raises an important point. Where climate change becomes tangible, it amplifies societal demands for action (Adger, 2016), and as weather-related hazards increase under a changing climate, values ascribed to places are also likely to shift in response to experience associated with such events (Olsson *et al.*, 2006). Consequently, it may only be when places are disrupted that attachment to place becomes disrupted (Anton and Lawrence, 2016), resulting in individuals taking adaptive actions to protect their infrastructure and livelihoods (Hess *et al.*, 2008). Interestingly, the last major flood event in Clontarf occurred in 2002, which may have led to complacency over the risks posed by flooding; flood defences are now being co-developed by the community and local authority.

Research suggests that proximate barriers are more malleable to change if they are more within an actor's (or several actors') control (Moser and Ekstrom, 2010). Findings from Clontarf question this, demonstrating that where social values associated with place are concerned, the proximity of a barrier to an actor's sphere of influence is unlikely to be a useful indication as to whether a barrier can more likely be overcome. Schwartz's (2012) theory focusing on understanding basic human values of openness to change, self-transcendence, self-enhancement and conservation offers a useful lens of how such social values develop and are perpetuated. In the context of this research, pursuing novelty and change in Clontarf was deemed to undermine preservation of cultural and recreational practices

and traditions associated with Clontarf promenade, something which community members were not prepared to sacrifice. Understanding, managing and negotiating these value trade-offs will be crucial for successful future adaptation.

Where societies ascribe strong values to the physical environment a re-alignment of values is likely to take considerable time and effort to achieve. Altering such values can be difficult within the relatively short timescales under which adaptation strategies are often planned and implemented. Whilst large-scale, once-off transformative change may continue to be vehemently resisted by communities owing to current social values as illustrated in the case of Clontarf, the sum of a series of (incremental) adaptation strategies may coalesce into something which is retrospectively considered as transformative over a longer timeframe (Pelling, 2011; Smith *et al.*, 2011; Kates *et al.*, 2012; Burch *et al.*, 2014). This research therefore argues that low-regrets strategies that are sufficiently robust and flexible, that take account of changing values over time, are cognisant of local knowledge capacities and are negotiated with communities, are more likely to overcome societal resistance and facilitate transformative change over time.

3.4.2 Technical expertise as a barrier to transformation

Findings from this research point towards the prominence of engineering knowledge and approaches in flood risk management, which acted as a significant barrier to transformative change in the context of both case studies. This was evident in Skibbereen in the flood committee's support for structural flood defences due to issues related to flood insurance provision. Similarly, the prevalence of traditional engineering knowledge and approaches served to reinforce community opposition against unwanted flood defences in Clontarf.

Recent research highlights the importance of strong informal institutions in challenging rigid formal institutions to move towards transformative adaptation (Pelling *et al.*, 2015), with extreme events providing a space for

social transformations to occur (Pelling and Dill, 2010). Two important lessons can be drawn from this. First, in the context of this study, a prominent individual from the group which proposed the environmental park in Skibbereen was criticised for demonstrating weak leadership which, as others have also noted, is incommensurate with facilitating transformative change (O'Brien, 2012). And second, and more prevalent in Skibbereen, was societal (and institutional authorities) preference for technical responses in the immediate aftermath of severe flooding, which constrained consideration of non-structural alternatives (see also Devitt and O'Neill, 2016). The urgency of the Skibbereen flood committee in campaigning for an immediate solution to flooding prevented flood committee members from supporting an integrated option which was perceived as potentially prolonging flood risk and is further explained by concerns regarding reinstatement of flood insurance. Perceived protection of structural solutions is difficult to overcome at a societal level owing to human inertia associated with ingrained habits and preferences (Fischer *et al.*, 2011). The significance of flooding in Skibbereen in 2009 served only to reinforce these preferences.

That a technocratic option was considered as the only legitimate solution to solving flooding by the community's flood committee in Skibbereen is demonstrative of broader institutional flood risk management practices nationally which are deeply tied to structural flood relief measures, an issue which is compounded by a distinct lack of financial resources allocated to non-structural flood relief measures (Office of Public Works, 2004). Moreover, institutional practices which continue to prioritise structural flood relief measures create a positive feedback mechanism whereby technical skills and expertise are considered a panacea for managing flood risks nationally, thus preventing alternative forms of human capital from informing decision-making processes. This supports the contention that resource-based constraints hindering transformation should be more critically examined with respect to underlying institutional practices (Jantarasami *et al.*, 2010; Ekstrom and Moser, 2014).

Furthermore, it illustrates the interconnected and compounding nature of barriers (Eisenack *et al.*, 2014) in terms of the effect policies and practices have on decision-making in both Clontarf and Skibbereen.

Moving to a system of flood risk management that facilitates non-structural approaches – as recommended in the national Flood Policy Review over a decade ago – will prove challenging under current arrangements. Owing to the dominance of a neoliberal discourse and an emphasis on national policy which promotes Ireland as a modern country with technologically-advanced cities, technological/structural fixes remain the preferred means of responding to flood risks (Jeffers, 2013a). Moreover, an emphasis on permanent, structural flood defences in the provision of flood insurance means that alterations to flood risk management strategies are unlikely to significantly deviate from technocratic solutions in the near future (Jeffers, 2013a; Jeffers, 2013b).

Embedding non-structural measures into flood risk management decision-making may only succeed where decisions taken are classified as ‘no-regrets’, for example, having no residual effect on the provision of flood insurance, thus constraining the potential for immediate transformative pathways to flood risk management practices. Nonetheless, such options may offer opportunities for transformation over a longer horizon through shifting from traditional practices alone, thereby facilitating the potential for remote and historic institutional barriers to be overcome in the longer term (Ekstrom *et al.*, 2011). However, it may be that changing institutional structures without transforming actors’ values and beliefs will not produce transformative outcomes (Olsson *et al.*, 2010; Mustelin and Handmer, 2012).

The findings from Clontarf also demonstrate the role of socio-technical institutional practices in flood risk management decisions. The current engineering model of understanding and managing flood risks creates significant obstacles to adaptation, and as the community’s response in Clontarf suggests, may lead to perceptions that change is being unnecessarily imposed. The evidence presented from this research

suggests that only through considering successful adaptation as beyond the remit of technical solutions, and as inherently participatory and place-related, can barriers to transformation be reduced.

3.4.3 Regulatory practices as a barrier to transformation

Some scholars have pointed to the need to re-structure path dependent institutional structures, organisational cultures and policy-making procedures in shifting to transformative agendas (Burch, 2010b). Findings from Clontarf suggest that statutory policies related to the notification of flood relief projects are not conducive to facilitating effective governance practices, supporting the conclusions of Lehmann *et al.* (2013) that existing institutional bureaucracies and regulations impede adaptation. Research concerning transformation and sustainability management illustrates the importance of governance principles of procedural justice and transparency in reducing the risk of unfavourable transformations (Chapin III *et al.*, 2010; Mustelin and Handmer, 2012; Park *et al.*, 2012; Revi *et al.*, 2014; Pelling *et al.*, 2015). This is particularly relevant because of resistance associated with transformative change (O'Brien, 2012). Barriers that emerged during the governance process in Clontarf are indicative of procedural justice concerns and broader institutional practices and regulations defined under national and EU legislation regarding how flood relief schemes are designed, consulted upon and subsequently communicated to the public (Council Directive 2003/35/EC; Council Directive 2007/60/EC).

Researchers have noted that inclusiveness in adaptation decision-making needs to be more than an 'illusion of inclusion' (Few *et al.*, 2007). Moving beyond these barriers towards transformative agendas demands greater public awareness and engagement, facilitated by effective and transparent governance practices. As Benson *et al.* (2014) argues, and as the findings from Clontarf attest, individuals perceive participation as requiring more than conformance to statutory requirements. Transformative change is unlikely to be supported where communities perceive that they have little opportunity to participate and influence the adaptation process. The

merits of statutory legislation are important in the context of managing flood risks, but used in isolation, they may be insufficient to lead to acceptance of the process and subsequent outcomes where adaptation is concerned. Enacting regulations differently by tailoring communication and engagement for different stakeholders offers a practical means of overcoming these concerns. Given the inertia typically associated with larger governance structures however (Mukheibir *et al.*, 2013), any changes to historic and inflexible regulatory practices may themselves be construed as transformative and take considerable time and effort to achieve (IPCC, 2012; Kates *et al.*, 2012; Aall *et al.*, 2015).

3.5 Conclusion

This chapter sought to explore barriers to transformative change in two Irish case studies relating to flood risk by applying the Moser and Ekstrom (2010) diagnostic framework. The chapter identified three primary barriers that inhibit transformative adaptation, namely; place attachment, dependency on technical expertise and institutional regulatory issues. It also showed how the framework serves to categorise these in relation to their temporal and spatial/jurisdictional characteristics (how and why barriers emerge) and illustrated potential intervention strategies where barriers to transformation arise.

For barriers pertaining to place attachment, transformative change might only be realised when extreme weather events are personally experienced. Communities may continue to favour incremental changes which do not interfere with these values until such time as sense of place is threatened from natural as opposed to anthropogenic forces i.e. threats from weather-related events rather than anticipatory changes initiated by institutional authorities. This research has shown that rather than waiting for latent social values to emerge, understanding residents' environmental perceptions towards change early in the adaptation process is crucial because it potentially impacts on attachment to place, as processes in Clontarf illustrate. Where barriers to transformation are likely to emerge, transformation may instead be achieved through a series of incremental

changes, which culminate in something that is retrospectively transformative in nature. Facilitating transformation through incrementalism demands institutions and strategies that are sufficiently flexible, transparent and responsive to intransigent social values.

This chapter shows that institutional practices which prioritise some forms of technical expertise, and which invest resources accordingly, can also act as a significant barrier to transformation. Altering governance and institutional systems to embrace inter-disciplinary knowledge may facilitate a move from rigid path dependencies that lock-in the range of available options for future generations to more transformative agendas (Levin *et al.*, 2012; Ekstrom and Moser, 2014; Patterson *et al.*, 2015). Recognising both the benefits and limitations of technological interventions is crucial and requires looking beyond technical solutions as the sole means of responding to flooding to exploring and understanding complex interdependencies and embracing current technologies to improve public participation opportunities.

Whilst this chapter used a small sample of respondents to elicit barriers to transformation, the findings are considered robust given the richness of data in both cases. Nonetheless, the addition of quantitative research methods such as questionnaire surveys would be useful to corroborate findings identified herein, particularly surrounding the notion of place attachment given the dearth of research on this with respect to transformative adaptation. Further empirical studies across a range of sectors where barriers to transformation emerged would also prove useful to help contextualise these findings within a broader context.

Although barriers pertaining to transformative adaptation within a single sector (flood risk management) and country (Ireland) were explicitly examined here, it is argued that the findings have applicability for other sectors and places given the generalised nature of identified barriers. They are particularly pertinent for agents interested in future adaptation planning where transformative change may play a greater role than at present and illustrate how transformative adaptation may be

conceptualised and planned for in the long-term. The growing global demands for transformative adaptation in response to various climatic risks including flooding (IPCC, 2014b), and the fact that often more is learned when processes fail than succeed, suggests that empirical analysis of barriers to transformation is not just important, but necessary, in moving the transformative adaptation agenda forward.

4 Place attachment, disruption and transformative adaptation

4.1 Introduction

Findings from Chapter 3 emphasized the moderating influence of place attachment in constraining transformative adaptation in Clontarf. Specifically, results pointed to the potential role of tangible climate change impacts increasing societal demands for adaptation. It was subsequently suggested that increased experience of weather-related hazards in the future might result in a decline in place attachment processes as places undergo more frequent involuntary disruptive change. Additionally, Chapter 3 also highlighted how ineffective governance processes might act as a barrier to transformation, particularly as individuals have come to expect greater involvement in public consultation processes surrounding adaptation planning. The present chapter dissects these findings to examine disruptive place change and perceptions of governance processes arising from transformative adaptation along Clontarf promenade in greater detail.

4.1.1 Place disruption

When a place becomes unavailable or is threatened, awareness of the benefits it provides may increase (Cheng and Chou, 2015). This suggests that under a changing climate, as environments are fundamentally altered or as adaptation requiring landscape modifications intensifies, individuals' attachment to place is increasingly likely to be challenged (Adger *et al.*, 2009; Quinn *et al.*, 2015). Empirical research has repeatedly demonstrated how identities embedded in particular places and occupations influence climate risk perceptions, motivation and adaptation (Marshall *et al.*, 2013; Clarke *et al.*, 2016). Conversely, psychological change may also be necessary to promote adaptation and avoid maladaptation risks (Quinn *et al.*, 2015).

Place attachment describes a usually positive emotional connection to certain locations or to particular landscapes, typically encompassing both physical and social elements (Lewicka, 2011; Devine-Wright, 2013), which may lead to specific individual and collective actions (Manzo and Perkins, 2006; Devine-Wright, 2009). Place attachment emerges through personal experience with the environment. Attributes such as natural environmental qualities, cultural values, mobility, length of residence and recreational opportunities, have been shown to affect the development of attachment (Beery and Jönsson, 2017). Place attachment consists of two related dimensions: place dependence and place identity (Chapter 2) (e.g. Anton & Lawrence, 2016).

Place dependence refers to functional features of a place that facilitate certain activities and emotional connections (Brown & Raymond, 2007). Natural resource settings contribute strongly to creating dependence, which is often increased by frequent visitation of a place (Vaske and Kobrin, 2001). Place identity denotes how physical and symbolic features of places are embodied in an individual's sense of identity (Devine-Wright, 2013); this occurs through a long-term, complex process where place becomes a befitting part of a person's identity (Lewicka, 2008; Anton & Lawrence, 2016).

Researchers argue that repeated visitation to a place due to place dependence enhances place identity (Vaske and Kobrin, 2001). Others attest that the relative significance an individual attributes to a place through place dependence determines their extent of attachment and can also shape identity (Chow and Healey, 2008). Moore and Graefe (1994) demonstrated that when socio-demographic variables (e.g. age) and situational variables (e.g. distance of a recreational setting from home) are considered, similar socio-demographic variables correlated in similar ways to both place dependence and place identity. The literature is replete with examples where both physical and social attributes of place are interconnected and mutually reinforce place attachment processes (Stedman *et al.* 2004; Brehm, 2007). Consequently, researchers have

frequently combined both dimensions to form a uni-dimensional measure of place attachment (Kaltenborn and Bjerke, 2002).

Disruptions to place may include relocation, physical landscape change, changes to legal or symbolic designations, or perceived/potential changes, often resulting in negative social and psychological consequences, affecting place attachment and its processes (Devine-Wright, 2013; Cheng & Chou, 2015). Individuals subjected to such processes may deploy coping mechanisms (e.g. resisting change, re-establishing place meanings, questioning powerful interests) to reduce threats of disruptions and protect their sense of attachment (Anton and Lawrence, 2016).

In the context of climate change, adaptation may lead to place disruption (Hess *et al.*, 2008), although studies exploring this are few. Transformative adaptation is increasingly suggested as an approach to managing unavoidable climate change risks (Kates *et al.*, 2012). Transformation implies non-linear changes to meaning, norms and values, social networks, power structures, institutional arrangements or regulations (IPCC, 2012). Studies exploring the relationship between place attachment and disruption arising from proposed transformative adaptation highlight the difficulties in implementing such transformative changes (Marshall *et al.*, 2012; Clarke *et al.*, 2016). Understanding interpretations of place change is crucial in determining the relationship between place and acceptance of disruption (Devine-Wright, 2009). Developing and assessing place-related meanings, for instance, via interpretative, evaluative and attitudinal measures in relation to disruptive place change may assist in this regard (Devine-Wright and Howes, 2010).

Perception and interpretation of change are related to individuals' awareness of potential disruption (Devine-Wright and Howes, 2010), and their views of processes and outcomes related to such disruption (Schlosberg *et al.*, 2017). Weak governance surrounding public participation has been persistently identified as a barrier to transformation (Clarke *et al.*, 2016; Gibson *et al.*, 2016). Research suggests that where consultation is inadequate, place attachment processes may become

threatened (Anton and Lawrence, 2016). Inclusive and participatory governance processes can reduce place disruption and may positively influence place-related values (Von Wirth *et al.*, 2016), facilitating effective adaptation planning. The growing body of research on place attachment suggests that for disruptions to be minimised or overcome, place-related identities and meanings should be incorporated into policy and planning processes (Fresque-Baxter and Armitage, 2012). However, few studies have empirically examined how perceptions of governance processes and disruptive place change processes unfold where adaptation planning is concerned.

Using flood risk management in Ireland as an example of climate change adaptation, this chapter examines disruptive place change in response to proposed transformative adaptation by:

1. understanding place-related symbolic meanings and the relationship between place-protective interpretative responses and place attachment.
2. exploring whether support for flood defences is constrained by the desire to prevent disruptive place change occurring.
3. investigating the relationship between oppositional attitudes towards proposed adaptation and perceptions of governance processes.
4. examining differences in place attachment and support for proposed flood defences (and flood defences in general) based on both flood experience and flood risk.

4.2 Methods

4.2.1 Background to study

This study is centred on Clontarf promenade, County Dublin. Clontarf is a middle-class coastal suburban community located 6km north of Dublin city centre with a population of approximately 31,000 people. The community is bordered to the east by the Irish Sea and by Bull Island, a UNESCO Biosphere Reserve. The area is characterised by several physical landscape

features including a 3 km coastal promenade, which runs parallel to the coast and adjoins the suburb. The promenade is highly utilised for recreational purposes and is considered a focal point of community life.

Whilst coastal flooding in Clontarf has been limited in the last decade, significant tidal flooding occurred in 2002 and 2004. Following these events, Dublin City Council (DCC) undertook an examination to identify locations in Dublin at risk of coastal flooding, through which Clontarf emerged as highly exposed (Royal Haskoning, 2005). Several flood defence options were identified as offering an appropriate level of protection for a 1-in-200 year flood event, the national standard for coastal defences (Department of Environment, Heritage and Local Government, 2009). Of those options identified, DCC subsequently proposed constructing an earthen mound through the promenade and erecting flood walls elsewhere, ranging in height from 0.85 m - 2.75 m, for which planning approval was granted in 2008.

In 2011, two community groups representing residents and businesses became aware of the proposed project and formed a coalition to oppose the defences. Virtual depictions of the proposed defences were subsequently widely distributed by community groups at information meetings to help residents understand the impacts on the landscape (Figure 4.1). Community groups raised concerns over both the scale of the proposed defences and the public consultation process and were influential in compelling DCC to abandon plans despite the council investing €1.1m developing defences to that point. Discussions for developing alternative flood defences are ongoing. The flood defences can be characterised as transformative based on IPCC definitions of transformation to the extent that completion was deemed to fundamentally change the existing landscape. This was deemed to challenge existing social values and norms ascribed to the promenade and significantly alter its functionality as an expansive communal recreational space from both the coalition community groups' and wider community perspectives (Clontarf.ie, 2011a; Clontarf.ie, 2011b; IPCC, 2012).



Figure 4.1: View of Clontarf promenade. Top - existing view. Bottom - virtual depiction of proposed flood defences along Clontarf promenade. Source: Dublin City Council (2011b)

4.2.2 Participants and sample

Questionnaires were distributed to Clontarf residents in July 2014. Although more than two years after the project stalled, awareness levels of the flood defences were still significant for three reasons. First, a protest against the project in 2011 was attended by approximately 5,000 people. Second, the flood defences received significant national media and political attention, and third, discussions over alternative flood defences were ongoing in 2014. Residents were frequently informed of these through a community website and newsletter.

A pilot questionnaire involving six Clontarf residents was undertaken in July 2014, after which questions were refined based on respondent feedback. Questionnaire distribution employed a drop-and-collect method, whereby they were circulated on one day and collected the following day (Allred and Ross-Davis, 2011). A one-day turnaround period was chosen owing to resource and time constraints. Four fieldworkers were responsible for survey distribution. Details of these individuals can be found in the acknowledgements section of the publication from which this chapter is derived. Each individual was provided with a map and a set of instructions and was responsible for distribution and collection within the confines of a specific geographical area of Clontarf. One questionnaire was left per household. Residents were divided into those directly adjacent to the promenade and those further inland. Questionnaire distribution occurred within the confines of two parishes (referred to herein as Clontarf) derived from Irish population census boundaries, within which the defences were proposed – namely Dollymount and Clontarf, St. John’s (Central Statistics Office, 2014). Every third house on each street was included as part of this sampling technique (see Kyle *et al.*, 2004; Devine-Wright and Howes, 2010; Devine-Wright, 2011a). The parishes represent a subset of the larger Clontarf area. The village of Clontarf is also located at the intersection of these parishes. As Bull Island is largely uninhabited, and flood defences were proposed on the landward side of the island (Figure 4.2), it was not included as part of the sampling area.

Although the original flood defences were proposed in 2007 by DCC, the questionnaire explicitly referred to flood defence proposals for Clontarf promenade made by DCC in 2011 (Appendix E: Q1). This discrepancy in the date used for the questionnaire was to account for the fact that most residents only became aware of the proposed defences in 2011.

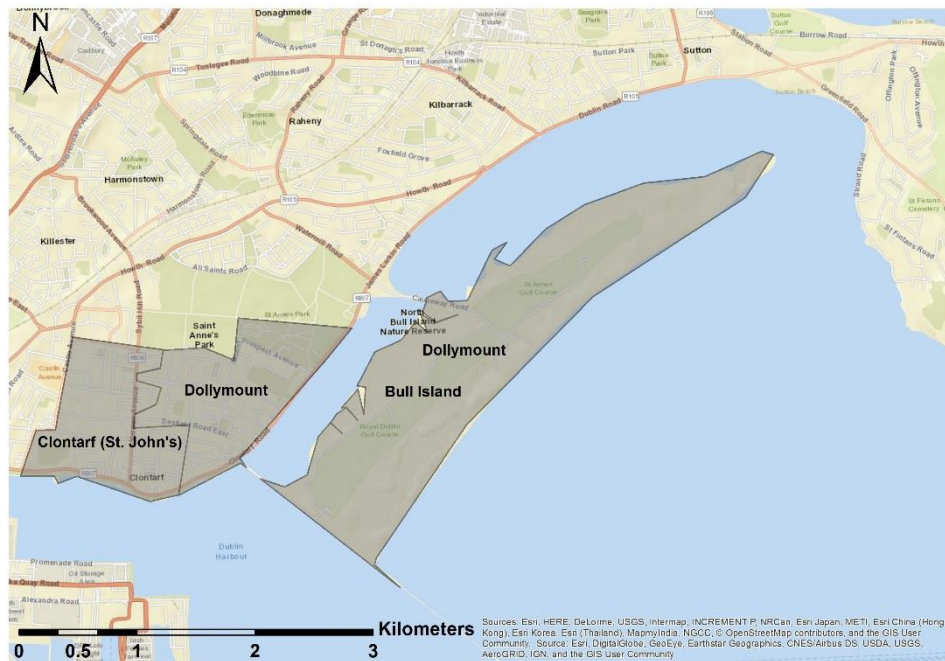


Figure 4.2: Location map of Clontarf questionnaire distribution. Grey shaded areas highlight Clontarf (St. John’s) and Dollymount parishes

Census data showed the population of both parishes in 2011 as 9,867 (Central Statistics Office, 2014). 378 questionnaires were distributed, with 280 returned (response rate 74.1%). 88.1% of respondents had lived in Clontarf for 10 years or more i.e. prior to severe flooding in 2004 and the initial flood defence proposals put forward by DCC in 2007. Sample biases were identified using a z-test by comparing proportional differences between the sample size and census data for each socio-demographic category (Table 4.1). Among the survey participants, younger respondents were under-represented whilst older individuals were over-represented. Similarly, participants were significantly more likely to have higher levels of educational attainment. Additionally, retired respondents were over-represented, and students under-represented within the study. Finally, individuals were more likely to own and were less likely to rent their property compared with census data.

Demographic factors		Clontarf promenade	Census data: Dollymount and Clontarf – St. John’s
Age (%)	18 – 29	4.4**	18.7
	30 – 44	18.9*	26.4
	45 – 59	37.0**	26.9
	60 – 74	25.2**	16.4
	75+	14.4	11.6
Sex (%)	Male	51.6	47.1
	Female	48.4	52.9
Ceased Education (%)	Second level	22.5*	29.9
	Vocational qualification	8.8	6.3
	Bachelor’s degree or equivalent	34.5*	26.9
	Masters/PhD or equivalent	28.5**	19.2
	No formal qualifications	1.6*	.4
Employment status (%)	Working full-time/part-time	53.5	53.2
	Looking after children/home	5.5	8.3
	Unemployed	2.2	3.9
	Retired	33.6**	18.9
	Student	3.3**	12.7
Household status (%)	Buying through mortgage	36.7*	43.4
	Own outright	59.5**	33.9
	Renting	3.4**	20.5

Table 4.1: Socio-demographic characteristics for Clontarf promenade questionnaire respondents compared with census data. Note: * significant at $p < .05$; ** significant at $p < .001$ compared with census data (Central Statistics Office, 2014)

4.2.3 Measures

To understand processes of disruptive place change, questionnaires were designed to elicit place attachment, symbolic place-related meanings, place-protective interpretative responses, attitudinal responses, and perceptions of governance processes surrounding flood defences. A copy of the questionnaire is provided in Appendix E. All measures, conditions and data exclusions for analyses are presented herein. In reporting results, pairwise deletion methods were employed for missing data values to maximise valid data (Pallant, 2013).

4.2.3.1 Place attachment

Place attachment was operationalised using a questionnaire consisting of items related to place dependence and place identity. Drawing on a review of the literature, nine statements were used to measure place attachment (e.g. Kaltenborn & Bjerke, 2002; Brown & Raymond, 2007). Place dependence was captured through three Likert statements, whilst place identity comprised six Likert statements (Appendix E: Q12). In line with

existing place attachment literature in which multiple individual Likert statements are combined to form a uni-dimensional scale (e.g. Jorgensen and Stedman, 2001; Kaltenborn and Bjerke, 2002; Brown and Raymond, 2007; Devine-Wright and Howes, 2010; Devine-Wright, 2011a), the nine items were merged into a uni-dimensional scale measuring place attachment. A Cronbach alpha test demonstrated the place attachment construct to have good internal reliability ($\alpha = .84$) (Von Wirth *et al.*, 2016). However, an examination of corrected-item total correlations indicated that responses to the place identity statement “*Clontarf is seen from outside as possessing prestige*” was weakly correlated with the overall scale ($r = 0.26$), and was not considered as measuring the same construct as each of the other eight statements (Pallant, 2013). The statement was subsequently removed from analysis and the scale’s reliability improved ($\alpha = .85$) (Table 4.2). Response options for each statement were measured using 5-point Likert statement responses ranging from 1 = Strongly agree, to 5 = Strongly disagree, with 3 = Neither agree nor disagree. The scores for each respondent from these eight items were combined and then averaged to create a measure of place attachment (see also Devine-Wright and Howes, 2010; Devine-Wright, 2011a).

4.2.3.2 *Symbolic place-related meanings*

Place-related meanings were elicited using a free association task (Devine-Wright and Howes, 2010). Participants were asked to ‘*identify, in order of importance, three aspects of the promenade that are of most value to you*’ (Appendix E: Q2). Content analysis was conducted to categorise observable themes ($n = 738$). Following several iterations to refine categories and avoid overlap, 7 thematic categories and 44 sub-themes were first developed by the author of this research using deductive techniques based on similar methods developed by Devine-Wright and Howes (2010). Interrater reliability analyses using the percentages of agreement method was then used (Hallgren, 2012). Specifically, a second researcher was provided with the original questionnaires and was subsequently instructed to code all responses using the pre-defined thematic categories, which resulted in

93% agreement of place-related meaning categorisations. To identify potential biases in coding responses between both individuals, inter-rater reliability analysis was also conducted by a third researcher, external to this study. Results also showed high agreement (91%) with pre-defined thematic categories. The core themes are given in Appendix F; proportional responses were generated for each thematic category (Section 4.3.1).

4.2.3.3 Place protective interpretative responses

Interpretation of proposed flood defence outcomes was measured using nine negatively worded Likert items e.g. The proposed flood defences would have... *'negatively impacted the cultural heritage of Clontarf', 'created an eyesore', 'spoiled views of the bay'* (Table 4.2). Each of the statements was captured using a 5-point Likert statement response as above (Appendix E: Q6).

4.2.3.4 Attitudes towards flood defences and place disruption

Attitudinal feelings towards place change were measured using three separate 5-point Likert statements (Table 4.2). Attitudinal support was measured with the statement *'I was in favour of the proposed flood defences'* (Appendix E: Q1). During analysis this statement was reverse-worded to *'I was not in favour of the proposed flood defences'* to denote oppositional attitudes to the proposed flood defences, with Likert statement responses also reverse coded; 1 = Strongly agree, to 5 = Strongly disagree.

A second Likert statement, *'Flood defences are necessary to protect Clontarf from flood damage'*, was included to measure attitudinal feelings towards the general need for flood defences in Clontarf (Appendix E: Q1). The statement *'Keep the promenade as it is, there is no need for change'* was included to understand individuals' attitudes towards disruptive change (Appendix E: Q1). The relationship between these two statements was used to determine respondents' attitudes to flood defences and whether they perceived these would change the promenade's form or function.

The statements *'I was in favour of the proposed flood defences'* and *'Flood defences are necessary to protect Clontarf from flood damage'* were also used to understand if attitudes towards the proposed flood defences and attitudes towards the general need for flood defences differed between residential location (see Section 4.2.3.5).

4.2.3.5 *Quantifying residential location*

Residential location was quantified through two separate measures to examine potential response differences between flood experience and flood risk. Both stratified datasets were used to explore interactions between i) flood experience and ii) flood risk, and attitudes towards proposed flood defences, place attachment and perceptions of governance processes. First, the question *'Have you ever been affected by flooding in Clontarf?'* was utilised to capture flood experience, with a dichotomous Yes/No response option. Those who answered 'Yes' were asked how they had been affected by historical flooding in Clontarf (Appendix E: Q5). Responses were coded into four experiences of flooding; 1 = Directly affected (property flooded), 2 = Indirectly affected (traffic disruption, road closures, flood threats to property), 3 = Affected but not specified, and 4 = Unaffected.

Second, flood risk was quantified using available flood maps for Clontarf for a 1-in-200 year flood event (Dublin City Council, 2011b). These flood maps assessed flood risk based on local topography, the condition of existing flood defences and extreme tide level scenarios (Royal Haskoning, 2005). Respondents were subsequently divided into two groups. Those objectively at-risk, and therefore afforded protection through the proposed flood defences, were classified as "coastal" residents. Those not exposed to these flood risks were defined as "inland" residents. Both measures of residential location were examined because individuals in a flood risk area might be unaware that they are exposed to flood risks, particularly if they have never experienced flooding in the past. They therefore might respond to questions believing that they are not exposed to flood risks.

4.2.3.6 *Perceived effectiveness of governance and stakeholder groups*

To measure perceived effectiveness of governance processes, eight Likert statements were developed based on a review of existing literature (e.g. Gross, 2007). These items encompassed perceptions of fairness, transparency, accountability, inclusive decision-making, legitimacy and trust. Statements included: *'The planning process was fair'*, *'Information from Dublin City Council was truthful, sincere and open'*, and *'It was easy to access and obtain information about the flood defence plan'* (Appendix E: Q9) (Table 4.2). Responses ranged from 1 = Strongly agree, to 5 = Strongly disagree. The items were used in two ways. First, they were used individually to examine the relationship between oppositional attitudes and perceptions of governance processes. And second, examination of corrected-item total correlations confirmed each item as measuring the same construct (Table 4.2). As the 8 items showed good internal consistency ($\alpha = .88$), they were combined to form a uni-dimensional scale measuring overall perceptions of governance processes (Table 4.2). Responses from these items for each respondent were subsequently totalled and averaged (similar to the place attachment scale in Section 4.2.3.1) (see Devine-Wright and Howes, 2010). This scale was then used to examine whether perceptions of governance processes influence strength of place attachment. It was also used to explore whether perceptions of governance processes differed depending on one's experience of flooding or exposure to flood risk.

Finally, to elicit which stakeholder groups were viewed as legitimate, participants were asked to indicate which organisation best represented local community views. Response options included elected representatives, Dublin City Council, Clontarf Residents Association and Clontarf Business Association (Appendix E: Q10).

	Corrected item-total correlation	Mean (M)	Standard Deviation (SD)	Median
Place attachment (one composite item) n = 254		1.77	.64	1.63
Place identity				
Clontarf is part of my identity	.77	1.77	.95	1.00
I have good memories of Clontarf	.67	1.38	.59	1.00
My family has connections to this area from far back	.46	2.61	1.46	2.00
I feel that Clontarf is a part of me	.75	1.87	.99	2.00
I feel part of a community in Clontarf	.70	1.63	.74	1.00
Place dependence				
No other place provides the same opportunities to do what I like in my spare time	.57	1.98	1.02	2.00
It is important to me how this area develops	.55	1.27	.46	1.00
The area is important to me because of my lifestyle	.61	1.59	.78	1.00
Attitudes to disruptive place change				
I was not in favour of the proposed flood defences		1.81	1.21	1.00
Keep the promenade as it is, there is no need for change		3.09	1.20	3.00
Flood defences are necessary to protect Clontarf from flood damage		2.02	.90	2.00
Place-protective interpretative responses				
The proposed flood defences would have ...				
Negatively impacted the cultural heritage		1.94	1.11	2.00
Decreased security of the place		1.76	1.07	1.00
Promoted anti-social behaviour		1.72	1.03	1.00
Created an eyesore		1.44	.86	1.00
Spoiled views of the bay		1.32	.76	1.00
Impacted wildlife		2.51	1.05	3.00
Reduced property values		2.18	1.03	2.00
Damaged tourism		2.02	1.05	2.00
Reduced the recreational value		1.45	.90	1.00
Perceptions of governance process (one composite item) n = 229				
The planning process was fair	.64	3.96	1.05	4.00
The planning process was open & transparent	.72	4.00	1.04	4.00
The local community was recognised as a partner in the planning process	.74	3.92	1.09	4.00
Community views were listened to	.72	3.69	1.17	4.00
Information from Dublin City Council was truthful, sincere and open	.72	3.78	1.02	4.00
It was easy to access and obtain information about the flood defence plan	.66	3.49	1.11	4.00
I was able to influence the planning and decision-making process	.34	3.63	1.07	4.00
I trust in Dublin City Council to make flood defence related decisions regarding Clontarf	.60	4.07	1.02	4.00

Table 4.2: Descriptive statistics for disruptive place change measures for Clontarf promenade. Note: Five-point Likert-statement responses; 1 = Strongly agree, 2 = Agree, 3 = Neither agree nor disagree, 4 = Disagree, 5 = Strongly disagree

4.3 Results

For the present study, preliminary investigations revealed that the subdimensions of place attachment, place-protective interpretative responses, attitudinal responses and perceptions of the governance process were not normally distributed. Non-parametric tests were therefore applied throughout the analysis.

4.3.1 Place-related meanings, interpretations and place attachment

Analysis of free association data of place-related symbolic meanings revealed that the promenade was primarily recognised for its aesthetic and recreational values. Its coastal location and its connection with nature were intrinsic to this. For example, in the first free association responses (Section 4.2.3.2), the three most frequently identified thematic categories were beautiful environment (52%), recreational amenity (45%) and community concerns (2%) (Table 4.3). Similarly, among the second free association responses, recreational amenity (50%) and beautiful environment (45%) were cited most frequently, followed by social factors (2%). Finally, in the third free association, beautiful environment (50%), recreational amenity (39%), social factors (4%) and community concerns (4%) were the place meanings ascribed to the promenade. The core theme *'beautiful environment'* comprised subthemes including scenery, sea, wildlife, identity and preservation, whilst the *'recreational amenity'* theme was characterised by subthemes including exercise, recreation, relaxation and sports (Appendix F). The regular associations of aesthetic features and recreational functions suggests that changes to the promenade would challenge those symbolic meanings, and thus deeply affect place attachment should place disruption occur.

Spearman's rank correlations were also performed between place attachment and place-protective interpretative responses (Table 4.4). Findings demonstrated a positive correlation between place attachment and each item related to negative interpretation of change, including those

of the two primary free association thematic categories (*'beautiful environment'* and *'recreational amenity'*). For example, the relationship between place attachment and interpreting that flood defences would have *'created an eyesore'* ($\rho = .25, n = 250, p < .001$), *'reduced the recreational value'* ($\rho = .24, n = 251, p < .001$), *'negatively impacted on the cultural heritage'* ($\rho = .40, n = 251, p < .001$), *'spoiled views of the bay'* ($\rho = .23, n = 249, p < .001$) or *'impacted wildlife'* ($\rho = .34, n = 245, p < .001$) all displayed statistically significant positive correlations.

Consistent rankings of *'beautiful environment'* and *'recreational amenity'* as the two most frequently recorded themes during the free association task, and the significant positive correlations between place attachment and each of the statements measuring negative interpretive place change, demonstrate that the primary reasons for respondents' attachment to the promenade were specifically its natural aesthetic features and its importance in fulfilling recreational needs.

Thematic category	Free association 1	Free association 2	Free association 3
Beautiful environment	52%	45%	50%
Recreational amenity	45%	50%	39%
Social	Not identified	2%	4%
Community concerns	2%	1%	4%

Table 4.3: Response proportions for free association of place-related symbolic meanings for Clontarf promenade

4.3.2 Relating place disruption to support for flood defences

To understand if individuals were willing to accept some form of disruptive place change, the relationship between the statements *'Flood defences are necessary to protect Clontarf from flood damage'* and *'Keep the promenade as it is, there is no need for change'* was examined. Correlation analysis indicated a strong negative relationship between the statements ($\rho = -.46, n = 256, p < .001$), with descriptive statistics suggesting that whilst individuals recognised the necessity for flood defences, they were less supportive of change in the promenade's appearance (Table 4.2). These

results reveal the contradictory nature of both apathy to and recognition of the need for change in relation to flood management.

4.3.3 Role of governance on perceptions of disruptive change

Spearman's rank correlations were performed between each of the eight items measuring perceptions of the governance process related to public participation and oppositional attitude (i.e. *'I was not in favour of the proposed flood defences'*) (Table 4.4). Significant negative relationships between oppositional attitude and each but one of the statements measuring positive perceptions of the governance process emerged. For example, opposition towards proposed defences was negatively correlated with *'trust in Dublin City Council to make flood defence related decisions regarding Clontarf'* ($\rho = -.45, n = 254, p < .001$), the *'community was recognised as a partner in the planning process'* ($\rho = -.46, n = 253, p < .001$), and *'the planning process was fair'* ($\rho = -.48, n = 249, p < .001$). Analysis of descriptive statistics subsequently indicated that individuals were largely opposed to the proposed flood defences, believing that governance processes were inadequate (Table 4.2).

These sentiments were reflected in representation of community views. Of the four primary stakeholder groups, Clontarf Residents Association ($n = 239$) and Clontarf Business Association ($n = 142$) were regarded as most likely to represent community views, with Dublin City Council recording the lowest count across the groups ($n = 13$). Lack of trust in the local authority to make decisions about flood management (Table 4.4), and the sentiments that the community was not recognised as a partner in the planning process, indicate negative perceptions of governance processes.

To understand the relationship between perceptions of governance and place attachment further, the eight items measuring perceptions of the governance process were combined to create a uni-dimensional scale. Respondents were subdivided into groups reporting strong (score ≤ 1.50), moderate (2.50 – 3.50) and weak (3.51 – 5.00) perceptions of the governance process based on similar categorisations utilised by Devine-

Wright and Howes (2010). Since the number of cases in the ‘strong’ governance category was small ($n = 1$), it was not included in further testing. A Mann-Whitney U Test was used to examine whether place attachment differed between ‘moderate’ and ‘weak’ governance subgroups. Analysis revealed a significant difference in place attachment between individuals who perceived the governance process as moderate ($Md = 2.00, n = 57$) compared to those who viewed it as weak ($Md = 1.50, n = 148, U = 2974, z = -3.29, p < .01, r = .23$). Individuals were likely to display higher levels of place attachment where they perceived the governance process was weak compared to those who believed it was moderately effective.

	Place attachment (a)	Not in favour of proposed flood defences (b)
Place-protective interpretative responses		
<i>The proposed flood defences would have ...</i>		
Negatively impacted the cultural heritage	.40**	
Decreased security of the place	.24**	
Promoted anti-social behaviour	.29**	
Created an eyesore	.25**	
Spoiled views of the bay	.23**	
Impacted wildlife	.34**	
Reduced property values	.35**	
Damaged tourism	.38**	
Reduced the recreational value	.24**	
Perceptions of governance process		
The planning process was fair	-.30**	-.48**
The planning process was open & transparent	-.24**	-.44**
The local community was recognised as a partner in the planning process	-.21*	-.46**
Community views were listened to	-.20*	-.35**
Information from Dublin City Council was truthful, sincere and open	-.28**	-.39**
It was easy to access and obtain information about the flood defence plan	-.12	-.28**
I was able to influence the planning and decision-making process	-.05	-.02
I trust in Dublin City Council to make flood defence related decisions regarding Clontarf	-.19*	-.45**

Table 4.4: (a) Bivariate correlation between place attachment (one composite item, see Table 4.2) and both place-protective interpretative responses and perceptions of governance processes; (b) Bivariate correlations between opposition to proposed flood defences and perceptions of governance processes for Clontarf promenade. Note: * significant at $p < .05$; ** significant at $p < .001$

4.3.4 Effects of i) flood experience and; ii) flood risk on place attachment, attitudes towards flood defences and perceptions of governance processes

First, to test whether experience of flooding contributes to lower levels of place attachment, a Kruskal-Wallis test was conducted using each of the four subgroups (see Section 2.3.5). The results indicated no significant difference in place attachment between subgroups (Gp 1, $n = 22$: directly affected, Gp2, $n = 13$: indirectly affected, Gp3, $n = 10$: affected but unclear how, Gp4, $n = 207$: not affected), $\chi^2(3, n = 252) = 6.10, p > .05$, with individuals in each category reporting similar levels of place attachment. The effects of residential location (coastal versus inland residents) was also explored with respect to place attachment. A Mann-Whitney U Test showed no significant differences in place attachment between coastal ($Md = 1.69, n = 24$) and inland respondents ($Md = 1.50, n = 185, U = 2202, z = -.07, p > .05, r < .01$).

Second, the association between attitudes towards the proposed flood defences and flood experience was examined. Again, no significant difference in support for the proposed flood defences was observed across subgroups (Gp 1, $n = 22$: directly affected, Gp2, $n = 13$: indirectly affected, Gp3, $n = 10$: affected but unclear how, Gp4, $n = 218$: not affected), $\chi^2(3, n = 263) = 3.64, p > .05$. The relationship between residential location and attitudes towards the proposed flood defences was then examined. No significant differences emerged between groups, with both coastal ($Md = 5.00, n = 26$) and inland respondents ($Md = 5.00, n = 190, U = 2000, z = -1.79, p > .05, r = .12$) displaying similar attitudes, suggesting that exposure to flood risks was not sufficient in influencing support for the proposed flood defences.

Third, the relationship between flood experience and general support for flood defences was investigated. Again, the results revealed no significant differences between each subgroup (Gp 1, $n = 23$: directly affected, Gp2, $n = 14$: indirectly affected, Gp3, $n = 10$: affected but unclear how, Gp4, $n =$

219: not affected), $\chi^2 (3, n = 266) = 1.18, p > .05$). The association between residential location and general support for flood defences was examined. Again, coastal respondents ($Md = 2.00, n = 25$) were not statistically more likely to support flood defences in general compared to those living inland ($Md = 2.00, n = 191, U = 2367, z = -.08, p > .05, r < .01$), further strengthening the argument that neither experience nor risk of flooding contribute to heightened demands for adaptation.

Finally, the relationship between flood experience and the composite measure of perceptions of governance processes was examined (see Section 2.3.6). The results indicated no significant difference in perceptions between subgroups (Gp 1, $n = 19$: directly affected, Gp2, $n = 13$: indirectly affected, Gp3, $n = 10$: affected but unclear how, Gp4, $n = 186$: not affected), $\chi^2 (3, n = 228) = 1.85, p > .05$), with individuals in all four categories reporting similar perceptions of governance processes. The influence of residential location was also explored with respect to perceptions of governance processes, with no significant differences obtained in perceptions between coastal ($Md = 4.25, n = 21$) and inland residents ($Md = 3.88, n = 161, U = 1492, z = -.88, p > .05, r = .06$).

4.4 Discussion

Where disruptive change is viewed as positive and familiar, both support for change and place attachment can increase, enabling a pathway for transformation i.e. disruptive change does not always produce negative attitudes (Von Wirth *et al.*, 2016). Respondents in this study recognised the need for flood defences but were less supportive where flood defences required changes to the form and/or function of the promenade. Where individuals recognise the need for place change, but symbolic values associated with place appear to contradict such changes, some form of cognitive transformation may be necessary to overcome the psychological dissonance between the desire for both stability and change. In this context, educational awareness has been shown to play a supportive role in facilitating transformative adaptation (Schlosberg *et al.*, 2017). Respondents in this study however criticised the availability and

transparency of information from the local authority. Moreover, increasing educational awareness alone may be insufficient to encourage adaptation where place attachment is concerned (Lewicka, 2011).

Researchers have suggested that once climate change becomes tangible, societal demands for adaptation will intensify (Adger, 2016). Experience of extreme weather events may impact place meanings (Carroll *et al.*, 2009). Individuals may proactively influence place attachment processes, counteracting effects on value change caused by extreme weather. For instance, Fleming *et al.* (2015) found that where place attachment was concerned, some individuals were willing to engage in transformative adaptation (relocation) should climate change affect their future livelihoods, but this was conditional on their ability to continue working in the same industry as before the relocation. Negotiating this dichotomy for both concurrent stability and change is likely to prove difficult as the findings from Clontarf also confirm, but is likely to be more acceptable than the alternative i.e. continued flood risks. Overcoming such obstacles is likely to hinge significantly on how adaptation is planned and implemented and is thus strongly dependent on effective governance.

Inadequate consultation can weaken place attachment by diminishing feelings of self-efficacy and control (Anton and Lawrence, 2016). Results from Clontarf contradict these findings. Results demonstrate that place attachment sentiments were strongest amongst individuals who perceived governance processes as weak, supporting previous studies which suggest that individuals with stronger place attachment are likely to place greater importance on participatory processes (Mesch & Talmud, 2010). To reduce or overcome disruptions, place-based identities and meanings should be incorporated into policy and planning processes (Agyeman *et al.*, 2009; Fresque-Baxter & Armitage, 2012). As this study illustrates, understanding emotional place-related values early in the adaptation process may contextualise attributes of place by detailing what aspects cause concern where disruptions are proposed.

Marshall *et al.* (2013) found that individuals with local knowledge and lower attachment to place were more likely to have the capacity to implement transformative adaptation. This raises two important points. First, it is often those with higher levels of place attachment who are more willing to engage in public participation processes (Bernardo, 2013). In the context of fair and inclusive governance, this raises a challenge for decision-making that aims to be representative of the wider population rather than being responsive to those who might exert greater influence on decision-making processes (Fresque-Baxter and Armitage, 2012). And second, place attachment can create significant reserves of local knowledge (Mock *et al.*, 2016), which might also help to better inform adaptation planning. In this regard, studies demonstrate that local knowledge often remains underutilised in environmental decision-making at the expense of scientific expertise (Burley *et al.*, 2007). Notably, respondents in this study unanimously agreed that whilst community organisations were the most likely to represent community views, local knowledge was not used to inform the initial decision-making process.

Despite assertions that intentions to take future adaptive actions are influenced by past experiences of extreme events (Rawluk *et al.*, 2017), findings from Clontarf showed no such relationship. Instead, this study found that both flood experience and flood risk, and subsequent willingness to adapt, are insufficient to encourage people to take preventative actions and affect-based variables such as place attachment interact to negatively moderate its effect (De Dominicis *et al.*, 2015). Moreover, in contrast to several other researchers who have demonstrated that place attachment diminishes based on experience of hazardous events (e.g. Brown & Perkins, 1992; Ellis & Albrecht, 2017), no significant differences were reported in strength of place attachment between those with or without flood experience. Quinn *et al.* (2015) attest that where climate change impacts are relatively benign, the impacts on an individual's sense of place will occur in a slow and enduring fashion. That place attachment remained strong in Clontarf irrespective of individuals'

experience of flooding is perhaps demonstrative of the relative infrequency with which tidal flooding has occurred in Clontarf since 2004. As climate change becomes tangible and extreme events increase in frequency and intensity, demands for adaptation to protect livelihoods and homes are likely to increase (Hess *et al.*, 2008), and a re-evaluation of the things that people value in places is expected to occur (Olsson *et al.*, 2006; Clarke *et al.*, 2016).

These findings raise several points for adaptation planning. First, considering the views of both those at-risk and those less exposed to extreme events is critical in overcoming adaptation barriers. Ignoring or prioritising the views of segments of a community based on their experience or risk of extreme events may be a precarious strategy, particularly where place attachment is concerned. Place attachment may be equally important regardless of one's experience or risk of flooding. Where landscapes become threatened because of adaptation planning, these results demonstrate the need to consider the views of the wider community. Second, it further highlights the benefits of early proactive adaptation, particularly whilst there exists sufficient community-wide recognition of the need for adaptation. As concerns for fairness in adaptation increase, attempting to manage place attachment processes at a community level by proactively taking adaptive actions is likely to prove fairer in terms of process and outcome compared to alternatives of no, or delayed adaptation. The latter are liable to disproportionately affect place attachment for those directly experiencing weather-related impacts.

4.4.1 Future research

Whilst this study has illustrated that those who exhibit stronger place attachment are more likely to perceive governance processes as inadequate, it was not possible to identify a causal relationship between these. It may be that strong place attachment acted as a mediator for interpreting governance processes as weak, thereby contributing to opposition to disruptive place change. Equally, perceptions of inadequate public participation may have resulted in individuals developing a stronger

sense of place attachment, leading to stronger feelings of disruptive place change. It would be particularly interesting for future research to examine the causal relationship between these factors, which would heighten arguments for considering the relationship between place attachment and willingness to act in adaptation planning.

Although no significant differences were reported between those with and without flood experience, future research could explore levels of place attachment and support for flood defences immediately after a flood event, particularly focusing on if and how place attachment changes in response to such risks. Equally, whilst not explicitly addressed here, it may prove particularly useful to examine the role of climate change awareness and risk perception of individuals in a similar situation to respondents in this research to understand whether this could also influence (un)willingness to adapt. This issue is particularly relevant in the context of rising sea levels, which could see extreme flood events becoming a much more frequent occurrence under future climate change projections, as is predicted for Clontarf and is likely to be the case in many other coastal settings globally. Examining public awareness and perceptions of climate change is a particularly important issue as managed retreat in coastal locations is likely to form part of adaptation discussions in the near future under future sea level rise scenarios. Such approaches might improve our understanding of socio-cultural aspects that can cause resistance to change.

4.5 Conclusion

Results demonstrate the challenges associated with transformative adaptation where communities wish to limit and regulate disruptive place change impacts. Specifically, where adaptation is recognised as necessary by individuals, but place attachment reduces support for specific measures, an explicit consideration of individual and community values is crucial in shaping adaptation decisions. As demands for transformative adaptation intensify under a changing climate, where place attachment processes are concerned, proactive adaptation is likely to prove more acceptable and

fairer for individuals than alternatives that transform places involuntarily through experience of extreme weather events or through a lack of community involvement in decision-making. Whilst a transformation of individual understandings or knowledge may prove beneficial for proactive adaptation, where individuals have strong attachment to place they may continue to adopt contradictory positions. Recognising individuals as partners in, and not solely recipients of, adaptation planning is therefore crucial.

5 Attempting incremental adaptation when transformation fails: Evidence from flood risk management

5.1 Introduction

Chapter 3 discussed the barriers associated with attempting transformative adaptation. Specifically, it was argued that where place attachment is concerned, transformation may best be achieved through a series of incremental measures, the cumulative outputs of which may become transformative. Building on this work, in Chapter 4 the impacts of disruptive place change and place attachment were explored in greater detail with respect to transformative adaptation using the case of Clontarf, specifically those flood defences proposed along Clontarf promenade. It was shown that effective and inclusive governance, and the integration of diverse knowledge forms (including local knowledge) and place-related values in decision-making were important in facilitating transformative adaptation (see Chapter 3 also). In light of the role of place-related values and governance practices that constrained transformative adaptation in Clontarf, this chapter returns to the same community over two years later. The chapter explores these two issues further, in this instance with reference to incremental adaptation planning, and examines whether lessons learned from past governance failures relating to transformative adaptation can support incremental adaptation planning efforts.

5.1.1 Significance of learning for adaptation planning

Recent studies suggest that where climate change adaptation is concerned governance interventions should be adapted to enable a shift in the role of central governance actors from initiators to a more modest role of facilitators (Termeer *et al.*, 2016). In this regard, the literature highlights the importance of collective learning through reflexivity and practice (IPCC, 2012; Pelling *et al.*, 2015), and recognises the need to learn for systemic governance transformation (van Bommel *et al.*, 2016). For instance,

research repeatedly illustrates that reflexivity and learning from past events and actions can open up opportunities for adaptation (Burch, 2010b; Chapin III *et al.*, 2010; Jones and Boyd, 2011; IPCC, 2012; Mustelin and Handmer, 2012; Patterson *et al.*, 2015).

In the context of governance processes, learning strategies involve monitoring, evaluating and responding to signs of social and environmental change (Olsson *et al.*, 2004; Olsson *et al.*, 2010), which if responded to appropriately can help to overcome adaptation barriers (Moser and Ekstrom, 2010). Too often however, learning is constrained as administrations responsible for adaptation planning attempt to validate, improve and legitimise judgements of the most salient adaptation issues based on technical or scientific expertise (Cloutier *et al.*, 2015). The literature on environmental governance has defined this as 'single-loop' (Pahl-Wostl, 2009) or 'incremental' learning (Holling *et al.*, 2002), whereby learning is carried out by self-referential professionals who consider dealing with such changes as problem-solving (Holling *et al.*, 2002). Actions are taken to improve decision-making without altering established assumptions, routines or decision-making processes (Pahl-Wostl, 2009).

Conversely, 'double-loop' learning occurs when inadequacies are identified in underlying systems, policy failures are recognised, and problems are re-framed (priorities altered, new aspects introduced, system boundaries changed) (Holling *et al.*, 2002; Pahl-Wostl, 2009). A primary way of facilitating this learning in bureaucratic systems is through the introduction of new actors (Holling *et al.*, 2002). The benefits of co-learning and co-producing knowledge and strategies based on both local and scientific expertise have been repeatedly demonstrated within this approach (Cloutier *et al.*, 2015). Local actors exhibit knowledge of the entire territory in which they live. Whilst they may not fully appreciate climate projections or other technical information, they are nonetheless well-placed to identify common responses to specific meteorological hazards (Cloutier *et al.*, 2015). Integrating double-loop learning throughout the adaptation process can prevent those responsible for planning from instinctively reverting to a

process of (re)framing problems based on scientific expertise alone (single-loop learning) (Cloutier *et al.*, 2015). Moreover, where socially or environmentally unacceptable side effects are ignored or emerge through the governance of adaptation, affected actors may be unforgiving, particularly where learnings from past shortcomings are not evident (Ekstrom *et al.*, 2011).

Recently, 'triple-loop' learning has also been advocated as an extension of the double-loop learning paradigm. Triple-loop learning challenges embedded principles (Pahl-Wostl, 2009; IPCC, 2012). Recognising that current management strategies and structures are not appropriate to solve complex global issues, triple-loop learning questions how social structures, value structures, cultural norms and other constructs that mediate risk might be transformed (IPCC, 2012). In the context of flood management, this might involve fundamentally new ways of governing, including crossing cultural, institutional, national and other boundaries that inherently contribute to flood risk, and planning centred on robust decisions instead of strategies focused on flood risk optimisation within particular settings (Pahl-Wostl, 2009).

5.1.2 Incremental and transformative adaptation challenges

Until recently the majority of scholars have focused on incremental adaptation as a means of responding to climate change (Smith *et al.*, 2011; Kates *et al.*, 2012; Mustelin and Handmer, 2012). Incremental adaptation serves to maintain existing systems, development pathways and practices (Revi *et al.*, 2014). Where such adaptations are occurring, they tend to involve only minor changes to the trajectories of public, private and social institutions (Termeer *et al.*, 2016). Recognising that incremental adaptation in isolation may be insufficient to deal with current and projected climate change risks, researchers have recently concentrated on transformative adaptation (Kates *et al.*, 2012; Noble *et al.*, 2014; Marshall *et al.*, 2016; Termeer *et al.*, 2016; Juhola *et al.*, 2017; Satyal *et al.*, 2017). Transformation is typified by nonlinear change or deviation from the status quo and marks a fundamental departure from incremental change

(O'Brien, 2012; Pelling *et al.*, 2015 Marshall *et al.*, 2016). Transformative adaptation remains rare in practice however (Chapin III *et al.*, 2010; Revi *et al.*, 2014).

As with many change processes, Kates *et al.* (2012) argue that a primary reason for failing to implement transformative adaptation centres on institutional and behavioural constraints that seek to maintain existing practices and policies. For instance, the literature suggests that selling incremental adaptation to citizens is easier, with capacities for making future decisions also formulated in the process (Smith *et al.*, 2011; Rickards and Howden, 2012). Similarly, once transformative change has been perceived as being positive, previous system functions are re-established and decision-making reverts to incremental adaptation until additional transformative change is warranted (Park *et al.*, 2012). To-date however, studies have failed to explore the potential challenges of implementing incremental change when transformative adaptation is attempted but fails.

5.1.3 Disruptive place change related to adaptation

Local responses to climate change are ultimately influenced by how change impacts existing livelihoods and assets (O'Neill and Handmer, 2012; Fenton *et al.*, 2017). Because adaptation planning typically focuses on material well-being and other issues which can be handled through traditional planning systems, important aspects of culture and place may be ignored in governance processes (Adger and Barnett, 2009). However, individual and collective agency over change (e.g. adaptation) is crucial for maintaining psychological and emotional well-being, particularly where cultural and place-related values are concerned (Devine-Wright and Howes, 2010). Without such considerations, perceptions of undesirable transformation can result (Clarke *et al.*, 2016).

As adaptation is often initiated and implemented at a local level, affected individuals are likely to have a desire for control over how potential disruption as a result of adaptation is enacted (Carter *et al.*, 2015). Disruption does not necessarily infer physical changes to place, but can

occur as a result of psychological stress or perceived threats from potential future change (Brown and Raymond, 2007; Devine-Wright, 2009; Mihaylov and Perkins, 2014). Participatory governance processes can reduce the disruptive effect of change, and may instead have a positive influence on place-related bonds (Von Wirth *et al.*, 2016), helping to facilitate effective adaptation planning. In the context of disruptive change, scholars have thus called for longitudinal studies in an attempt to understand if and how these values evolve over time (Devine-Wright, 2009; Korpela *et al.*, 2009). For instance, Anton and Lawrence (2016) demonstrated that successful protesting against proposed disruptive change to local government boundaries in Australia helped to maintain strength of place attachment over a 12-month period.

Whether support for adaptation differs depending on whether adaptation is incremental or transformative is less well understood, which is likely to have repercussions for the success of adaptation planning. This chapter expands on findings presented in Chapter 4 through a repeated cross-sectional study. Specifically, in the aftermath of failed transformative change along Clontarf promenade and the issues which emerged surrounding place-related values and contentious governance processes with respect to flood defence planning, it focuses on the same community over two years later and asks how incremental adaptation related to flood defence planning is understood.

Focusing specifically on how incremental adaptation proceeds when transformation fails, this chapter addresses the following two research questions:

1. Do place-related values and support for flood defences differ depending on whether adaptation is incremental or transformative?
2. In what ways do governance processes integrate past learnings of failed transformative change into adaptation planning?

Section 5.2 describes the methods and the case study employed. Results are presented in Section 5.3. In Section 5.4, results are discussed with reference to the challenges of implementing incremental adaptation in the aftermath of failed transformative change before considering potential future directions that research could take.

5.2 Methods

5.2.1 Background to study

This study centres on a multi-functional flood defence project for Clontarf initiated by Dublin City Council (DCC) in 2009 along a separate section of the coastline to those flood defences discussed in Chapter 4. This involved the installation of flood defences, the integration of a new water main for the area and the development of a 2 km cycle track that formed part of a 22 km cycle track around North Dublin Bay (referred to as Dollymount promenade). A substantial proportion of the proposed flood defences are situated adjacent to St. Anne's Park, a municipal recreational area. Consequently, coastal flood risks to properties are significantly lower than is the case along Clontarf promenade (Chapter 4). Public consultation pertaining to the scheme was undertaken in 2012-2013. This included two public information meetings attended by approximately 180 people and on-site availability of representatives from DCC to answer public queries. A letter-drop to residents and business owners also took place in April 2015 in advance of works commencing (Dublin City Council, 2015b). However, when works began in 2015 concerns began to emanate within the community relating to the proposed design of some sections of the flood defences (Figure 5.1). Two prominent community groups (Clontarf Residents Association and Clontarf Business Association), along with other community bodies, launched a campaign to oppose the flood defence element of the project. Following discussions between community groups and DCC, a compromise solution was reached in March 2016 resulting in both a change to the aesthetic finish and a 300 mm reduction in height to a section of the proposed defences. Construction works are ongoing.



Figure 5.1: View of Dollymount promenade. Top – existing view. Bottom– virtual depiction of proposed flood defences along Dollymount promenade (Dublin City Council, 2009)

The defences are classified herein as incremental based on IPCC definitions of incremental adaptation provided in Chapter 2 (IPCC, 2012). Specifically, with respect to community concerns, unlike those issues which arose with respect to Clontarf promenade (Chapter 4), no fundamental deleterious change to the function of the space was proposed. Instead, existing walkway/pedestrian corridors were to be expanded, thereby enhancing the space’s amenity value (Figure 5.1) (Dublin City Council, 2009). And second, based on national flood risk management strategies which focus on structural defences (Jeffers, 2013a; Clarke *et al.*, 2016), the project was incremental as it involved maintaining existing systems and practices by moderately increasing the height of existing seawall defences. For instance, 72% of the flood defence project involved an increase in seawall height of

less than 0.4m, with the remaining 28% requiring an increase in flood defence height of less than 0.7m. Figure 5.2 provides a location map for the proposed defences along both Dollymount promenade and Clontarf promenade to assist in distinguishing both flood defence projects from one another.

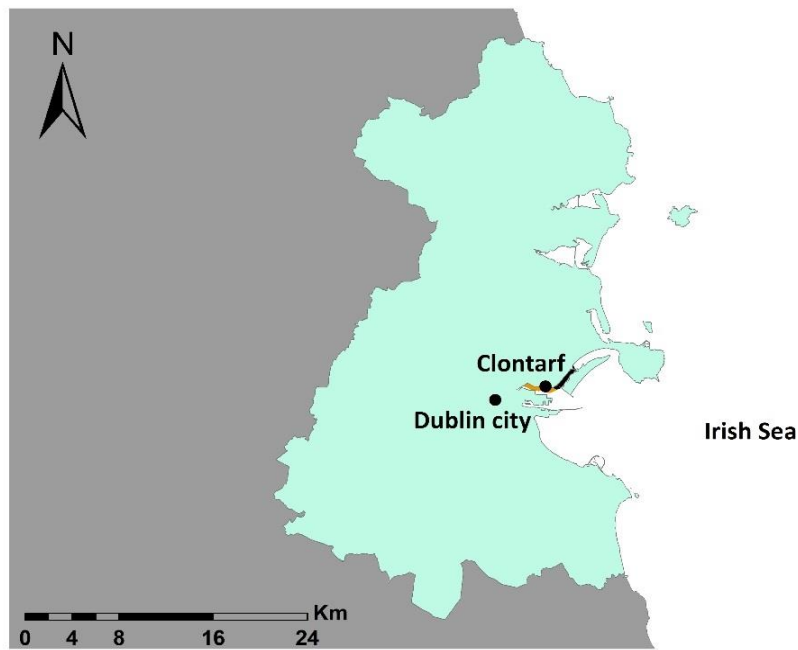


Figure 5.2: Clontarf flood defence locations. Orange line relates to proposed flood defences for Clontarf promenade. Black line relates to proposed flood defences for Dollymount promenade

5.2.2 Data triangulation

The use of multi-methods or data triangulation, which incorporates multiple data analysis techniques, have gained prominence in adaptation studies (Bryan *et al.*, 2013; Ekstrom and Moser, 2014). Triangulation improves data richness and robustness and facilitates advancement of theoretical knowledge (Driscoll *et al.*, 2007; Johnson *et al.*, 2007; Creswell, 2013). In this context, secondary data was analysed to explicitly identify manifest and recurring responses related to community perceptions of the proposed flood defences. This was done to contextualise and validate responses from questionnaires, which were also distributed in the area to understand community perceptions of Dollymount promenade flood defences. The secondary data review comprised an examination of grey literature including official local authority documents, public submissions

made to the local authority regarding the proposed projects (obtained under Freedom of Information Act 2014), social media activity, community websites and digital media sources amongst others (see Appendix D for sources consulted; e.g. Anderson, 2015; Change.org, 2015; Clontarf.ie, 2015a; Clontarf.ie, 2015b; Dublin City Council, 2015a; Facebook.com, 2015).

5.2.3 Questionnaire participants and sample

To examine processes of place disruption for Dollymount promenade, questionnaires were identical to those developed for Clontarf promenade in content, wording and layout. The questionnaire was piloted with ten individuals in Clontarf in October 2016, with modifications only required to the wording of questions to make the clear distinction that the questionnaire related to Dollymount promenade flood defences (Appendix G). Refined questionnaires were circulated in November 2016, eight months after agreement was reached to reduce flood defence heights along Dollymount promenade. The short recall period ensured that respondents were likely to still be aware of the proposals.

Questionnaire distribution methods employed a drop-and-collect procedure identical to that used for the Clontarf promenade study. Specifically, four fieldworkers were provided with a map and a set of instructions. Each team member was responsible for distribution and collection within the confines of a specific geographical area. Residents were divided into those directly adjacent to the promenade and those further inland; every third house on each street was included as part of this sampling technique (see Kyle *et al.*, 2004; Devine-Wright and Howes, 2010; Devine-Wright, 2011a) (Section 4.2.2). Questionnaire distribution also occurred within the same parishes as used for the Clontarf promenade study (Dollymount and Clontarf, St. John's). Both parishes are adjacent to the proposed Dollymount promenade flood defences. The parishes represent a subset of the larger Clontarf area. As Bull Island is largely uninhabited, and flood defences were proposed on the landward side of the island (Figure 5.3), it was not included as part of the sampling area.

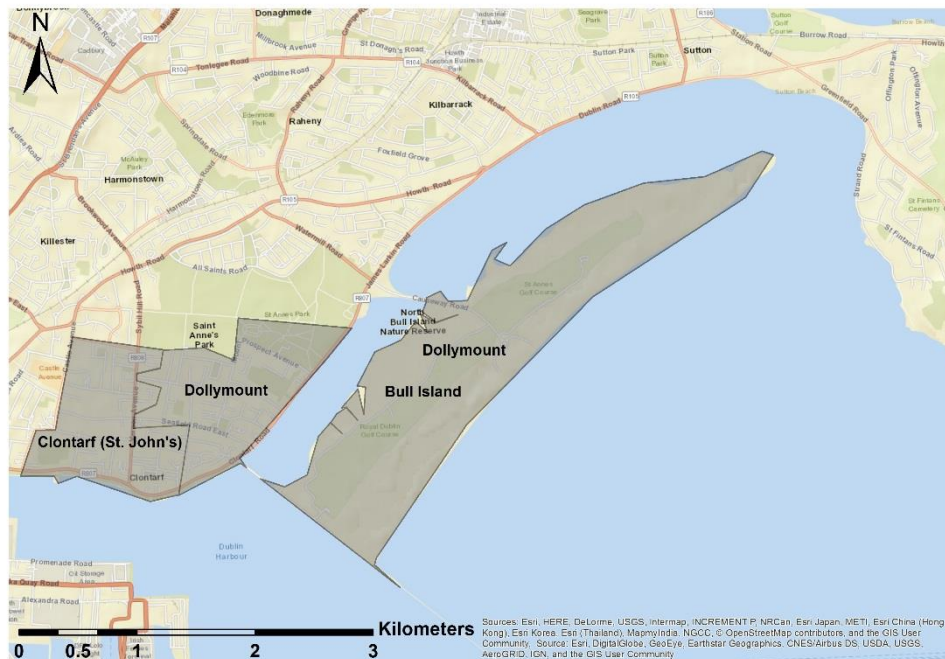


Figure 5.3: Location map of Clontarf questionnaire distribution. Grey shaded areas highlight both parishes

Using 2011 Dublin parish level census data, the population of both parishes was recorded as 9,867 (Central Statistics Office, 2014). 416 questionnaires were distributed with 242 returned (response rate; 58.2%). Sample biases were identified using a z-test by comparing proportional differences between the sample size and census data for each socio-demographic category (Table 5.1). Younger respondents were underrepresented whilst older individuals were overrepresented compared to census derived data. Similarly, participants were significantly more likely to have higher levels of educational attainment in comparison to census data. Additionally, retired respondents were over-represented and students under-represented compared with census data. Finally, individuals were more likely to own and were less likely to rent their property compared with census data.

	Demographic factors	Dollymount promenade	Census 2011 data: Dollymount and Clontarf – St. John’s
Age (%)	18 – 29	1.3**	18.7
	30 – 44	20.0*	26.4
	45 – 59	42.1**	26.9
	60 – 74	28.1**	16.4
	75+	8.5	11.6
Sex (%)	Male	48.1	47.1
	Female	51.9	52.9
Ceased Education (%)	Second level	15.0**	29.9
	Vocational qualification	5.3	6.3
	Bachelor’s degree or equivalent	45.6**	26.9
	Masters/PhD or equivalent	27.9**	19.2
	No formal qualifications	1.3*	.4
Employment status (%)	Working full-time/part-time	59.1	53.2
	Looking after children/home	4.8	8.3
	Unemployed	2.2	3.9
	Retired	30.9**	18.9
	Student	.9**	12.7
Household status (%)	Buying through mortgage	38.7	43.4
	Own outright	54.8**	33.9
	Renting	6.1**	20.5

Table 5.1: Socio-demographic characteristics for Dollymount promenade questionnaire respondents compared with census data. Note: * significant at $p < .05$; ** significant at $p < .001$ compared with census 2011 data (Central Statistics Office, 2014)

5.2.4 Measures

Chapter 4 (Section 4.2.3) provides justification and reliability of measures of place attachment, symbolic place-related meanings, place-protective interpretative responses, attitudinal responses, and perceptions of governance processes used for the Clontarf promenade study. These measures were subsequently replicated for this study to answer the two research questions. The eight-item place attachment scale showed good internal reliability for the Clontarf promenade study (Chapter 4) ($\alpha = .85$). A Cronbach alpha for the place attachment scale within the present study also exhibited good internal reliability ($\alpha = .84$). Similarly, content analysis of symbolic place-related meanings for Dollymount promenade was conducted to elucidate manifest themes ($n = 570$) using the same seven thematic categories and 44 sub-themes developed for Clontarf promenade in Chapter 4 (Appendix F).

5.3 Results

Similar to the Clontarf promenade study in Chapter 4, preliminary investigations revealed that the subdimensions of place attachment, place-protective interpretative responses, attitudinal responses and perceptions of the governance process were not normally distributed. Non-parametric tests were therefore applied throughout the analysis. Although the results of the Clontarf promenade study are reported in Chapter 4, the following section re-introduces some of these findings to aid interpretation and comparison with the present study. In this regard, Table 5.2 provides an overview of descriptive statistics for each of the measures used in this study as well as for the Clontarf promenade study.

	Clontarf promenade				Dollymount promenade			
	Corrected item-total correlation	Mean (M)	Standard Deviation (SD)	Median	Corrected item-total correlation	Mean (M)	Standard Deviation (SD)	Median
Place attachment (one composite item)		1.77	.64	1.63		1.77	.67	1.63
<i>Place identity</i>								
Clontarf is part of my identity	.77	1.77	.95	1.00	.77	1.83	1.01	1.00
I have good memories of Clontarf	.67	1.38	.59	1.00	.72	1.45	.66	1.00
My family has connections to this area from far back	.46	2.61	1.46	2.00	.37	2.60	1.59	2.00
I feel that Clontarf is a part of me	.75	1.87	.99	2.00	.82	1.86	1.00	2.00
I feel part of a community in Clontarf	.70	1.63	.74	1.00	.67	1.63	.79	1.00
<i>Place dependence</i>								
No other place provides the same opportunities to do what I like in my spare time	.57	1.98	1.02	2.00	.50	1.97	1.01	2.00
It is important to me how this area develops	.55	1.27	.46	1.00	.55	1.24	.55	1.00
The area is important to me because of my lifestyle	.61	1.59	.78	1.00	.56	1.60	.80	1.00
Attitudes to disruptive place change								
I was not in favour of the proposed flood defences**		1.81	1.21	1.00		2.27	1.26	2.00
Keep the promenade as it is, there is no need for change		3.09	1.20	3.00		2.79	1.29	3.00
Flood defences are necessary to protect Clontarf from flood damage		2.02	.90	2.00		2.05	1.07	2.00
Place-protective interpretative responses								
<i>The proposed flood defences would have ...</i>								
Negatively impacted the cultural heritage*		1.94	1.11	2.00		2.20	1.21	2.00
Decreased security of the place**		1.76	1.07	1.00		2.87	1.24	3.00
Promoted anti-social behaviour**		1.72	1.03	1.00		2.70	1.28	3.00
Created an eyesore**		1.44	.86	1.00		1.82	1.10	1.00
Spoiled views of the bay**		1.32	.76	1.00		1.63	.99	1.00
Impacted wildlife		2.51	1.05	3.00		2.42	1.12	3.00
Reduced property values**		2.18	1.03	2.00		2.77	1.14	3.00
Damaged tourism**		2.02	1.05	2.00		2.50	1.18	2.00
Reduced the recreational value**		1.45	.90	1.00		2.11	1.20	2.00
Perceptions of governance process (one composite item)		3.86	.76	4.00		3.91	.85	4.00
The planning process was fair	.64	3.96	1.05	4.00	.79	3.83	1.10	4.00

The planning process was open & transparent	.72	4.00	1.04	4.00	.82	3.95	1.09	4.00
The local community was recognised as a partner in the planning process	.74	3.92	1.09	4.00	.83	4.01	1.05	4.00
Community views were listened to*	.72	3.69	1.17	4.00	.79	3.91	1.08	4.00
Information from Dublin City Council was truthful, sincere and open	.72	3.78	1.02	4.00	.80	3.79	1.06	4.00
It was easy to access and obtain information about the flood defence plan	.66	3.49	1.11	4.00	.64	3.65	1.03	4.00
I was able to influence the planning and decision-making process*	.34	3.63	1.07	4.00	.54	3.84	1.04	4.00
I trust in Dublin City Council to make flood defence related decisions regarding Clontarf	.60	4.07	1.02	4.00	.74	3.92	1.15	4.00

Table 5.2: Descriptive statistics for place attachment, attitudes to place change, place-protective interpretative responses and perceptions of the governance process for Clontarf promenade and Dollymount promenade questionnaires. Note: * significant differences at $p < .05$; ** significant at $p < .001$ between Clontarf promenade and Dollymount promenade questionnaire responses; Five-point Likert-statement responses; 1 = Strongly agree, 2 = Agree, 3 = Neither agree nor disagree, 4 = Disagree, 5 = Strongly disagree

5.3.1 Understanding place-related values and support for incremental adaptation

Comparison of free association data related to place-related symbolic meanings repeatedly identified both the natural environment and its recreational features as the two primary factors embodying what Dollymount promenade represented for respondents (Table 5.3). For instance, these two aspects accounted for 89%, 80% and 75% of responses across the 1st, 2nd and 3rd free association tasks respectively for Dollymount promenade questionnaire respondents. Notwithstanding proportional differences in place-related symbolic meanings between both studies, the two themes of *'beautiful environment'* and *'recreational amenity'* consistently dominated individuals' responses across both Clontarf promenade and Dollymount promenade. The results across both studies therefore highlight that place-related meanings were predominately described in terms of physical features of the environment and much less centred on other aspects that these places provided to residents i.e. social, mobility, well-being, economic or community concerns (Table 5.3).

Thematic category	Clontarf promenade			Dollymount promenade		
	Free association 1	Free association 2	Free association 3	Free association 1	Free association 2	Free association 3
Beautiful environment	52%	45%	50%	71%	50%	49%
Recreational amenity	45%	50%	39%	18%	30%	26%
Social	Not identified	2%	4%	Not identified	Not identified	Not identified
Ease of mobility	Not identified	Not identified	Not identified	7%	10%	12%
Community concerns	2%	1%	4%	4%	8%	10%

Table 5.3: Response proportions for free association of place-related symbolic meanings for Clontarf promenade and Dollymount promenade questionnaires

To further understand place-related meanings, Spearman's Rho correlations between place attachment and place-protective interpretative responses were examined for Dollymount promenade, with findings showing positive correlations across many of the relationships (Table 5.4).

For example, the relationship between place attachment and negatively interpreting that flood defences would have '*impacted wildlife*' ($\rho = .35, n = 219, p < .001$), '*spoiled views of the bay*' ($\rho = .21, n = 220, p < .05$) or '*reduced the recreational value*' of Dollymount promenade ($\rho = .24, n = 221, p < .001$) displayed statistically significant positive relationships, similar to those correlations displayed for these variables across the Clontarf promenade questionnaire (Table 5.4). Likewise, a Mann-Whitney U Test showed no difference in strength of place attachment between respondents for Clontarf promenade ($Md = 1.63, n = 254$) and Dollymount promenade questionnaires ($Md = 1.63, n = 222, U = 28064, z = -.09, p > .05, r < .01$).

However, a Mann-Whitney U Test examining differences in support for both flood defence projects showed respondents were significantly more likely to oppose flood defences along Clontarf promenade ($Md = 1.00, n = 266$) than Dollymount promenade ($Md = 2.00, n = 229, U = 23300, z = -4.83, p < .001, r = .22$). Similarly, whilst analysis of descriptive statistics showed that respondents still interpreted place-change as disruptive along Dollymount promenade, interpretations of place change here were considered as significantly less disruptive than along Clontarf promenade. For instance, respondents believed that proposed flood defences along Clontarf promenade "*reduced the recreational value*" ($Md = 1.00, n = 273$) to a greater extent than along Dollymount promenade ($Md = 2.00, n = 237, U = 21031, z = -7.66, p < .001, r = .34$). Likewise, individuals suggested that proposed flood defences along Clontarf promenade were more likely to have "*created an eyesore*" ($Md = 1.00, n = 273$) than those proposed for Dollymount promenade ($Md = 1.00, n = 234, U = 25185, z = -4.79, p < .001, r = .21$). People were also significantly more likely to perceive that proposed flood defences along Clontarf promenade "*spoiled views of the bay*" ($Md = 1.00, n = 272$) to a greater extent than Dollymount promenade ($Md = 1.00, n = 235, U = 26049, z = -4.48, p < .001, r = .20$). This trend of viewing proposed place change as significantly more disruptive along Clontarf promenade was exhibited for all interpretations of disruptive

change except for perceptions that flood defences ‘impacted wildlife’ (Table 5.2).

	Clontarf promenade	Dollymount promenade
	Place attachment	
Attitudes to disruptive place change (a)		
I was not in favour of the proposed flood defences	.25**	.21*
Place-protective interpretative responses (b)		
<i>The proposed flood defences would have ...</i>		
Negatively impacted the cultural heritage	.40**	.31**
Decreased security of the place	.24**	.14*
Promoted anti-social behaviour	.29**	.10
Created an eyesore	.25**	.22**
Spoiled views of the bay	.23**	.21*
Impacted wildlife	.34**	.35**
Reduced property values	.35**	.30**
Damaged tourism	.38**	.26**
Reduced the recreational value	.24**	.24**

Table 5.4: Bivariate correlations between place attachment and a) attitudes to place change and; b) place-protective interpretative responses for Clontarf promenade and Dollymount promenade questionnaires. Note: * significant at $p < .05$; ** significant at $p < .001$

5.3.2 Integrating past governance learnings into adaptation planning

To examine perceptions of governance processes surrounding Dollymount promenade flood defences, the relationship between oppositional attitudes and perceived effectiveness of the governance process were examined. Spearman’s Rho correlations between the reverse-worded statement ‘I was not in favour of the proposed flood defences’ and each statement measuring positive perceptions of the governance process subsequently displayed negative relationships (Table 5.5). For example, correlation analysis showed statistically significant negative relationships between oppositional attitudes and belief that the planning process was ‘fair’ ($\rho = -.49$, $n = 221$, $p < .001$), ‘trust in Dublin City Council to make flood defence related decisions regarding Clontarf’ ($\rho = -.47$, $n = 223$, $p < .001$) or ‘community views were listened to’ ($\rho = -.53$, $n = 223$, $p < .001$).

A Mann-Whitney U Test was conducted to identify potential differences in perceptions of governance processes between Clontarf and Dollymount promenade questionnaires. Results showed a relatively small deterioration in perceptions of effective governance between both studies related to those statements measuring perceptions of agency and control over decision-making. For instance, individuals were significantly less likely to believe that “community views were listened to” for Dollymount promenade defences ($Md = 4.00, n = 229$) compared to Clontarf promenade ($Md = 4.00, n = 251, U = 25704, z = -2.09, p < .05, r = .09$). Similarly, individuals perceived that they were significantly less likely to be “able to influence the planning and decision-making process” for Dollymount promenade ($Md = 4.00, n = 221$) than for Clontarf promenade flood defences ($Md = 4.00, n = 256, U = 25083, z = -2.22, p < .05, r = .10$). All other statements measuring perceptions of governance processes showed no improvements over time (Table 5.2).

	Clontarf promenade	Dollymount promenade
	Not in favour of proposed flood defences	
Perceptions of governance processes		
The planning process was fair	-.48**	-.49**
The planning process was open & transparent	-.44**	-.51**
The local community was recognised as a partner in the planning process	-.46**	-.53**
Community views were listened to	-.35**	-.53**
Information from Dublin City Council was truthful, sincere and open	-.39**	-.51**
It was easy to access and obtain information about the flood defence plan	-.28**	-.34**
I was able to influence the planning and decision-making process	-.02	-.29**
I trust in Dublin City Council to make flood defence related decisions regarding Clontarf	-.45**	-.47**

Table 5.5: Bivariate correlations between opposition to proposed flood defences and perceptions of the governance process for Clontarf promenade and Dollymount promenade. Note: ** significant at $p < .001$

Perceptions that historic failures in governance planning were not addressed following the issues which arose for Clontarf promenade defences was evidenced from an analysis of secondary data sources used to capture manifest themes, which repeatedly highlighted residents’

dissatisfaction of governance processes surrounding Dollymount promenade flood defences:

“It is quite unbelievable that no lessons were learned from the debacle that unfolded when a previous flood defence plan for the Clontarf Road was imposed on the local community” – Elected representative (Clontarf.ie, 2015b)

“I think it's time the people of Clontarf and surrounding area should have another march like we did before to show DCC that we don't want and will not have this wall” – Local resident 1 (Clontarf.ie, 2015a)

“DCC cannot continue to bombard us with information that they expect us to accept without question” – Local resident 2 (Facebook.com, 2015)

“Lack of foresight from the council and planning department once again” – Local resident 3 (Change.org, 2015)

“If the information was clear when planning permission was sought there would have been too many complaints from the local community to go ahead” – Local resident 4 (Larkin, 2016)

The lack of control felt by individuals over decision-making was further reflected by many individuals who expressed doubts over the necessity for coastal flood defences of any kind along Dollymount promenade based on historical experience of pluvial flood risks in this area:

“In over 50 years I have never seen a flood at this end of Clontarf” – Local resident 5 (Facebook.com, 2015)

“I've listened to very experienced locals continually say this area floods from St. Anne's Park, not from the bay” – Local resident 6 (Facebook.com, 2015)

“They're fixing a problem that never existed” – Local resident 7 (Anderson, 2015)

These sentiments were later reiterated following extensive pluvial flooding along Dollymount promenade in May 2017:

“A total disgrace. We sat across a table for over a year and told them [Dublin City Council] they were building a flood defence where there was virtually no tide, that the flooding problem was from the Naniken River in the park. They assured us that the drainage problems in the park had been resolved. Yesterday no tide and yet flooding” – **Local resident 8** (Facebook.com, 2017)

“Well done to those who built the new road and flood defence. You have managed to make the problem worse. Everybody knows the flooding always comes from the park” – **Local resident 9** (Facebook.com, 2017)

“This is beyond a joke. Hundreds of residents have expressed the fact that... 'pluvial water'... is the real cause [of flooding]” – **Local resident 10** (Facebook.com, 2017)

“If they [Dublin City Council] had asked the local people, we could have told them the floods were from the park and not the sea coming over the wall” – **Local resident 11** (Facebook.com, 2017)

These results demonstrate that rather than perceptions of governance processes improving between both studies based on historic learnings, individuals believed they had less control over flood defence decision-making in the present study than for Clontarf promenade defences. Moreover, failure to integrate local knowledge into decision-making was recognised as a key barrier to transformative adaptation along Clontarf promenade (Chapter 4). The re-emergence of this issue for flood defences along Dollymount promenade, and the perceived inability of the local authority to account for local knowledge in adaptation planning by addressing concerns over more pressing pluvial flood risks specific to Dollymount promenade, is demonstrative of why perceptions of governance processes did not improve over time.

5.4 Discussion

Some researchers have suggested that individuals may consciously loosen their attachment to place in order to minimise place disruption (Brown and Perkins, 1992; Possick, 2006). Although interpretative responses to flood defences along Dollymount promenade were deemed as less threatening to place than those proposed along Clontarf promenade, the stability of place attachment across both studies shows no evidence of this occurring. Instead, both opposition and place-protective interpretative responses were weaker for Dollymount promenade flood defences despite place attachment remaining stable over time, suggesting that place attachment processes are resilient in the face of repeated threats to place. Attachment to place is considered as slow-moving, influencing the rate at which planned adaptation proceeds (Marshall *et al.*, 2012; Quinn *et al.*, 2015). However, strength of place attachment in isolation does not necessarily determine the extent of opposition to place change, but opposition is also dependant on how change is interpreted, which is subsequently determined by the social context and trust individuals have in key organisations (Devine-Wright and Howes, 2010), as this study also confirms.

The literature suggests that where the object of place attachment is primarily based on social rather than physical attributes, interpreting whether proposed place change will directly improve the local community, as opposed to its environmental impacts, will largely determine public responses (Devine-Wright, 2009). For instance, Stedman demonstrated that individuals who held symbolic beliefs about a recreational area as a “*community of neighbors*” were less likely to oppose development, regardless of strength of place attachment (Stedman, 2002: 569). The results from Clontarf across both studies however point to strong meanings ascribed to physical environmental features, and less on the social aspects these spaces provide. Specifically, it suggests that individuals who ascribe stronger values to physical characteristics of place may be more willing to oppose disruptive change than those who value its social aspects

(Stedman, 2002). This offers further evidence for the need for greater consideration of place attachment processes in adaptation planning.

For adaptation planning, how communities interpret change also depends on existing knowledge and lived experience of weather-related hazards in that place, influencing attitudes towards adaptation (Adger, 2016). In this regard, the need for double-loop and triple-loop learning in environmental governance has long been recognised (Holling *et al.*, 2002). Through such learning new actors are introduced, policy failures in underlying systems can be addressed and priorities can be re-framed (Holling *et al.*, 2002), preventing those responsible for adaptation planning from instinctively re-defining problems in terms of scientific knowledge (Cloutier *et al.*, 2015). Embracing approaches beyond single-loop learnings and moving towards double-loop and triple-loop learning offers an effective means of systemic governance transformation (van Bommel *et al.*, 2016), as this study also confirms.

As the case of Dollymount promenade shows, residents had contrasting beliefs to that of institutional authorities over the primary cause of flood risks in the area based on lived experience (pluvial versus tidal). This offers an important lesson because how different perspectives of weather-related hazards are negotiated between planners and communities has a profound influence on public attitudes, place change interpretations and the subsequent success of adaptation strategies. Findings from this study strengthen the argument for using solutions that guide local interventions towards adaptation planning based on an understanding of citizens' environmental experience (von Wirth *et al.*, 2016). The results also suggest that the traditional 'Decide, Announce, Defend' strategy adopted by decision-makers for public consultation and justice in environmental decision-making in Ireland has created a legacy of distrust between stakeholders (Ewing *et al.*, 2011), and more specifically highlights the limited role of citizens in national flood risk management decision-making (Revez, 2014).

How individuals perceive and experience adaptation is influenced by levels of autonomy and control they have over decisions, in addition to governmental leadership, action and support (Gibson *et al.*, 2016; Marshall *et al.*, 2016; Schlosberg *et al.*, 2017). Theoretical and empirical evidence suggests that the core factor shaping public behaviour and deference to legal authorities is the perceived fairness of government policies and decisions (Tyler, 2003; Adger *et al.*, 2016). Governance practices are subsequently open to renegotiation, particularly as events unfold or as new information emerges (O'Brien *et al.*, 2009; Pelling and Dill, 2010; Adger, 2013). It was therefore expected that in the aftermath of objections to governance processes for Clontarf promenade flood defences, perceptions of public participation processes for flood defences along Dollymount promenade would improve in response to those lessons learned by the local authority. Instead, individuals' perceptions of governance processes remained static over the course of both studies. Indeed, perceptions of lower autonomy, expressed by individuals in terms of being less able to influence decision-making for flood defences along Dollymount promenade compared with Clontarf promenade, was evidenced in this study.

Learning from past events can open up emergent spaces for change (Chapin III *et al.*, 2010). Clarke *et al.* (2016) demonstrated that where transformative adaptation fails, adaptation may be best achieved through a series of incremental measures, the results of which might coalesce into transformation. In Clontarf however, historic concerns regarding the efficacy of public participation were latent and compounding in nature. Specifically, those concerns related to ineffective governance processes for proposed flood defences along Clontarf promenade re-emerged again for Dollymount promenade flood defences. Where perceptions exist that authorities have failed in their obligations with respect to public consultation on one occasion, future adaptation of any kind is unlikely to be smooth and efficient.

Studies have frequently argued that a transformation of governance processes is necessary for transformative adaptation (Olsson *et al.*, 2004;

Olsson *et al.*, 2006; Termeer *et al.*, 2016; Patterson *et al.*, 2017), to which this research adds important insights. Specifically, where transformative change that threatens community values is attempted and fails (Clontarf promenade), even incremental change becomes highly contested (Dollymount promenade) to the extent that a transformation of governance processes is required to reduce the likelihood of resistance to incremental adaptation. Governance processes need to incorporate learnings accordingly or consequently face the risk of repeatedly encountering community resistance to adaptation once perceived as rational.

5.4.1 Future work and limitations

Whilst others have conducted time-sensitive research and reported the stability of place attachment and resistance to change over shorter periods of time (Cox *et al.*, 2014; Anton and Lawrence, 2016), the temporal element of this research was limited to approximately 28 months, which in the context of adaptation planning is a relatively short timeframe. If, as many have suggested, place-related values are to be considered in adaptation planning (Marshall *et al.*, 2013; Fleming *et al.*, 2015; Clarke *et al.*, 2016; Marshall *et al.*, 2016), extending the temporal dimension of this study over a longer period would prove useful (Von Wirth *et al.*, 2016).

This research has focused on examining disruptive place change as a negative outcome of adaptation processes. Much might be learned however where disruptions to place are viewed positively, and are deemed to enhance both place and place attachment processes (von Wirth *et al.*, 2016). Where adaptation is concerned, this remains an under-researched topic. Further studies examining both place disruption and issues of procedural justice with an explicit focus on adaptation are therefore warranted.

5.5 Conclusion

This chapter sought to explore how incremental adaptation unfolds when transformation fails, and adds to our understanding of place attachment,

disruptive place change and the governance of adaptation. Specifically, it highlights that place attachment alone does not necessarily determine the extent of opposition to place change. Instead, opposition is dependent on how change fits with existing understandings of the physical and social characteristics of place and in the trust individuals develop with authorities responsible for adaptation planning.

One of the primary questions addressed in this chapter was to understand the challenges with attempting incremental adaptation in the aftermath of failed transformation. In this regard, this research has illustrated the difficulties for authorities responsible for adaptation when they are perceived as “getting it wrong” with respect to public participation on one occasion. It highlights the governance challenges with attempting relatively small-scale, incremental change in the aftermath of failed transformation, and shows the fundamental role that learning contributes to successful adaptation planning in such circumstances. Specifically, when adaptation fails because of perceived weak governance processes, there is a pressing need to learn from such issues. Repairing lost trust between stakeholders before progressing with future adaptation measures is crucial, regardless of the scale of change proposed or the perceived benefits it might provide for communities. Where opportunities exist to embed learnings from past governance failures into decision-making, authorities would do well to take heed of such experiences and transform their governance processes accordingly. Failure to do so may result in unnecessary and costly adaptation both in terms of wasted resources and damaged relationships with communities expected to benefit from adaptation.

6 Discussion and conclusions

6.1 Introduction

This chapter provides a synthesis of the core findings of this research. It ultimately draws conclusions on emerging patterns from each of the empirical chapters to understand the challenges associated with implementing transformative adaptation. Section 6.2 briefly summarises the main findings from the empirical chapters in this thesis. It then evaluates the primary contributions this research makes to existing literature in Section 6.3. This is preceded by an analysis of cross-cutting themes and policy implications in Section 6.4, before identifying some of the limitations of this thesis in Section 6.5. Finally, in Section 6.6 potential areas for further research are discussed.

6.2 Summary of research findings

The core aim of this thesis was to:

- Investigate the challenges associated with transformative climate change adaptation using the case of flood risk adaptation in Ireland

Specifically, three research questions were identified in Chapter 2 and were addressed in Chapters 3-5:

1. How and why might barriers to transformative adaptation emerge, and how might these be overcome?
2. In what ways are place disruption and place attachment understood in response to transformative change, and does flood risk or flood experience impact attitudes towards adaptation, place attachment or perceptions of governance processes?
3. How does incremental adaptation proceed when transformation fails?

The research aim and questions examined in this thesis address a significant gap in the adaptation literature. There is growing evidence that highlights the salience of transformative adaptation in responding to

climate change risks (Kates *et al.*, 2012; Marshall *et al.*, 2012; Park *et al.*, 2012; Marshall *et al.*, 2016; Termeer *et al.*, 2016). Yet, limited research of transformative adaptation planning in practice exists. Equally, incremental change is often believed to be a relatively pain free process and is assumed easier to implement than transformation (Adger *et al.*, 2009; Fleming *et al.*, 2015; Marshall *et al.*, 2016). Where transformation fails, and incremental adaptation is subsequently attempted, it is equally unclear what impact this might have on adaptation efforts. Few studies have examined these issues. Using flood risk management as an example of climate change adaptation, these research questions were ultimately guided by insights from two Irish case study locations. Both case studies were selected for two reasons. First, they represent situations where barriers to different forms of transformative adaptation arose in recent years, thereby offering contrasting perspectives on what it means to transform. And second, one of the case studies employs a temporal dimension to assess how incremental adaptation proceeds following failed attempts at transformative change.

In Skibbereen, the research centred on a town that experienced significant and repeated flood events in recent years. The case was focused on a proposal developed by an environmental group to construct a multi-functional environmental park on the town's periphery to act as a wetland environment. Specifically, it was expected to combine both flood defences and recreational and tourism opportunities – a transformative strategy in the context of existing flood risk management strategies nationally (Chapter 3).

The case study of Clontarf formed the second component of this thesis. The case study was sub-divided into failed attempts at both transformative, and later incremental adaptation. The first of these studies focused on attempts at implementing transformative flood defences for Clontarf promenade, which were perceived as fundamentally disrupting existing social values ascribed to the promenade and its functionality from a community perspective (Chapters 3 and 4). An incremental adaptation

strategy proposed for Dollymount promenade several years later was also met with resistance, despite the fact that the proposed flood defence development involved only a moderate increase to the height of existing coastal defences and enhanced the space's amenity value for recreational users (Chapter 5).

Detailed quantitative and qualitative methods were utilised to answer each of the research questions drawing on extensive primary and secondary data. A qualitative approach was used to first contextualise the barriers that arise in the context of transformative adaptation (Chapter 3). Quantitative methods were employed to assess in greater detail place-related values concerning transformation (Chapter 4). Finally, both quantitative and qualitative methods were again utilised to understand the challenges with attempting incremental adaptation when transformation fails (Chapter 5). A brief overview of the main findings from each of the empirical chapters is now provided.

6.2.1 RQ 1: Barriers to transformative adaptation (Chapter 3)

Chapter 3 explicitly examined potential barriers that arise in the context of transformative adaptation and suggested appropriate intervention strategies based on both the temporal and spatial origin of those barriers using empirical examples from Skibbereen and Clontarf promenade. Despite suggestions that transformative adaptation is likely to produce different barriers than incremental adaptation (Moser and Ekstrom, 2010), barriers identified were reflective of those identified in the literature more broadly. Specifically, impediments to transformation across both cases were related to social values and governance/institutional processes.

The chapter demonstrated the impact of governance processes in constraining transformation. First, because flood risk adaptation funding is heavily weighted towards structural flood defence provision in Ireland, decision-making processes tend to rely on technical expertise, often failing to challenge underlying assumptions and embedded practices associated with technical responses to flooding. Altering governance processes to

embrace other forms of knowledge by introducing new actors to account for inter-disciplinary knowledge was recognised as a potential way to facilitate transformation. And second, utilising statutory public participation processes in isolation were found to be uncondusive to increasing societal support for transformation. Instead, it was recognised that authorities need to embrace current technologies to encourage and improve public participation. A transformation of governance structures and practices based on outdated participatory decision-making processes was therefore also advocated to support effective adaptation planning.

With respect to social values, the importance of place attachment processes in Clontarf emerged as a contributing factor in the expression of community resistance towards proposed flood defences. The results highlighted that where individuals had a strong attachment to specific places and deemed adaptation as threatening to such places, perceptions that transformation was being forced upon them was a potential outcome. It was suggested that transformative change may best succeed when extreme weather events are realised. Under such circumstances, it was argued that planned transformative adaptation may instead be best achieved through a series of incremental adaptation measures that culminate in transformation over a longer timeframe. Conversely, it was also argued that extreme weather events may provide a window of opportunity to initiate community support for once-off transformative adaptation efforts, particularly when social thresholds are exceeded, and communities subsequently reflect on their priorities. The results from Clontarf were used to provide deeper insights into the role of place disruption, place-related values and governance practices in transformative adaptation planning in Chapter 4.

6.2.2 RQ 2: Place disruption in response to transformation (Chapter 4)

This chapter expanded the work undertaken in Chapter 3 by quantitatively assessing the impact of place disruption and place-related values as a consequence of transformative adaptation in Clontarf. It was recognised

that studies discussing the impact of place disruption on adaptation planning were largely absent from the literature. Increasing our understanding of psycho-social and governance challenges that arise in the context of adaptation was therefore deemed important to advance our understanding of the social and institutional barriers to transformative adaptation identified in Chapter 3.

Contradictory demands in which individuals supported flood defences but resisted disruptive place change emerged at a community level in Clontarf, highlighting the dilemma individuals and institutional authorities face where adaptation planning threatens valued places. Societal demands for adaptation are likely to intensify as climate change becomes tangible for individuals. However, it was argued that proactively controlling place attachment through planned adaptation rather than waiting to have such values altered forcibly in response to extreme events is likely to prove fairer and more acceptable for communities exposed to such risks. This is likely to require some form of psychological change in what individuals ascribe value to.

Demonstrating the important role of place attachment in adaptation governance, the results also showed that individuals with the strongest levels of place attachment were significantly more likely to perceive governance processes as weak. It was also noted how individuals exhibiting strong place attachment are often highly knowledgeable about the local area, which could be used to better inform and create support for adaptation. For place disruption to be reduced or overcome, place-related identities need to be incorporated into adaptation planning at the earliest possible opportunity.

The chapter concluded by examining the relationship between flood experience and flood risk and i) place attachment and; ii) support for adaptation planning. Findings from this element of the study highlighted several important points. First, neither flood experience nor flood risk had an impact on strength of place attachment, support for flood defences or perceptions of governance processes. This provides compelling evidence of

the moderating role of place attachment and place-related values in influencing support for adaptation planning. Moreover, if barriers related to place attachment are to be minimised, it demonstrates the benefits of considering the views of both those affected and unaffected by climate change rather than prioritising the views of those directly experiencing climate change.

6.2.3 RQ 3: Incremental adaptation when transformation fails (Chapter 5)

The final empirical chapter employed a temporal dimension to this research. Following public concerns relating to a second flood defence project in Clontarf in 2015, this chapter re-examined some of the core issues which arose from Chapter 4. Specifically, primary findings from Chapter 4 identified the influential role of place-related values and perceptions of governance processes where transformative adaptation was proposed. Chapter 5 returned to examine these issues where incremental adaptation was subsequently planned in the aftermath of failed transformation.

Supporting the findings in Chapter 4, it was shown that place attachment alone does not determine opposition to disruptive place change. Instead, opposition is determined by how change is understood and interpreted, which is a factor of the social context and trust individuals develop with key organisations. Specifically, in Clontarf place-related values were expressed through physical rather than social characteristics of place. In instances where physical features of place are attributed more importance than the social aspects these places provide, stronger resistance to place change was illustrated as a potential outcome.

The second component of this chapter explored the role of learning in adaptation planning. It was hypothesised that the failures identified and accepted by the local authority regarding the governance process for Clontarf promenade flood defences would be remedied, and perceptions of governance processes would improve over time. Despite a more

detailed consultation process for Dollymount promenade however, perceptions of the legitimacy of governance processes remained constant over time and deteriorated to a certain extent where local control over decision-making was concerned. Indeed, concerns raised in Chapter 3 and Chapter 4 about the integration of local knowledge and expertise into decision-making re-emerged in Chapter 5 following pluvial flooding along Dollymount promenade, which residents subsequently argued superseded any risks from coastal flooding in this area.

Whilst Chapter 3 suggested that a series of incremental adaptation strategies may converge into transformation, the findings from Chapter 5 specifically highlight the challenges for institutional authorities with implementing relatively modest incremental forms of adaptation in the aftermath of failed transformation. Where authorities fail to integrate learnings from past actions into decision-making, a transformation of governance processes is likely to prove necessary to reduce the risk of future adaptation efforts being opposed.

6.3 Contribution to knowledge

6.3.1 Barriers to transformation and incremental adaptation do not differ

The literature on adaptation has rarely assessed those barriers that arise in the context of transformative adaptation. There remains conflicting evidence on whether barriers to transformation therefore differ to those barriers identified for incremental adaptation. For some, barriers to transformation are assumed different and more challenging than those related to incremental change (Moser and Ekstrom, 2010). Yet, others have suggested that barriers to transformation do not differ from incremental change, with challenges associated with risks and benefits, perceived costs of change, institutional apathy and behavioural inertia characterising both incremental (Biesbroek *et al.*, 2013; Wilson, 2014) and transformative change (Kates *et al.*, 2012; O'Brien and Sygna, 2013). The empirical evidence from this thesis has shown that barriers to both incremental and

transformative change are similar in nature. Specifically, barriers across both case studies were characterised as either socio-cultural or governance related, both of which are representative of barriers to adaptation more generally.

Incremental adaptation is considered a relatively pain free approach compared to transformative change (Adger *et al.*, 2009). Despite incremental adaptation requiring only relatively minor adjustments to the trajectories of public, private and social institutions (Termeer *et al.*, 2016), the case of Dollymount promenade has demonstrated the challenges in progressing incremental adaptation in the aftermath of failed transformation. It adds substance to the theory that transformation can be facilitated through a series of incremental measures over time (Kates *et al.*, 2012; Pelling *et al.*, 2015; Termeer *et al.*, 2016). This is a significant finding from this thesis. First, it provides empirical evidence that implementing incremental change can prove equally as difficult as transformative change, particularly when ineffective governance processes or place-related values are concerned. And second, it highlights the challenges with attempting incremental adaptation following failed transformation. Specifically, this research has shown that transformation through incremental adaptation is likely to be inherently difficult unless governance practices adjust to meet societal expectations for fair, transparent and inclusive decision-making.

As suggested at the outset of this thesis, adapting to climate change and associated extreme weather, such as warming above 4°C by 2100, without transformative changes to governance and social systems is likely to prove difficult. If not voluntarily chosen through proactive measures, forced transformations are likely. This raises a fundamental point. Some degree of climate change because of past and current greenhouse gas emissions is now inevitable. However, if we wish to avoid a 4°C warmer world, there is a pressing need for societal transformations at a scale not yet seen. Such societal transformations include a transformation of current social, energy, agricultural, urban and economic practices amongst other systems. Continually investing in those activities and adaptive actions that have

defined adaptation until now is likely to contribute to maladaptation by, at best, proving costly and pointless, and at worst, preventing more transformative change from emerging (Adger and Barnett, 2009).

Proactive societal transformations to avoid irreversible changes in the climate should now be the overriding imperative (O'Brien and Sygna, 2013). Unfortunately to date, extensive societal transformation at all scales has largely been missing in practice. Instead, as this thesis has demonstrated, systems and practices continue to perpetuate vulnerability and promote adaptation strategies that increase the risk of maladaptation to climate change. Whilst transformative adaptation in response to a significantly warmer world is an option, and whilst transformations are likely to be necessary to a certain extent as an adaptive response, radically transforming our efforts now to mitigate the risks of a 4°C global temperature increase is likely to prove fairer and more palatable than transforming systems of governance and social actions in response to a 4°C warmer world. Indeed, it may well be that experience of tangible climate change impacts serves as a mechanism for encouraging the increase of mitigation efforts across various scales (e.g. individual, local, national).

6.3.2 Social capital and adaptation

Of particular salience across each of the three empirical chapters was the influence of social capital on the outcomes achieved (i.e. levels of social interaction and social networks evident within a community) (Fresque-Baxter and Armitage, 2012; Marshall and Stokes, 2014). Research suggests that high levels of social capital can result in both support for (Huang *et al.*, 2011), and resistance towards adaptation (Wolf *et al.*, 2010). In this regard, several categorisations of social capital have been identified in the literature. Bonding social capital relates to strong ties at a community level based on shared social identity. Bridging social capital focuses on the ability to create links with individuals across different socio-demographic backgrounds, whilst linking social capital focuses on the ability to create alliances with those in influential positions of power (Szreter and Woolcock, 2004; Harrison *et al.*, 2016). Although linking social capital

signifies a weak social relationship, it proves the most effective means for those that seek to derive benefit from its application (Hawkins and Maurer, 2009). Thus, in this context it can be argued that linking social capital offers the greatest potential for communities to achieve desired outcomes with respect to adaptation planning.

For instance, Chapter 3 discussed the influential role of the flood committee in Skibbereen in politicising and directly engaging with authorities responsible for flood risks and in advocating for structural flood defences. The flood committee established a National Flood Forum to highlight the issue of flooding nationally and gained credibility with influential political figures and institutional authorities as the national representative body for flooded communities, demonstrating strong linking social capital in the process. Moreover, committee members were historically involved in managing flood risks in the area for over four decades and used flood risk knowledge developed over this time to advocate for the necessity of structural flood defences. Conversely, whilst the promoter of the environmental park was highly motivated initially and developed relationships with certain groups within the community, their limited success in networking with external authorities, and their perceived weak leadership, constrained their ability to achieve their desired objectives.

This also raises the question of unequal social power relations, which can exclude some individuals or stakeholders from influencing decision-making processes. For some, fairness in decision-making focuses on equal distribution of political power amongst participants in decision-making processes. Yet, for others fairness is concerned with proportional distribution of power related to a participant's stake in the outcome of decisions (Davoudi and Brooks, 2012). Interestingly, the proposer of the environmental park in Skibbereen did not reside in the town and was therefore not subjected to flood risks. Conversely, those individuals advocating for structural flood defences in Skibbereen had been subject to extensive and repeated flooding of both private and commercial properties

in recent decades. It therefore further illustrates the difficulties for governance processes that aim to be fair and inclusive in both process and outcome, particularly when the ultimate outcome of adaptation is to meet the needs of those most adversely affected by climate change.

In Clontarf, strong leadership characteristics from community groups (Clontarf Residents Association/Clontarf Business Association) and from local elected representatives was evident throughout this research. Members of the community involved in opposing flood alleviation measures were recognised as leaders with respect to environmental concerns, particularly in terms of opposing previously unwanted developments in Dublin Bay. It was noted that several community members voluntarily devoted significant amounts of time and resources to opposing flood defences for Clontarf and Dollymount promenades. The level of leadership exhibited by the Clontarf Residents Association/Clontarf Business Association, and their combined abilities to mobilise resources was influential in creating a large internal network within the community, thus contributing to high levels of bonding social capital at a community level in opposing the flood relief scheme. Furthermore, two public protests, which 8,000 people attended from various communities around Dublin, signify the strength of their external social networking skills. This ability to gain support from other communities and various city-wide organisations increased bridging social capital in the process. Most importantly in the context of opposition to change, residents were also considered as having strong levels of linking social capital, having developed close working relationships with elected representatives at both a city council level and at a national level, which was pivotal in terms of securing political support for the community's position. The results from both Clontarf and Skibbereen support findings concerning the influential role of social capital in fostering civic engagement (Lewicka, 2005).

Research has highlighted the mediating role of social capital in constraining adaptation efforts (Wolf *et al.*, 2010). Equally, Menzel and Buchecker (2013) contend that social capital can be used to attain other forms of

capital to achieve desired outcomes. For instance, physical, financial, human, natural and social capital do not operate in a vacuum. Instead, they interact in response to development opportunities or disruptions to contribute to community actions and outcomes (Harrison *et al.*, 2016). This thesis adds some valuable empirical insights to the adaptation literature. Specifically, where communities utilise existing forms of social capital to influence adaptation, this may have consequences for other forms of capital upon which they rely. For instance, in Clontarf opposition to flood defences has resulted in ongoing risks of coastal flooding to physical and natural assets including private properties, public infrastructure and recreational areas, which both of the proposed flood defences were designed to offer protection against. Similarly, residents remain at continued risk of financial losses owing to ongoing flood risks and the non-availability of flood insurance in areas affected by flooding. In Skibbereen, the implementation of structural flood defences has resulted in a potential loss of natural capital through engineered responses to flood risks. Moreover, it is conceivable that natural capital could have been enhanced through the development of the proposed environmental park and may have indirectly enhanced bonding and bridging forms of social capital by providing a communal recreational and meeting space. These results support the contention that high levels of social capital can exacerbate weaknesses in other forms of capital (Wolf *et al.*, 2010). Whilst communities rich in linking social capital might derive benefit from being able to influence decision-making process, revealing the true cost of adaptation actions and outcomes necessitates mapping the potential effects of social capital on other forms of capital. Whilst this thesis has not examined the moderating role of social capital in adaptation planning in detail, it nonetheless further confirms how socio-cultural factors interact to constrain adaptation efforts.

6.3.3 Place attachment in adaptation governance and planning

Whilst it is accepted that adaptation may lead to place disruption (Hess *et al.*, 2008), the current adaptation literature provides limited empirical

evidence of the moderating impact of socio-cultural aspects of place in adaptation planning or in assessments of adaptive capacity. Accordingly, this thesis is one of a few empirical studies to assess place-related values in response to adaptation and has shown that place attachment and place-related values are significant predictors of societal support for adaptation. It adds empirical weight to the need to explicitly account for place-related values in climate change adaptation. Moreover, the case of Clontarf exposes the prevailing assumption in the literature that systems with assumed high adaptive capacity respond more favourably to adaptation. Used in isolation, the theory of adaptive capacity is therefore insufficient in explaining adaptation. It fails to account for the way in which adaptation is socially-mediated and context-specific and cannot explain much of what matters to individuals or what they ultimately derive value from.

The dearth of longitudinal assessments measuring place attachment has hampered understandings of whether it evolves over time (Devine-Wright, 2009; von Wirth *et al.*, 2016). For instance, when a place is disrupted, or potentially disrupted, the impact on place attachment processes remains unclear. Some researchers have demonstrated how negative place disruption can result in a deterioration of place attachment over time (Speller, 2000; Cheng and Chou, 2015), whilst others have shown that continuity of place attachment is possible where potential disruption is prevented (Anton and Lawrence, 2016). The former may have negative social and psychological consequences (Devine-Wright, 2013), and reduce the ability of individuals to adapt to climate change. The repeated cross-sectional study in Clontarf, specifically questionnaire analysis applied to the cases of both Clontarf promenade and Dollymount promenade, is demonstrative of how place attachment processes can be sustained over time even as communities contend with potentially negative place disruptions arising from repeated adaptation planning. It offers useful lessons for the literature because it highlights how communities can use their attachment as a force for action in resisting adaptation. As climate change adaptation efforts amplify, these attitudes are likely to be reflected

in other communities where socio-cultural values and valued landscapes are at risk, which may also be a significant barrier to future adaptation efforts.

6.4 Cross-cutting themes and policy implications

6.4.1 Experiencing loss and context-specific adaptation

- **Policy recommendation:** Current adaptation planning largely accounts for tangible, economic losses associated with climate change. However, considering intangible, place-related values in adaptation strategies is equally important to reduce the risk of adaptation efforts failing.

People experience loss when they are dispossessed of the things that they value, and for which they cannot readily substitute alternatives (Barnett *et al.*, 2016). Climate change threatens both tangible and intangible assets. For instance, losses from climate change may be signified by dispossession of tangible goods such as property, personal possessions, or financial resources. For others however, losses may be intangible, signified by damage to culture, social cohesion, place attachment, social identity or health. When loss is extensive, significant social and environmental problems can arise (Barnett *et al.*, 2016). Individuals with varying degrees of flood experience are likely to have different thresholds for tolerating flood risks related to how they characterise loss based on a variety of social, economic, and environmental factors. Based on understandings of loss, people are subsequently likely to develop ideologies and conceptions of what successful adaptation looks like.

Recent studies have suggested that an understanding of what people value, how they become valued and how values change over space and time is crucial for successful adaptation (Barnett *et al.*, 2016). Adaptation policies and strategies are typically designed based on economic metrics assessing monetary losses of material assets (Adger, 2013; Graham *et al.*, 2013). However, communities are not homogenous, and neither should adaptation strategies be. Whilst conducting economic analyses to prevent

monetary losses addresses one of the two primary ways in which loss can be experienced, it ignores the intangible element. For instance, this research has demonstrated how losses can be interpreted in a tangible sense when communities are primarily concerned about financial losses because of repeated experience of flooding (Skibbereen). Equally important for adaptation policy and decision-making are potential losses arising from damage to intangible assets, as the case of Clontarf demonstrates.

A significant proportion of this thesis was dedicated to understanding potential loss of socio-cultural aspects of place because of coastal adaptation, specifically those related to place-related values (Clontarf). Research suggests that coastal flood risks are likely to increase considerably in the future (Nicholls *et al.*, 1999; Jongman *et al.*, 2012; Woodruff *et al.*, 2013), and may even surpass fluvial flood risks towards the end of this century (Hall *et al.*, 2006). Problems associated with coastal flooding are expected to be further compounded by a relative increase in coastal floodplain settlement (Hall *et al.*, 2006). These concerns are also likely to be experienced in Ireland owing to predicted sea-level rise and increased storm surges by the end of this century (Desmond *et al.*, 2009), and predicted increases in population in coastal cities relative to the rest of the country (Central Statistics Office, 2013). Of salience to adaptation is that place-related values such as place attachment are likely to be particularly concentrated in coastal locations (Brown and Raymond, 2007), where there is likely to be an increased demand in the future for adaptive responses to climate change. Research has shown how recreational, landscape and aesthetic values are likely to be especially strong in coastal settings (Mortreux and Barnett, 2009; Novaczek *et al.*, 2011; Graham *et al.*, 2014). The case of Clontarf serves to highlight a potentially growing challenge for coastal communities expected to undergo adaptation, as well as decision-makers responsible for such strategies.

This research also has relevance to other coastal locations around the world expected to undergo transformative adaptation e.g. forced migration

from low-lying Pacific atoll nations where a strong sense of place attachment and identity exists (Mortreux and Barnett, 2009). The findings from this thesis offer insight into the psycho-social challenges and resistance that might emerge as these communities are expected to undergo loss as a consequence of potential migration. Understanding loss from the perspective of those who are expected to benefit from adaptation is therefore fundamental. Asking communities what they value and how they become valued can provide important insights at a local-level that can be better used to inform decision-making. Potential losses arising from psycho-social processes can subsequently be minimised, ensuring that migratory options provide the best opportunity for maintaining such values e.g. resettling entire communities together where forced relocation/migration is necessary.

6.4.2 Knowledge diversity and learning for transformative adaptation

- **Policy recommendation:** Knowledge co-production from a range of stakeholders is needed for flood risk management and broader adaptation decision-making. Currently, flood risk adaptation in Ireland is heavily weighted towards reliance on technical expertise at the expense of other relevant knowledge.

Studies suggest that contrasting languages and frames of reference can be a barrier to knowledge-sharing and mutual understandings between stakeholders (Cloutier *et al.*, 2015). That a flood committee has existed in Skibbereen for several decades, and has been proactively working with flood authorities during this time in advocating for structural flood defences, is demonstrative of a group that is aware of and supports the technical aspects of structural flood defences. Moreover, the influence of the flood committee as the representative organisation within the community on flood-related issues is illustrative of how language barriers might be broken down between communities and institutional authorities with respect to understanding complex adaptation strategies. In contrast, despite the flood risks posed in Clontarf the community lacked a

designated flood committee to liaise with flood authorities from the outset of each project. This contributed to a lack of awareness until late in the planning process, and ultimately a poor understanding at a community-level of the technical aspects of flood defences proposed.

If significant social change is required to move towards more transformative pathways, existing forms of knowledge production and use may not be effective in achieving this. Existing knowledge forms often fail to account for a diversity of views, disregarding the subsequent complexities and ethical considerations associated with such change (Fazey *et al.*, 2017). Instead, reflecting on the ways in which individuals acquire and use knowledge, including perception, intuition, reasoning and emotional intelligence, may be necessary (Pelling *et al.*, 2015). Growing evidence therefore points to the value of co-producing knowledge and including diverse knowledge and experience in decision-making for transformation (Bahadur and Tanner, 2012; van Bommel *et al.*, 2016). Single actors rarely possess the knowledge, experience, resources, or legitimacy required to address complex global environmental challenges (Armitage and Plummer, 2010). The literature has therefore shown how transformative change can be supported through the integration of various knowledge forms, including knowledge from science, the private sector, decision-makers and civil society (Olsson *et al.*, 2010; Burch, 2016; Satyal *et al.*, 2017).

Although local knowledge is useful for progressing climate change adaptation, researchers have questioned its utility when rapid or non-linear transformative changes emerge (Adger *et al.*, 2013). However, ignoring local knowledge may also prove to be a precarious strategy for policymakers where transformative change is concerned. For instance, if, as this thesis has argued, transformative change is likely to be best achieved through a series of incremental measures (see also Kates *et al.*, 2012; Pelling *et al.*, 2015; Termeer *et al.*, 2016), continuously integrating local knowledge and expertise into adaptation planning will prove crucial to maintaining societal support for adaptation and potential

transformation in the long-term. Without accounting for context-specific lived experiences and associated local knowledge of climate change risks, communities are likely to have difficulties accepting the legitimacy of external knowledge sources over their own internalised experiences. Equally, local knowledge may also need to be open to external forms of knowledge that extend beyond lived experience, particularly because impacts arising from climate change predictions are unlikely to be comparable with one's historic experiences of extreme weather. Findings from both Skibbereen and Clontarf augment the need for continuous co-production of knowledge and diverse knowledge representation in moving towards transformative adaptation.

A common finding across both case studies was that technical approaches to adaptation are insufficient. In the context of this research, barriers associated with technical responses to flood risks largely illustrate how these relate to values, worldviews, beliefs, education, experience and interests, rather than technical challenges i.e. it is the individual and political mindsets which are focused on technical responses that frame flood risk problems and solutions in this way (O'Brien and Selboe, 2015), which subsequently constrains transformation. An important point here is the process of systemic learning for managing change. Current management strategies and decision-making practices at all scales (e.g. individual, local, national) are not commensurate with meeting demands associated with complex global issues including climate change adaptation. Historically, adaptation has focused on taking decisions to fit with existing worldviews, allowing embedded systems and practices to continue on a business-as-usual trajectory. However, this thesis has emphasized that learning for systemic transformation of social systems, political systems, value structures and governance practices are instead likely to be necessary if the impacts associated with large-scale climatic change are to be minimised. Specifically, this calls for a move away from the dominant business-as-usual approach, where decisions seek to frame problems based on existing ways of knowing (single-loop learning), to instead take

account of policy failures, re-framing problems and altering priorities (double-loop learning), and challenging the very social structures, social values, power relations and cultural norms that current decisions are based on to minimise our need for transformative adaptation (triple-loop learning).

6.4.3 Technological transformations for adaptation

- **Policy recommendation:** Technological interventions (e.g. virtual reality technologies) should be integrated into adaptation planning to help individuals visually understand the impacts of potential future climate change scenarios and any adaptation measures proposed.

A defining feature of the Clontarf case study and the resistance to change that emerged for flood defences along both Clontarf and Dollymount promenade was the inability of individuals to visualise what the proposed flood defences would look like on completion. Residents suggested that in both instances they had difficulties understanding the scale of the proposed flood defences and the impact any changes would have on the landscape. For instance, it was only when objections were raised by residents concerning the height of flood defences along Clontarf promenade that visual images of defences became available. Similarly, whilst visual depictions were developed for Dollymount promenade it was not made explicit from these the exact changes to the landscape that would arise e.g. that sea views would be obstructed for road users (Dublin City Council, 2009).

An emerging field of scientific enquiry with respect to environmental planning is the role of geo-technologies and geo-computation in capturing, analysing, modelling and visualising spatial data, in particular, through the use of visually immersive virtual reality technologies (Orland *et al.*, 2001; Ball *et al.*, 2005). Virtual technologies have been shown to enhance information management and the knowledge transfer experience for improved public participation (Appleton and Lovett, 2003; Ball *et al.*, 2005).

Whilst data on sea level rise and climate change scenarios is constantly being revised in response to emerging scientific evidence (Shaw *et al.*, 2009), there exists potential to integrate such applications into adaptation policy to make tangible the potential impact of sea-level rise at a local level, and to enable individuals more easily visualise potential modifications to the landscape where environmental change is proposed.

Awareness of and concern for climate change is considered moderate to high amongst European citizens (Steenjes *et al.*, 2017), yet researchers continue to note a disparity between this awareness/concern and behavioural responses (Lorenzoni *et al.*, 2007). European citizens continue to believe that risks associated with climate change are both temporally and spatially distant (Steenjes *et al.*, 2017). Individuals fail to see the link between climate change and the impacts this might have on their local environment and livelihoods. Considerable evidence therefore exists of the need for more emotionally engaging scientific communication (Moser and Pike, 2015). Virtual reality can play a significant role here by making a 'distant' threat like climate change locally relevant (Nicholson-Cole, 2005), potentially helping to elicit behavioural responses (e.g. increasing public support for adaptation planning, enhancing individual mitigation efforts). In this context, the use of virtual reality technologies requires a consideration of ethical implications to ensure that its application is equally defensible and emotive, and avoids both scare-mongering and underrepresentation of potential future scenarios however. Fostering mutual understanding in landscape planning is as much about other stakeholders educating planners as planners educating stakeholders. This necessitates participatory scenario planning to ensure that knowledge used to inform different scenarios is co-produced and agreed upon by key stakeholders, where adaptation planning is informed by consensus and debate (see also Sections 6.3.3 and 6.4.2).

Evidence of successfully blending advanced visual communication tools and local knowledge in spatial planning already exists however (Portman, 2014), suggesting the potential benefits of exploiting such technologies for

adaptation purposes. Embedding virtual reality visualisations into environmental planning policy might help to negate those barriers that emerged in Clontarf from arising in other adaptation proposals in the future, particularly as the complexity of climate change impacts and adaptation responses increase.

6.5 Research limitations

Chapters 3-5 discussed limitations relevant to each chapter. However, in the context of the entirety of this thesis, two additional limitations pertinent to the overall findings are now discussed.

6.5.1 Distinguishing incremental and transformative adaptation

Transformation is defined as a *“a fundamental qualitative change . . . that often involves a change in paradigm and may include shifts in perception and meaning, changes in underlying norms and values, reconfiguration of social networks and patterns of interaction, changes in power structures, and the introduction of new institutional arrangements and regulatory frameworks”* (IPCC, 2012; 465). To-date, transformation as a concept has largely been explored using a solution-oriented lens (i.e. as a broad metaphor to indicate and advance fundamental change), with analytic-descriptive approaches less evident (i.e. engaging with concepts of transformation to test theories and advance theoretical insights) (Feola, 2015). The adaptation literature is replete with examples advocating solution-oriented approaches. For instance, ‘social transformations’ to adapt to environmental change are widely recognised as necessary (Olsson *et al.*, 2004; Asara *et al.*, 2015; O’Brien and Selboe, 2015). Yet, what exactly this entails is less explicit.

The nature of the definition ‘transformation’ means that it is inherently subjective and relative. A core issue which therefore emerged in this thesis was centred on the approach taken in defining adaptation measures proposed within each of the case studies; in particular, whether adaptation in each case constituted either incremental or transformative change, or some form of intermediate adaptation measure. In this regard,

classification of the environmental park proposal as transformative adaptation in Skibbereen was taken based on how it contrasted with the prevailing national preference and usage of structural (incremental) flood defences as the primary means of flood protection. Yet, this research adopted a contrasting approach when classifying adaptation proposals as either transformative or incremental in Clontarf. This, despite the fact that structural flood defences were proposed for both Clontarf and Dollymount promenades, a typical incremental response to flood risks in the context of national flood risk management strategies. Specifically, within this thesis proposed flood defences along Clontarf promenade were classified as transformative, yet structural defences along Dollymount promenade were categorised as incremental. For Clontarf promenade, consideration to classify the project as transformative was ultimately based on the fundamental altering of the primary focal point and recreational area of the community into a potentially unusable space, and the impacts this would have on the social values ascribed to the community and the promenade. In contrast, for Dollymount promenade no adverse effects to the functionality of the space were proposed. Instead, the recreational opportunities were to be enhanced through development of a new promenade incorporating a walkway and cycleway. Additionally, the proposed changes to the existing flood wall involved only relatively modest increases to an existing flood defence structure (≤ 0.7 m increase) compared to Clontarf promenade (≤ 2.85 m increase). It was for these reasons that categorisation of adaptation measures differed between both flood defence projects in Clontarf.

The findings from this research illustrate the inherent challenges when transformation is applied in a metaphorical sense. Consequently, there is always a potential that adaptation will be considered as transformative by some individuals and not by others, particularly when a diversity of perspectives is considered. When metaphors are used to represent topical issues or terms e.g. 'transformation', there is the prospect that the term becomes diluted (Strunz, 2012). This vagueness can also constrain the

advancement of understandings of the social processes involved in transformational change (Strunz, 2012). A major risk with this approach is that powerful interests may impose their own definitions of transformation, potentially legitimising those vested interests' positions, including those opposed to radical change of existing systems (Bahadur and Tanner, 2014). The issue of conceptual clarity is further compounded when different disciplines employ the term transformation based on the specific intellectual roots of that discipline (Feola, 2015).

Termeer *et al.* (2016) suggest that it is perhaps time to move adaptation discussions beyond the incremental/transformational debate towards continuous transformation given the inherent subjectivity of both terms. Two reasons suggest that this approach may not be wise. First, Chapter 3 demonstrated that transformational change is likely to be best achieved through a series of small incremental wins that accumulate over time. This necessitates an ability to make sense of and recognise patterns of continuous incremental adjustments such that small changes and new experiences in incremental practices can be successfully embedded in existing institutional and societal routines for transformation. And second, this thesis has shown that understanding and defining adaptation is important as it allows for an examination of the relationship between current system conditions (e.g. social, economic, institutional, environmental) and how adaptation is understood and progressed at various scales (e.g. individual, community, municipality, national).

Fair and transformational adaptation requires a policy process that facilitates diverse and representative views from all stakeholders who are impacted by climate change (Schlosberg *et al.*, 2017). For instance, this thesis has shown that progressing transformational change to improve equity, fairness and resilience is likely to raise questions from some stakeholders about the meaning of progress and the necessity for change (see also O'Brien, 2012). Incorporating diverse views, creativity and problem-solving are therefore particularly useful for examining the processes through which adaptation might become transformational drawing on multiple stakeholder

perspectives, and in subsequently facilitating discussions around fairness and equity in adaptation.

6.5.2 Case study research

The use of case studies in climate change adaptation is not particularly new but has steadfastly increased in recent years (e.g. Burch, 2010a; Burch, 2010b; Jantarasami *et al.*, 2010; Ekstrom and Moser, 2014; Antwi-Agyei *et al.*, 2015; Barnett *et al.*, 2015; Mersha and Laerhoven, 2016), to which this thesis adds additional empirical examples of adaptation in practice. Researchers have critiqued the efficacy of case study research however. For instance, some have argued that generalisability of findings is not possible given the often context-specific nature of results (Flyvbjerg, 2006). Others have also examined the effectiveness of case studies as a means of helping to develop theoretical insights given the richness of case study data and the temptation of researchers to include everything (Eisenhardt, 1989), which often results in large, incomprehensible documents (Yin, 2009).

Researchers have advocated the benefits of drawing on multiple case studies within the research process. A multiple case study approach brings three additional elements to the research: i) by comparing two or more cases using similar methods social phenomena can be better understood, particularly in relation to examining causality because the researcher can assess whether evidence of repeated causal mechanisms exist in opposing or similar situations (Bryman, 2012); ii) it broadens the scope of the research by drawing on two cases which provides for validation of findings and; iii) it makes the findings potentially more generalisable and robust than through single case study designs (Rowley, 2002; Eisenhardt and Graebner, 2007; Yin, 2009). Conversely, where findings deviate from those predicted or from those identified in previous studies, case studies serve as useful in challenging previous theoretical assumptions in order to improve theoretical reliability and validity (Mays and Pope, 1995). For these reasons, this research utilised both a comparative case study approach in Chapter 3 and a repeated cross-sectional study in Chapter 5.

Moreover, much of this thesis was devoted to a single case study location (Clontarf). Given the heavy reliance on a single case study as a unit of analysis, the decision to implement a repeated cross-sectional study design in Chapter 5 was subsequently taken for two reasons. First, reliance on a single case study to understand place disruption processes raised concerns over being unable to generalise findings from Chapters 3 and 4. Implementing an identical questionnaire in Chapter 5 to that used in Chapter 4 allowed for a critique and substantiation of findings from Chapter 4 surrounding the role of place attachment and perceptions of governance processes in adaptation. To validate and assist in generalising findings further, Chapters 3 and 5 also employed mixed research methods. Specifically, findings from Chapter 3 were grounded in empirical interviews with key stakeholders relevant to both case studies and an analysis of secondary data sources. Equally, Chapter 5 drew on multiple research methods, including a questionnaire study and analysis of secondary data sources to contextualise and validate findings from Chapter 4.

Whilst case study methods are subject to both scientific rigour and bias criticisms, the broad range of research methods applied in this research have reduced some of the inherent difficulties and biases associated with their use. Moreover, it is often the minute details and the richness of data evidenced from case studies that leads to an accumulation of information (Jensen and Rodgers, 2001), and the development of novel or new insights (Flyvbjerg, 2006), which can subsequently help to advance theoretical insights (Rowley, 2002; Gerring, 2004). It is these issues which this thesis was inherently interested in engaging with and understanding.

6.6 Future research directions

Throughout each of the empirical chapters this thesis identified avenues that future research could explore. Two of the most promising areas for further research are explored in greater detail here.

6.6.1 Relationship between place attachment and perceptions of governance processes

Evidence suggests that weak governance concerning public participation is a barrier to transformation (Gibson *et al.*, 2016). Inadequate consultation can threaten self-efficacy and control over change, threatening place attachment in the process (Brown *et al.*, 2003; Anton and Lawrence, 2016). Conversely, governance processes which are inclusive and participatory can minimise disruptive change, thereby enhancing place-related values (Long and Perkins, 2007; Von Wirth *et al.*, 2016), and facilitating effective adaptation planning.

Few studies have examined whether place attachment is a cause or consequence of particular outcomes (Scannell and Gifford, 2016). However, those that do exist show that place attachment serves to influence other processes (e.g. well-being). For instance, Carroll *et al.* (2009) showed that the onset of flooding in the UK contributed to a sense of place loss, subsequently causing psychological harm to those affected. Similarly, others have demonstrated the moderating role of place attachment in facilitating psychological needs (Scannell and Gifford, 2016). Such empirical studies support the directionality of place attachment's influence on particular outcomes.

Chapter 4 highlighted that those individuals exhibiting stronger place attachment were more likely to perceive governance processes as inadequate. However, the design of the study did not allow for an examination of the causal relationship between these variables. It was subsequently suggested that strong place attachment sentiments may have been responsible for individuals perceiving governance processes as inadequate. Equally however, perceptions of inadequate governance processes may have contributed to individuals developing a stronger sense of attachment to place. Whilst Chapter 5 demonstrated the stability of both place attachment and perceptions of governance processes over time in Clontarf, the nature of the repeated cross-sectional study design, specifically replication of the same questionnaire across Chapters 4 and 5,

resulted in it being difficult to identify a causal relationship between these factors. Combining both quantitative (i.e. controlled trials) and qualitative methods (i.e. interviews) may be useful as a means of understanding such causal inferences (Palinkas, 2014). Indeed, it may be that place attachment does not influence other processes in a unidirectional manner as others have suggested (Scannell and Gifford, 2016), but instead such processes influence each other bi-directionally (Fresque-Baxter and Armitage, 2012), or each may be influenced by an additional mediating factor not represented herein. If, as this research attests, place-related values are to be incorporated into policy and planning processes (see also Agyeman *et al.*, 2009; Devine-Wright, 2011; Fresque-Baxter and Armitage, 2012), future research examining this causal relationship using multiple research methods will be crucial.

6.6.2 Place attachment and support for transformation

Research by Marshall *et al.* (2012) highlighted how place attachment can constrain individuals' ability to transform livelihood practices in response to climate change. Conversely, others attest that where individuals experience tangible effects of climate change demands for adaptation are likely to increase (Adger, 2016). Similarly, where social values are concerned, experience of extreme weather can contribute to a deterioration in place attachment (Carroll *et al.*, 2009), and may open up a window of opportunity, providing the space necessary for societal acceptance and support for transformative adaptation (Chapter 4). Disasters can subsequently mobilise individuals to develop on pre-disaster trajectories/ideas, and can open up the space for initiating large-scale social change or transformation (Pelling and Dill, 2010; IPCC, 2012).

Existing discussions surrounding place disruption and attachment have suggested that places are often involuntarily transformed as a consequence of natural disasters (Devine-Wright, 2009). It is often during such crises that new meanings are ascribed to actions and new narratives are established to make sense of lived experience (Fazey *et al.*, 2017). However, both the qualitative and quantitative studies undertaken in

Clontarf were limited to a period when coastal flood risks were relatively rare. The last major coastal flood event in Clontarf occurred in 2004, ten years prior to initiating this research. It would thus be particularly useful for future research to explore societal attitudes towards transformation in the direct aftermath of extreme weather events, and in what ways such events might shape place attachment processes and understandings of climate change awareness and risk. This would greatly enhance our understanding of the role of foci events in influencing individuals' attitudes to transformative change, and would assist in supporting future adaptation planning efforts.

Research has also illustrated how place attachment can increase when transformative urban change minimises place disruption (Von Wirth *et al.*, 2016), suggesting that appropriately planned interventions may have a positive effect on person-place relations. Empirical examples of adaptation that maintains or enhances the integrity of existing places remain rare however. Consequently, Chapter 4 suggested that some form of psychological change in what individuals value may be necessary as climate change risks increase and the likelihood of transformative adaptation intensifies. This thesis has highlighted the need for further longitudinal studies exploring both successful and unsuccessful transformative adaptation in practice. This would require incorporating an assessment of the governance processes that contributed to such successes/failures, and how these unfold over time throughout the adaptation process. Such studies would greatly assist policymakers and communities to identify and successfully negotiate value trade-offs, thereby minimising the risk of place disruption and wasted investment of governance resources as a consequence of adaptation efforts.

6.7 Concluding remarks

This thesis was devoted to understanding the challenges of transformative adaptation. It has considerable implications for current and future adaptation policy both in Ireland and in a wider context. Specifically, many of the issues identified in this thesis are not confined to Irish adaptation

planning but are representative of similar challenges in other jurisdictions. This research has demonstrated that whilst distinguishing between incremental and transformative change may be difficult in practice given its context-specific nature, this should not detract efforts from doing so. Rather, understanding how adaptation is characterised and understood is crucial. Without a consideration of what adaptation means to stakeholders affecting or affected by such changes, fairness and justice in adaptation is unlikely to be guaranteed.

The context-specific nature of adaptation means that assessing losses arising from climate change requires understanding both tangible, monetary damages and intangible assets. In light of significant expenditure proposed for structural flood defence planning in the coming decade in Ireland, it is an opportune time for policymakers and decisionmakers to reflect on the importance of this point. Different communities will ultimately have different concepts of loss arising from climate change. For some, protecting physical assets will remain the over-riding concern. Conversely, whilst intangible assets have largely been ignored by policymakers in adaptation planning to date, failing to account for such losses is likely to prove counterintuitive to fair or cost-efficient adaptation. The context-specific nature of how individuals experience loss means that adaptation is likely to be heavily dependent on diverse stakeholders co-producing and negotiating various knowledge forms and adaptation measures in the long-term. As Freire notes, *“if true commitment to the people, involving the transformation of the reality by which they are oppressed, requires a theory of transforming action, this theory cannot fail to assign the people a fundamental role in the transformation process (Freire, 2000: 126).* As the scale and intensity of climate change impacts and adaptation efforts increase, integrating innovative technologies into public participation practices will also be crucial to assist individuals in contextualising potential losses.

This thesis has re-emphasized the interconnected and compounding nature of many barriers associated with both incremental and transformative

adaptation, and some of the primary issues which decision-makers, policymakers and communities are likely to have to contend with now and in the future unless fundamental changes are made to both societal and governance practices concerning adaptation planning. Whilst some form of transformative adaptation in response to climate change impacts is now inevitable, one way of minimising such transformative adaptations is for fundamental societal transformations to mitigate further climate change before forced transformative adaptations become pervasive and are seen as an increasingly necessary adaptive response. Specifically, the diversity of the case studies presented offer useful insights for policy and practice of how and why various adaptation measures come to be resisted and can be navigated by various stakeholders involved in adaptation planning.

7 References

- Aall, C., Juhola, S., Hovelsrud, G.K. (2015) Local climate change adaptation: moving from adjustments to transformation? *Local Environment*. **20**(4), 401–407.
- Adger, N. (2013) Emerging dimensions of fair process for adaptation decision-making. In J. Palutikof, S. L. Boulter, A. J. Ash, M. S. Smith, M. Parry, M. Waschka, & D. Guitart, eds. *Climate Adaptation Futures*. John Wiley & Sons, pp. 69–74.
- Adger, N., Arnell, N.W., Tompkins, E.L. (2005) Successful adaptation to climate change across scales. *Global Environmental Change*. **15**(2), 77–86.
- Adger, N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D.R., Naess, L.O., Wolf, J., Wreford, A. (2009) Are there social limits to adaptation to climate change? *Climatic Change*. **93**(3–4), 335–354.
- Adger, N., Lorenzoni, I., O’Brien, K. eds. (2009) *Adapting to Climate Change: Thresholds, Values, Governance*. Cambridge: Cambridge University Press.
- Adger, W.N. (2016) Place, well-being, and fairness shape priorities for adaptation to climate change. *Global Environmental Change*. **38**, A1–A3.
- Adger, W.N. (2003) Social Capital, Collective Action, and Adaptation to Climate Change. *Economic Geography*. **79**(4), 387–404.
- Adger, W.N., Barnett, J. (2009) Four reasons for concern about adaptation to climate change. *Environment and Planning A*. **41**(12), 2800 – 2805.
- Adger, W.N., Barnett, J., Brown, K., Marshall, N., O’Brien, K. (2013) Cultural dimensions of climate change impacts and adaptation. *Nature Climate Change*. **3**(2), 112–117.
- Adger, W.N., Quinn, T., Lorenzoni, I., Murphy, C. (2016) Sharing the Pain: Perceptions of Fairness Affect Private and Public Response to Hazards. *Annals of the American Association of Geographers*. **106**(5), 1079–1096.
- Adger, W.N., Quinn, T., Lorenzoni, I., Murphy, C., Sweeney, J. (2013) Changing social contracts in climate-change adaptation. *Nature Climate Change*. **3**(4), 330–333.
- Agrawal, A. (2010) Local Institutions and Adaptation to Climate Change. In R. Mearns & A. Norton, eds. *Social Dimensions of Climate Change : Equity and Vulnerability in a Warming World*. Washington D.C.: World Bank, pp. 173–198.
- Agyeman, J., Devine-Wright, P., Prange, J. (2009) Close to the Edge, down by the River? Joining up Managed Retreat and Place Attachment in a Climate Changed World. *Environment and Planning A*. **41**(3), 509–513.

- Allred, S.B., Ross-Davis, A. (2011) The drop-off and pick-up method: An approach to reduce nonresponse bias in natural resource surveys. *Small-Scale Forestry*. **10**(3), 305–318.
- Altman, I., Low, S. eds. (1992) *Place Attachment*. New York: Plenum Press.
- Amundsen, H., Berglund, F., Westskog, H. (2010) Overcoming barriers to climate change adaptation—a question of multilevel governance? *Environment & Planning C: Government & Policy*. **28**(2), 276–289.
- Anderson, N. (2015) Battle of Clontarf over new flood wall. *Irish Independent* [online] 2 December 2015.
- Anon. (2011) Forces gather at Clontarf for Battle of Flood Barrier. *The Irish Times* [online] 15 October 2011.
- Anton, C.E., Lawrence, C. (2014) Home is where the heart is: The effect of place of residence on place attachment and community participation. *Journal of Environmental Psychology*. **40**, 451–461.
- Anton, C.E., Lawrence, C. (2016) The relationship between place attachment: The theory of planned behaviour and residents' response to place change. *Journal of Environmental Psychology*. **47**, 145–154.
- Antwi-Agyei, P., Dougill, A.J., Stringer, L.C. (2015) Barriers to climate change adaptation: evidence from northeast Ghana in the context of a systematic literature review. *Climate and Development*. **7**(4), 297–309.
- Appleton, K., Lovett, A. (2003) GIS-based visualisation of rural landscapes: defining 'sufficient' realism for environmental decision-making. *Landscape and Urban Planning*. **65**(3), 117–131.
- Archie, K.M. (2014) Mountain communities and climate change adaptation: Barriers to planning and hurdles to implementation in the Southern Rocky Mountain Region of North America. *Mitigation and adaptation strategies for global change*. **19**(5), 569–587.
- Armah, F.A., Luginaah, I., Hambati, H., Chuenpagdee, R., Campbell, G. (2015) Assessing barriers to adaptation to climate change in coastal Tanzania: Does where you live matter? *Population and Environment*. **37**(2), 231–263.
- Armitage, D., Plummer, R. (2010) Adapting and Transforming: Governance for Navigating Change. In R. Plummer & D. Armitage, eds. *Adaptive capacity and environmental governance*. Berlin, Germany: Springer, pp. 286–302.
- Arnell, N., Charlton, M. (2009) Adapting to the effects of climate change on water supply reliability. In N. Adger, I. Lorenzoni, & K. O'Brien, eds. *Adapting to Climate Change: Thresholds, Values, Governance*. Cambridge: Cambridge University Press, pp. 42–53.

Artur, L., Hilhorst, D. (2012) Everyday realities of climate change adaptation in Mozambique. *Global Environmental Change*. **22**(2), 529–536.

Asara, V., Otero, I., Demaria, F., Corbera, E. (2015) Socially sustainable degrowth as a social–ecological transformation: repoliticizing sustainability. *Sustainability Science*, 1–10.

Bahadur, A., Tanner, T. (2014) Transformational resilience thinking: putting people, power and politics at the heart of urban climate resilience. *Environment and Urbanization*. **26**(1), 200–214.

Bahadur, A., Tanner, T. (2012) *Transformation: theory and practice in climate change and development*. Brighton: Institute of Development Studies University of Sussex.

Ball, J., Capanni, N., Watt, S. (2005) Virtual reality for mutual understanding in landscape planning. *Development*. **2**.

Bardsley, D.K. (2015) Limits to adaptation or a second modernity? Responses to climate change risk in the context of failing socio-ecosystems. *Environment, Development and Sustainability*. **17**(1), 41–55.

Barnett, J., Evans, L.S., Gross, C., Kiem, A.S., Kingsford, R.T., Palutikof, J.P., Pickering, C.M., Smithers, S.G. (2015) From barriers to limits to climate change adaptation: Path dependency and the speed of change. *Ecology & Society*. **20**(3), 324–334.

Barnett, J., Tschakert, P., Head, L., Adger, W.N. (2016) A science of loss. *Nature Climate Change*. **6**(11), 976–978.

Beery, T., Jönsson, K.I. (2017) Outdoor recreation and place attachment: Exploring the potential of outdoor recreation within a UNESCO Biosphere Reserve. *Journal of Outdoor Recreation and Tourism*. **17**, 54–63.

Béné, C., Godfrey Wood, R., Newsham, A., Davies, M. (2012) *Resilience: New Utopia or New Tyranny? Reflection about the Potentials and Limits of the Concept of Resilience in Relation to Vulnerability Reduction Programmes*. Brighton: Institute of Development Studies.

Benson, D., Fritsch, O., Cook, H., Schmid, M. (2014) Evaluating participation in WFD river basin management in England and Wales: Processes, communities, outputs and outcomes. *Land Use Policy*. **38**, 213–222.

Bernardo, F. (2013) Impact of place attachment on risk perception: Exploring the multidimensionality of risk and its magnitude. *Estudios de Psicología*. **34**(3), 323–329.

Berrang-Ford, L., Ford, J.D., Lesnikowski, A., Poutiainen, C., Barrera, M., Heymann, S.J. (2014) What drives national adaptation? A global assessment. *Climatic Change*. **124**(1–2), 441–450.

- Berrang-Ford, L., Ford, J.D., Paterson, J. (2011) Are we adapting to climate change? *Global environmental change*. **21**(1), 25–33.
- Bierbaum, R., Smith, J.B., Lee, A., Blair, M., Carter, L., Iii, F.S.C., Fleming, P., Ruffo, S., Stults, M., McNeeley, S., Wasley, E., Verduzco, L. (2012) A comprehensive review of climate adaptation in the United States: more than before, but less than needed. *Mitigation and Adaptation Strategies for Global Change*. **18**(3), 361–406.
- Biermann, F., Gupta, A. (2011) Accountability and legitimacy in earth system governance: A research framework. *Ecological economics*. **70**(11), 1856–1864.
- Biesbroek, G.R., Klostermann, J.E.M., Termeer, C.J.A.M., Kabat, P. (2013) On the nature of barriers to climate change adaptation. *Regional Environmental Change*. **13**(5), 1119–1129.
- Biesbroek, R. (2014) *Challenging barriers in the governance of climate change adaptation*. Wageningen: Wageningen University.
- Biesbroek, R., Klostermann, J., Termeer, C., Kabat, P. (2011) Barriers to climate change adaptation in the Netherlands. *Climate law*. **2**(2), 181–199.
- van Bommel, S., Blackmore, C., Foster, N., de Vries, J. (2016) Performing and orchestrating governance learning for systemic transformation in practice for climate change adaptation. *Outlook on Agriculture*. **45**(4), 231–237.
- Boyle, M. (2000) Euro-regionalism and struggles over scales of governance: the politics of Ireland's regionalisation approach to Structural Fund allocations 2000–2006. *Political Geography*. **19**(6), 737–769.
- Brand, U., Brunnengräber, A., Andresen, S., Driessen, P., Haberl, H., Hausknost, D., Helgenberger, S., Hollaender, K., Læssøe, J., Oberthür, S., Omann, I., Schneidewind, U. (2013) Debating transformation in multiple crises. In *World Social Science Report*. Paris: ISSC, UNESCO, pp. 480–484.
- Braun, V., Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*. **3**(2), 77–101.
- Breakwell, G.M. (1993) Social representations and social identity. *Papers on social representations*. **2**(3), 198–217.
- Brehm, J.M. (2007) Community attachment: The complexity and consequence of the natural environment facet. *Human Ecology*. **35**(4), 477–488.
- Brown, B., Perkins, D.D., Brown, G. (2003) Place attachment in a revitalizing neighborhood: Individual and block levels of analysis. *Journal of environmental psychology*. **23**(3), 259–271.

- Brown, B.B., Perkins, D.D. (1992) Disruptions in Place Attachment. In I. Altman & S. M. Low, eds. *Place Attachment*. Human Behavior and Environment. Springer US, pp. 279–304.
- Brown, G., Raymond, C. (2007) The relationship between place attachment and landscape values: Toward mapping place attachment. *Applied Geography*. **27**(2), 89–111.
- Bryan, E., Ringler, C., Okoba, B., Roncoli, C., Silvestri, S., Herrero, M. (2013) Adapting agriculture to climate change in Kenya: Household strategies and determinants. *Journal of environmental management*. **114**, 26–35.
- Bryman, A. (2012) *Social Research Methods*. 4th ed. New York: Oxford University Press.
- Bulkeley, H., Mol, A.P.J. (2003) Participation and Environmental Governance: Consensus, Ambivalence and Debate. *Environmental Values*. **12**(2), 143–154.
- Burch, S. (2010a) In pursuit of resilient, low carbon communities: An examination of barriers to action in three Canadian cities. *Energy Policy*. **38**(12), 7575–7585.
- Burch, S. (2010b) Transforming barriers into enablers of action on climate change: Insights from three municipal case studies in British Columbia, Canada. *Global Environmental Change*. **20**(2), 287–297.
- Burch, S. (2016) *Will Ontario's Climate Change Action Plan Transform Communities?* Ontario: Centre for International Governance Innovation.
- Burch, S., Shaw, A., Dale, A., Robinson, J. (2014) Triggering transformative change: A development path approach to climate change response in communities. *Climate Policy (Earthscan)*. **14**(4), 467–487.
- Burch, S., Sheppard, S.R., Shaw, A., Flanders, D. (2010) Planning for climate change in a flood-prone community: municipal barriers to policy action and the use of visualizations as decision-support tools. *Journal of Flood Risk Management*. **3**(2), 126–139.
- Burgess, M.M., Williams-Jones, B. (2004) Social Contract Theory and Just Decision Making: Lessons from Genetic Testing for the BRCA Mutations. *Kennedy Institute of Ethics Journal*. **14**(2), 115–142.
- Burley, D., Jenkins, P., Laska, S., Davis, T. (2007) Place Attachment and Environmental Change in Coastal Louisiana. *Organization & Environment*. **20**(3), 347–366.
- Burton, I. (2009) Climate change and the adaptation deficit. In E. L. F. Schipper & I. Burton, eds. *Earthscan Reader on Adaptation to Climate Change*. London: Earthscan, pp. 89–95.

- Callanan, M., Tatham, M. (2014) Territorial interest representation in the European Union: actors, objectives and strategies. *Journal of European Public Policy*. **21**(2), 188–210.
- Carroll, B., Morbey, H., Balogh, R., Araoz, G. (2009) Flooded homes, broken bonds, the meaning of home, psychological processes and their impact on psychological health in a disaster. *Health & Place*. **15**(2), 540–547.
- Carter, J.G., Cavan, G., Connelly, A., Guy, S., Handley, J., Kazmierczak, A. (2015) Climate change and the city: Building capacity for urban adaptation. *Progress in Planning*. **95**, 1–66.
- Central Statistics Office (2014) Census 2011 Small Area Population Statistics. [online]. Available from: <http://www.cso.ie/en/census/census2011smallareapopulationstatistics/s/> [Accessed May 10, 2016].
- Central Statistics Office (2013) Regional Population Projections 2016 - 2031. [online]. Available from: <http://www.cso.ie/en/releasesandpublications/er/rpp/regionalpopulationprojections2016-2031/> [Accessed September 21, 2016].
- Change.org (2015) Owen Keegan of Dublin City Council: Stop the Clontarf Sea Wall. [online]. Available from: https://www.change.org/p/owen-keegan-of-dublin-city-council-stop-the-clontarf-sea-wall/c?source_location=petition_show [Accessed May 26, 2017].
- Chapin III, F.S., Carpenter, S.R., Kofinas, G.P., Folke, C., Abel, N., Clark, W.C., Olsson, P., Smith, D.M.S., Walker, B., Young, O.R., Berkes, F., Biggs, R., Grove, J.M., Naylor, R.L., Pinkerton, E., Steffen, W., Swanson, F.J. (2010) Ecosystem stewardship: Sustainability strategies for a rapidly changing planet. *Trends in Ecology & Evolution*. **25**(4), 241–249.
- Chapin III, S., Matson, P., Mooney, H. (2002) *Principles of Terrestrial Ecosystem Ecology*. New York: Springer.
- Cheng, C.-K., Chou, S.-F. (2015) The Influence of Place Change on Place Bonding: A Longitudinal Panel Study of Renovated Park Users. *Leisure Sciences*. **37**(5), 391–414.
- Chornesky, E.A., Ackerly, D.D., Beier, P., Davis, F.W., Flint, L.E., Lawler, J.J., Moyle, P.B., Moritz, M.A., Scoonover, M., Byrd, K., Alvarez, P., Heller, N.E., Micheli, E.R., Weiss, S.B. (2015) Adapting California's Ecosystems to a Changing Climate. *BioScience*. **65**(3), 247–262.
- Chow, K., Healey, M. (2008) Place attachment and place identity: First-year undergraduates making the transition from home to university. *Journal of Environmental Psychology*. **28**(4), 362–372.

Church, J., Clarke, P., Cazenave, A., Gregory, J., Jevrejeva, S., Levermann, A., Merrifield, M., Milne, G., Nerem, R., Nunn, P., Payne, A., Pfeffer, W., Stammer, D., Unnikrishnan, A. (2013) Sea Level Change. In T. Stocker, D. Qin, G. Plattner, M. Tignor, S. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, & P. Midgley, eds. *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, UK: Cambridge University Press, pp. 1137–1216.

Ciscar, J., Feyen, L., Soria, A., Lavalle, C., Raes, F., Perry, M., Nemry, F., Demirel, H., Rozsai, M., Dosio, A., Donatelli, M., Srivastava, A., Fumagalli, D., Niemeyer, S., Shrestha, S., Ciaian, P., Himics, M., Van Doorslaer, B., Barrios, S., Ibáñez, N., Forzieri, G., Rojas, R., Bianchi, A., Dowling, P., Camia, A., Libertà, G., San Miguel, J., de Rigo, D., Caudullo, G., Barredo, J., Paci, D., Pycroft, J., Saveyn, B., Van Regemorter, D., Revesz, T., Vandyck, T., Vrontisi, Z., Baranzelli, C., Vandecasteele, I., Bastita e Silva, F., Ibarreta, D. (2014) *Climate Impacts in Europe. The JRC PESETA II Project*. Luxembourg: Publications Office of the European Union.

Clarke, D., Murphy, C., Lorenzoni, I. (2016) Barriers to Transformative Adaptation: Responses to Flood Risk in Ireland. *Journal of Extreme Events*. **3**(2), 1650010.

Clément, V., Rivera, J. (2016) From Adaptation to Transformation An Extended Research Agenda for Organizational Resilience to Adversity in the Natural Environment. *Organization & Environment*, 1086026616658333.

Clontarf.ie (2011a) Clontarf Residents Association and Clontarf Business Association: Letter to Councillors, 4 December 2011.

Clontarf.ie (2011b) *Current position of the Clontarf Residents' Association and Clontarf Business Association*. Dublin: Clontarf Residents' Association and Clontarf Business Association, 7 November 2011.

Clontarf.ie (2011c) Flood Defences - But at What Cost? [online] 8 October 2011. Available from: <http://www.clontarf.ie/news/flood-defences-but-at-what-cost> [Accessed September 11, 2016].

Clontarf.ie (2015a) Sea Wall in Clontarf - Latest Update. [online] 5 November 2015. Available from: <http://www.clontarf.ie/news/sea-wall-in-clontarf-latest-update> [Accessed 1 December, 2016].

Clontarf.ie (2015b) Statement from Sean Haughey - Sea Wall [online] 3 November 2015. Available from: <https://www.clontarf.ie/news/statement-from-sean-haughey-sea-wall> [Accessed 8 November, 2016].

Clontarf.ie (2015c) Stop the Sea Wall - How You Can Help?! [online] 9 November 2015. Available from: <http://www.clontarf.ie/news/stop-the-sea-wall-how-you-can-help> [Accessed 26 September, 2016].

- Cloutier, G., Joerin, F., Dubois, C., Labarthe, M., Legay, C., Viens, D. (2015) Planning adaptation based on local actors' knowledge and participation: a climate governance experiment. *Climate Policy*. **15**(4), 458–474.
- Colloff, M.J., Martín-López, B., Lavorel, S., Locatelli, B., Gorddard, R., Longaretti, P.-Y., Walters, G., van Kerkhoff, L., Wyborn, C., Coreau, A., Wise, R.M., Dunlop, M., Degeorges, P., Grantham, H., Overton, I.C., Williams, R.D., Doherty, M.D., Capon, T., Sanderson, T., Murphy, H.T. (2016) An integrative research framework for enabling transformative adaptation. *Environmental Science & Policy*. **In Press**.
- Cooper, J.A.G., McKenna, J. (2008) Social justice in coastal erosion management: The temporal and spatial dimensions. *Geoforum*. **39**(1), 294–306.
- Council Directive 2003/35/EC Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC. *Official Journal of the European Communities*. **Commission of the European Communities**, Brussels.
- Council Directive 2007/60/EC Directive 2007/60/EC of the European Parliament and of the Council on the assessment and management of flood risks. *Official Journal of the European Union*. **Commission of the European Communities**, Brussels.
- Cox, G.R., Tucker, C.J., Sharp, E.H., Gundy, K.T.V., Rebellon, C.J. (2014) Practical Considerations: Community Context in a Declining Rural Economy and Emerging Adults' Educational and Occupational Aspirations. *Emerging Adulthood*. **2**(3), 173–183.
- Craig, R.K. (2010) *'Stationarity is Dead' - Long Live Transformation: Five Principles for Climate Change Adaptation Law*. Rochester, NY: Social Science Research Network.
- Creswell, J.W. (2013) *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications.
- Cretney, R.M., Bond, S. (2017) Shifting relationships to place: a relational place-based perspective on SES resilience. *Urban Geography*. **38**(1), 8–24.
- Dale, V.H., Efroymson, R.A., Kline, K.L. (2011) The land use–climate change–energy nexus. *Landscape Ecology*. **26**(6), 755–773.
- Davoudi, S., Brooks, E. (2012) *Environmental Justice and the City: Full Report*. Newcastle: Global Urban Research Unit.

- De Dominicis, S., Fornara, F., Ganucci Cancellieri, U., Twigger-Ross, C., Bonaiuto, M. (2015) We are at risk, and so what? Place attachment, environmental risk perceptions and preventive coping behaviours. *Journal of Environmental Psychology*. **43**, 66–78.
- Department of Environment, Heritage and Local Government (2009) *The Planning System and Flood Risk Management: Guidelines for Planning Authorities*. Dublin: Department of Environment, Heritage and Local Government.
- Department of Housing, Planning, Community and Local Government (2015) *Dublin Port Company - Alexandra Basin Re-development*. Dublin: Department of Housing, Planning, Community and Local Government.
- Department of the Environment, Community and Local Government (2012) *National Climate Change Adaptation Framework*. Dublin: Department of the Environment, Community and Local Government.
- Desmond, M., O'Brien, P., McGovern, F. (2009) *A Summary of the State of Knowledge on Climate Change Impacts for Ireland*. Wexford: Environmental Protection Agency.
- Devine-Wright, P. (2012) Explaining 'NIMBY' Objections to a Power Line: The Role of Personal, Place Attachment and Project-Related Factors. *Environment and Behavior*. **45**(6), 761–781.
- Devine-Wright, P. (2011a) Place attachment and public acceptance of renewable energy: A tidal energy case study. *Journal of Environmental Psychology*. **31**(4), 336–343.
- Devine-Wright, P. (2011b) Public engagement with large-scale renewable energy technologies: breaking the cycle of NIMBYism. *Wiley Interdisciplinary Reviews: Climate Change*. **2**(1), 19–26.
- Devine-Wright, P. (2009) Rethinking NIMBYism: The role of place attachment and place identity in explaining place-protective action. *Journal of Community & Applied Social Psychology*. **19**(6), 426–441.
- Devine-Wright, P. (2013) Think global, act local? The relevance of place attachments and place identities in a climate changed world. *Global Environmental Change*. **23**(1), 61–69.
- Devine-Wright, P., Howes, Y. (2010) Disruption to place attachment and the protection of restorative environments: A wind energy case study. *Journal of Environmental Psychology*. **30**(3), 271–280.
- Devisscher, T., Vignola, R., Coll Besa, M., Cronenbold, R., Pacheco, N., Schillinger, R., Canedi, V., Sandoval, C., Gonzalez, D., Leclerc, G. (2016) Understanding the socio-institutional context to support adaptation for future water security in forest landscapes. *Ecology and Society*. **21**(4).

- Devitt, C., O'Neill, E. (2016) The framing of two major flood episodes in the Irish print news media: Implications for societal adaptation to living with flood risk. *Public Understanding of Science*. **26**(7), 872–888.
- Dinshaw, A., Fisher, S., McGray, H., Rai, N., Schaar, J. (2014) *Monitoring and Evaluation of Climate Change Adaptation*. Paris: OECD Publishing.
- Donnelly, C., Greuell, W., Andersson, J., Gerten, D., Pisacane, G., Roudier, P., Ludwig, F. (2017) Impacts of climate change on European hydrology at 1.5, 2 and 3 degrees mean global warming above preindustrial level. *Climatic Change*. **143**(1–2), 13–26.
- Driscoll, D.L., Appiah-Yeboah, A., Salib, P., Rupert, D.J. (2007) Merging qualitative and quantitative data in mixed methods research: How to and why not. *Ecological and Environmental Anthropology (University of Georgia)*, 18.
- Dublin City Council (2011a) *Clontarf Flood Defence Project: Final Report to Dublin City Council Meeting 5th November 2011*. Dublin: Dublin City Council.
- Dublin City Council (2011b) Clontarf Flood Defence Scheme. [online]. Available from: <http://www.dublincity.ie/clontarfflooddefence> [Accessed 21 September, 2016].
- Dublin City Council (2009) *Dollymount Promenade and Flood Protection Project (DPFPP) Environmental Impact Statement*. Dublin: Dublin City Council.
- Dublin City Council (2015a) *Dollymount Promenade Flood Defences - Public Submissions*. Dublin: Dublin City Council.
- Dublin City Council (2015b) *Sutton to Sandycove Promenade and Cycleway (S2S): Frequently Asked Questions*. Dublin: Dublin City Council.
- Dublin City Council (2017) *Sutton to Sandycove Sea Wall Works – James Larkin Road Sea Wall Works Part VIII Proposals*. Dublin: Roughan & O'Donovan Consultants.
- Dunne, S., Hanafin, J., Lynch, P., McGrath, R., Nishimura, E., Nolan, P., Ratnam, J., Semmler, T., Sweeney, C., Varghese, S., Wang, S. (2008) *Ireland in a Warmer World: Scientific Predictions of the Irish Climate in the Twenty-First Century*. R. McGrath & P. Lynch, eds. Dublin: Community Climate Change Consortium for Ireland (C4I).
- Dupuis, J., Biesbroek, R. (2013) Comparing apples and oranges: The dependent variable problem in comparing and evaluating climate change adaptation policies. *Global Environmental Change*. **23**(6), 1476–1487.

Eisenack, K., Moser, S.C., Hoffmann, E., Klein, R.J., Oberlack, C., Pechan, A., Rotter, M., Termeer, C.J. (2014) Explaining and overcoming barriers to climate change adaptation. *Nature Climate Change*. **4**(10), 867–872.

Eisenack, K., Stecker, R. (2012) A framework for analyzing climate change adaptations as actions. *Mitigation and Adaptation Strategies for Global Change*. **17**(3), 243–260.

Eisenhardt, K.M., Graebner, M.E. (2007) Theory building from cases: Opportunities and challenges. *Academy of management journal*. **50**(1), 25–32.

Ekstrom, J.A., Moser, S.C. (2014) Identifying and overcoming barriers in urban climate adaptation: Case study findings from the San Francisco Bay Area, California, USA. *Urban Climate*. **9**, 54–74.

Ekstrom, J.A., Moser, S.C., Tom, M. (2011) *Barriers to adaptation: A diagnostic framework*. Sacramento, CA: Lawrence Berkeley National Laboratory.

Ellis, N., Albrecht, G. (2017) Climate change threats to family farmers' sense of place and mental wellbeing: A case study from the Western Australian Wheatbelt. *Social Science & Medicine*. **In Press**.

Engle, N.L., Lemos, M.C. (2010) Unpacking governance: building adaptive capacity to climate change of river basins in Brazil. *Global Environmental Change*. **20**(1), 4–13.

Eolas (2009) The case for an Environmental Climate Change Park. [online]. Available from: <http://www.eolasmagazine.ie/the-case-for-an-environmental-climate-change-park/> [Accessed March 3, 2017].

Esterhuyse, W.P. (2003) The challenge of transformation: Breaking the barriers. *South African Journal of Business Management*. **34**(3), 1–8.

European Commission (2014) *Adaptation to climate change*. Brussels: European Commission.

Ewing, M., Hough, A., Amajirionwu, M. (2011) *Assessing Access To Information, Participation, and Justice in Environmental Decision Making in Ireland*. Wexford: Environmental Protection Agency.

Facebook.com (2017) Clontarf.ie Video Update 2. [online]. Available from: <https://www.facebook.com/Clontarf.ie/> [Accessed May 29, 2017].

Facebook.com (2015) Save Our Seafront. [online]. Available from: <https://www.facebook.com/pg/SaveOurSeafrontClontarf/posts/> [Accessed May 26, 2017].

- Falaleeva, M., O'Mahony, C., Gray, S., Desmond, M., Gault, J., Cummins, V. (2011) Towards climate adaptation and coastal governance in Ireland: Integrated architecture for effective management? *Marine Policy*. **35**(6), 784–793.
- Fazey, I., Moug, P., Allen, S., Beckmann, K., Blackwood, D., Bonaventura, M., Burnett, K., Danson, M., Falconer, R., Gagnon, A.S., Harkness, R., Hodgson, A., Holm, L., Irvine, K.N., Low, R., Lyon, C., Moss, A., Moran, C., Naylor, L., O'Brien, K., Russell, S., Skerratt, S., Rao-Williams, J., Wolstenholme, R. (2017) Transformation in a changing climate: a research agenda. *Climate and Development*. **In Press**.
- Fenton, A., Paavola, J., Tallontire, A. (2017) Autonomous adaptation to riverine flooding in Satkhira District, Bangladesh: implications for adaptation planning. *Regional Environmental Change*. **In Press**.
- Fenton, A., Tallontire, A., Paavola, J. (2016) *Autonomous adaptation to riverine flooding in Satkhira District, Bangladesh: insights for transformation*. Leeds: Centre for Climate Change Economics and Policy.
- Feola, G. (2015) Societal transformation in response to global environmental change: A review of emerging concepts. *Ambio*. **44**(5), 376–390.
- Few, R., Brown, K., Tompkins, E. (2007) Public participation and climate change adaptation: Avoiding the illusion of inclusion. *Climate Policy*. **7**(1), 46–59.
- Fischer, A., Peters, V., Vávra, J., Neebe, M., Megyesi, B. (2011) Energy use, climate change and folk psychology: Does sustainability have a chance? Results from a qualitative study in five European countries. *Global Environmental Change*. **21**(3), 1025–1034.
- Fleming, A., Park, S.E., Marshall, N.A. (2015) Enhancing adaptation outcomes for transformation: Climate change in the Australian wine industry. *Journal of Wine Research*. **26**(2), 99–114.
- Flyvbjerg, B. (2006) Five misunderstandings about case-study research. *Qualitative inquiry*. **12**(2), 219–245.
- Folke, C., Carpenter, S., Walker, B., Scheffer, M., Chapin, T., Rockström, J. (2010) Resilience Thinking: Integrating Resilience, Adaptability and Transformability. *Ecology and Society*. **15**(4), 20.
- Formanowicz, M., Sczesny, S. (2016) Gender-Fair Language and Professional Self-Reference: The Case of Female Psychologists in Polish. *Journal of Mixed Methods Research*. **10**(1), 64–81.
- Fraser, N. (1998) *Social justice in the age of identity politics: Redistribution, recognition, participation*. Social Science Research Center Berlin (WZB).

- Freire, P. (2000) *Pedagogy of the oppressed*. New York: Continuum.
- Fresque-Baxter, J.A., Armitage, D. (2012) Place identity and climate change adaptation: A synthesis and framework for understanding. *Wiley Interdisciplinary Reviews: Climate Change*. **3**(3), 251–266.
- Fried, M. (1982) Residential Attachment: Sources of Residential and Community Satisfaction. *Journal of Social Issues*. **38**(3), 107–119.
- Füssel, H.-M. (2007) Adaptation planning for climate change: concepts, assessment approaches, and key lessons. *Sustainability science*. **2**(2), 265–275.
- Gerring, J. (2004) What Is a Case Study and What Is It Good for? *The American Political Science Review*. **98**(2), 341–354.
- Gibson, T.D., Pelling, M., Ghosh, A., Matyas, D., Siddiqi, A., Solecki, W., Johnson, L., Kenney, C., Johnston, D., Du Plessis, R. (2016) Pathways for Transformation: Disaster Risk Management to Enhance Resilience to Extreme Events. *Journal of Extreme Events*. **3**(1), 1671002.
- Gifford, R.D., Chen, A.K.S. (2016) Why aren't we taking action? Psychological barriers to climate-positive food choices. *Climatic Change*, 1–14.
- Glaser, B.G., Strauss, A.L. (2009) *The discovery of grounded theory: Strategies for qualitative research*. New York: Transaction Publishers.
- Graham, S., Barnett, J., Fincher, R., Hurlimann, A., Mortreux, C. (2014) Local values for fairer adaptation to sea-level rise: A typology of residents and their lived values in Lakes Entrance, Australia. *Global Environmental Change*. **29**, 41–52.
- Graham, S., Barnett, J., Fincher, R., Hurlimann, A., Mortreux, C., Waters, E. (2013) The social values at risk from sea-level rise. *Environmental Impact Assessment Review*. **41**, 45–52.
- Gray, C.L., Mueller, V. (2012) Natural disasters and population mobility in Bangladesh. *Proceedings of the National Academy of Sciences*. **109**(16), 6000–6005.
- Gross, C. (2007) Community perspectives of wind energy in Australia: The application of a justice and community fairness framework to increase social acceptance. *Energy Policy*. **35**(5), 2727–2736.
- Grothmann, T., Patt, A. (2005) Adaptive capacity and human cognition: The process of individual adaptation to climate change. *Global Environmental Change*. **15**(3), 199–213.

- Håkon Inderberg, T. (2011) Institutional constraints to adaptive capacity: adaptability to climate change in the Norwegian electricity sector. *Local Environment*. **16**(4), 303–317.
- Hall, J.W., Sayers, P.B., Walkden, M.J.A., Panzeri, M. (2006) Impacts of climate change on coastal flood risk in England and Wales: 2030–2100. *Philosophical Transactions of the Royal Society of London A: Mathematical, Physical and Engineering Sciences*. **364**(1841), 1027–1049.
- Hallegatte, S. (2009) Strategies to adapt to an uncertain climate change. *Global Environmental Change*. **19**(2), 240–247.
- Hallgren, K.A. (2012) Computing Inter-Rater Reliability for Observational Data: An Overview and Tutorial. *Tutorials in Quantitative Methods for Psychology*. **8**(1), 23–34.
- Hamin, E.M., Gurran, N. (2009) Urban form and climate change: Balancing adaptation and mitigation in the US and Australia. *Habitat international*. **33**(3), 238–245.
- Hamin, E.M., Gurran, N., Emlinger, A.M. (2014) Barriers to Municipal Climate Adaptation: Examples From Coastal Massachusetts' Smaller Cities and Towns. *Journal of the American Planning Association*. **80**(2), 110–122.
- Handmer, J.W., Dovers, S.R. (1996) A Typology of Resilience: Rethinking Institutions for Sustainable Development. *Organization & Environment*. **9**(4), 482–511.
- Hanjra, M.A., Qureshi, M.E. (2010) Global water crisis and future food security in an era of climate change. *Food Policy*. **35**(5), 365–377.
- Harries, T., Penning-Rowsell, E. (2011) Victim pressure, institutional inertia and climate change adaptation: The case of flood risk. *Global Environmental Change*. **21**(1), 188–197.
- Harrison, J.L., Montgomery, C.A., Bliss, J.C. (2016) Beyond the Monolith: The Role of Bonding, Bridging, and Linking Social Capital in the Cycle of Adaptive Capacity. *Society & Natural Resources*. **0**(0), 1–15.
- Hawkins, R.L., Maurer, K. (2009) Bonding, bridging and linking: how social capital operated in New Orleans following Hurricane Katrina. *British Journal of Social Work*. **40**(6), 1777–1793.
- Hedrén, J., Linnér, B.-O. (2009) Utopian thought and the politics of sustainable development. *Futures*. **41**(4), 210–219.
- Hernández, B., Carmen Hidalgo, M., Salazar-Laplace, M.E., Hess, S. (2007) Place attachment and place identity in natives and non-natives. *Journal of Environmental Psychology*. **27**(4), 310–319.

Hess, J.J., Malilay, J.N., Parkinson, A.J. (2008) Climate Change: The Importance of Place. *American Journal of Preventive Medicine*. **35**(5), 468–478.

Hidalgo, M.C., Hernández, B. (2001) Place Attachment: Conceptual and Empirical Questions. *Journal of Environmental Psychology*. **21**(3), 273–281.

Hilliard, M. (2016) Insurance sector rules out blanket flood cover. *The Irish Times* [online] 26 January 2016.

Holling, C., Carpenter, S., Brock, W., Gunderson, L.H. (2002) Discoveries for sustainable futures. In L. Gunderson & C. Holling, eds. *Panarchy: Understanding Transformations in Human and Natural Systems*. Washington: Island Press, pp. 395–417.

Houses of the Oireachtas (2015) Dáil Éireann Debate. *Houses of the Oireachtas*. **896**(4).

Huang, C., Vaneckova, P., Wang, X., FitzGerald, G., Guo, Y., Tong, S. (2011) Constraints and barriers to public health adaptation to climate change: a review of the literature. *American journal of preventive medicine*. **40**(2), 183–190.

Huitema, D., Adger, W.N., Berkhout, F., Massey, E., Mazmanian, D., Munaretto, S., Plummer, R., Termeer, C. (2016) The governance of adaptation: choices, reasons, and effects. Introduction to the Special Feature. *Ecology and Society*. **21**(3).

Huntjens, P., Lebel, L., Pahl-Wostl, C., Camkin, J., Schulze, R., Kranz, N. (2012) Institutional design propositions for the governance of adaptation to climate change in the water sector. *Global Environmental Change*. **22**(1), 67–81.

Insurance Ireland (2015) MOU between Insurance Ireland and the OPW.

IPCC (2012) Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. In C. B. Field, V. R. Barros, T. Stocker, D. Qin, D. Dokken, K. L. Ebi, M. Mastrandrea, K. J. Mach, G. Plattner, S. Allen, M. Tignor, & P. Midgley, eds. *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: Special Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.

IPCC (2014a) *Climate Change 2014: Synthesis Report, Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. R. Pachauri & L. Meyer, eds. Geneva, Switzerland: IPCC.

IPCC (2014b) Summary for Policymakers. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea, & L. L. White, eds. *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, United Kingdom, and New York, NY, USA: Cambridge University Press, pp. 1–32.

Islam, M.M., Sallu, S., Hubacek, K., Paavola, J. (2014) Limits and barriers to adaptation to climate variability and change in Bangladeshi coastal fishing communities. *Marine Policy*. **43**, 208–216.

Jantarasami, L.C., Lawler, J.J., Thomas, C.W. (2010) Institutional barriers to climate change adaptation in US national parks and forests. *Ecology and Society*. **15**(4), 33.

Jeffers, J.M. (2011) The Cork City flood of November 2009: Lessons for flood risk management and climate change adaptation at the urban scale. *Irish Geography*. **44**(1), 61–80.

Jeffers, J.M. (2013a) Double exposures and decision making: Adaptation policy and planning in Ireland's coastal cities during a boom–bust cycle. *Environment and Planning A*. **45**(6), 1436 – 1454.

Jeffers, J.M. (2013b) Integrating vulnerability analysis and risk assessment in flood loss mitigation: An evaluation of barriers and challenges based on evidence from Ireland. *Applied Geography*. **37**, 44–51.

Jeffers, J.M. (2014) Environmental knowledge and human experience: using a historical analysis of flooding in Ireland to challenge contemporary risk narratives and develop creative policy alternatives. *Environmental Hazards*. **13**(3), 229–247.

Jensen, J.L., Rodgers, R. (2001) Cumulating the Intellectual Gold of Case Study Research. *Public Administration Review*. **61**(2), 235–246.

Jick, T.D. (1979) Mixing qualitative and quantitative methods: Triangulation in action. *Administrative science quarterly*. **24**(4), 602–611.

Johnson, C.L., Tunstall, S.M., Penning-Rowsell, E.C. (2005) Floods as Catalysts for Policy Change: Historical Lessons from England and Wales. *International Journal of Water Resources Development*. **21**(4), 561–575.

Johnson, R.B., Onwuegbuzie, A.J. (2004) Mixed methods research: A research paradigm whose time has come. *Educational researcher*. **33**(7), 14–26.

Johnson, R.B., Onwuegbuzie, A.J., Turner, L.A. (2007) Toward a Definition of Mixed Methods Research. *Journal of Mixed Methods Research*. **1**(2), 112–133.

- Joint Committee on the Environment, Heritage and Local Government (2010) *Fourth Report of the Joint Committee The Management of Severe Weather Events in Ireland & Related Matters*. Dublin: Houses of the Oireachtas.
- Jones, L., Boyd, E. (2011) Exploring social barriers to adaptation: Insights from Western Nepal. *Global Environmental Change*. **21**(4), 1262–1274.
- Jongman, B., Ward, P.J., Aerts, J.C. (2012) Global exposure to river and coastal flooding: Long term trends and changes. *Global Environmental Change*. **22**(4), 823–835.
- Jorgensen, B., Stedman, R. (2001) Sense of Place as an Attitude: Lakeshore Owners Attitudes Toward Their Properties. *Journal of Environmental Psychology*. **21**(3), 233–248.
- Juhola, S. (2016) Barriers to the implementation of climate change adaptation in land use planning: A multi-level governance problem? *International Journal of Climate Change Strategies and Management*. **8**(3), 338–355.
- Juhola, S., Keskitalo, E.C.H., Westerhoff, L. (2011) Understanding the framings of climate change adaptation across multiple scales of governance in Europe. *Environmental Politics*. **20**(4), 445–463.
- Juhola, S., Klein, N., Käyhkö, J., Schmid Neset, T.-S. (2017) Climate change transformations in Nordic agriculture? *Journal of Rural Studies*. **51**, 28–36.
- Juhola, S., Westerhoff, L. (2011) Challenges of adaptation to climate change across multiple scales: a case study of network governance in two European countries. *Environmental Science & Policy*. **14**(3), 239–247.
- Kaltenborn, B.P. (1997) Recreation homes in natural settings: factors affecting place attachment. *Norsk Geografisk Tidsskrift - Norwegian Journal of Geography*. **51**(4), 187–198.
- Kaltenborn, B.P., Bjerke, T. (2002) Associations between Landscape Preferences and Place Attachment: A study in Røros, Southern Norway. *Landscape Research*. **27**(4), 381–396.
- Kaltenborn, B.P., Williams, D.R. (2002) The meaning of place: attachments to Femundsmarka National Park, Norway, among tourists and locals. *Norsk Geografisk Tidsskrift*. **56**(3), 189–198.
- Kasarda, J.D., Janowitz, M. (1974) Community Attachment in Mass Society. *American Sociological Review*. **39**(3), 328–339.
- Kates, R.W., Travis, W.R., Wilbanks, T.J. (2012) Transformational adaptation when incremental adaptations to climate change are insufficient. *Proceedings of the National Academy of Sciences*. **109**(19), 7156–7161.

- Keskitalo, E.C.H., Juhola, S., Baron, N., Fyhn, H., Klein, J. (2016) Implementing Local Climate Change Adaptation and Mitigation Actions: The Role of Various Policy Instruments in a Multi-Level Governance Context. *Climate*. **4**(1), 7.
- King, D.A. (2004) Climate change science: adapt, mitigate, or ignore? *Science*. **303**(5655), 176–177.
- Kitchin, R., O’Callaghan, C., Boyle, M., Gleeson, J., Keaveney, K. (2012) Placing neoliberalism: the rise and fall of Ireland’s Celtic Tiger. *Environment and Planning A*. **44**(6), 1302–1326.
- Klein, R.J., Midgley, G.F., Preston, B.L., Alam, M., Berkhout, F.G., Dow, K., Shaw, M.R., Botzen, W., Buhaug, H., Butzer, K.W. (2014) Adaptation opportunities, constraints, and limits. In C. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea, & L. L. White, eds. *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press, pp. 899–943.
- Klein, R.J., Nicholls, R.J., Ragoonaden, S., Capobianco, M., Aston, J., Buckley, E.N. (2001) Technological options for adaptation to climate change in coastal zones. *Journal of Coastal Research*, 531–543.
- Klein, R.J., Schipper, E.L.F., Dessai, S. (2005) Integrating mitigation and adaptation into climate and development policy: three research questions. *Environmental Science & Policy*. **8**(6), 579–588.
- Knez, I. (2005) Attachment and identity as related to a place and its perceived climate. *Journal of Environmental Psychology*. **25**(2), 207–218.
- Korpela, K. (2002) Children’s environment. In R. Bechtel & A. Churchman, eds. *Handbook of Environmental Psychology*. New York: John Wiley & Sons, pp. 363–373.
- Korpela, K.M., Ylén, M., Tyrväinen, L., Silvennoinen, H. (2009) Stability of self-reported favourite places and place attachment over a 10-month period. *Journal of Environmental Psychology*. **29**(1), 95–100.

Kovats, R., Valentini, L., Bouwer, L., Georgopoulou, E., Jacob, D., Martin, E., Rounsevell, M., Soussana, J.-F. (2014) Europe. In V. R. Barros, C. B. Field, D. J. Dokken, M. Mastrandrea, K. J. Mach, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea, & L. L. White, eds. *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, United Kingdom: Cambridge University Press, pp. 1267–1326.

Kristjanson, P., Reid, R.S., Dickson, N., Clark, W.C., Romney, D., Puskur, R., MacMillan, S., Grace, D. (2009) Linking international agricultural research knowledge with action for sustainable development. *Proceedings of the National Academy of Sciences of the United States of America*. **106**(13), 5047–5052.

Kuruppu, N., Liverman, D. (2011) Mental preparation for climate adaptation: The role of cognition and culture in enhancing adaptive capacity of water management in Kiribati. *Global Environmental Change*. **21**(2), 657–669.

Kyle, G.T., Mowen, A.J., Tarrant, M. (2004) Linking place preferences with place meaning: An examination of the relationship between place motivation and place attachment. *Journal of Environmental Psychology*. **24**(4), 439–454.

Larkin, L. (2016) Deluge of complaints for council's 'Berlin Wall on the Clontarf Road'. *Evening Herald*.

Lawrence, J., Sullivan, F., Lash, A., Ide, G., Cameron, C., McGlinchey, L. (2015) Adapting to changing climate risk by local government in New Zealand: Institutional practice barriers and enablers. *Local Environment*. **20**(3), 298–320.

Lehmann, P., Brenck, M., Gebhardt, O., Schaller, S., Süßbauer, E. (2013) Barriers and opportunities for urban adaptation planning: Analytical framework and evidence from cities in Latin America and Germany. *Mitigation and Adaptation Strategies for Global Change*. **20**(1), 75–97.

Levin, K., Cashore, B., Bernstein, S., Auld, G. (2012) Overcoming the tragedy of super wicked problems: Constraining our future selves to ameliorate global climate change. *Policy Sciences*. **45**(2), 123–152.

Lewicka, M. (2011) Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology*. **31**(3), 207–230.

Lewicka, M. (2008) Place attachment, place identity, and place memory: Restoring the forgotten city past. *Journal of Environmental Psychology*. **28**(3), 209–231.

- Lewicka, M. (2005) Ways to make people active: The role of place attachment, cultural capital, and neighborhood ties. *Journal of Environmental Psychology*. **25**(4), 381–395.
- Libecap, G.D. (2011) Institutional path dependence in climate adaptation: Coman's 'Some unsettled problems of irrigation'. *The American Economic Review*. **101**(1), 64–80.
- Long, D.A., Perkins, D.D. (2007) Community social and place predictors of sense of community: A multilevel and longitudinal analysis. *Journal of Community Psychology*. **35**(5), 563–581.
- Loorbach, D., Van Der Brugge, R., Taanman, M. (2008) Governance in the energy transition: Practice of transition management in the Netherlands. *International Journal of Environmental Technology and Management*. **9**(2–3), 294–315.
- Lorenzoni, I., Hulme, M. (2009) Believing is seeing: Laypeople's views of future socio-economic and climate change in England and in Italy. *Public Understanding of Science*. **18**(4), 383–400.
- Lorenzoni, I., Nicholson-Cole, S., Whitmarsh, L. (2007) Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global Environmental Change*. **17**(3–4), 445–459.
- Low, S.M., Altman, I. (1992) Place Attachment. In I. Altman & S. M. Low, eds. *Place Attachment: A Conceptual Enquiry*. Human Behavior and Environment. London: Plenum Press, pp. 1–12.
- Major, D.C., Juhola, S. (2016) Guidance for Climate Change Adaptation in Small Coastal Towns and Cities: A New Challenge. *Journal of Urban Planning and Development*. **0**(0), 2516001.
- Manzo, L.C. (2003) Beyond house and haven: toward a revisioning of emotional relationships with places. *Journal of Environmental Psychology*. **23**(1), 47–61.
- Manzo, L.C., Perkins, D.D. (2006) Finding Common Ground: The Importance of Place Attachment to Community Participation and Planning. *Journal of Planning Literature*. **20**(4), 335–350.
- Markell, D. (2016) *Working Paper: Sea-Level Rise and Changing Times for Florida Local Governments*. New York: Sabine Center for Climate Change Law.
- Marshall, N.A., Crimp, S., Curnock, M., Greenhill, M., Kuehne, G., Leviston, Z., Ouzman, J. (2016) Some primary producers are more likely to transform their agricultural practices in response to climate change than others. *Agriculture, Ecosystems & Environment*. **222**, 38–47.

- Marshall, N.A., Dowd, A.-M., Fleming, A., Gambley, C., Howden, M., Jakku, E., Larsen, C., Marshall, P.A., Moon, K., Park, S., Thorburn, P.J. (2013) Transformational capacity in Australian peanut farmers for better climate adaptation. *Agronomy for Sustainable Development*. **34**(3), 583–591.
- Marshall, N.A., Park, S.E., Adger, W.N., Brown, K., Howden, S.M. (2012) Transformational capacity and the influence of place and identity. *Environmental Research Letters*. **7**(3), 34022.
- Marshall, N., Stokes, C. (2014) Identifying thresholds and barriers to adaptation through measuring climate sensitivity and capacity to change in an Australian primary industry. *Climatic Change*. **126**(3/4), 399–411.
- Massey, E., Biesbroek, R., Huiteima, D., Jordan, A. (2014) Climate policy innovation: The adoption and diffusion of adaptation policies across Europe. *Global Environmental Change*. **29**, 434–443.
- Massey, E., Huiteima, D. (2016) The emergence of climate change adaptation as a new field of public policy in Europe. *Regional Environmental Change*. **16**(2), 553–564.
- Matasci, C., Kruse, S., Barawid, N., Thalmann, P. (2014) Exploring barriers to climate change adaptation in the Swiss tourism sector. *Mitigation and Adaptation strategies for global change*. **19**(8), 1239–1254.
- Matyas, D., Pelling, M. (2015) Positioning resilience for 2015: the role of resistance, incremental adjustment and transformation in disaster risk management policy. *Disasters*. **39**(s1), s1–s18.
- Mays, N., Pope, C. (1995) Rigour and qualitative research. *BMJ: British Medical Journal*. **311**(6997), 109.
- McDaniels, T.L., Gregory, R.S., Fields, D. (1999) Democratizing risk management: Successful public involvement in local water management decisions. *Risk analysis*. **19**(3), 497–510.
- McEvoy, D., Matczak, P., Banaszak, I., Chorynski, A. (2010) Framing adaptation to climate-related extreme events. *Mitigation and Adaptation Strategies for Global Change*. **15**(7), 779–795.
- McGrath, F. (2011) Clontarf Update: McGrath and O’Farrell Oppose New Clontarf Flood Proposals. [online]. Available from: <http://www.finianmcgrath.ie/viewNews/id/476/cYear/2011/cMonth/11/>.
- McMillan, D.W., Chavis, D.M. (1986) Sense of community: A definition and theory. *Journal of community psychology*. **14**(1), 6–23.
- Measham, T.G., Preston, B.L., Smith, T.F., Brooke, C., Gorddard, R., Withycombe, G., Morrison, C. (2011) Adapting to climate change through local municipal planning: Barriers and challenges. *Mitigation and Adaptation Strategies for Global Change*. **16**(8), 889–909.

- Mees, H. (2016) Local governments in the driving seat? A comparative analysis of public and private responsibilities for adaptation to climate change in European and North-American cities. *Journal of Environmental Policy & Planning*, 1–17.
- Mees, H.L.P., Driessen, P.P.J., Runhaar, H.A.C. (2014) Legitimate adaptive flood risk governance beyond the dikes: the cases of Hamburg, Helsinki and Rotterdam. *Regional Environmental Change*. **14**(2), 671–682.
- Meijerink, S., Nooteboom, S.G., Termeer, C. (2008) Real Barriers to Climate Adaptation: a systems approach to learn about new modes of governance. In *EGPA Conference 2008*.
- Menzel, S., Buchecker, M. (2013) Does Participatory Planning Foster the Transformation Toward More Adaptive Social-Ecological Systems? *Ecology & Society*. **18**(1), 1–15.
- Mersha, A.A., Laerhoven, F.V. (2016) A gender approach to understanding the differentiated impact of barriers to adaptation: Responses to climate change in rural Ethiopia. *Regional Environmental Change*. **16**(6), 1701–1713.
- Mesch, G.S., Talmud, I. (2010) Internet connectivity, community participation, and place attachment: A longitudinal study. *American Behavioral Scientist*. **53**(8), 1095–1110.
- Mihaylov, N., Perkins, D.D. (2014) Community place attachment and its role in social capital development. In L. C. Manzo & P. Devine-Wright, eds. *Place attachment: Advances in theory, methods and applications*. New York: Routledge, pp. 61–74.
- Milligan, J., O’Riordan, T., Nicholson-Cole, S.A., Watkinson, A.R. (2009) Nature conservation for future sustainable shorelines: Lessons from seeking to involve the public. *Land Use Policy*. **26**(2), 203–213.
- Mishra, S., Mazumdar, S., Suar, D. (2010) Place attachment and flood preparedness. *Journal of Environmental Psychology*. **30**(2), 187–197.
- Mock, S.E., Havitz, M.E., Lemieux, C.J., Flannery, P.D., Eagles, P.F.J., Doherty, S.T. (2016) The Contributions of Parks Commitment and Motivations to Well-Being. *Journal of Park & Recreation Administration*. **34**(3), 83–98.
- Moore, R.L., Graefe, A.R. (1994) Attachments to recreation settings: The case of rail-trail users. *Leisure Sciences*. **16**(1), 17–31.
- Mortreux, C., Barnett, J. (2017) Adaptive capacity: exploring the research frontier. *Wiley Interdisciplinary Reviews: Climate Change*. **In Press**, n/a-n/a.
- Mortreux, C., Barnett, J. (2009) Climate change, migration and adaptation in Funafuti, Tuvalu. *Global Environmental Change*. **19**(1), 105–112.

- Moser, S. (2009) Governance and the art of overcoming barriers to adaptation. *Magazine of the International Human Dimensions Programme on Global Environmental Change*. **3**, 31–36.
- Moser, S., Boykoff, M.T. eds. (2013) *Successful Adaptation to Climate Change: Linking Science and Policy in a Rapidly Changing World*. Abingdon, Oxon: Routledge.
- Moser, S.C. (2014) Communicating adaptation to climate change: The art and science of public engagement when climate change comes home. *Wiley Interdisciplinary Reviews: Climate Change*. **5**(3), 337–358.
- Moser, S.C., Ekstrom, J.A. (2010) A framework to diagnose barriers to climate change adaptation. *Proceedings of the National Academy of Sciences of the United States of America*. **107**(51), 22026–22031.
- Moser, S.C., Pike, C. (2015) Community engagement on adaptation: Meeting a growing capacity need. *Urban Climate*. **14**, Part 1, 111–115.
- Mueller, V., Gray, C., Kosec, K. (2014) Heat stress increases long-term human migration in rural Pakistan. *Nature climate change*. **4**(3), 182–185.
- Mukheibir, P., Kuruppu, N., Gero, A., Herriman, J. (2013) Overcoming cross-scale challenges to climate change adaptation for local government: A focus on Australia. *Climatic Change*. **121**(2), 271–283.
- Murphy, C., Tembo, M., Phiri, A., Yerokun, O., Grummell, B. (2016) Adapting to climate change in shifting landscapes of belief. *Climatic Change*. **134**(1–2), 101–114.
- Mustelin, J., Handmer, J. (2012) Triggering transformation: Managing resilience or invoking real change? In *Proceedings of Transformation in a Changing Climate, 19–21 June 2013*. Oslo.
- National Directorate for Fire and Emergency Management (2016) *Report on Flooding December 4 2015 – January 13 2016*. Dublin: Department of Housing, Planning, Community and Local Government.
- National Directorate for Fire and Emergency Management (2014) *Report on Severe Weather From 13 December 2013 to 6 January 2014*. Dublin: Department of the Environment, Community and Local Government.
- Nelson, D.R., Adger, W.N., Brown, K. (2007) Adaptation to Environmental Change: Contributions of a Resilience Framework. *Annual Review of Environment and Resources*. **32**(1), 395–419.
- Nicholls, R.J., Hoozemans, F.M., Marchand, M. (1999) Increasing flood risk and wetland losses due to global sea-level rise: Regional and global analyses. *Global Environmental Change*. **9**, S69–S87.

Nicholson-Cole, S.A. (2005) Representing climate change futures: a critique on the use of images for visual communication. *Computers, environment and urban systems*. **29**(3), 255–273.

Nielsen, J.Ø., Reenberg, A. (2010) Cultural barriers to climate change adaptation: A case study from Northern Burkina Faso. *Global Environmental Change*. **20**(1), 142–152.

Noble, I.R., Huq, S., Anokhin, Y.A., Carmin, J., Goudou, D., Lansigan, F.P., Osman-Elasha, B., Villamizar, A. (2014) Adaptation needs and options. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea, & L. L. White, eds. *Climate Change 2014: Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, United Kingdom: Cambridge University Press, pp. 833–868.

Norris, M., Hearne, R. (2016) Privatizing public housing redevelopment: Grassroots resistance, co-operation and devastation in three Dublin neighbourhoods. *Cities*. **57**, 40–46.

Norton, A., Leaman, J. (2004) *The Day After Tomorrow: Public Opinion on Climate Change*. London: MORI Social Research Institute.

Novaczek, I., MacFadyen, D., Bardati, D., MacEachern, K. (2011) *Social and Cultural Values Mapping as a decision-support tool for climate change adaptation*. Charlottetown, Canada: Institute of Island Studies, University of Prince Edward Island.

Ó Broin, D., Waters, E. (2007) *Governing below the centre - Local governance in Ireland*. Dublin: TASC.

Ó Ríordáin, A. (2011) Topical Issue Debate - Flood Relief. [online] 13 October 2011. Available from: <http://oireachtasdebates.oireachtas.ie/debates%20authoring/debateswebpack.nsf/takes/dail2011101300009?opendocument> [Accessed September 11, 2016].

O'Brien, K. (2017) Climate Change Adaptation and Social Transformation. In *The International Encyclopedia of Geography*. Chichester, West Sussex: John Wiley & Sons, pp. 1–8.

O'Brien, K. (2009) Do values subjectively define the limits to climate change adaptation? In N. Adger, I. Lorenzoni, & K. O'Brien, eds. *Adapting to Climate Change: Thresholds, Values, Governance*. Cambridge: Cambridge University Press, pp. 164–180.

O'Brien, K. (2012) Global environmental change II: From adaptation to deliberate transformation. *Progress in Human Geography*. **36**(5), 667–676.

- O'Brien, K., Barnett, J. (2013) Global Environmental Change and Human Security. *Annual Review of Environment and Resources*. **38**(1), 373–391.
- O'Brien, K., Hayward, B., Berkes, F. (2009) Rethinking social contracts: building resilience in a changing climate. *Ecology and Society*. **14**(2), 12.
- O'Brien, K., Selboe, E. (2015) Social Transformation: The Real Adaptive Challenge. In K. O'Brien & E. Selboe, eds. *The Adaptive Challenge of Climate Change*. New York: Cambridge University Press, pp. 311–324.
- O'Brien, K., Sygna, L. (2013) Responding to climate change: the three spheres of transformation. In *Proceedings of Transformation in a Changing Climate*. Oslo, Norway: University of Oslo, pp. 16–23.
- O'Carroll, S. (2011) Clontarf residents object to 'insane' flood defence plans. *The Journal* [online] 12 October 2011.
- Office of Emergency Planning (2012) *A National Risk Assessment for Ireland*. Dublin: Department of Defence.
- Office of Public Works (2004) *Report of the Flood Policy Review Group*. Trim, Co. Meath: Office of Public Works.
- Office of Public Works (2014) *Memorandum of Understanding Between Insurance Ireland and the Office of Public Works*. Dublin: Office of Public Works.
- Office of Public Works (2015a) *Draft for Consultation Climate Change Sectoral Adaptation Plan Flood Risk Management (2015 - 2019)*. Dublin: Office of Public Works.
- Office of Public Works (2015b) Minister Simon Harris announces major €430m capital investment in Flood Relief Measures. [online]. Available from: <http://www.opw.ie/en/pressreleases2015/articleheading,35339,en.html> [Accessed August 8, 2016].
- Office of the Attorney General (1995) *Arterial Drainage (Amendment) Act, 1995*.
- Olsson, P., Bodin, Ö., Folke, C. (2010) Building Transformative Capacity for Ecosystem Stewardship in Social-Ecological Systems. In R. Plummer & D. Armitage, eds. *Adaptive capacity and environmental governance*. Berlin, Germany: Springer, pp. 263–285.
- Olsson, P., Folke, C., Hahn, T. (2004) Social-ecological transformation for ecosystem management: the development of adaptive co-management of a wetland landscape in southern Sweden. *Ecology and Society*. **9**(4), 2.

- Olsson, P., Gunderson, L.H., Carpenter, S.R., Ryan, P., Lebel, L., Folke, C., Holling, C.S. (2006) Shooting the rapids: Navigating transitions to adaptive governance of social-ecological systems. *Ecology and society*. **11**(1), 18.
- O'Neill, S.J., Handmer, J. (2012) Responding to bushfire risk: the need for transformative adaptation. *Environmental Research Letters*. **7**(1), 14018.
- Orland, B., Budthimedhee, K., Uusitalo, J. (2001) Considering virtual worlds as representations of landscape realities and as tools for landscape planning. *Landscape and urban planning*. **54**(1), 139–148.
- Paavola, J., Adger, W.N. (2006) Fair adaptation to climate change. *Ecological Economics*. **56**(4), 594–609.
- Pahl-Wostl, C. (2009) A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Global Environmental Change*. **19**(3), 354–365.
- Palinkas, L.A. (2014) Causality and Causal Inference in Social Work: Quantitative and Qualitative Perspectives. *Research on social work practice*. **24**(5), 540–547.
- Pallant, J. (2013) *SPSS survival manual. A step by step guide to data analysis using IBM SPSS*. 5th ed. Berkshire, UK: Open University Press.
- Pape, J., Rau, H., Fahy, F., Davies, A. (2011) Developing Policies and Instruments for Sustainable Household Consumption: Irish Experiences and Futures. *Journal of Consumer Policy*. **34**(1), 25–42.
- Park, S.E., Marshall, N.A., Jakku, E., Dowd, A.M., Howden, S.M., Mendham, E., Fleming, A. (2012) Informing adaptation responses to climate change through theories of transformation. *Global Environmental Change*. **22**(1), 115–126.
- Parry, M., Arnell, N., Hulme, M., Nicholls, R., Livermore, M. (1998) Adapting to the inevitable. *Nature*. **395**(6704), 741–741.
- Patt, A. (2013) Should adaptation be a distinct field of science? *Climate and Development*. **5**(3), 187–188.
- Patterson, J., Schulz, K., Vervoort, J., Adler, C., van der Hel, S., Schmidt, A., Barau, A., Obani, P., Sethi, M., Hissen, N., Tebboth, M., Anderton, K., Börner, S., Widerberg, O. (2015) *'Transformations towards sustainability' Emerging approaches, critical reflections, and a research agenda*. Lund and Amsterdam: Earth System Governance Project.
- Patterson, J., Schulz, K., Vervoort, J., van der Hel, S., Widerberg, O., Adler, C., Hurlbert, M., Anderton, K., Sethi, M., Barau, A. (2017) Exploring the governance and politics of transformations towards sustainability. *Environmental Innovation and Societal Transitions*. **24**, 1–16.

- Pelling, M. (2011) *Adaptation to Climate Change: From Resilience to Transformation*. Abingdon, Oxon: Routledge.
- Pelling, M., Dill, K. (2010) Disaster politics: Tipping points for change in the adaptation of sociopolitical regimes. *Progress in Human Geography*. **34**(1), 21–37.
- Pelling, M., Manuel-Navarrete, D. (2011) From resilience to transformation: the adaptive cycle in two Mexican urban centers. *Ecology and Society*. **16**(2), 11.
- Pelling, M., O'Brien, K., Matyas, D. (2015) Adaptation and transformation. *Climatic Change*. **133**(1), 113–127.
- Penning-Rowsell, E., Johnson, C., Tunstall, S. (2006) 'Signals' from pre-crisis discourse: lessons from UK flooding for global environmental policy change? *Global Environmental Change*. **16**(4), 323–339.
- Porter, J.J., Demeritt, D., Dessai, S. (2015) The right stuff? informing adaptation to climate change in British Local Government. *Global Environmental Change*. **35**, 411–422.
- Portman, M.E. (2014) Visualization for planning and management of oceans and coasts. *Ocean & coastal management*. **98**, 176–185.
- Possick, C. (2006) Coping with the threat of place disruption by long-term Jewish settlers on the West Bank. *International Social Work*. **49**(2), 198–207.
- Pretty, G.H., Chipuer, H.M., Bramston, P. (2003) Sense of place amongst adolescents and adults in two rural Australian towns: The discriminating features of place attachment, sense of community and place dependence in relation to place identity. *Journal of Environmental Psychology*. **23**(3), 273–287.
- Proshansky, H. (1978) The City and Self-Identity. *Environment and Behavior*. **10**(2), 147–169.
- Proshansky, H.M., Fabian, A.K., Kaminoff, R. (1983) Place-identity: Physical world socialization of the self. *Journal of Environmental Psychology*. **3**(1), 57–83.
- Quinn, T., Lorenzoni, I., Adger, W.N. (2015) Place attachment, identity, and adaptation. In K. L. O'Brien & E. Selboe, eds. *The Adaptive Challenge of Climate Change*. New York: Cambridge University Press, pp. 160–170.
- Ratter, B.M.W., Philipp, K.H.I., von Storch, H. (2012) Between hype and decline: recent trends in public perception of climate change. *Environmental Science & Policy*. **18**, 3–8.

- Rau, H. (2007) Going local? Public participation and future mobility in Ireland. *Probing the Boundaries: Environmental Justice and Global Citizenship The Inter-Disciplinary Press*.
- Rawluk, A., Ford, R.M., Neolaka, F.L., Williams, K.J. (2017) Public values for integration in natural disaster management and planning: A case study from Victoria, Australia. *Journal of Environmental Management*. **185**, 11–20.
- Reckien, D., Flacke, J., Olazabal, M., Heidrich, O. (2015) The Influence of Drivers and Barriers on Urban Adaptation and Mitigation Plans—An Empirical Analysis of European Cities. *PLoS ONE*. **10**(8), 1–21.
- Relph, E.C. (1976) *Place and placelessness*. London: Pion Limited.
- Revez, A. (2014) *Flood risk management in Ireland: the role of public participation*. Galway: National University of Ireland, Galway.
- Revi, A., Satterthwaite, D., Aragón-Durand, F., Corfee-Morlot, J., Kiunsi, R.B.R., Pelling, M., Roberts, D., Solecki, W., Gajjar, S.P., Sverdlík, A. (2014) Towards transformative adaptation in cities: The IPCC's Fifth Assessment. *Environment and Urbanization*. **26**(1), 11–28.
- Rickards, L., Howden, S.M. (2012) Transformational adaptation: Agriculture and climate change. *Crop and Pasture Science*. **63**(3), 240–250.
- Rowles, G.D. (1983) Place and personal identity in old age: Observations from Appalachia. *Journal of Environmental Psychology*. **3**(4), 299–313.
- Rowley, J. (2002) Using case studies in research. *Management research news*. **25**(1), 16–27.
- Royal Haskoning (2005) *Final Report Volume 1 - Main Report*. Dublin Coastal Flooding Protection Project. Dublin: Dublin City Council.
- Runhaar, H., Mees, H., Wardekker, A., van der Sluijs, J., Driessen, P.P. (2012) Adaptation to climate change-related risks in Dutch urban areas: stimuli and barriers. *Regional Environmental Change*. **12**(4), 777–790.
- Satyál, P., Shrestha, K., Ojha, H., Vira, B., Adhikari, J. (2017) A new Himalayan crisis? Exploring transformative resilience pathways. *Environmental Development*. **In Press**.
- Scannell, L., Gifford, R. (2016) Place Attachment Enhances Psychological Need Satisfaction. *Environment and Behavior*, 13916516637648.
- Schlosberg, D., Collins, L.B., Niemeyer, S. (2017) Adaptation policy and community discourse: risk, vulnerability, and just transformation. *Environmental Politics*. **0**(0), 1–25.

- Schwartz, S.H. (2012) An overview of the Schwartz theory of basic values. *Online Readings in Psychology and Culture*. **2**(1).
- Shah, T. (2009) Climate change and groundwater: India's opportunities for mitigation and adaptation. *Environmental Research Letters*. **4**(3), 35005.
- Shaw, A., Sheppard, S., Burch, S., Flanders, D., Wiek, A., Carmichael, J., Robinson, J., Cohen, S. (2009) Making local futures tangible—synthesizing, downscaling, and visualizing climate change scenarios for participatory capacity building. *Global Environmental Change*. **19**(4), 447–463.
- Simões, E., de, S.J., de, F., Mills, M., Iwama, A.Y., Gonçalves, I., Olivato, D., Fidelman, P. (2017) Barriers and opportunities for adapting to climate change on the North Coast of São Paulo, Brazil. *Regional Environmental Change*. **In Press**.
- Simpson, M.C., Gössling, S., Scott, D., Hall, C.M., Gladin, E., others (2008) Climate change adaptation and mitigation in the tourism sector: frameworks, tools and practices. *Climate change adaptation and mitigation in the tourism sector: frameworks, tools and practices*.
- Skibberien Town Council (2009) *Skibberien Town Development Plan 2009-2015*. Skibberien: Skibberien Town Council.
- Skillington, T. (1997) Politics and the Struggle to Define: A Discourse Analysis of the Framing Strategies of Competing Actors in a 'New' Participatory Forum. *The British Journal of Sociology*. **48**(3), 493–513.
- Smit, B., Burton, I., Klein, R.J.T., Wandel, J. (2000) An Anatomy of Adaptation to Climate Change and Variability. *Climatic Change*. **45**(1), 223–251.
- Smit, B., Pilifosova, O. (2003) Adaptation to climate change in the context of sustainable development and equity. *Sustainable Development*. **8**(9), 9.
- Smit, B., Skinner, M.W. (2002) Adaptation options in agriculture to climate change: a typology. *Mitigation and Adaptation Strategies for Global Change*. **7**(1), 85–114.
- Smith, M., Horrocks, L., Harvey, A., Hamilton, C. (2011) Rethinking adaptation for a 4°C world. *Philosophical Transactions of the Royal Society of London A: Mathematical, Physical and Engineering Sciences*. **369**(1934), 196–216.
- Speller, G. (2000) *A Community in Transition: A longitudinal study of place attachment and identity processes in the context of an enforced relocation*. Surrey: University of Surrey.
- Spires, M., Shackleton, S., Cundill, G. (2014) Barriers to implementing planned community-based adaptation in developing countries: a systematic literature review. *Climate and Development*. **6**(3), 277–287.

- Stedman, R. (2003) Is It Really Just a Social Construction?: The Contribution of the Physical Environment to Sense of Place. *Society & Natural Resources*. **16**(8), 671–685.
- Stedman, R., Beckley, T., Wallace, S., Ambard, M. (2004) A picture and 1000 words: Using resident-employed photography to understand attachment to high amenity places. *Journal of Leisure Research*. **36**(4), 580.
- Stedman, R.C. (2002) Toward a Social Psychology of Place Predicting Behavior from Place-Based Cognitions, Attitude, and Identity. *Environment and Behavior*. **34**(5), 561–581.
- Steele, D. (2008) Repeated Cross-Sectional Design. In P. Lavrakas, ed. *Encyclopedia of Survey Research Methods*. Thousand Oaks California: Sage Publications, Inc.
- Steenjes, K., Pidgeon, N.F., Poortinga, W., Corner, A., Mays, C., Poumadère, M., Tvinnereim, E., Böhm, G., Arnold, A., Ruddat, M., Scheer, D., Sonnberger, M. (2017) *European Perceptions of Climate Change (EPCC) Topline findings of a survey conducted in four European countries in 2016*. Cardiff: Cardiff University.
- Stern, N. (2007) *The Economics of Climate Change: The Stern Review*. Cambridge: Cambridge University Press.
- Strunz, S. (2012) Is conceptual vagueness an asset? Arguments from philosophy of science applied to the concept of resilience. *Ecological Economics*. **76**, 112–118.
- Swart, R., Biesbroek, R., Lourenço, T.C. (2014) Science of adaptation to climate change and science for adaptation. *Frontiers in Environmental Science*. **2**.
- Szreter, S., Woolcock, M. (2004) Health by association? Social capital, social theory, and the political economy of public health. *International Journal of Epidemiology*. **33**(4), 650–667.
- Tanner, T., Bahadur, A. (2013) *Distilling the characteristics of transformational change in a changing climate*. Oslo: University of Oslo.
- Termeer, C., Biesbroek, R., Van den Brink, M. (2012) Institutions for adaptation to climate change: comparing national adaptation strategies in Europe. *European Political Science*. **11**(1), 41–53.
- Termeer, C.J., Dewulf, A., Biesbroek, G.R. (2016) Transformational change: Governance interventions for climate change adaptation from a continuous change perspective. *Journal of Environmental Planning and Management*. **60**(4), 558–576.

Tompkins, E.L., Adger, W.N., Boyd, E., Nicholson-Cole, S., Weatherhead, K., Arnell, N. (2010) Observed adaptation to climate change: UK evidence of transition to a well-adapting society. *Global Environmental Change*. **20**(4), 627–635.

Tuan, Y.-F. (1974) *Topophilia: A study of environmental perceptions, attitudes, and values*. New York: Columbia University Press.

Twigger - Ross, C., Bonaiuto, M., Breakwell, G. (2003) Identity theories and environmental psychology. In M. Bonnes, T. Lee, & M. Bonaiuto, eds. *Psychological Theories for Environmental Issues*. Hants: Ashgate, pp. 203–234.

Tyler, T.R. (2003) Procedural justice, legitimacy, and the effective rule of law. *Crime and justice*. **30**, 283–357.

Uittenbroek, C.J. (2016) From Policy Document to Implementation: Organizational Routines as Possible Barriers to Mainstreaming Climate Adaptation. *Journal of Environmental Policy & Planning*. **18**(2), 161–176.

Uittenbroek, C.J., Janssen-Jansen, L.B., Runhaar, H.A.C. (2012) Mainstreaming climate adaptation into urban planning: Overcoming barriers, seizing opportunities and evaluating the results in two Dutch case studies. *Regional Environmental Change*. **13**(2), 399–411.

Urwin, K., Jordan, A. (2008) Does public policy support or undermine climate change adaptation? Exploring policy interplay across different scales of governance. *Global environmental change*. **18**(1), 180–191.

Vasileiadou, E., Botzen, W. (2014) Communicating adaptation with emotions: the role of intense experiences in raising concern about extreme weather. *Ecology and Society*. **19**(2), 36.

Vaske, J.J., Kobrin, K.C. (2001) Place Attachment and Environmentally Responsible Behavior. *Journal of Environmental Education*. **32**(4), 16.

Vine, E. (2012) Adaptation of California's electricity sector to climate change. *Climatic Change*. **111**(1), 75–99.

Vorkinn, M., Riese, H. (2001) Environmental Concern in a Local Context: The Significance of Place Attachment. *Environment and Behavior*. **33**(2), 249–263.

Vousdoukas, M.I., Mentaschi, L., Voukouvalas, E., Verlaan, M., Feyen, L. (2017) Extreme sea levels on the rise along Europe's coasts. *Earth's Future*. **In Press**.

Wehn, U., Rusca, M., Evers, J., Lanfranchi, V. (2015) Participation in flood risk management and the potential of citizen observatories: A governance analysis. *Environmental Science & Policy*. **48**, 225–236.

Weitzman, E.R., Kaci, L., Mandl, K.D. (2010) Sharing Medical Data for Health Research: The Early Personal Health Record Experience. *Journal of Medical Internet Research*. **12**(2), e14.

White, D.D., Virden, R.J., Riper, C.J. van (2008) Effects of Place Identity, Place Dependence, and Experience-Use History on Perceptions of Recreation Impacts in a Natural Setting. *Environmental Management*. **42**(4), 647–657.

Whitmarsh, L. (2008) Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response. *Journal of Risk Research*. **11**(3), 351–374.

Wilby, R.L., Dessai, S. (2010) Robust adaptation to climate change. *Weather*. **65**(7), 180–185.

Williams, D.R., Roggenbuck, J.W. (1989) Measuring place attachment: Some preliminary results. In *Symposium on Outdoor Recreation Planning and Management*. NRPA Symposium on Leisure Research. San Antonio, TX: NRPA Symposium on Leisure Research.

Williams, D.R., Vaske, J.J. (2003) The Measurement of Place Attachment: Validity and Generalizability of a Psychometric Approach. *Forest Science*. **49**(6), 830–840.

Wilson, G.A. (2014) Community Resilience: Path Dependency, Lock-In Effects and Transitional Ruptures. *Journal of Environmental Planning and Management*. **57**(1–2), 1–26.

Wilson, L., O'Brien, G., O'Keefe, P., England, K. (2014) Barriers to adaptation in Newcastle upon Tyne, UK: Preliminary findings. *Urban Climate*. **7**, 33–46.

von Wirth, T., Grêt-Regamey, A., Moser, C., Stauffacher, M. (2016) Exploring the influence of perceived urban change on residents' place attachment. *Journal of Environmental Psychology*. **46**, 67–82.

Wise, R.M., Fazey, I., Stafford Smith, M., Park, S.E., Eakin, H.C., Archer Van Garderen, E.R.M., Campbell, B. (2014) Reconceptualising adaptation to climate change as part of pathways of change and response. *Global Environmental Change*. **28**, 325–336.

Wolf, J., Adger, W.N., Lorenzoni, I., Abrahamson, V., Raine, R. (2010) Social capital, individual responses to heat waves and climate change adaptation: An empirical study of two UK cities. *Global Environmental Change*. **20**(1), 44–52.

Woodruff, J.D., Irish, J.L., Camargo, S.J. (2013) Coastal flooding by tropical cyclones and sea-level rise. *Nature*. **504**(7478), 44–52.

Wynveen, C.J., Kyle, G.T., Sutton, S.G. (2012) Natural area visitors' place meaning and place attachment ascribed to a marine setting. *Journal of Environmental Psychology*. **32**(4), 287–296.

Yin, R.K. (2009) *Case Study Research: Design and Methods*. 4th ed. London: SAGE.

Yohe, G., Tol, R.S.J. (2002) Indicators for social and economic coping capacity—moving toward a working definition of adaptive capacity. *Global Environmental Change*. **12**(1), 25–40.

8 Appendices

Appendix A: Participant consent form (interview)



Community-led strategies for managing flood risks

Darren Clarke

Irish Climate Analysis and Research Units (ICARUS) - Maynooth University

Material gathered during this research will be treated as confidential and securely stored on encrypted devices and treated following the security and anonymity protocols of the Irish Qualitative Data Archive. You have the right to access any of your interview materials (tapes, transcripts and notes) at any time.

Please answer each statement below concerning the collection of the research data.

1.	I have read and understood the Information Sheet form.	Yes No
2.	I have been given the opportunity to ask questions about the study.	Yes No
3.	I have had my questions answered satisfactorily.	Yes No
4.	I understand that I can withdraw from the study at any time without having to give an explanation.	Yes No
5.	I agree to the interview being audiotaped and to its contents being used for research purposes.	Yes No

Below, are sets of statements that give you, the interviewee, a series of options about how you wish your interview to be used. Please answer each statement.

6.	I agree that excerpts from the interview can be used in papers, reports and books published for academic and educational purposes	Yes No
7.	I agree to being identified in this interview and in any subsequent publications or use	Yes No

IF YOU ANSWERED "YES" TO Q.7, GO TO Q.9; IF "NO" PLEASE ALSO ANSWER Q.8

8.	Where used my name must be removed and my comments made unattributable.	Yes No
----	---	-----------

9.	I agree to the interview notes/transcripts (in line with the conditions outlined above) being archived and used by other bona fide researchers.	Yes No
10.	I agree to my audio files (in line with the conditions outlined above) being archived and used by other bona fide researchers, excluding Intellectual Property Rights, corporate strategies and other commercially sensitive information.	Yes No
11.	I agree to the interview notes/transcripts (in line with the conditions outlined above) being archived and used by other bona fide researchers even if my anonymity cannot be guaranteed	Yes No

Name _____ **(printed)**

Signature _____

Date _____

Your contribution is greatly appreciated. Feel free to contact us if you have any further questions.

Darren Clarke Phone: (01) 708 6836 Email: darren.clarke@nuim.ie

If during your participation in this study you feel the information and guidelines that you were given have been neglected or disregarded in any way, or if you are unhappy about the process, please contact the Secretary of the Maynooth University Ethics Committee at research.ethics@nuim.ie or +353 (0)1 708 6019. Please be assured that your concerns will be dealt with in a sensitive manner.



Community-led strategies for managing flood risks

Darren Clarke

Irish Climate Analysis and Research Units (ICARUS) - Maynooth University

Date:

Dear Sir/Madam

You are asked to participate in an interview on the theme of understanding community-led approaches to managing flood risks in Ireland which is being conducted as part of a European Commission funded project entitled TRANS-ADAPT.

You were selected as a key informant in this research project because you are considered a key stakeholder with specific knowledge of community-led approaches to managing flood risks. If you volunteer to participate in this research, you will be asked a short series of questions about flood protection measures in Clontarf.

These interviews may be recorded, transcribed or notes may be taken by hand or on a computer. In total, the interviews should take approximately one hour. Further, follow-up calls or meetings may be required to clarify information or to acquire recommended documents. These communications will be brief. You will be allowed to view the notes and quotes of the interview and any other documents produced as a result of this interview. You may also decide to have the information you provide attributed or not in publications.

The nature of the questions is not personal or confidential and should pose no risks or discomfort to you. You will not be remunerated by the researcher for your participation as you are participating as a volunteer.

Your participation in the interview will assist individuals and organisations interested in this topic to develop a better understanding in encouraging community-led approaches to dealing with flood risks and the results will be part of a case study to inform academic publications.

You will be asked if any material should or should not be directly attributed to you. Any information that is obtained in connection with this study is not considered personal or confidential. However, if information gathered during these interviews is to be disseminated beyond the researcher, your name will not be disclosed while the role and the name of your institution

may be identified, unless otherwise specified. The researcher will keep this consent form confidential and any other documents related to this research will simply refer to you by your role and institution.

In the event that your name requires disclosure this will only be done with your permission or as required by law. With regard to the latter, it must be recognised that, in some circumstances, confidentiality of research data and records may be overridden by courts in the event of litigation or in the course of investigation by lawful authority. In such circumstances Maynooth University will take all reasonable steps within law to ensure that confidentiality is maintained to the greatest possible extent.

Any data gathered during the course of these interviews will be stored on encrypted CD, data keys, laptops and folders on a server. File names will include dates and an assigned number for you only. These will be shared with the other researchers on the project. Once the research project is complete the recordings will be deposited in the Irish Qualitative Data Archive (IQDA) and made accessible to future researchers. Data made available to the IQDA will only be allowed with consent of the interviewees. Data will also be held on file with Maynooth University for a minimum of ten years following publication in accordance with the university's research integrity guidelines.

Should the discussion move on to propriety Intellectual Property Rights, corporate strategies and other commercially sensitive information, that information will not be disclosed nor deposited in the IQDA.

If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. Should you decide to withdraw you may decide at that time if I may use the information you have provided, or you may request that it be destroyed. You may also refuse to answer any questions you don't want to answer and still remain in the study. The researcher may withdraw you from this research if circumstances arise which warrant doing so.

This research was reviewed and received ethics clearance by the Maynooth University Social Research Ethics Sub-Committee. If you have any questions or concerns about the research, please feel free to contact:

Secretary of the National University of Ireland Maynooth
Ethics Committee
research.ethics@nuim.ie
or +353 (0)1 708 6019

Having read this information sheet please read and sign the consent form.

Once again, we thank you for your participation.

Kind regards,

Darren Clarke & Dr. Conor Murphy

Irish Climate Analysis and Research Units (ICARUS), Maynooth University

General introduction

- Could you tell me about your role in the flood protection project?
- Who initiated the flood protection project?
- Which other actors were involved and what were their main roles?
- What role did the community play in the flood protection project?
- At which stage(s) were residents/local community involved?
- To what extent did the involvement of residents/local community influence the key decisions of the project?
- What are your greatest concerns in relation to flooding?
- What do believe are/were the main drivers in the planning and execution of the project?
- What were the main successes of the project in your opinion?
- What were the main barriers in the planning and execution of the project?
- What were the main failures of the project in your opinion?
- To what extent are the outcomes of the project accepted by the community?
- To what extent have the initial objectives for flood risk protection been achieved?

Social/Cultural

- Could you please describe any past flood events that you are aware of and how they were managed?
- Do you believe that there are flooding issues that are specific to [insert place name]?
- Do you think that there is agreement or disagreement in relation to the main causes of flooding in the area and other surrounding areas?
- How aware in your view is the wider community of problems associated with flooding?
- Aside from protection from flooding, what in your opinion is the most important aspect of any flood protection measure located within the community?
- What do you think would be required to enable more non-traditional flood protection measures to be considered and implemented?
- Leading agencies in charge of flood management strategies in several countries have started to shift some responsibility for flood protection to citizens. In Ireland, the Office of Public Works and local authorities have also stated that citizens at risk of flooding have a responsibility in relation to flooding and that citizens should take their own flood prevention measures to reduce flood risks. What is your opinion on this?
 - What do you think are the implications of this for people living in flood prone areas?
 - In your view what happens if this approach becomes more prevalent? E.g. if at-risk communities were required to bear some of the costs associated with flood protection

Networking

- Can you comment on the level of coordination between different groups involved in the flood protection project and how different interests and concerns were represented in terms of flood management practices?
- Did you develop any links/connections with community groups within/outside of the local community during the process?
 - If so, what role did these groups play in supporting your position?
- Was a specific individual(s)/group(s) appointed at a community level to deal with flood authorities on behalf of the local community?
 - If so, what was that person's role in the community prior to this?
 - How did this individual engage with local community members before and after they met with flood authorities? E.g. community meetings, e-mails, social media, community newsletters, informally
 - Were there any events organised by the local community to highlight and explicitly express your views on the proposed flood defence measure?
 - What kind of forums were established for participation/deliberation between stakeholders?

Resources/Financial

- How has flood risk affected the availability of property insurance in [insert place name]?
- Are you aware if local people have used their own financial resources to protect themselves against flooding?

Governance - Public Participation/Procedural Justice

- Flood management strategies in Ireland are based on requirements from the European Union, which encourages a high level of public participation in all matters related to the management of floods. What comes to mind when you hear of public participation?
- What is your opinion on local participation in flood management plans?
- Could you please tell me about how the local community is/was involved in the flood protection measure from the initial idea to its current state?
- In what ways do you think public participation and engagement with communities could benefit flood management plans?
- What do you think are the possible barriers to achieving meaningful participation from local people?
- Are you aware of any problems relating to injustices or unfairness in the way flood management is currently carried out?

For members of OPW/DCC only

- What was the role of the national/local government/OPW in the proposed project in [insert place name]?

- Could you please tell me about how the local community is/was involved in the flood protection measure from the initial idea to its current state?
- What was the primary criteria upon which the proposed project was developed/rejected?
 - E.g. Cost-benefit analysis, environmental sustainability, ability to withstand increased risk of extreme flood events etc.
- Some countries are shifting some responsibilities to a local level in terms of flood risk management (e.g. UK, central European countries). What is your opinion on this?
 - Are there any measures/resources which you believe local actors would require for this to happen?
 - What kind of flood protection measures do you believe that this would lead to at a local level?
- Non-engineered solutions as well as engineered solutions are recognised as important in dealing with increased flood risks
 - How are non-engineered approaches to flood risk management viewed with respect to flood protection? e.g. use of property insurance instead of structural measures, early warning systems, development of wetlands, land use planning, improved laws and regulations
 - Are there resources/capabilities in the organisation at present to deal with alternative, non-engineered approaches to flood risk management?
 - If so, please explain what support/resources are already available
 - If not, please explain what support/resources you would require for this to happen (including support of local community acceptance)
- Aside from major engineering measures, does [insert institutional authority name] provide financial resources to communities at risk of flooding for flood protection whilst flood protection measures are being implemented?
- How do you think societal resistance to flood protection can be best overcome at a more general level?
 - Again, at a more general level do you feel that communities will need to accept larger scale changes to flood protection than has been the case up to now?
 - Do you think communities are equipped/have necessary resources to deal with these large-scale changes at present?
 - What do you think they would require to be better prepared for coping with larger scale changes?
- Does anything else come to mind? Did you want to say something?

Appendix D: Overview of documentary and grey literature sources consulted

Skibbereen Chapter 4	Clontarf promenade Chapter 4	Dollymount promenade Chapter 5	National/Supranational Chapter 4
<ul style="list-style-type: none"> • Southern Star (newspaper) • Parliamentary debates • Eolas (magazine) • Skibbereen.ie website • Partnership for Change website • River Ilan (Skibbereen) Drainage Scheme Environmental Impact Statement: Non-Technical Summary (2013) • Skibbereen Town Development Plan 2009-2015 • Correspondence between national elected representative and government departments 	<ul style="list-style-type: none"> • Clontarf Residents Association Twitter • Dublin City Council correspondence to community groups in Clontarf and elected representatives • Correspondence from community groups in Clontarf to various stakeholders including local authority • Evening Herald (newspaper) • Irish Times (national newspaper) • RTE.ie (national broadcaster) • Irish Examiner (national newspaper) • Dublin City Council website • Clontarf TV • Clontarf.ie website • The Journal.ie • Parliamentary questions • Final Report Volume 1 - Main Report. Dublin 	<ul style="list-style-type: none"> • Save Our Seafront Twitter • Dublin City Council correspondence to community groups in Clontarf and elected representatives • Correspondence and public submissions from individuals and community groups in Clontarf to various stakeholders including local authority • Correspondence between elected representatives and community • Correspondence between elected representatives and government ministers • Evening Herald (newspaper) • Irish Times (national newspaper) • Sunday Times (national newspaper) • Irish Examiner (national newspaper) • Dublin City Council website • Clontarf.ie website 	<ul style="list-style-type: none"> • Arterial Drainage Act 1945 and 1995 • EU Water Framework Directive 2000 • Planning and Development Act, 2000 • Planning and Development Regulations, 2001 • European Communities (Water Policy) Regulations (2003) • EU Directive on providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice (2003) • Report of Flood Policy Review Group 2004 • EU Floods Directive 2007 • The Planning System and Flood Risk Management: Guidelines for Planning Authorities 2009

	<p>Coastal Flooding Protection Project (2005)</p> <ul style="list-style-type: none"> • North City Water Arterial Watermain and Clontarf Flood Defence (2007) • National Planning Authority documents related to proposed flood defences 	<ul style="list-style-type: none"> • The Journal.ie • 98FM (radio station) • Parliamentary questions • Save Our Seafront Facebook • Clontarf.ie Facebook • Dublin Streams blog • Avaaz.org community petitions • Change.org petition • Sutton to Sandycove Cycleway & Footway Interim Works Bull Wall (Wooden Bridge) To Causeway Road Habitats Directive Assessment – Screening Report • Dollymount Promenade and Flood Protection Project (DPFPP) Environmental Impact Statement • National Planning Authority documents related to proposed flood defences 	<ul style="list-style-type: none"> • European Communities (Assessment and Management of Flood Risks) Regulations (2010) • Fourth Report of the Joint Committee: The Management of Severe Weather Events in Ireland & Related Matters (2010) • National Climate Change Adaptation Framework (2012). • Draft Water Services Strategic Plan (2015) • Climate Change Sectoral Adaptation Plan - Flood Risk Management (2015 - 2019) • OPW website
--	---	--	---



Survey on Place Attachment and Community Participation in Decision-Making

Dear Householder,

We are researchers from the National University of Ireland, Maynooth (NUIM). We are carrying out surveys to examine your views on the proposed flood defences for Clontarf Promenade made by Dublin City Council in 2011. In particular we are interested in the role of place attachment and community involvement in decision-making processes.

We would very much appreciate if you would participate in this survey. Any information that you provide will be kept strictly confidential and will only be reported in anonymous statistical form.

Please work through all the sections of the questionnaire, answering as much or as little as you want for each question. There are no right or wrong answers, what comes into your mind is most important. We are interested in your opinions, as ALL your views are relevant. It will take 10 minutes to fill it in.

If you have any queries or would like more information, please contact Dr. Conor Murphy, Department of Geography, NUI Maynooth on 01 7083494 or email conor.murphy@nuim.ie

Please leave the completed questionnaire outside your door in the envelope provided.

One of our team will come and collect it tomorrow evening.

In the following questions we are interested in exploring your opinions on the original flood defence proposals for Clontarf promenade made by Dublin City Council in 2011.

Q1. Please indicate the extent to which you agree or disagree with each of the following statements. Please tick the appropriate box for each statement.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<i>I was in favour of the proposed flood defences</i>					
<i>Flood defences are necessary to protect Clontarf from flood damage</i>					
<i>A flood wall is not an appropriate solution</i>					
<i>Keep the promenade as it is, there is no need for change</i>					
<i>General re-development of the promenade is important for Clontarf</i>					
<i>The Promenade is fundamental to the identity of Clontarf</i>					

Q2. Please identify, in order of importance, three aspects of the promenade that are of most value to you.

- i).
- ii).
- iii).

**Q3. How did you first become aware of the proposed flood defences?
Please tick the appropriate option(s).**

- Word of mouth*
 - Local website*
 - Newspaper coverage*
 - Radio/TV reports*
 - Public Meeting organised by Dublin City Council*
 - Public Meeting organised by Local Community*
 - Local awareness campaign (flyers/posters)*
 - Other, please specify*
-

Q4. Please indicate how each of the following emotions best describe your feelings towards the proposed flood defences. Please tick the appropriate box for each emotion.

	Describes Extremely Well	Describes Well	Describes neither Well nor Poorly	Describes Poorly	Describes Extremely Poorly
<i>Angry</i>					
<i>Threatened</i>					
<i>Happy</i>					
<i>Anxious</i>					
<i>Hopeful</i>					
<i>Shocked</i>					
<i>Indifferent</i>					
<i>Disappointed</i>					

Q5. Have you previously been affected by flooding in Clontarf?

- Yes No

If yes, please indicate how you have been affected.

Q6. In relation to the perceived impacts of the proposed flood defences on Clontarf, please indicate the extent to which you agree or disagree with each of the following statements. Please tick the appropriate box for each statement.

'The proposed flood defences would have....'

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<i>...negatively impacted the cultural heritage of Clontarf</i>					
<i>...decreased security of the place</i>					
<i>...promoted anti-social behaviour</i>					
<i>...created an eyesore</i>					
<i>...spoiled views of the bay</i>					
<i>...impacted on wildlife</i>					
<i>...reduced property values</i>					
<i>...damaged tourism</i>					
<i>...lessened the recreational value of the area</i>					

Q7. In your experience, please indicate which of the following presents the greatest risk of flooding to Clontarf? Please tick the appropriate option.

- Coastal flooding
 - Heavy rainfall
 - Inadequate infrastructure (blocked drains)
 - Other (please specify)
-

Q8. In response to the proposed flood defences please indicate which of the following actions you have personally undertaken. Please tick the appropriate option for each statement.

	Never	Once	More than Once
<i>Written to a newspaper in favour of original defences</i>			
<i>Signed a petition in favour of original defences</i>			
<i>Written to a local politician/Dublin City Council in favour of original defences</i>			
<i>Written to a newspaper opposing original defences</i>			
<i>Signed a petition opposing original defences</i>			
<i>Written to a local politician/Dublin City Council opposing original defences</i>			
<i>Participated in public protests opposing original defences</i>			

Q9. In relation to the planning and decision-making process around the proposed flood defences, please indicate the extent to which you agree or disagree with each of the following statements. Please tick the appropriate option for each statement.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<i>The original planning process was fair</i>					
<i>The original planning process was open & transparent</i>					
<i>The local community was recognised as a partner in the original planning process</i>					
<i>Community views were listened to</i>					
<i>Information from Dublin City Council was truthful, sincere and open</i>					
<i>It was easy to access and obtain information about the original flood defence plan</i>					
<i>I was able to influence the original planning and decision-making process</i>					
<i>I trust Dublin City Council to make flood defence related decisions regarding Clontarf</i>					

Q10. Please indicate which organisations you feel best represent the views of the local community. Please tick the appropriate option(s).

- Clontarf Residents Association
 - Clontarf Business Association
 - Elected Local Representatives
 - Dublin City Council
 - Other, please specify
-

Q11. Write, as quickly as you can, any words or phrases that come to mind when you think about Clontarf.

Q12. Please indicate the extent to which you agree or disagree with each of the following statements. Please tick the appropriate option for each statement.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<i>I like living in Clontarf</i>					
<i>I feel attached to Clontarf</i>					
<i>I would regret having to move to another area</i>					
<i>When I'm away, I miss Clontarf</i>					
<i>No other place provides the same opportunities to do what I like in my spare time</i>					
<i>It is important to me how this area develops</i>					
<i>Clontarf is part of my identity</i>					
<i>I have good memories of Clontarf</i>					
<i>My family has connections to this area from far back</i>					
<i>The area is important to me because of my lifestyle</i>					
<i>I feel that Clontarf is part of me</i>					
<i>I feel part of a community in Clontarf</i>					
<i>Clontarf is seen from outside as possessing prestige</i>					

And finally, please tell us a little about yourself and your household.....

Q13. What is your age? (please tick one)

- 18-29
- 30-44
- 45-59
- 60-74
- 75+

Q14. What is your current status? (please tick one)

- Working (full time/part time)
 - Looking after children/the house
 - Unemployed
 - Retired
 - Student
 - Other (please state):
-

Q15. What is your gender? (please tick one)

- Male
- Female
- Other

Q16. What is the highest educational or professional level qualification you have obtained? (please tick one)

- Intermediate/Junior Certificate
- Leaving Certificate
- Vocational qualifications
- Bachelor's degree or equivalent
- Masters/PhD or equivalent
- Other
- No formal qualifications

Q17. How many children under 16 live in this household? (please tick one)

- None
- 1
- 2
- 3
- 4 or more

Q18. How long have you lived in Clontarf? (please tick one)

- Less than 1 year
- 1 year – less than 5 years
- 5 years – less than 10 years
- 10 years – less than 20 years
- Greater than 20 years
- All my life

Q19. About your home, are you: (please tick one)

- Buying through mortgage/loan
- Outright owner
- Renting privately
- Renting from council
- Don't know

Q20. What is your nationality? Please state:

**Thank you very much for taking part in this survey.
Your input and time are much appreciated.**

Please leave this completed questionnaire outside your door in the plastic pocket provided. One of our team will collect it tomorrow evening.

Appendix F: Coding template for free associations of place-related symbolic meanings for Clontarf promenade and Dollymount promenade

Thematic categories	Sub-theme
Beautiful environment	Untouched Scenic Sea Greening in city Wildlife/Nature reserve Accessibility/open space Preserving promenade/Beauty threatened Landscapes connected Enhances area Clontarf identity Heritage/history Iconic features Landmark
Recreational amenity	Exercise Recreation/Amenity Relaxation Sports Communal space Safe recreation
Social	Clean Nice place to live Family friendly Meeting place
Well-being	Health
Economic	Tourist attraction House valuations
Ease of mobility	Convenient/Central location (proximity to city/beach/other locations) Lack of traffic Parking Commuting ease
Community concerns	Bins needed Beach dirty Refurbish baths Lighting required Views on flood defences Acts as flood defence Vandalism Maintain road Local businesses Expensive Wall appearance Re-development Road needs improvement Flood insurance



Survey on Place Attachment and Community Participation in Decision-Making

Dear Householder,

We are researchers from Maynooth University. We are carrying out research to examine your views on the ***ongoing flood defence project*** from ***Wooden Bridge to the Causeway Road***. In particular, we are interested in your attachment to Clontarf and the role of community involvement in the ***original decision-making*** process. By ***'original proposals/defences'*** and ***'original decision-making'*** processes, we explicitly refer to planned flood defences by Dublin City Council ***prior to a reduction in flood defence height being agreed*** in recent months to preserve sea views along this section of the coast.

We would very much appreciate if you would participate in this survey. Any information that you provide will be kept strictly confidential, will not be given to third parties and will only be reported in anonymised statistical form. Please work through all sections of the questionnaire, answering as much or as little as you like for each question. There are no right or wrong answers, what comes into your mind is most important. We are very interested in your opinions and ***all*** your views are relevant. It will take about 15 minutes to complete.

If you have any queries or would like more information, please contact one of our research team:

Phone: 01-7086836 or 01-7083494

E-mail: Darren Clarke: darren.clarke@nuim.ie

Dr. Conor Murphy: conor.murphy@nuim.ie

Post: Room 1.9 Laraghbryan House, Irish Climate Analysis and Research Units, Maynooth University, Maynooth, Co. Kildare

Please leave this completed questionnaire outside your door in the plastic pocket provided. One of our team will come and collect it tomorrow evening.

Q1. Please indicate the extent to which you agree or disagree with each of the following statements. Please place a tick in the appropriate box for each statement.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<i>I was in favour of the originally proposed flood defence project between Wooden Bridge and the Causeway Road</i>					
<i>The section between Wooden Bridge and the Causeway Road is fundamental to the identity of Clontarf</i>					
<i>Flood defences are necessary to protect Clontarf from flood damage</i>					
<i>Keep the section between Wooden Bridge and the Causeway Road as it is, there is no need for change</i>					
<i>General re-development of the section between Wooden Bridge and the Causeway Road is important for Clontarf</i>					
<i>Flood defence heights between Wooden Bridge and the Causeway Road should not have been reduced to protect sea views</i>					

Q2. How did you first become aware of the proposed flood protection project between Wooden Bridge and the Causeway Road? Please tick the appropriate option(s).

- Word of mouth*
 - Local website*
 - Media coverage*
 - Public Meeting organised by Dublin City Council*
 - Public Meeting organised by Local Community*
 - Local awareness campaign (flyers/posters)*
 - Elected representative(s)*
 - Other, please specify*
-

Q3. Have you ever been affected by flooding in Clontarf?

- Yes No

If yes, please indicate how you have been affected.

Q4. Please identify, in order of importance, three aspects of the section between Wooden Bridge and the Causeway Road that are of most value to you.

- i).
- ii).
- iii).

Q5. In relation to the perceived impacts of the *originally proposed flood protection project between Wooden Bridge and the Causeway Road (prior to a reduction in flood defence height being agreed)*, please indicate the extent to which you agree or disagree with each of the following statements. Please tick the appropriate box for each statement.

'The proposed flood defences would have....'

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<i>...negatively impacted the cultural heritage of Clontarf</i>					
<i>...decreased security of the place</i>					
<i>...promoted anti-social behaviour</i>					
<i>...created an eyesore</i>					
<i>...spoiled views of the bay</i>					
<i>...impacted on wildlife</i>					
<i>...reduced property values</i>					
<i>...damaged tourism</i>					
<i>...lessened the recreational value of the area</i>					

Q6. In your experience, please indicate which of the following presents the greatest risk of flooding to Clontarf? Please tick the appropriate option(s).

- Coastal flooding
- Heavy rainfall
- Inadequate infrastructure (e.g. blocked drains)
- Combination (please specify)

Q7. Please indicate how each of the following emotions best describe your feelings towards the *originally proposed flood defence project between Wooden Bridge and the Causeway Road (prior to a reduction in flood defence height being agreed)* when you became aware of proposals. Please tick the appropriate box for each emotion.

	Describes Extremely Well	Describes Well	Describes neither Well nor Poorly	Describes Poorly	Describes Extremely Poorly
<i>Angry</i>					
<i>Threatened</i>					
<i>Happy</i>					
<i>Anxious</i>					
<i>Hopeful</i>					
<i>Shocked</i>					

Q8. In response to the originally proposed flood defence project between Wooden Bridge and the Causeway Road (prior to a reduction in flood defence height being agreed), please indicate which actions you have personally undertaken. Please tick the appropriate option for each statement.

	Never	Once	More than Once
<i>Written to a newspaper in favour of original defences</i>			
<i>Signed a petition in favour of original defences</i>			
<i>Written to a local politician/Dublin City Council in favour of original defences</i>			
<i>Written to a newspaper opposing original defences</i>			
<i>Signed a petition opposing original defences</i>			
<i>Written to a local politician/Dublin City Council opposing original defences</i>			
<i>Participated in public protests opposing original defences</i>			

Q9. Please indicate which organisation(s) you feel best represent the views of the local community. Please tick the appropriate option(s).

Clontarf Residents Association

Clontarf Business Association

Elected Local Representatives

Dublin City Council

Other, please

specify _____

Q10. In relation to the *planning and decision-making process around the originally proposed flood defences between Wooden Bridge and the Causeway Road (prior to a reduction in flood defence height being agreed)*, please indicate the extent to which you agree or disagree with each of the following statements. Please tick the appropriate option for each statement.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<i>The original planning process was fair</i>					
<i>The original planning process was open & transparent</i>					
<i>The local community was recognised as a partner in the original planning process</i>					
<i>Community views were listened to</i>					
<i>Information from Dublin City Council was truthful, sincere and open</i>					
<i>It was easy to access and obtain information about the original flood defence plan</i>					
<i>I was able to influence the original planning and decision-making process</i>					
<i>I trust Dublin City Council to make flood defence related decisions regarding Clontarf</i>					

Q11. Write, as quickly as you can, any words or phrases that come to mind when you think about Clontarf.

Q12. Please indicate the extent to which you agree or disagree with each of the following statements. Please tick the appropriate option for each statement.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
<i>I like living in Clontarf</i>					
<i>I feel attached to Clontarf</i>					
<i>I would regret having to move to another area</i>					
<i>When I'm away, I miss Clontarf</i>					
<i>No other place provides the same opportunities to do what I like in my spare time</i>					
<i>It is important to me how this area develops</i>					
<i>Clontarf is part of my identity</i>					
<i>I have good memories of Clontarf</i>					
<i>My family has connections to this area from far back</i>					
<i>The area is important to me because of my lifestyle</i>					
<i>I feel that Clontarf is part of me</i>					
<i>I feel part of a community in Clontarf</i>					
<i>Clontarf is seen from outside as possessing prestige</i>					

And finally, please tell us a little about yourself and your household.....

Q13. What is your age? (please tick one)

- 18-29
- 30-44
- 45-59
- 60-74
- 75+

Q14. What is your current status? (please tick one)

- Working (full time/part time)
- Looking after children/the house
- Unemployed
- Retired
- Student
- Other (please state):

Q15. What is your gender? (please tick one)

- Male
- Female
- Other

Q16. What is the highest educational or professional level qualification you have obtained? (please tick one)

- Intermediate/Junior Certificate
- Leaving Certificate
- Vocational qualifications
- Bachelor's degree or equivalent
- Masters/PhD or equivalent
- Other
- No formal qualifications

Q17. How many children under 16 live in this household? (please tick one)

- None
- 1
- 2
- 3
- 4 or more

Q18. How long have you lived in Clontarf? (please tick one)

- Less than 1 year
- 1 year – less than 5 years
- 5 years – less than 10 years
- 10 years – less than 20 years
- Greater than 20 years
- All my life

Q19. About your home, are you: (please tick one)

- Buying through mortgage/loan
- Outright owner
- Renting privately
- Renting from council
- Don't know

Q20. What is your nationality? Please state:

**Thank you very much for taking part in this survey.
Your input and time are much appreciated.**

Please leave this completed questionnaire outside your door in the plastic pocket provided. One of our team will collect it tomorrow evening.