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Incremental adaptation when transformation fails: The importance of place-based values and trust in governance in avoiding maladaptation

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ABSTRACT

Climate change threatens human wellbeing and adaptation is essential. To-date, little research has examined connections between incremental and transformative adaptation. We address this gap using two multi-functional flood defence projects in Clontarf, a community in Dublin, Ireland, one of which represents transformative and the other incremental adaptation. Using a repeated study, we ask (i) does the importance of place-related values differ depending on whether adaptation is incremental or transformative, and (ii) what role does trust in governance play in incremental adaptation when transformation fails? Surveys were administered in Clontarf in 2014 (n = 280) after community resistance to transformative flood defences. A follow-up study using an identical survey was undertaken to evaluate separate incremental flood defences in 2016 (n = 242). Results highlight several important findings. First, both adaptation interventions show repeated potential threats to place from perceived weak governance rather than from disruptive place change caused by climate change. Second, where place attachment is strong, communities may repeatedly resist potential threats to place by challenging poor governance. However, this inadvertently threatens place disruption from climate change e.g., extreme climatic events. This could cause maladaptation, tying future decisions to past actions and failing to consider alternative transformative adaptation pathways. Finally, community discussions on transformative pathways and avoiding maladaptation risks are crucial for successful adaptation. This includes recognising trade-offs between place disruption threats from proposed adaptation strategies and climate change. Governance processes may subsequently need to transform and incorporate learnings or risk repeated resistance to adaptation previously considered rational. Many of these issues are likely to be encountered in all regions globally and across multiple adaptation sectors. Findings therefore provide important evidence to improve adaptation outcomes more generally.

1. Introduction

Climate change increasingly threatens human wellbeing (Devine-Wright & Quinn, 2020), with adaptation recognised as a necessary response (IPCC, 2022; Pelling & Garschagen, 2019). There is strong evidence that adaptation is not happening at the pace and scale required (IPCC, 2022). Where adaptation is happening, there is concern that existing approaches could lock society into maladaptive pathways, whereby choices today increase long-term risks (Chi et al., 2020). For instance, whilst current adaptation approaches may reduce vulnerability and maintain wellbeing in the short term, they may be maladaptive by creating a false sense of safety for communities (Magnan et al., 2016). Moreover, individuals may fail to consider or accept alternative adaptation options should existing adaptation pathways be insufficient, increasing long-term vulnerability and threatening wellbeing (Adger et al., 2016; Quinn et al., 2015).

It is widely understood that vulnerabilities manifest at the local level, where adaptation should focus (Aguiar et al., 2018; IPCC, 2022). Research suggests that climate adaptation should be place-based and designed collaboratively with vulnerable communities to meet their needs, taking account of both short and long-term risks (Trell & van Geet, 2019). This requires engaging with diverse views, being open to new ways of adapting and realising opportunities suited to particular places rather than attempting to fit adaptation around 'one size fits all' practices (Butts & Adams, 2020; Neef et al., 2018).

Whilst climate change risks have increased in recent decades

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(Eckstein et al., 2018), social, cultural, political and governance practices have not responded (IPCC, 2022). Adaptation can therefore be a contested issue, resulting in resistance and delay (Marshall et al., 2012). How these practices are managed over the coming years and decades will ultimately determine whether adaptation is successful for those places and communities that adaptation seeks to protect.

1.1. Incremental and transformative adaptation pathways

Most research has focused on incremental adaptation (Kates et al., 2012; Mustelin & Handmer, 2013; Smith et al., 2011), which serves to maintain existing systems, development pathways and practices (IPCC, 2022). These adaptations involve typically minor changes to public, private and social institutions' trajectories (IPCC, 2022; Termeer et al., 2016). Recognising that incremental adaptation is often insufficient to deal with climate change, transformative adaptation is being increasingly considered as necessary (IPCC, 2022; Juhola et al., 2017; Kates et al., 2012; Marshall et al., 2016; Satyal et al., 2017; Termeer et al., 2016). Transformation is typified by nonlinear change or deviation from the status quo (IPCC, 2022; Marshall et al., 2016; O'Brien, 2012; Pelling et al., 2015). For example, for climate change, incrementally adapting by constructing higher flood barriers or elevating houses may be insufficient. This modifies the social or ecological system to accommodate change, but the fundamental system characteristics remain vulnerable. A transformative response may consider relocating houses or restoring wetlands upstream to address the root causes of vulnerability (Fedele et al., 2019; IPCC, 2022).

Transformative adaptation remains rare in practice (Berrang-Ford et al., 2021; Chapin et al., 2010; IPCC, 2022; Revi et al., 2014). One of the primary reasons for this is that institutional and behavioural constraints tend to support existing practices (Jeffers, 2020; Kates et al., 2012). Moreover, incremental adaptation often has high public visibility e.g. engineered adaptation responses (Novalia & Malekpour, 2020). Selling and demonstrating incremental adaptation to citizens is often easier, with capacities for making future decisions formulated in the process (Novalia & Malekpour, 2020; Rickards & Howden, 2012). However, this can lead to lock-in of existing approaches that makes it difficult to consider transformative responses (Magnan et al., 2020). As with any adaptation efforts however, where transformative adaptation is not systemic or does not account for multiple perspectives there can be unintended, negative consequences such as increased vulnerability or inequalities (Colloff et al., 2021; Eriksen et al., 2021), which may lead to maladaptation. Moreover, those who believe that they have observed negative consequences may be less likely to support future adaptation efforts – creating further negative consequences. For instance, when individuals are highly motivated to oppose climate-related projects, efforts that they have assessed as having "failed" or having unintended negative consequences – even if causality can't be determined – might hinder future climate action (Oladipo, 2023).

1.2. Learning for adaptation planning

For climate change adaptation, the importance of considering a broad range of stakeholder views and collective learning through reflexivity and practice is well recognised (Pelling et al., 2015; Ziervogel et al., 2022), as is the need to learn for systemic governance transformation (van Bommel et al., 2016; Ziervogel et al., 2022). Reflexivity and learning from past events and actions can support adaptation and transformation (Burch, 2010; Feindt & Weiland, 2018; Jones & Boyd, 2011; Mustelin & Handmer, 2013; Patterson et al., 2015; Plank et al., 2021; Werners et al., 2021).

Learning strategies involve monitoring, evaluating and responding to signs of social and environmental change (Olsson et al., 2004, 2010), which can help overcome adaptation barriers (Moser & Ekstrom, 2010; Quang & Wit, 2020). Learning is often constrained as institutions attempt to validate, improve and legitimise salient adaptation issues based on technical or scientific expertise (Cloutier et al., 2015; Hügel & Davies, 2020). However, where socially or environmentally unacceptable side effects emerge, affected actors may be unforgiving, particularly where learnings from past shortcomings are ignored (Ekstrom et al., 2011; Lausier & Jain, 2019). For place-based adaptation the benefits of co-learning and co-producing knowledge and strategies based on both local and scientific expertise have been demonstrated (Cloutier et al., 2015). This can prevent adaptation from instinctively being framed based on scientific expertise alone and improve adaptation outcomes (Cloutier et al., 2015).

1.3. Disruptive place change related to adaptation

Local responses to climate change are influenced by how change impacts livelihoods, assets and wellbeing (Fenton et al., 2017; IPCC, 2022; Kabir & Serrao-Neumann, 2020; O'Neill & Handmer, 2012). Because adaptation planning typically focuses on material issues which can be handled through traditional planning systems and cost benefit analysis, governance processes may ignore aspects of culture, place and wellbeing (Adger et al., 2013; Adger & Barnett, 2009; Shrestha et al., 2019). Individual and collective agency in adaptation is crucial for wellbeing, particularly where place-related values are concerned (Devine-Wright & Howes, 2010).

Hence, affected individuals are likely to seek control over how potential disruption from adaptation is enacted (Carter et al., 2015). Disruption does not necessarily infer physical place change, but can occur from psychological stress or perceived threats from potential future change (Brown & Raymond, 2007; Devine-Wright, 2009; Mihaylov & Perkins, 2014). However, adaptation strategies rarely account for place-based community values (Jeffers, 2022; O'Brien & Wolf, 2010). Participatory governance can reduce disruptive change, and may positively influence place-related bonds (von Wirth et al., 2016), facilitating effective adaptation. In the context of disruptive place change, repeated studies within specific locales can help to understand evolving place-based values (Devine-Wright, 2009; Korpela et al., 2009), which could help our understanding of how to support effective adaptation, whether incremental or transformative.

To-date, little research has examined connections between incremental and transformative adaptation. The literature review highlighted how learning from past events and integrating place-based values into decision-making are central in facilitating transformative adaptation pathways, helping to overcome barriers and contributing to successful adaptation. Empirical evidence of how learning and place-based values interact across both incremental and transformative adaptation remain very rare, however. This research addresses this gap using a repeated study design by asking:

1. Does the importance of place-related values differ depending on whether adaptation is incremental or transformative?
2. When attempts at transformative adaptation fail, what role does trust in governance play in enacting incremental adaptation?

2. Methods

2.1. Study background

This study centres on two multi-functional flood defence projects in Clontarf, a community in Dublin, Ireland, one of which represents transformative and the other incremental adaptation. The proposed flood defences were expected to connect with one another on completion, providing integrated flood defences for the community. Clontarf is a coastal suburban community 6 km north of Dublin city centre and borders the Irish Sea and Bull Island, a UNESCO Biosphere Reserve. The area is characterised by several physical landscape features and is highly utilised recreationally.

2.1.1. Clontarf promenade

The first of these projects, herein referred to as "Clontarf promenade", relates to transformative adaptation and proposed construction of an earthen mound through a 3 km coastal promenade and erecting flood walls elsewhere along the promenade, ranging in height from 0.85 m–2.75 m, for which planning approval was granted in 2008. The proposed flood defences lie directly adjacent to several hundred coastal properties (Office of Public Works, 2017). However, the local community objected to both the scale of the proposed defences and public consultation processes. This led to Dublin City Council (DCC) abandoning construction plans in 2011 (Clarke et al., 2016; 2018). Flood defences for this section of Clontarf are not expected to be completed until 2027 at the earliest (Kelly, 2021). The flood defences were transformative because completion was deemed to fundamentally change the existing environment and threaten social values and norms ascribed to the promenade by significantly altering its functionality as an expansive communal space (IPCC, 2012).

2.1.2. Dollymount promenade

The second project is also in the Clontarf community and refers to "Dollymount promenade". It centres on an incremental multi-functional flood defence project initiated by DCC in 2009. This involved flood defences, a new water main and a 2 km cycle track that formed part of a 22 km cycleway around Dublin Bay. The proposed defences were expected to connect with "Clontarf promenade" flood defences on completion, creating integrated coastal defences for the Clontarf community. A substantial proportion of Dollymount flood defences are adjacent to St. Anne's Park, a municipal recreational area. Consequently, coastal flood risks to properties are significantly lower than along Clontarf promenade. Public consultation was undertaken in 2012–2013. This included two public information meetings attended by approximately 180 people and on-site availability of representatives from DCC. A letter-drop to residents and business owners also took place in April 2015 in advance of works (Dublin City Council, 2015). However, when works began community concerns emerged relating to proposed designs of some flood defence sections. The community 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 were completed in 2017 (S2S: Sutton to Sandycove, 2017).

The Dollymount defences are incremental based on IPCC definitions of incremental adaptation (IPCC, 2022). First, with respect to community concerns, unlike issues that arose for Clontarf promenade, no fundamental change to the function of the space was proposed. Instead, existing walkway/pedestrian corridors were to be expanded, thereby enhancing its amenity value (Fig. 1) (Dublin City Council, 2009). And second, based on national flood risk management strategies which prioritise structural defences (Jeffers, 2020, 2013), the project maintained existing systems and practices by moderately increasing the height of existing seawall defences. For instance, 72% of the project involved increasing seawall heights by less than 0.4m, with the remaining 28% increasing by less than 0.7m. Fig. 2 provides a location map for both sites.

2.2. Data collection

Adaptation studies frequently use data triangulation, incorporating multiple data analysis techniques (Bryan et al., 2013; Chenani et al., 2021; Ekstrom & Moser, 2014). Triangulation improves data richness and robustness and supports theoretical knowledge (Cresswell, 2013; Driscoll et al., 2007; Johnson et al., 2007; Landauer et al., 2019). In keeping with this approach, primary and secondary data used for data triangulation purposes are outlined in Sections 2.2.1–2.2.2.

2.2.1. Clontarf promenade

This study re-introduces published quantitative questionnaire results from Clontarf promenade undertaken by Clarke et al. (2018). This is to provide comparability for public perception of adaptation, governance, place attachment and place disruption processes over time between Clontarf promenade and Dollymount promenade. Details of qualitative data consulted for Clontarf promenade however are not presented herein (see Clarke et al., 2016).

Fig. 1. View of Dollymount promenade at various stages. Top-left – original view prior to flood defence works. Top-right – virtual depiction of proposed flood defences. Bottom-left – view of completed flood defences.
Sources: Top-left and top-right: Dublin City Council (2009). Bottom-left: Authors' image.

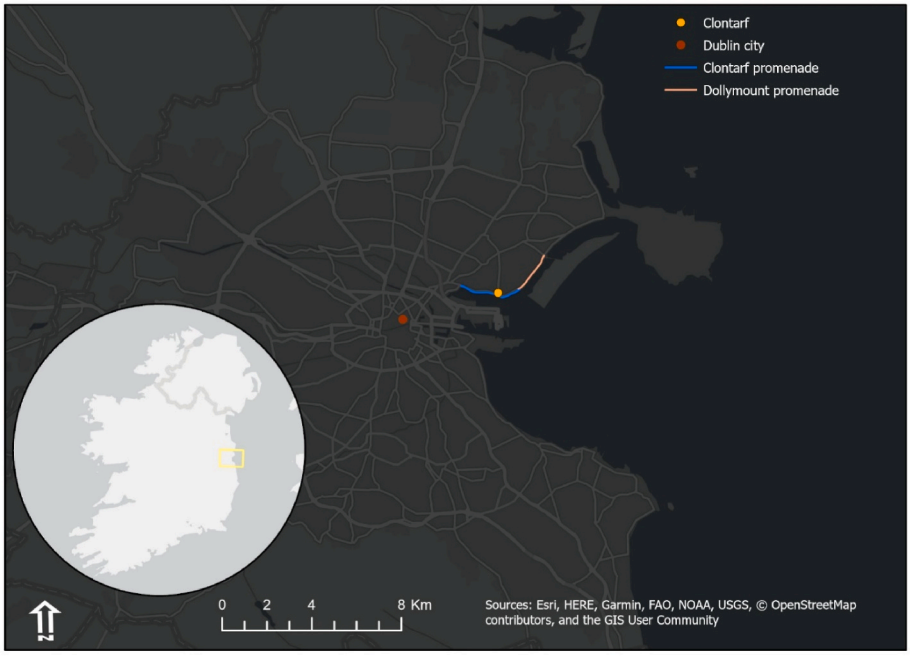

Fig. 2. Map of study location.

2.2.2. Dollymount promenade

For this study, questionnaires identical to Clarke et al. (2018), which focused on place attachment and processes of place disruption for Clontarf promenade, were distributed for comparability to understand community perceptions of Dollymount promenade flood defences and whether these differed to flood defences for Clontarf promenade. Additionally, secondary data for Dollymount promenade was analysed to understand community perceptions of the proposed flood defences. The secondary data examined grey literature including official local authority documents, public submissions made to the local authority (DCC) regarding the proposed project (obtained under Freedom of Information Act 2014), social media activity, community websites and digital media sources amongst others (e.g. Anderson, 2015; Change.org, 2015; Clontarf.ie, 2015a, 2015b; Save our Seafront, 2015).

2.3. Questionnaire measures

To examine disruption processes, questionnaires for Dollymount promenade included place attachment, symbolic place-related meanings, place-protective interpretative responses, attitudinal responses, and perceptions of governance processes surrounding flood defences. Given the repeated nature of this study, the questionnaire design and format was replicated from Clarke et al. (2018) from their Clontarf promenade study. Questionnaire measures are detailed in Sections 2.3.1–2.3.5. All measures, conditions and data exclusions for analyses are detailed herein. Pairwise deletion methods were used for missing data to maximise valid data (Pallant, 2020).

2.3.1. Place attachment

Place attachment was measured through eight statements focused on place dependence and place identity (see Clarke et al., 2018; Devine--Wright & Howes, 2010; Kaltenborn & Bjerke. 2002). Place dependence was measured through three 5-point (strongly agree to strongly disagree) Likert statements e.g. *The area is important to me because of my lifestyle*. Place identity consisted of five Likert statements e.g. '*Clontarf is part of my identity*' (Clarke et al., 2018). Following Clarke et al. (2018) Clontarf promenade study, a combined eight-item place attachment scale showed good internal reliability for the Dollymount promenade questionnaire ($\alpha = 0.84$) (von Wirth et al., 2016). The scores for each respondent from these eight items were combined and then averaged to develop a measure of place attachment (Devine-Wright, 2011; Devine-Wright & Howes, 2010).

2.3.2. Symbolic place-related meanings

Place-related meanings were captured using a free association task (Clarke et al., 2018). Participants were asked to *'identify, in order of importance, three aspects of [Dollymount] promenade that are of most value to you'*. Analysis of symbolic place-related meanings for Dollymount promenade was conducted to identify manifest themes (n = 570) using 7 thematic categories developed by Clarke et al. (2018). These included beautiful environment, recreational amenity, social, wellbeing, economic, ease of mobility and community concerns. Proportional responses were subsequently generated for each theme.

2.3.3. Place protective interpretative responses

Similar to Clarke et al. (2018), interpretation of proposed flood defences for Dollymount promenade was measured using nine negatively worded Likert items to ensure comparability with Clontarf promenade. These included *'The proposed flood defences would have … 'impacted wildlife'*, *'spoiled views of the bay'*, *'reduced the recreational value'*. Each of the statements used a 5-point Likert statement response ranging from strongly agree to strongly disagree.

2.3.4. Attitudes towards flood defences and place disruption

Attitudes towards place change were measured using three 5-point Likert statements. Support was measured with the statement *'I was in favour of the proposed flood defences'*. During analysis this statement was reverse-worded to *'I was not in favour of the proposed flood defences'* to determine opposition to Dollymount promenade flood defences, with Likert statement responses also reverse coded (Clarke et al., 2018).

2.3.5. Perceived effectiveness of governance

For Dollymount promenade, perceived effectiveness of governance processes were measured using eight Likert statements similar to Clarke et al. (2018). These captured perceptions of fairness, transparency, accountability, inclusive decision-making, legitimacy and trust, including: *'The planning process was fair'*, *'I was able to influence the planning and decision-making process'*, *'I trust in Dublin City Council to*

make flood defence related decisions regarding Clontarf'. Responses used 5-point Likert statements from strongly agree to strongly disagree.

2.4. Questionnaire implementation

The questionnaire was piloted with ten individuals in October 2016 with minor modifications required. Given the repeated nature of this study and the fact that both study sites are in the same community, the questionnaire explicitly distinguished the study site of Clarke et al. (2018) (i.e. Clontarf promenade) and the current study site (i.e. Dollymount promenade). Questionnaires were circulated in November 2016, eight months after agreement to reduce flood defence heights along Dollymount promenade.

Questionnaire distribution used a drop-and-collect procedure, during which they were distributed one day and collected the following day (Stedman et al., 2019). One questionnaire was left per household, with individuals 18 years or older asked to complete it. Every third house on each street was included as part of this sampling technique (Clarke et al., 2018; Devine-Wright & Howes, 2010; Kyle et al., 2004). Participants were not asked if they recalled completing a previous survey for Clontarf promenade. It is therefore possible that some respondents may have been sampled across both studies.

2.5. Participants and sample

Questionnaire distribution occurred within the same area as Clarke et al. (2018) for their earlier Clontarf promenade study (i.e. Dollymount and Clontarf, St. John's parishes). Both areas are adjacent to the proposed Dollymount promenade flood defences. The areas are a subset of the larger Clontarf area. Using 2016 Dublin parish level census data, the population of both parishes was recorded as 10,290 (Central Statistics Office, 2016). 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 1). Younger respondents were underrepresented whilst older individuals were over-represented compared to census data. Similarly, participants were significantly more likely to have a third level education compared to census data (i.e., Bachelor's degree or equivalent). 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.

Table 1
Socio-demographic characteristics for Dollymount promenade respondents. Note: * significant at $p < .05$; ** significant at $p < .001$ compared with census 2016 data (Central Statistics Office, 2016).

Demographic factors		Dollymount promenade respondents	Census 2016 data: Dollymount and Clontarf – St. John's
Age (%)	18–29	1.3**	17.7
	30–44	20.0*	26.6
	45–59	42.1**	25.9
	60–74	28.1*	18.7
	75+	8.5	11.1
Sex (%)	Male	48.1	47.3
	Female	51.9	52.7
Ceased Education (%)	Second level	15.0*	25.0
	Vocational qualification	5.3	5.3
	Bachelor's degree or equivalent	45.6**	29.4
	Masters/PhD or equivalent	27.9	24.5
	No formal qualifications	1.3*	0.4
Employment status (%)	Working full-time/part-time	59.1	53.9
	Looking after children/home	4.8	6.9
	Unemployed	2.2	3.2
	Retired	30.9*	20.3
	Student	.9**	12.7
Household status (%)	Buying through mortgage	38.7	40.3
	Own outright	54.8**	35.6
	Renting	6.1**	21.1

3. Results

Non-parametric tests were applied throughout. Where appropriate, the results re-introduce the findings identified by Clarke et al. (2018) for their Clontarf promenade study for comparison. Table 2 provides an overview of descriptive statistics for each measure from both studies.

3.1. Understanding place-related values and support for incremental adaptation

Comparison of free association data related to place-related symbolic meanings repeatedly identified the natural environment and its recreational features as the two primary factors embodying what Dollymount promenade represented for respondents (Table 3). For instance, these aspects accounted for 89%, 80% and 75% of responses across the 1st, 2nd, and 3rd free association tasks respectively for Dollymount promenade. Notwithstanding proportional differences in place-related symbolic meanings between both studies, the two themes of *'beautiful environment'* and *'recreational amenity'* consistently dominated responses across both studies.

To further understand place-related meanings, Spearman's Rho correlations between place attachment and place-protective interpretative responses were examined for Dollymount promenade. Findings showed numerous significant positive correlations (Table 4), including the relationship between place attachment and interpreting that flood defences would have *'impacted wildlife'* ($rho = 0.35$, $n = 219$, $p < .001$), *'spoiled views of the bay'* ($rho = 0.21$, $n = 220$, $p < .05$) or *'reduced the recreational value'* of Dollymount promenade ($rho = 0.24$, $n = 221$, $p < .001$). Similar results were found for Clontarf promenade (Table 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 ($Md = 1.63$, $n = 222$, $U = 28{,}064$, $z = -0.09$, $p > .05$, $r < 0.01$), demonstrating its consistency despite repeated risks of disruptive place change.

However, a Mann-Whitney U Test examining differences in support for both flood defence projects showed respondents were significantly more opposed to transformative flood defences along Clontarf promenade ($Md = 1.00$, $n = 266$) than to incremental adaptation along Dollymount promenade ($Md = 2.00$, $n = 229$, $U = 23{,}300$, $z = -4.83$, $p < .001$, $r = 0.22$). Similarly, whilst analysis of descriptive statistics showed that respondents interpreted place change as disruptive along Dollymount promenade, they were considered as significantly less disruptive than Clontarf promenade. For instance, respondents believed that Clontarf promenade flood defences *"reduced the recreational value"* ($Md = 1.00$, $n = 273$) to a greater extent than along Dollymount promenade ($Md = 2.00$, $n = 237$, $U = 21{,}031$, $z = -7.66$, $p < .001$, $r = 0.34$). Likewise, flood defences along Clontarf promenade were more likely to have *"created an eyesore"* ($Md = 1.00$, $n = 273$) than those for Dollymount promenade ($Md = 1.00$, $n = 234$, $U = 25{,}185$, $z = -4.79$, $p < .001$, $r = 0.21$). People were also significantly more likely to perceive that flood defences along Clontarf promenade *"spoiled views of the bay"* ($Md = 1.00$, $n = 272$) to a greater extent than Dollymount promenade ($Md = 1.00$, $n = 235$, $U = 26{,}049$, $z = -4.48$, $p < .001$, $r = 0.20$). Place change was considered significantly more disruptive along Clontarf promenade for all interpretations of disruptive change except for perceptions that flood defences *'impacted wildlife'* (Table 4).

Table 2
Descriptive statistics for place attachment and attitudes to place change, place-protective interpretative responses and perceptions of governance processes for Clontarf promenade (Clarke et al., 2018) and Dollymount promenade. 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.

	Clontarf promenade				Dollymount promenade			
	Cronbach alpha (α)	**Mean (M)**	**Standard Deviation (SD)**	**Median**	**Cronbach alpha (α)**	**Mean (M)**	**Standard Deviation (SD)**	**Median**
Place attachment (one composite item)	**.85**	**1.77**	**.64**	**1.63**	**.84**	**1.77**	**.67**	**1.63**
Place identity								
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
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	.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
Place-protective interpretative responses								
Proposed flood defences would have …								
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
Governance process perceptions		**3.86**	**.76**	**4.00**		**3.91**	**.85**	**4.00**
The planning process was fair		3.96	1.05	4.00		3.83	1.10	4.00
The planning process was open & transparent		4.00	1.04	4.00		3.95	1.09	4.00
The local community was recognised as a partner in the planning process		3.92	1.09	4.00		4.01	1.05	4.00
Community views were listened to*		3.69	1.17	4.00		3.91	1.08	4.00
Information from Dublin City Council was truthful, sincere and open		3.78	1.02	4.00		3.79	1.06	4.00
It was easy to access and obtain information about the flood defence plan		3.49	1.11	4.00		3.65	1.03	4.00
I was able to influence the planning and decision-making process*		3.63	1.07	4.00		3.84	1.04	4.00
I trust in Dublin City Council to make flood defence related decisions regarding Clontarf		4.07	1.02	4.00		3.92	1.15	4.00

Table 3
Free association response proportions of place-related symbolic meanings for Clontarf promenade (Clarke et al., 2018) and Dollymount promenade.

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%

3.2. Integrating past learnings into adaptation governance

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

Table 4
Bivariate correlations between place attachment and a) attitudes to place change and; b) place-protective interpretations for Clontarf promenade (Clarke et al., 2018) and Dollymount promenade. Note: * significant at p < .05; ** significant at p < .001.

	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)		
The proposed flood defences would have …		
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**

reverse-worded statement *'I was not in favour of the proposed flood defences'* and each statement measuring perceptions of the governance process displayed negative relationships (Table 5). For example, analysis showed significant negative relationships between oppositional attitudes and belief that the planning process was *'fair'* ($rho = -0.49$, n = 221, p < .001), *'trust in Dublin City Council to make flood defence related decisions regarding Clontarf'* ($rho = -0.47$, n = 223, p < .001) or *'community views were listened to'* ($rho = -0.53$, n = 223, p < .001).

Rather than improving, a Mann-Whitney *U* Test showed deterioration in perceptions of effective governance between both studies, particularly related to agency and control over decision-making. Individuals were less likely to believe that *"community views were listened to"* for Dollymount promenade defences ($Md = 4.00$, $n = 229$) than Clontarf promenade ($Md = 4.00$, $n = 251$, $U = 25{,}704$, $z = -2.09$, $p < .05$, $r = 0.09$). Similarly, individuals perceived that they were 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 ($Md = 4.00$, $n = 256$, $U = 25{,}083$, $z = -2.22$, $p < .05$, $r = 0.10$). No statements measuring perceptions of governance processes showed improvements over time (Table 5).

Table 5
Bivariate correlations between opposition to proposed flood defences and perceptions of governance for Clontarf promenade (Clarke et al., 2018) and Dollymount promenade. Note: ** significant at p < .001.

	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**

Perceptions that failures in governance were not addressed following the issues that arose for Clontarf promenade were also evidenced from secondary data sources for Dollymount promenade, which repeatedly highlighted residents' dissatisfaction of governance processes:

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

> *"[Dublin City Council] cannot continue to bombard us with information that they expect us to accept without question"* – **Local resident 1** (Save our Seafront, 2015)

> *"Lack of foresight from the council and planning department once again"* – **Local resident 2** (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 3** (Larkin, 2016)

The lack of control over decision-making was further reflected in community doubts over the necessity for coastal flood defences of any kind along Dollymount promenade based on historical experience of flood risks in this part of the community:

> *"In over 50 years I have never seen a flood at this end of Clontarf"* – **Local resident 4** (Save our Seafront, 2015)

> *"I've listened to very experienced locals continually say this area floods from St. Anne's Park, not from the bay"* – **Local resident 5** (Save our Seafront, 2015)

> *"They're fixing a problem that never existed"* – **Local resident 6** (Anderson, 2015)

These sentiments were reiterated following 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 7** (Save our Seafront, 2015)

> *"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 8** (Save our Seafront, 2015)

> *"This is beyond a joke. Hundreds of residents have expressed the fact that … 'pluvial water' … is the real cause [of flooding]"* – **Local resident 9** (Save our Seafront, 2015)

> *"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 [sea]wall"* – **Local resident 10** (Save our Seafront, 2015)

Despite the local authority engaging extensively with the community in the intervening period between Clontarf promenade and Dollymount promenade flood defences, individuals believed they had less control over decision-making for the latter. Moreover, failure to integrate local knowledge into decision-making was a key barrier to transformative adaptation along Clontarf promenade. The re-emergence of this issue for Dollymount promenade, particularly with respect to community pluvial flooding concerns, is demonstrative of why perceptions of governance processes deteriorated rather than improved.

4. Discussion

This research sought to explore i) whether the importance of place-

related values differ depending on whether adaptation is incremental or transformative, and ii) the role that trust in governance plays in incremental adaptation when transformation fails. The results demonstrate that implementing incremental adaptation where transformation fails is difficult. More importantly however, they provide practical and valuable lessons for adaptation planning more generally.

4.1. Transformative - incremental adaptation

How individuals perceive and experience adaptation is influenced by levels of autonomy and control they have over decisions, in addition to government leadership, action and support (Gibson et al., 2016; Marshall et al., 2016; Schlosberg et al., 2017). Public behaviour and deference to legal authorities depends on perceived fairness of governance policies and decisions (Adger et al., 2016; Tyler, 2003). Governance practices are open to renegotiation, particularly as events unfold or as new information emerges (Adger, 2013; O'Brien et al., 2009; Pelling & Dill, 2010). It was therefore expected that lessons learned in the aftermath of objections to governance processes for Clontarf promenade would improve perceptions of governance processes for Dollymount promenade. Instead, individuals' perceptions of governance processes remained static across both studies. Indeed, perceptions of lower autonomy over decision-making were expressed by individuals for Dollymount promenade compared with Clontarf promenade flood defences.

Learning from past events can support change (Chapin et al., 2010). Clarke et al. (2016) found that where transformation fails, adaptation might be best achieved through multiple incremental measures, the results of which coalesce into transformation. In Clontarf however, historic concerns regarding the efficacy of public participation may have been latent and compounding. Specifically, ineffective governance concerns for flood defences along Clontarf promenade re-emerged again for Dollymount promenade flood defences. Local leadership and active engagement with affected communities can contribute to effective adaptation governance even where communities are apathetic to adaptation or where political support for climate action is typically low (Moser & Ekstrom, 2011). However, there was weak public and political support for both flood defences in Clontarf (see also Clarke et al., 2016, 2018). Where perceptions exist that authorities have failed in their governance obligations on one occasion, future adaptation of any kind may not be smooth. Moreover, negative consequences of poor governance can last well beyond initial adaptation efforts as this research attests, particularly where trust between parties is lost. Governance processes may need to transform accordingly and incorporate much greater community involvement and learnings from past events or face the risk of repeatedly encountering resistance to adaptation previously considered rational.

This research raises important questions about how adaptation is planned, implemented, and understood by different stakeholders and has important theoretical impacts. Specifically, results point to different stakeholders perceiving adaptation in different ways across two separate flood defence projects, one a transformative change in the use of recreational space (Clontarf promenade) and the other a modest incremental increase in existing structural flood defences (Dollymount promenade). Research to date indicates that attempts at transformative adaptation encounter many more barriers than incremental adaptation (Fedele et al., 2019; Kates et al., 2012). Policymakers, planners, and vulnerable communities face difficult choices. More generally, what was once considered incremental infrastructural upgrades to protect against greater climate impacts can no longer be assumed to hold true under a changing climate as valued places are threatened with even incremental adaptation. It is increasingly likely that incremental adaptation efforts could be considered as transformative where they threaten to transform places. This blurs the distinction between incremental and transformative adaptation based on one's values and worldviews. It also raises deeper questions about how definitions and understandings of incremental and transformative adaptation will need to evolve as climate impacts increase.

4.2. Competing threats of place disruption from weak governance and climate change

Some researchers have suggested that individuals may consciously loosen their attachment to place in order to minimise place disruption (Brown & Perkins, 1992; Possick, 2006). For adaptation planning, how communities interpret change also depends on existing knowledge and lived experience of climatic hazards, influencing attitudes towards risk and adaptation (Adger, 2016). This study highlights repeated potential threats to place from perceived weak governance rather than from disruptive place change arising directly from climate change risk. This is an important point. For communities expected to undergo significant climate adaptation, individuals can feel more empowered when issues of identity and place are central to the planning process (Quinn et al., 2015). Despite Dublin City Council demonstrating the risks of coastal flooding along Dollymount promenade, there was weak appetite for the proposed flood defences, which were subsequently reduced from the national standard of 1-in-200-year to 1-in-100-year flood protection (Dublin City Council, 2017). This could result in maladaptation, locking future generations and planners into a perpetual cycle of raising existing structural flood defences, but which fail to consider alternative adaptation pathways.

Objections to both sets of flood defences in Clontarf shows that where place attachment is strong communities may be prepared to repeatedly resist potential threats to place if it is within their control to do so, i.e., by challenging poor governance practices. However, in delaying or preventing adaptation or by failing to consider alternatives, it inadvertently threatens to disrupt place from climate change, e.g., extreme climatic events. This research therefore raises an important issue more generally. Climate change impacts and climate adaptation will likely lead to negative, long-lasting place change for many communities globally. Ignoring place-based values as an adaptation policy response may have a more detrimental impact on wellbeing in the long-term, as this study demonstrates.

4.3. Integrating place attachment through technological interventions

Researchers have suggested that individuals may consciously loosen their attachment to place to minimise place disruption, particularly where they are forced to consider the loss of social or physical features of specific places (Reese et al., 2019). However, the repeated aspect of this study shows that it is difficult for people to perceive how changes will affect valued places if they have not experienced climate impacts in the past. A key aspect of this study and the resistance to change from flood defences along Dollymount promenade was the difficulty for individuals to visualise coastal flooding based on historic flood experience. Individuals also had difficulty in understanding what flood defences along both Clontarf and Dollymount promenades would look like on completion.

An emerging aspect in environmental planning is how geo-technologies and geo-computation could capture, analyse, model and visualise spatial data, in particular, through visually immersive virtual reality technologies (Ball et al., 2005; Orland et al., 2001). Meaningful visualisations representing local climate change futures could support emotional responses from individuals, and help to make an abstract concept like climate change locally relevant (Nicholson-Cole, 2005). This could highlight the trade-offs between potential threats to place disruption from proposed adaptation strategies and from climate change discussed in Section 4.2. Evidence of integrating these tools and local knowledge in spatial planning exists (Portman, 2014), suggesting potential benefits of such technologies for adaptation.

Embedding technological visualisations into environmental planning policy as a planning prerequisite might help to overcome those barriers

that repeatedly emerged in Clontarf. Such technologies may also help public engagement efforts by policymakers and planners with communities, demonstrating what is being preserved as opposed to what is lost because of proposed adaptation. It may also help communities to understand the threats to place arising from both climate change and from proposed adaptation strategies that seek to minimise damage to valued places. This could also open discussions on alternative transformative adaptation pathways, including relocation (Cosoveanu et al., 2019). Managing community adaptation trade-offs that minimise negative place disruption impacts in the short-term, whilst also developing adaptation strategies that protect against climate change in the long-term is a crucial aspect of successful adaptation. Technological interventions could greatly assist here.

4.4. 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 (Anton & Lawrence, 2016; Cox et al., 2014), 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 (Clarke et al., 2016; Fleming et al., 2015; Marshall et al., 2014; 2016), extending the temporal dimension over a longer period would be useful (von Wirth et al., 2016).

Where place-based values are strong, policymakers and planners need to be skilled in a range of persuasion methods during planning and implementation of adaptation efforts. Persuasive methods are increasingly being used to obtain compliance related to enhancing environmental sustainability (Khashe et al., 2016). There is currently a lack of research on how different psychologically persuasive techniques such as "foot-in-the-door", "door-in-the-face" or "nudging" could be applied to shift support and behaviour towards effective adaptation, particularly where transformative adaptation is proposed but is highly contentious. Whilst not within the scope of this study, such research could provide important insights into how best to encourage societal support where difficult adaptation decisions are necessary.

Clarke et al. (2018) controlled for place attachment, perceptions of governance processes and support for flood defences proposed along Clontarf promenade using flood risk data to categorise questionnaire responses based on objective flood risk and reported no significant differences in place attachment, perceptions of governance or support for flood defences between those objectively exposed to coastal flood risks and those not exposed. Flood defences along Dollymount promenade in this study are directly adjacent to St. Anne's Park, a municipal recreational area. The study area is largely absent of properties exposed to flood risk. Whilst it was therefore not possible to introduce a similar control group for the present study based on the lack of objective flood risk along Dollymount promenade there may be other unmeasured factors aside from place attachment, governance, or community support for flood defences that this study has not accounted for. Nonetheless, this research adds important insights into how place-based values and attachment relate to support for adaptation measures.

5. Conclusion

This research sought to explore how incremental adaptation unfolds when transformation fails and adds to our understanding of place attachment, disruptive place change and adaptation governance. The issues encountered in this study are not unique to Irish climate adaptation, nor are they only relevant to flood risk management or coastal communities. Such issues are likely to be encountered in all regions globally and across multiple adaptation sectors as different stakeholders negotiate what adaptation means to them and respond accordingly (see also Quinn et al., 2023). Findings therefore provide important evidence of how potential barriers can be overcome to improve adaptation outcomes regardless of sector or location. The evidence highlights that place attachment alone does not necessarily determine the extent of opposition to place change. Instead, opposition depends on how change fits with existing understandings of the physical and social characteristics of place and in individuals' trust in authorities responsible for adaptation planning.

The primary questions addressed in this paper aim to understand the challenges with attempting incremental adaptation in the aftermath of failed transformation. This research has illustrated the difficulties for authorities responsible for adaptation when they are perceived as "getting it wrong" on one occasion. It highlights the governance challenges with attempting incremental change following failed transformation and shows the fundamental role that learning contributes to successful adaptation planning. Specifically, when adaptation fails because of perceived weak governance processes, there is an urgent need to learn from such issues and transform governance processes to avoid maladaptation. Repairing lost trust before progressing with future adaptation is crucial, regardless of the scale of change proposed or the perceived societal benefits. Failure to do so may result in unnecessary and costly adaptation in terms of both wasted resources and damaged relationships. Moreover, moving beyond incremental adaptation, which runs the risk of locking society into maladaptive pathways, is urgently needed.

Declaration of interests

None.

Author statement

Darren Clarke: Conceptualization, Methodology, Formal Analysis, Investigation, Data Curation, Writing – Original Draft, Visualization, Project administration. **Conor Murphy:** Conceptualization, Methodology, Writing – Review and Editing, Funding acquisition.

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