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RESEARCH ARTICLE

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Place-Based Arts Engagement and Learning Histories: An Effective Tool for Climate Action

Kate Smith, Briony McDonagh and Ed Brookes

University of Hull, Hull, UK

ABSTRACT

Artistic works informed by the global climate emergency are now common. Yet research typically focuses on the role of art in climate communication, rather than evaluating opportunities for large-scale public art to drive climate action and behavioral change amongst audiences. Indeed, arts, culture, and heritage are poorly integrated into Action for Climate Empowerment (ACE) even though understanding whether, and how, art drives community engagement with climate issues is crucial for pursuing meaningful adaptation and resilience strategies. This paper addresses these research gaps, drawing on the evaluation of *FloodLights*, a series of multimedia art installations exploring experiences of living with water past/present/future in Kingston-Upon-Hull, UK, shown in October 2021. Key findings demonstrate that *FloodLights* empowered audience members to engage in climate and water action. Emotional responses to the installations drove engagement amongst audience members and inspired behavior change. Feedback from respondents demonstrates specific ways in which increased awareness of water and flooding issues is coupled with tangible connections to family and community. We demonstrate that arts-based interventions are effective in raising climate awareness and changing behaviors, and demonstrate that local communities have profound connections to their watery histories and identities, driving even greater impact in the future.

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Climate change communication; arts and heritage; place-based; action for climate empowerment; flooding and flood risk

1. Introduction: research and policy context

Action for Climate Empowerment [ACE], the term adopted by the UN Framework Convention on Climate Change [UNFCCC] to describe the empowerment of everybody in society to take climate action, emerged as a key theme from recent COP26 and COP27 UNFCCC events. The UNFCCC's stated ambition to "empower all members of society to engage in climate action" (2022), and specifically those from underrepresented groups, goes beyond earlier approaches to climate communication, stressing the importance of active engagement from civil society in developing solutions for climate mitigation and climate adaptation. The Race to Resilience similarly requires active involvement from all stakeholders in decision-making. Within these movements, climate communication, climate education and awareness raising are recognized as important drivers of ACE (UNFCCC, 2020). Arts, culture and heritage can play a key role in meeting the UNFCCC's objectives but are not currently well integrated into specific ACE delivery (Climate Heritage Network, 2022) or environmental and climate change planning more broadly (Richardson et al,

CONTACT Kate Smith k.smith7@hull.ac.uk University of Hull, Cottingham Road, Hull, HU6 7RX, UK

2023), despite strong arguments for the crucial importance of imaginative engagement in climate futures (Yussoff & Gabrys, 2011).

At the same time, artworks informed by the global climate emergency are now common, with practitioners drawing inspiration from present and future climate impacts on humans and the planet. Within this broad genre of "climate art" exists a wide range of expressive and artistic responses to water stresses and shocks, with sea level rise and flooding featuring particularly within coastal and estuarine communities facing increased hazards under future scenarios. The High Waterline Project, for example, used illuminated signs and chalk markings to highlight potential flood depths in New York City as a result of sea level rise (Mosher, 2007), while Watermarks used projections to mark future sea levels on buildings in Bristol city center (Bodle, 2009). Boston Coastline Future-Past engaged the public in a "walking data visualization" of Boston, USA's future coastline (D'Ignazio & Sutton, 2015), while Drowning Worlds used photography to visualize the impacts of rising water, capturing different images of communities around the world in increasingly deep bodies of water (Mendel, 2007). This growing body of public climate art has been accompanied by burgeoning scholarly research on climate communication and the role of arts and humanities-led story-telling within it (Corbett & Clark, 2017; Hulme, 2011; Rice et al., 2019).

Such research includes studies of how environmental and climate concerns can be addressed through diverse art forms from visual media to literature, performance to sound and film (Cant & Morris, 2006; Daniels & Endfield, 2009; Hawkins et al., 2015; Magrane, 2021; Scott-Bottoms, 2012). Amongst this work, there are theoretical and conceptual explorations of the role arts can play in communicating climate issues (Hawkins & Kanngieser, 2017; Holmes McDowell et al., 2021; Moser, 2019; Rice et al., 2019). Kloeckner and Sommer (2021) analyzed responses to visual art inspired by climate change showing that positive feelings about climate-related policy arose from emotionally meaningful interaction with climate art. They demonstrate a link between emotional activation and cognitive processing, and postulating the mechanisms by which this may occur from an environmental psychology perspective.

However there has often been uncritical acceptance that arts-based interventions can/do deliver impactful climate communication and – at times – reliance on subjective academic interpretation of impact and effect with less attention given to the interpretive work done by audiences as reported in their words (Burke et al., 2018). Grobman (2019) presents a lucid and thoughtful exploration of the impact of place-based story/performance on shifting behavior and identity but there are few larger-scale studies (in terms of audience size) assessing whether and how climate-specific art impacts audiences (though see Sommer & Klöckner, 2021) and little work specifically addressing how climate art can drive behavioral change amongst audiences (though see Hawkins & Kanngieser, 2017). As a result, the potential for arts – visual, mixed media, sound and performance – interventions to engage and activate diverse (including more deprived, low social capital) communities with flood risk is yet to be fully assessed. Thus there remain questions around the capacity of public art to drive community engagement with climate impacts and actions, including in relation to climate-induced water hazards.

Simultaneously, the potential of place-based, historically-informed approaches for raising climate or flood awareness, and driving climate action have not been adequately interrogated, although Grobman (2019) demonstrates their capacity for driving cognitive shifts about place-based identity more broadly. Aragon et al. (2019) and Giannachi (2012) explore the utility of incorporating site-specific content, while Burke et al. (2018) demonstrate that situating artwork within quotidian contexts increases audience engagement. Some studies suggest that site-specific or site-related work may generate experiences that are physically, emotionally and intellectually accessible to diverse audiences (Bonnemaison & Eisenbach, 2009; Galafassi et al., 2018; Hein, 1996) but most work on place attachment in climate change communication focusses on the impact of framing climate change as a local rather a global problem (Altinay, 2017; Rebich-Hespanha & Rice, 2016; Scannell & Gifford, 2013; Schweizer et al., 2013). Brookes et al. (2023) argue that "place-based approaches help make climate impacts more tangible and relatable to members of the public – and so build a platform for engagement and action", but the

relative scarcity of climate arts evaluations means there is relatively little in the way of empirical evidence to corroborate these assertions (though see Altinay, 2017, finds that stronger affective connection to "local environments" positively correlated with intention to act on climate). Nor have there been concerted efforts to assess whether, and in what ways, historically-informed approaches foster place attachment in audiences, not least because there have been few attempts to explore the deep or archival past of places through climate art. In what follows, we address precisely this research and policy gap, providing critical interrogation of the effectiveness of place-based *and* historically-informed arts-based engagement in raising climate awareness and driving climate action.

In this sense, we reframe thinking about climate communication by focusing on how place-based, historically-informed arts interventions can inspire ACE. We do this by presenting evidence from *FloodLights*, a large-scale public art event taking place in Kingston-Upon-Hull, UK, in October 2021. This paper sets out the key findings from audience evaluation of *FloodLights*, a series of site-specific, multimedia light and sound installations exploring experiences of living with water past, present and future that were shown over 4 days and nights, attended by an audience estimated by the organizers to be c. 11,000. Our primary research question addresses the issue of whether, and in what ways, large-scale, climate-focused public art can drive audience engagement with climate and flood resilience actions and behaviors. Secondary questions ask whether these approaches can be incorporated into climate-focused art and consider the effectiveness of such approaches in relation to people's existing sense of place- and water-attachment.

We set out to address these questions using audience responses to a post-event questionnaire. Respondents were asked about event attendance and event experience, demographic characteristics, their perceptions of climate change impacts, about water cultures, and about their behavioral intentions around action for climate empowerment. Our analysis of this data leads us to identify five key findings, which we contextualize and explore in the following three sections. The first briefly introduces the city of Hull and the *FloodLights* event, providing context to the installation and detailing our survey and analysis approaches, while the second sets out the paper's five key findings. The third section presents concluding comments, identifying the effectiveness of place-based, historically-informed arts-led engagement for raising climate awareness and encouraging future climate action.

1.1. Risky cities, Hull and FloodLights

Located on the River Hull at its confluence with the Humber Estuary, the city of Kingston-Upon-Hull faces a unique combination of flood hazard and risk. The city is exposed to river flooding from Hull and Humber (the latter draining 20% of land in England), as well as from the sea. Moreover, Hull's low-lying topography and chalk/glacial clay geology makes the city wholly dependent on pumping to drain water from the city. Facing worsening extreme weather events and rising sea levels, the city's exposure to flooding from all sources remains extremely high (ARUP, 2019; Environment Agency, 2019). Whilst the city's tidal barrier, constructed in 1980 in the wake of major twentieth-century floods, now provides protection from tidal surges, archival evidence stretching back to the city's earliest (thirteenth century) records shows that regular major flooding was a feature of life in and around Hull (McDonagh et al., 2023; McDonagh et al., 2024).

These records, and the legacy of maritime wealth embodied in the city's buildings, also show that regular flooding was no barrier to Hull importance in the UK fishing industry and as a major international port (Tommarchi & Bianchini, 2022). Despite this legacy, the city is now widely regarded as one of the UK's "left-behind" coastal communities (ibid) due in part to the collapse of the city's fishing fleet in the 1970s (Byrne, 2015). In recent decades, this has contributed to negative perceptions and experiences of the city – similar to many other rust belt and European port cities (Lehmann, 2016; The Economist, 2013; Van Hooydonk, 2007). Such challenges, however, fed into the city's successful bid for UK City of Culture (CoC) in 2017, which foregrounded a place "emerging from the shadows" to become a cultural center within the UK (Hull UK City of Culture, 2017). Hull's CoC year was broadly successful, whilst some short-term economic benefits

were realized, the longer-term benefits have been harder to quantify (Tommarchi & Bianchini, 2022). However, the legacy of CoC thrives in Hull's vibrant arts and cultural sector, in part the inspiration for the Risky Cities' project's ambition to mobilize arts and heritage for climate/flood resilience. The audience for public art in Hull is enthusiastic and receptive: 96% of our survey respondents had been to outdoor arts event in the city before, with 65% indicating that they had been to three or more. This produces a "broad educated audience" (Young, 2010) possessing an enhanced capacity to engage with and pass critique on cultural events, including public and outdoor art. Although monitoring and evaluation have accompanied previous public art initiative in the city, these have not been reported in the public domain. One exception to this (Bianchini et al., 2021) evaluates the outcomes of the Hull's CoC year across five broad impact areas finding overall that whilst residents "rediscovered their home city" the positive impacts of 2017 were "somewhat fragile".

Hull audiences may be familiar with arts events, but their engagement with flooding and flood-risk as climate-related issues is comparatively low – despite major flood events in 2007 (caused mainly by pluvial/surface water), 2013 (caused by a tidal surge) and minor surface water floods every few years (Hull City Council, 2021). Thus national awareness of Hull's future flood risk (Coulthard & Frostick, 2010; Pitt, 2008) finds little reflection at the local community level. The city has had low numbers of sign-ups to the Environment Agency's flood warnings service (Yorkshire Water, 2022), and a recent report highlighted limited community engagement with public flood consultation events (Hull City Council, 2021). Responding to this, and building both on the University of Hull's interdisciplinary floods expertise and the City of Culture's legacy, the University launched the major UKRI-funded *Risky Cities*[1] project in 2020. The project brings together science, social science, humanities and arts in an innovative programme of research and public engagement. The focus of this paper, *FloodLights*, was the first significant public art output of the project.

1.2. About FloodLights

Taking place in the city center over 4 days and nights in October 2021, *FloodLights* comprised three site-specific, multimedia installations commissioned by arts and cultural development charity Absolutely Cultured in partnership with the *Risky Cities* project and the Energy and Environment Institute at the University of Hull, the Living with Water partnership, and Yorkshire Water (Figure 1).[2] *FloodLights* illuminated the city's experiences of living with water and flood in the past, present and future. In explicitly holding these perspectives in dialogue, *FloodLights* was distinct from the artistic interventions around flooding mentioned above. Rather than starting with "outsider" information (e.g. IPCC sea-level rise scenarios, *pace* Bodle 2009), *FloodLights* focused on learning from Hull's past beyond living memory to engage local audiences and encourage action: we emphasized local histories of living with water and flooding to build resilience in the future. Our commissioned artists drew on a range of materials in their creative practice and development workshops, including historical analyses of Hull's 800-year history of living with water (recovered from archival materials, newspapers, and maps), literary analysis of flood fictions in poetry, plays and folklore, and watery stories and flood experiences shared by local participants.

The workshopping process that initiated the *FloodLights* programme was part of a wider programme of co-creative work to generate two-way dialogue and knowledge exchange between academics, artists, and communities, starting with a series of creative activities with local community members, University students, and some of the pupils at Trinity House Academy. These in-person workshops explored the materiality and memory of water, pollution, climate change's impacts on water, and the cultural life of water in myth, symbolism, and superstition. The workshops were in progress when the UK's national stay-at-home order was announced in March 2020. As a result, *FloodLights* was temporarily suspended and plans for installations to be displayed in November 2020 were delayed, first to spring 2021 and eventually to October 2021. The process of devising,

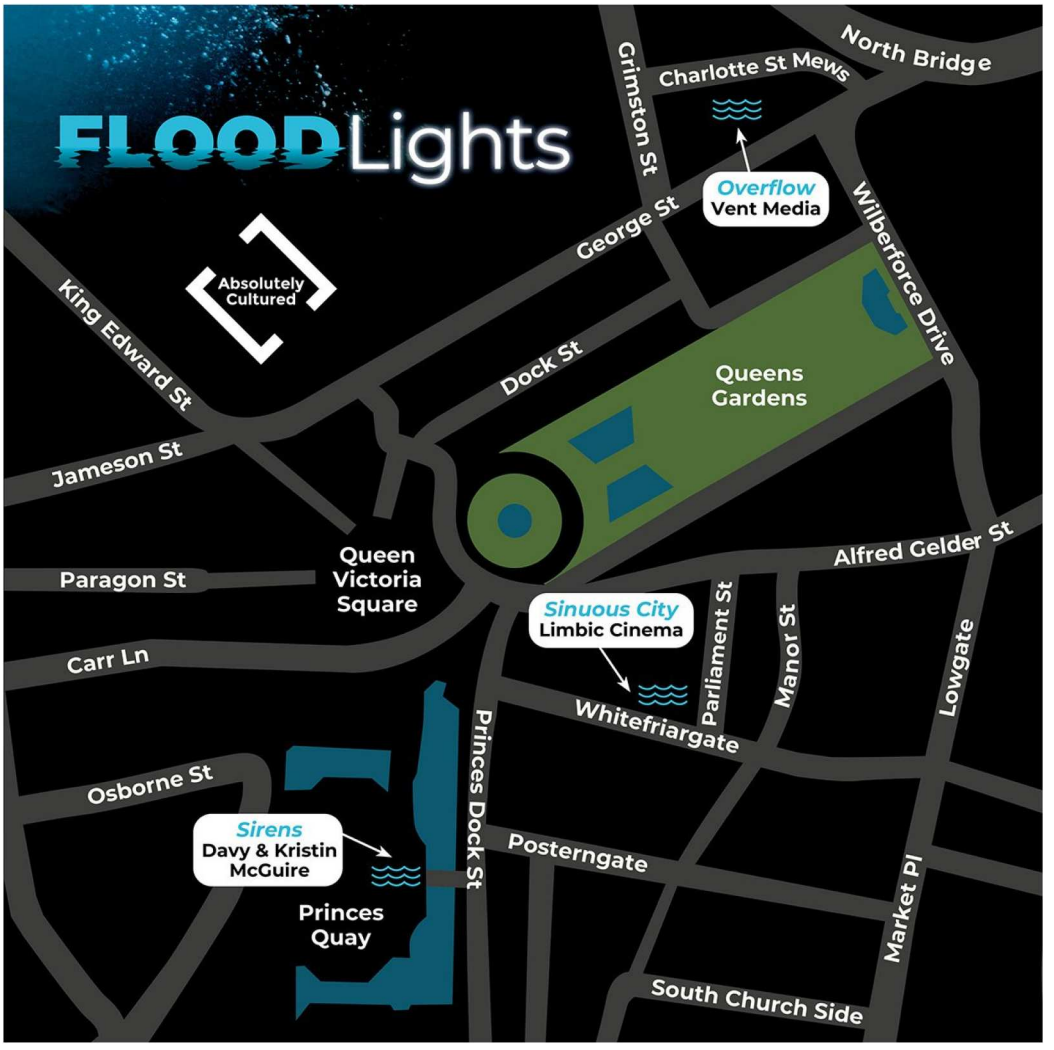

Figure 1. FloodLights exhibition map which documents the placement of the installations throughout the city. Absolutely cultured, 2021. Accessed 04/04/2021.

researching and finalizing the installations moved online throughout 2020 and early 2021; although the process of creating *FloodLights* was heavily impacted by COVID-19 restrictions this extended creative process offered opportunities for additional knowledge exchange, collaborative workshops and reflection that would not have been possible in the project as originally devised.

The final event comprised three large-scale, light-and-sound installations each responding to place and site in different ways. They were:

- *Sinuous City*, an immersive flood experience created by multimedia creative studio Limbic Cinema, and by two local creatives – poet Vicky Foster and composer Joe Acheson (Hidden Orchestra) at 51 Whitefriargate, an empty city-center retail unit (Figure 2)
- *Sirens*, by Hull-based Studio McGuire, projected holographs into the water outside Princes Quay shopping center, depicting sea creatures including mermaids, turtles and exotic fish alongside plastic pollution and imagery of climate migration and extinction (Figure 3)

Figure 2. Sinuous city – the audience engages with the interactive light and sound artworks. 2021.

- *Overflow*, by Vent Media at Trinity House Academy responded to the building's unique architecture as the canvas on which to explore the school's 235-year nautical history and Hull's sea-faring past (Figure 4).

Each of the installations was free and opens for the public to explore, with *Sinuous City* event ticketed to facilitate indoor social distancing. They were accompanied by a digital programme of free behind-the-scenes videos, a live roundtable discussion and launch event.

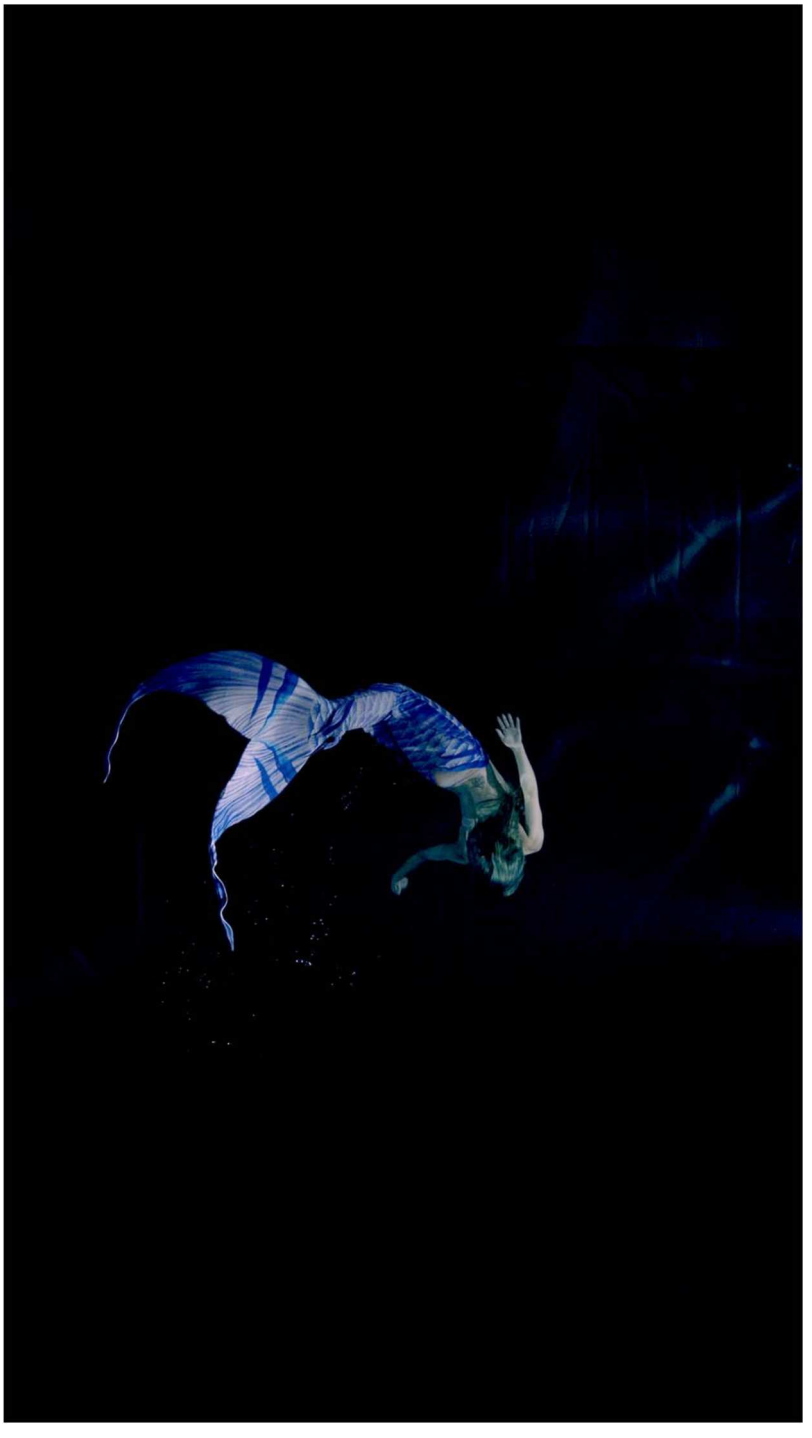

Figure 3. Sirens – a mermaid projected into the water. Absolutely cultured, 2021. Accessed 04/04/2021.

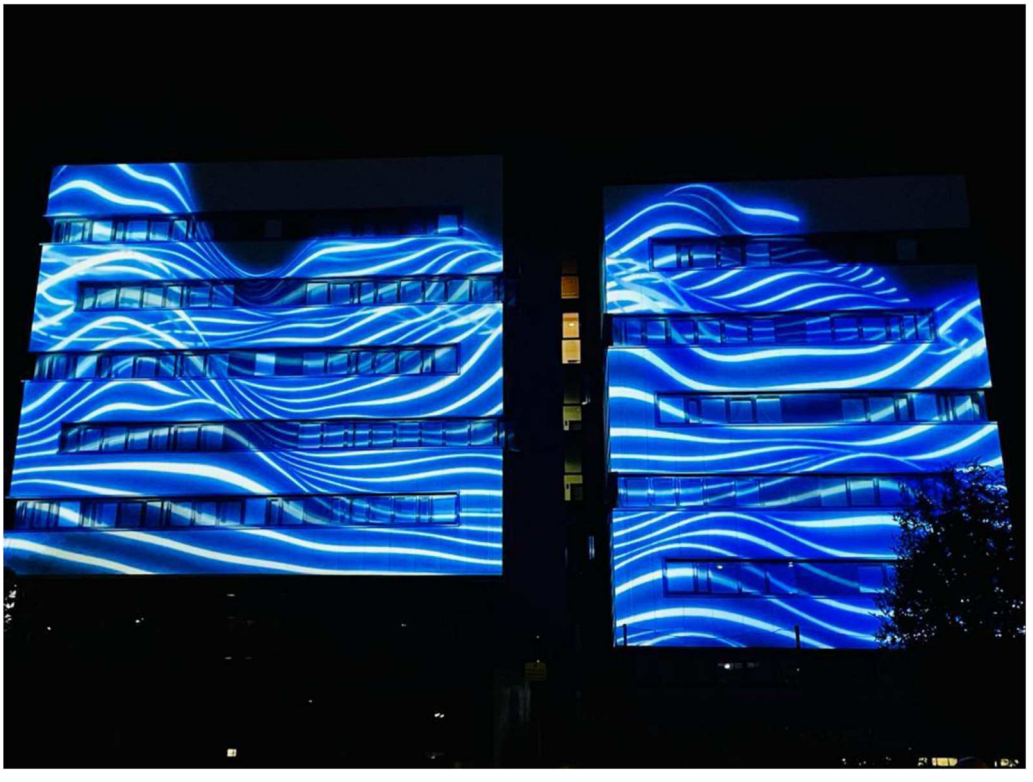

Figure 4. Overflow – watery images ebb and flow on the surface of the Trinity academy school (McDonagh et al., 2021).

1.3. Survey method

Comprising 22 questions in total (including informed consent and an ethics and data management statement), the survey that formed the data collection method for this work was devised by the authors in conjunction with local delivery partners indicated above. Audience members were invited to complete an evaluation survey through signage at the event, by event volunteers, on social media via Absolutely Cultured and the University of Hull, and via email to the Absolutely Cultured and Risky Cities mailing lists and to Sinuous City ticket-holders. Surveys were distributed using Jisc Online Surveys. Question choice was informed both by the literature above, in particular Kloeckner and Sommer's (2021) re-examination of Sommer and Klöckner (2021), echoing their questions about art's impact on audience thinking about climate change and about pre-existing environmental attitudes, and Marks et al.'s (2016) use of questions about intention to change behavior. We also included questions to satisfy our local partners' evaluation objectives in relation to artistic and quality assessment (Arts Council, 2024) which were presented internally shortly after the event took place. Types and purpose of questions are outlined in Table 1. Data collection adhered to our ethics approval and the standards outlined in the UK Research Concordat (Universities UK, 2019). Quantitative data from the survey were imported into SPSS for data cleaning (described in Section 3.2) and initial descriptive statistical analysis. For Likert-scale answers, quantitative analysis was performed using SPSS to determine significance using χ^2 and significance as $p = \leq 0.05$. Qualitative analysis was performed using NVivo to generate thematic codes, some of which were then subjected to transformative analysis using SPSS, using a simplified framework in which the codes of open-ended questions were categorized under quantitative units to enable statistical analysis (Srnka & Koeszegi, 2007).

Table 1. Question types and purposes.

Number	Question type	Purpose	Format
Q1	Informed consent	Ethical good practice	Check box
Q2–Q5	Attendance and participation	Arts-partner evaluation	Multiple choice
Q6–Q7, Q9	Event experience	Understanding audience enjoyment	Likert scale
Q8	Interaction with volunteers	Arts-partner evaluation	Likert scale
Q10	Emotional response	Understanding impact	Open-ended
Q11	FloodLights made me think about …	Understanding impact	Likert scale
Q12	Environmental attitudes	Audience perceptions and beliefs	Likert scale
Q13	Water cultures	Audience perceptions and beliefs	Likert scale
Q14–Q15	Intention to change behaviour	Understanding impact	Multiple choice
Q16	Arts-event participation	Arts-partner evaluation	Open-ended
Q17–Q22	Demographic characteristics	Arts-partner evaluation	Multiple choice

1.4. Survey respondents

The audience for *FloodLights* between 21st and 24th October was estimated by project partner Absolutely Cultured to be 11,000. In total, 460 surveys were completed between 22nd October and 8th November 2021; four respondents had not attended or engaged with any part of the *FloodLights* programme, three completed only the first question. These seven responses are excluded from this analysis. We undertook single imputations by the mean to manage item non-response to quantitative questions (Zanutto & Gelman, 2001); item non-response rate occurred for quantitative questions at a mean rate of 0.89%. The remaining 453 valid responses show that 86% of the audience responding to our survey had attended two or more of the installations, thus the estimated attendance of 11,000 probably represents c. 5000 individual audience members. Our 453 valid responses represent the views 9% of individual audience members. Geographically, our respondents were predominantly drawn from Hull and the surrounding areas with 85% ($n = 383$) of respondents giving an HU postcode. In terms of demographic characteristics comparing our results with the city council's Data Observatory (HCC, 2021), our respondents tended to be slightly older than the city's reported age profile; more strongly weighted towards female-identifying respondents; majority white; less likely to have a disability; educated to a slightly higher level. These characteristics are in line with those reported by Absolutely Cultured at similar events (Absolutely Cultured, 2018).

2. Results and discussion

The result of our thematic coding and statistical analysis leads us to identify five key findings; these are presented and discussed in turn in Sections 4.1–4.6.

2.1. Key finding 1 – FloodLights was overwhelmingly well-received by its audience

Despite the challenges of planning a large-scale arts event during a pandemic, our audience thought the project a success. Overall, 83% ($n = 373$) of respondents rated their experience at *FloodLights* as either good or very good, with 90% ($n = 405$) describing the quality of the installation as good/very good, and 91% ($n = 411$) of respondents agreeing/strongly agreeing that *FloodLights* had been an enjoyable experience. Eighty-seven percent ($n = 389$) of respondents said they would recommend *FloodLights* to somebody else. This was supported by open-ended responses from audience members who *"really enjoyed these events going on in our [sic] city … "* as they helped to " … *enrich the city buildings and spaces*" (Respondent 73). Within these responses, we saw a wider civic pride and celebration of Hull, linked to previous large-scale public arts events during and since the CoC year as people were "*proud that things like this still happen in Hull after 2017*" (Respondent 60). Moreover, *FloodLights* was one of the first large-scale arts event to take place in the city after the UK national lockdowns of 2020 and early 2021. Whilst some respondents expressed concern about being in busier open spaces,[3] many audience members celebrated and valued the return of

large-scale art events to the city's public spaces: "*fantastic installation. It was good to see people out & about again in our great city. More of these events periodically throughout the year would be amazing*" (Respondent 256). We argue that the positive reception of *FloodLights* was a product of it being both an enjoyable experience and a celebration of the city, and that it this positive experience was crucial for driving the impacts reported below (Osnes & Fahmy, 2022, p. 54).

2.2. Key finding 2 – attending FloodLights impacted our respondents thinking on climate change, flood risk and living with water

As Figure 5 shows, more than two-thirds of respondents (67%, $n = 300$) reported that attending *FloodLights* had made them think about climate change, with a similar number (65%, $n = 293$) reporting that it had made them think about living with water in the future. This included wider water and environmental concerns as it "*made you think about all the different aspects of life which involve water, also about pollution*" (Respondent 389). Over half the respondents indicated that attending *FloodLights* made them think about climate change's impacts on their community (59%, $n = 263$), about their role in climate change (53%, $n = 233$) and about flooding and their flood risk (51%, $n = 225$). Many reflected on very personal impacts of climate change and "*what this would mean for my grandchildren if something isn't done in time*" (Respondent 341), while others commented on how their increased awareness would change their relationship to water in their homes, associating this with actions to help reduce flood risk in the wider community:

> *… almost immediately I have become more mindful of water waste and energy waste. Also, how lucky we are with our flood defences in our area. Even made me aware of checking my sinks for drainage outside my property and on the road outside my property. We all have a part to play so il [sic] keep that sink clear for everyone's benefit.* (Respondent 325)

The feedback from respondents therefore demonstrates the specific ways in which increased awareness of water and flooding issues is coupled with tangible connections to family and community, and an urgency and responsibility surrounding future action.

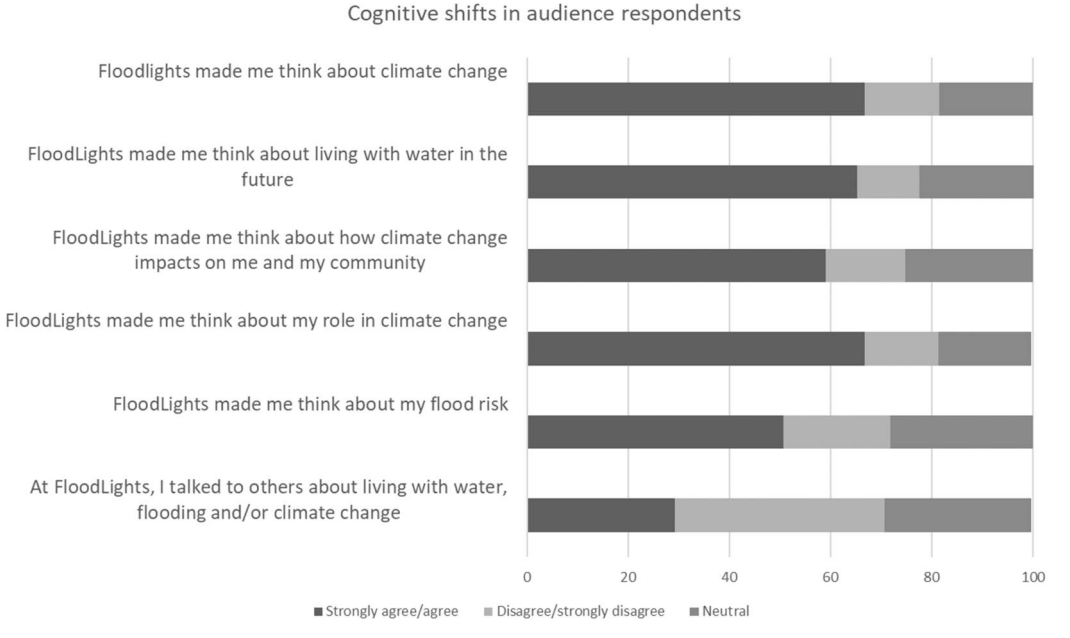

Figure 5. Cognitive impacts of FloodLights.

Responses to questions about impact on thinking track a gradually diminishing trajectory from general challenges (climate change in its broadest sense) to person-specific issues (my role in climate change); across all five statements more than twice as many people responded positively to the statements as negatively. Thus, for the majority of our audience, engaging with *FloodLights* resulted in thinking about climate change in local and personal terms, supporting arguments about the efficacy of place-based art in increasing the saliency of thinking about and acting on climate change as a local, rather than just an abstract "out-there-somewhere" global problem (Corbett & Clark, 2017; Hawkins & Kanngieser, 2017).

Given that *FloodLights* took place in October 2021 (having been rescheduled on two previous occasions due to the Covid-19 pandemic) and was amongst the first post-pandemic public art events held in the city, we expected our audience to have some concerns about attending a public art event – albeit one that was mostly outdoors, and which was carefully planned to reduce transmission risks. Some respondents reported concerns about entering busier outdoor spaces or queuing with others in the open air; others reported frustration around different interpretations of the public health guidance in operation at the time, which did not mandate outdoor masking-wearing. Thus, while *FloodLights* was effective at driving cognitive shifts towards thinking about specific climate change issues, it was less successful in driving conversations amongst audience members and their friends or family. Only 29% ($n = 130$) of respondents reported talking to others about living with water, flooding, and climate change at or immediately after attending *FloodLights*; conversations were primarily between family members, and ranged from simply "*spend[ing] more time talking with others and particularly my younger grandchildren about things*" (Respondent 32) to "*discussion in the family around our relationship with water, Hull's geography and the part it has played in the city's history*" (Respondent 103).

We argue that stimulating conversation in almost 3 in 10 respondents – against the backdrop of ongoing pandemic anxiety – can be read as evidence that *FloodLights* offered the kind of dialogic experience (even if concentrated within family networks) posited by Moser (2019) as a necessary condition for transformation change. In other words, using art to communicate about climate and flooding did more than just raise awareness at the level of individual consciousness: it offered a novel stimulus for people to consider and talk about their own and each other's experience of living with water and flooding in a changing climate. We are confident, therefore, in stating that *FloodLights* drove positive cognitive shifts about living with water, flooding and flood risk, and the impacts of climate change on individuals, families, and communities.

2.3. Key finding 3 – FloodLights *is correlated with intent to change behaviors in relation to climate, flooding, and living with water*

Existing research has shown that engaging with climate art has positive impacts on climate awareness amongst audience members (Aragon et al., 2021; Kloeckner & Sommer, 2021; Sommer et al., 2019; Sommer & Klöckner, 2021), whilst recognizing the complexity of and barriers to making definitive causal links between event experience and actual behavior of audiences over different timescales (Marks et al., 2016, p. 320). Here, we go beyond measuring impacts on climate awareness alone, demonstrating intent to make positive environmental behavior changes amongst audience members. Figure 6 shows that, of the 256 participants who responded to our question about intent to change behavior, 34% ($n = 85$) indicated that they would be making changes in their behavior in relation to living with water, flooding and/or climate change. A quarter (25% $n = 63$) indicated that they had already made these kinds of change, while a further 36% ($n = 94$) said they that they would not make changes; 5% ($n = 14$) were unsure whether they would make changes. Reported behavioral changes ranged from the general, such as "b*eing more conscious of the effects and impacts of water on communities and society and what we can do to make ourselves more resilient*" (Respondent 119), to specific actions such as "*reducing number of cars in [the] family, solar panels and whether [a] rain water collection system [would be] an option*" (Respondent 74). Others suggested "*sign[ing] up to*

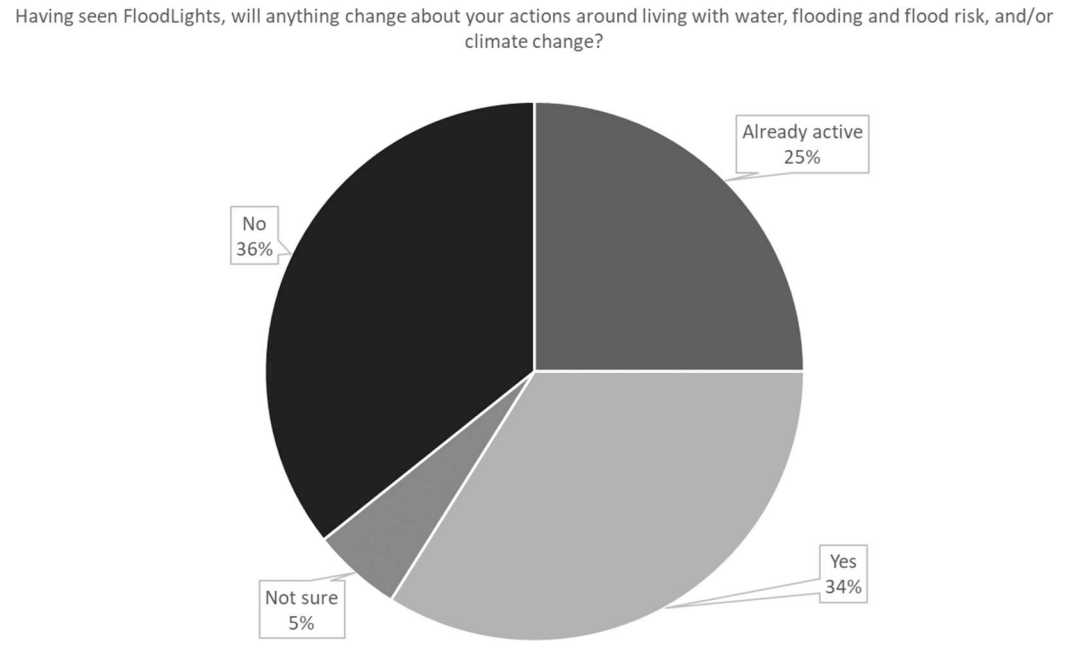

Figure 6. Audience intention to make behavioural changes.

[national] flood alerts" (Respondent 117) and seeking opportunities for local activism through "*social disobedience, targeting companies who ruin [the] planet*" (Respondent 102).

The wide variety of intended actions highlights the multiple ways in which people positioned flooding and climate change within their lives, and the measures they felt best addressed them. Whilst responses to this question are evenly split between those who had already changed their behavior, those who did not intend to, and those who did, achieving a positive behavioral impact in a third of the people who answered this question indicates success in this aspect of *FloodLights*' objectives. Where action was not intended, many respondents noted feelings of apathy and hopelessness about the relevance of individual impacts when structural-systemic shifts are what is needed (Osnes & Fahmy, 2022). The relative scarcity of climate art research that directly monitors and evaluates behavior change means that – notwithstanding the challenges collecting robust data, and the limitations to interpreting and understanding data about behavior change (see Jackson, 2005 quoted in Marks et al., 2016) – this result makes a substantial contribution to understanding the impacts of climate art, and provides evidence for the better recognition of the positive contribution that can be made by arts-based engagement.

2.4. Key finding 4 – emotional response is linked to intention to change behavior

Our analysis indicates a statistically significant relationship between people's experience of emotion at *FloodLights* and a consequent tendency to report an intention to change their behavior around living with water, flooding, and climate change. Cross-tabulating data about behavioral intention with emotional response data shows that people reporting an emotional response to the installations were seven times more likely to report intent to change behavior. Table 2 illustrates the significance of the relationship between experiencing an emotion and intent to change behavior as a result of attending *FloodLights*. Figure 7 demonstrates the strength of this relationship, showing the robustness of the relationship between emotion and intention to change behavior. This matters because one of the biggest challenges in understanding what makes for effective climate art lies in

Table 2. Chi-square tests on emotion versus overall event experience.

	Value	df	Asymptotic significance (2-sided)
Pearson Chi-Square	42.242[a]	5	<0.001
Likelihood ratio	43.719	5	<0.001
Linear-by-Linear Association	32.684	1	<0.001
No. of valid cases	453		

[a]3 cells (25.0%) have expected count less than 5. The minimum expected count is .76.

the difficulty of connecting audience experience of climate art with specific behavior change (Burke et al., 2018; Galafassi et al., 2018; Hawkins & Kanngieser, 2017; Roosen et al., 2018).

Emotional responses to *FloodLights* were also strongly correlated with overall perceptions of the event, and to both cognitive shifts and planned behavioral change. When asked, 62% of respondents ($n = 281$) reported an emotional response to their experience of attending *FloodLights*, varying across broad spectrum from awe and wonder to devastation and loss – resulting in 92 unique self-reported affective responses. We found a strong relationship between participants' overall perception of the event (reported on a scale from very good to very poor) and emotional response. Table 2 demonstrates the significant relationship between experiencing an emotional response – whether positive or negative – and being more likely to rate the event as good or very good, and vice versa, with people reporting no emotion being more likely to rate the event less positively. Our audience data demonstrates that art's capacity to generate emotional responses offers it an advantage over "ordinary climate communication" (Weber, 2006 cited in Roosen et al., 2018), providing empirical evidence that climate art can be effective in "imaginatively recasting" (Yussoff & Gabrys, 2011) climate change to something relevant at the local, personally actionable scale.

2.5. Key finding 5 – strong place-based attachment drives deeper engagement with climate impacts

Finally, whilst the primary objective of our evaluation of *FloodLights* was to assess the efficacy of mobilizing place-based, historically-informed arts engagement to drive climate (and specifically flood) resilience, our data include compelling evidence of the ongoing importance of water, its social significance and associated cultural expressions (on this more generally, see Strang, 2004). In common with other cities along the east coast of the UK, Hull's considerable historical wealth

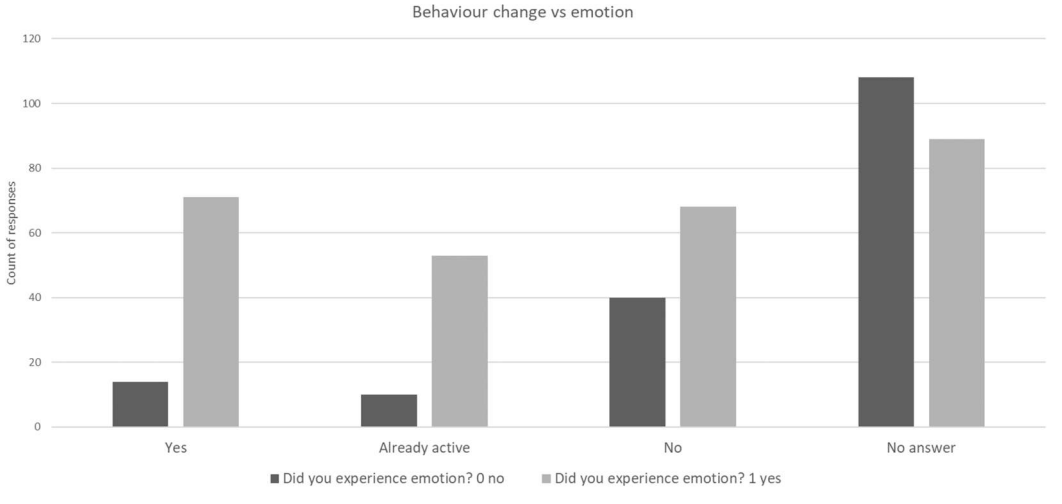

Figure 7. Audience experience of emotion versus intention to change behaviour.

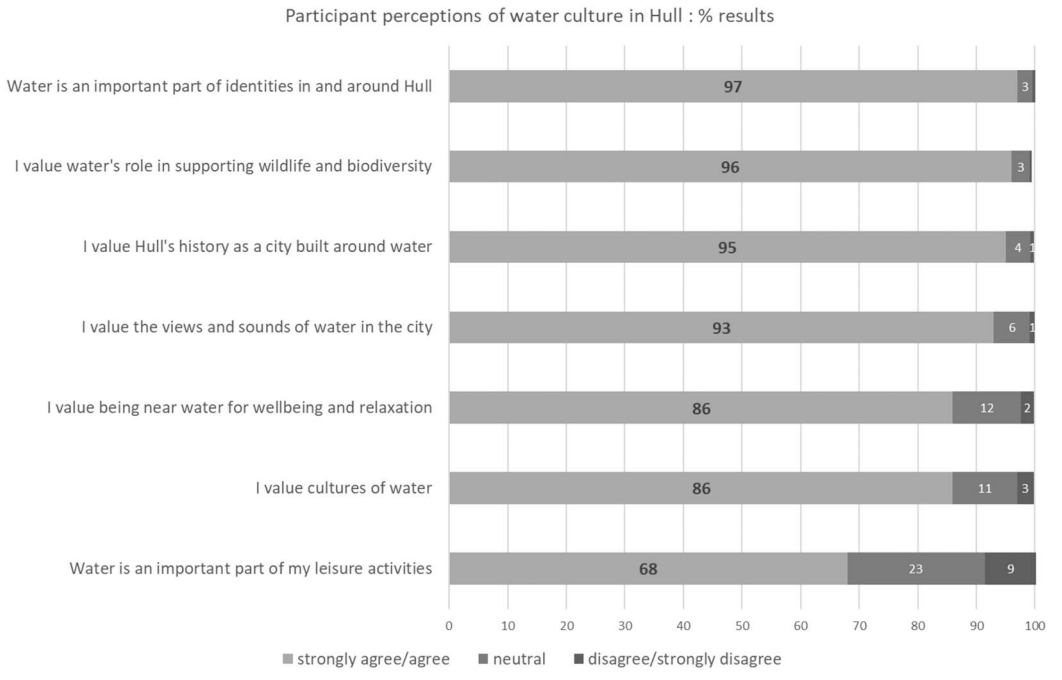

Figure 8. Perceptions of water cultures in Hull.

was underpinned by a range of maritime industries, including shipbuilding, whaling, trade with overseas and inland ports and perhaps most famously, fishing (Starkey et al., 2017). Our data shows that despite the city's challenges in the later twentieth century, people in Hull still hold the city's watery heritage in high esteem. Figure 8 illustrates our audience's extremely strong place- and heritage-based attachment, showing near-universal appreciation of different aspects of water cultures in the city: 96.5% of respondents ($n = 446$) agreed or strongly agreed that that water was an important part of identities in and around Hull, 96% ($n = 433$) similarly valued water's role in supporting biodiversity, 94.5% ($n = 426$) valued Hull's history as a city built around water, 92% ($n = 416$) valued views and sounds of water in the city, 85% ($n = 384$) valued water both for wellbeing and relaxation and for its role in fostering expressive culture, e.g. songs and stories, and 66% ($n = 339$) agreed that water was an important part of their leisure activities. Open-ended responses elsewhere in the survey capture this hydrophilic identity (Strang, 2004) in response to the depiction of the city's story as light and sound projections: "*I felt pride in my maritime heritage and city and thoughts for the future of our planet*" (Respondent 19); "*[I am] more appreciative of where I live – on the corner of two rivers. Doesn't stop me loving where I live – wouldn't move*" (Respondent 47). This data presents a picture of a city very much in touch with its maritime and riverine heritage, and accessing a narrative imagination which includes space for a new watery identity (Grobman, 2019, p. 180).

This final finding has two primary dimensions. First, the place- and site-specific nature of the installations[4] was a key driver of their success, responding to both individual and collective place-attachments within the city (Scannell & Gifford, 2010) and locating climate change visualization within the context of locally important landmarks and iconic objects (Yussoff & Gabrys, 2011). Situating *FloodLights'* installations in high-profile public spaces – for example, the dock next to one of the city's major shopping centers – and/or incorporating iconic landmarks, imagery and words helped make the artistic works (and the themes they explored) relevant to our audience – and thus more impactful. Respondents shared experiences of the humbling impact of seeing familiar places

Table 3. Chi-square tests on emotion vs intent to change behaviour.

	Value	df	Asymptotic significance (2-sided)
Pearson Chi-Square	53.537[a]	3	<0.001
Likelihood Ratio	56.674	3	<0.001
Linear-by-Linear Association	33.637	1	<0.001
No. of Valid Cases	453		

[a]0 cells (0.0%) have expected count less than 5. The minimum expected count is 23.92.

transformed by art and linked this to practical actions to increase personal climate and flood resilience, for example "*The Sinuous City poem made me think about those whose homes have previously flooded in Hull and how much strength a person would need to rebuild their home*" (Respondent 251) and "*It definitely stirred thoughts around flooding, particularly the Sinuous City piece and the submerged landmarks like the barrier or phone boxes*" (Respondent 15). Indeed, where respondents had commented on the individual artworks, we noted the warmth with which respondents mentioned Overflow, which both in situation (projected onto the side of Trinity School, the city's historic merchant navy college) and content (featuring nautical, shipbuilding and engineering motifs as well as marine life) chimed with many audience members. In the light of this, we revisited our quantitative data to explore the relationship between overall event experience and the pattern of attendance at each separate artwork: there is a significant relationship between audience members having visited Overflow and reporting a more positive overall experience at *FloodLights* (see Table 3). Combining this data with results cited above about the impacts on audience thinking and behavior confirms the importance of mobilizing culturally potent places, objects, and visual references (Schweizer et al., 2013).

For many people, visiting *FloodLights* stimulated pride in the city and region, which led to awareness of the need to address the city's future vulnerability, "*rethink[ing] about Hull's link with water (the river, estuary and sea)*" (Respondent 9) and thinking about "*Hull and it's watery past, although I have thought about flood prevention and climate diversity since attending FloodLights*" (Respondent 28). For some this thoughtfulness related to their choices and impacts: *[I felt] mainly awe at the artistry of Sirens. Overflow had a big impact on thinking about seas and climate change … [I will make] more careful choices to reduce my carbon footprint* (Respondent 427) while others reflected on the disruption faced to their everyday lives by future flood impacts: *[I felt] thoughtful of the future. Especially seeing my workplace underwater like a shipwreck in Limbic Cinema* (Respondent 425). Our findings respond to calls for better use of place attachment in climate change communication (Scannell & Gifford, 2013) and confirm the potential of mobilizing collective experiences and shared history for increasing the impact of climate art (Corbett & Clark, 2017). We argue therefore that place-based approaches were integral to our success in using arts interventions to drive climate awareness and action in the city of Hull (Table 4).

Second, we posit that mobilizing place-based, historically-informed stories about living with water and flood in Hull was important in audience members being able to make the cognitive leap from the general (e.g. climate change in its broadest sense) to the particular and the personal (one's role in climate change). Running a Spearman's *rho* correlation test (see Table 5) on this data shows a strong positive correlation between the overall experience of *FloodLights* and changes in people's thinking about flooding, flood risk, and climate change: where people had a more positive experience, they

Table 4. Chi-square tests on overflow attendance vs overall experience.

	Value	df	Asymptotic significance (2-sided)
Pearson Chi-Square	39.864[a]	5	<0.01
Likelihood Ratio	27.634	5	<0.01
Linear-by-Linear Association	18.001	1	<0.01
No. of Valid Cases	453		

[a]4 cells (33.3%) have expected count less than 5. The minimum expected count is .27.

Table 5. Spearman's rho correlation analysis on event experience vs cognitive shifts.

			CORRELATIONS: *FLOODLIGHTS* MADE ME THINK …						
	The overall experience		… about living with water in the past	… about living with water in the future	… about my flood risk	… about climate change	… about how climate change impacts on me and my community	… about my role in climate change	
SPEARMAN'S RHO	The overall experience	Correlation Coefficient	1.000	.396**	.447**	.369**	.430**	.438**	.384**
		Sig. (2-tailed)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
		N	450	444	446	442	446	443	440
	FloodLights made me think about living with water in the past	Correlation Coefficient	.396**	1.000	.647**	.590**	.541**	.551**	.552**
		Sig. (2-tailed)	<0.001		0.000	0.000	0.000	0.000	0.000
		N	444	447	446	443	445	443	442
	FloodLights made me think about living with water in the future	Correlation Coefficient	.447**	.647**	1.000	.744**	.753**	.779**	.758**
		Sig. (2-tailed)	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001
		N	446	446	449	444	447	445	443
	FloodLights made me think about my flood risk	Correlation Coefficient	.369**	.590**	.744**	1.000	.727**	.740**	.748**
		Sig. (2-tailed)	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
		N	442	443	444	445	444	442	441
	FloodLights made me think about climate change	Correlation Coefficient	.430**	.541**	.753**	.727**	1.000	.891**	.849**
		Sig. (2-tailed)	0.000	<0.001	<0.001	<0.001		<0.001	<0.001
		N	446	445	447	444	449	444	442
	FloodLights made me think about how climate change impacts on me and my community	Correlation Coefficient	.438**	.551**	.779**	.740**	.891**	1.000	.881**
		Sig. (2-tailed)	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
		N	443	443	445	442	444	446	441
	FloodLights made me think about my role in climate change	Correlation Coefficient	.384**	.552**	.758**	.748**	.849**	.881**	1.000
		Sig. (2-tailed)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
		N	440	442	443	441	442	441	443

were more likely to have had shifts to higher-order thinking about climate change and their role in it. This demonstrates the capacity of locally-relevant arts events to push audiences to consider climate change at a community and individual scale and not just at an abstract level, highlighting the value of historically-informed site-specific art for engaging audiences with the local impacts of climate issues, with particular emphasis on flooding and flood risk (Aragon et al., 2019; Lee, 2021; Moser, 2019) and in imagining their future adaptive ACE (Yussoff & Gabrys, 2011).

This reveals the power of incorporating place attachment and lived experience in driving action for climate empowerment (Munshi et al., 2020), showing that *FloodLights* mobilized specific, local and place-based meanings of water within Hull. Shaping the arts interventions in the light of Hull's specific place-based watery histories led to positive impacts on the audience's critical engagement with flooding, flood-risk, and climate change impacts. In doing so, we reframe and extend Hawkins and Kanngieser's (2017) analysis of what happens when climate change communication combines with aesthetic experience: going beyond their aesthetic register, we argue that the high level of cognitive engagement achieved in our audience reflects their strong identification with Hull's history as a city founded on and around water. *FloodLights* demonstrates the powerful impact of "rendering proximate" (ibid.) a city's flood stories across time and space by presenting immersive, captivating and inspirational imagery of flooding and water cultures in accessible, sense-able formats and inviting audiences to reinvent their thinking and behavior in relation to living with water, flooding and climate change. In so doing, *FloodLights* fulfilled the Risky Cities project's aim of enhancing flood resilience in the Hull and Humber region.

2.6. Limitations

This paper's main aim has been to demonstrate that arts and heritage-based approaches are an important addition to the arsenal of tools for driving action for climate empowerment: to that end, we have reported descriptive statistics about our audience's demographic characteristics to demonstrate the extent to which our audience reflects the city of Hull's population. This necessarily limits the extent to which we have undertaken detailed analysis of demographic variables – a topic that awaits further analysis and publication elsewhere – but which may be important in understanding the extent to which this kind of work is replicable. We are also aware that, although numerous, our sample represents around 9% of the total audience for the event; subsequent events within Risky Cities allowed for evaluation methods yielding sample sizes of up to 20% (publications forthcoming) and are in line with or better than the impacts we were able to report for this event. We also acknowledge the limitations inherent in applying quantitative and transformative methods to understanding the impact of art, which varies based on subtle and specific differences in the human imaginary. Without seeking to deny that the rich qualitative importance of arts experiences is inherently valuable, we also recognize that some degree of quantification of these experiences is necessary to render them legible within discourses that priorities quantified (e)valuation. Pre-surveying and follow-up work were not undertaken, partly for practical reasons as most of the installations were unticketed and partly because *FloodLights* was one part of a larger, longer-term project working with artists and communities over several years, making post-hoc attribution of impact to this single event problematic.

3. Conclusion

Considering directions for further research, the learning from *FloodLights* directly informed the delivery of the remaining community engagement elements of Risky Cities. Research outputs documenting and interrogating the learning histories approach used throughout the project include McDonagh et al. (2023). Whilst we have, throughout our community engagement work, sought to be inclusive and non-extractive, future studies could usefully consider mechanisms for increasing the longer-term benefits to communities and communities participants, particularly in challenged and restrictive funding landscapes. There is also a need for more studies that explicitly address the

possibilities and limitations of different approaches to impact evaluation from different methodological standpoints, and in particular for critical realist evaluation approaches to what "works" in creative climate engagement, for whom and in what circumstances.

We have provided a critical interrogation of arts-based engagement for climate action, moving beyond the question of *climate communication* to focus instead on how place-based and historically-informed arts interventions and engagement can drive *action for climate empowerment*. Working at a larger-scale (albeit with a relatively small sample size) than other previous efforts to evaluate the effectiveness of climate art, we have focused on the way that historically-informed approaches can combine with place attachment in audiences to increase impact. Whilst there are limitations in the measurement of behavioral change over time, we can demonstrate significant impacts on our audience's intent to make environmental positive behavioral changes if they hadn't already done so. Specifically, we have demonstrated the positive effect of using deeper time perspectives to drive creative encounters between academics, creative practitioners and a public audience. In doing so, we address several research gaps, delivering against persistent calls for evidence-based evaluation of the ways in which climate art actually delivers change both by raising climate awareness and by inspiring behavior change, and also for evaluators to take on the challenge of mixed-methods approaches. Thus we also provide an exemplar of how audience responses can be collected and analyzed to demonstrate the effectiveness of arts-based climate engagement and action.

Our data shows that *FloodLights* empowered our audience to engage in climate and water action today and for the future. A number of important factors were critical for achieving this. The co-created process and the presence of local histories, stories and experiences (including those shared by community participants and by children and young people at Trinity House Academy) were central to our success. Our approach specifically seeks to hold in dialogue deep time perspectives drawn from our archival encounters about living with water and flood in Hull over more than 800 years – our "learning histories" – with more recent stories and experiences shared by community members, and mobilize these within a place-based approach that uses site-specific installations to drive engagement and action. As we have seen, audience members' emotional responses to the installations – which were visually and thematically linked to recognizable local places and stories represented within the installations – were important for enhancing audience impacts including intention to take climate action. Our place-based and historically-informed approach was crucially important in audience members being able to make the cognitive leap from the general (e.g. climate change in its broadest sense) to the particular and the personal (one's role in climate change). Put simply, arts engagement that utilizes deep time perspectives and community experiences to bolster and support place attachment helps make global climate stories tangible and relatable at the local level, thus driving climate awareness and action amongst community participants and audience members.

Crucially, these findings show that large-scale arts-based interventions around climate change offer ways of achieving both affective and effective engagement with water, flooding and climate change issues. *FloodLights* therefore presents a realistic, robust and replicable model for leveraging climate action, and underlines the importance of better integrating arts, culture and heritage into ACE policy. The urgency of addressing the climate crisis means that *all* effective tools need to be deployed at scale and pace: we have shown here that using arts and heritage for climate engagement and action works, and works well when such activity uses interdisciplinary insights to respond to the deep histories of people's significant places. Our work thereby offers a novel model for raising climate awareness and building flood resilience in other risky estuarine and coastal cities across the world, as well as an urgent call for policy and decision makers to include these approaches as a key strategy for equipping humanity to deal with its greatest challenge.

Notes

1. See https://riskycities.hull.ac.uk/
2. 21st Oct (preview); 22nd–24th Oct (open to the general public).

3. The one indoor installation was run in compliance with, and in fact exceeded the cautiousness of, public health guidance then in place in the UK. – this event was ticketed to manage audience numbers and was staged to minimise audience contact.
4. Whilst only one installation, that at Trinity school was truly site-specific, all three were place-based i.e. informed and shaped by their place of origin and performance.

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References

Absolutely Cultured. (2018). *Northern lights evaluation report (unpublished)*. Absolutely Cultured Ltd.

Altinay, Z. (2017). Visual communication of climate change: Local framing and place attachment. *Coastal Management*, *45*(4), 293–309. https://doi.org/10.1080/08920753.2017.1327344

Aragon, C., Buxton, J., & Infield, E. (2019). The role of landscape installations in climate change communication. *Landscape and Urban Planning*, *189*, 11–14. https://doi.org/10.1016/j.landurbplan.2019.03.014

Aragon, C., Jasim, M., & Mahyar, N. (2021). *RisingEMOTIONS: Bridging art and technology to visualize public's emotions about climate change*. Creativity and cognition (C&C '21), June 22–23, 2021, virtual event, Italy. ACM. https://doi.org/10.1145/3450741.3465259

Arts Council. (2024). Artistic and quality assessment. https://www.artscouncil.org.uk/supporting-arts-museums-and-libraries/artistic-and-quality-assessment. Accessed 24th March 2024.

ARUP. (2019). City water resilience approach: City characterisation report, Hull'. Available via ARUP. https://www.arup.com/perspectives/publications/research/section/city-characterisation-report-hull. Accessed 19th December 2022.

Bianchini, F., Bissett, V., Cavalleri, F., Grabher, B., Morpeth, N., Oancă, A., & Tommarchi, E. (2021). Cultural transformations: The impacts of Hull city of culture 2017. https://research.brighton.ac.uk/files/37858736/Cultural_Transformation_Conference_Nov2019_April2021_compressed_file.pdf. Accessed 28 March 2024.

Bodle, C. (2009). 'Watermarks', watermarks project. Available via Watermarks project. https://watermarksproject.org/project. Accessed 5 April 2021.

Bonnemaison, S., & Eisenbach, R. (2009). *Installations by architects: Experiments in building and design*. Princeton Architectural Press.

Brookes, E., McDonagh, B., Wagner, C., Ashton, J., Harvey-Fishenden, A., Macdonald, N., & Smith, K. (2023). Learning from arts and heritage-based approaches for building climate resilience in the UK. In S. Dessai, K. Lonsdale, J. Lowe, & R. Harcourt (Eds.), *Quantifying climate risk and building resilience in the UK* (pp. 75–89). Palgrave Macmillan.

Burke, M., Ockwell, D., & Whitmarsh, L. (2018). Participatory arts and affective engagement with climate change: The missing link in achieving climate compatible behaviour change? *Global Environmental Change*, *49*, 95–105. https://doi.org/10.1016/j.gloenvcha.2018.02.007

Byrne, J. (2015). After the trawl: Memory and afterlife in the wake of Hull's distant-water fishing industry. *International Journal of Maritime History*, *27*(4), 816–822. https://doi.org/10.1177/0843871415610281

Cant, S., & Morris, N. (2006). Geographies of art and the environment. *Social and Cultural Geography*, *7*(6), 857–861. https://doi.org/10.1080/14649360601055797

Climate Heritage Network. (2022). *The climate heritage manifesto for COP27*. Available via Climate Heritage Network. https://www.climateheritage.org/s/Manifesto_CultureAtCOP27_en.pdf. Accessed 12 December 2022.

Corbett, J., & Clark, B. (2017). The arts and humanities in climate change engagement. In H. von Storch (Ed.), *Oxford research encyclopaedia of climate science*. Oxford University Press. https://doi.org/10.1093/acrefore/9780190228620.013.392

Coulthard, T., & Frostick, L. (2010). The Hull floods of 2007: Implications for the governance and management of urban drainage. *Journal of Flood Risk Management*, *3*(3), 223–231. https://doi.org/10.1111/j.1753-318X.2010.01072.x

Daniels, S., & Endfield, G. (2009). Narratives of climate change: Introduction. *Journal of Historical Geography*, *35*(2), 215–222. https://doi.org/10.1016/j.jhg.2008.09.005

D'Ignazio, C., & Sutton, A. (2015). Boston coastline: Future past. Available via Kanarika. http://www.kanarinka.com/project/boston-coastline-future-past. Accessed 5 April 2022.

The Economist. (2013). The urban ghosts. *The economist* Available via The Economist. https://www.economist.com/britain/2013/10/12/the-urban-ghosts. Accessed 19 Nov 2022.
Environment Agency. (2019). Humber 2100+ consultation overview. Available via. https://consult.environment-agency.gov.uk/humber/strategyreview/ Accessed 11 December 2023.
Galafassi, D., Kagan, S., Milkoreit, M., Heras, M., Bilodeau, C., Bourke, S., Merrie, A., Guerrero, L., Petursdottir, G., & Tabara, J. (2018). Raising the temperature: The arts on a warming planet. *Current Opinion in Environmental Sustainability*, *31*, 71–79. https://doi.org/10.1016/j.cosust.2017.12.010
Giannachi, G. (2012). Representing, performing and mitigating climate change in contemporary art practice. *Leonardo (Oxf)*, *45*(2), 124–131. https://doi.org/10.1162/LEON_a_00278
Grobman, L. (2019). Lynn Nottage's *this is Reading*: (Re)Identifying a city in story. *Storytelling, Self, Society*, *15*(2), 166–190. https://doi.org/10.13110/storselfsoci.15.2.0166
Hawkins, H., & Kanngieser, A. (2017). Artful climate change communication: Overcoming abstractions, insensibilities, and distances. *WIREs Climate Change*, *8*(5), e472. https://doi.org/10.1002/wcc.472
Hawkins, H., Marston, S., Ingram, M., & Straughan, E. (2015). The art of socioecological transformation. *Annals of the Association of American Geographers*, *105*(2), 331–341. https://doi.org/10.1080/00045608.2014.988103
Hein, H. (1996). What is public art? Time, place, and meaning. *Journal of Aesthetics and Art Criticism*, *54*(1), 1–7. https://doi.org/10.2307/431675
Holmes McDowell, J., Borland, K., Dirksen, R., & Tuohy, S. eds. (2021). *Performing environmentalisms: Expressive culture and ecological change*. University of Illinois Press.
Hull City Council [HCC]. (2021). Investigate significant local flooding incidents. Available via Hull City Council. https://www.hull.gov.uk/environment/adverse-weather/investigate-significant-local-flooding-incidents. Accessed 10 November 2022.
Hull UK City of Culture [HUKCoC]. (2017). Hull UK city of culture. Tell the world: Final bid. Available via National Archives. https://discovery.nationalarchives.gov.uk/details/r/a9a7bc424789494492fc8638d697ee1e. Accessed 19 November 2022.
Hulme, M. (2011). Meet the humanities. *Nature Climate Change*, *1*(4), 177–179. https://doi.org/10.1038/nclimate1150
Jackson, T. (2005). *Motivating sustainable consumption: A review of evidence on consumer behaviour and behavioural change*. Sustainable Development Research Network, Centre for Environmental Strategies.
Kloeckner, C. A., & Sommer, L. K. (2021). Visual art inspired by climate change – an analysis of audience reactions to 37 artworks presented during the 21st UN climate summit in Paris. *PLoS One*, *16*(2), e0247331. https://doi.org/10.1371/journal.pone.0247331
Lee, K. (2021). Urban public space as a didactic platform: Raising awareness of climate change through experience arts. *Sustainability*, *13*(5), 2915–2932. https://doi.org/10.3390/su13052915
Lehmann, A. (2016). The Rise of Trump Comes as No Surprise on England's Disaffected East Coast Available via *The Guardian*. https://www.theguardian.com/uk-news/2016/nov/12/trumps-rise-no-surprise-englands-disaffected-east-coast-hull-grimsby. Accessed 19 Nov 2022.
Magrane, E. (2021). Climate geo-poetics (the earth is a composted poem). *Dialogues in Human Geography*, *11*(1), 8–22. https://doi.org/10.1177/2043820620908390
Marks, M., Chandler, L., & Baldwin, C. (2016). Re-imagining the environment: Using and environmental art festival to encourage pro-environmental behaviour and a sense of place. *Local Environment*, *21*(3), 310–329. https://doi.org/10.1080/13549839.2014.958984
McDonagh, B., Brookes, E., Smith, K., Worthen, W., Coulthard, T. J., Hughes, G., Mottra, S., Skinner, A., & Chamberlain, J. (2023). Learning histories, participatory methods and creative engagement for climate resilience. *Journal of Historical Geography*, *82*, 91–97. https://doi.org/10.1016/j.jhg.2023.09.002
McDonagh, B., Worthen, H., Mottram, S., & Buxton-Hill, S. (forthcoming). Living with water and flood in medieval and early modern hull. *Environment and History*, 1–30. https://doi.org/10.3828/whp.eh.63830915903577
Mendel, G. (2007). Drowning world. Available via Gideon Mendel. https://gideonmendel.com/drowning-world-introduction. Accessed 5 April 2022.
Moser, S. (2019). Not for the faint of heart: Task of climate change communication in the context of societal transformation. In G. Feola, H. Geoghegan, & A. Arnall (Eds.), *Climate and culture: Multidisciplinary perspectives of knowing, being and doing in a climate change world* (pp. 141–167). Cambridge University Press. https://doi.org/10.1017/9781108505284.008
Mosher, E. (2007). *Highwaterline*. Available via HighWaterLine. http://highwaterline.org/new-york-city. Accessed 5 April 2022.
Munshi, D., Kurian, P., Cretney, R., Morrison, S. L., & Kathlene, L. (2020). Centering culture in public engagement on climate change. *Environmental Communication*, *14*(5), 573–581. https://doi.org/10.1080/17524032.2020.1746680
Osnes, B., & Fahmy, S. (2022). Keeping the fund in staying with the trouble: *Green Suits* and environmental activist pleasure. *Theatre Topics*, *32*(2), 49–60. https://doi.org/10.1353/tt.2022.0014
Pitt, M. (2008). *Learning lessons from the 2007 floods [The Pitt review]*. Cabinet Office.

Rebich-Hespanha, S., & Rice, R. E. (2016). Dominant visual frames in climate change news stories: Implications for formative evaluation in climate change campaigns. *International Journal of Communications*, *10*, 4830–4862. https://ijoc.org/index.php/ijoc/article/view/4701

Rice, R., Rebich-Hespanha, S., & Zhu, H. (2019). Communicating about climate change through art and science. In Robert Gutsche Jr, Juliet Pinto, & Paola Prado (Eds.), *Climate change, media & culture: Critical issues in global environmental communication* (pp. 129–154).

Richardson, T. G., Kay, J., Owens, M., & Frandy, T. (2023). Urgencies" in the field: Three perspectives. *Journal of American Folklore*, *136*(540), 181–198. https://doi.org/10.5406/15351882.136.540.03

Roosen, L., Klöckner, C., & Swim, J. (2018). Visual art as a way to communicate climate change: A psychological perspective on climate change–related art. *World Art*, *8*(1), 85–110. https://doi.org/10.1080/21500894.2017.1375002

Scannell, L., & Gifford, R. (2010). Defining place attachment: A tripartite organizing framework. *Journal of Environmental Psychology*, *30*(1), 1–10. https://doi.org/10.1016/j.jenvp.2009.09.006

Scannell, L., & Gifford, R. (2013). Personally relevant climate change: The role of place attachment and local versus global message framing in engagement. *Environment and Behaviour*, *45*(1), 60–85. https://doi.org/10.1177/0013916511421196

Schweizer, S., Davis, S., & Thompson, J. L. (2013). Changing the conversation about climate change: A theoretical framework for place-based climate change engagement. *Environmental Communication*, *7*(1), 42–62. https://doi.org/10.1080/17524032.2012.753634

Scott-Bottoms, S. (2012). Climate change 'science' on the London stage. *WIREs Climate Change*, *3*(4), 339–348. https://doi.org/10.1002/wcc.173

Sommer, L., & Klöckner, C. (2021). Does activist art have the capacity to raise awareness in audiences? A study on climate change art at the ArtCOP21 event in Paris. *Psychology of Aesthetics, Creativity, and the Arts*, *15*(1), 60–75. https://doi.org/10.1037/aca0000247

Sommer, L., Swim, J., Keller, A., & Klockner, C. (2019). Pollution pods: The merging of art and psychology to engage the public in climate change. *Global Environmental Change*, *59*, 101992. https://doi.org/10.1016/j.gloenvcha.2019.101992

Srnka, K., & Koeszegi, S. (2007). From words to numbers: How to transform qualitative data into meaningful quantitative results. *Schmalenbach Business Review*, *59*(1), 29–57. https://doi.org/10.1007/BF03396741

Starkey, D. J., Atkinson, D., McDonagh, B., McKeon, S., & Salter, E. (2017). *Hull: Culture, history, place*. University of Liverpool Press.

Strang, V. (2004). *The meaning of water*. Routledge.

Tommarchi, E., & Bianchini, F. (2022). A heritage-inspired cultural mega-event in a stigmatized city: Hull UK city of culture 2017. *European Planning Studies*, *30*(3), 478–498. https://doi.org/10.1080/09654313.2021.1959722

United Nations Framework Convention on Climate Change [UNFCCC]. (2020). Race to resilience criteria. Available via Race to Zero. https://racetozero.unfccc.int/wp-content/uploads/2020/12/Race-to-Resilience-Minimum-Criteria.pdf. Accessed 24 Nov 2022.

United Nations Framework Convention on Climate Change [UNFCCC]. (2022). Action for climate empowerment, Available via UNFCCC. https://unfccc.int/ace. Accessed 24 Nov 2022.

Universities UK. (2019). The Concordat to Support Research Integrity, Available via UUK. https://www.universitiesuk.ac.uk/topics/research-and-innovation/concordat-support-research-integrity

Van Hooydonk, E. (2007). *Soft values of seaports: A strategy for the restoration of public support of seaports*. Garant.

Yorkshire Water [YW]. (2022). Hull bottom of Yorkshire flood warning sign up league table', https://www.yorkshirewater.com/news-media/news-articles/2022/hull-bottom-of-yorkshire-flood-warning-sign-up-league-table. Accessed 7 December 2022.

Young, J. (2010). Art and the educated audience. *Journal of Aesthetic Education*, *44*(3), 29–42. https://doi.org/10.5406/jaesteduc.44.3.0029

Yussoff, K., & Gabrys, J. (2011). Climate change and the imagination. *WIREs Climate Change*, *2*(4), 516–534. https://doi.org/10.1002/wcc.117

Zanutto, E., & Gelman, A. (2001). Analysis of large-scale social survey. In N. J. Smelser, & P. B. Baltes (Eds.), *International encyclopedia of the social and behavioural sciences* (pp. 8386–8392). Oxford. http://doi.org/10.1016/B0-08-043076-7/00531-3