TALLINN UNIVERSITY OF TECHNOLOGY
SCHOOL OF ENGINEERING
Department of Mechanical and Industrial Engineering

ESTONIAN ACADEMY OF ARTS
FACULTY OF DESIGN

MSc. Design and Technology Futures

LET SLEEPING BOGS PLAY: OPPORTUNITIES FOR COMBINING SYSTEMS THINKING WITH PLAY THEORY TO SHIFT MENTALITIES AND INTERACTIONS WITH DONEGAL PEATLANDS

LASE MAGAVATEL SOODEL MÄNGIDA : SÜSTEEMIMÕTLEMISE JA MÄNGUTEOORIA ÜHENDAMISE VÕIMALUSED MUUTMAKS MENTALITEETI JA SUHTUMIST DONEGALI SOODESSE

MASTER THESIS

Student: Francesca Keaveney

Student code: 201675MADM

Supervisor: Ruth-Helene Melioranski

Tallinn 2023

AUTHOR'S DECLARATION

Hereby I, Francesca Keaveney, declare that I have written this thesis independently. No academic degree has been applied for based on this material. All works, major viewpoints and data of the other authors used in this thesis have been referenced.

"....." ..... 20…..

Author: .....
/signature /

Thesis is in accordance with terms and requirements

"....." ..... 20….

Supervisor: ….....
/signature/

Accepted for defence

"....."..... 20… .

Chairman of theses defence commission: .....
/name and signature

Non-exclusive licence for reproduction and publication of a graduation thesis[1]

I Francesca Keaveney, grant Tallinn University of Technology a non-exclusive licence for my thesis

Let sleeping bogs play: opportunities for combining systems thinking with play theory to shift mentalities and interactions with donegal peatlands

supervised by **Ruth-Helene Melioranski**

1.1 to be reproduced for the purposes of preservation and electronic publication of the graduation thesis, incl. to be entered in the digital collection of the library of Tallinn University of Technology until expiry of the term of copyright;

1.2 to be published via the web of Tallinn University of Technology, incl. to be entered in the digital collection of the library of Tallinn University of Technology until expiry of the term of copyright.

1. I am aware that the author also retains the rights specified in clause 1 of the non-exclusive licence.

2. I confirm that granting the non-exclusive licence does not infringe other persons' intellectual property rights, the rights arising from the Personal Data Protection Act or rights arising from other legislation.

_____ (date)

[1] *The non-exclusive licence is not valid during the validity of access restriction indicated in the student's application for restriction on access to the graduation thesis that has been signed by the school's dean, except in case of the university's right to reproduce the thesis for preservation purposes only. If a graduation thesis is based on the joint creative activity of two or more persons and the co-author(s) has/have not granted, by the set deadline, the student defending his/her graduation thesis consent to reproduce and publish the graduation thesis in compliance with clauses 1.1 and 1.2 of the non-exclusive licence, the non-exclusive license shall not be valid for the period.*

Department of Mechanical and Industrial Engineering

THESIS TASK

Student: Francesca Keaveney, 201675 MADM

Study programme, Design and Technology Futures

Supervisor: Ruth-Helene Melioranski, (+372) 5660 3440

Thesis topic:

Let sleeping bogs play: opportunities for combining systems thinking with play theory to shift mentalities and interactions with Donegal peatlands

Lase magavatel soodel mängida : süsteemimõtlemise ja mänguteooria ühendamise võimalused muutmaks mentaliteeti ja suhtumist donegali soodesse

Thesis main objectives:

1. Research the current state and conservation of peatlands in Ireland, focusing on County Donegal.
2. Identify opportunities to engage local communities with peatlands outside of cutting for fuel.
3. Design a concept that promotes interaction with and dialogue about Donegal peatlands.

Thesis tasks and time schedule:

No	Task description	Deadline
1.	Qualitative Research & Literature Review	17 March 2023
2.	Concept Design	7 April 2023
3.	Prototyping & Playtesting	8 May 2023
4.	Evaluation & Conculsion	18 May 2023
5.	Thesis Finalisation	22 May 2023

Language: English **Deadline for submission of thesis:** 22nd May, 2023

Student: Francesca Keaveney. ..... "....."..... 20....a

/signature/

Supervisor: Ruth-Helene Melioranski ..... "....."..... 20....a

/signature/

Head of study programme: Kätlin Kangur ..... "....."..... 20.....a

/signature/

Terms of thesis closed defence and/or restricted access conditions to be formulated on the reverse side

ABSTRACT

Peatlands ecosystems act not only as a home for a wide variety of flora and fauna but as incredible carbon sinks, making them an essential ecosystem to conserve and restore when tackling climate change. While historically harvested for the fuel this carbon-rich soil provides, especially in Ireland, in which peatlands have been the country's main source of energy, with growing conservation efforts and pressure from the European Union to cease the harvesting and burning of peat, Ireland is now beginning to move towards a future away from peat on an industrial scale. Rural communities, however, remain heavily reliant on peatlands and therefore are resistant to top-down legislation on the matter, having not been included in the discourse around the future of rural peatlands.

This research employs systems thinking to identify opportunities for leverage within the current cultural system and mindsets around peatlands in Donegal, utilising both qualitative research methods, including interviews and field observations, along with literature reviews for both peatlands and broader habitat and species conservation efforts, while examining current precedents in this field.

This thesis aims to offer a solution that provides opportunities for alternative interactions with peatlands while still fostering a sense of community and governance through play by drawing on play theory and frameworks for location-based augmented reality play in combination with participatory practices, to meet the need to include locals in the discourse around peatlands, and encourage shifts in mentalities at a grassroots level while acknowledging the importance of peatland ecosystems to these communities, both as a source of fuel and a place of community.

Keywords: Peatlands, systems thinking, play theory, play, conservation, augmented reality, climate change, community, master's thesis.

CONTENTS

List of abbreviations and symbols

AR – Augmented Realities

EU – European Union

GARN – Global Alliance for the Rights of Nature

GEN X – Generation X

GEN Z- Generation Z

IPCC – Irish Pealand Conservation Council

MR – Mixed Realities

1. INTRODUCTION

Peatlands, which are also referred to as Bogs, have shaped not only the geography but also the culture and economy of Ireland; the word bog itself is one of the few English words that originate from Gaelic, where it means soft, a nod to the spongey sphagnum mosses that carpet the ecosystem. Irish peatlands have been a treasure trove of insights into our past, inexplicably shaping the very nature and idea of "Irishness", especially within rural communities. Some of the best examples of preserved Irish Elk skeletons have come from Irish Bogs, and "Bog Bodies" have also been uncovered, with these mummified remains providing information on life in the Bronze and Iron Ages.

However, as Proulx (2022) accurately explains, "Ireland, with plenty of bogs and few oil wells, and thus more dependent on peat than most, has been struggling with difficult decarbonisation goals". These ecosystems, which cover a fifth of the country (Tierney, 2020), have traditionally been harvested for fuel on both industrial and private scales, primarily spurred on by movements made by the British government in the eighteen hundreds to re-purpose an ecosystem that was then, and largely still remains, viewed as a waste of land. However, as a category of wetland ecosystems, peatlands are vital habitats to preserve due to their ability to sequester carbon, acting as highly efficient carbon sinks. These ecosystems store a quarter of the world's soil carbon despite covering only 3% of land globally (Toner, 2021).

Due to Ireland's high peatland coverage, and heavy reliance on peat, there has been a growing discourse in the country on the need to preserve and restore our peatlands. Within the country, a focus has been placed on the transition away from turf-cutting on an industrial scale, mainly due to pressure from the European Union, which classifies raised bogs as priority habitats under the EU habitats directive (Irish Peatland Conservation Council, 2021a), and conservation organisations such as the Irish Peatland Conservation Council. These efforts and initiatives, however, have primarily focused on peatlands located in Ireland's midlands, where industrial turf cutting occurred, and locals were reliant on the jobs it created. In other rural peatland settings, strong resilience remained to proposed legislation on the cutting and selling of peat, as approximately 70% of Ireland's peatlands are privately owned. Many of these communities in rural Ireland remain heavily reliant on peat as a source of fuel, which may be further exacerbated by ongoing concerns over fuel supplies within the EU, and these communities have not been included in the discourse on the creation of proposed policies.

The combination of reliance on and negative mindsets towards peatlands consequently results in the misuse of these ecosystems, from peat harvesting to illegal dumping. Simultaneously, the process of turf cutting, which is a group activity, generates a strong sense of community within peatland settings for those who partake in the practice, creating a paradox in ecosystem valuations. As such, there is an urgent need to develop alternative methods of engagement that promote grassroots, sustainable interactions with peatlands while continuing to foster a sense of community.

The focus of this research is to examine how a holistic shift in mentalities towards peatlands might be achieved among locals of County Donegal in Ireland. As a relatively isolated county in Ireland's northwest, the ingrained mindsets regarding peatlands run particularly deep, and there is strong opposition to initiatives from perceived outside forces that might infringe on the community's rights to cut peat. Therefore, it is vital that any change comes from within these communities to create a preferred future for interactions with peatlands. As a Donegal native with a deep appreciation for local peatlands and an understanding of community mindsets, this is a key research goal.

This thesis will employ a multidisciplinary approach to achieve these objectives, combining systems thinking methodologies, including participatory workshops, with play theory. Through a series of interviews, literature reviews, on-site observations, and participatory workshops, the research will identify and assess current community engagement practices both in peatland and broader conservation efforts and explore potential alternative methods that can shift community involvement and mentalities into a more sustainable and positive outlook. In particular, the potential for play to act as a powerful tool for community engagement is highlighted, as it can provide opportunities to engage with citizenship and governance in an open, exploratory, and inclusive manner.

This thesis explores and proposes an alternative approach to community engagement with peatlands in Donegal through playful, participatory practices, examining how technology and nature might blend to create captivating, augmented realities experiences that empower communities to empathise with peatlands and engage in playful citizenship through open discussions on peatland governance.

1.1 Chapter Overview

Chapter one introduces the thesis topic and defines the scope of the thesis.

Chapter two discusses the research process and methodologies utilised within the work's research and design ideation phases**.**

Chapter three presents the peatland ecosystem, analysing the timeline of peatlands in Ireland, and the current state of peatlands in Donegal from onsite observations, presenting insights gained on mindsets towards peatlands from stakeholder interviews.

Chapter four discusses peatland conservation both in Ireland and globally, covering work carried out by the IPCC (Irish Peatland Conservation Council), researchers and community initiatives, Re-Peat, along with broader conservation efforts and precedence, including GARN (The Global Alliance for the Rights of Nature), the Snow Leopard Trust Partner Principals, and FrogID.

Chapter five summarises the problem space through the utilisation of a series of mapping exercises, including cluster mapping, mental models, and the Iceberg Model**.**

Chapter six introduces play theory, the playable cities model, and precedents, including Epiphyte, an augmented bushwalk concept.

Chapter seven presents the design process and the Let Sleeping Bogs Play concept, including concept playtesting and developmental co-designing workshops.

Chapter eight discusses the further potential for the concept, including the possibilities for further development, and presents the study's contribution to the field.

1.2 Limitations of the study

As peatland conservation is a complex and multifaceted issue, it is necessary to define the scope and limitations of this thesis as follows:

Location: While many categories of Peatlands are found across the globe, and even within Ireland, both Raised and Blanket bogs can be found, this thesis limits the study to Blanket Bogs in Rural areas, namely County Donegal in the Northwest of the country. Due mainly to their utilisation for industrial-scale turf cutting by Bord Na Móna and

subsequent work carried out to restore them with the help of the Irish Peatland Conservation Council (hereafter referred to as the IPCC) and Government funded retaining scheme for locals affected by the job losses as a result of the phasing out of turf cutting, Raised Bogs were ruled out of the scope of this work. Additionally, due to their topography, they are much easier to restore with a "one size fits all" set of guidelines. Blanket Bogs are more complex, as strategies for optimal drain blockage require individual assessment, and many are privately owned and used for own use cutting.

Generation: This thesis focuses primarily on Generation Z (hereafter referred to as "Gen Z")- typically acknowledged as those born between 1997 to 2013 (Dimock, 2019), and younger Millennials, with selected participants for workshops and playtesting between the ages of 18-28. This age group was selected as a target audience as not only will they be the next generation of peatland custodians and have been identified by researchers as a missing link in conservation efforts, but as a more environmentally conscious group, they are in the best position to evoke change in rural mentalities around Peatlands.

Older community members from the Boomer Generation and Generation X (hereafter referred to as "Gen X") - were interviewed as part of the research process, as they are the current custodians of peatlands; however, among these generations, there is a heavy reliance on them as a source of fuel and strong opposition to bans on turf cutting.

Infrastructure and Regulations: Providing alternative fuel sources or the infrastructure to move away from the reliance on turf to heat rural homes goes beyond the scope of this thesis, as this aspect of the challenge is in the hands of both local and national governments to address. Additionally, top-down proposed legislation has been met with backlash and resistance in rural areas, especially in County Donegal, which locals refer to as "the forgotten county" due to its remote location as the country's most northerly county, isolation from the Republic with the majority of Donegal's border shared with Northern Ireland, and subsequent lack of infrastructure and connection to the rest of Ireland. However, shifting the mindset of the next generation has the potential to create interest in the conservation of rural, private peatlands on a grassroots level.

Conservation Guidelines: This thesis does not aim to set guidelines for the physical conservation of Blanket Bogs, as researchers and conservation stakeholders such as the

IPCC are in the best position to provide guides on how best to block drainage channels and restore the water tables of bogs so they might become active peatlands once more.

1.3 Acknowledgements

Research carried out for this thesis was possible thanks to the Dora Plus Scholarship program, run through HARNO and the European Union European Regional Development Fund. Additionally, the author would like to acknowledge Nuala Madigan of the Irish Peatland Conservation Council, Dr Kate Flood, the Peatlands Postgraduate group and the Dongeal natives who helped to inform and participated in the research for this thesis, as without their contributions, this research would not have been possible.

2. METHODOLOGY

This chapter provides a general overview of the research and research process, including the selected research methodologies utilised.

2.1 Research overview

The research examines the historical context of peatlands in Ireland along with the current state of and mentality towards peatlands in Donegal to identify opportunities for alternate engagement of local communities with peatlands. Due to the complex nature of the relationship between Irish people and peatlands, research began with extensive explorations into local perspectives on peatlands and challenges faced in conservation initiatives, evolving to examine broader approaches to local engagement in conservation. The lack of alternative methods of interacting with peatlands outside of current destructive practices, and opportunities for locals to employ their extensive knowledge of local peatlands in management strategies, further led to explorations into how people are being engaged with their everyday surroundings and empowered to contribute to multi-stakeholder discussions on local governance outside of conservation efforts.

Research Problem

Peatlands are vital ecosystems to preserve and restore due to their incredible qualities as carbon sinks and as homes to vast species of flora and fauna. However, in Ireland, peatlands have been viewed either as sources of fuel or wastelands to dump rubbish, with many rural families in Donegal still reliant on peat and resistant to top-down Government bans on peat cutting.

Research Question

How can we shift perspectives to give Peatlands a voice while celebrating tradition and community?

Research Aims

- Identify opportunities to provide alternative methods of engaging with peatlands in Donegal.
- Design a concept that encourages alternate interactions with peatlands, with the goal of opening community dialogue on the future of peatlands.

Hypothesis

Shifting perspectives on the value of Donegal peatlands through alternative forms of community engagement would encourage local communities to participate in conservation efforts.

2.2 Research Methodology

Here, a brief overview of the methodologies and frameworks utilised to conduct research for this thesis is presented, along with reasonings for their utilisation.

2.2.1 Systems Thinking

Systems thinking is a method of viewing groups of interdependencies forming a complex, unified whole in a way that better helps us to understand and work with systems in order to influence them (Kim, 1999). In this context, systems thinking in the vein of sustainability and conservation examines systems which contain both natural, in the peatlands ecosystem, and social, in the local communities, elements, in a coupled human-environment system (Fischer and Riechers, 2019). These living systems are "continually evolving and have the capacity to change their purpose, temporarily or permanently" (Kim, 1999). By employing systems thinking to examine these systems, it is possible to identify leverage points according to the "Places to Intervene in a System" framework by Meadows (1999). Fischer and Riechers (2019) argue that "a leverage points perspective on human–environment systems deserves greater attention because it holds substantial promise to inspire new directions in sustainability science and practice." Thus, systems thinking was utilised in order to analyse the peatland ecosystem and identify opportunities, with causal loop diagrams, mental models, cluster mapping and the iceberg model among the tools utilised to map out and understand the research and problem space. Additionally, participatory practices formed a key part of the design research process; having been selected as the problem space is one in which the engagement of key stakeholders is vital, with co-designing workshops run to develop design concepts and cultural probes informing the delivery and feedback of prototype playtesting.

2.2.2 Literature Review

A review of relevant literature was conducted, covering the fields of systems thinking, conservation strategies, along with play theory, to gain insights into the existing

research within these fields and aid in identifying opportunities for this research, as literature reviews help to develop hypotheses and in framing research questions (Winchester and Salji, 2016). Authors whose work informed this study include Kate Flood, a PhD researcher in the field of community engagement with peatland conservation and Matthew Riley, whose research focuses on developing augmented and mixed realities experiences in natural settings.

2.2.3 Interviews

To further gain perspective not only on the peatland conservation efforts being made but also on the perspective of Donegal natives, a semi-standardised interview format was utilised. (Flick, 2009). This interview format was explicitly selected as, with this approach and dialogue, "the interviewee's position is made more explicit and may also be further developed "(Flick, 2009). Topics and questions were pre-selected to guide these interviews, which were conducted between November 2021 and June 2022 and included online interviews with professionals and researchers in peatland conservation as well as in-person interviews with members of the Donegal community. During the interviews, written notes were taken, and afterwards, the information and insights gained were analysed through various mapping techniques, including cluster and information flow maps.

Interviews with conservation specialists:

Interviews were conducted with a representative of the IPCC, Nuala Madigan, selected as the IPCC is the leading body in efforts to conserve and restore Irish peatlands, having worked closely with the government, researchers and communities, and Dr Kate Flood, selected due to their work the field of community engagement with peatland conservation in Ireland. These interviews were focused on gaining insights into current conservation practices, frameworks, and missing links within peatland restoration efforts.

Interviews with Donegal natives:

Interviews were conducted with natives of Donegal across Boomer, Gen X, Millennial and Gen Z generations, with four interviewees from the older generations and four from the younger, with interviewees selected based on age, location, and family ties to peatlands. The goal here was to gain insights into current perspectives on peatlands and the practice of turf cutting across different generations in order to identify themes in thinking and leverage points.

2.2.4 Field Research

On-site field research was conducted in April of 2022 to study the current state of and interactions with privately owned peatlands compared to protected peatlands in Donegal, with data collected in the form of photography. These observations were conducted in a Non-Participant Observation format (Flick, 2009), wherein no interventions are made to the field, but rather "simple observers follow the flow of events. Behaviour and interaction continue as they would without the presence of a researcher, uninterrupted by intrusion" (Denzin and Lincoln, 2008). The purpose of this field research was to utilise on-site observations as a method of gaining a deeper understanding of local peatlands, expanding on insights gained from interviews and cultural autoethnography as "triangulation of observations with other sources of data and the employment of different observers increase the expressiveness of the data gathered" (Flick, 2009). Additionally, extensive photography of visited peatlands was conducted to document findings.

3. THE PEATLAND ECOSYSTEM

Though globally, they cover only around 3% of the land; peatlands store 25% of the world's soil carbon, equivalent to three times the amount of carbon stored by rainforests (Toner, 2021). Additionally, they contain an abundance of flora and fauna, many of which are not just unique to Peatlands but also to individual bogs. This makes them an invaluable biome, especially as society is moving to tackle climate change.

Beginning with waterlogged conditions from heavy, consistent rainfall in upland areas or standing lakes (International Peatland Society, 2019), it is through the addition of sphagnum mosses that bogs form. Labelled an "ecosystem engineer", sphagnum is the keystone species of peat formation; it absorbs water and the minerals within it, replacing them with hydrogen ions, thus making the water acidic (van Breemen, 1995). Combined with the lack of oxygen flow due to the hyaline cells of the moss holding over twenty times their weight in water, this creates an environment in which the decaying process is slowed, allowing for the formation of peat (Prolux, 2022) at a rate of 1cm per ten years (DAERA, 2015). It is as peat is the accumulation of partially decomposed organic matter, and thus a form of carbon fuel and the first stage of coal formation, that it is harvested to burn for energy and heating, and as Prolux (2022), points out: "It can take ten thousand years for a bog to convert to peat, but in only a few weeks a human on a peat cutter machine can strip a large area down to the primordial gravel." The relationships between the process of peat formation and human cutting can be illustrated through the use of causal loop (Kim, 1999) diagrams (Figure 1).

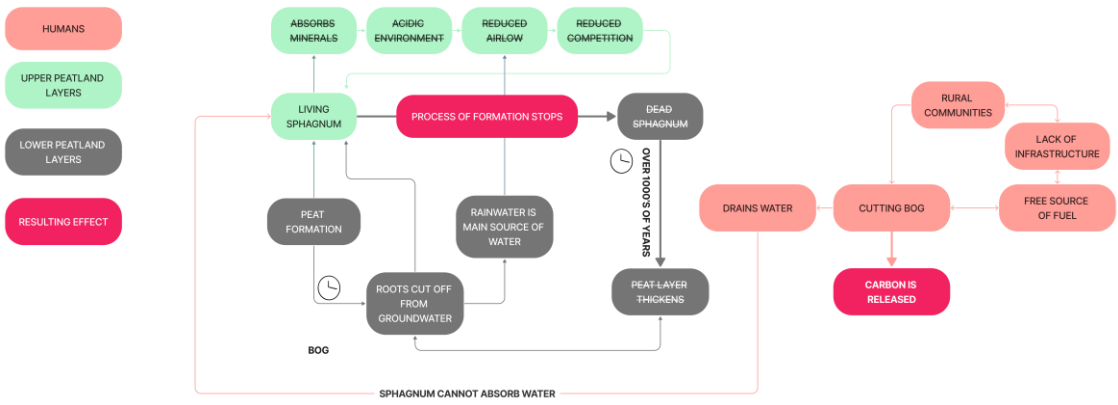

Figure 1: Causal Loop Diagram, adapted from van Breemen, (1995).

Peatlands in Ireland fall under two categories, Raised Bogs and Blanket Bogs. A summarisation of these two types follows:

Raised Bogs

These bogs have usually formed from a lake basin and are surrounded by agricultural grasslands, and generally contain deeper deposits of peat. (Coillte, 2023), They are characterised by their dome-shaped, raised masses. (Irish Peatland Conservation Council, 2021a) The Raised Bogs in Ireland are considered to be the finest example of their kind in Europe, and under the EU Habitats Directive, they are a priority habitat (Irish Peatland Conservation Council, 2021a).

Blanket Bogs

There are two types of Blanket Bog found in Ireland: the Atlantic Blanket Bogs found along the west coast and the Mountain Blanket Bogs found in mountainous regions. Unlike Raised Bogs, they tend to be much more spread out, forming carpets across the landscape (Coillte, 2023). They are also an uncommon Bog type, and 8% of the world's Blanket Bogs can be found in Ireland, making it the most important country in Europe for this bog type. (Irish Peatland Conservation Council, 2021b)

As outlined in the **limitations** of this research, Blanket Bogs, specifically those found in County Donegal, are the focus of this research, as, drawing from the following research, Raised Bogs have mainly been the focus of conservation and restoration initiatives in Ireland.

3.1 Irish peatlands timeline

Peat, or Turf as it is commonly referred to in Ireland, can be described as logs of soil cut from the peat layer of bogs, and these logs are a viable source of carbon fuel that the Irish have utilised for hundreds of years; there is evidence of turf cutting going back 1000 years. However, the draining of Peatlands to cut turf, and the subsequent burning of it, releases the carbon stored within the bogs. Turf releases more carbon into the atmosphere than coal. (O'Sullivan, 2018) So why, then, given the importance of Peatlands for our environment, are they utilised in such a way? For this, the way these lands have been viewed historically and the Irish economy must be examined.

Due to the nature of wetlands, very little can be done with the land itself - they are not ideal for agricultural use, or as sites for infrastructure unless drained - therefore, the view has long perpetuated that Pleatlands are wastelands and worthless, primarily

shaped by Western Capitalism and Imperialism (Prolux, 2022). In an extract (taken from Peatland Utilisation and Research in Ireland, The Irish Peat Society, 2006, P7-12) on the history of Peatlands in Ireland on the Bord na Móna website, peatlands are painted as miserable wastelands: "the bog itself in the Irish mind was a symbol of barrenness" (Andrews 1982, as cited by Bord Na Móna, 2017). As early as the 1700s, while Ireland was still under British rule, there were initiatives to reclaim Peatlands for agriculture by draining them. In the 1800s, the view shifted to looking at bogs as a source of fuel for the country, and unlike the reclamation for agriculture, this was seen as a viable and valuable use of the land, so much so that turf cutting was industrialised (Bord Na Móna, 2017). With Irish independence and the formation of the Irish government in the 1930s, the Turf Development Board - later renamed Bord na Móna - was established to industrialise turf cutting on a larger scale, and turf became the fuel of choice for the country's power plants as there are minimal alternate sources of fuel on the island. This view that Peatlands are either wastelands or only suitable for the fuel they provide has mostly continued to this day, a reflection of Western culture's "attitude of looking at nature solely as something to be exploited" (Prolux, 2022). Additionally, the mass cutting of peatlands in the 1980s and 1990s was spurred on by Government funding schemes for private cutting, further solidifying the perspectives of older generations on bogs (Bord Na Móna, 2017). It is only recently that Bord na Móna began phasing out their use of turf and gradual closure of harvesting sites, and to offset the job losses in the midlands, there is a retraining scheme in place: "With the potentially devastating impact of the sudden end of the peat industry looming, the Irish government is funding a Just Transition programme for the Midlands. This will include retraining, funding for new enterprises including in renewable energy and investment in the tourism, heritage and leisure sectors" (Tierney, 2020). What impact these job losses will have on rural communities is yet to be seen, and there is still the question of what will happen to these bogs.

Peatlands have also been used as forestry sites, with Collatie, a state-owned forestry company, owning approximately 233,000 hectares of peatland and, largely thanks to Government initiatives to restore national forestry coverage from 1% to 17% (coverage is thought to have been 80% before depletion), have been planting trees in bogs, which are often unsuitable. These actions, as Toner (2021) highlights, have a negative impact on carbon emissions: "Though trees are often thought of as an all-around positive addition to the environment, planting trees on peatland disturbs a normally treeless ecosystem and one that has much carbon stored in its organic soil. Though some carbon is newly sequestered by trees as they grow, carbon is also escaping from the drained

peat soil." They, too, have been working on the restoration of forested blanket bogs under their ownership, with trees removed from about 2000 hectares of peatland.

A complicated relationship emerges from this examination of the timeline of peatlands in Ireland. For many years, Ireland has depended on these ecosystems to power the country, even incentivising private harvesting. With negative mentalities towards peatlands stretching back to the country's time under British rule, mindsets around peatlands and their value have become deeply ingrained in Irish society, creating a challenge for conservation efforts as the country now looks to move away from cutting and burning peat.

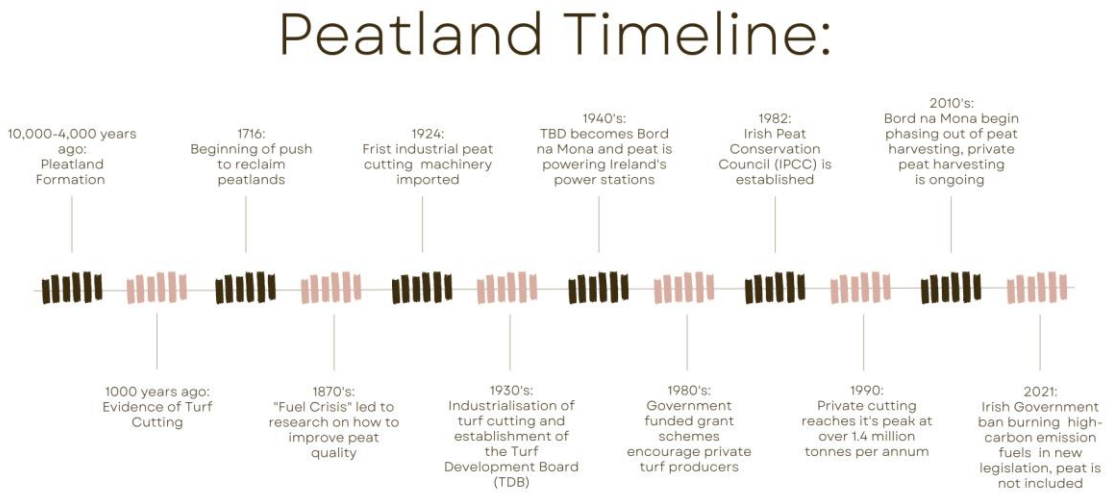

Figure 2: Peatlands Timeline, adapted from Bord Na Móna (2017).

3.2 The significance of rural peatlands and the turf-cutting process

In addition to being harvested the burnt on an industrial scale, many rural families are reliant on peat to heat their homes and have cut turf for generations. 69% of peatland in Ireland is privately owned, primarily by such families. Seen as a summer family - or even community - activity, locals of all ages will go to the bog in the warmer summer months to cut the turf and leave it to dry until autumn. In winter and spring, the bogs are mostly empty, except for the sheep left to graze on the vegetation that grows there. For many, this tradition is their only interaction with peatlands and enforces the prevailing view of the ecosystem: an endless, free domestic fuel source. This view that

the bog has always been there and will always be there goes against the very nature of peatlands; they are, like other fossil fuels, finite and will be depleted if harvested. Through incremental cutting over time, some bogs have been thoroughly gutted, with very little remaining untouched. Furthermore, due to their reliance on turf, many of these rural communities object to attempts by the Irish government to designate privately owned bogs as habitat for restoration or the regulation of peat cutting and burning, with many seeing the cutting of turf on land that they own as a right that the government has no place to attempt to take away. While the European Union has banned peat burning in recently proposed fossil fuel regulations, the Irish government have omitted peat from restrictions (Ryan, 2021), prioritising the objections of citizens over the financial repercussions of going against EU law. McHugh (2022), points out:
"'Going to the bog' for a day can be a novelty, but those in the know understand that saving turf can be a gruelling process and comes a lot of pride. Taking turf cutting away from rural Ireland will cause a lot of pain given that generations have often worked the same bogs ". With such deep generational ties to the land and the pride that comes with the work and tradition of cutting turf, combined with the reliance these communities have on peat, a difficult problem space emerges. Additionally, McHugh (2022) expands on this by highlighting the industrialisation of the turf-cutting process: "We always hear how turf cutting is part of our culture and about people's 'right' to cut turf. However, I think we need to make a clear distinction between cutting turf by hand, which is culturally significant, and cutting turf with machines which is not." To elaborate on this, an explanation of the differences in the traditional and modern approaches to turf cutting follows.

3.2.1 The turf cutting processes

Traditionally, specialised spades, called sleáns, would be used to cut turf. There are many variations of sleán, but all were capable of cutting peat into regular sods and were widespread in small-scale cutting use until the 1980s. Cutting peat with a sleán is the least invasive method of turf extraction. (McHugh, 2022) The cutting of turf is incredibly labour-intensive work, and as such most turf cutting is carried out by machinery today, even on a small scale, individual level. McHugh (2022) explains: "generally, machine cutting is carried out by local contractors and the bog owner has two choices, the 'sausage' or the 'hopper' machine." However, there are still areas of the country where sleáns are used, and "footing" - the stacking of cut turf to dry is still done by hand. The cut turf needs to be turned so it can dry on all sides before being placed into triangular formations, or "stacks" (McHugh, 2022). This work, as previously mentioned, is carried out in the Irish summer months, when the sod will dry out the quickest. Once Autumn

hits, the sods are either covered if they are not dry or collected and transported to local homes if they are. This summer harvest provides households with all, if not the vast majority, of their fuel for the year.

3.3 Field research and interviews with locals

To gain an understanding of current mindsets towards Donegal peatlands and observe their current state, a research trip to Donegal was undertaken in April 2022, primarily focusing on the area of Inishowen, as this is a rural area in the county with an abundance of blanket bogs, with the intention of carrying out both field research on peatlands and interviews with selected members of the local community.

3.3.1 Interviews with Donegal Locals

As part of the field research, interviews were conducted with Donegal locals to better understand current mentalities towards peatlands, the necessity for turf cutting and proposed legislation to limit the private cutting and selling of turf. Eight members of the local community were selected based on their ties to peatlands: among the older generations, interview participants were locals who had life-long ties to local peatlands, having owned or rented land for turf cutting, while with younger generations, participants were split, two having family connections to peatlands, and two whom's family had purchased and burnt turf but had never spent time on peatlands. While these interviews provided insights into the views of locals and, indeed, solidified the hypothesis that in rural locations, many still do just see Peatlands as an endless fuel source, within older generations, the eagerness to talk about and sentimentality towards the bog was a surprising key takeaway.

Older members of a local Donegal community, falling within the Boomer and Gen X generations, who owned strips of peatlands and cut turf, were interviewed. Across all interviewees, there was excitement to talk about their experiences on the "Hill", as it is referred to locally, a name derived from the fact that Blanket Bogs form in upland regions. The process of cutting and footing turf was discussed in detail, with many personal stories shared and interviewees reflecting on their relationships with bogs. Within this group of participants, turf cutting is both a social activity and a nostalgic summer memory, and there is something special about this sentimentality: local bogs brought families and communities together. This group was also the most vocal about their rights and need to continue to cut turf, especially with growing concerns over a fuel crisis. Outside of the turf-cutting season, they discussed how they would still visit

the bog, finding it a quiet and calming environment. Key points brought out in the interviews are that while they firmly believe that turf cutting should continue and that the Irish government is wrong to attempt to limit or outright ban it, they also have a deep connection to and knowledge of local peatlands.

Among interviewed Millennial and Gen Z community members, some have also spent time on the local bogs during the Irish summers. One interviewee whose family used to cut turf lamented that they were not allowed to join older siblings and cousins in footing the turf due to their age, as it seemed like a fun activity. Those with a family connection to local bogs or experience cutting turf would continue the practice. Interviewees who had no connection to the practice of turf cutting also felt no connection to local peatlands. Among this age group, peatlands are viewed as an endless source of fuel, a place to be together with family, or just a part of the local countryside. A key takeaway was the struggle to see how a shift in mentalities around peatlands could be achieved.

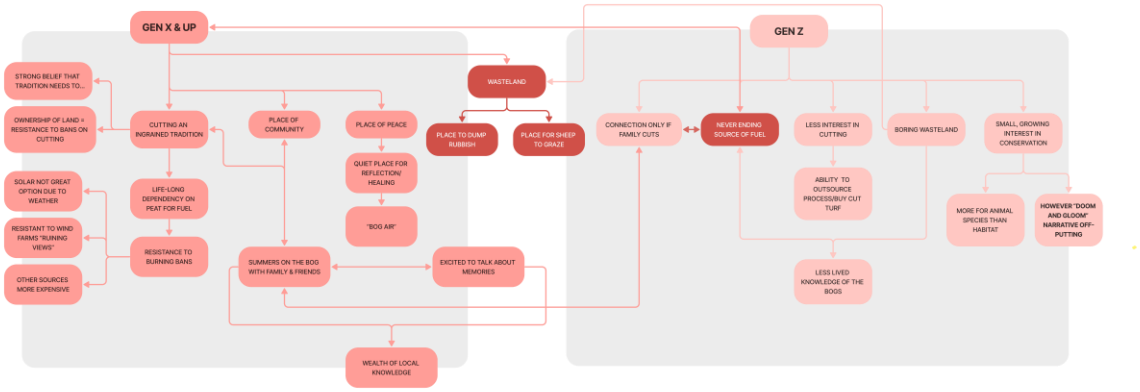

Figure 3: Donegal generational views mapping

3.3.2 Field research on Donegal peatlands

Several peatlands were selected to visit to conduct on-site observations of their current state. While most of the peatland locations were privately owned and selected as they are in rural areas where turf cutting is known to occur, two of the seven were part of the National Parks system and thus protected from local cutting. These two locations were selected to serve as a comparison and assist in assessing the damage done to the peatlands utilised for private cutting. The selected locations are illustrated below (Figure 4), with photo documentation from the trips in Appendix 2.

Figure 4: Peatland Locations Visited (Taken from Google Maps, 2022)

Glenveagh National Park, with its sprawling grounds that include vast blanket bogs, is well known in Ireland as it was the site chosen to re-introduce Golden Eagles to the country. This location was the only peatland visited outside the Inishowen peninsula and was selected for its status as a national park. It serves not only as an example of a thriving and active blanket bog ecosystem, which a multitude of flora and fauna visible (including butterflies, berry bushes, heather, and bog cotton), but of the potential for blanket bog trails to be popular tourist attractions. Despite the visit occurring on an overcast weekday, plenty of visitors were observed walking along the trails at the park, including the designated bog trail.

The Slieve Snaght (translating to Snow Mountain in English) bogs were the second protected area of blanket bog visited. Within the protected area, the bog was in excellent condition, with plenty of healthy sphagnum, heather and bog cotton covering the slopes and very little observable human activity before the peak, at which the ground is covered in slabs of stone and a "holy well" can be found. This stood in sharp contrast to the surrounding bog, which has been heavily cut and, in some places, has been fully stripped down, with the peat walls between these channels standing taller than a person. In these areas, it is possible to observe bog oak, preserved remains of oak trees that had once been encased within layers of peat.

The rest of the peatland areas, which fell under private ownership, were in a similar state to the unprotected bog surrounding Slieve Snaght, though perhaps not as heavily cut. Of the five locations, all were devoid of human activity, with old turf leftover from the previous year's harvest remaining scattered throughout four of the locations, and, most surprisingly, the dumping of rubbish was rampant. Across these peatlands, old machinery, building materials and other forms of hard rubbish lay in the channels or just off the gravel roads running through them. The difference between the plant life was also apparent, with the heather and sphagnum close to the drainage channels and areas of cutting appearing dried up. Additionally, due to the precise nature of the cut areas and proximity to the roadways, it would appear that cutting had been conducted with machinery rather than by hand.

4. CONSERVATION STRATEGIES

This chapter discusses conservation strategies and initiatives for peatlands within Ireland and globally, along with examining border conservation strategies for both habitats and species to understand current methods, frameworks and precedents within the general field. This research was conducted to better inform the problem space, as by gaining an understanding of the success and struggles of the various approaches taken, opportunities for intervention could better be identified. A brief overview of the current approaches within peatland conservation has been condensed into a cluster map illustrating the various scales of intervention (Figure 5).

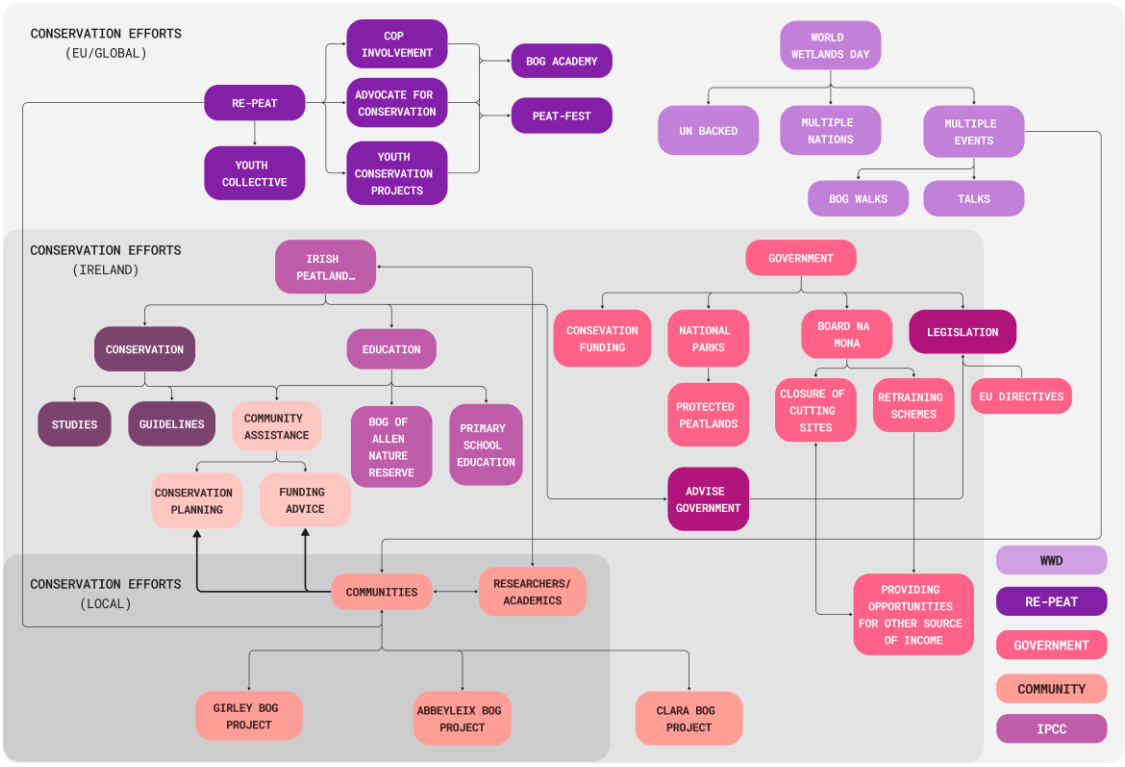

Figure 5: Scales of Peatland Conservation

4.1 Irish peatlands

Irish peatlands have been the subject of conservation efforts for several decades, with the Irish Peatland Conservation Council, along with peatlands researchers and community activist groups leading the way. However, these efforts have primarily focused on the raised bogs of the Irish midlands, many of which fall under the ownership of Bord na Móna, the semi-state-owned entity that provides the country with power and has historically been an area of industrial-scale turf cutting. This research focuses on

the work of the IPCC, and leading research in the field of community engagement, along with precedents for local community restoration efforts.

4.1.1 The Irish Peatland Conservation Council

The Irish Peat Conservation Council was established in 1982 with a mission to: "conserve a representative sample of the peatlands of Ireland for people to enjoy now and in the future." (Irish Peatland Conservation Council, n.d.) Since their formation, they have worked with the government on Action Plans for peatlands, developed and published guidelines for peatland conservation, restored the Bog of Allen -where they are based- and worked on gaining community engagement through education and getting locals involved in Peatland conservation.

From an interview with Nuala Madigan from the Irish Peatland Conservation Council, not only were many relevant insights brought out, but more importantly, an in-depth understanding of what the council do and its conservation methodologies was gained. The council's work covers three areas: Conservation, Education and Legislation, the latter two falling under the conservation category.

Education and community engagement were the focus of this interview, as this is the core of their conservation work. Much of what they do is to facilitate a "new education stream" by taking academic and scientific research and, in a way, "translating" it to make it easier for everyone to understand, curating lessons on Peatlands along with "Day on the Bog" trips for Primary School Education, and hosting skill-sharing workshops for individuals and communities interested in restoring their local bogs based on scientific methods. This last point was highlighted as being of great importance as 69% of Peatland is under private ownership, and they see a growing need for engagement with these Peatland custodians. As there is no one fix for everything, with each bog having unique needs (a point especially true for blanket bogs), the main challenge faced by custodians who are interested in conservation is that funding is difficult to obtain. Applying requires knowledge and skills in peatland monitoring, and the vast majority of funds go to State-owned sites. However, the council do not reach out to communities to engage them in this way, but these individuals and communities must find the IPCC. Other initiatives the council are involved with include Rural Link, from the Wetlands Forum, which is also a platform to support community restoration projects, and The Peatlands Gathering, a yearly event where local communities, researchers and conservationists meet to discuss and celebrate Peatlands. Also

highlighted was the Peatlands and People initiative, which is working towards building a network of peatlands across the country, intending to redefine bogs and highlight their potential as places for leisure and tourism. This initiative, funded by the EU LIFE program, also encompasses the JUST TRANSITION ACCELERATOR, a government-backed program to provide citizens affected by the transition away from industrial-scale turf cutting with re-skilling opportunities.

When discussing the reliance of rural families on turf, it was highlighted that one of the main reasons for the backlash on cutting and burning restrictions is the top-down structure and nature of these types of initiatives and legislation. Locals were often not consulted before the government introduced measures, and due to the rural locations, they do not have the infrastructure or support to transition away from this reliance on peat. There must be a balance between the needs of the people and the needs of the land and environment, and this is a difficult thing to do, so many are leaving it to the next generation to decide the fate of turf cutting and bogs.

4.1.2 Current Research and conservation initiatives

In "Assigning value to cultural ecosystem services: The significance of memory and imagination in the conservation of Irish peatlands", Flood et al. (2021) examine how values are assigned to the cultural ecosystem services of peatlands in Ireland, with a focus on the raised bogs in the midlands. As Flood et al. (2021) highlight, there is an under-representation of cultural and social values of peatlands in conservation, management, and decision-making, and "the need to legitimately represent people who hold cultural values and to incorporate these values into decision-making continues to be an important issue", as other valuations of peatlands, such as economics, tend to inform policies, and this can exclude locals from the decision-making process.

The aim of this research was to explore this transitionary period for Ireland's peatlands, where they shift from places of resource extracting to places that facilitate education, conservation, and recreation, by examining how both individuals and communities value cultural ecosystem services in order to improve the understanding of how this value is created through an approach of co-creation (Flood et al.,2021). The authors state that to do this, key system leverage points (Meadows, 1999) should be activated to create new social norms for the sustainable ecosystem management of peatlands through inclusive decision-making that benefits all stakeholders. (Flood et al.,2021). By exploring the potential of these leverage points through a relational, exertional and

cultural lens, the authors developed a framework by which the temporal dimensions of cultural ecosystem services might be valued.

This framework, which includes not only the temporal dimensions but also identified modes of valuing: Mind, Body, Culture and Nature, was utilised by the authors in conducting the participatory aspect of the research, which included an online survey to identify themes within the data, and participatory community mapping workshop to facilitate the mapping of individual experiences with bogs, and participate in the discussion and share knowledge as a group.

The findings of this paper were of particular interest, given the scope of the research and the inclusion of participatory practices. It was highlighted that "many of the participants in this research described a close connection to their local peatland landscape, often through memories of living or working on the bog when they were younger" (Flood et al.,2021), with the values arising from memory focused on appreciating the bog as a source of fuel, which links in with findings from the interviews conducted with older generations of Donegal locals. Additionally, the negative perceptions of peatlands as wastelands were discussed, as observed with the blanket bogs of Donegal, there was a perception of peatlands as a place to dump rubbish, with the survey run by Flood et al. (2021), finding that the illegal dumping of waste in bogs was cited by 70% of respondents as a negative aspect of their visits to peatlands. Through the research, it was also highlighted that it is through everyday interactions and emotions and sensory experiences with peatlands that deeper relationships with the ecosystem form over time, with participants engaging in social media, visual and performing arts, oral histories, writing, education and conservation activities in peatland settings (Flood et al.,2021), with attention drawn to the value still found in the sense of community and social connection on peatlands, though through the lens of conservation work, rather than in the traditional practice of turf cutting. The research participants also found value in perceiving health benefits from being on the bog. Again, a link is found with the interviews conducted with the older generations of Donegal locals, who described bog walking as an activity to de-stress.

While the findings of this research focused on a different geographical location and peatland type within Ireland, they provide key insights into not only the perspectives of those involved in community conservation projects but also similar issues and values across Irish peatlands. Furthermore, the "framework for valuing the temporal dimensions of cultural ecosystem services" serves as a relevant tool to utilise within this thesis's research and design process.

An online interview with Dr Kate Flood was conducted in the spring of 2022 to gain further insights into the research and community conservation efforts, as Dr Flood is a member of the Girley Bog project, running the "A Bog's Life" blog, along with the Irish Peatlands Postgraduate group (a group dedicated to supporting and sharing knowledge between postgraduate students caring out projects across all areas of peatland research). A key topic of the interview was a post, "Listening to the bog" (Flood, 2021), discussing the "Rights of Nature" (GARN) movement and the potential of giving the bog a voice by not just listening to but inhabiting the viewpoint of the bog, and "Deep Listening Walks", an immersive audio-visual project by artist Kathy Hinde (2022), where the sounds of the blanket bogs of Scotland's "Flow Country" were recorded at different levels to listen to the bog back through time (Hinde, 2022). Additional key insights from the interview surrounded the lingering effects of colonisation on the mindsets towards peatlands, which efforts being made to de-colonise peatland maps and databases, issues surrounding the length of time that restoration takes, as for some it can make the process feel unrewarding if they cannot see the end result within their lifetimes (a point backed up by Tierney (2020), who points out that it will take years for the bogs to recover. It can be difficult for everyone in these communities to have such long-term views), and a missing generational link between current conservation projects and Gen Z, for whom a tool kit to engage this audience in a way that promotes conservation in a positive light would be beneficial to the continuation of the projects. With this last point, the need for positivity was highlighted, as the "doom and gloom" of climate change and habitat destruction can be off-putting for Gen Z in the experience of those working on these projects.

Community restoration initiatives, such as the Girley Bog and Abbeyleix Bog projects, have mainly been undertaken in the raised bogs of Ireland's midlands, led by communities and researchers in the field of peatland restoration. These initiatives aim to manage, conserve, and highlight not only the heritage but also the conservation value of these sites and utilise them for recreation and educational purposes (Flood et al., 2021). These initiatives have seen success, having been brought up in interviews with Nuala Madigan and Kate Flood due to their broader community stakeholder engagement. Additionally, thanks to community protests, some sites, such as the Clara Bog Reserve, which is a National Nature Reserve, a Special Area of Conservation, Ramsar Wetland Site, Natura 2000 site, and Natural Heritage Area (Clara Bog Nature Reserve, 2023), have been purchased by the National Parks and Wildlife Service, allowing for them to be transformed into protected nature reserves. While these initiatives, as previously mentioned, have been focused on raised bog locations rather

than blanket bogs, they serve as precedents for the power of local communities to initiate the restoration of peatlands on a grassroots level.

4.2 International peatlands initiatives

In addition to research on conservation strategies for peatlands in Ireland, research was conducted on broader peatland restoration initiatives, including World Wetlands Day, Re-Peat, and Re:Wet. Peatland conservation is becoming more of a mainstream topic, as evidenced by the inclusion of the Peatland Pavillion at the COP26 gathering, which serves as a library to explore global peatland conservation initiatives, with a companion virtual version available to explore online, acting as a long-lasting resource and knowledge hub, that will be expanded with time. (IUCN Peatland Programme, 2021). The following initiatives highlight a growing global community dedicated to sharing knowledge and empowering conservation and restoration movements across various platforms and engagement methods and have been selected to analyse as they inform the research on the scope of work currently undertaken and potential opportunities for intervention that have already been successfully approached within this field.

4.2.1 World Wetlands Day

World Wetlands Day, on the 2nd of February, was established by the United Nations in 2021 and is an initiative to raise awareness about wetlands globally. The day also marks the Convention of Wetlands anniversary, an international treaty adopted in 1971 (World Wetlands Day, 2021). Various governments, organisations, collectives, and conservationists use World Wetlands Day as an opportunity to run events, such as bog walks or exhibitions and in-person or online seminars, which cover topics usually covering conservation and restoration. Past peatland events in Ireland to mark the day have been hosted at Clara Bog, a community restoration project, and Boora Discovery Park, a Bord na Móna-owned peatland undergoing restoration, both of which are raised bogs.

4.2.2 Re-Peat

Re-Peat is an international youth-led collective dedicated to the conservation of peatlands, with a manifesto to collaborate, educate and re-imagine to create a peatland paradigm shift (RE-PEAT, 2015b). Their work includes participation in the COP26 agreement, which featured the physical form of the "Peatland Pavillion", the Bog

Academy project, a unique educational program designed for children to learn about peatlands and the challenges they face in order to inspire the next generation and promote sustainable futures for peatlands (RE-PEAT, 2022) - in which Kate Flood has participated, providing tours of Girley Bog - and PEAT-FEST, a 24-hour long online festival in 2020 and 2021, and six-day online festival in 2022. These festivals featured a variety of seminars, similar to the World Wetlands online events, and in 2020-2021 these youth-led events connected over 900 peat lovers, scientists and activists from across the globe (RE-PEAT, 2021). The 2022 iteration revolved around the theme "Rights of Peatlands", inspired by the GARN movement. Day five of the festival was dedicated to offline experiences, encouraging participants to explore their local peatlands or organise an activity with friends and other participants. As a youth-led organisation, classifying themselves as a collective of mostly under 25's, with some youthful over 25's (RE-PEAT, 2015a), they serve as a precedent for the successful international engagement of Gen Z in peatland conservation.

4.2.3 Re:Wet/Peat:Lab

Re:Wet/Peat:Lab is a peatlands monitoring and service project currently in its pilot stage. Created by Milan Bergheim to tackle issues of peatland restoration in Germany with the utilisation of Digital Twin technologies, Re:Wet empowers farmers in Germany, where 92% of peatlands have been drained, mostly for agriculture (German Eco Design Award, 2022), to begin the process of re-wetting and restoring the county's peatlands. Through this service and the Re:Wet Lab device, an "easy-to-use device that uses RTK-GNSS, a GPS version accurate to the centimetre and in connection with a smartphone" (RE:WET, 2022), farmers may determine critical factors relating to the site, including water levels, peat thickness and terrain heights (RE:WET, 2022). The collected data is then used to model a digital twin of the peatland site and inform monitoring and restoration planning, with additional data collection undertaken annually. The aim of this project is not only to encourage peatlands restoration and provide training and incentives to farmers who undertake restoration efforts but to make the process more efficient and cost-effective, cutting down on time and effort landscape planning offices and specialists would be required to spend on monitoring and planning activities (RE:WET, 2022). This service shows the potential for the implementation of technology to empower local landowners in peatland restoration efforts while also providing various stakeholders with tangible incentives for using it, and the utilisation of technology in a natural setting, though perhaps not in the same manner, is something to carry forward into the ideation phase.

4.3 Boarder conservation strategies and precedents

An investigation into border conservation strategies has also been undertaken as part of this research to understand how it has been approached in other settings and identify potential methods and frameworks that could be applied to rural peatlands settings. This chapter covers the work of GARN, the Global Alliance for the Rights of Nature, which was discussed in an interview with Kate Flood, the Snow Leopard Trust's approach to engaging local communities in the conservation of the species, along with platforms designed to engage the broader public in various restoration and monitoring efforts.

4.3.1 The Global Alliance for the Rights of Nature (GARN)

Champions of the "Rights of Nature" movement, GARN, or the Global Alliance for the Rights of Nature, push for natural ecosystems to be legally recognised not as property to own but as natural communities which have the right to exist, maintain and regenerate their vital cycles (GARN, 2021a). Established in 2010, the alliance has a mission to: "create a system of jurisprudence that sees and treats nature as a fundamental, rights-bearing entity and not as mere property to be exploited at will" (GARN, 2021) in order to create a sustainable relationship with, and future for, natural environments. Through this movement, ecosystems are recognised as having the same rights as humans, approaching conservation from a more-than-human perspective and in line with the traditions of indigenous cultures globally. The alliance currently comprises over 5000 members across more than 100 countries (GARN, 2020), and through GARN, ecosystems in counties Ecuador and New Zealand have had their rights legally regained, allowing local communities to preserve them better. Resources, such as publications and information on GARN, are available through the alliance's website, alongside information on how to join or submit a case to the Rights of Nature Tribunals, a forum in which people are empowered to speak on behalf of nature, providing not only an educational framework for communities and governments but a platform by which legal experts might examine and understand how to better integrate the Rights on Nature into current policies and law (GARN, 2021b).

Having been discussed both in an interview with and the work of Kate Flood and with the most recent iteration of PEAT-FEST themed around the Rights of Nature, the alliance has clear links with peatland conservation efforts in Ireland and globally. While the approach taken by GARN is legal, its basis in empathy, indigenous custodian traditions, and more-than-human perspective illustrate how these principles can be utilised in the

creation of a platform that effectively engages communities globally, showing sustained growth and uptake of the ideology.

4.3.2 The Snow Leopard Trust Partner Principals

Not engaging and involving local communities in conversation efforts has led to the establishment of "inappropriate interventions that have led to serious injustice to local people and have also set back conservation efforts in the long-term." (Fiechter, 2017). Too often, little consideration has been given to these local communities, which are often rural and dependent on the habitats (as is the case with Irish Peatlands). Mishra et al. (2017) state: "In most cases, it is not appropriate or realistic to simply impose science or policies and legislation onto communities. A more effective approach is likely to come from genuine long-term engagement, built on mutual respect and trust."

In response to this, and as a result of 20 years of experience working with communities in Asia to protect snow leopards, the Snow Leopard Trust has developed a set of guidelines - a framework for community engagement - they call the "Partner Principles". These Principles are described as "a blend of the practical and the ethical, are born out of the realization that one size does not fit all and that even within the same landscape, conservation challenges and opportunities can vary between one community and the next, and often even within villages or families." (Fiechter, 2017) These eight principles, as they have been defined within a paper for the Journal of Applied Ecology, follow the acronym "PARTNER" (Mishra et al.,2017):

PRESENCE: Inclusion of practitioners in the local community.
APTNESS: Appropriate community-based interventions.
RESPECT: A relationship that views the community with dignity, with interactions based on beneficence and non-malfeasance.
TRANSPARENCY: Open and honest interactions with local communities.
NEGOTIATIONS: Integrative discussions with local communities and interventions based on formal agreements and linkages.
EMPATHY: The ability to view problems, constraints, and opportunities from the community's perspective.
RESPONSIVENESS: The ability to adaptively improve the programmes and address emerging problems and opportunities responsively and creatively.
STRATEGIC SUPPORT: To increase the resilience and reach of community-based conservation efforts.

The overlap between wildlife and habitat conservation and the similarities here in the context of how it has been historically approached - the top-down decision-making pertaining to peatlands and its impact on rural communities - is significant and could potentially provide or be adapted to a framework for approaching and exploring this "wicked problem" as part of the solution space.

4.3.3 Restoration and monitoring initiatives

Restor, a finalist in the 2021 Earthshot Prize due to its innovative approach to ecosystem restoration on a global scale, has a mission to accelerate "the conservation and restoration of nature for the benefit of people, biodiversity, and climate." by connecting people to scientific data, monitoring tools, funding, and each other to increase the impact, scale, and sustainability of restoration efforts. (Restor, 2023). The platform, which partners with the WWF and Jane Goodall Institute, is aimed at ecosystem restoration and conservation, not only allowing users to analyse plots of land and register their conservation efforts but also providing tools for monitoring the progress of restoration projects through collaboration with Google. Additionally, users are able to able to publish their projects, to share information and progress through the site. This platform is an interesting precedent, allowing the general public to easily designate their land as sites of conservation and gain insights on potential soil carbon levels or biodiversity, and platform such as this could be a way to engage local communities in peatland conservation efforts, especially if it is possible to show the long-term impacts of sustainable peatland management.

Frog ID is a monitoring platform established by the Australian Museum developed to gain data on the impacts of climate change and habitat loss on frog species across Australia. This project aims to utilise the data gathered to create a nationwide database reflecting the true diversity and distribution of Australia's frog species over time, which will allow them to inform land planning policies and conservation prioritisation (FrogID, 2023).

This mobile application allows the public to record and upload audio of frog calls with data on location, biome and time of day and provides users with a list of potential species. Frog call experts at the museum analyse and verify these audio recordings, collecting relevant data on the species identified, and the uploader is notified of the verified species. Additionally, users can view information on native frog species and their habitats in the app, and the project also utilises gamification with individual and

community leader boards, incentivising users to create more recordings. Through this application, FrogID and the Australian Museum hope to: "connect the public with nature and raise awareness of the frogs and biodiversity conservation, facilitating participation in scientific research." (FrogID, 2023). To date, over 540,000 recordings have been uploaded, with over 810,000 frogs and 217 species identified (FrogID, 2023). While the focus of this initiative is on species monitoring and conservation, it serves as a powerful precedent for national, civilian engagement in a vital study. A key point brought up in the research was the difficulty for individuals and communities to see the long-term benefits of conservation efforts, and, as with Restor, providing users with feedback on the identified species within their recordings presents an opportunity to see changes in the behaviours and prevalence of species over time.

5. PROBLEM SPACE

Within this chapter, the problem space is explored, utilising a series of maps to summarise and evaluate insights gained from the research, with the goal of identifying leverage points and areas of opportunity for the design concept. Cluster maps of the problem space were created simultaneously with the research in order to visualise and connect the relationships between different areas and stakeholders, which were later distilled down to create a simplified cluster map highlighting the key findings (Figure 6, larger version in Appendix 1).

Figure 6: Cluster mapping of problem space

To compliment this map, additional maps were created to explore the relationships between peatland stakeholders (Figure 7), focusing on the blanket bogs of Donegal. Within the stakeholder mapping, five key stakeholders were identified: citizens, conservationists, government, the environment and peatlands themselves, the last two included in line with the "Rights of Nature" movement and to incorporate more-than-human perspectives within the mapping. This highlighted the relationship between peatlands and the local environment as they provide a habitat for species of flora and fauna, along with water retention and filtration, benefitting local communities.

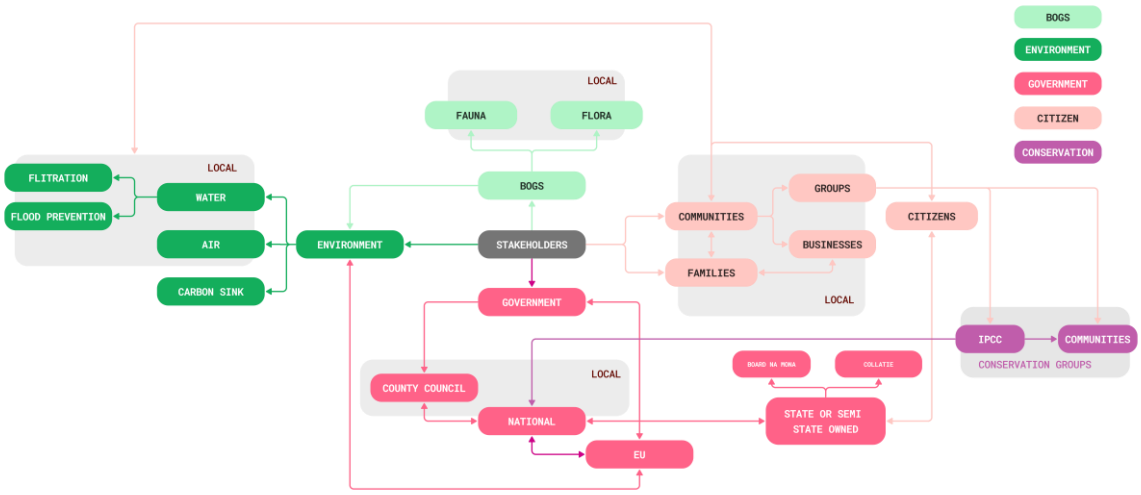

Figure 7: Peatland Stakeholder mapping

The leading causes of damage to peatlands in Donegal were also explored (Figure 8). Within this mapping, causes of damage were attributed to either government or citizen actions. As discussed in **3.1 Irish peatlands timeline**, the Irish government and Collaite are now reversing actions carried out on state-owned peatlands designated as locations to plant trees for the national forestry initiative. The government assigning peatlands as sites for wind farms is an additional cause of damage due to the machinery required to transport and place wind turbines. Meanwhile, harvesting peatlands for fuel remains the primary cause of damage on privately owned sites, along with local livestock farmers utilising them as locations for sheep to graze and the illegal dumping practices observed from observations to blanket bogs in Inishowen.

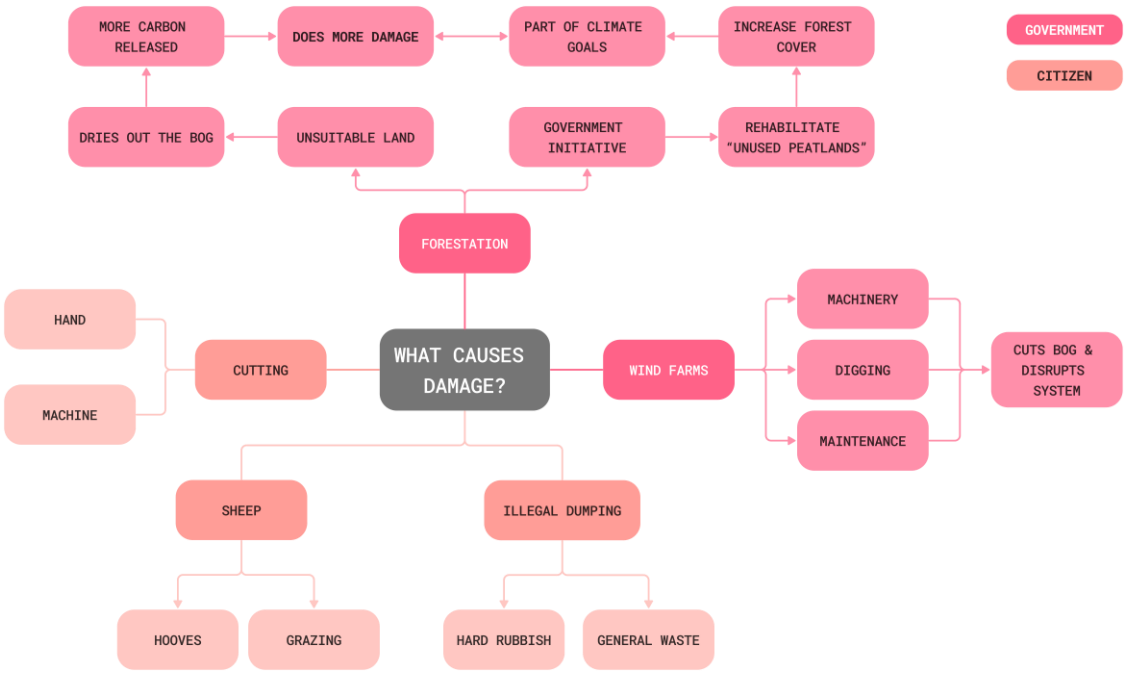

Figure 8: Main causes of damage to peatlands in Donegal

The initial causal loop diagram (Figure 1) was expanded upon to include the feedback loops from conservation efforts, as key insights that were highlighted within the research pointed to delays, i.e. the amount of time it takes for aspects of the loop to change state (Kim, 1999), as a detriment to conservation and restoration efforts (Figure 9). As the delay between initiating restoration of a damaged peatland and its conversion back to an active, healthy ecosystem can take many years given the rate of peat formation, it is difficult to motivate individuals and communities to participate when the sense of accomplishment and reward that comes with it is so far in the future, as Prolux (2021) highlights: “our species is not adept at seeing slow and subtle changes”, a point which was also discussed in an interview with Kate Flood.

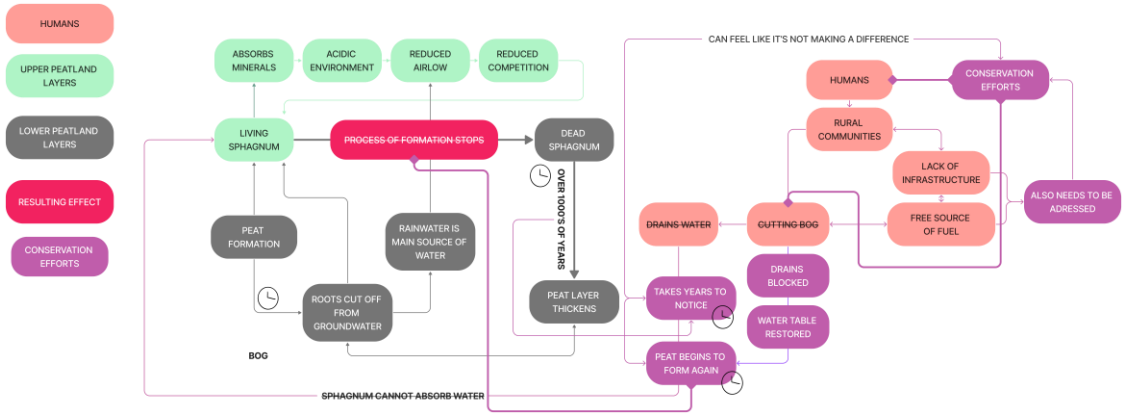

Figure 9: Causal loop diagram adapted to include conservation

An additional mental model map (Figure 10) was created from the insights gained through interviews and autoethnography to illustrate and explore mindsets towards peatlands and governance within County Donegal, which locals refer to as "the forgotten county" due to its remote location as the country's most northerly county, isolation from the Republic with the majority of Donegal's border shared with Northern Ireland, and subsequent lack of infrastructure and connection to the rest of Ireland. This map, in particular, was vital in understanding the underlying perceptions within the community, as the challenges faced by locals add to the complexity of the problem space and differentiate this setting from the issues and challenges in the conservation of peatlands in other rural locations, such as Ireland's midlands. With a population who feel so far removed from the national government, there is a perception that the Irish government does not care about them or their needs, and this is what creates community resistance to legislation banning the cutting or sale of turf privately, especially when many members of these communities are heavily reliant on peat as a fuel source. Therefore, not only is it essential to approach the solution space with an understanding that any

change must occur at a grassroots level, initiated by locals, but the proposed solution should not include removing peat as a resource. While this may seem in opposition to the aims of the research, as any cutting of peatlands is unsustainable, to do this would create a disconnect with local communities.

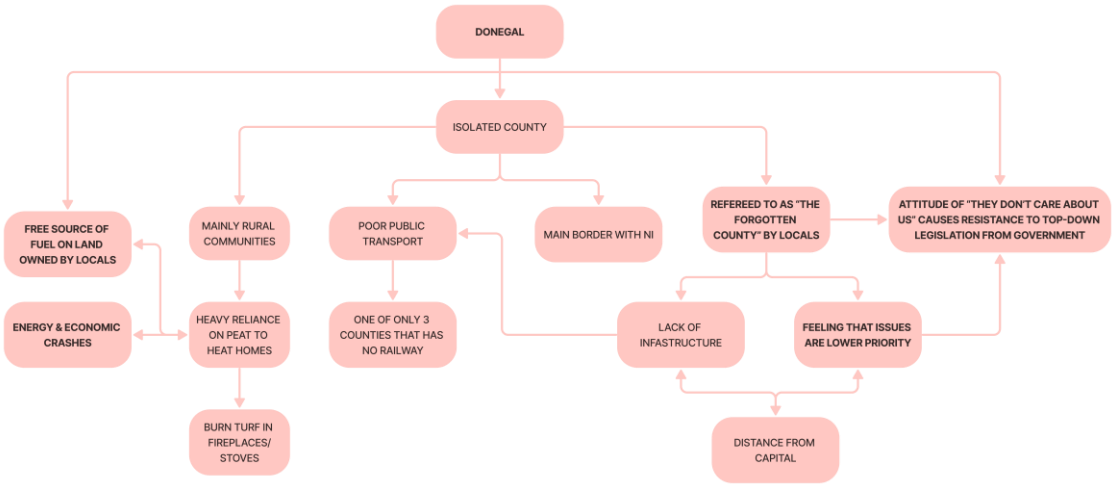

Figure 10: Mindsets towards peatlands in Donegal

5.1 Points of Leverage and Solution Space

As part of the synthesis of the problem space, an Iceberg model (Figure 11) was utilised to further contextualise the multiple levels of perspective: events, patterns and the systematic structures that generate them (Kim, 1999). Additionally, the "Mental Models" that inform the systematic structures were included, as perspectives and mindsets towards peatlands are key in understanding the problem space. Through this model, it is possible to look deeper than the events and better understand deeper systematic opportunities which may be leveraged rather than designed in reaction to the events. By applying this model to communities and peatlands in the context of Donegal blanket bogs, we can observe that, in order to create deep, impactful changes, the mindsets out of which the current system arises Meadows (1999) would be the ideal point of leverage. To shift the cultural mindsets from viewing peatlands as only valuable for the fuel that may be harvested, and otherwise as wastelands, places to conveniently – and illegally - discard rubbish, to places of community, where there are opportunities to connect not only with nature but also with each other, tapping into the values identified from interviews. Additionally, the "doom and gloom" aspect of tackling climate change and

peatland restoration, as discussed in the interview with Kate Flood, is essential to take into consideration, as a solution should be approached from a positive perspective.

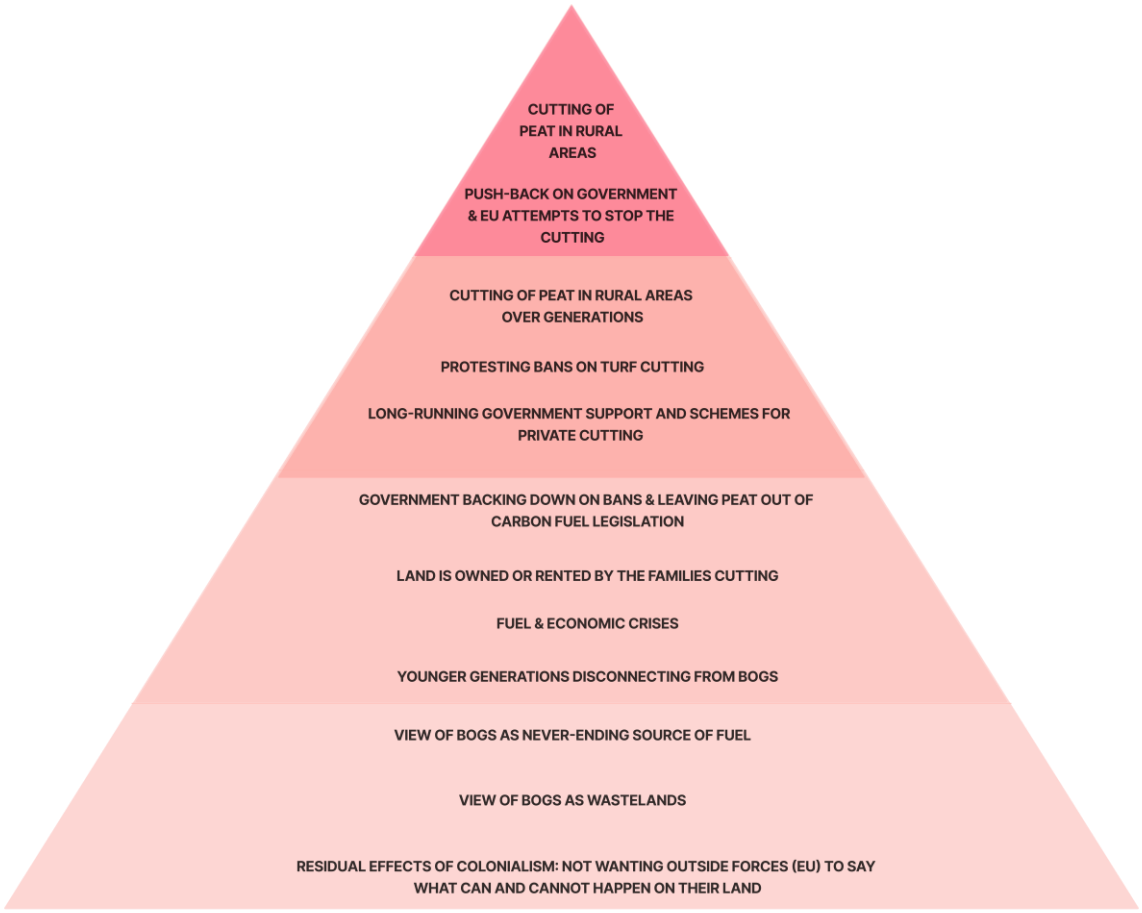

Figure 11: Iceberg model examining Donegal peatlands

6. PLAY THEORY AND PRECEDENTS

Drawing from the systehesis of the research, an opportunity to include play in the design concept was identified, as play is an inherent part of life, making it a powerful tool for engagement. The play has been a way for communities to unite throughout history, share experiences, and create social connections. From childhood playground games to video games with online, multiplayer interactions, it is possible to observe the sense of community generated. Additionally, gamification, which is a form of play, is often included in service and systems design as a way to encourage and reward desired behaviours. This chapter presents a brief overview of play theory and discusses precedents of play as a method of community engagement, both in urban and natural settings.

6.1 Play Theory

Play theory usually builds upon Vygotsky's theory of cognition, hypothesising that "play is an important component of both language development and understanding the external world as children play and role-play situations to find solutions." (Lewis Miller, 2021). While generally used in the context of early childhood development, play theory and behaviour informed Csikszentmihalyi's concept of Flow: "a state in which people are so involved in an activity that nothing else seems to matter; the experience is so enjoyable that people will continue to do it even at great cost, for the sheer sake of doing it" (Csikszentmihalyi, 1990). Play is also a means by which the character capabilities and status of both individuals and groups are displayed (Huizinga, 1955). Hendricks (2014) further expands on this: "In play, people envision and enact the possibilities of living in their societies; for that reason, play is an important agency of social and cultural change". Callois (2001) identified other modes of play, presenting the differences between paidia, a form of open and exploratory play, and ludus, a form of play more constrained by rules. The "Pleasures of Play" framework, developed by Edmuds and Costello (2007), examines different modes of play across play theory and synthesises them into thirteen categories of play experiences.

6.2 Playable Cities

Playable Cities, which has been running for ten years now, puts "people and play at the heart of the future city" (Playable City, 2023b), providing artists, designers and collectives with the opportunity to create interventions through installations that are creative, innovative and technology-driven. With an aim to re-use city infrastructure

and re-appropriate smart city technologies to create connections and inspire change, these projects and installations are presented to the public, with themes of conversation varying from location to location, as the movement currently spans nine cities globally (Playable City, 2023a).

Installations include Hello Lamp Post, which premiered in Bristol in 2013, with further iterations located in Tokyo, Manchester, Austin, Malmo, Astana and Bordeaux (Playable City, 2016). This concept, which was a collaboration between PAN Studio, Tom Armitage and Gyorgyi Galik, allows people to "strike up playful conversations with familiar city objects" (Playable City, 2016), via a texting platform, allowing them to exchange messages with everyday city objects such as lamp posts and post boxes, discovering their thoughts and feelings, and uncovering the secret lives of these objects. In the project's initial run of eight weeks, 25,000 messages were sent, in which the object could pass along information previously received about their surroundings to the public who interacted with them in a simple and friendly manner, creating opportunities for dialogue across the city. Empath, another Playable City installation developed by Spalsh&Ripple, aims to foster empathy for a stranger by allowing others to briefly navigate their life via audio-augmented reality (Playable City, 2019). Here, the audience can influence the story of the narrator according to choices made in the real world, including the routes taken, challenging their perspectives on the lives of others and their surroundings.

The experiences that communities of participating cities are provided grant them opportunities to engage with their surroundings in new, exploratory ways, fostering a more profound sense of connection to their everyday environments and the people they pass by. With the success of Playable Cities, the potential to implement similar experiences in peatland settings is worth exploring: how might locals feel journeying through a bog as though they were the bog themselves, or how might they communicate with the local peatlands?

6.2.1 Co-Design and Playable Cities

Within the paper "Co-Imagining the Future of Playable Cities", Altarriba Bertran et al. (2022) present a "co-design exploration into the potential of technology to playfully re-signify urban spaces.", facilitating multi-stakeholder discussions surrounding the playful potential of smart cities through a speculative catalogue of urban technology. (Altarriba Bertran et al., 2022). Having identified a missing opportunity in the lack of attention paid to the potential of technology in enriching the sociocultural fabric of cities,

especially as technology becomes more intertwined with the human experience, the authors highlight the importance of public spaces beyond public services as places of passing and in the moment interactions between the public that should be "socially rewarding, culturally stimulating, and emotionally rich" (Altarriba Bertran et al., 2022), and have developed this project to examine the potential for the socio-emotional reclamation of these space via playful technology. Here, the authors discuss the socio-emotional relevance of play as a "fundamental human need that enriches the experience of the world we live in" (Altarriba Bertran et al., 2022), linking back to play theory. They point out that not only does play generate positive emotions and bring joy to everyday situations and support social interactions, but it can also allow us to experience agency by empowering us to act upon the world surrounding us in meaningful ways (Altarriba Bertran et al., 2022).

This paper discusses the Playable Cities model and further breaks down the different approaches that exist, including location-based games (one such notable example of which is Pokemon Go, an AR mobile game based on the popular Pokemon franchise), games which fall under the urban gamification category: playful interventions to "support productive, measurable goals rather than to simply enrich people's experience of their city" (Altarriba Bertran et al., 2022), urban planning games which focus on promoting and supporting dialogues for urban planning between multiple stakeholders to engage citizens in decision-making (Altarriba Bertran et al., 2022), which may also promote playful citizenship and empower the public to engage in city-making through play, and finally what the authors classify as technology-mediated invitations to engage in free-form urban play (Altarriba Bertran et al., 2022). This last category includes the previously mentioned *Hello Lamp Post* experience and is a form of open-ended, ambiguous, and unstructured play.

By utilising the Situated Play Design, Altarriba Bertran et al. (2022) explored the playful things people do and the context in which they are done through digital ethnography and an online co-design workshop to develop "play potentials" for use as design material. Here, the co-design workshop was of interest to the research, as it was focused on discovering the play potentials that emerge from culture and traditions in a participatory method. The authors used Miro, an online whiteboard tool, to facilitate the workshop (which included participants from games, urban planning, and design backgrounds) and create and shared map of play potentials. The identified play potentials were then synthesised into a shorter, more actionable list (Altarriba Bertran et al., 2022) composed of seven categories:

Augmented infrastructure for authoring urban experiences: which utilities and enhances urban infrastructure.

Parallel (in)visible realities: which enable people to experience parallel, fantastical realities.

Spontaneous instigators of strange(r) connections: which engage people in social play while passing the time in urban environments.

Large-scale urban toys", which are interactive installations to promote light-weight, open-ended play.

Portals of imagination: which engage people in fantasy play (Edmunds and Costello, 2007) through ambiguous stories, allowing them to fill in gaps with their imaginations.

Local lore modules: which act as modes to deliver local knowledge, with locals adding and creating this content.

Shared canvases for collective grandeur: which reflect the socio-emotional states of urban environments through interactive installations.

The Authors then conducted multi-stakeholder interviews and a second co-design workshop to analyse the value of these speculative design ideas, finding that "many participants saw the value of transcending utilitarianism in urban innovation and enriching the experiential texture of streets by adding social focal points of play citizens could gather around." (Altarriba Bertran et al., 2022), and as places for people to connect and create new relationships. Concerns over privacy and safety were discussed, with a finding that consent is critical to interacting with playful experiences and allowing others to interact with their data, and inclusivity is an inherently important quality of the designs. Additionally, participants "generally gravitated towards tangible and embodied interactions with interfaces embedded in existing urban infrastructure." (Altarriba Bertran et al., 2022).

This paper, while focused on urban environments, has some key insights and takeaways which may be applied to peatlands in a play context, namely, the Augmented infrastructure for authoring urban experiences Parallel (in)visible realities, Portals of imagination, and Local lore modules could be examined as methods for playfully engaging communities with peatlands, in a way that draws on local knowledge and perspectives, and encourages discussions on the governance of peatlands.

6.3 Playful Experiences through Augmented and Mixed Realities

Augmented Realities (AR) and Mixed Realities (MR) are often utilised in delivering playable concepts, including installations and projects that are part of the Playable Cities initiative. They have also been utilised for general public engagement with their surroundings — the Melbourne AR.Trial, which ran from the 22nd of August to the 30th of September 2022, is one such example. This experience was a collaboration with Acute Art, who had previously staged AR experiences in various cities such as London, New York and Tokyo. The Melbourne iteration delivered the city's largest AR art trail, featuring twenty-two digital artworks comprised of both Australian and international artists (Premier of Victoria, 2022), and aimed to engage locals and tourists with Melbournes cultural corridor, an area within the city's Central Business District that features The National Gallery of Victoria, Federation Square and the Australian Centre for the Moving Image, in an effort to enhance their experience. While these experiences, as with the Playable Cities projects, are mainly focused on engagement in urban environments (there are examples of AR experiences in natural settings, such as Epiphyte, a discussion of which follows), their effectiveness in engaging the public is highlighted, with local government funding and the range of creatives willing to participate.

6.3.1 Epiphyte

In this PhD thesis, Riley (2018) investigates how augmented reality can be utilised to alter experiences in Australian bushlands, presenting both a framework for designing bushland location-based AR games and the resulting prototype Epiphyte. This thesis was examined as the project "set out to frame, interpret, represent and amplify bushland for players and foster new community engagement examined bushwalking as a cultural activity and mode of place-making, tracing its iconic importance in Australia." (Riley, 2018), providing a relevant precedent for the combination of play in natural settings of cultural importance. In developing the framework for Epiphyte, Riley (2018) explored relevant practices and theories, including contemplative play, and combinations of the outdoors and technology for play, such as Geocaching, a collaborative GPS-based treasure-hunting experience in which participants exchange objects (Geocaching, 2017), and Notes For Walking, an interactive walking experience in Sydney, Australia, created by Megan Heyward, that is "part treasure hunt and part mystery tour." (Mossman Art Gallery, 2023), while also acknowledging indigenous

Australian bushwalking practices. Further, Riley (2018), highlights the plethora of mixed and augmented realities projected within urban environments, compared to works situated in natural environments, resulting in less understanding of their potential opportunities and challenges. These explorations of theories on contemplative play and Mixed Realities experiences, under which AR falls, were combined with participatory design practices, with the development of Epiphyte informed by a "play community" via "workshops, focus groups, play-tests and collaborations instructing the planning, production and evaluation cycles of the project." (Riley, 2018).

Riley (2018) classifies the Epiphyte project as a location-based AR simple game which re-conceptualises a bushland setting with the aim to "grow an artificial ecosystem while keeping it alive" (Riley, 2018) through player engagement. Players have thirty minutes to seek out and collect AR markers to collect seeds, which grow and create a virtual ecosystem on their screens. The "Danger" category of play, as defined by Costello and Edmonds (2007): "the pleasure of participants feeling scared, in danger, or as if they are taking a risk", is included via the introduction of limited seed lifespans, encouraging players to seek the next collection marker. Additionally, players may experiment with interactions between the collected seeds, discovering different possibilities for the plants in their virtual ecosystem. At the end of the walk, the player's collections "come(s) to life and transform(s) into a unique composition of sound and image that reflects their individual bushwalk" (Riley, 2018).

While the Australian bushland is a different natural ecosystem from Irish peatlands in that it is a forest or scrubland habitat and thus does not share the same challenges around mindsets, it too has been used as a resource and holds cultural significance to Australians. This project serves as a precedent for employing participatory practices and models of play with mixed and augmented realities to engage the community with natural environments.

7. DESIGN CONCEPT

This chapter synthesises the research conducted into the ideation of the design concept that leverages opportunities within the solution space identified. Here, the concept ideation and development processes, including participatory workshops and playtesting, is discussed, and the Let Sleeping Bogs Play concept, a playable, interactive concept which aims to provide alternative ways of connecting to peatlands both individually and as a community, is presented..

7.1 Concept Ideation

As highlighted in the research and various approaches to conservation, including the Partner Principals, participatory design is essential for a concept to be successful, especially in a problem space as multifaceted and complex as peatland conservation. Additionally, the reviewed literature on peatland conservation and playable interactions also included co-designing practices, with workshops informing the research. Thus, co-design practices were deemed vital design practices to be utilised and inform the ideation phase of the concept. The ideation phase also drew from the "framework for valuing the temporal dimensions of cultural ecosystem services" (Flood et al.,2021), as it was judged that this framework would be suitable to adapt and apply within this context.

7.1.1 Initial workshop

An initial co-thinking workshop was planned for and conducted in April of 2022 with four participants, mainly Gen Z students in Donegal, in order to test the potential of combining the "framework for valuing the temporal dimensions of cultural ecosystem services" with on-location play drawing from the Pleasures of Play framework (Costello and Edmonds, 2007), in the form of:

Exploration: the pleasure of exploring a situation.
Sympathy: the pleasure of sharing emotional feelings with something.
Camaraderie: the pleasure of developing a sense of fellowship with something.

In this workshop, hosted outdoors in an Inishowen blanket bog specifically chosen after the field research was conducted due to the damage caused by both turf cutting and illegal dumping (Appendix 1), participants were engaged in role-play as both custodians

of peatland in the first activity and the bog itself in the main activity, while the closing activity was designed as an open discussion to synthesise the workshop results. A summary of the activities follows:

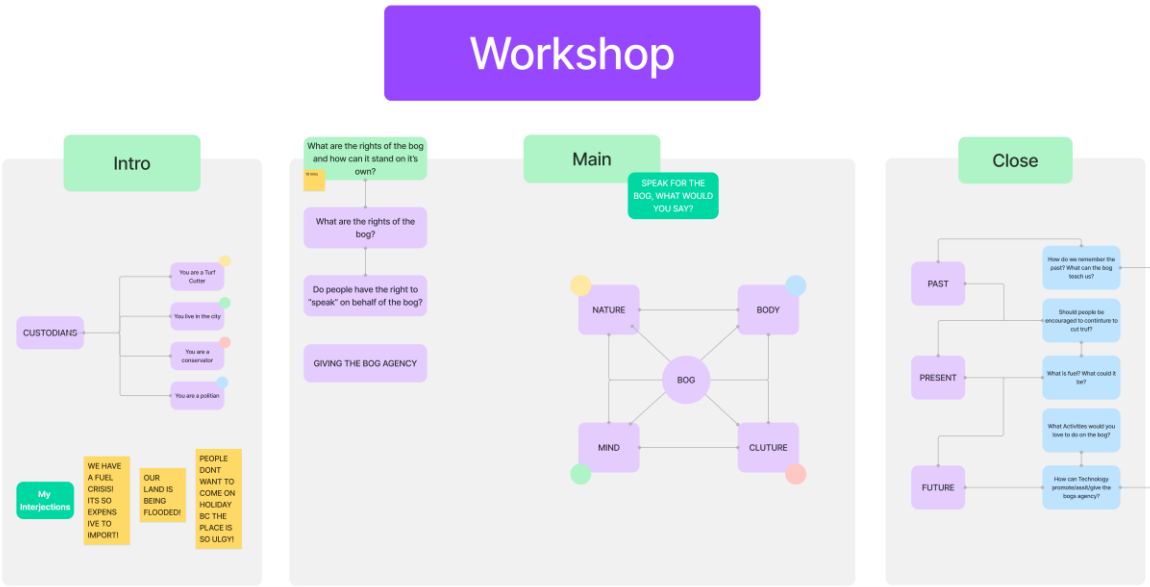

Figure 12: Initial workshop outline mapping

Introduction Activity: In this brief activity, participants were assigned roles randomly based on their choice of colour, from four options: turf cutters, city or town dwellers, politicians, and conservationists, and then presented with a series of issues with a goal of discussing how to best represent the interests of all groups in response to challenges. As an icebreaker activity, the aim was to introduce participants to the themes of the workshop and engage them in governance-related role-play before moving into the main activity. The crises presented centred around the stakeholder and mental models mapping discussed in **5. Problem Space**, along with earlier research on the peatland ecosystems, included a fuel crisis, linking to current issues faced within the EU, flooding, as healthy peatland ecosystems effectively store and filter water, and a perceived lack of tourism due to the "unsightly" nature of peatlands when widespread cutting and illegal dumping occurs. With each issue, participants engaged in brief discussions on how to best govern local peatlands in response while accounting for the impact of previous decisions. This resulted in a shift from three out of four participants pushing for the cutting of peatlands for fuel to reaching an agreement on minimising the amount of peat cut and initiating restoration and cleaning efforts.

Main Activity: The main activity centred around the voice of peatlands; here, participants first engaged in discussions on the rights of peatlands, drawing from the

GARN movement. Participants were again randomly assigned roles based on the "framework for valuing the temporal dimensions of cultural ecosystem services" (Flood et al.,2021): the Mind of the Bog, the Body of the bog, the Culture of the bog and the Nature of the bog, and explored the site, collecting thoughts and engaging in conversation to imagine the scenario. Among the activities, this was the most successful in engaging participants in collaborative and explorative role-play, with excitement among participants as they made discoveries about the site. One participant, who took on the role of the Body of the bog, commented that the strips where cutting had occurred were "like scars on skin", prompting discussions on self-care and healthcare for the bog, along with participants lamenting the prevalence of rubbish at the location. Signs of plant and animal life were also discussed, with grazing sleep and various species of birds and insects spotted, with participants noting how calming the sounds were and pausing to listen for activity.

Closing Activity: This activity drew from the temporal aspect of the "framework for valuing the temporal dimensions of cultural ecosystem services" (Flood et al.,2021) to engage participants in a follow-up discussion on the past, present and future of Donegal peatlands. From these discussions, it emerged that while participants understood the importance of turf cutting, especially among older community members, they would like to see a future in which local peatlands were not so heavily cut or used as dumping grounds. However, it was difficult for them to imagine how that might be achieved.

This workshop provided valuable insights into the feasibility of combining existing frameworks for both conservation and play in natural-based settings. With how positively participants reacted to the main activity, being thoroughly invested in understanding the viewpoint of the peatland, it is clear that location-based experiences can be powerful methods for engagement. While providing feedback at the end of the workshop, participants commented on the immersive nature of the workshop, finding it an exciting activity that made them consider the bog in a way they would not have previously considered, a positive step towards the goal of changing mentalities.

7.1.2 Playful monitoring interactions

Drawing from the research and initial workshop, the opportunity to create playful monitoring interactions, where, potentially with the utilisation of AR and real-time data, users could see the damage done by turf cutting and illegal dumping on bogs, was explored. To allow more playful options with this concept and tie back into the "framework for valuing the temporal dimensions of cultural ecosystem services" (Flood

et al.,2021), there could be an option to "travel" backwards and forwards in time, seeing simulations of the past and potential futures of peatlands. This would also align with the parallel (in)visible realities (Altarriba Bertran et al., 2022) play potential and the information flows leverage point (Meadows, 1999), especially if "restored" futures are included, as it would allow users to visualise conservation progress beyond their lifetimes. The concept would also require links to conservation resources; otherwise, locals prompted to contribute to restoration efforts would have to search out this information themselves. However, this concept would not have many opportunities for locals to contribute their skills and knowledge or indeed provide an alternative means of interaction with peatlands and may not be the aptest concept in terms of respect and empathy for the local community (Mishra et al.,2017). Additionally, such a concept may not be the most novel approach, given the existence of a plethora of environmental and species monitoring applications and products, among which Restor, FrogID and Re:Wet have been discussed in this research.

7.1.3 Playable Bogs

The potential to implement a similar concept to Playable Cities and drawing on the work of Riley (2018), wherein community play utilising augmented realities was located in natural settings, was also an area of exploration in this initial stage of design concept development (Figure 13), especially as it could build more closely on the initial workshop. With this concept, the "framework for valuing the temporal dimensions of cultural ecosystem services" (Flood et al.,2021) was again explored, as drawing from participant feedback on the earlier workshop, it has the potential to be an effective framework to combine with play when aiming to engage local communities with peatlands. The valuation categories of "Mind", "Body", "Culture", and "Nature" create the thematic bases for playful activities, creating opportunities to explore the past and speculating on the future of peatlands in a way that encourages communities to re-imagine the value of and interactions with them.

To further foster engagement, periodical community-led workshops could provide a platform for locals to express ideas and utilise their skills to create their own interactions, allowing the concept to evolve and adapt over time, meeting the changing needs of these communities.

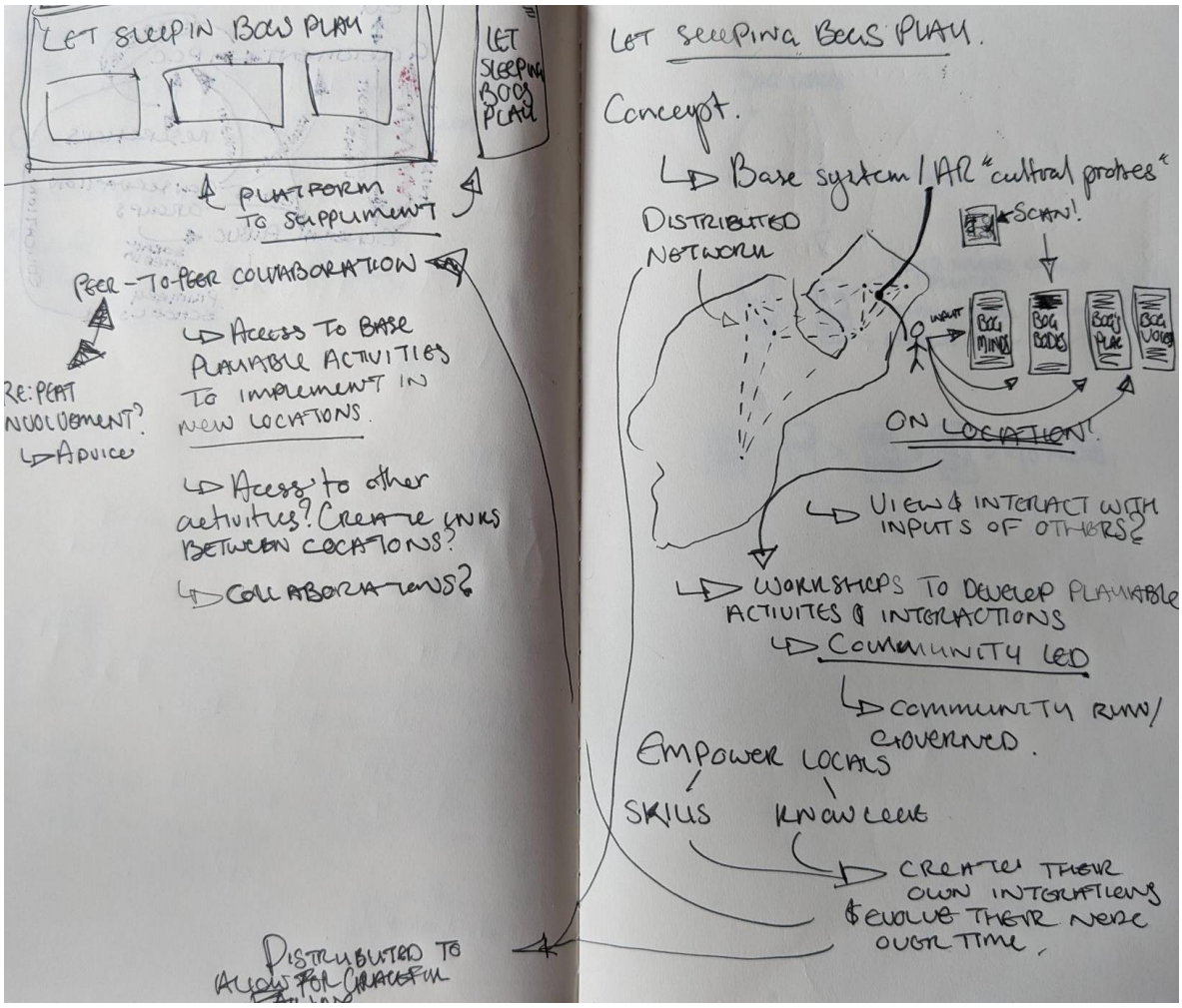

Figure 13: Initial mapping of playable bogs concept

Various potentials for this concept were considered, including the potential for a distributed network of play locations, with local community management. In this way, an interconnected network of peatlands could be established, with room for nodes to "fail gracefully"; if the level of activity or engagement at one location were to drop, there would be no knock-on effects for other sites. A platform to connect communities across various peatlands and to conservation resources is another aspect of the concept that could exist, as this would additionally tackle pain points in easily accessing information, as was brought up in interviews. However, the concept should first be tested and evaluated before building upon it.

7.2 Let Sleeping Bogs Play Concept

Developing the playable bogs further resulted in the Let Sleeping Bogs Play concept, which name draws on the piece „Let Sleeping Bogs Lie" (1990) by visual artist Remco de Fouw (featured in Fen, Bog & Swamp: A Short History of Peatland Destruction and

Its Role in the Climate Crisis (Proulx, 2022)), and is itself a take on the idiom „Let Sleeping Dogs Lie", along with the role of play as a method of engagement within the concept. Instead of aiming to remove human activity and interference from the ecosystem, due both to the reliance of local communities on them and as in their current state, many peatlands now require human interventions to return them to an active state, this concept focuses on the need to shift the ways in which we interact with peatlands, encouraging more sustainable community practices. In the following subchapters, this development process, which included participatory practices, is presented.

7.2.1 Let Sleeping Bogs Play development

Drawing from both the initial concept mapping and reflecting on the research and initial workshop, the concept was explored in more detail. As the core of the concept, the categories for AR interactions based on the framework created by Flood et al. (2021) with peatlands were examined in context with the research and initial workshop, with an adapted framework (Figure 14) was created to better align with findings and insights. In this case, "Nature" was replaced by "Voice" to tie more closely into the "Rights of Nature" movement while acting as a vehicle by which communities can explore not only the voice of the bog but their collective and individual voices, and "Place" has been made interchangeable with "Culture", as this value also examines the place of peatlands in Irish culture historically and allows for speculation on how that might evolve in the future.

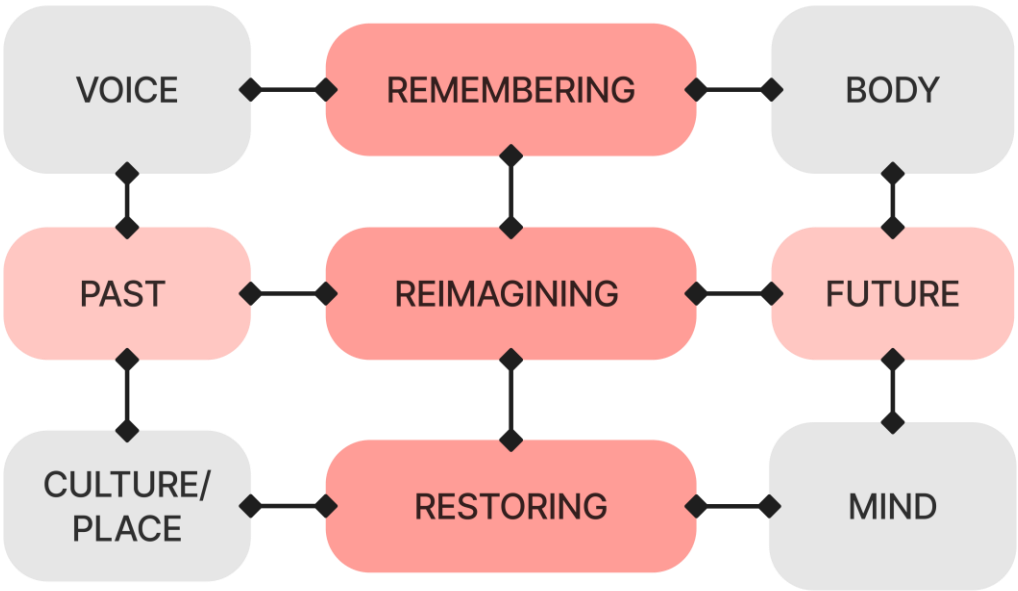

Figure 14: Valuation Framework adapted from Flood et al. (2021).

As a category, “Mind” would provide opportunities for open, inclusive, and playful discussions on the mindsets towards peatlands, and allow communities to share their knowledge, making it an essential category in the creation of Local Lore Modules (Altarriba Bertran et al., 2022), further tying the concept in with the Playable Cities research. “Body” would invite locals and visitors to peatlands to engage in role-play while also tapping into the danger and captivation categories of play (Costello and Edmonds, 2007) by providing opportunities for participants to feel a sense of danger related to the destruction of peatlands, while also feeling as though their thoughts and actions are being controlled by the bog. With the success of the main activity of the initial workshop, which was based on the original framework, there is potential for these categories to successfully engage participants, though testing the adapted categories remains necessary.

Figure 15:Mock-up of playable categories for the concept

The basis of this concept is playing the form of exploration, in which users would be encouraged to explore a local peatland location through the use of location-based Augmented Reality, using playable points as a starting place for the experiences and engaging in play that open up possibilities to interact with and consider peatlands in alternative ways.

Figure 16: Let Sleeping Bogs Play early concept mock-up

7.2.2 Testing of concept

A prototype was developed utilising Figma, Google Maps and Miro and made available to participants within the 18-28 age range in Donegal to playtest and gain feedback. Included in the playtesting were information slides on the project and instructions on the activities, as, due to locational differences, this playtesting had to be carried out remotely rather than on location as the concept is intended to be experienced. As such, with each play activity, participants were provided two Google Maps links to the street view of pathways along blanket bogs in Donegal to navigate and explore as they carried out the activities. The majority of selected locations were the same peatlands within the Inishowen region that had been selected for field research, as potential participants were primarily located within that area. In conducting the activities, participants had the option of collecting their responses through picture, video, voice and text formats, linking in with the concepts response options, with a link provided to a cloud folder provided for participants to drop off their responses.

The prototypes created and shared via Figma featured a brief introduction to the theme of the activity, followed by prompts to consider as they virtually examined the peatland locations provided and collected material and thoughts for their answers. In this way, the prototypes, while basic iterations of activities for the Let Sleeping Bogs Play concept, could simulate the experience of the concept. In designing the playtesting activities, the cultural probes research methodology, in which participants are asked to "follow the given instructions and self-document certain experiences with field notes and photos,

and/or to collect relevant artifacts based on an autoethnographic approach" (Stickdorn, 2018), was referenced, as the playtesting would be conducted remotely and virtually.

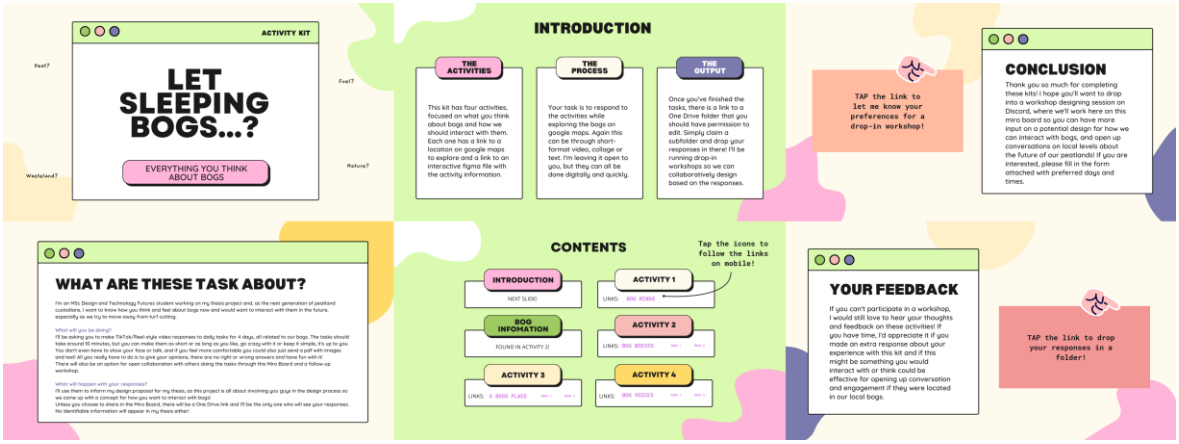

Figure 17: Playtesting of concept on Miro

Additionally, due to the nature of the prototypes, which ask for participant responses, it was deemed that conducting the playtesting via an approach with roots in systems thinking could provide valuable insights both into how the prototypes could be navigated and the mindsets of participants while making the purpose of the activities clear. The prototype activities are outlined below:

Bog Minds: In this activity, participants were prompted to discuss and share their thoughts and experiences with peatlands, tapping into community views and traditions.

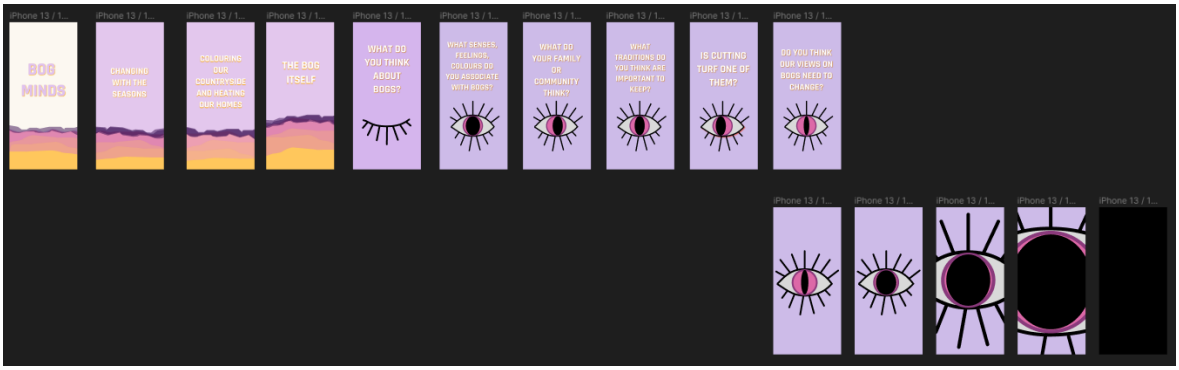

Figure 18: Bog Minds prototype activity

Bog Bodies: This activity prompts participants to engage in camaraderie and sympathy play (Costello and Edmonds, 2007), by stepping into the body of the bog and envisioning life as a peatland ecosystem.

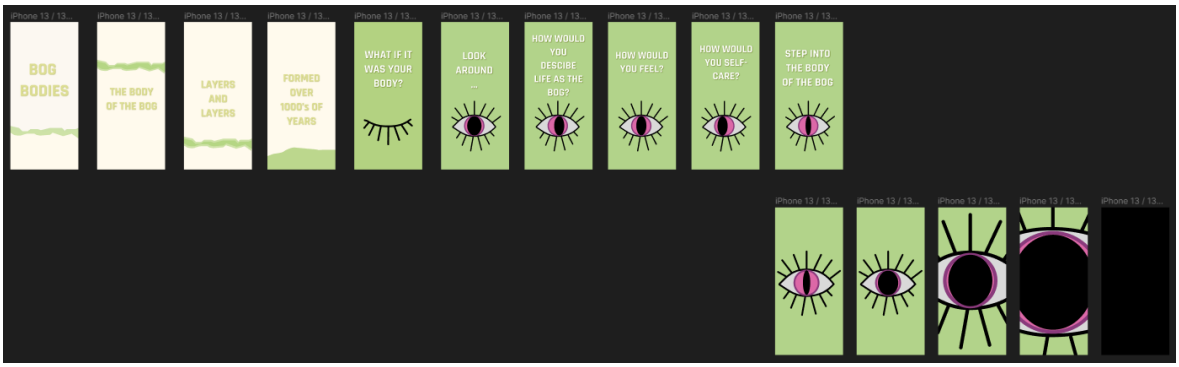

Figure 19: Bog Bodies prototype activity

A Bog's Place: This activity examines the place of peatlands historically, culturally, socially, economically and environmentally, asking participants to consider what the place of peatlands is by placing themselves in the bog.

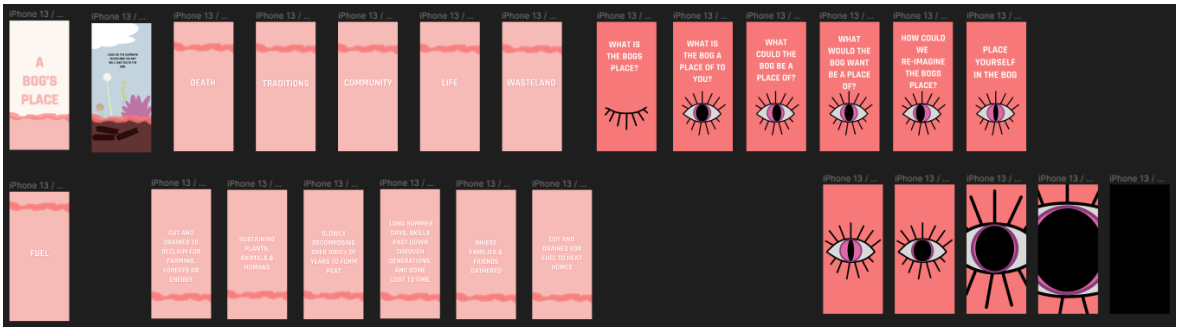

Figure 20: A Bog's Place prototype activity

Bog Voices: This activity explores the "voice(s) of the bog", prompting participants to consider the different voices that have interests in peatlands along with what they would say if they could speak for the bog.

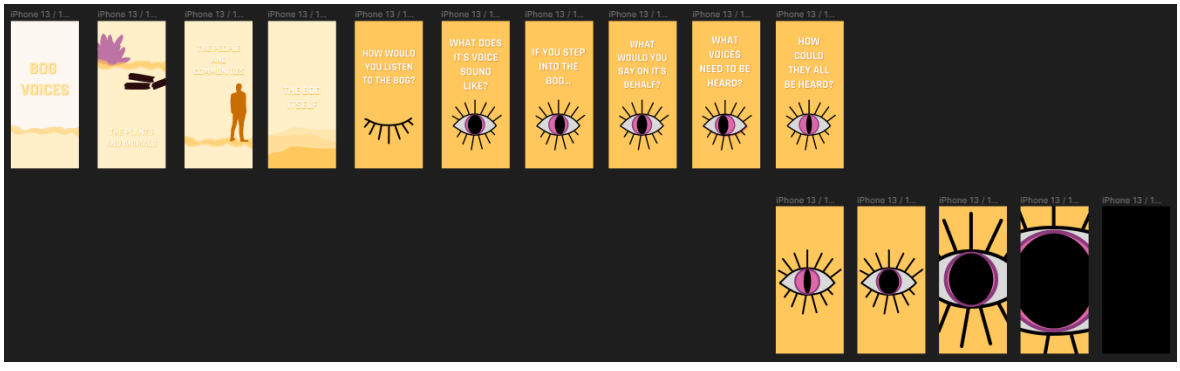

Figure 21: Bog Voices prototype activity

An invitation to playtest the concept was sent to six individuals, with three of the six returning responses by a deadline of the 5th of May, 2023. Of these responses, all were text heavy, with screenshots of the linked locations included. Due to the limited number of participants, it is not yet possible to determine if this would be the case in a location-based setting or if this was due to the remote nature of the playtesting and reliance on sending files. A surprising finding for the playtesting was that among responses, there was a general sense of empathy for peatlands, with participants discussing the need to better care for peatlands, especially within the category of **Bog Bodies,** even among participants with family ties to peatlands. The topics of peatland education and the ability of peatlands to act as time capsules were also highlighted, with a focus on the small-town mentalities that lead to local peatland destruction. Feedback on the prototypes was positive, with participants finding the activities engaging and enjoyable to carry out, expressing interest in

While responses (Appendix 3) were limited in number, the main goal of the playtesting was to ascertain the viability of delivering the concept in this format, utilising the adapted framework of Flood et al. (2021) to select themes for playable interactions. Given the relative ease in which participants who were available to participate could motivate the prototypes, despite the format being conducted virtually to simulate an on-location experience and feedback obtained from participants on the positive experience of playtesting, the concept in this format was advanced for development in a co-designing workshop.

7.2.3 Concept development workshop

A workshop was carried out on the 8th of May 2023, after the prototype testing phase, to continue developing the concept and gain the insights of local Gen Z community members who had participated in the playtesting activities. The aim of this workshop was to build on the prototype, adding feedback and ideas from participants on how they could develop the concept in the future with the skills, knowledge and needs of community members. While the initial workshop was separated into activities, this concept development workshop was implemented as a one-and-a-half-hour mapping and sketching session hosted through Miro and Discord, with open discussions on the playtesting experiences and how the concept might be enhanced.

Participants were introduced to the concept as a whole, and not just the prototypes, and presented with the intentions and goals of Let Sleeping Bogs Play before delivering

feedback on the prototypes and ideating how the concept could be translated into a location-based experience that could live and grow with the community. Several key insights were gained from the workshop, with participants discussing the potential to add gamification elements as added incentives to engage with the concept, as this would be a way to encourage them to return and continue to explore the AR experiences and could be implemented through collectables.

There was also a desire to see educational content so they might gain a deeper understanding of not only how peatlands form and thrive, including the species dependent on peatlands but also how communities have interacted with them historically. The history of peatlands was a major talking point of the workshop, with participants highlighting the potential for the playable points, if not incorporated into pre-existing signage, to be presented in the form of standing stones and the use of Ogham, an ancient Irish form of writing, within the concept. This could provide significant cultural ties between the concept, communities and locations, as is it not uncommon to find standing stones in Inishowen's blanket bogs.

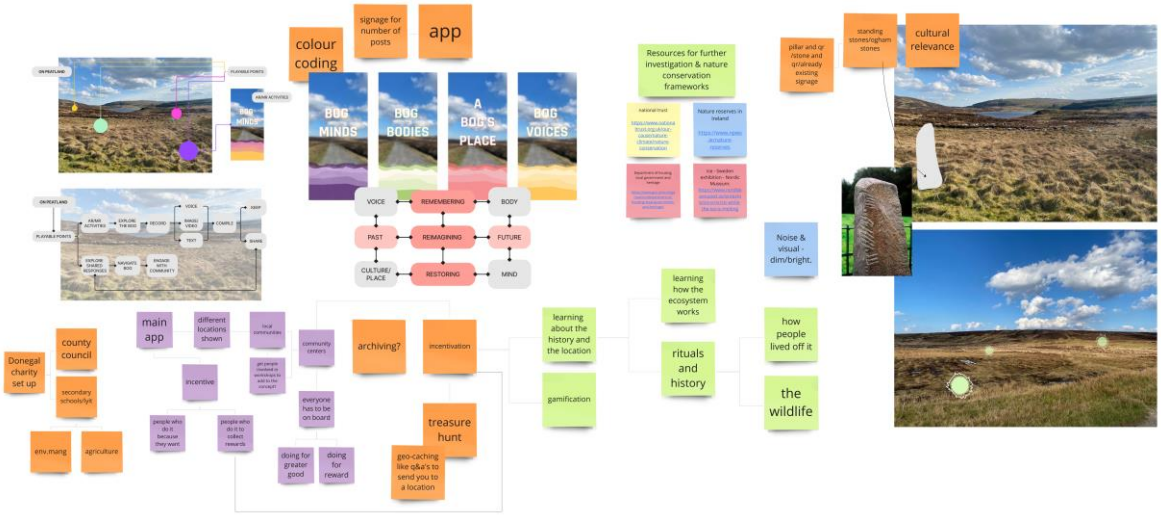

Figure 22: Workshop hosted on Miro

Additionally, participants discussed the potential to engage local study programs in implementing and maintaining the concept and hosting workshops in community centres, to include community members and creatives in generating and developing experiences that would fit the concept's themes. These points, in particular, were viable when considering the future of the concept and would be a viable next step for development. Having observed the difference in engagement between remote participatory activities and the on-location initial workshop, further activities would

ideally be conducted on-location as that allowed participants a more immersive experience.

7.2.4 Let Sleeping Bogs Play Concept

The Let Sleeping Bogs Play concept is a series of interactive Augmented Reality experiences to open dialogue on peatland governance and create empathy for peatlands through playful interactions. The goal is to open dialogue in a way that is inclusive and provides opportunities to engage with peatlands both individually and as a community through play, encouraging communities to step into the role of the bog and consider its needs as a central stakeholder, along with those of the community. Aiming to shift current mentalities around peatlands as wastelands or sources of fuel by promoting positive interactions and experiences with peatlands while also tapping into the values for community members that were highlighted in the research process, namely in interviews, this concept opens opportunities for new forms of engagement with peatlands. By blending technology and nature in this way and drawing upon play in the form of exploration, sensation, sympathy, camaraderie, and creation (Costello and Edmonds, 2007), individuals and communities can contribute to the creation of Local lore modules (Altarriba Bertran et al., 2022), by sharing local, lived, and generational knowledge, and may also engage in playful citizenship, through discussions on peatland management at a grassroots level.

Figure 23: Let Sleeping Bogs Play Concept

"Playable Points", reminiscent of standing stones, initiate the activities and should be implemented in a non-invasive way. There is potential here to incorporate 3D printing into the concept to fabricate such structures from ceramic materials, which would allow

QR codes to be embedded within them as a way of initiating the augmented experiences (Figure 23). Participants explore a local peatland location, following the activation of the experiences through the playable points, and are given the opportunity to engage in the identified categories of play, walking through and examining the bog to collect their thoughts and responses to the prompts via image, speech or text. They can then share responses with others by selecting locations to "drop" responses, e.g., memories that happened in a specific location or thoughts related to a specific area of the bog (Figure 24).

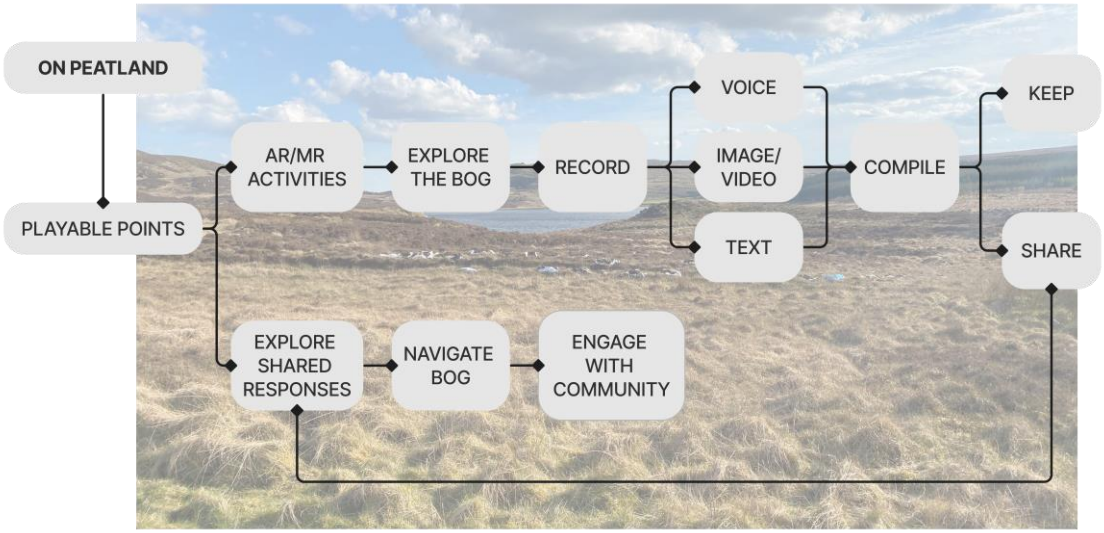

Figure 24: Journey Map for playable activities

They may also explore previously shared responses by navigating the bog and searching for “drop points”, allowing for the community to engage with responses (Figure 25). To implement this, a database of the users and responses would be necessary, with three pieces of information collected when sharing: a username or assigned number, the content and format of the responses, along with the geographical location, which could be attained through latitude and longitude coordinates.

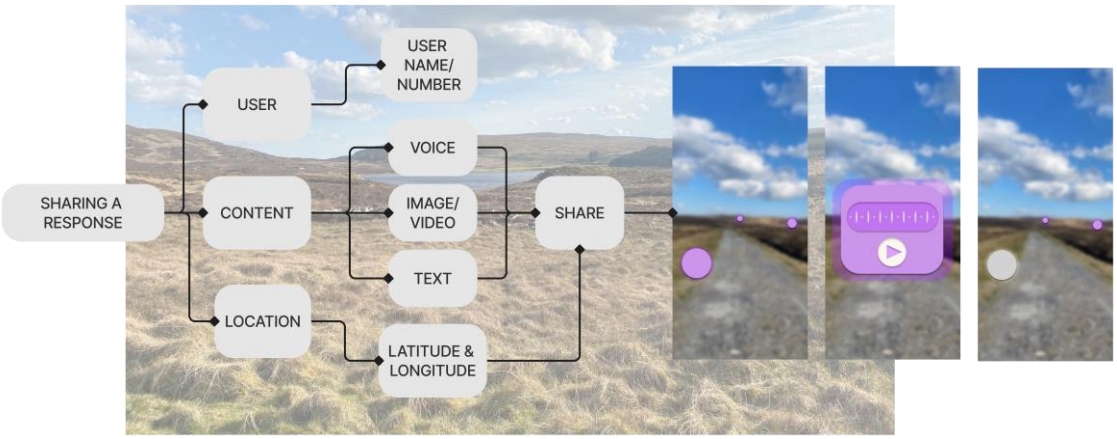

Figure 25: Mapping interactions for sharing responses

As these pieces of information would be required, the sharing of responses would be optional rather than a requirement.

To interact with shared responses, participants search for drops using augmented reality on mobile devices, with categories communicated through colour coding and Ogham sigils (Figure 26). Drawing from workshop ideations, they take the form of floating orbs that gently pulse, glowing brighter with proximity, with a sound element incorporated to create a more immersive and inclusive experience. As with the colours, specific audio would be attributed to different categories of response for clarity. To avoid confusion over which responses have been interacted with, these orbs would become a light grey upon the completion of interaction to signify they have previously been explored (Figure 25).

Figure 26: Ogham sigils corresponding to Mind, Body, Place and Voice

The intent of this concept is to grow over time, acting as a local lore module (Altarriba Bertran et al., 2022), a time capsule that reflects the evolving mindsets of locals as they interact with peatlands. In this way, an ever-changing experience is created, providing incentives for locals to return to the peatlands and engage with Let Sleeping Bogs Play to discover what might have been added since their last visit. Due to the location, the weather is a significant consideration in the feasibility of the concept; therefore, it could be delivered in such a way that it would run from mid-spring through to mid-autumn, to catch the peak summer activity on peatlands and make the most of the milder weather. An archive of previously shared responses would be made available with each iteration, acting as a living library and showcasing the history of interactions.

To further engage locals, development workshops would be run as part of World Wetlands Day or with local education institutions to utilise the skills, creativity and knowledge of local communities and generate a sense of ownership over the concept,

which is vital in bringing about change in mentalities and generating long-term, sustainable engagement with both the Let Sleeping Bogs Play concept and local peatlands. These workshops and community-created activities could also act as a platform to contribute to peatlands education, which would aid in shifting mentalities.

Ultimately, the aim of this concept is to foster a sense of community and connection not just among each other but with peatlands themselves through a platform that allows community members the space to have open discussions on the importance of Donegal's bogs and creating positive change for multiple peatland stakeholders.

8 DISCUSSION

This research answers the question of how we might shift perspectives to give Peatlands a voice while celebrating tradition and community by providing the rural communities dependent on these ecosystems a playful platform as a potential for alternative engagement with peatlands by shifting how a sense of community is created in peatland settings while also showcasing their potential to be viewed not as wastelands but as thriving and diverse natural playgrounds. In this way, community members across generations can interact with each other and their local peatlands and participate in vital discourse on how these privately owned peatlands should be managed and governed in a mutually beneficial way.

Our relationships with bogs should be positive and reciprocal, one that acknowledges the valuable resource they have been within rural communities for generations but aims to foster a new system of valuation so that peatlands might benefit from human activity. Let Sleeping Bogs play aims to invoke this kind of change from within communities, with augmented reality activities and experiences tailored to a specific region where locals often feel overlooked by government initiatives and legislation, empowering them from within to participate in more sustainable peatland management practices.

8.1 Further development of the concept

The Let Sleeping Bogs Play concept is focused on a particular area and community in Ireland and, as such, would require on-location playtesting to further develop and iterate the concept, which could, along with assessing the practical implications and technical issues that might arise when implementing location-based augmented realities experiences, including collaboration with those experienced in implementing such systems. Testing is required to assess how 3D-printed ceramic standing stones could be fabricated and implemented as playable points in a non-invasive and sustainable way and how to best implement an AR iteration of the concept, which could be achieved using either Adobe Areo or Unity and Vuforia. Additionally, the interface of the platform requires further development, being that it is currently still in a prototype phase and with more comprehensive testing, more user feedback can be implemented to deliver an easily readable and inclusive UI. Further workshops should be run in Donegal to engage local communities through local community centres or higher education programs to better utilise local skills and knowledge and foster a sense of community ownership of the concept.

There are also opportunities to develop the concept for use in other peatland settings or in collaboration with conservation groups such as RE-PEAT, as it would be possible to host the concept in other locations within Ireland or Europe.

8.2 Contribution to peatland conservation

The thesis contributes to the field of peatland conservation within Irealand by opening up discussions on how issues surrounding conservation efforts could be approached through multi-disciplinary and participatory practices and the potential for play to be leveraged in community engagement with natural ecosystems. This blending of systems thinking and play theory is a novel approach to tackling the complex problem space, creating opportunities for alternative interactions with peatlands. Furthermore, the research emphasizes the importance of including overlooked communities that heavily rely on peat, enabling them to contribute their lived, local knowledge of these ecosystems. By involving key stakeholders, including peatlands themselves, this study contributes to the discourse on the necessity of engaging all relevant parties in peatland conservation efforts.

SUMMARY

Peatlands are crucial ecosystems, responsible for supporting biodiversity and water filtration on local scales, but also critical for their ability to store large amounts of soil carbon globally. The historical practice of peat extraction in rural Ireland and misuse of the land due to underlying mindsets has resulted in significant environmental damage to these ecosystems. In line with growing concern over the future of peatlands globally, efforts have been made in Ireland to shift away from the utilisation of peat as a source of fuel, primarily due to the influence of the European Union, the Irish Peatland Conservation Council, and community-based initiatives, which have seen outstanding sustainability and success, with some projects approaching their twentieth year. However, communities in County Donegal, which are the focus of this study, remain heavily reliant on peat and in opposition to proposed legislation from perceived outside forces that might infringe on their right to cut turf, especially among older generations. Additionally, the positive engagement of Gen Z stakeholders in these communities could stand to be improved.

To address these challenges, this research explores the development of an alternative approach to conservation through play that fosters and empowers community engagement with local peatlands. Through interviews with leading practitioners in the field of Irish peatland restoration, field research along with Donegal natives, and on-site observations of local peatlands, this thesis investigates the community mentalities towards, and values of peatlands in Donegal, emphasising the importance of understanding the cultural, socioeconomic and ecological importance of these ecosystems in identifying and leveraging opportunities to shift mindsets at a grassroots level, as change must originate within these communities if it is to be successful. Additionally, this work recognises the global sustainability agenda, as reflected in the United Nations Sustainable Development Goals (SDG), and contributes to the body of literature on community-based approaches to natural resource governance and conservation. By prioritising community engagement through play and including peatlands as central stakeholders, this study aligns with the principles of inclusivity and participation found within various conservation movements and frameworks, including the "Rights of Nature" and PARTNER principles.

The research develops a solution tailored to the case study of the communities and peatlands in Donegal through a multi-disciplinary approach that blends systems thinking with play theory, anchored in participatory practices, including co-designing workshops. Through this exploration into the potential to utilise playable AR experiences

in engaging communities in natural settings, the Let Sleeping Bogs Play concept aims to highlight the possibilities to provide communities with alternative forms of positive engagement with peatlands that can also act as platforms to open up discussions on the governance and future of these ecosystems. The concept could be further developed by engaging local communities in location-based playtesting of further iterations and co-design workshops to utilise the skills and creativity of locals, especially Gen Z students, in implementing the concept. Additionally, there is potential to collaborate with conservation groups, such as RE-PEAT, to test the concept in broader peatland settings.

This research explores under-researched areas in both location-based AR experiences and peatlands conservation. It aims to create opportunities for a long-term shift in mentalities towards peatlands by empowering locals to change how they interact with them, benefiting both the environment and local communities.

KOKKUVÕTE

Turbarabad on olulised ökosüsteemid, mis toetavad kohalikul tasandil bioloogilist mitmekesisust ja vee filtreerimist ning on ühtlasi olulised suure hulga mullasüsiniku globaalseks salvestamiseks. Peaaegu kogu Iirimaa maapiirkonnas minevikus läbiviidud turba ja turbamaade vale kasutamine on põhjustanud märkimisväärset keskkonnakahju nendele ökosüsteemidele. Ülemaailmse mure kasvades turbaväljade tuleviku pärast on Iirimaal tehtud jõupingutusi suunamaks eemale turbakasutusest kütusena, peamiselt Euroopa Liidu, Iirimaa Turbaväljade Kaitse Nõukogu ja kogukonnapõhiste algatuste mõjul, mis on näidanud väljapaistvat jätkusuutlikkust ja edu, mõned projektid juba peaaegu 20 aastat. Käesoleva uurimuse fookuses olevad Donegali maakonna kogukonnad on endiselt tugevalt sõltuvad turbast ning nad on vastuolus väljaspoolt tajutud jõudude poolt esitatud seadusandlusele, mis võib rikkuda nende õigust turvast lõigata, eriti vanemate põlvkondade hulgas. Lisaks võiks parandada Z-põlvkonna sidusrühmade positiivset kaasamist nendes kogukondades.

Nende väljakutsetega tegelemiseks uurib käesolev uurimus alternatiivset lähenemist läbi mängu, mis soodustab ja võimendab kogukonna kaasamist kohalike turbaväljadega. Intervjuude, Iiri turbaväljade taastamise valdkonna juhtivate praktikute, kohalike elanikega läbiviidud välitööde ja kohapealsete turbaväljade vaatluste kaudu uurib see lõputöö Donegali kogukonna suhtumist turbamätastesse ja nende väärtustesse, rõhutades nende ökosüsteemide kultuurilise, sotsiaalmajandusliku ja ökoloogilise tähtsuse mõistmise tähtsust võimaluste tuvastamiseks ja ära kasutamiseks meelelaadi muutmiseks kogukondlikul tasandil, kuna muutus peab alguse saama nendest kogukondadest, et see oleks edukas. Lisaks tunnustab see töö Ühinenud Rahvaste Organisatsiooni Säästva Arengu Eesmärkide (SDG) raames kajastuvat ülemaailmset jätkusuutlikkuse päevakorda ning annab panuse kirjandusse kogukonnapõhiste lähenemisviiside kohta loodusvarade valitsemisel ja kaitsekorralduses. Prioriteediks seades kogukonna kaasatuse läbi mängu, kaasates turbamättad kesksеteks sidusrühmadeks, kattub see uuring mitmesuguste kaitseliikumiste ja raamistike põhimõtetega, sealhulgas "Looduse õiguste" ja PARTNER põhimõtetega.

Uurimus pakub võimaluse Donegali kogukondade ja turbaväljade juhtumiuuringule mitme eriala lähenemisviisiga, kus süsteemne mõtlemine ühendatakse mänguteooriaga ja toetutakse kaasavatele praktikatele, sealhulgas kaasloome töötubadele. Läbi võimaluse, kuidas kasutada mängitavat liitreaalsuse kogemust kogukondade

kaasamiseks looduskeskkonnas, eesmärgiga tuua esile võimalusi pakkuda kogukondadele alternatiivseid positiivseid suhteid turbaväljadega, mis saavad samal ajal olla platvormid aruteludeks nende ökosüsteemide valitsemise ja tuleviku üle. Kontseptsiooni arendus, kaasates kohalikke kogukondi asukohapõhiseks mängulise testimiseks ja koosloometöötubades osalemiseks, et kasutada kohalike oskusi ja loovust, eriti Z-põlvkonna õpilaste kaasamiseks kontseptsiooni elluviimisel. Lisaks on potentsiaali koostööks keskkonnakaitse rühmitustega, nagu RE-PEAT, kontseptsiooni testimiseks laiemates turbaväljade seadetes.

See uurimus uurib nii asukohapõhiste liitreaalsuse kogemuste kui ka turbamätaste kaitsealade ala-uurimisvaldkondi, eesmärgiga luua võimalusi pikemaajaliseks meelelaadi muutmiseks turbamätaste suhtes, võimaldades kohalikel muuta oma suhteid nendega, mis kasuks tuleb nii keskkonnale kui ka kohalikele kogukondadele.

LIST OF REFERENCES

Altarriba Bertran, F., Bisbe Armengol, L., Cooke, C., Chen, I., Dong, V., Dastoor, B., Tadano, K., Dean, F., Wang, J., Altarriba Bertran, A., Duval, J. and Isbister, K. (2022). Co-Imagining the Future of Playable Cities. *CHI Conference on Human Factors in Computing Systems*. doi:https://doi.org/10.1145/3491102.3501860.

Biggs, C., Ryan, C. and Wiseman, J. (2010). *Distributed Systems: A design model for sustainable and resilient infrastructure Business Intelligence and Policy Instruments*.

Bord Na Móna (2017). *Brief History of the Peat Industry in Ireland*. [online] Living History. Available at: https://www.bordnamonalivinghistory.ie/article-detail/brief-history-of-the-peat-industry-in-ireland/ 'Taken from: Peatland Utilisation and Research in Ireland, The Irish Peat Society, 2006, P7-12'.

Clara Bog Nature Reserve (2023). *Clara Bog Nature Reserve*. [online] Clarabognaturereserve.ie. Available at: https://www.clarabognaturereserve.ie/ [Accessed 16 May 2023].

Coillte (2023). *Information About Bogs from the Blanket Bog Restoration Project in Ireland*. [online] Irishbogrestorationproject.ie. Available at: https://www.irishbogrestorationproject.ie/about_bogs.html [Accessed 16 May 2023].

Costello, B. and Edmonds, E. (2007). A study in play, pleasure and interaction design Interactive Art Installations View project Analysis techniques for Front End Design View project A Study in Play, Pleasure and Interaction Design. *Proceedings of the 2007 Conference on Designing Pleasurable Products and Interfaces*. doi:https://doi.org/10.1145/1314161.1314168.

DAERA (2015). *Peatlands | Department of Agriculture, Environment and Rural Affairs*. [online] DAERA. Available at: https://www.daera-ni.gov.uk/articles/peatlands#:~:text=Peat%2C%20or%20turf%2C%20as%20it,1cm%20of%20peat%20to%20form! [Accessed 27 Apr. 2023].

Denzin, N.K. and Lincoln, Y.S. (2008). *Collecting and interpreting qualitative materials*. Thousand Oaks, Calif.: Sage Publications.

Dimock, M. (2019). *Defining generations: Where Millennials end and Generation Z begins*. [online] Pew Research Center. Available at:

https://www.pewresearch.org/short-reads/2019/01/17/where-millennials-end-and-generation-z-begins/ [Accessed 27 Apr. 2023].

Fischer, J. and Riechers, M. (2019). A leverage points perspective on sustainability. *People and Nature*, 1(1), pp.115–120. doi:https://doi.org/10.1002/pan3.13.

Flick, U. (2009). *An Introduction to Qualitative Research*. 4th ed. SAGE.

Flood, K. (2021). *Listening to the bog*. [online] A Bog's Life. Available at: https://abogslife.com/2021/01/04/listening-to-the-bog/ [Accessed 2 May 2023].

Flood, K., Mahon, M. and McDonagh, J. (2021). Assigning value to cultural ecosystem services: The significance of memory and imagination in the conservation of Irish peatlands. *Ecosystem Services*, 50, p.101326. doi:https://doi.org/10.1016/j.ecoser.2021.101326.

FrogID (2023). *About FrogID*. [online] Frogid.net.au. Available at: https://www.frogid.net.au/about-frogid [Accessed 29 Apr. 2023].

GARN (2020). *Global Alliance for the Rights of Nature (GARN)*. [online] Global Alliance for the Rights of Nature (GARN). Available at: https://www.garn.org/ [Accessed 18 May 2023].

GARN (2021a). *About GARN - Global Alliance for the Rights of Nature (GARN)*. [online] Global Alliance for the Rights of Nature (GARN). Available at: https://www.garn.org/about-garn/ [Accessed 18 May 2023].

GARN (2021b). *International Rights of Nature Tribunal - Global Alliance for the Rights of Nature*. [online] Global Alliance for the Rights of Nature (GARN). Available at: https://www.garn.org/rights-of-nature-tribunal/ [Accessed 18 May 2023].

Geocaching (2017). *What is Geocaching?* [online] www.youtube.com. Available at: https://www.youtube.com/watch?v=vuFiLhhCNww&ab_channel=Geocaching [Accessed 30 Apr. 2023].

German Eco Design Award (2022). *re:wet – peat:lab*. [online] Bundespreis-ecodesign.de. Available at: https://bundespreis-ecodesign.de/en/winners/2022-rewet-peatlab [Accessed 30 Apr. 2023].

Henricks, T. (2014). Play as Self-Realization Toward a General Theory of Play. *American Journal of Play*, 6(2).

Hinde, K. (2022). *Deep Listening Walks*. [online] Kathy Hinde. Available at: https://kathyhinde.co.uk/deep-listening-walks/ [Accessed 2 May 2023].

International Peatland Society (2019). *Peat formation - International Peatland Society*. [online] International Peatland Society. Available at: https://peatlands.org/peat/peat-formation/ [Accessed 27 Apr. 2023].

Irish Peatland Conservation Council (2021a). *Blanket Bogs of Ireland Factsheet*. [online] Irish Peatland Conservation Council. Available at: http://www.ipcc.ie/a-to-z-peatlands/blanket-bogs/ [Accessed 20 May 2023].

Irish Peatland Conservation Council (2021b). *Raised Bogs in Ireland Factsheet*. [online] Irish Peatland Conservation Council. Available at: http://www.ipcc.ie/a-to-z-peatlands/raised-bogs/ [Accessed 20 May 2023].

IUCN Peatland Programme (2021). *Peatland Pavilion at COP26 | IUCN UK Peatland Programme*. [online] IUCN Peatland Programme. Available at: https://www.iucn-uk-peatlandprogramme.org/events/peatland-pavilion-cop26 [Accessed 2 May 2023].

Kim, D.H. (1999). *Introduction to Systems Thinking*. Waltham, Mass. Pegasus Comm. [20]07.

Lewis Miller, C. (2021). *Play Theory*. [online] Pressbooks.pub. Available at: https://mlpp.pressbooks.pub/gamebasedlearning/chapter/play-theory/#:~:text=Play%20theory%20generally%20refers%20to,play%2C%20situations%20to%20find%20solutions. [Accessed 27 Apr. 2023].

McHugh, M. (2022). All you need to know about turf cutting. [online] Available at: https://www.rte.ie/brainstorm/2022/0426/1206028-bogs-turf-cutting-culture-climate-change-ireland/ [Accessed 16 May 2023].

Meadows, D. (1999). *Leverage Points Places to Intervene in a System*.

Mishra, C., Young, J.C., Fiechter, M., Rutherford, B. and Redpath, S.M. (2017). Building partnerships with communities for biodiversity conservation: lessons from Asian mountains. *Journal of Applied Ecology*, 54(6), pp.1583–1591. doi:https://doi.org/10.1111/1365-2664.12918.

Mossman Art Gallery (2023). *Notes for Walking | Mosman Art Gallery*. [online] Mosmanartgallery.org.au. Available at:

https://mosmanartgallery.org.au/exhibitions/notes-for-walking [Accessed 30 Apr. 2023].

National Geographic (n.d.). *bog | National Geographic Society*. [online] education.nationalgeographic.org. Available at: https://education.nationalgeographic.org/resource/bog/ [Accessed 4 Apr. 2023].

O'Sullivan, K. (2018). *Why peat is most damaging fuel in terms of global warming, even worse than coal*. [online] The Irish Times. Available at: https://www.irishtimes.com/news/environment/why-peat-is-most-damaging-fuel-in-terms-of-global-warming-even-worse-than-coal-1.3674537.

PAN Studio (2023). *PAN Studio*. [online] Vimeo. Available at: https://vimeo.com/user7688874 [Accessed 17 May 2023].

Peatland Pavilion (2023). *COP26 Virtual Peatland Pavilion*. [online] Net-fs.com. Available at: https://storage.net-fs.com/hosting/6147066/7/ [Accessed 2 May 2023].

Playable City (2016). *Hello Lamp Post | Playable City*. [online] Playable City. Available at: https://www.playablecity.com/projects/hello-lamp-post/ [Accessed 5 May 2023].

Playable City (2019). *Empath | Playable City*. [online] Playable City. Available at: https://www.playablecity.com/projects/empath/ [Accessed 17 May 2023].

Playable City (2023a). *About | Playable City*. [online] Playable City. Available at: https://www.playablecity.com/about/ [Accessed 17 May 2023].

Playable City. (2023b). *Home | Playable City*. [online] Available at: https://www.playablecity.com/ [Accessed 17 May 2023].

Poulos, C.N. (2021). Conceptual foundations of autoethnography. pp.3–17. doi:https://doi.org/10.1037/0000222-001.

Premier of Victoria (2022). *Melbourne's Largest Ever Augmented Reality Art Trail | Premier of Victoria*. [online] Vic.gov.au. Available at: https://www.premier.vic.gov.au/melbournes-largest-ever-augmented-reality-art-trail [Accessed 17 May 2023].

Proulx, A. (2022). *Fen, Bog and Swamp*. Simon and Schuster.

RE-PEAT (2015a). *Intro to RE-PEAT | RE-PEAT*. [online] RE-PEAT. Available at: https://www.re-peat.earth/intro-to-re-peat [Accessed 2 May 2023].

RE-PEAT (2015b). *Peat | RE-PEAT*. [online] RE-PEAT. Available at: https://www.re-peat.earth/ [Accessed 2 May 2023].

RE-PEAT (2021). *Peat-Fest Report | RE-PEAT*. [online] RE-PEAT. Available at: https://www.re-peat.earth/peat-fest [Accessed 2 May 2023].

RE-PEAT (2022). *Bog Academy | RE-PEAT*. [online] RE-PEAT. Available at: https://www.re-peat.earth/re-imagining-nature-in-the-classroo [Accessed 2 May 2023].

RE:WE (2022). *RE:WET*. [online] RE:WET. Available at: https://rewet.org/#schritte [Accessed 30 Apr. 2023].

Restor (2023). *About | Restor*. [online] Restor. Available at: https://restor.eco/about/ [Accessed 19 May 2023].

Riley, M. (2018). *The augmented bushwalk: contemplative play across digital systems and natural worlds*. PhD Thesis.

Ryan, Ó. (2021). *'Most polluting' solid fuels to be banned in Ireland within a year*. [online] TheJournal.ie. Available at: https://www.thejournal.ie/solid-fuel-ban-in-ireland-5542391-Sep2021/?fbclid=IwAR0Dj0jSfGgBEEvu-9-AD7whPgLkIEXgO510a-yUUHilXkOpdyWQ2BnBMec [Accessed 16 May 2023].

Stickdorn, M. (2018). *This is service design doing, applying service design thinking in the real world: a practitioners' handbook.* Sebastopol Oreilly & Associates Inc.

Tierney, N. (2020). *How Ireland is abandoning its dirty fuel*. [online] Bbc.com. Available at: https://www.bbc.com/future/article/20201203-peat-the-decline-of-the-worlds-dirtiest-fuel [Accessed 16 May 2023].

Toner, E. (2018). *Field Notes | Bog Curious: Exploring Irish Peatlands*. [online] fieldnotes.nationalgeographic.org. Available at: https://fieldnotes.nationalgeographic.org/expedition/irishbogs (Blog started 20/07/2018, Last updated 03/08/2021).

van Breemen, N. (1995). How Sphagnum bogs down other plants. *Trends in Ecology & Evolution*, 10(7), pp.270–275. doi:https://doi.org/10.1016/0169-5347(95)90007-1.

Winchester, C.L. and Salji, M. (2016). Writing a Literature Review. *Journal of Clinical Urology*, [online] 9(5), pp.308–312. doi:https://doi.org/10.1177/2051415816650133.

World Wetlands Day (2021). *About - World Wetlands Day*. [online] Worldwetlandsday.org. Available at: https://www.worldwetlandsday.org/about [Accessed 2 May 2023].

LIST OF FIGURES

APPENDICES

APPENDIX 1: CLUSTER MAP

Figure A1.1: Cluster map

APPENDIX 2: FIELD RESEARCH DOCUMENTATION

Figure A2.1: Photographs from Glenveagh National Park

Figure A2.2: Photographs from Slieve Snagh Bogs

Figure A2.3: Photographs collected showing damage to Inishowen peatlands from draining and cutting

Figure A2.4: Photographs collected showing damage to Inishowen peatlands from illegal dumping of rubbish

Figure A2.5: Photographs from the location of the initial workshop

APPENDIX 3: PLAYTESTING RESPONSES

Figure A3.1: Playtest response 1

Figure A3.2: Playtest response 2

Activity 1 - Bog Minds

With bogs I associate greens and browns. Bogs instill a feeling of mystery, similar to the ocean; what exists beneath the surface? They make me feel uneasy as a result. Though they attract a lot of wildlife - specifically insects and frogs, neither of which I personally find appealing.

In terms of others, my family has lived off boglands for many years, with turf being a primary fuel in my household for many generations. This is common practice for many of the locals in the small village I'm from. Each summer families will head to the hills to cut turf and prepare for winter, often storing it in sheds. I think tradition wise it would be nice to get more families going to the bogs together, the bogs have often been a bit of a social gathering spot for local farmers from where I'm from. But it feels to me that this is a dying tradition among the community i'm from.

Activity 2

If my body was a bog I would like others to treat it with respect and not take more from it than what is needed, I would like the relationship to be transactional, with equal parts give and take. If I were a bog I think I would feel serene. I believe it would be a bustling environment for life, but a peaceful feeling.

Activity 3

To me unfortunately I only see the bog as a place of selfishness for humans, a place where people destroy nature to fuel their own livelihood with no regard for the wetlands. I think this is in part due to the ignorance towards nature that many people have - taking it for granted and that it will always be there, as it's always existed within their lifetime. I don't believe the threat to the environment is ever taken seriously, especially in smaller communities who oftentimes oppose government intervention. This is especially true within Donegal where the term "Small town, small minds" is true.

If there was a way to educate others on how important the bogs are and the preservation we might have hope, similar to how regulations have been in place to stop overfishing of the oceans. I believe that humans and the bog need to live in partnership with one another, to encourage the other to grow and sustain itself.

The bog itself could act as a time capsule, as historically we have found human remains preserved within its layers - even food! The bogs could be used to help us preserve our own history. It could also be used as land for native wildlife to thrive in peace.

Activity 4

Personally I believe that the bogs, as with all nature at the moment. Could be cared for better by the communities that live from it. To the bog's voice is one of solitude but gentleness. It means no harm, though harm can befall it as a result - think of animals that may wander into the unstable ground and be swallowed whole by the mucky earth. If I were to represent the voice of the bog, I would do so to educate people to the importance of it, as people only seemingly respect the things they know about. Educating the communities on the importance of the bogs to me would be crucial. The realization that boglands and wetlands are not infinite resources that we can just take and take and take from are a paramount message to me that I believe needs to be first and foremost. It needs to be communicated to local communities what negative things might befall them and their future generations if we don't start to respect our world and take only what we need while giving back in return.

Figure A3.3: Playtest response 3