

An exploration into the views and perspectives of Welsh Local Authority
Practitioners towards Natural Flood Management (NFM).

Casey Colcombe

2318518

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This dissertation has been submitted to the University of Wales Trinity Saint David
for the fulfilment of the requirements for the degree of Master of Science.

Author's Declarations

I declare that the work in this dissertation was carried out in accordance with the regulations of UWTSD. The work is original except where indicated by special references in the text, and no part of the dissertation has been submitted for any other degree. Any views expressed in the dissertation are those of the author and in no way represent those of the UWTSD. The dissertation has not been presented to any other University for examination either in the United Kingdom or overseas. I hereby give permission for my work, if accepted, to be available for photocopying and inter-library loan, and for the title and summary to be made available to outside organisations.

I must declare that participants interviewed for this study are colleagues within the organisation I am employed with. However, to mitigate potential conflicts of interest and minimise potential bias, reflective practices and a maintained, singular role as researcher were employed throughout the process. Participants were informed and participated in the study voluntarily. The research was also conducted ethically, adhering to safe practice guidelines and professional boundaries were maintained for the duration of the project.

I acknowledge the use of ChatGPT (<https://chatgpt.com>) from between the period of November 2025 to January 2026 to assist in the initial coding of interview transcripts following the Interpretive Phenomenological Analysis Process. I used the prompts outlined in the Appendix and have listed the generated outputs from said prompts. I confirm that I have not presented any AI-generated text as my own work. I confirm I have copies of my drafts, notes, and other resources I used before and after the use of AI tools, which I may be asked to provide in evidence.

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Abstract

Natural flood management (NFM), the catchment-based, natural approach to flood risk management, has gained momentum in academic and governmental circles in recent years as a sustainable, multi-functional approach that can reduce flood risk but also contribute to wider goals in today's society. Despite the growing interest, implementation and uptake of the approach remains slow and uneven. Studies investigating the social causes for this trend have been dominated by a focus on private stakeholders and have failed to incorporate professional stakeholders, such as local authority practitioners, despite their role in facilitating NFM at the local level. In addition to this demographic bias, geographical biases exist in which most social studies relating to NFM are undertaken in Scotland and England.

Subsequently, this study examines the perspectives of ten local authority members from a Welsh rural local authority to explore their perspectives and views. This study aims to explore practitioners' understanding and views of NFM as an approach, to ascertain their views of the surrounding policy environment, and to highlight perceived enablers and barriers to NFM practice, providing recommendations to improve practice and delivery. This study utilises the Interpretive Phenomenological Analysis approach and was assisted by ChatGPT, a generative AI chatbot, in the initial coding process, to analyse practitioners' accounts and explore the deeper, subjective meanings practitioners give to their lived experience.

Overall, local authority practitioners displayed a clear understanding and support for NFM and framed it as a shift in flood risk management philosophy to work with nature in an integrated approach across the catchment. Practitioners regarded NFM as an effective strategy that is well supported by policy, but faces social, practical and institutional issues in its implementation. Recommendations made by practitioners highlighted the need for cultural and institutional change to fully realise the benefit of NFM and improve project delivery and general practice.

Consequently, this study addresses a critical gap within the literature and provides the basis for future studies to continue exploring local authority practitioners' views, but more importantly, provides actionable improvements that can be used to improve NFM practice.

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Introduction

Climate change, the label for the long-term shift in climate and weather patterns, has received increasing recognition over recent decades as a catalyst for the growing number of intensifying hydrological extremes observed in the UK (Bezak *et al.*, 2024; Stafford *et al.*, 2021). Where increasing frequency and magnitude of precipitation events and wetter seasons, by approximately 8% on average compared to the previous decade, have seen a rise in the frequency and severity of localised, flash flooding have been observed (Carvalho and Spataru, 2023; Met Office, 2022; 78). The rise in rainfall amount can be seen in Figure 1 below.

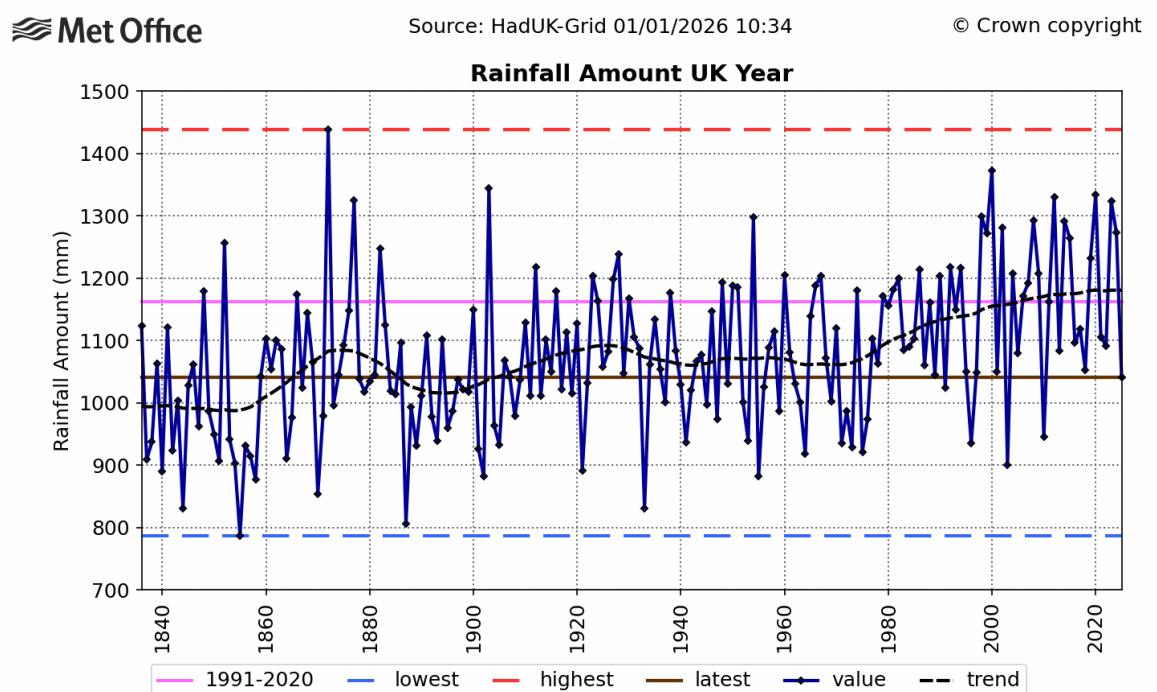


Figure 1: Time series of UK rainfall amount (mm) from 1836 to 2026 (Met Office, 2025)

The rising occurrence of damaging flood events has gained momentum as one of the costliest hazards in today's climate (Bezak *et al.*, 2024), whereby we are experiencing a significant rise of flooding in unprecedented areas, causing significant damage to people, property and critical infrastructure (Stevens, Clarke and Nicholls, 2016). Over the last decade, the UK has seen its fair share of significant flood events associated with named storms (Welsh Government, 2020; Kendon *et al.*, 2023). This

includes Storms Ciara and Dennis in February of 2020, flooding more than 6000 properties and costing approximately £330 million in damages (Carvalho and Spataru, 2023; Welsh Government, 2020; Sefton *et al.*, 2021; Kendon *et al.*, 2023), while Storm Claudia in November 2025, led to major flooding across the UK, but most notably in South Wales (Met Office, 2025).

While flooding has always been an issue in the UK, the risk of intense and frequent flooding is growing. UK flood risk is projected to rise, alongside the Met Office's projection for increasing storm frequency and intense rainfall events (Wentworth and Ermgassen, 2020; Welsh Government, 2020; Hill *et al.*, 2023). One in six people in the UK is now at risk of flooding, with approximately 245,100 properties in Wales threatened by flooding under future projections (Wells, 2019; Natural Resources Wales, 2023). UK flood damage is estimated to increase by over 2000% by 2080, while the number of people affected by riverine flooding is expected to double by 2050 (Hill *et al.*, 2023; Morrison, Westbrook and Noble, 2018). While these figures are only projections, the future for flood risk management still looks to be a daunting and costly venture.

While climate change is a strong influence for rising flood risk, human development and land use have had their own influence. Increased urban development, intensive agricultural practices and deforestation activities have constrained water movement and removed natural storage areas (Wells, 2019; Forbes, Ball and McLay, 2015; Dadson *et al.*, 2017; Wang *et al.*, 2022; Ruangpan *et al.*, 2024). Traditional flood risk management (FRM) approaches focused on diverting water with infrastructure and aimed to separate people and property from water to prevent adverse impacts (Wells, 2019; Wren *et al.*, 2022; Wang *et al.*, 2022). However, these conventional approaches are facing increased pressure under the current climate, raising concerns over the sustainability of conventional engineering practices (Chiu, Raina and Chen, 2021; Vann, Marjoribanks and Chmutina, 2025; Lashford *et al.*, 2022; Pitt, 2008; Carvalho and Spataru, 2023).

Consequently, we have seen the rise of more sustainable FRM methods, where nature is used to build more resilient approaches (Wells, 2019; Wingfield *et al.*, 2019; Hill *et al.*, 2023). This shift to nature-friendly solutions has gained popularity, particularly in Europe, where 'green measures' are being increasingly

promoted as a solution (Bezak *et al.*, 2024; Lashford *et al.*, 2022; Rouillard *et al.*, 2015).

One such approach that is gaining traction is Natural Flood Management (NFM). NFM aims to utilise natural processes on a catchment-based level to restore, enhance and protect natural features and characteristics to reduce flood risk (Wren *et al.*, 2022; Forbes, Ball and McLay, 2015). While the term NFM is most commonly used, other names such as Working With Natural Processes (WWNP), Slowing the Flow, and nature-based solutions (NbS) have been used for the same effect (Lane, 2017). These approaches are recognised as multi-functional methods; therefore, NFM is seen as a multi-beneficial solution that can contribute to wider environmental, social and economic goals (IPCC, 2023; Chiu, Raina and Chen, 2021).

As a result, recognition for such approaches has been rising within policy, where growing support has been observed for NFM within governmental organisations (Stafford *et al.*, 2021; Huq and Stubbings, 2015; Welsh Government, 2020), where strategies such as the national FCERM (Flood and Coastal Erosion Risk Management) programme promote NFM as a sustainable FRM approach (Wells, 2019; Welsh Government, 2020; Environment Agency, 2025).

Despite the growing support and recognition for natural flood management, uptake and delivery remain low, whereby the reality of implementation does not reflect the ambition of policy (Wells *et al.*, 2020). Socio-economic-technical studies to investigate the reasons behind these trends have highlighted that social and economic barriers tend to be more significant in influencing the delivery and adoption of nature-based solutions. However, these barriers are still understudied, and social and institutional gaps still exist (Venkataramanan *et al.*, 2020; Wingfield *et al.*, 2021; Bezak *et al.*, 2024). Studies addressing the social gaps generally focused on private stakeholders, including private landowners, community residents and the agricultural community (Wells *et al.*, 2020). Where limited studies on professional perspectives exist, there are still representation gaps where local authority practitioners, as key facilitators and implementers of policy, are severely underrepresented in the literature (Bark, Martin-Ortega and Waylen, 2021; Morris and Tippet, 2024; Venkataramanan *et al.*, 2020; Wells, 2019; Wingfield *et al.*, 2021). Studies are also geographically disproportionate, with studies focused within England and Wales

(Morris and Tippet, 2024). Therefore, the perspectives of Welsh people and Welsh communities are scarce in the literature, and Welsh practitioners are virtually absent.

Subsequently, this study aims to explore local authority practitioners' perceptions and attitudes towards natural flood management from a Welsh perspective and seeks to understand their experiences and opinions within a professional and governmental setting. The research sets out to explore practitioners' understanding and value of NFM, perception of policy environment, identify perceived benefits and challenges and also highlight recommendations to improve NFM practice and implementation. This research will address critical gaps in the current literature by exploring the perspectives of Welsh local authority practitioners in depth, providing views of stakeholders that are absent from academic research.

The study will explore the perspectives of local authority practitioners from a single, rural local authority in Wales, and sample practitioners from a range of disciplines either directly or indirectly related to natural flood management, its practice and implementation. Department areas covered will include Flood Defence, Conservation, Sustainability and the environmental and land management division in general.

To achieve this aim, five objectives have been constructed to aid and direct the exploration of perspectives. The objectives are as follows:

- 1) Understand practitioners' definitions and understanding of natural flood management and its principles
- 2) Understand practitioners' attitudes towards natural flood management as a flood risk management strategy
- 3) Understand practitioners' attitudes towards policy support for natural flood management
- 4) Identify the perceived benefits and challenges of natural flood management implementation
- 5) Recommend improvements to enhance and improve local natural flood management implementation

Each objective will comprise two research questions, which will support the research's purpose to dive deep into the practitioner's opinions and provide a richer understanding of the practitioner's viewpoint (Table 1).

Table 1: Summary of guiding questions under the research objectives, to help achieve the overall study aim.

Objective	Research Questions
1	1) How do practitioners define natural flood management, and what key principles do they associate with the approach?
	2) What examples or practices do practitioners consider natural flood management measures?
2	3) How do practitioners perceive the effectiveness of natural flood management in reducing flood risk, and how do these perceptions compare to traditional hard engineering approaches?
	4) How do practitioners differentiate between traditional and natural flood risk management, and what are the key perceived differences?
3	5) How do practitioners perceive the effectiveness of local and national policies to support the implementation and consideration of natural flood management?
	6) How do practitioners perceive current policy in relation to natural flood management - does it actively promote or prioritise natural flood management, or are there conflicts and inconsistencies between policy areas?
4	7) What do practitioners perceive as the main benefits of natural flood management, and what wider benefits do they associate with this approach?
	8) What do practitioners perceive as challenges and limitations of natural flood management, and which do they consider the most significant?

5	9) What do practitioners consider lacking from the natural flood management process, and what suggestions are made to strengthen implementation?
	10) What additional resources or support do practitioners recommend to streamline and aid natural flood management implementation and practice?

Insights gained from this research could be utilised by other organisations, including other local councils, Natural Resources Wales or the Welsh Government, to improve NFM delivery and local NFM practice. Additionally, outcomes from the study could be used to inform practice, guidance and policy implementation going forward on local levels, to better reflect the realities of practitioners and key stakeholders. Studies have shown that a lack of involvement of critical stakeholders and their perspectives within practice and decision-making can reduce organisational performance and limit the progress of nature-based solutions (Ferreira, 2021; de Gooyert, 2017). Therefore, improved understanding of practitioners' views can lead to better advocacy and acceptance of NFM, resulting in higher environmental outputs and help to bridge the gap between policy ambition and practice (Gregory, 2000; Reed, 2008; Mattor *et al.*, 2014; Newig and Fritsch, 2009; Creswell, 2007). Consequently, understanding local authority practitioners' views, as critical stakeholders, is essential to strengthening the practice and implementation of NFM to facilitate more sustainable and climate-resilient flood risk management.

Literature Review

To understand the relevance of practitioners' views within the context of current academic and professional practice, the current literature within the field must be reviewed to ascertain the basis for stakeholder views and perceptions regarding natural flood management. Critically reviewing literature helps to identify key themes, debates and assumptions within the field, and reveals important research gaps which future studies can address. Therefore, this review explores NFM evidence-based and practice-based literature, flood risk management governance and political literature and synthesises existing qualitative stakeholder research. The review also identifies key gaps throughout the literature and therefore, provides justification for further, in-depth qualitative studies on stakeholder perceptions.

Natural Flood Management

Defining Natural Flood Management

Literature presents NFM as a broad umbrella term that covers a wide range of interventions that contribute to reducing flood risk (Lashford *et al.*, 2022; Singhvi, Luijendijk and van Oudenhoven, 2022). NFM is consistently regarded as a catchment-scale practice that works to protect, restore and mimic nature to mitigate flooding within a landscape (Wren *et al.*, 2022; Wentworth and Ermgassen, 2020; Forbes, Ball and McLay, 2015; Welsh Government, 2023). Intervention types can be seen in Figure 2 below, which demonstrates the placement of such measures within the catchment.

The use of the abbreviation has increased noticeably in recent years, while early literature focused on its flood reduction abilities, current literature reflects NFM's applicability to wider targets and is present in wider environmental discourse (Ripiyee, 2016; Forbes, Ball and McLay, 2015; Lane, 2017).

While NFM lacks a specific universal definition, there is a clear shared understanding that NFM is a nature-friendly, climate-resilient flood risk management strategy that focuses on using nature, rather than working against it, to alleviate flooding.

Core principles underpinning Natural Flood Management

While definitions may vary, the hydrological mechanisms behind the approach are widely agreed upon in the literature (Lane, 2017). These mechanisms include increasing infiltration and soil water retention, slowing overland and channel flow, and finally, increasing capacity and distributions of water storage (Lane, 2017; Wren *et al.*, 2022; Environment Agency, 2017).

The emphasis lies in restoring hydrological processes from source to sea, whereby flood risk alleviation is achieved by treating the catchment as a connected system (Iacob, 2014). Unlike hard engineering, NFM aims to slow, store and work with water and to de-synchronise flows and attenuate flood peaks to decrease flooding downstream rather than divert water outright (Iacob, 2014; Wentworth and Ermgassen, 2020).

The aim of NFM, to manage water at its source proactively, appears to be a dominant theme within the literature and is often contrasted with hard engineering, which is typically more reactive in nature. This shift reflects a broader change within flood risk management (FRM) strategy towards a more holistic, catchment-wide thinking. The range of flood risk management strategies can be seen summarised below in Figure 2.

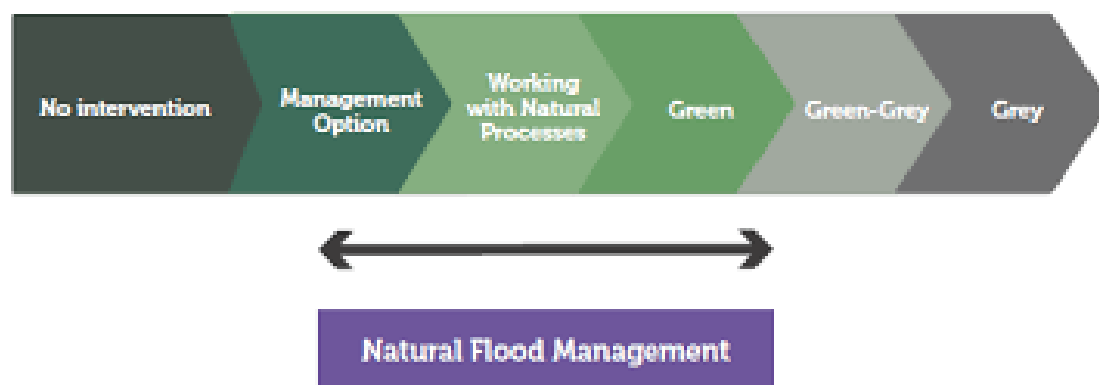


Figure 2: Flood risk management option appraisal continuum taken from the Welsh National Flood and Coastal Erosion Risk Management (FCERM) strategy (Welsh Government, 2020)

Common Natural Flood Management measures

NFM interventions vary considerably but are grouped into four categories depending on the type of intervention and where it is applied throughout the catchment. River and floodplain management measures generally work to restore physical processes and hydrological connectivity between water and its natural storage areas (Environment Agency, 2018; Iacob, 2014; Environment Agency, 2017). Woodland management measures look to retain and attenuate floodwater through various forms of tree planting within the catchment (Environment Agency, 2018). Runoff management measures aim to store water across the landscape with interventions designed to capture overland flow (Environment Agency, 2025; Cumbria Strategic Flood Partnership, 2017). Lastly, coast and estuary management measures focus on restoring coastal processes and reducing erosion impacts (Environment Agency, 2018; Zhu *et al.*, 2024). Intervention types can be seen in Figure 3 below, which demonstrates the placement of such measures within the catchment.

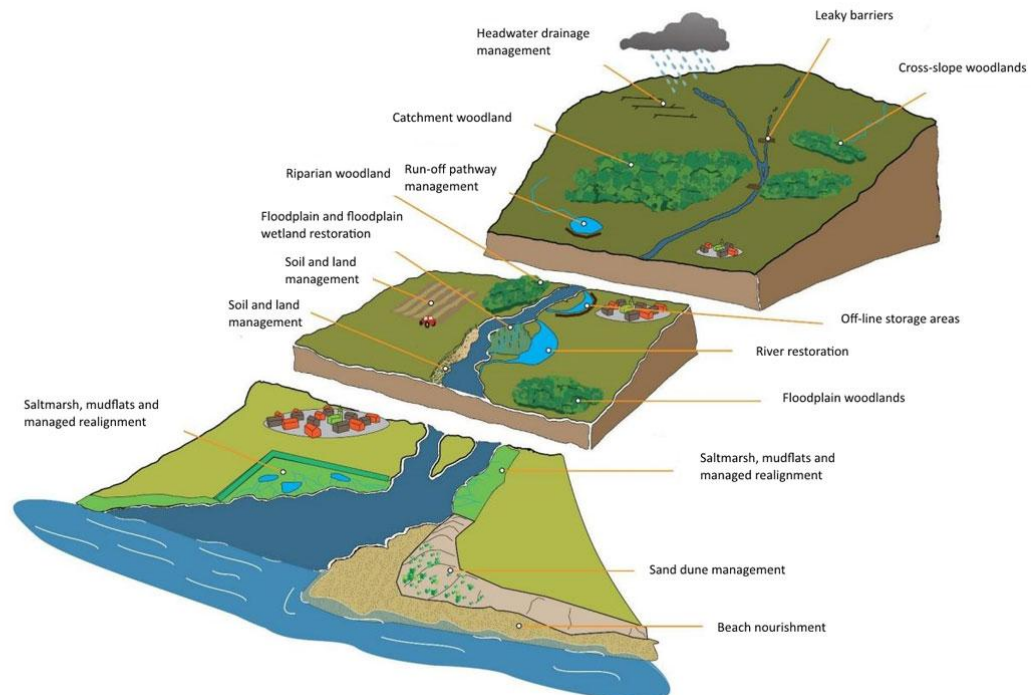


Figure 3: NFM intervention types summarised by the Environment Agency in their Working with Natural Processes Evidence Directory (Environment Agency, 2017).

Although these interventions contribute to reducing flood risk collectively, literature suggests that some measures receive greater attention than others. Measures such as leaky barriers and woodland and hedgerow planting seem to dominate the literature and are closely followed by ponds and storage areas (Welsh Government, 2023; Environment Agency, 2018). By contrast, large-scale interventions and coastal measures are discussed less frequently. A further debate concerns whether Sustainable Urban Drainage Systems (SuDS) should fall under the umbrella of NFM. Some academics question whether SuDS genuinely represents NFM when applied in engineered designs (72).

Lastly, while NFM is framed as a range of measures to be applied across the catchment, NFM continues to be associated more strongly with rural landscapes, especially as it harnesses similar environmental and land management practices as agriculture. This, therefore, explains the trend within the literature which addresses NFM as a rural FRM approach.

Evidence base for Natural Flood Management effectiveness

Evidence for NFM effectiveness generally falls under two categories: modelling studies and empirical monitoring of real-world schemes (Welsh Government, 2023). Both approaches evaluate effectiveness by examining reductions in peak flow, increases in flood lag time, and decreases in flood probability (Iacob, 2014).

Modelling studies appear to dominate the literature and generally simulate simplified hydrological systems through linear 1D flow domains (Hill *et al.*, 2023). These models can estimate the potential impact of interventions before implementation. For example, modelling in the Eddleston catchment demonstrated a 23% reduction in peak flow through increased floodplain roughness, while woodland planting in the Coalburn catchment reduced flood frequency by approximately 50% (Hill *et al.*, 2023). However, modelling approaches have also been criticised for their reliance on simplified environmental representations, which may not fully capture the complexity of real-world processes (Dadson *et al.*, 2017).

Empirical evidence based on monitoring real-world schemes is therefore often considered more reliable (Environment Agency, 2025; Welsh Government, 2023,

Bagheri-Gavkosh *et al.*, 2025). Data collected from rainfall gauges and river telemetry have demonstrated measurable impacts from NFM interventions. For example, river restoration within the New Forest resulted in a 21% reduction in peak flows and a 38% increase in flood peak travel time (Environment Agency, 2018; Environment Agency, 2025). Nonetheless, empirical evidence remains limited due to the relatively recent implementation of many NFM schemes, summarising the well-recognised paradox of needing stronger empirical evidence to justify wider implementation, but requiring further implementation to generate the evidence (Environment Agency, 2025).

However, both modelling and empirical studies reach a broad consensus that NFM can effectively reduce flood risk when applied appropriately (Ramsbottom *et al.*, 2019; Zhu *et al.*, 2024; Environment Agency, 2025). It is prefaced that the effectiveness of NFM is highly dependent on scale and the number of measures implemented (Dadson *et al.*, 2017; Wren *et al.*, 2022; Kingsbury-Smith *et al.*, 2023; Lane, 2017). Unlike hard engineering, which provides clearly defined standards of protection, NFM outcomes are highly context-dependent and therefore more difficult to standardise (Lane, 2017; Environment Agency, 2025).

Natural Flood Management in practice: benefits, challenges and integration with hard engineering

Literature consistently references NFM as a complementary flood risk management approach, rather than a replacement for conventional engineering approaches. While hard defences remain essential within densely populated urban areas, NFM is often considered particularly suitable for upstream and rural parts of the catchment (Wingfield *et al.*, 2019).

One key distinction between NFM and hard engineering is the multiple co-benefits associated with the softer approach. These include improved soil, air and water quality, biodiversity protection and enhancement, climate resilience and improved recreation and wellbeing opportunities (Wren *et al.*, 2022; Environment Agency, 2025, Stafford *et al.*, 2021). These wider benefits are frequently cited as an advantage of NFM, and add to its growing presence within sustainability and climate resilience agendas (Morris *et al.*, 2024; Environment Agency, 2018).

Although NFM is well supported in its concept, delivering NFM schemes remains challenging. Land ownership issues, short-term funding cycles and long-term maintenance responsibilities often complicate the implementation process (Department for Environmental Food and Rural Affairs, 2020). Furthermore, NFM performance depends heavily on the surrounding environment; therefore, the feasibility of NFM is physically demanding (Welsh Government, 2020; Welsh Government, 2023). Additionally, some of these challenges stem from the fact that existing flood risk management governance and practices were established for conventional engineered approaches. Therefore, institutions and delivery mechanisms are often better suited to conventional methods and do not reflect the methods of natural flood management.

Overall, the literature describes a clear shift towards integrated flood risk management that combines both engineered and natural flood management, and demonstrates NFM as a strategy to be delivered alongside conventional approaches rather than a substitute (Wingfield *et al.*, 2019).

Political environment and governance for Natural Flood Management in Wales

Flood risk governance in Wales

Flood risk governance in Wales operates within a multi-level institutional structure consisting of 28 Risk Management Authorities (RMA's). The Welsh Government sits at the top of this structure and oversees the remaining authorities (Welsh Government, 2020). These include Natural Resources Wales, the 22 Local Authorities acting as Lead Local Flood Authorities (LLFA's) and Welsh water companies (Welsh Government, 2020). An overview of the responsibilities of RMAs is summarised in Figure 4 below.



Figure 4: Overview of roles and responsibilities of Risk Management Authorities (RMAs) taken from the Welsh National Strategy for Flood and Coastal Erosion Risk Management (Welsh Government, 2020)

The Welsh Government establishes national strategic priorities and policy direction for floor risk management (Department for Environmental Food and Rural Affairs, 2020). NRW provides regulatory oversight and technical guidance for other RMAs, while LLFAs are responsible for implementing Flood and Coastal Erosion Risk Management (FCERM) strategies within their local jurisdictions (Department for Environmental Food and Rural Affairs, 2020). Water companies, although not directly involved in flood management, manage critical water infrastructure and supply systems (Natural Resources Wales, 2023).

While this structure separates policy leadership, technical expertise and local implementation responsibilities, it also creates challenges for implementing innovative approaches such as NFM. Although national policies promote NFM, its delivery ultimately relies on local authority practitioners who must interpret and implement these policies within local governance contexts (Welsh Government, 2025; Welsh Government, 2020).

Policy framework supporting Natural Flood Management

Wales is widely recognised within the literature for its supportive policy framework for NFM (Environment Agency, 2017), with one key document, the 2020 National FCERM strategy, which is praised for explicitly promoting working with natural processes (Environment Agency, 2017; Welsh Government, 2020a; Welsh Government, 2020b). This strategy positions NFM as a viable option as a flood risk reduction strategy alongside conventional engineering approaches. Available funding through capital grants has also been created for LLFAs and NRW to deliver NFM schemes (Welsh Government, 2025; James and Griffiths, 2023; Environment Agency, 2025). However, the majority of funding continues to support the delivery and design of traditional engineering approaches (Vann, Marjoribanks and Chmutina, 2025; Chan *et al.*, 2022; Lashford *et al.*, 2022).

Other legislative frameworks that align with NFM have also been recognised in the literature, including the Water Environment (Water Framework Directive) and the Flood and Water Management Act 2010, which call for sustainable management of resources and FRM (Natural Resources Wales, 2023; Huq and Stubbings, 2015; Short *et al.*, 2018; UK Government, 2017; West Worlds Slow the Flow, 2021; Rouillard *et al.*, 2015; UK Government, 2010). Furthermore, broader Welsh legislation such as the Well-being of Future Generations (Wales) Act 2016 and the Environment (Wales) Act 2016, has been recognised as emphasising integrated environmental governance and sustainable approaches (Welsh Government, 2020; Lashford *et al.*, 2022; Welsh Government, 2023).

Together, these policies and actions reflect an increasingly supportive political environment for NFM and highlight the affinity of NFM to contribute to wider climate adaptation and nature recovery objectives (Welsh Government, 2025).

Political and institutional barriers to Natural Flood Management

Despite this apparent policy shift, the literature highlights how ongoing political and institutional barriers hinder NFM implementation. Governance structures of FRM place significant pressure on LLFAs to implement local NFM schemes, whereby the

imbalance between resources, priorities and ambition for NFM leads to uneven implementation of NFM across authorities (Lashford *et al.*, 2022; Rouillard *et al.*, 2015; Wingfield *et al.*, 2019, CIWEM, 2022). This represents a tension which is recognised across literature between national policy ambition and local delivery capacity, whereby the NFM delivery is largely discretionary (Vann, Marjoribanks and Chmutina, 2025).

Reliance on conventional quantitative metrics, such as standard levels of protection, also restricts NFM expansion, as these fail to capture its full benefits and complexities of the approach, placing NFM at a disadvantage within existing evaluation frameworks (Welsh Government, 2020). Therefore, exacerbating the investment paradox, whereby funding requires evidence of performance. Additionally, the instability of long-term funding for NFM provides another barrier as short-term funding cycles and shifting political priorities limit future progress (Molnar-Tanaka and Surminski, 2024; Vann, Marjoribanks and Chmutina, 2025).

Overall, these barriers highlight that limitations to NFM are embedded within governance, evaluation and funding structures.

Stakeholder perceptions of Natural Flood Management

Overview of stakeholder qualitative research

Qualitative research for natural flood management has grown in recent years, reflecting the growing support for the approach in policy as a flood risk management strategy. While literature is still dominated by quantitative studies, more focus groups and case-study-based research have emerged within academic fields exploring stakeholders' views towards the approach (Venkataramanan *et al.*, 2020). Most studies are action-oriented, focusing on identifying barriers and enablers to NFM delivery from a policy perspective (Morrison, Westbrook and Noble, 2018). As a result, research has tended to prioritise implementation outcomes over deeper exploration of stakeholder understanding and interpretation of NFM.

Geographically, the literature is dominated by studies in North-West Europe, particularly within the UK, with England and Scotland-based research dominating academia (Morris and Tippet, 2024; Bark, Martin-Ortega and Waylen, 2021, Keech,

Clarke and Short, 2023; Wells *et al.*, 2020, Holstead *et al.*, 2017). In a similar way, representation of stakeholders also holds biases, whereby private landowners and land managers are most frequently studied, followed by residents and community groups (Morris and Tippet, 2024; Keech, Clarke and Short, 2023; Wells *et al.*, 2020). Professional practitioners, including governmental, public service and industry workers, are far less represented and are often grouped together (Morris and Tippet, 2024; Bark, Martin-Ortega and Waylen, 2021; Wells, 2019). This imbalance is significant given that these actors are essential in the design and delivery of NFM schemes.

Summary of findings across stakeholder literature for Natural Flood Management

Qualitative studies produce consistent findings across stakeholder groups, where NFM is widely supported and commonly understood as a 'softer' approach that uses natural processes to reduce flood risk while providing additional benefits (Wingfield *et al.*, 2021; Holstead *et al.*, 2017). It is consistently framed as a nature-friendly and environmentally positive strategy (Christopher *et al.*, 2024). Professional stakeholders tend to conceptualise NFM as an integrated land management approach, while non-professional groups often emphasise its environmental and social benefits (Wells, 2019; Morris and Tippet, 2024; Pietkiewicz and Smith, 2014).

However, confidence in NFM varies across stakeholder groups. Professionals are generally confident in its potential effectiveness but highlight challenges in quantifying outcomes and ensuring appropriate implementation (Rouillard *et al.*, 2015). In contrast, private stakeholders are often more cautious, requiring greater understanding before accepting the approach (Morris and Tippet, 2024). Therefore, perceptions of NFM performance are linked to familiarity and experience with the approach, where those who have experienced flooding on a personal level favour hard engineering due to its perceived security and certainty.

Research from key actors also identifies a range of barriers for NFM implementation, with social, political and institutional factors identified as more substantial than technical constraints (Holstead *et al.*, 2017). Community members and landowners name financial support, competing land use and maintenance responsibilities, while professionals emphasise public perceptions, evidence issues and governance

challenges are the main barriers for wider delivery (Wells *et al.*, 2020, Department for Environment Food and Rural Affairs, 2017; Rouillard *et al.*, 2015; Wells, 2019; Santoro *et al.*, 2019).

Despite these perceived issues, stakeholders are generally supportive of NFM, where many recognise the wider benefits associated with the approach, including biodiversity enhancement, ecosystem services and community wellbeing (Morris and Tippet, 2024; Department for Environment Food and Rural Affairs, 2017; Anderson and Renaud, 2021; Bezak *et al.*, 2024; Keech, Clarke and Short, 2023). These additional benefits contribute to NFM being widely perceived as a 'win-win' solution aligned with broader environmental and policy objectives (Anderson *et al.*, 2022). Overall, NFM is supported across stakeholder groups, although perceptions vary depending on experience and exposure to the professional role.

Summary of literature and research gaps

Existing literature has provided valuable insights into how NFM is perceived and understood by several stakeholders, but several critical gaps remain (Wingfield *et al.*, 2019). Firstly, local authority practitioners remain severely underrepresented, representing a critical gap as practitioners act as key facilitators of NFM delivery (Morris and Tippet, 2024; Bark, Martin-Ortega and Waylen, 2021).

Secondly, geographical gaps within the literature minimise the inclusion of stakeholders' views from wider regions, which may present differences in opinion. Wales, as a whole, is an underrepresented region which needs to be included, especially with its support of NFM in policy.

Thirdly, the literature focuses on identifying barriers and enablers for NFM practice; therefore, it falls short in understanding stakeholders' perceptions in depth. Subsequently, the literature lacks understanding of how stakeholders form their perceptions and how subjective experiences can influence decision-making. Therefore, present a literature gap that needs addressing to improve the quality of findings.

Consequently, understanding how Welsh local authority practitioners interpret and implement NFM is therefore essential for examining how policy is translated into

practice, addressing underrepresented areas in the literature. An in-depth qualitative study focusing on these actors is, therefore, well justified, as it would provide insight into how NFM is conceptualised and operationalised, while addressing the key gaps in the literature highlighted above.

Methodology

Given the rising importance and need for natural flood management (NFM) in sustainable flood risk management, alongside its uneven uptake across the nation, understanding practitioner perspectives as key facilitators of flood risk management policy is critical. Therefore, this chapter outlines the methodological choices adopted to explore local authority practitioners' views regarding natural flood management.

As this study aimed to explore the subjective views and experiences of practitioners, a qualitative, inductive approach was taken (Creswell, 2009). A qualitative research method suits the study's aim as it allows for the complex and subjective views of participants to be examined and focuses on the meaning given to lived experience by individuals rather than objectively measuring relationships and associations (Pietkiewicz and Smith, 2014). This approach suits the study as it enables the exploration of perceptions and professional experiences that shape practitioners' perspectives towards natural flood management within local authority contexts.

Additionally, qualitative approaches are appropriate for studies examining topics where limited research exists, as they allow detailed and rich investigation (Creswell, 2009). Within the NFM field, research specifically examining local authority practitioners remains limited, qualitative inquiry, therefore, provides an opportunity to generate deeper insights into practitioners' experiences and institutional perspectives.

Moreover, the inductive approach allows for the exploration of unanticipated themes that may emerge from practitioners' perspectives. Unlike deductive research, which tests predetermined hypotheses, inductive approaches offer more flexibility to capture complex and context-rich perspectives of social phenomena, which is suited to exploring the nuanced perspectives of local authority practitioners (Alase, 2017). These approaches were selected for their ability to capture the subjective views of local authority practitioners towards NFM and support the focus of deriving meaning from participants' perspectives (Muzari, Shava and Shonhiwa, 2022; Lim, 2025).

Therefore, this chapter outlines the qualitative methodological approach selected to explore practitioners' perspectives, covering research philosophy and design,

sampling and recruitment procedures, data collection, management and analysis processes, ethical considerations, limitations alongside research reliability and rigour. The methodological options for academic research are summarised in Figure 5 below.

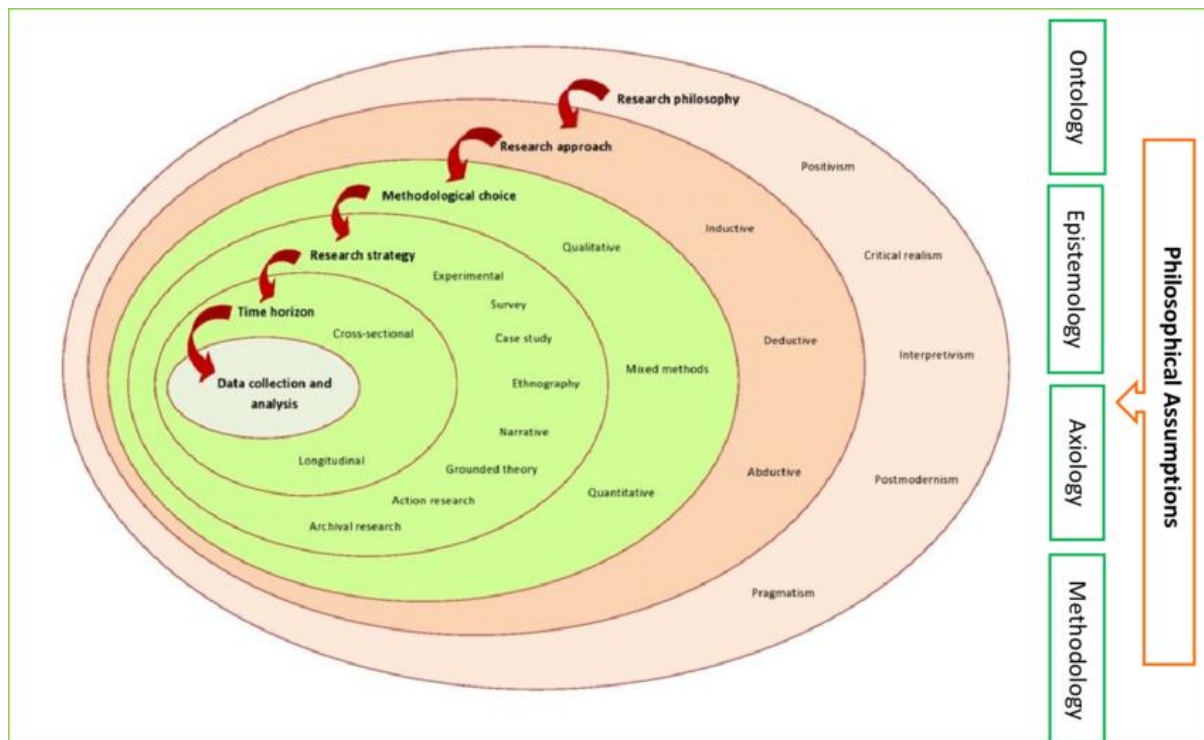


Figure 5: Summary of methodological options for academic research, commonly referred to as the research onion (Saunders *et al.*, 2019).

Research philosophy and design

The first stage of qualitative research is to identify and understand the philosophical beliefs and assumptions that guide and underpin the research approach and methodology that follows. Philosophical assumptions form the foundation of a research worldview and fall under one of the four categories: epistemology, ontology, axiology and methodology.

Epistemology focuses on understanding what constitutes knowledge, ontology concerns the nature of reality, axiology considers ethical values within research, while methodology focuses on how research is conducted (Creswell, 2007).

Research philosophy

Out of these philosophies, epistemology, the theory of knowledge, is most suited to the research's aims as it aligns with qualitative research approaches and focuses on understanding how individuals perceive and interpret lived experiences (Tuffour, 2017; Pietkiewicz and Smith, 2014). Epistemology, while often closely linked to ontology, is better suited to the research's aims as it seeks a deep and contextual understanding of a topic and is founded on the assumption that knowledge is subjective and developed from an individual's experience and interactions with their environment (Creswell, 2007). This assumption complements the research as it seeks to derive meaning from the lived experiences of practitioners towards NFM.

Research paradigms

Under philosophical beliefs, research paradigms or worldviews shape the actions of research and help dictate methodological approaches to ensure methods are compatible and directed to achieving the research's aims (Creswell, 2007). Research paradigms include positivism, interpretivism/constructivism, critical theory, and pragmatism.

Out of these categories, interpretivism, constructivism and pragmatism lend themselves more to exploring stakeholders' perceptions. Constructivism assumes that individuals socially construct reality, while pragmatism focuses on the practical application of research. Interpretivism, while closely linked to constructivism, places greater emphasis on understanding subjective experiences and exploring the meaning individuals attach to their perceptions (Creswell, 2007; Creswell, 2009; Muzari, Shava and Shonhiwa, 2022).

Therefore, in line with the research's aim, interpretivism was adopted as it values depth of understanding of individual perspectives over the development of generalisable theories. Interpretivism enables the researcher to explore the complexity of practitioner perspectives and interpret the meanings practitioners attach to their experiences of NFM within their professional roles.

Subsequently, the interpretivist paradigm supports the capture of rich and contextualised insights into the perceptions and experiences of local authority practitioners, and provides cohesion with the research philosophy and the study's epistemological foundations (Creswell, 2007; Muzari, Shava and Shonhiwa, 2022).

Research strategy

There are several research strategies available within qualitative research design to explore stakeholders' views, including grounded theory, narrative research and phenomenology. Grounded theory aims to develop new theories from qualitative data, while narrative research focuses on understanding the stories and accounts individuals construct around their experiences (Creswell *et al.*, 2007). While both approaches are suited to qualitative research, phenomenology was adopted for this study as it focuses on understanding how individuals experience and interpret specific phenomena within their everyday lives, therefore, it most closely aligns with the aim of the study (Pham, 2018). Rather than producing simple explanations, phenomenology seeks to capture the shared essence of participants' experiences (Moustakas, 1994; Creswell, 2007; Eatough and Smith, 2021).

Interpretive phenomenology, which was conceptualised by Clark Moustakas in 1994, is most suited to the research as it recognises that individuals' views are shaped by their subjective experiences and the contextual environments in which they operate (Muzari, Shava and Shonhiwa, 2022). Therefore, it is suited to understanding the subjective essence of NFM according to local authority practitioners.

In the same way, the hermeneutic phenomenological approach developed by Martin Heidegger in the early twentieth century was followed as it emphasises meaning making and interpretation of participants' perspectives, therefore is well suited to interpreting participants' views within their broader social and professional contexts (Al Balushi, 2018; Tuffour, 2017; Alase, 2017).

Ultimately, these approaches were considered the most appropriate methodology as they allow the capture of rich and contextual insights into practitioners' lived experiences of NFM (Creswell, 2009; Creswell, 2007).

Sampling and recruitment

Sampling strategy

There are several non-probability sampling strategies available for qualitative research to target specific participant groups. However, to selectively sample appropriate local authority practitioners for this study, purposive sampling was adopted. Purposive sampling involves selecting participants based on specific criteria relevant to the aims of the research in order to gain insights into a particular phenomenon (11, Islam and Aldaihani, 2022; Muzari, Shava and Shonhiwa, 2022). This strategy is particularly suited to studies examining individuals who have direct experience with the phenomenon being investigated.

Consequently, purposive samples were used to intentionally select participants to provide context-rich perspectives of natural flood management within local authority institutions (Tajik, Golzar and Noor, 2024; Lim, 2025). By selecting practitioners with relevant professional knowledge and experience, it ensures that the information collected is more applicable and relevant for the study's aim, as they reflect informed perspectives of NFM implementation and practice.

While purposive sampling does not necessarily produce generalisable results, it allows researchers to obtain detailed insights into complex social relationships, and given the interpretive phenomenological nature of this study, the depth of information-rich insight was prioritised over broader representativeness (Muzari, Shava and Shonhiwa, 2022).

Participant profile, sampling criteria and recruitment process

Participants were initially selected based on their employment within the local authority being studied. The particular local authority is situated in Wales and is largely rural with a strong presence of agricultural land use. The county contains several large towns with significant river systems. To maintain anonymity, the authority will be referred to as the local authority throughout the study.

Following the initial selection, sampling criteria were refined to include practitioners working in departments relevant to natural flood management, its principles and practice. Participants were therefore selected from departments including flood risk

management, nutrient management, conservation and general environmental management.

Participants were required to possess an understanding, familiarity with or professional experience relating to natural flood management and its associated concepts. These concepts include nature-based solutions, sustainable land management, sustainable flood risk management and approaches that work with natural processes.

Participants represented both rural and urban contexts and had varying levels of engagement with NFM within their professional roles. Potential participants were contacted via email using existing professional networks. Invitation emails were distributed in June 2025 to twenty potential participants, outlining the purpose of the study and participation requirements.

Following expressions of interest, an information and consent form explaining the study and participants' rights was sent to practitioners to be signed before formally commencing the data collection process.

Sample size

Qualitative research typically involves smaller sample sizes than quantitative research as it prioritises depth of understanding rather than broad generalisation.

Within phenomenological research, sample sizes typically range between eight and twenty-five participants (Pietkiewicz and Smith, 2014; Alase, 2017). While this may appear small, such sample sizes are appropriate as phenomenological studies aim to conduct detailed and interpretive analyses of participants' experiences.

Out of the twenty individuals invited to participate, ten practitioners took part in the study. This sample size falls within the recommended range for interpretive phenomenological research and allows sufficient depth of analysis for each individual participant's experience to be examined in detail. Consequently, the selected sample size aligns with established qualitative research practices and supports the interpretive aims of the study (Pietkiewicz and Smith, 2014; Magnusson and Marecek, 2015; Alase, 2017).

Data collection, management and analysis

Data collection

Choosing appropriate data collection methods is critical for qualitative research to gather meaningful and relevant data that fits the aims and objectives of the proposed research. Specifically for qualitative research, these methods commonly include interviews, focus groups, surveys and observations. From these methods, to gather a deep understanding of local practitioners' perspectives towards NFM, interviews were selected as the data collection method for this research.

Interviews are well-suited to qualitative research and allow researchers to capture detailed narratives and explore participants' experiences and perspectives in depth (Moustakas, 1994; Islam and Aldaihani, 2022; Creswell, 2009; Creswell, 2007). Interviews suit interpretivist phenomenological research in particular, as they allow meaning to be explored from participants' own experiences and words towards a topic.

Interviews can be structured in one of three ways. Structured interviews include sets of predetermined questions, unstructured interviews have few set questions, while semi-structured interviews are a balance between these approaches and have a set of predetermined questions but allow for exploration of unexpected themes. (Lim, 2025; Qu and Dumay, 2011; Pietkiewicz and Smith, 2014). As semi-structured interviews are the most applicable to exploring a specific topic but allow for exploration of unexpected topics, it was the chosen method for this study (Qu and Dumay, 2011; Islam and Aldaihani, 2022; Oppenheim, 1992; Muzari, Shava and Shonhiwa, 2022).

Interviews may also be conducted either in person or online. While in-person interviews can capture non-verbal cues and are the preferred option for research, online interviews offer more flexibility and accessibility for the researcher and participants (Qu and Dumay, 2011; Magnusson and Marecek, 2015; Anthony *et al.*, 2025). Additionally, communication platforms such as Microsoft Teams have become commonplace within professional settings, including local authorities, and therefore provide a familiar option for participants to partake in the research online.

Consequently, online interviews were conducted using Microsoft Teams between August and November 2025, where interviews ranged between 45 and 90 minutes and followed the semi-structured format. Each interview included ten core questions relating to the five research objectives and included two introductory questions designed to understand participants' professional roles and experiences with NFM. Lastly, interviews were flexible to ask exploratory and additional questions to explore unexpected topic discussions that emerge during interviews. The set of questions can be seen in the interview guide attached in the Appendix.

Data management

Following recommendations for qualitative research practice, interviews were audio-recorded using Microsoft Teams and subsequently transcribed verbatim using Microsoft Word (Muzari, Shava and Shonhiwa, 2022; Alase, 2017; Magnusson and Marecek, 2015). Participants' consent was obtained before recording.

Transcripts were completed shortly after each interview to ensure familiarity with the data and accuracy of transcription. All transcripts were securely stored using two-factor authentication protection in accordance with General Data Protection Regulation (GDPR) requirements (Lin, 2009; Magnusson and Marecek, 2015).

To maintain confidentiality for participants, all transcripts were anonymised before any data analysis, and all identifiable features were removed and replaced with pseudonyms (Arifin, 2018; Qu and Dumay, 2011).

Data analysis

To achieve the detailed examination of practitioners' perspectives towards natural flood management, interpretive phenomenological analysis (IPA) was adopted as the primary analytical approach. IPA focuses on exploring how individuals interpret and make sense of their lived experiences (Tuffour, 2017; Pietkiewicz and Smith, 2014).

IPA, developed by Jonathan Smith, Paul Flowers and Michael Larkin in the 1990s, is widely used approach within qualitative research, being grounded in phenomenology and hermeneutics, to explore the individual meanings attached to personal

experience (Tuffour, 2017; Pietkiewicz and Smith, 2014; Alase, 2017; Smith, Jarman and Osborn, 1999). IPA follows the double hermeneutic approach, whereby researchers interpret the meanings participants give to personal experiences (Creswell *et al.*, 2007; Islam and Aldaihani, 2022). Moreover, IPA follows the idiographic approach where individual cases are examined before widening the analysis to analyse themes across participants. The process of IPA data analysis is summarised in Figure 6 below.

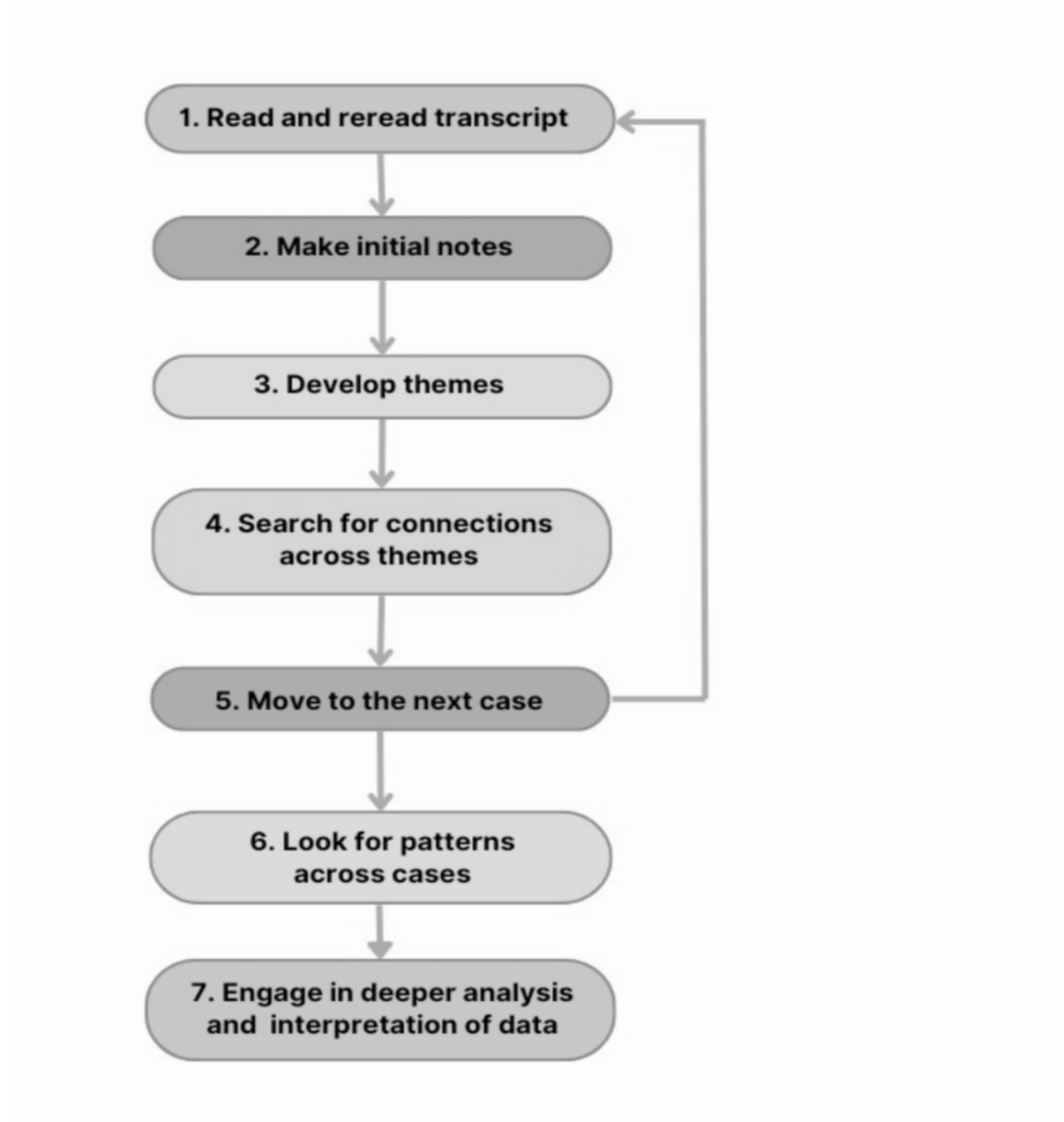


Figure 6: Summary of interpretative phenomenological analysis process (Whelan, O'Brien and Hyde, 2025)

Thematic analysis techniques, developed by Braun and Clarke, were also used during the IPA process to identify recurring themes across the data (Eatough and Smith, 2021; Braun and Clarke, 2006; Lim, 2025; Creswell, 2007; Moustakas, 1994; Magnusson and Marecek, 2015). Therefore, common patterns of meaning across practitioner perspectives were identified while maintaining focus on individual experience.

Modern qualitative research has also adapted to reflect the rise of artificial intelligence (AI) and has seen the increasing use of AI to assist with the data analysis process (Sen, Sen and Sahin, 2023; Islam and Aldaihani, 2022).

Subsequently, ChatGPT, a free AI-powered chatbot, was used as a supplementary research tool and assisted in initial coding and code clustering of data (Morgan, 2023; Erdem and Pamuk, 2025).

To ensure the credibility of data analysis, all outputs were manually verified by the researcher through comparison with verbatim transcripts. Therefore, all interpretation was undertaken by the researcher to maintain interpretive integrity, and an audit trail of ChatGPT outputs was included in the appendices for transparency.

Ethical considerations

Ethical approval is a critical component of qualitative research as it ensures the integrity of the research process and safeguards the privacy and safety of participants (Creswell, 2007; Al Balushi, 2018). Therefore, before research commenced, ethical approval was obtained from the University of Wales Trinity Saint David (UWTSD) ethics committee, which evaluated the proposal of the study as adhering to the necessary research ethical standards (Creswell, 2007).

Additionally, consent was obtained from each participant before their participation in the study started, where participants were informed of the research purpose, participation requirements and their rights, which included the right to withdraw and right to privacy for the duration of the study (Moustakas, 1994; Pietkiewicz and Smith, 2014; Arifin, 2018; Qu and Dumay, 2011). Participants were also notified that their identities and any sensitive information would remain confidential throughout the course of the research, whereby any identifiable features were anonymised and

replaced with pseudonyms to protect participant privacy (Wang *et al.*, 2022; Kang and Hwang, 2023).

Lastly, all collected data was securely stored in accordance with GDPR guidelines and will be deleted following submission of the final dissertation and viva voce presentation.

Limitations and research reliability, reflexivity and rigour

While ethical considerations are essential for maintaining research integrity, acknowledging research limitations and implementing strategies to ensure rigour within research are equally important.

One limitation of the study is the relatively small sample size. While this limits the generalisability of results, the methodology selected was adopted to prioritise depth of insight over generalised representation. However, to maintain credibility of results from the limited sample size, audit trails of analytical decisions, member-checking transcripts with participants and adopting reflexive practices were used throughout the study (Pietkiewicz and Smith, 2014; Creswell, 2007; Qu and Dumay, 2011; Tajik, Golzar and Noor, 2024; Oppenheim, 1992; Braun and Clarke, 2006).

A reflexive journal was kept to document the researcher's assumptions, interpretations and reflections during the research process, which is important in interpretivist research as the researcher plays an active role in interpretation (Magnusson and Marecek, 2015; Alase, 2017; Lim, 2025). Moreover, the reflexive journal helped to identify, minimise and acknowledge potential research bias, especially as the researchers hold an academic interest in the topic (Creswell, 2009; Muzari, Shava and Shonhiwa, 2022; Arifin, 2018).

Finally, the use of ChatGPT could introduce potential limitations relating to inaccurate outputs and misinterpretation of surrounding context; therefore, all AI-generated outputs were manually validated against transcript experts and cross-checked during manual interpretation by the researcher (Morgan, 2023; Erdem and Pamuk, 2025; Sen, Sen and Sahin, 2023).

Conclusion

Overall, the methods adopted in this study were chosen to allow the in-depth exploration of local authority practitioners' perspectives towards natural flood management. The interpretivist phenomenological approach allows for the capture of the deep, lived experiences of practitioners, and the chosen data collection methods helped to gather detailed and meaningful information relevant to the aim of the study. Methodological choices adopted worked to maintain transparency, reflexivity and analytical rigour through the research process and worked to uphold ethical principles associated with qualitative research.

The following chapter presents the key findings from the interpretive analysis and outlines the themes that emerged from practitioners' experiences of natural flood management within the local authority context.

Results

This research aimed to explore local authority practitioners' views and experiences of natural flood management (NFM) from a Welsh local authority perspective. Ten participants were recruited for the study. The profiles for these ten participants are summarised in Table 2 below.

Table 2: Summary table of participant profiles.

Participant ID	Department Area	Role	Experience with NFM
P1	Ecology	Conservation Officer	Indirect involvement through habitat management and conservation activities (e.g. peatland restoration and pond creation) that provide NFM functions
P2	Ecology	Woodland Officer	Direct involvement through advisory role and practical experience, creating woodlands and managing runoff on farms and Council land
P3	Ecology	Ecologist	Limited direct involvement through advisory role on Council projects and ecological work
P4	Flood Defence	Flood Technician	Direct involvement in the development and delivery of NFM schemes for capital flood projects
P5	Flood Defence	Flood Project Manager	Direct involvement in the management, development and delivery of NFM schemes for capital flood projects
P6	Strategic Policy	Nutrient Management Officer	Direct involvement through advisory role and practical experience, managing nutrients on farms, Council land and through Catchment Partnerships
P7	Flood Defence	Senior Sab Engineer	Indirect involvement through an advisory role associated with Sustainable

			Drainage Approval Body (SAB) applications
P8	Ecology	Planning Ecologist	Indirect involvement but awareness of principles with habitat management experience before the role.
P9	Flood Defence	Assistant SAB Engineer	Indirect involvement through advisory role associated with Sustainable Drainage Approval Body (SAB) applications and existing awareness of principle through postgraduate study
P10	Ecology	Landscape Officer	Indirect involvement but awareness of principles through ecological work and prior experience

Five superordinate themes emerged from the analysis, each containing several subthemes (Figure 7). These themes reflect how practitioners understand NFM, evaluate its effectiveness, and experience the institutional and practical realities of implementing the approach.

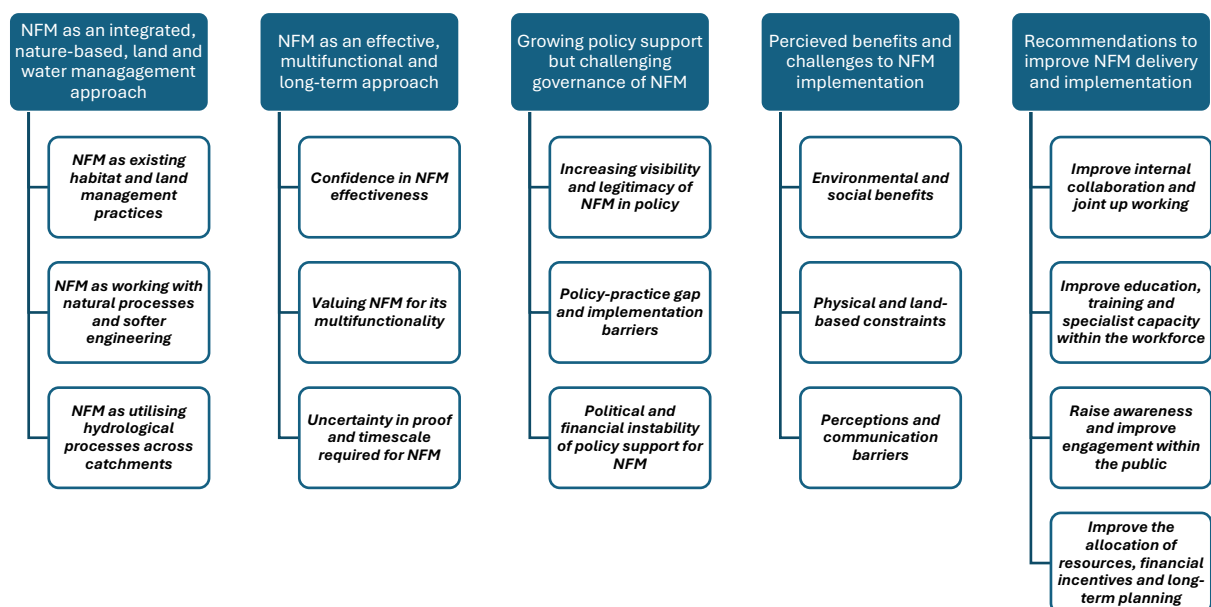


Figure 7: Thematic roadmap of themes and subthemes from IPA data analysis.

Theme 1 – NFM as an integrated, nature-based, land and water management approach

This theme captures how practitioners conceptualise NFM within their professional roles, directly addressing research objective 1. Participants commonly described NGM as an approach that works with natural processes across the landscape to influence water movement. Rather than defining NFM in technical terms, practitioners typically framed their understanding in terms of practical environmental management actions and hydrological processes. Key terms associated with this theme are summarised in Figure 8.

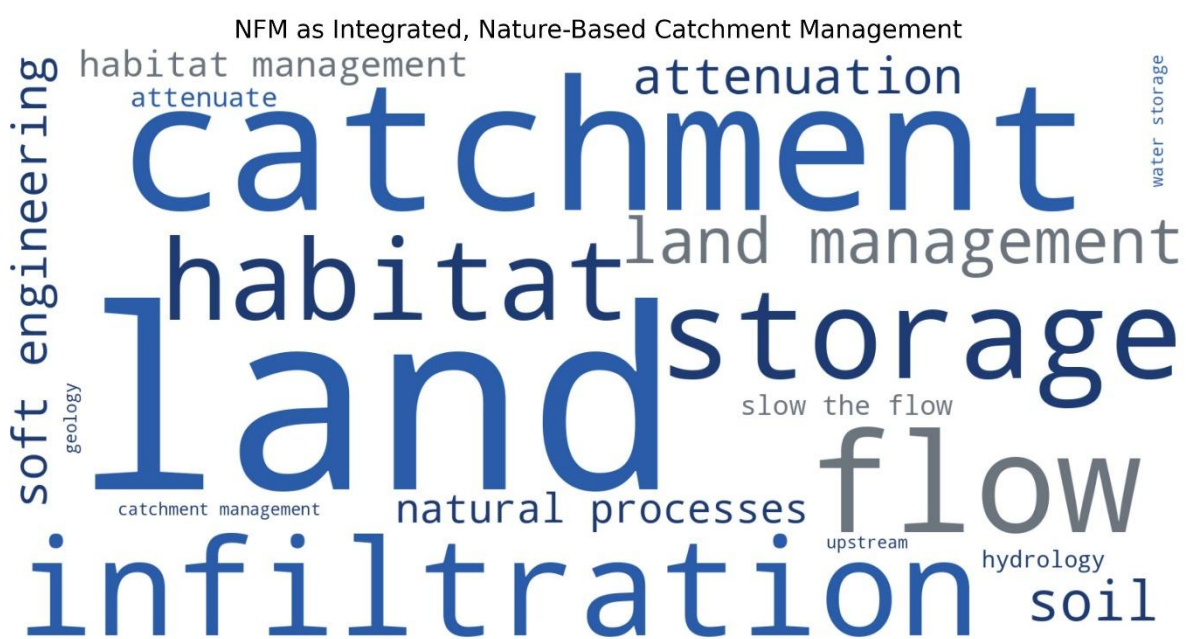


Figure 8: Word cloud representing key terms from participant interviews associated with theme 1.

Subtheme 1.1 – NFM as existing habitat and land management practices

Practitioners frequently interpreted NFM as closely aligned with land management and conservation practices already embedded within their professional work. Rather than viewing NFM as a completely new concept, many participants described recognising elements of NFM within activities they had previously undertaken for environmental or agricultural purposes.

Participant 1 described this connection when reflecting on their own work:

I realised that a lot of, well, pretty much all of the habitat management work I do is NFM in some way. So, if I'm planting or managing hedgerows, then that would be NFM, creating ponds and scrapes, working on peatland, doing ditch blocking, contour bonding and stuff. (P1).

Similarly, participant 5 explained how their previous experience in land management aligned with NFM practices, although it was not previously described using that terminology:

I do have a bit of land management experience, I suppose, from an agricultural background, but certainly didn't call it nature-based solutions or anything at that time. (P5).

These accounts suggest that practitioners make sense of NFM through their existing professional knowledge and experience and understand NFM through the lens of existing environmental practices rather than as a distinct technical intervention. Therefore, it is interpreted less as a novel approach but more as a reframing of familiar practices to emphasise flood risk reduction.

Subtheme 1.2 – NFM as working with natural processes and softer engineering

Participants also made the distinction between NFM and conventional engineered flood defences. Practitioners frequently characterised NFM as a “softer” approach that works with environmental processes rather than controlling water through built infrastructure.

Participant 6 described this understanding as follows:

But my understanding of NFM is working with the land, with the soils, the geology and the hydrology, the way water moves over the land to reduce the risk of flooding in the most kind of softest engineering way possible. (P6).

Participants also emphasised differences in the materials and structures used within NFM schemes. Participant 3 contrasted natural materials with conventional engineering:

There's also the idea of just a much softer engineering approach, so not using mortar, concrete, or steel to build big sort of weirs and culverts and so on. But using softer materials, local materials, for leaky dams, for example. (P3).

Participant 4 further illustrated this perspective using a comparison with natural structures in “Something like a dam a beaver would build.”

There was some variation in opinion regarding whether Sustainable Drainage urban Systems (SuDS) should be fully considered NFM, but participants agreed that the underlying philosophy differs from conventional flood management.

Rather than relying on concrete structures, participants described NFM as working with natural features and materials to manage water in a less invasive way, reflecting a broader shift in professional thinking to value ecological dynamics in flood risk management.

Subtheme 1.3 – NFM as utilising hydrological processes across catchments

Participants also described NFM through its hydrological mechanisms, particularly slowing water movement, increasing storage within the landscape, and improving infiltration. These processes were frequently referenced as key mechanisms through which NFM reduces downstream flooding.

Participants 5 and 9 both emphasise the importance of slowing water movement within catchments in “All really is just to slow the flow and store water,” and “Managing water better and slowing down the flow of water,” respectively.

These comments reflect a shared understanding among practitioners that NFM operates through cumulative processes distributed across the catchment. Rather than addressing flooding at the point of impact, NFM interventions were commonly described as targeting the sources of water flow upstream.

Participant 7 summarised this perspective through a rhetorical question:

*If you’ve got a problem at A, why are you trying to solve the problem at B?
(P7).*

These accounts illustrate how practitioners understand NFM as a catchment-scale approach that manages water movement throughout the landscape. Practitioners frequently emphasised that addressing the hydrological process upstream can reduce the pressure placed on downstream flood references, representing a systematic shift in flood risk management approach, interpreting NFM as a preventative approach that addresses drivers of flooding rather than its impacts.

Theme Summary

Overall, participants conceptualised NFM as a holistic approach that integrates environmental management and hydrological processes to influence water movement across catchments. Understanding of NFM was largely grounded in practical experience and professional roles, with participants frequently describing the approach through land management activities and natural processes.

Collectively, these accounts suggest that practitioners view NFM as both a continuation of existing practices and a broader shift in philosophy within flood risk management.

Theme 2 – NFM as an effective, multifunctional and long-term approach

This theme explores practitioners' attitudes towards NFM as a flood risk management strategy, addressing research objective 2. Participants generally expressed support for NFM, emphasising its ability to reduce flood risk while providing wider environmental services. However, practitioners also highlighted uncertainties relating to evidence, measurement, and the timescales required to demonstrate effectiveness. These perspectives highlight how practitioners. Key terms associated with this theme are summarised in Figure 9.

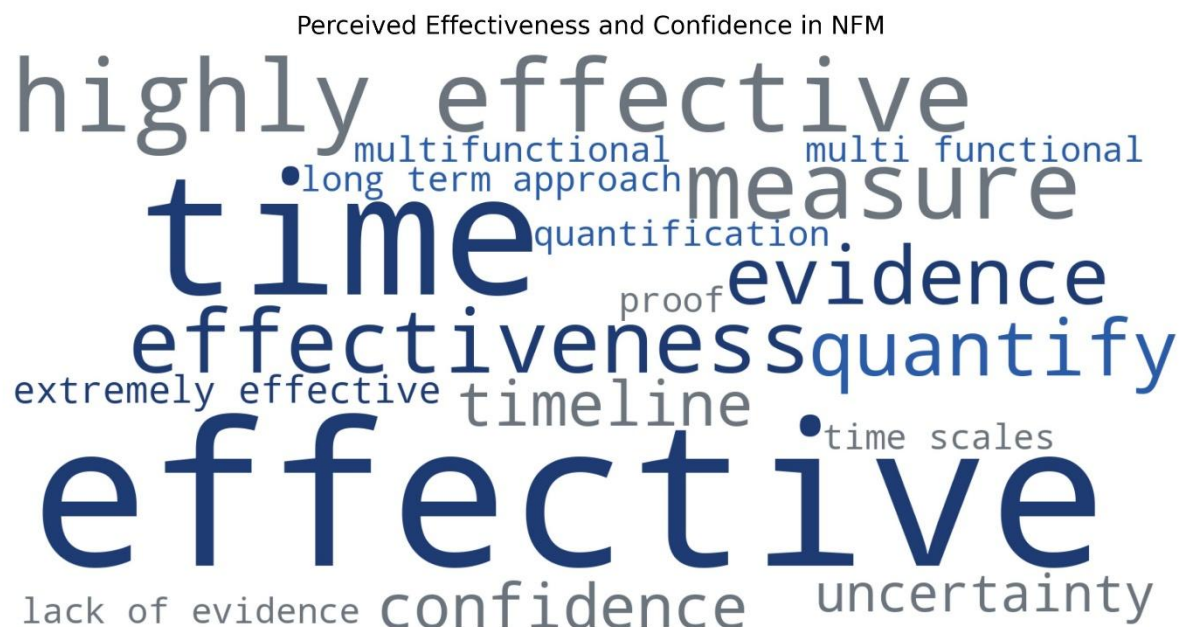


Figure 9: Word cloud representing key terms from participant interviews associated with theme 2.

Subtheme 2.1 – Confidence in NFM effectiveness

Many practitioners expressed confidence in the effectiveness of NFM as a flood risk management approach. For some participants, this confidence was expressed strongly.

Participants 5 and 7 described their confidence in the approach in “Highly effective... it has really got to be the first option” and “Extremely effective”, respectively. These statements reflect strong confidence among some practitioners, demonstrating their conviction that NFM plays a significant role in flood risk reduction.

Other participants expressed a more cautious perspective, suggesting that NFM effectiveness may depend on environmental conditions or the scale of implementation. Participant 2 stated, “I think it’s entirely dependent on the extent of how much is done.” Similarly, participant 10 suggested that NFM may not always function as a standalone solution: “I’m not confident that NFM on its own could provide a solution.”

These perspectives indicate that while practitioners generally support NFM, many view it as a part of a wider flood management strategy, whereby variation in confidence appears to reflect different professional backgrounds. Participants express strong support rooted in environmental values, while a more cautious perspective reflects risk management considerations.

Subtheme 2.2 – Valuing NFM for its multifunctionality

Practitioners frequently emphasised the wider environmental services associated with NFM. In many cases, practitioners described these additional ecosystem services as a key reason for supporting the approach.

Participant 7 summarised this perspective in “Extremely effective, I think, as it’s multifunctional.” Similarly, participant 3 described NFM as beneficial beyond flood risk management in “I think of it as better for everything else,” while participant 9 highlighted the importance of considering wider benefits in “But you have to look at the wider benefits as well as just the flood risk benefits to kind of understand the use of NFM.”

These comments illustrate how practitioners often evaluate NFM through its capacity to deliver multiple environmental outcomes reflecting wider sustainability and

ecological stewardship, and framing the approach as environmentally responsible and morally ethical.

Subtheme 2.3 – Uncertainty in proof and timescale required for NFM

Despite overall support for NFM, participants highlighted challenges in demonstrating its effectiveness within existing institutional frameworks. Practitioners frequently noted that NFM outcomes can take longer to become visible compared to engineered flood defences.

Participant 5 reflected on this challenge in “A long-term approach to flooding shouldn’t be 12 months; it should be 10 years, 15 years ... We’re kind of the Amazon Prime generation.”

Participants also discussed the difficulty of quantifying NFM benefits using existing evaluation systems. Participant 6 explained, “In a local authority and statutory setting, it is about ticking that box and quantifying the benefits, and it’s so much easier to quantify the benefits of hard engineering that it is for NFM”.

Another challenge raised by practitioners is related to public perceptions of visible infrastructure. Participant 6 commented:

I think people consider it to be ‘airy fairy’ where it’s not a real solution... people want to see concrete, they want security, and that’s delivered with cranes and concrete and lorries, where you can see walls and physical flood defences with your eyes very clearly. (P6).

These accounts illustrate how institutional systems prioritise immediate and measurable results, creating challenges to demonstrate NFM’s value, and how practitioners perceive these tensions as a mismatch between ecological timescales and organisational expectations.

Theme Summary

Overall, practitioners generally viewed NFM as a promising and valuable flood risk management strategy. Practitioners emphasised its environmental benefits and multifunctionality, although many also recognised challenges relating to evidencing effectiveness and operating within institutional systems designed around engineered infrastructure.

Theme 3 – Growing policy support but challenging governance of NFM

This theme reflects practitioners' experiences of navigating the political and institutional environment surrounding NFM. Participants generally perceived that recognition of NFM within policy has increased in recent years, particularly through its alignment with broader environmental agendas such as climate change mitigation and biodiversity protection. However, practitioners also described challenges associated with translating policy ambition into practical delivery.

This theme addresses research objective 3 and consists of the three subthemes: increasing visibility and legitimacy of NFM in policy, policy-practice gap and implementation barriers, and political and financial instability of support for NFM. Key terms associated with NFM's policy environment and governance are summarised in Figure 10.

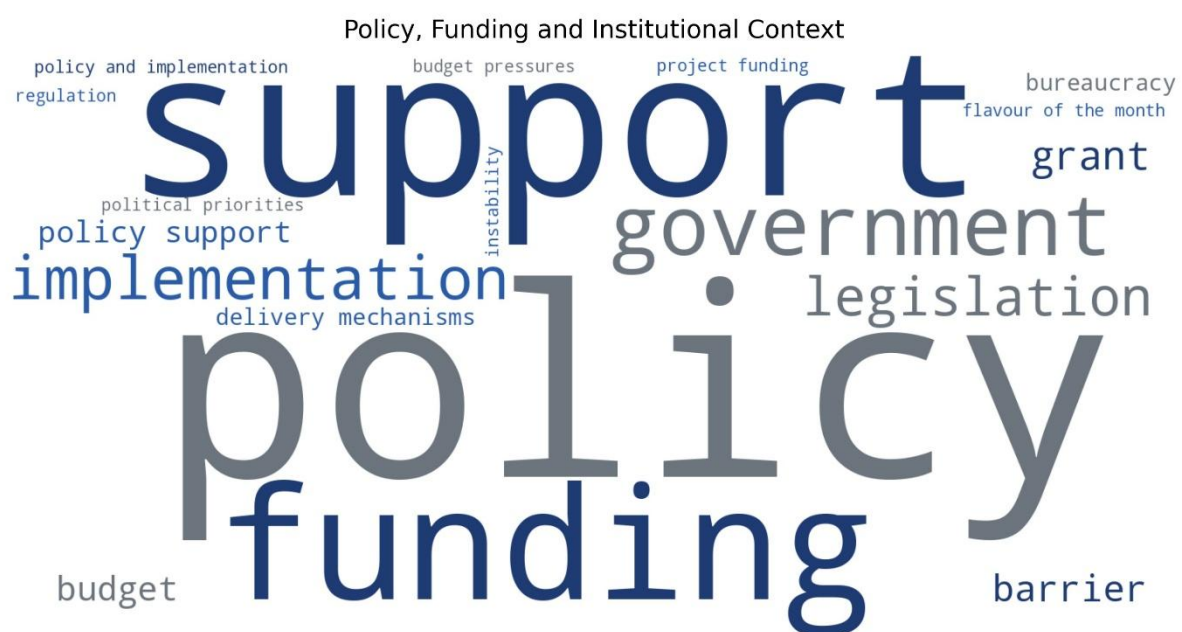


Figure 10: Word cloud representing key terms from participant interviews associated with theme 3.

Subtheme 3.1 – Increasing visibility and legitimacy of NFM in policy

Participants widely recognised that NFM has become increasingly visible within policy and environmental discourse. This recognition was commonly associated with increased funding opportunities, strategic guidance, and the broader rise of nature-based solutions within environmental governance

Participant 1 described this perceived growth in interest: “There does seem to be a lot of interest in it and a lot of funding around... policy-wise... It’s coming into everything.” Similarly, participant 4 emphasised the growing prominence of NFM within policy discussions in “Becoming more high profile.”

These accounts indicate that practitioners perceive NFM as gaining legitimacy within the policy landscape. Increased references to nature-based approaches within environmental strategies were interpreted as NFM becoming more widely recognised.

Some practitioners suggested that policy support for NFM is often linked to broader environmental services rather than to flood risk reduction. Participant 5 reflected on this distinction:

I think there’s obviously recognition that we’re in a climate emergency, but I don’t think, from a flood perspective, there is any policy to support NFM as much as we could use it. I think we could probably coincide on other benefits, so biodiversity benefits and the policy for NFM might be slightly stronger for it. (P5).

These perspectives suggest that practitioners interpret policy recognition of NFM as emerging primarily through environmental agendas rather than through flood risk management policy alone.

Subtheme 3.2 – Policy-practice gap and implementation barriers

Many practitioners describe a gap between policy ambition and the practical delivery of schemes. Practitioners frequently emphasised that while policy frameworks encourage NFM, translating these ambitions into implemented projects can be difficult.

Participant 4 described this perceived disconnect in “There’s definitely a gap between policy and implementation... policies are increasingly trying to encourage NFM ... doesn’t seem to be a huge number of schemes”. Participant 2 further reflected on the extent of this gap in “But it’s how big that gap is, and I think it’s fairly large.”

Participants suggested that institutional structures and delivery mechanisms often remain better suited to traditional flood management approaches. Participant 6

highlighted these structural challenges in “Delivery mechanisms required are just not there yet... That’s not really reflected in the kind of reality with the money distribution and the mechanisms and ways things are delivered, and in terms of short timescales for delivery.”

Practitioners therefore appear to NFM implementation as negotiating systems that were traditionally developed for engineered flood defences. This suggests the presence of institutional inertia within flood risk management, which is perceived as threatening NFM progress.

Subtheme 3.3 – Political and financial instability of policy support for NFM

Participants also expressed concern regarding the stability of policy and funding support for NFM. Practitioners frequently described environmental initiatives as vulnerable to changing political priorities and economic pressures.

Participant 1 reflected on the uncertainty associated with political change in “If we have a change in Government, things might change.” Participant 7 similarly described policy priorities as subject to political trends in “Political priorities, basically, it’s down to the government’s flavour of the month”.

Participants suggested that environmental initiatives such as NFM can be particularly vulnerable within reactive political systems. Participant 6 described this uncertainty in relation to funding and institutional capacity:

We are vulnerable right now because our work depends on the budget being there, so we don’t know what the future is going to look like for our work because it is so politically dependent... It’s very reactive; we live in a really reactive political landscape. (P6).

These accounts highlight how practitioners perceive policy support for NFM as contingent and potentially unstable. Although participants acknowledged increasing attention towards NFM, many felt that long-term commitment remains uncertain and appeared cautious over continued support.

Theme Summary

Overall, participants described the policy environment for NFM as increasingly supportive but institutionally complex. While NFM is becoming more visible within

environmental policy frameworks, participants emphasised that it remains constrained by delivery mechanisms, funding structures, and political uncertainty.

Theme 4 – Perceived benefits and challenges to NFM implementation

This theme captures how participants' experiences of implementing NFM in practice highlight both the perceived advantages of the approach and the constraints that can limit delivery. Participants frequently emphasised the environmental and social benefits associated with NFM, while also identifying practical challenges related to land availability, environmental suitability, and social perceptions.

This theme addresses research objective 4 and contains three subthemes: environmental and social benefits, physical and land-based constraints, and perception and communication barriers. Key terms associated with this theme are summarised in Figure 11.



Figure 11: Word cloud representing key terms from participant interviews associated with theme 4.

Subtheme 4.1 – Environmental and social benefits

Participants consistently listed the wider environmental and social benefits of NFM. Many practitioners described improvements to biodiversity, ecosystem health and social amenity gain as important outcomes of NFM interventions.

Participant 6 outlined several environmental benefits:

Improving water quality and improving the health of our aquatic ecosystems, providing habitat, shade, and shelter for biodiversity. Improving the quality of our land for carbon retention, the nutrient retention of our soils improves infiltration, which improves productivity on agricultural land, healthier crops and healthier animals. (P6).

Participants frequently framed these benefits as interconnected outcomes of working with natural systems. Participant 8 summarised this perspective in “On the whole, it’s all benefits.”

Participants also highlighted potential social benefits, including opportunities for recreation, education, and improving community wellbeing. Participants 3, 7 and 9 reflected on these benefits in “Creating nice spaces for people to be in or walk through,” “A natural amenity value space for the good and well-being of the community,” and “Obviously you’ve got educational benefits to local communities, schools, and amenity as well,” respectively.

These accounts illustrate how practitioners interpret NFM as a holistic approach capable of delivering both environmental and social value alongside flood risk management to contribute to wider sustainability goals.

Subtheme 4.2 – Physical and land-based constraints

Despite recognising the benefits of NFM, practitioners also identified practical constraints related to land availability and environmental suitability. Participants frequently explained that NFM interventions depend on specific landscape characteristics and access to suitable land.

Participant 6 clearly stated land ownership as a key challenge in “The main challenge is land ownership,” while participant 10 emphasised the potential conflict between NFM schemes and existing land uses in “The loss of valuable land uses and the balance between those two... Site may be great for something else”. Participants' accounts suggested that these challenges can be particularly significant in agricultural landscapes, where land is already used for productive purposes.

Environmental suitability was also described as an important factor. Participant 5 explained how landscape characteristics can influence the effectiveness of NFM interventions:

If you haven't got the right contours and topography for the land, then as much as you'd want to put NFM in there, you're going to be very limited with what you can do and the effectiveness of what you can deliver. (P5).

These perspectives highlight how NFM is viewed as an inherently complex approach that specifically caters to the dynamics and nuances of the environment, but must compete with agricultural and competitive land uses.

Subtheme 4.3 – Perceptions and communication barriers

Participants also identified social perceptions and communication challenges as barriers to NFM implementation. Several practitioners suggested that limited awareness of NFM among stakeholders can contribute to misunderstandings about the approach.

Participant 2 described the lack of understanding in “There’s a massive amount of misunderstanding around NFM.” Participant 9 similarly emphasised the importance of awareness in “The biggest challenge... to get people to embrace the change, to get people aware of NFM and its benefits.” These imply that negative misconceptions arise from a lack of awareness and knowledge.

Some participants also suggested that resistance to NFM can occur within professional contexts. Participant 5 reflected on this internal challenge in “It’s not public perception, it’s internal perception.” Participant 3 highlighted the need for broader understanding across all groups in “Includes everyone... And that’s not just the public, that’s acceptance from everybody.”

These accounts suggest that public confidence is closely linked to familiarity with hard defences and the visibility of flood infrastructure. Practitioners suggest that improving awareness and communication may play an important role in increasing acceptance of NFM among both professional stakeholders and the wider public.

Theme Summary

Overall, participants recognised NFM as providing significant environmental and social benefits. However, participants also emphasised practical and social challenges that can limit implementation, including land availability, environmental suitability and general understanding of the approach, acknowledging that successful delivery requires negotiating difficult social tensions and physical obstacles.

Theme 5 – Recommendations to improve NFM delivery and implementation

This theme captures practitioners' recommendations for improving the implementation and adoption of natural flood management. Participants frequently emphasised the need for improved collaboration, knowledge development, public engagement and institutional capacity.

The theme consists of four subthemes: improve internal collaboration and joint working, improve education, training and specialist capacity within the workforce, raise awareness and improve engagement within the public, and improve resources, financial incentives and long-term planning. Key terms associated with this theme are summarised in Figure 12.



Figure 12: Word cloud representing key terms from participant interviews associated with theme 5.

Subtheme 5.1 - Improve internal collaboration and joint working

Participants frequently emphasised the importance of collaboration between departments and organisations involved in NFM delivery. Practitioners suggested that NFM requires coordinated working across multiple professional disciplines.

Participant 1 reflected on the importance of communication in “We need to be talking to each other... Really should be thinking more about integrating it into their approach as well.” Participant 6 also described the benefits of collaborative working across departments for delivery in:

For NFM, the flood team, nutrients team and biodiversity team and whatever could all meet together to discuss and plan projects with clients and relevant actors, then go in to apply for a pot of funding to deliver something together with all their expertise. (P6).

These perspectives reflect practitioners’ experiences in their professional roles, and indicate that practitioners view collaboration as essential for integrating NFM within existing organisational structures.

Subtheme 5.2 - Improve education, training and specialist capacity within the workforce

Participants also emphasised the importance of improving knowledge and professional expertise related to NFM. Several practitioners suggested that many professionals involved in flood risk management have limited exposure to NFM during their training.

Participant 4 highlighted the importance of education in “More education and training available to convince people that it works, building that confidence that goes through risk management authorities like us, contractors, consultants and the wider public, to build more awareness and confidence.” Participant 7 similarly emphasised the need for specialist knowledge in “We need to educate designers and contractors in these natural engineering processes and that education isn’t there, or there’s not enough of them at the moment.” Participant 5 further stressed the importance of education and described a perceived knowledge gap among graduates entering the workforce. Participant 5 noted:

It's an obvious gap to me when you have over 20 graduate civil engineers on a training course and not one of them has done anything on NFM, where they've come from all over with different backgrounds, all over the country, but none of them has even discussed NFM options. (P5).

These accounts suggest that strengthening education and training could help increase professional confidence in NFM, and imply the need for a long-term shift within education and the workforce.

Subtheme 5.3 - Raise awareness and improve engagement within the public

Participants also emphasised the importance of public engagement for improving acceptance of NFM schemes. Practitioners suggested that communities may be more supportive of NFM if they understand the reasons behind interventions.

Participant 1 highlighted the importance of involving and engaging with communities early in “You mustn’t be just implementing and making changes. You’re illustrating to those who are affected why something’s being done.” Participant 9 also emphasised the need to challenge assumptions about traditional flood defences in “The challenge is getting residents to accept that these accepted and sustainable measures don’t always involve concrete structures or traditional hard engineering approaches.”

These accounts highlight how practitioners view communication and engagement as important tools for building trust and acceptance to enable greater adoption of NFM.

Subtheme 5.4 - Improve the allocation of resources, financial incentives and long-term planning

Participants frequently emphasised the importance of institutional resources and long-term planning in supporting NFM implementation.

Participant 7 summarised this need in:

Money, capacity and ability. So, if people had the ability, and the right people have the capacity, you have enough staff and funding, and have enough money to enact, to actively and proactively do the necessary things, so moving away from a reactive to a proactive approach, we would improve opportunities for NFM. (P7).

Participants also emphasised the importance of financial incentives for landowners to drive NFM adoption, where participant 1 explained, “It has to be a benefit to the landowner; otherwise, you can’t assume or expect them to do it one way or another... Any monetary values that can be placed that may benefit the farmer, like a credit system, would be fantastic.”

These perspectives highlight how practitioners view financial support and long-term planning as important enablers for wider NFM adoption.

Theme Summary

Overall, participants emphasised that improving NFM delivery requires stronger collaboration between organisations and disciplines, alongside increased professional knowledge and capacity through education and training. Practitioners also highlighted the importance of improved public engagement, adequate resources, and long-term strategic support to overcome institutional and social barriers to NFM implementation.

Cross-theme Summary

Across all participants, several shared patterns emerged in how local authority practitioners understand and experience natural flood management, which showed how subthemes were interlinked, particularly for themes 3, 4 and 5, which can be seen in Figure 13.

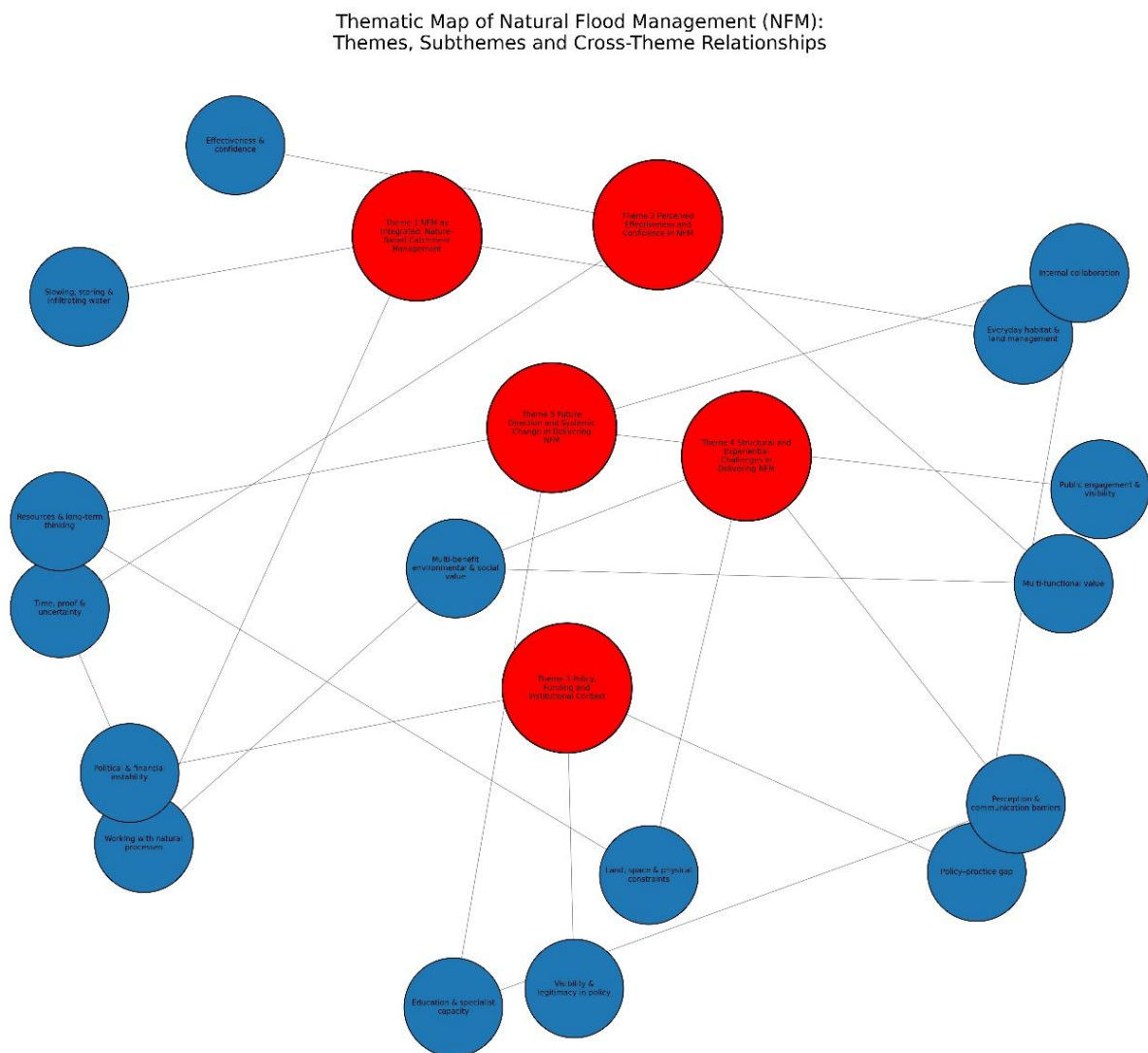


Figure 13: Conceptual thematic map showing relationships between themes and subthemes.

Practitioners generally demonstrated a clear conceptual understanding of NFM, commonly described as a nature-based, catchment-scale approach using nature and familiar processes to manage water. But also expressed strong support for the approach as a flood risk management strategy, founded on its multifunctionality and additional benefits. Confidence in the approach was accompanied by recognition of practical and institutional challenges.

Practitioners described the policy environment as increasingly supportive of NFM, particularly within wider environmental agendas, but identified gaps between political ambition and practical implementation. Challenges relating to land availability and suitability, social perceptions, and limited institutional capacity were raised as

particular barriers, where recommendations were made to address them to provide a long-term progressive shift.

Collectively, these findings suggest that while practitioners recognise the potential of NFM, wider adoption requires addressing tensions between the emerging philosophy and institutional, political and social systems within flood risk management.

Discussion

This study set out to explore local authority practitioners' perceptions and experiences towards natural flood management (NFM) within a Welsh local authority context. This study investigated practitioners' views and understanding towards NFM, its perceived effectiveness, the surrounding policy environment, perceived benefits, challenges and recommended improvements. This research addresses a critical literature gap whereby previous literature was dominated by landowner and community stakeholders, underrepresenting local authority practitioners within professional circles, particularly Welsh local authority stakeholders.

The findings revealed five key themes, demonstrating how practitioners understand and support the concept and ideology of NFM, but also recognise structural tensions where the main barriers to NFM appear to be institutional, political and practical, rather than conceptual.

The following discussion is structured according to the five key themes.

Theme 1 – NFM as an integrated, nature-based, land and water management approach

This theme reveals how practitioners conceptualised NFM as a holistic approach that integrates and mimics natural features and processes to manage water across the catchment. Largely, participants viewed NFM as a reframing of existing practices but also as a shift in flood risk management (FRM) philosophy and strategy.

Practitioners understood NFM through existing habitat and land management practices that were reframed to focus on the flood risk reduction benefit, naming aspects such as woodland planting, river restoration, floodplain reconnection, and peatland restoration. These understandings fit within the wider literature, which recognises NFM as an umbrella term encompassing practical land management interventions across the catchment (Dadson *et al.*, 2017; Wren *et al.*, 2022; Christopher *et al.*, 2024). Dadson *et al.* 2017 phrased NFM as not a single intervention but a range of practical measures. Similarly, it was recognised among the practitioners that NFM lacks a standardised universal definition. This was also reflected in wider literature, where NFM is expressed as a broad concept rather than tightly or specifically bound (Bark, Martin-Ortega and Waylen, 2021). Lane (2017)

summarises this idea, emphasising NFM as having an ambiguous and conceptually broad definition. These findings imply that NFM is understood through familiar practices rather than learnt under a strict definition. This may explain why conceptual support is strong within this sample, as environmental practitioners may be able to associate NFM with existing roles more easily than those in wider fields, reflecting a crucial link for NFM support.

Additionally, practitioners conceptualise NFM as a distinguished approach separate from conventional flood defence methods by emphasising how NFM works with the land and hydrology and uses natural materials to manage water. These findings strongly coincide with wider NFM and nature-based solutions research, which highlights NFM as working with natural processes (WWNP) to manage water rather than control water using hard infrastructure (Christopher *et al.*, 2024; Environment Agency, 2025; Bark, Martin-Ortega and Waylen, 2021). This study and wider literature emphasise the distinction between 'hard' and 'soft' approaches, but focus on how NFM and conventional engineering methods should complement each other for an integrated flood risk management approach (Anderson *et al.*, 2022; D'Souza, Johnson and Ives, 2021). These findings suggest that practitioners not only engage with and support NFM but also endorse the philosophy shift to a more holistic FRM approach, whereby 'softer' methods utilising nature are often regarded more positively, supporting the findings of wider literature and the findings of Bark, Martin-Ortega and Waylen (2021).

Participants also displayed strong awareness of NFM's hydrological mechanisms, especially focusing on slowing the flow, increasing storage and improving infiltration, particularly in upper catchments. These results align closely with NFM's evidence base, which describes NFM as using these mechanisms to reduce flood peaks, increase lag time and reduce downstream flood risk (Venkataramanan *et al.*, 2020; Morris and Tippet, 2024; Lane, 2017; Wells, 2019; Collentine and Futter, 2016). These findings demonstrate how practitioners display technical literacy for NFM and the way it works, but highlight how conceptualisation is formed through process-based understanding of how measures achieve flood risk reduction. This suggests that, despite not having a formalised understanding, practitioners truly comprehend NFM through practical and technical understanding, rather than just reiterating NFM rhetoric and language.

Generally, the views and stances taken by practitioners reflected subtle differences between their professional roles. For example, natural environment-based participants consistently emphasised how they viewed NFM as a less-invasive, nature-friendly approach. On the other hand, engineering and infrastructure-related roles were more technical in their assessment, citing more design and construction-related comments. These interpretations reflected the subjective experiences and biases of practitioners within their professional roles, suggesting how understanding of NFM reflects former knowledge and professional contexts within which practitioners were based.

Overall, theme 1 demonstrates that practitioners conceptualise NFM clearly as a change in flood management philosophy to work with nature to manage water across the catchment, utilising hydrological processes to do so. The results reveal that despite the lack of a standardised definition for NFM, practitioners comprehend the concept through practical and process-based activities, displaying an awareness of the concept, but also the technical mechanisms behind it. These findings support those in wider literature and generally reflect how NFM is perceived as a shift in approach rather than as a whole new concept.

Theme 2 – NFM as an effective, multifunctional and long-term approach

This theme summarises how practitioners generally regard NFM as an effective approach to reducing flood risk, but explains how performance and confidence in the approach are context-specific, where NFM cannot fully replace conventional hard engineering at critical places. Much of this confidence given to NFM is due to its multi-functionality and support of wider ecosystem services. However, despite this confidence, practitioners highlighted tensions between NFM and existing evidence and evaluation systems, which are suited to conventional engineered approaches.

Participants expressed support for NFM and demonstrated general confidence in the approach to reduce flood risk, although this support was cautioned by some practitioners as depending on the surrounding environment and physical attributes of the land. These findings are highly consistent with the wider evidence base, which denotes NFM as an effective measure, but is context-dependent and scale-specific (Environment Agency, 2025; Welsh Government, 2023; Wingfield *et al.*, 2021). Stakeholder research further validates general support within professional groups,

whereby water and environmental practitioners were found to view NFM as a no-brainer, but reflect a divergence with private landowners and community groups who are less optimistic about NFM's effectiveness (Morris and Tippet, 2024; Dadson *et al.*, 2017; Waylen *et al.*, 2018; Bark, Martin-Ortega and Waylen, 2021). These findings show that practitioner support mirrors the academic position where NFM works, but requires the right topography and environment, and implies that professional experience can improve confidence through increased awareness and familiarity with the approach (Wells, 2019; Welsh Government, 2023; Dadson *et al.*, 2017).

Moreover, practitioners strongly value NFM for its contribution to wider ecosystem services and alignment with climate change, biodiversity and sustainability goals. These results support wider NFM and nature-based solutions research, where value was found to be given to nature-friendly approaches for their provision of wider regulatory and supporting services (Environment Agency, 2025; Bark, Martin-Ortega and Waylen, 2021). This view was found across all stakeholder groups and was summarised in the works of Seddon *et al.* (2020) and Bark, Martin-Ortega, and Waylen (2021). These findings suggest that practitioners view NFM through a broader sustainability and environmental lens, rather than a sole focus on flood risk reduction. This criterion for value may indicate why practitioners continue to support NFM as they value the wider outcomes of the approach and view these as equally important. This argument is reflected by wider research and displays a valuable connection between positive perceptions and ecosystem services.

Participants also repeatedly highlighted the difficulty of proving NFM effectiveness within the required short-term project cycles and conventional evaluation systems, which struggle to convey the long-term benefits of the approach. These findings are extremely similar to wider research, where difficulties in measuring NFM effectiveness are noted, highlighting how current systems are suited to the standardised evaluation and instant results of hard defences (Waylen *et al.*, 2018; D'Souza, Johnson and Ives, 2021; Welsh Government, 2023). It is emphasised within the literature that evidence to support the approach exists, but regulation of evaluation methods and adaptation of systems to reflect the long-term outlook for NFM is needed (Giordano *et al.*, 2020; Wren *et al.*, 2022; Anderson *et al.*, 2022; Dadson *et al.*, 2017; Seddon *et al.*, 2020). These findings demonstrate that while

practitioners view NFM as an effective measure, confidence and trust in the approach are constrained by the current institutional and evaluation systems. This insinuates that uncertainty regarding NFM effectiveness is not necessarily due to a lack of evidence, but due to the inadequacy of current practices to integrate and accurately reflect the nuances of NFM.

Practitioners with direct experience and knowledge of NFM were more convinced of NFM's performance as an FRM strategy and considered the approach to be an effective method to manage floodwater. Whereas practitioners with less familiarity rationalised their support for NFM as a strategy by naming its wider benefits. These ideas demonstrate how those who were less acquainted with NFM turned to their personal experience and knowledge to form an assessment. This implies that practitioners value experiential learning and require familiarity to build trust with NFM in its own right.

Overall, this theme highlights how practitioners' valuation of NFM incorporates wider ecosystem value, not in flood risk reduction in isolation. Despite confidence in efficiency and a high regard for the approach, practitioners note that uncertainty in effectiveness arises from inadequate evaluation processes within institutions suited to engineered defences. These findings highlight a critical tension between environmental solutions and institutional frameworks and decision-making, whereby systems need to be adapted to integrate and realise the potential of NFM and wider nature-based solutions.

Theme 3 – Growing policy support but challenging governance of NFM

This theme summarises practitioners' experience of the political environment surrounding NFM and reflects how policy support and ambition appear to be growing for NFM, but that inadequate delivery mechanisms and institutional practices can hinder progress and implementation.

Participants perceived NFM as becoming more visible and more legitimate in policy, noting apparent links to wider climate change, biodiversity and sustainability legislation and targets. Participants made particular note of the relevance of NFM to the goals and ambitions of the national Flood and Coastal Erosion Risk Management (FCERM) strategies, Environment (Wales) Act 2016, the Flood and Water

Management Act (2010) and the Wellbeing of Future Generations (Wales) Act 2015. These findings support literature which highlights NFM as embedded within wider environmental policy agendas and financial investments (Vann, Marjoribanks and Chmutina, 2025; Welsh Government, 2023; Environment Agency, 2025; Wells, 2019; Bark, Martin-Ortega and Waylen, 2021; Department for Environment, Food and Rural Affairs, 2017; Louise, Williams and Hurst, 2025; Lokidor *et al.*, 2024). These results imply that practitioners view NFM legitimacy through application to wider political priorities, and not through flood risk policy alone. This may explain the positive political environment perceived by practitioners, noted as visibility through wider environmental discourse, even though unique policies specific to NFM are absent, besides ambition in national FRM strategies. Moreover, these findings highlight how policy support is viewed through investment and increasing political rhetoric, and features NFM as an institutionally viable option even though it is not fully mainstreamed in FRM policy.

Practitioners also described a clear gap between supportive policy language and practical implementation, highlighting a lack of sufficient delivery mechanisms at varying levels to effectively deliver national ambition. This strongly supports flood governance research, which emphasises how current practices, delivery mechanisms and ways of working are not aligned to deliver the multi-functional and widespread activity of NFM, denoting a critical gap between vision and reality (Wingfield *et al.*, 2021; Bernello, Mondino and Bortolini, 2022; Wells, 2019; Martin *et al.*, 2025). These arguments are specifically noted in Waylen *et al.* 2018 and Keech, Clarke, and Short (2023), which stress governance fragmentation and insufficient delivery mechanisms as hindering implementation of holistic flood risk management approaches. These findings imply that practitioners recognise that current practice is insufficient to effectively facilitate NFM implementation. These findings are noted by other professional groups and highlight the apparent policy-practice gap as a particular issue for wider NFM delivery.

In addition, participants noted how support for NFM is politically contingent and financially unstable, emphasising how continued support for the approach in the future is unpredictable. Practitioners noted how the reactive nature of policy support creates uncertainty for the future of NFM and that the short-termism of support may negatively affect the long-term timescale required for ecological approaches. These

views are consistent with wider governance literature, which describes how environmental approaches are often undermined by fixed-term resources, short-term political interest and a reactive political environment (Wells *et al.*, 2020; Zarei and Shahab, 2025; Raska *et al.*, 2022; Zhou *et al.*, 2024). Seddon *et al.* (2020) and Waylen *et al.* (2018) both summarise how securing extended resources to fit the long-term perspective of NFM is one of the main constraints for widespread adoption. These results indicate how practitioners and wider stakeholders perceive NFM as existing within a reactive, short-term political and financial system. And although NFM is generally supported, the lack of long-term security may inadvertently reinforce the reliance on conventional engineering approaches and erode stakeholders' trust in natural flood management.

Overall, this theme highlights how NFM is perceived as prominent in current policy through its application to wider policy agendas and targets. However, institutional inertia and the short-term nature of resources constrain further uptake and demonstrate added difficulty in moving towards an integrated flood risk management approach.

Theme 4 – Perceived benefits and challenges to NFM implementation

This theme reveals how practitioners perceive NFM not only as a multi-functional option, but one that has multiple benefits, particularly environmental and social benefits. While these are viewed positively, practitioners also revealed how challenges relating to land use and ownership, land availability and public perceptions can provide particular barriers to wider NFM implementation.

Participants emphasised the broader environmental and social benefits associated with NFM as a rationale for their positive regard for the approach, naming biodiversity gain, climate resilience and improved amenity and community wellbeing as key benefits of NFM. This is widely consistent with stakeholder perception and environmental practice research, which highlights a link between positive perception and multi-beneficial opportunities observed across all stakeholder groups (Anderson and Renaud, 2021; Morris and Tippet, 2024; Ferreira, 2021; D'Souza, Johnson and Ives, 2021; Wells, 2019). Seddon *et al.* (2020) and Bark, Martin-Ortega, and Waylen (2021) explicitly support these findings and found that the value for nature-based solutions and NFM rises when wider benefits are considered. These results suggest

that NFM is perceived by practitioners as a holistic environmental approach that can be implemented for numerous reasons and contribute to several political goals. Moreover, it suggests that NFM support is not weak, but that the benefits and opportunities for NFM have not yet been fully realised.

Participants identified issues with land ownership, competing land use and site suitability as major implementation barriers, emphasising how these hard constraints can limit land availability and feasibility for NFM schemes to be delivered. These findings strongly align with existing research, which highlights how physical, land-based constraints can act as key obstacles for NFM feasibility and highlights the importance of landowner cooperation (Waylen *et al.*, 2018; Welsh Government, 2023; Christopher *et al.*, 2024; Morris and Tippet, 2024; Dadson *et al.*, 2017). These views focus on upland agricultural landscapes, which impose economic pressures on landowners to maintain existing land use (Holstead *et al.*, 2017; Raska *et al.*, 2022; Recalde Aza *et al.*, 2026; Zarei and Shahab, 2025). This implies that, while NFM can be constrained by environmental factors, socioeconomic constraints facing landowners pose a barrier to NFM adoption. Therefore, this highlights how tensions can arise between NFM and land use, which can further constrain the practicality of NFM to be delivered in suitable locations, emphasising the importance of landowner cooperation for implementation.

Additionally, practitioners also identified social barriers within professional and public groups, which hinder NFM adoption, naming misconceptions and limited awareness of the approach and preconceived preferences for visible flood defence structures as contributing to negative associations with NFM. These perspectives are mirrored in wider stakeholder perception literature, which expresses how inadequate understanding within stakeholder groups and inadequate communication can assist in misunderstandings towards NFM and amplify negative relations (Bernello, Mondino and Bortolini, 2022; Zhou *et al.*, 2024; Anderson and Renaud, 2021; Lane, 2017). Existing literature framed these issues as more prevalent in private and community stakeholder groups, but demonstrated how social barriers exist across all stakeholders. These findings imply that perception barriers reflect wider information cultures, where reduced exposure and familiarity with NFM can be linked to preferences for conventional methods (Zarei and Shahab, 2025; Waylen *et al.*, 2018; Welsh Government, 2023; Holstead *et al.*, 2017). Therefore, emphasises how

enhanced information sharing and communication can be used as tools to improve stakeholder perceptions and understanding, to build awareness and acceptance across all stakeholder groups.

While all practitioners named a range of social, practical and somewhat institutional barriers that affect the implementation of NFM, practitioners in project-delivery-based roles were more likely to cite the social and practical issues, while all practitioners generally noted institutional barriers. These views reflect how barriers named by practitioners are often specific to their roles, whereby project-delivery practitioners highlighted challenges within project implementation, and others noted wider institutional limitations that hinder NFM outside of project delivery. This implies that barriers and pressures against NFM delivery are not equally distributed among local authority members, whereby frontline staff face increased pressures for project implementation, highlighting NFM as a disproportionate strain for local authorities.

Overall, practitioners emphasise the multi-beneficial nature of NFM as a rationale for its wider support and perceived value. However, hard physical limits and social perceptions can hinder NFM implementation and lead to issues with project feasibility. Subsequently, successful implementation requires not only technical feasibility but also effective communication and stakeholder engagement, emphasising the importance of facilitating acceptance and adoption.

Theme 5 – Recommendations to improve NFM delivery and implementation

This theme summarises the recommendations practitioners identified as having the ability to improve NFM acceptance, uptake and implementation, based upon the barriers identified in the previous theme. Whereby, practitioners noted improved communication and engagement within the public, improved professional capacity, education and collaboration within expert groups and wider institutional capacity, resource and improved long-term strategic planning as methods to improve NFM practice and implementation.

Participants emphasised the need for stronger collaboration across departments and organisations involved in NFM delivery to streamline the multi-disciplinary work of natural flood management, particularly within professional groups. This argument is supported by wider governance research, which summarises how negative

interactions and silo working between crucial actors can hinder implementation, calling for improved collaboration and cross-departmental working to better deliver the multi-functional features of NFM (Welsh Government, 2023; Wells, 2019; Wren *et al.*, 2022; Giordano *et al.*, 2020). Practitioners emphasise this need for collaborative working within expert organisations, but wider literature stresses better collaborative working across all actors (Department for Environment, Food and Rural Affairs, 2017; Zhou *et al.*, 2024; Wingfield *et al.*, 2021; Santoro *et al.*, 2019). Nevertheless, a recurring theme is that weak coordination is seen as a main challenge for NFM implementation, which requires attention (Waylen *et al.* 2018). These findings reveal how NFM is regarded as a multi-team responsibility which requires institutional integration and improved collaborative working across teams such as flood defence, environmental management, land use planning and conservation. This implies a wider argument that NFM requires institutional reorganisation and improved governance to better enable interdepartmental working, but in the meantime, requires better joint-up working between relevant parties.

Participants also identified gaps in specialist knowledge and education, especially among engineers and contractors, highlighting institutional partiality for conventional flood engineering and a critical absence of NFM in professional education, training and qualifications. These findings reflect results in wider research, which displays how practice is shaped by stakeholders' foundations (Anderson *et al.*, 2022; Recalde Aza *et al.*, 2026; Martin *et al.*, 2025; Wells, 2019; Ferreira, 2021; Department for Environment, Food and Rural Affairs, 2017). Results reveal how current institutions inadvertently reinforce society's predisposition to hard-engineered defences through the lack of inclusion of nature-based solutions and NFM in education, particularly for expert fields directly involved in NFM implementation. Morris and Tippet (2024) summarise this argument, where negative perceptions of NFM within professional parties were found to be directly linked to a lack of schooling specific to NFM and subsequent principles. Therefore, these results suggest how social barriers and implementation issues from within the professional stakeholder group may be formed through a lack of professional education and a hard engineering workforce culture. This, therefore, strengthens the recommendation for institutional change to build capacity within the practitioner workforce to improve knowledge, skillset and affinity

with NFM practices, to improve the competence of professional actors to advise and implement NFM.

Additionally, practitioners also recommended better public engagement and clearer communication with the public and community groups as a way to improve public acceptance by raising awareness of how NFM works and demonstrating its wider benefits to local communities to address public misconceptions. These recommendations are consistent with wider stakeholder research, which expresses that improving public acceptance is directly linked to communicating NFM to local members to improve public understanding (Chiu, Raina and Chen, 2021; Wells *et al.*, 2020; Wingfield *et al.*, 2021; Magnusson and Marecek, 2015; Christopher *et al.*, 2024). These results imply that, as support is linked to knowledge, to truly improve the legitimacy of NFM within the public eye, effective engagement is required. Effective engagement includes productive conversations with local stakeholders and early and long-term engagement to involve members in decision-making processes to build trust and foster acceptance. Therefore, these results express how practitioners recognise public parties as key stakeholders within NFM delivery and emphasise how effective engagement requires educating the public and improving stakeholder understanding, which is crucial to enabling wider adoption and delivery of NFM through better public relations.

Lastly, participants argued that NFM progress is limited within current practices and institutions, and called for greater staff capacity, stable funding, incentives to support local landowners and long-term strategic planning to secure resources and interest for NFM in the future. These recommendations for more sustained resources are strongly supported by NFM practice literature, which stresses the need for organisational change to secure resources to enable the long-term delivery of NFM (Zhou *et al.*, 2024; Anderson and Renaud, 2021; Waylen *et al.*, 2018; Wingfield *et al.*, 2021). Recommendations highlight the demand for fixed resources as tools to improve the capacity and ability of local stakeholders to deliver NFM, and stress that short-term project cycles and investment terms pose significant challenges to achieve the delivery ambitions for NFM (Anderson and Renaud, 2021; Raska *et al.*, 2022; Department for Environment Food and Rural Affairs, 2017; Wells *et al.*, 2020, Holstead *et al.*, 2017).

Research also highlights how the lack of public funding and grant availability for private landowners inhibits wider roll-out and uptake of NFM, thereby calling for financial incentives to address the financial strain of implementing NFM for private landowners (Department for Environment, Food and Rural Affairs, 2017; Wells *et al.*, 2020; Holstead *et al.*, 2017). These results show how practitioners view NFM as being currently undermined by institutional and financial systems, emphasising that NFM requires holistic, long-term resource management and endorsement. Moreover, long-term strategic planning and investment are highlighted as a way to alleviate the pressures of political and financial instability within flood risk governance. Generally, recommendations to improve NFM practice address issues identified within current reactive governance systems but reflect wider challenges that threaten the advancement of nature-based solutions and wider environment-friendly approaches.

While all practitioners listed improved education and awareness across stakeholder groups as enablers for NFM, improved collaboration and capacity building between stakeholders, and financial incentives for local landowners were only recommended by a niche group of project-based practitioners who expressed familiarity with multi-agency delivery. Additionally, the majority of this niche group also described experience with agricultural practices and the farming community. These findings imply that subjective backgrounds help to inform decision-making and practice, signifying that practitioners' views are inherently based upon lived experiences and that perspectives reflect practitioners' individual history outside of their professional duties.

Overall, this theme summarises the challenges identified by practitioners for NFM delivery and highlights the short- medium term and long-term changes required to improve general environmental management practice for NFM. Improved collaboration, communication, education and secure resources were all highlighted as enablers for improved NFM practice and emphasise the importance of integration of NFM across agencies, education and wider to improve NFM adoption and assimilate NFM into mainstream flood risk management action.

Limitations

While the findings of this study are convergent with research in wider academic literature, limitations must be acknowledged when interpreting the findings of this research.

Firstly, the study comprises a small participant sample from a single local authority in Wales. While this is an appropriate sample size for the followed methodology, it must be noted that generalisability for other authorities and institutional contexts is limited. Moreover, as the sample focuses on a single authority, findings may differ across organisations and other regions of the UK.

Secondly, as with the interpretative nature of qualitative research, findings are influenced by the researcher within the double hermeneutic approach. However, the influence of the researcher was minimised through reflexive strategies and member checking, and results have been solely interpreted through participants' words and voices.

Lastly, the use of artificial intelligence software to support the early stages of data analysis coding produces potential limitations in terms of accuracy, bias and limited contextualisation. Therefore, to negate these issues, manual validation of outputs and audit trails was used to mitigate the prevalence of inaccuracies.

Summary

Across all themes, findings illustrate general compatibility between practitioners' perspectives and views within wider literature, but address a distinct gap within academic research by voicing the opinions of local authority practitioners.

Generally, practitioners displayed strong conceptual acceptance and understanding of the principles of NFM and viewed the approach as a nature-forward, sustainable approach to flood risk management. Practitioners also expressed confidence in NFM's ability to reduce flood risk and presented NFM as a solution to wider societal issues, with its multifunctionality and numerous benefits, as providing additional rationale for the value of the approach. Moreover, current political landscapes are perceived as being committed to NFM and praise the approach for such advantages through increased policy rhetoric, ambition and financial support. However, this support and embrace for NFM fails to be translated into practical, delivered

schemes, resulting in a significant policy-practice and implementation gap that is perceived by practitioners.

Critically, practitioners perceive current systems, cultures and frameworks as limiting NFM's implementation through its intrinsic bias towards conventional engineering methods. Evaluation systems, delivery mechanisms and general governance are ill-suited for NFM's long-term approach, where its reactive and short-term focus nature limits the strategic delivery of NFM. Additionally, while hard, environmentally-based constraints exist, the lack of communication and general understanding is viewed as particularly challenging for NFM, through its ability to influence acceptance, trust and adoption of NFM across and within stakeholder groups. Overall, practitioners describe the key challenge of NFM as institutional and somewhat social, highlighting tensions between NFM and reactive governance systems.

Consequently, practitioners recommend improved collaboration, education, and communication of NFM and its benefits across all stakeholder groups to address social misconceptions and improve professional capacity for NFM to be delivered as a cross-departmental approach. Moreover, long-term proposals call for institutional and structural reforms to secure stable and long-standing resources to build capacity and deliver NFM schemes in the future.

Overall, results demonstrate how practitioners' views and opinions are founded in their professional experience, exposure and personal dispositions, and that their regard for NFM as a favourable approach to flood risk management is based upon their lived experiences, familiarity and professional knowledge. Moreover, this research supports the argument that NFM is recognised as a paradigm shift in FRM, which calls for a systematic shift in governance to reflect a proactive, holistic attitude. While this study reflects the views of local authority practitioners from a Welsh local authority, research suggests that the findings do not sit in isolation and may reflect wider discourse regarding environmental governance and institutional practice.

Therefore, future research is required to determine if the views in this study are replicated by other local authorities in Wales and across the UK region, and to study practitioners in a much larger sample. Moreover, future studies should consider sampling more participants in Wales from across stakeholder groups to determine if previous studies across the UK hold similar findings. Lastly, research utilising the

mixed-methods methodology could be used to determine the generalisability of the results from this study, while an action research study could be undertaken to investigate the policy-practice gap perceived by practitioners to determine whether recommendations made by participants hold any value for practice.

Conclusion

This study aimed to explore local authority practitioners' perceptions and experiences of natural flood management (NFM) within a Welsh local authority. This research is necessary to address gaps in stakeholder literature and the underrepresentation of Welsh local authority practitioners. Moreover, local authority practitioners must be understood as key facilitators of NFM delivery to identify enabling opportunities and concerning barriers of professional actors to improve NFM practice and implementation.

Practitioners presented a strong conceptual understanding and support for the approach, viewing NFM as a holistic, catchment-based approach which utilises nature and the surrounding environment to reduce flood risk through restoring hydrological processes. While practitioners recognised NFM as lacking a universal definition, NFM was understood as a paradigm shift in flood risk management (FRM) philosophy. Additionally, practitioners regarded NFM as a reframing of existing environmental management practices rather than as a completely new concept. Overall, these conceptions were grounded in professional experience and reflected practitioners' roles within the local authority.

Practitioners also viewed NFM as a generally effective FRM strategy, with the majority of practitioners expressing a high confidence in the approach, noting how the catchment-scale approach and addressing flood risk from the source are a more efficient approach for FRM. It was prefaced that the performance of NFM is very much context-dependent, and that the approach cannot fully replace conventional engineered approaches, particularly in urban areas. Practitioners rationalised their high value of NFM by listing the multiple functions and benefits associated with NFM, and regarded these additional perks as specific reasons for their support. However, practitioners highlighted how tensions exist between NFM's effectiveness and benefits with current institutional systems. They emphasised how the disparity between flood evaluation frameworks and NFM's approach leads to uncertainty and lack of trust despite evidence existing and perceived support.

Practitioners also noted how NFM appears to be more visible and present in policy and environmental agendas, but recognised that implementation did not reflect the policy support. Implementation of NFM was perceived as lacking due to weak

delivery systems, fragmented governance and short-term project and funding cycles. Therefore, while noting the increasing rhetoric of NFM in policy, delivery systems were acknowledged as hindering progress and wider delivery of NFM.

Practitioners also framed implementation of a challenge for NFM and expressed barriers to deliver schemes as being physical, social and institutional. Physically, land availability, suitability and ownership are seen as barriers to NFM feasibility. Socially, misunderstanding and lack of awareness of natural flood management and preconceived biases for conventional techniques were seen as barriers for NFM acceptance and adoption, noted across all stakeholder groups. And lastly, institutionally, short-term, reactive political interest and financial investment were seen as barriers to NFM practice and long-term progress. While social and physical barriers were noted by practitioners within implementation-based roles, institutional barriers were named by all.

Practitioners made recommendations for NFM practice and implementation that mostly reflected the social and institutional barriers mentioned above. Whereby, practitioners generally call for improved collaboration between stakeholders, improved education and specialist capacity regarding NFM and its design, better public engagement and communication with local stakeholders and sustained resources to enable the long-term, continued progress for NFM.

Overall, findings expressed how practitioners are not resistant to NFM but are generally highly supportive and informed regarding the approach. Views reflect the subjective experiences and roles of each individual, and emphasise how lived experiences of NFM and similar practices help form stakeholder perceptions of the approach. Whereby overall, practitioners highlight how issues facing NFM are not necessarily conceptual, but are institutional, political and social in nature.

Findings highlight the need for institutional and structural change to better support the practice and implementation of NFM, and emphasise the need to understand and incorporate stakeholders' views in decision-making and organisational changes to improve the quality and coherence of NFM practice.

Therefore, future research could look to extend the study sample to wider local authorities and wider geographical areas to improve the generalisability of results and determine whether enablers and barriers faced by practitioners in this local

authority reflect those from wider circles. Moreover, comparative studies across different stakeholder groups would be useful to explore differences in perspectives and priorities. Additionally, combining qualitative and quantitative methods for a mixed-methods study may be useful to support stakeholder perspectives with measurable outcomes.

In conclusion, NFM is widely supported and understood by practitioners, but is viewed as systematically constrained by current governance and institutions. Therefore, the transition to sustainable flood risk management, according to practitioners, requires institutional reform to support NFM as a long-term approach and commitment. Finally, NFM is viewed as having clear promise but requires aligned governance, policy and practice to achieve its full potential as a future flood risk management strategy.

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Appendices

Appendix A: A copy of the ethics approval form submitted to and approved by UWTSD ethics committee.

APPLICATION FOR ETHICAL APPROVAL

RESEARCH STUDENTS

This form is to be completed by the student within **SIX** months for full-time students and **TWELVE** months for part time students, after the commencement of the research degree or following progression to Part Two of your course.

Once complete, submit this form via the **MyTSD Doctoral College Portal** at (<https://mytsd.uwtsd.ac.uk>).

This document is also available in Welsh.

RESEARCH STAFF ONLY

All communications relating to this application during its processing must be in writing and emailed to pgresearch@uwtsd.ac.uk, with the title 'Ethical Approval' followed by your name.

STUDENTS ON UNDERGRADUATE OR TAUGHT MASTERS PROGRAMMES should submit this form (and receive the outcome) via systems explained to you by the supervisor/module leader.

In order for research to result in benefit and minimise risk of harm, it must be conducted ethically. A researcher may not be covered by the University's insurance if ethical approval has not been obtained prior to commencement.

The University follows the OECD Frascati manual definition of **research activity**: "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications". As such this covers activities undertaken by members of staff, postgraduate research students, and both taught postgraduate and undergraduate students working on dissertations/projects.

The individual undertaking the research activity is known as the "principal researcher".

Ethical approval is not required for routine audits, performance reviews, quality assurance studies, testing within normal educational requirements, and literary or artistic criticism.

Please read the notes for guidance before completing ALL sections of the form.

This form must be completed and approved prior to undertaking any research activity. Please see Checklist for details of process for different categories of application.

SECTION A: About You (Principal Researcher)

1	Full Name:	Casey Colcombe			
2	Tick all boxes that apply:	Member of staff:	☐	Honorary research fellow:	☐
	Undergraduate Student	☐	Taught Postgraduate Student	☒	Postgraduate Research Student
					☐

3	Institute/Academic Discipline/Centre:	W. I. S. A.
4	Campus:	SA1
5	E-mail address:	2318518@student.uwtsd.ac.uk
6	Contact Telephone Number:	07449 478275
For students:		
7	Student Number:	2318518
8	Programme of Study:	MSc Environmental Conservation and Management
9	Director of Studies/Supervisor:	Dr Deborah Hughes

SECTION B: Approval for Research Activity

1	Has the research activity received approval in principle? (please check the Guidance Notes as to the appropriate approval process for different levels of research by different categories of individual)	YES	☒	NO	☐
					Date
2	If Yes, please indicate source of approval (and date where known): Approval in principle must be obtained from the relevant source prior to seeking ethical approval	Research Degrees Committee	☐		
Institute Research Committee		☐			
Other (write in)		☒			

SECTION C: Internal and External Ethical Guidance Materials

	Please list the core ethical guidance documents that have been referred to during the completion of this form (including any discipline-specific codes of research ethics, location-specific codes of research ethics, and also any specific ethical guidance relating to the proposed methodology). Please tick to confirm that your research proposal adheres to these codes and guidelines. You may add rows to this table if needed.	
1	UWTSD Research Ethics & Integrity Code of Practice	☒
2	UWTSD Research Data Management Policy	☒
3	<i>[List any other relevant documents here]</i>	☐

SECTION D: External Collaborative Research Activity

If there are external collaborators then you should gain consent from the contact persons to share their personal data with the university. If there are no external collaborators then leave this section blank and continue to section E.

1	Institution	
2	Contact person name	
3	Contact person e-mail address	

4	Is your research externally funded?		YES	☐	NO	☐
5	Are you in receipt of a KESS scholarship?		YES	☐	NO	☐
6	Are you specifically employed to undertake this research in either a paid or voluntary capacity?	Voluntary	YES	☐	NO	☐
7		Employed	YES	☐	NO	☐
8	Is the research being undertaken within an existing UWTSD Athrofa Professional Learning Partnership (APLP)?	If YES then the permission question below does not need to be answered.	YES	☐	NO	☐
9	Has permission to undertake the research has been provided by the partner organisation?	(If YES attach copy) If NO the application cannot continue	YES	☐	NO	☐

Where research activity is carried out in collaboration with an external organisation

10	Does this organisation have its own ethics approval system?	YES	☐	NO	☐
	If Yes, please attach a copy of any final approval (or interim approval) from the organisation (this may be a copy of an email if appropriate).				

SECTION E: Details of Research Activity

1	Indicative title:	Exploring Local Authority Practitioners' Perceptions and Attitudes Towards Natural Flood Management			
2	Proposed start date:	1 st June 2025	Proposed end date:	1 st April 2026	
	Introduction to the Research (maximum 300 words per section) Ensure that you write for a <u>Non-Specialist Audience</u> when outlining your response to the points below: • <i>Purpose of Research Activity</i> • <i>Proposed Research Question</i> • <i>Aims of Research Activity</i> • <i>Objectives of Research Activity</i> Demonstrate, briefly, how <u>Existing Research</u> has informed the proposed activity and explain • <i>What the research activity will add to the body of knowledge</i> • <i>How it addresses an area of importance.</i>				
3	Purpose of Research Activity The purpose of my research will be to explore the perspectives of local authority members on natural flood management, a more climate-resilient flood risk management strategy that mimics and enhances natural processes to reduce flood risk. By understanding local authority members' perceptions and attitudes to different aspects of natural flood management, valuable insights into the perceived and experienced barriers to implementation and potential opportunities can be gained. These insights can then be used to				

	provide recommendations to improve the process in a professional setting and enhance delivery on a local scale. These suggestions can be used to inform policy, improve stakeholder acceptance and engagement and provide the basis for future research, continuing to address the critical research gap of understanding professional practitioners' perspectives – and promoting future research to be conducted in Wales, where such efforts are currently and particularly lacking. (this box should expand as you type)
4	Research Question How do local authority members' perceive natural flood management? Although studies have been done to explore professional and non-professional stakeholder perspectives, limited studies have focused on practitioner perceptions, with even fewer focusing on local authority members' views. Therefore, my research questions aims to address this research gap by exploring the perspectives of natural flood management among local authority members. (this box should expand as you type)
5	Aims of Research Activity The aim of the proposed research is to explore local authority members' perceptions and attitudes regarding natural flood management. (this box should expand as you type)
6	Objectives of Research Activity To achieve the aim above, five objectives are proposed. These are: 1) Understand stakeholders' definitions and understanding of natural flood management and its principles 2) Understand practitioners' attitudes towards natural flood management as a flood risk management strategy 3) Understand practitioners' attitudes towards policy support for natural flood management. 4) Identify the perceived benefits and challenges of natural flood management implementation 5) Recommend improvements to enhance local natural flood management implementation. (this box should expand as you type)
	Proposed methods (maximum 600 words) Provide a brief summary of all the methods that may be used in the research activity, making it clear what specific techniques may be used. If methods other than those listed in this section are deemed appropriate later, additional ethical approval for those methods will be needed. You do not need to justify the methods here, but should instead describe how you intend to collect the data necessary for you to complete your project.
7	An inductive qualitative research design will be used to explore local authority members' perceptions and attitudes towards natural flood management. This approach is better suited to investigating the practitioners' subjective interpretations of natural flood management and provides flexibility to collect rich, subjective data. An inductive approach will enable patterns and themes to emerge from the data and allow

	a deeper understanding of natural flood management perspectives among the participants. As this study focuses on the subjective knowledge and experience of natural flood management, an epistemological interpretivist stance was taken, following the theory that knowledge is subjective. This stance is suited to the concept that natural flood management perspectives will vary between individuals and depend on various socially constructed factors. Interpretive phenomenology was chosen as it aims to focus on understanding lived experience and the subjective meaning given to it by individuals, suiting the aim and objectives of this research. The research approach chosen for this study is interpretive phenomenological analysis (IPA). This qualitative research approach explores how individuals perceive and make sense of specific experiences and phenomena. Therefore, it is suited to exploring practitioners' perceptions of natural flood management. The IPA strategy requires the researcher to focus on individual subjective meanings before seeking a broader generalisation across a group to provide detailed interpretations and a deep understanding of stakeholder perceptions. Semi-structured interviews were chosen to collect qualitative data for this research. Interviews are better suited to qualitative research, particularly under the IPA approach, as they use visual and non-verbal cues in addition to the verbal responses given by the participant, allowing for a richer collection of data. This format was chosen as it enables participants to express complex and specific views while answering the main objectives. This structure will support the exploration of views and allow detailed insights to be gathered. There are 10 questions prepared for the interviews, with each research objective having a related two research questions. These open-ended questions will allow for in-depth discussions and deeper exploration of the participants' subjective perspective. Interviews will be audio-recorded and transcribed for future analysis as soon as possible after completion. To accompany the semi-structured interviews and the IPA approach, thematic coding analysis of each transcript will be undertaken. This will identify the 'essences' of each perspective and highlight key themes and patterns within participants' responses. Once every participant's transcript is analysed, the group of participants will be compared to highlight unique and nuanced experiences and shared perspectives and opinions regarding aspects of natural flood management. To select participants for the sample and invite them to partake in the research, purposive sampling has been selected to choose potential participants based on the criteria of having an involvement, awareness or understanding of natural flood management. Participants will be selected from a single Welsh Local Authority, utilising existing professional networks to approach individuals and invite them to the study. Written consent will be obtained before commencement of the research. (this box should expand as you type)
	Location of research activity Identify all locations where research activity will take place.
8	The research will be based on practitioners' views from a local authority in Wales, Carmarthenshire County Council. Depending on participants' preference and availability, the research will be conducted online or in person. In-person meetings will be held in a private meeting room in a central office space.

	(this box should expand as you type)
	Research activity outside of the UK If research activity will take place overseas, you are responsible for ensuring that local ethical considerations are complied with and that the relevant permissions are sought. Specify any local guidelines (e.g. from local professional associations/learned societies/universities) that exist and whether these involve any ethical stipulations beyond those usual in the UK (provide details of any licenses or permissions required). Also specify whether there are any specific ethical issues raised by the local context in which the research activity is taking place, for example, particular cultural and/or legal sensitivities or vulnerabilities of participants. If you live in the country where you will do the research then please state this.
9	(this box should expand as you type)

10	Use of documentation not in the public domain: Are any documents NOT publicly available?	NO	☒
		YES	☒
11	If Yes, please provide details here of how you will gain access to specific documentation that is not in the public domain and that this is in accordance with the current data protection law of the country in question and that of England and Wales. (this box should expand as you type)		

	Does your research relate to one or more of the seven aims of the Well-being of Future Generations (Wales) Act 2015?	YES	NO
12	A prosperous Wales	☐	☒
13	A resilient Wales	☒	☐
14	A healthier Wales	☒	☐
15	A more equal Wales	☐	☒
16	A Wales of cohesive communities	☒	☐
17	A Wales of vibrant culture and thriving Welsh language	☐	☒
18	A globally responsible Wales	☒	☐
19	If YES to any of the above, please give details:		
	As the research aims to provide recommendations to inform policy to support nature-based solutions, the work could contribute to a more ecological and climate-resilient Wales by supporting biodiversity and enhancing, promoting, and protecting natural processes and habitats. Additionally, by identifying perceived barriers and challenges within natural flood management implementation and providing solutions to these barriers, informed policies could accelerate and improve natural flood management implementation, providing a better work environment for practitioners but also providing amenity value within natural flood management schemes, improving physical and mental well-being. By improving natural flood management implementation, which is an over-arching ambition for this study, schemes across Wales could contribute more substantially towards our nature and climate emergency		

	targets by delivering nature based approaches that provide multiple benefits through natural flood management. Additionally, research into practitioners views can provide insightful opportunities towards community engagement, fostering a hope of a more cohesive and empowered community. (this box should expand as you type)
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SECTION F: Scope of Research Activity

	Will the research activity include:	YES	NO
1	Use of a questionnaire or similar research instrument?	☐	☒
2	Use of interviews?	☒	☐
3	Use of focus groups?	☐	☒
4	Use of participant diaries?	☐	☒
5	Use of video or audio recording?	☒	☐
6	Use of computer-generated log files?	☐	☒
7	Participant observation with their knowledge?	☐	☒
8	Participant observation without their knowledge?	☐	☒
9	Access to personal or confidential information without the participants' specific consent?	☐	☒
10	Administration of any questions, test stimuli, presentation that may be experienced as physically, mentally or emotionally harmful / offensive?	☐	☒
11	Performance of any acts which may cause embarrassment or affect self-esteem?	☐	☒
12	Investigation of participants involved in illegal activities?	☐	☒
13	Use of procedures that involve deception?	☐	☒
14	Administration of any substance, agent or placebo?	☐	☒
15	Working with live vertebrate animals?	☐	☒
16	Procedures that may have a negative impact on the environment?	☐	☒
17	Other primary data collection methods. Please indicate the type of data collection method(s) below.	☐	☒
	Details of any other primary data collection method: (this box should expand as you type)		

If NO to every question, then the research activity is (ethically) low risk and **may** be exempt from **some** of the following sections (please refer to Guidance Notes).

If YES to any question, then no research activity should be undertaken until full ethical approval has been obtained.

SECTION G: Intended Participants

If there are no participants then do not complete this section, but go directly to section H.

	Who are the intended participants:	YES	NO
1	Students or staff at the University?	☐	☒
2	Adults (over the age of 18 and competent to give consent)?	☒	☐
3	Vulnerable adults?	☐	☒
4	Children and Young People under the age of 18? (Consent from Parent, Carer or Guardian will be required)	☐	☒
5	Prisoners?	☐	☒
6	Young offenders?	☐	☒
7	Those who could be considered to have a particularly dependent relationship with the investigator or a gatekeeper?	☐	☒
8	People engaged in illegal activities?	☐	☒
9	Others. Please indicate the participants below, and specifically any group who may be unable to give consent.		
	Details of any other participant groups:	☐	☒
	(this box should expand as you type)		

	Participant numbers and source Provide an estimate of the expected number of participants. How will you identify participants and how will they be recruited?	
10	How many participants are expected?	10-20 participants will be expected to take part in the research. (this box should expand as you type)
11	Who will the participants be?	The participants will be local authority practitioners from a single Welsh Local Authority – Carmarthenshire County Council. Participants will include practitioners in the general Flood, Ecology and Environmental sectors. (this box should expand as you type)
12	How will you identify the participants?	Participants will be selected based on a purposive sampling strategy to identify potential subjects who are aware of or involved in natural flood management implementation. Participants will be approached and invited to participate in the study. Existing professional networks will be used to contact potential participants. (this box should expand as you type)

	Information for participants:	YES	NO	N/A
13	Will you describe the main research procedures to participants in advance, so that they are informed about what to expect?	☒	☐	☐
14	Will you tell participants that their participation is voluntary?	☒	☐	☐
15	Will you obtain written consent for participation?	☒	☐	☐

16	Will you explain to participants that refusal to participate in the research will not affect their treatment or education (if relevant)?	☒	☐	☐
17	If the research is observational, will you ask participants for their consent to being observed?	☒	☐	☐
18	Will you tell participants that they may withdraw from the research at any time and for any reason?	☒	☐	☐
19	With questionnaires, will you give participants the option of omitting questions they do not want to answer?	☐	☐	☒
20	Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	☒	☐	☐
21	Will you debrief participants at the end of their participation, in a way appropriate to the type of research undertaken?	☒	☐	☐
22	If NO to any of above questions, please give an explanation			
<i>(this box should expand as you type)</i>				

	Information for participants:	YES	NO	N/A
24	Will participants be paid?	☐	☒	☐
25	Is specialist electrical or other equipment to be used with participants?	☐	☒	☐
26	Are there any financial or other interests to the investigator or University arising from this study?	☐	☒	☐
27	Will the research activity involve deliberately misleading participants in any way, or the partial or full concealment of the specific study aims?	☐	☒	☐
28	If YES to any question, please provide full details			
<i>(this box should expand as you type)</i>				

SECTION H: Anticipated Risks

Outline any anticipated risks that may adversely affect any of the participants, the researchers and/or the University, and the steps that will be taken to address them. If you have completed a full risk assessment (for example as required by a laboratory, or external research collaborator) you may append that to this form.							
1	Full risk assessment completed and appended?		<table border="1"> <tr> <td>Yes</td> <td>☐</td> </tr> <tr> <td>No</td> <td>☒</td> </tr> </table>	Yes	☐	No	☒
Yes	☐						
No	☒						
2	Risks to participants For example: sector-specific health & safety, emotional distress, financial disclosure, physical harm, transfer of personal data, sensitive organisational information						
	Risk to participants: Participants may inadvertently disclose identifying or organisational specific information or even provide critical comments regarding sensitive organisational information.	How you will mitigate the risk to participants Informed written consent from participants will be obtained before commencement of the study stating aims of the research, its purpose, the participants rights to participate but also withdraw at any time, and their right to confidentiality and protection.					

	(this box should expand as you type)	All identifying information will be pseudonymised, and participants and the organisation they work for will be kept confidential. Any information relating to their department, organisation or local area will be screened to remove any identifiable information. Transcripts and interpretation will be reviewed with the participant to ensure accurate representation and to ensure confidentiality is maintained. All information will be stored securely on protected systems with password security. (this box should expand as you type)
3	If research activity may include sensitive, embarrassing or upsetting topics (e.g. sexual activity, drug use) or issues likely to disclose information requiring further action (e.g. criminal activity), give details of the procedures to deal with these issues, including any support/advice (e.g. helpline numbers) to be offered to participants. Note that where applicable, consent procedures should make it clear that if something potentially or actually illegal is discovered in the course of a project, it may need to be disclosed to the proper authorities	
	(this box should expand as you type)	
4	Risks to the investigator For example: personal health & safety, physical harm, emotional distress, risk of accusation of harm/impropriety, conflict of interest	
	Risk to the investigator: Potential conflict of interest as I work within the same organisation. (this box should expand as you type)	How you will mitigate the risk to the investigator: Participants will be informed of the nature of the study before participation commences and will be required to give written consent to participate in the research to explore practitioner perspectives towards natural flood management. Furthermore, any views I have will be bracketed from the data, and all transcripts and analyses will be reviewed with the relevant participant to ensure an accurate representation of the data and to confirm that the interpretations are based solely on the participants' responses. (this box should expand as you type)
5	University/institutional risks For example: adverse publicity, financial loss, data protection	
	Risk to the University: N/A (this box should expand as you type)	How you will mitigate the risk to the University: (this box should expand as you type)
6	Environmental risks For example: accidental spillage of pollutants, damage to local ecosystems	
	Risk to the environment:	How you will mitigate the risk to environment:

	N/A	
	<i>(this box should expand as you type)</i>	<i>(this box should expand as you type)</i>

	Disclosure and Barring Service			
	If the research activity involves children or vulnerable adults, a Disclosure and Barring Service (DBS) certificate must be obtained before any contact with such participants.	YES	NO	N/A
7	Does your research require you to hold a current DBS Certificate?	☐	☒	☐
8	If YES, please give the certificate number. If the certificate number is not available please write "Pending"; in this case any ethical approval will be subject to providing the appropriate certificate number.			

SECTION I: Feedback, Consent and Confidentiality

1	Feedback What de-briefing and feedback will be provided to participants, how will this be done and when?
	Transcripts with the initial analysis and interpretations of the interviews will be returned to the participants at another meeting, which will be organised with the participants. Participants will then review the analysis to ensure accurate interpretation and representation of responses. Participants will be able to view copies of the final dissertation after completion and marking has been permitted. <i>(this box should expand as you type)</i>
2	Informed consent Describe the arrangements to inform potential participants, before providing consent, of what is involved in participating. Describe the arrangements for participants to provide full consent before data collection begins. If gaining consent in this way is inappropriate, explain how consent will be obtained and recorded in accordance with prevailing data protection legislation.
	Participants will be approached before the commencement of the study to invite them to participate in the research. Participants will be informed of the nature, purpose and aim of the research and will be asked to sign a written consent form. The consent form will outline the study's purpose, aim, and methodology, and outline the participants' right to participate and withdraw at any time, their right to confidentiality, and to remain anonymous. The consent form will also outline the measures taken to store data gained within the study according to data protection legislation. Participants will also be given time to ask questions about their participation in the study. Written consent must be obtained before data collection can begin. <i>(this box should expand as you type)</i>
3	Confidentiality / Anonymity Set out how anonymity of participants and confidentiality will be ensured in any outputs. If anonymity is not being offered, explain why this is the case.
	All identifying features of the participant, their organisation and locality of the participants will be pseudonymised and kept confidential. Dates of interviews, meetings, responses and communications will be kept confidential. Data will be stored securely according to data protection legislation, and no personal data will be kept, recorded or shared throughout the study.

	(this box should expand as you type)
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SECTION J: Data Protection and Storage

	Does the research activity involve personal data (as defined by the General Data Protection Regulation 2016 “GDPR” and the Data Protection Act 2018 “DPA”)?	YES	NO
1	“Personal data” means any information relating to an identified or identifiable natural person (‘data subject’). An identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person. Any video or audio recordings of participants is considered to be personal data.	☐	☒
	If YES, provide a description of the data and explain why this data needs to be collected:		
2	(this box should expand as you type)		
	Does it involve special category data (as defined by the GDPR)?	YES	NO
3	“Special category data” means sensitive personal data consisting of information as to the data subjects’ – (a) racial or ethnic origin, (b) political opinions, (c) religious beliefs or other beliefs of a similar nature, (d) membership of a trade union (within the meaning of the Trade Union and Labour Relations (Consolidation) Act 1992), (e) physical or mental health or condition, (f) sexual life, (g) genetics, (h) biometric data (as used for ID purposes),	☐	☒
	If YES, provide a description of the special category data and explain why this data needs to be collected:		
4	(this box should expand as you type)		
	Will data from the research activity (collected data, drafts of the thesis, or materials for publication) be stored in any of the following ways?	YES	NO
5	Manual files (i.e. in paper form)?	☒	☐
6	University computers?	☐	☒
7	Private company computers?	☐	☒
8	Home or other personal computers?	☒	☐
9	Laptop computers/ CDs/ Portable disk-drives/ memory sticks?	☐	☒
10	“Cloud” storage or websites?	☒	☐
11	Other – specify:	☐	☒

12	For all stored data, explain the measures in place to ensure the security of the data collected, data confidentiality, including details of backup procedures, password protection, encryption, anonymisation and pseudonymisation:
	All information will be anonymised and any identifying features pseudonymised. The data will be stored in a secure location, which is password protected and uses two-factor authentication following data protection legislation and guidance.
	<i>(this box should expand as you type)</i>

	Data Protection		
	Will the research activity involve any of the following activities:	YES	NO
13	Electronic transfer of data in any form?	☐	☒
14	Sharing of data with others at the University outside of the immediate research team?	☐	☒
15	Sharing of data with other organisations?	☐	☒
16	Export of data outside the UK or importing of data from outside the UK?	☐	☒
17	Use of personal addresses, postcodes, faxes, emails or telephone numbers?	☐	☒
18	Publication of data that might allow identification of individuals?	☐	☒
19	Use of data management system?	☐	☒
20	Data archiving?	☐	☒
21	If YES to any question, please provide full details, explaining how this will be conducted in accordance with the GDPR and Data Protection Act (2018) (and any international equivalents, where appropriate):		
	<i>(this box should expand as you type)</i>		
22	List all who will have access to the data generated by the research activity:		
	<i>(this box should expand as you type)</i>		
23	List who will have control of, and act as custodian(s) for, data generated by the research activity:		
	<i>(this box should expand as you type)</i>		
24	Give details of data storage arrangements, including security measures in place to protect the data, where data will be stored, how long for, and in what form. Will data be archived – if so how and if not why not.		
	<i>(this box should expand as you type)</i>		
25	Please indicate if your data will be stored in the UWTSD Research Data Repository (see https://researchdata.uwtsd.ac.uk/). If so please explain. <i>(Most relevant to academic staff)</i>		
	<i>(this box should expand as you type)</i>		

26	Confirm that you have read the UWTSD guidance on data management (see https://www.uwtsd.ac.uk/library/research-data-management/)	YES	☒
27	Confirm that you are aware that you need to keep all data until after your research has completed or the end of your funding	YES	☒

SECTION K: Declaration

	The information which I have provided is correct and complete to the best of my knowledge. I have attempted to identify any risks and issues related to the research activity and acknowledge my obligations and the rights of the participants. In submitting this application I hereby confirm that I undertake to ensure that the above named research activity will meet the University's Research Ethics and Integrity Code of Practice which is published on the website: https://www.uwtsd.ac.uk/research/research-ethics/		
1	Signature of applicant:	<i>C.Colcombe</i>	Date: 15/05/2025

For STUDENT Submissions:

2	Director of Studies/Supervisor:		Date:
3	Signature:		

For STAFF Submissions:

4	Academic Director/ Assistant Dean:		Date:
5	Signature:		

Checklist: Please complete the checklist below to ensure that you have completed the form according to the guidelines and attached any required documentation:

☒	I have read the guidance notes supplied before completing the form.
☒	I have completed ALL RELEVANT sections of the form in full.
☒	I confirm that the research activity has received approval in principle
☐	I have attached a copy of final/interim approval from external organisation (where appropriate)
☐	I have attached a full risk assessment (where appropriate) ONLY TICK IF YOU HAVE ATTACHED A FULL RISK ASSESSMENT
☒	I understand that it is my responsibility to ensure that the above named research activity will meet the University's Research Ethics and Integrity Code of Practice.
☒	I understand that before commencing data collection all documents aimed at respondents (including information sheets, consent forms, questionnaires, interview schedules etc.) must be confirmed by the DoS/Supervisor, module tutor or Academic Director.

RESEARCH STUDENTS ONLY

Once complete, submit this form via the **MyTSD Doctoral College Portal** at (<https://mytsd.uwtsd.ac.uk>).

RESEARCH STAFF ONLY

All communications relating to this application during its processing must be in writing and emailed to pgresearch@uwtsd.ac.uk, with the title 'Ethical Approval' followed by your name.

STUDENTS ON UNDERGRADUATE OR TAUGHT MASTERS PROGRAMMES should submit this form (and receive the outcome) via systems explained to you by the supervisor/module leader.

Appendix B: Copy of the interview questions asked during participant interviews.

Interview Questions:

Can you give me an outline of what your current position is in the Authority?

What is your current position/role in the Authority?

Can you give me an outline of your experience or exposure to natural flood management in your role?

What is your experience with natural flood management?

Objective 1

How would you define natural flood management, and what key principles do you associate with the approach?

What examples, practices or measures do you associate with natural flood management?

Objective 2

How effective do you perceive natural flood management to be in reducing flood risk? How do these perceptions compare to “traditional” hard engineering approaches?

How do you differentiate between “traditional” hard engineering flood risk management approaches and natural flood management? What would you say are the key differences?

Objective 3

How effective do you perceive local and national policies to be in supporting the delivery and consideration of natural flood management?

How do you perceive the current policy environment to be in relation to natural flood management – does it actively promote/prioritise the concept, or are there conflicts/inconsistencies between policy areas?

Objective 4

What do you perceive to be the main benefits of natural flood management? What wider benefits do you associate with this approach?

What do you perceive to be the main challenges or limitations of natural flood management – what do you consider to be the most significant?

Objective 5

What, if any, do you consider to be lacking from the general natural flood management delivery process? What suggestions could you make to strengthen implementation?

What additional resources or support, if any, do you think are needed to streamline and aid natural flood management delivery?

Appendix C: A copy of the invitation to participate email sent to participants, cropped to anonymise the recipient.

Hope you're well.

I am currently studying my Master's degree in Environmental Conservation and Management, and as part of my dissertation project on 'exploring the perceptions and attitudes of local authority practitioners towards natural flood management', I am conducting a series of interviews on the topic of natural flood management.

I would be extremely grateful if you would consider participating in the project. The interview will take approximately 30 minutes up to an hour and cover 10 open-ended questions around the topic. Your insights would be incredibly valuable to my research.

If you are interested, please reply to this email with your availability so we can arrange a suitable time and date. I'm also happy to answer any questions you may have about the project or your involvement.

Thank you for your time and consideration, I look forward to your reply.

Kind regards,

Casey Colcombe

Appendix D: A copy of the participant information and consent form sent to participants and signed before involvement in study took place.

Participant Consent Form

Project Title: Exploring Local Authority Practitioners' Perceptions and Attitudes Towards Natural Flood Management

Researcher: Casey Colcombe

Institution: University of Trinity Saint David

Course: MSc Environmental Conservation and Management

Purpose of the Study

You are invited to participate in the qualitative research project looking to explore Local Authority Practitioners' perceptions and attitudes towards Natural Flood Management (NFM). The study aims to gain insight into your views and experiences through a one-off semi-structured interview conducted via Microsoft Teams or in person to fulfil the project requirements.

What Participation Involves

You will be asked to take part in one semi-structured interview, which will last approximately 30–60 minutes. The interview will be conducted online via Microsoft Teams or in person.

With your permission, the interview will be audio-recorded for transcription purposes only. Information in the transcription and notes will be verified by yourself before processing.

Your Rights as a Participant

Your participation is entirely voluntary. You have the right to withdraw from the study at any time and are free to decline any questions during the interview.

All data you provide will be kept confidential. Your name and the name of your organisation will not be disclosed at any stage of the research. All identifiable information will be anonymised during transcription and will remain anonymised for the duration of the project, including any final documents.

All data will be securely stored in compliance with data protection regulations and used solely for academic purposes. You may request a copy of the final dissertation once the project is complete.

Consent Declaration

Please read and confirm the following by signing below:

- I have read and understood the information provided above.
- I understand that my participation is voluntary and that I can withdraw at any time.
- I consent to the interview being audio-recorded.
- I understand that my identity and the identity of my organisation will remain anonymous.
- I give my informed consent to participate in this study.

Participant Name: _____

**Participant
Signature:** _____

Date: _____

Researcher Name: _____

**Researcher
Signature:** _____

Date: _____

Appendix E: A copy of the prompts used for initial data analysis using ChatGPT.

Prompts for ChatGPT

Qualitative IPA coding support utilised ChatGPT (OpenAI), using the GPT-5.3 large language model. The system was used to assist with organising verbatim initial codes and clustering outputs following an Interpretative Phenomenological Analysis (IPA) approach, and helped to develop the thematic framework for the research. All outputs were reviewed and validated by the researcher.

Prompt 1 for individual batches:

“In this chat, you will take the stance of a qualitative researcher and analyse, following the IPA thematic analysis approach, the transcripts for a dissertation exploring local authority practitioners' views towards natural flood management. I will provide the transcripts as part of one batch.

There are 10 transcripts total, analysed across three separate chats: Chat 1: Batch 1 (3 transcripts), Chat 2: Batch 2 (3 transcripts), Chat 3: Batch 3 (4 transcripts).

Use descriptive, close-to-verbatim IPA-style coding with no interpretation.

Keep all codes brief, descriptive, and as close as possible to participant wording.

Organise outputs for the initial coding and then separately for the descriptive clustering under the following research objectives.

- 1) Understand practitioners' definitions and understanding of natural flood management and its principles
- 2) Understand practitioners' attitudes towards natural flood management as a flood risk management strategy
- 3) Understand practitioners' attitudes towards policy support for natural flood management
- 4) Identify the perceived benefits and challenges of natural flood management implementation
- 5) Recommend improvements to enhance and improve local natural flood management implementation.

For each transcript in this batch, complete:

1. Initial Codes (Descriptive, Verbatim-like)

- Short, close-to-verbatim labels (1–5 words)
 - No interpretation
 - Keep the wording EXACT when later clustering
 - Provide a table:
 - Verbatim Quote
 - Initial Code
-

2. Descriptive Clustering

- Group codes into simple descriptive clusters
 - Do NOT change code wording
 - Do NOT omit any codes
 - Provide a table:
 - Cluster Name (descriptive)
 - Codes Included (exact wording)
 - Supporting Quotes
-

After finishing all transcripts in the batch:

3. Batch-Level Code List

- Provide a single combined list of ALL codes from all transcripts in this batch
 - No quotes, no transcript labels, no grouping
 - Codes must appear exactly as originally written, with no alterations
-

When done with a single transcript, say:

“Ready for next transcript in this batch.”

At the end of the analysis of all transcripts, say:

“Batch completed. Produce and save outputs for the cross-case analysis chat.””

Each anonymised transcript was then pasted into the chat separately. Each individual output per transcript saved separately.

Prompt 2 for individual batches:

“Produce a final output for all transcripts, following and using the research objectives as heading, produce a list of codes, with the verbatim quotes and reference of participant number next to the quote.”

Step was repeated for each individual batch, with final outputs consolidated into two separate documents. One displaying all codes from analysis for each objective. One demonstrating the initial codes, with supporting the quote and participant number for each objective.

Prompt 1 for consolidated analysis:

“Using the attached word documents, create a consolidated list of emergent themes and subthemes for each research objective combining analysis outputs of all three batches with all ten participants, with supporting codes and verbatim transcripts of participants (name the participants i.e. P1, P5 etc.), keep codes and verbatim transcripts exactly as attached”

Outputs from the consolidated batch analysis was uploaded into chat conversation to produce results. Outputs were saved into separate documents, one grouping codes into clusters for each objective, one consolidating clusters into themes, and one illustrating the thematic framework of analysis based on codes, clusters and themes.

Appendix F: A copy of all codes produced by ChatGPT. All results were manually verified by the researcher. Extensive copies of all data analysis outputs are available on request.

Master Batch List of Codes

- **Objective 1 – Definitions and understanding of NFM and its principles**

- “marshy grassland habitat management”
- “practical habitat management mostly”
- “wouldn’t immediately think I do anything with NFM”
- “all of the habitat management work I do is NFM”
- “planting or managing hedgerows”
- “creating ponds and scrapes”
- “ditch blocking, contour bonding”
- “marshy grassland... holds back water”
- “NFM as nature-based solution”
- “engineering with natural materials”
- “slowing down water flow”
- “integrated approach to land management”
- “woodland officer”
- “working with natural land management”
- “management of water on farms”
- “using natural processes”
- “slowing the rate of water”
- “leaky dams”
- “tree planting depends where and how”
- “intercept and slow runoff”
- “trees increase infiltration”
- “interventions along contours”

- “ditches and wetlands”
- “avoiding draining solution” ...)
- “soft solutions rather than hard engineering”
- “dam that a beaver would build”
- “incorporate SuDS systems”
- “rain gardens very fashionable”
- “natural is key”
- “dead branches or dead logs across a stream”
- “creating ponds or allowing areas to flood”
- “don’t relate SuDS attenuation ponds to NFM” ...)
- “restoring natural flooding pattern”
- “softer engineering approach”
- “using fallen trees and local materials”
- “introduce meanders into rivers”
- “restoring floodplains”
- “creating storage bunds”
- “allows mobility of water”
- “going back to nature”
- “recreating nature’s processes”
- “mindset of riparian owners”
- “NFM longer-term approach”
- “increase surface roughness”
- “slow the flow and store water”
- “working with the land soils hydrology”
- “softest engineering way possible”
- “using natural processes and vegetation”
- “wetland scrapes”
- “trees or bales in streams”
- “Flood Defence and Coastal Protection team”
- “Leading the SAB”

- “NFM every day”
- “Mimic nature as far as possible”
- “Harvesting water to reduce flood risk”
- “Utilise swales, basins, ponds, rain gardens”
- “Permeable paving and soakaways”
- “Creating natural storage”
- “Manage flood risk at source”
- “Less concrete, more natural material”
- “Managed a sand dune system”
- “Allowing the system to shape itself”
- “More about soft defences than hard defences”
- “Replenishing sand along beaches”
- “Working with salt marshes and mangroves”
- “restoring natural flooding pattern” etc.)
- **Objective 2 – Attitudes towards NFM as a flood risk management strategy**
 - “I’d imagine it’d be more effective”
 - “awful lot more effective”
 - “working with natural processes rather than against them”
 - “farmers think it’s a bad thing”
 - “takes more land”
 - “less cost-effective to use natural solutions”
 - “could be very effective”
 - “hard engineering bloody expensive”
 - “not enough public understanding”
 - “hard engineering quicker impact”
 - “NFM needs longer timeframe”
 - “would like to think it’s better”
 - “soft approaches good for biodiversity”
 - plus second / third batch codes like:
 - “haven’t had many NFM schemes”

- “NFM can be just as effective”
- “NFM is highly effective”
- “NFM more effective long-term”
- “NFM cheaper and easier”
- “NFM self-maintaining”
- “hard engineering last resort”
- “silver bullet golden measure”
- “hard engineering costs a fortune”
- “NFM considered airy fairy”
- “NFM extremely effective and multifunctional”
- “Cheaper to form a swale”
- “Natural materials reduce carbon footprint”
- “We don’t have an option as a society”
- “Hard defences have their place”
- “NFM systems are sustainable”
- “NFM isn’t going to work in built-up area” ...
- **Objective 3 – Attitudes towards policy support for NFM**
 - “a lot of interest and a lot of funding”
 - “Agri-environment schemes... big focus on it”
 - “Sustainable Farming Scheme will as well”
 - “policy framework incredibly complicated”
 - “don’t think they promote NFM”
 - “contradiction in policy”
 - “underfunding of NRW”
 - “divide between guidance and realities”
 - “SuDS quite well established now”
 - “Section 6 duty should encourage softer option”
 - “policies support NFM”
 - “awareness is growing”
 - “gap between policy and implementation”

- “engineering community think NFM is niche”
- “policy moving NFM mainstream”
- “often 100% NFM funding”
- “NFM recommendation not priority”
- “inconsistency in NFM definition”
- “scary politically right now”
- “policy reactive not preventative”
- “Schedule 3 a great step forward”
- “Support has increased vastly”
- “political priorities... flavour of the month” etc.
- **Objective 4 – Perceived benefits and challenges of NFM implementation**
Benefits codes:
 - “primary reason is habitat management”
 - “multiple benefits”
 - “acts as a store for water”
 - “alleviating flood risk”
 - “nutrient management”
 - “carbon sequestration”
 - “species conservation / habitat conservation”
 - “economic benefits”
 - “reduction in flood damage”
 - “benefits for environment and people”
 - “biodiversity benefit / great biodiversity benefit”
 - “creating nice spaces for people”
 - “huge social well-being benefit”
 - “biggest benefit natural water management”
 - “biodiversity aspect”
 - “amenity benefits”
 - “educational benefit”
 - “low impact on environment”
 - “low cost delivery”

- “looks like we’ve not been there”
- “benefits over 10–15 years”
- “preventing soil erosion”
- “improving water quality”
- “improves productivity healthier crops animals”
- “well-being and mental health benefits” ...

Challenges codes:

- “people not working together”
- “landowners... might be asked to do things... they don’t want to”
- “takes more time”
- “needs a lot more public engagement”
- “land ownership restrictions”
- “a lot less space to deliver schemes”
- “scale is the main challenge”
- “perceptions biggest challenge”
- “massive misunderstanding around NFM”
- “difficulty in communicating NFM”
- “too soft... might get washed away”
- “most significant challenge political”
- “engineers not familiar or confident it works”
- “maintenance might be an issue”
- “storage ponds silt up”
- “leaky dams easily damaged”
- “planning community wedded to old way”
- “reluctance in the community”
- “urban complicated land ownership”
- “problems of vandalism”
- “more organisational challenges”
- “nightmare for engineers”
- “right catchment biggest challenge”

- “floodplain reconnection limited / boggy land bad for livestock”
- “front-end heavy process”
- “landowners worry about negative effects”
- “main challenge is land ownership” etc.
- **Objective 5 – Recommendations to enhance/improve local NFM implementation**
 - “working together”
 - “sharing knowledge and collaboration between teams”
 - “keep having those conversations”
 - “spread this kind of principle or way of working”
 - “public engagement and awareness is a key thing that’s needed”
 - “getting the message out is always a challenge”
 - “lack of knowledge at source”
 - “lack of guidance”
 - “lack of funding”
 - “more workers on catchment basis”
 - “cooperate between landowners”
 - “more outreach and communication”
 - “financial incentives would help”
 - “more education and training”
 - “default is NFM”
 - “education and information sharing”
 - “bring NFM into schools / universities / civil engineering”
 - “training courses for contractors”
 - “using council assets more efficiently”
 - “more support money and staff”
 - “need practical and technical specialists”
 - “large market in GIS and data mapping”
 - “credit system would be fantastic”
 - “help everybody understand what’s involved”
 - “going out and seeing schemes” etc.

Appendix G: A copy of the cross case code clustering output provided by ChatGPT. All results were manually verified by the researcher.

Cross Case Cluster

Cluster Name	Codes (exact wording – illustrative, not exhaustive)	Transcripts
Habitat and land management as NFM	“marshy grassland habitat management”; “practical habitat management mostly”; “all of the habitat management work I do is NFM”; “planting or managing hedgerows”; “creating ponds and scrapes”; “managing marshy grassland for protected species”; “land management”; “wider land management”; “how they use their fields”; “land management on slopes”; “arable vs. grazing land”; “buffer strips on agricultural fields”; “planting of willow”; “tree planting and hedgerow management”; “stopping water running off bogs”; “management of water on farms”	P1, P2
Working with natural processes / soft engineering	“NFM as nature-based solution”; “engineering with natural materials”; “soft solutions rather than hard engineering”; “restoring natural flooding pattern”; “softer engineering approach”; “using fallen trees and local materials”; “intervening without changing process”; “recreating nature’s processes”; “softest engineering way possible”; “using natural processes and vegetation”; “rather than concrete and dredging”; “Soft engineering is using natural materials”; “More about soft defences than hard defences”	P1, P2, P3, P4, P5, P6, P7, P8, P9, P10
Slowing, storing and infiltrating water	“slowing down water flow”; “slowing the rate of water”; “leaky dams”; “intercept and slow runoff”; “trees increase infiltration”; “interventions along contours”; “slow the water into river”; “acts as a store for water”; “using nature to slow down the flow”; “slow the flow and store water”; “attenuate water and release slowly”; “infiltration is a big one”; “increasing infiltration is the general principle”; “Natural dams using logs”; “Surface water runoff neutrality”; “Water stays on site”	P1, P2, P4, P5, P6, P7, P8, P9, P10

Cluster Name	Codes (exact wording – illustrative, not exhaustive)	Transcripts
Catchment-wide and source-focused thinking	“integrated approach to land management”; “not just looking at flooding”; “problems at the source”; “water coming off fields”; “catchment-wide and small-scale”; “managing uplands most impactful”; “managing water better”; “Making room for water”; “Manage flood risk at source”; “looking at the source of the problem”; “If you’ve got a problem at A, why are you trying to solve the problem at B?”	P1, P2, P4, P5, P6, P7, P9, P10
SuDS and coastal analogues as (or not as) NFM	“incorporate SuDS systems”; “don’t relate SuDS attenuation ponds to NFM”; “SuDS include nature but are engineered”; “Wouldn’t call SuDS NFM”; “SuDS quite well established now”; “sand dunes as a natural defence”; “Managed a sand dune system”; “Replenishing sand along beaches”; “Working with salt marshes and mangroves”; “In lower floodplain you want to get the water out”; “Further up catchment you want to slow the water down”	P3, P7, P8, P10

Cluster Name	Codes (exact wording – illustrative)	Transcripts
NFM as effective, multifunctional and long-term	“I’d imagine it’d be more effective”; “awful lot more effective”; “could be very effective”; “potentially very effective”; “NFM can be just as effective”; “NFM is highly effective”; “NFM more effective long-term”; “baseline NFM protection”; “NFM extremely effective and multifunctional”; “NFM systems are sustainable”; “NFM is the silver bullet”; “NFM really has its place rural”	P1, P2, P3, P4, P5, P6, P7, P8, P10
Working with nature vs hard engineering	“working with natural processes rather than against them”; “too much reliance on hard engineering”; “hard engineering bloody expensive”; “concrete and steel... really expensive”; “hard engineering fixed capacity”; “hard engineering last resort”; “hard engineering worst-case scenario”; “you can’t beat nature”; “Natural approach is the way forward”; “NFM cheaper less physical strength”;	P1, P2, P5, P6, P7, P8, P10

Cluster Name	Codes (exact wording – illustrative)	Transcripts
Context-specific role of hard engineering	“hard engineering solutions... a higher capital cost, greater carbon footprint”	
	“some circumstances need hard engineering”; “need hard engineering in towns”; “hard engineering place urban”; “Hard defences have their place”; “you can’t really allow city centres to flood”; “NFM isn’t going to work in built-up area”; “Can’t totally replace engineered solutions with NFM”; “Engineered ones would use less land”	P6, P8, P10
Barriers: evidence, perceptions and timescales	“less cost-effective to use natural solutions”; “people might think that it’s less cost-effective”; “NFM considered airy fairy”; “people want concrete security”; “unaware of NFM existence”; “hard to quantify NFM value”; “easier to quantify hard engineering”; “difficult to measure effectiveness”; “NFM needs longer timeframe”; “doesn’t get given enough time”; “Amazon Prime generation”	P1, P2, P4, P5, P6, P7, P8, P10

Cluster Name	Codes (exact wording – illustrative)	Transcripts
Growing interest and funding for NFM	“a lot of interest and a lot of funding”; “Agri-environment schemes... big focus on it”; “SFS will as well”; “a lot of support for this sort of approach”; “policies support NFM”; “awareness is growing”; “policy moving NFM mainstream”; “support from Welsh Government and NRW”; “nature-based solutions high profile”; “NFM supported by national policy”; “Support has increased vastly”	P1, P2, P3, P5, P6, P7
Gaps, contradictions and barriers	“policy framework incredibly complicated”; “conflicts”; “contradiction in policy”; “underfunding of NRW”; “guidance–reality gap fairly large”; “bureaucracy and policy barriers”; “gap between policy and implementation”; “policy not translated on the ground”; “not very effective policy”; “NFM recommendation not priority”; “inconsistency in NFM definition”; “loads of conflicting stuff out there”; “ambitions but no effective delivery”; “policy reactive not preventative”; “statutory power	P1, P2, P3, P5, P6, P7

Cluster Name	Codes (exact wording – illustrative)	Transcripts
Competing political and economic priorities	but don't use it"; "hit a barrier and everything stalls"	
	"economy and money and jobs always come first"; "scary politically right now"; "really difficult political landscape"; "work depends on budget"; "don't know future for our work"; "political priorities... flavour of the month"; "Government forgets environmental issues"; "national crisis would push NFM out"	P1, P2, P6, P7

Cluster Name	Codes (exact wording – illustrative)	Transcripts
Ecological and environmental benefits	"primary reason is habitat management"; "species conservation"; "habitat conservation"; "biodiversity benefit"; "great biodiversity benefit"; "biodiversity"; "biodiversity aspect"; "biodiversity primary gain"; "improving aquatic ecosystems"; "improving land for carbon retention"; "better carbon sequestration and flood benefit"; "carbon retention and sequestration"; "nutrient management"; "nutrient retention improves infiltration"	P1, P2, P3, P4, P5, P6, P8, P10
Social, amenity and educational benefits	"creating nice spaces for people"; "nice spaces for people to be in"; "amenity benefit"; "amenity and educational benefit"; "amenity benefits"; "social well-being benefit"; "huge social well-being benefit"; "well-being and mental health benefits"; "educational benefit"	P1, P3, P4, P5, P6, P7, P8
Economic and land-management benefits	"economic benefits"; "reduction in flood damage"; "reduced flood risk economic benefit"; "people might not see the economic benefit"; "farmers lose vast amounts of topsoil"; "spend a whole lot less on fertiliser"; "long-term benefits"; "improves productivity healthier crops animals"; "potentially croppable resource"	P1, P2, P3, P6, P10
Physical / spatial constraints	"lot less space to deliver schemes"; "scale is the main challenge"; "urban complicated land ownership"; "right catchment biggest challenge"; "limited by contours and topography"; "floodplain reconnection limited"; "boggy land bad for	P1, P2, P4, P5, P6, P8, P10

Cluster Name	Codes (exact wording – illustrative)	Transcripts
Social, perceptual and knowledge barriers	livestock”; “NFM seen as taking land out”; “loss of valuable land uses”	
	“people not working together”; “perceptions biggest challenge”; “massive misunderstanding around NFM”; “difficulty in communicating NFM”; “not aware of wider consequences”; “reluctance in the community”; “harder to convince the community”; “certain audiences focus on negative”; “landowners worry about negative effects”; “people don’t understand natural processes”; “you don’t love what you don’t know”; “engineers not familiar or confident it works”	P1, P2, P3, P4, P5, P6
Organisational and technical barriers	“most significant challenge political”; “planning community wedded to old way”; “more organisational challenges”; “internal perception challenge”; “nightmare for engineers”; “reliance on consultants and designers”; “front-end heavy process”; “grant funding complicated”; “licenses extremely complicated”	P2, P3, P4, P5, P6, P7
Cluster Name	Codes (exact wording – illustrative)	Transcripts
Cross-disciplinary working inside councils	“working together”; “a lot better at working together”; “sharing knowledge and collaboration between teams”; “keep having those conversations”; “do things differently across the board in the Council”; “we need to be talking to each other”; “collaborating with other departments”	P1, P2, P7, P8, P9, P10
Public engagement, awareness and communication	“more publicity and training”; “tell residents what’s going on”; “illustrating to those who are affected, why something’s being done”; “public engagement and awareness is a key thing”; “getting the message out is always a challenge”; “more outreach and communication”; “going out and seeing schemes”; “talking to people getting them to see it works”; “people aren’t embracing it because they don’t understand it”; “we need to get them to understand it”	P1, P2, P3

Cluster Name	Codes (exact wording – illustrative)	Transcripts
Education, training and capacity-building	“more education and training”; “education and information sharing”; “broader management can be taught”; “Farming Connect workshops”; “training courses for contractors”; “bring NFM into schools”; “bring NFM into universities”; “bring NFM into civil engineering”; “next engineers think NFM”; “build knowledge base”; “need practical and technical specialists”; “more expertise in GIS modelling”; “large market in GIS and data mapping”	P1, P2, P3, P4, P5, P6, P7–P10
Incentives, funding and models of support	“financial incentives would help”; “more grants available”; “money is a big thing”; “lack of funding”; “support and funding needed”; “not just a question of funding”; “funds to back it up”; “pay people or intrinsic benefit”; “credit system would be fantastic”; “actions improved without huge funding”	P1, P2, P3, P4, P5, P6
Using assets and catchment-scale management	“more workers on catchment basis”; “cooperate between landowners”; “model to encourage activities”; “utilised highway network for NFM”; “using council assets more efficiently”; “huge potential along highway network”; “use existing assets for multiple benefits”; “looking at the whole catchment”; “works to waterways and ditches impact water movement”	P2, P3, P5, P6, P7, P8, P9

Appendix H: Extracts of reflexive log notes

Date	Event	Description	Actions and Learning
Early June 2025	Organisation and preparation for research	I felt nervous to start the process for this research project, particularly as I was unfamiliar with qualitative research in the past. I knew that my methods were well-founded and suited to the aims of my research, but I was nervous to carry out the IPA methodology	I spent time reading into the methodology of IPA and how to conduct high-quality interviews, to familiarise myself with the process and requirements of the methodology. After doing so, I felt more comfortable going forward and felt confident in my ability to carry out the research.
Late August 2025	Preparation for the commencement of interviews for the data collection process	I was anxious to get the interviews started, as I had never taken part in academic interviews for research before. While I felt comfortable with the number of participants who had volunteered to partake in the study, I was familiar with the use of Microsoft Teams and Word to record and transcribe meetings. I was apprehensive about undertaking the	To get more comfortable acting as the interviewer, I practised conducting interviews, asking research questions and using interviewing techniques on friends and family, which helped to calm my nerves and ease my concerns regarding interviews.

		interviews for the first time as a researcher.	
September 1 st 2025	First interview	I was incredibly nervous during my first interview, but felt that it went well overall. After the interview was over, I reflected on my performance and realised that due to my nervousness, I did not ask many follow-up or exploratory questions to examine interesting comments made by the participant.	Subsequently, for future interviews, I focused on actively listening to the participants and engaged with them more by asking additional questions related to the topic. I also made sure to phrase the key questions slowly, as some were double-barrelled, to support the comprehension of the questions by participants.
September 4 th 2025	Second interview	I felt more rehearsed for the second interview through the improvements made from the first session. However, during the interview, there were a few interruptions from the participant's end, which broke up the meeting a few times. While I appreciate that working online does allow for unintended interruptions, I found it challenging to return to the flow that was set in the interview before the interview began.	Therefore, I made a selective effort to remain calm, using my notes to bring us back to the topic and briefly summarising the points we were talking about to get the participant back to where we left off.
September 8 th 2025	Third interview	The third interview went well without any hiccups, and it felt good to receive praise from the participant on my professionalism as an interviewer.	No further actions.
September 9 th 2025	Fourth interview	This interview was the first time the participant joined Teams in a public setting; therefore,	Subsequently, I made a specific effort to put the concerns of the participant at ease and made sure they were

		displayed more hesitancy initially than other participants.	comfortable continuing before starting the interviewing process. I made a note to go forward to provide brief small-talk with the participant to warm them up for the interview before starting the official recording and interview process.
September 10 th 2025	Fifth interview	This interview went well, and I was glad to be halfway through with my data collection process. I also enjoyed the close scheduling of interviews, which were long enough apart to have a fresh mindset, but also not so far apart that it felt as if I was starting anew.	No further actions.
September 12 th 2025	Sixth interview	The interview went well, but the participant tended to stray from NFM-focused comments to comment on wider points of discussion.	Therefore, during the interview I made effort to remind the participant of the initial question and focus of NFM, but phrased it in a way that it would not offend or make the participant uneasy. For future interviews, I made sure to specify the question for its relevance to NFM when necessary.
September 12 th 2025	Seventh interview	This was the second interview on the same day, so although the interview went smoothly, I was mindful to 'forget' previously discussed topics and treat this interview as a completely new interview.	I focused on responding directly to the participants' responses and not inferring from previous conversations from the day, and made a note to try to schedule interviews for different days if possible, to not repeat the potential bias that could have occurred.
October 8 th 2025	Eighth interview	The interview went well with no issues,	No further actions.

		despite having a substantial time gap	
October 23 rd 2025	Ninth interview	The interview went really well, I felt really confident at this point. It was also really nice to hear that the participant enjoyed the interview and found the line of questioning interesting. They also commented that my role as an interviewer suited me and that they appreciated my professionalism.	After the praise of this interview, I would try to bring the same energy and professionalism for the final interview.
November 11 th 2025	Tenth interview	The interview went well despite the time that had passed since the first interview. The participant also enjoyed the topic and line of questioning, and was really eager to participate which was appreciated. I was relieved to finish the data collection process and start examining and analysing the responses.	No further actions.
Late November 2025 – Early January 2026	Initial data analysis with ChatGPT and manual interpretation	I was apprehensive at first when starting my data analysis as I was using ChatGPT to help with the initial coding, following the recommendations of academics who utilised the same AI system in their qualitative research. I found that sometimes, codes didn't necessarily reflect the context of the participants' words and that some codes were repetitive. After	To address my suspicions of ChatGPT, I prompted the service to only produce descriptive short codes. Outputs were then manually verified with my handwritten notes and with verbatim quotes from participant transcripts. Moreover, I manually merged or altered coding/wording to accurately reflect participants' accounts and narratives and tried to reduce repetition to a minimum. I also

		landing on my final codes and themes, I found that I was agreeing with points and comments made by participants that resonated with me and my subjective knowledge, so I made a point in justifying all results and narratives with participants' accounts.	interpreted the meaning and context behind participants' responses to accurately reflect hidden meaning and attend to the double hermeneutic approach of my methodology. As mentioned, I justified all results with participants' accounts and made sure that my findings reflected my interpretations of participants' perspectives.
Early January 2026 – Late February 2026	Writing up the results	Initially, I struggled with the conciseness of my results section and realised why IPA methodological studies were suited to smaller sample sizes, because of the breadth of information and directions the results could be taken in. But overall, I am very happy with the points that were raised and am happy with the contribution to wider stakeholder research.	Therefore, I focused on highlighting the key points and narratives raised by practitioners that were relevant to achieving the aim and objectives of the study. I made effort to highlight the subjective nuances of practitioners' views but accepted that some small points will need to be left out to meet the length requirements. In future, I would perhaps cut down on the scope of the topic so that I have more allowances to discuss points at length. But overall, I am happy with the study.