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Canolfan Polisi Cyhoeddus Cymru

The role of maps in Welsh policy making

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Contents

Summary 6

Acknowledgements 8

Introduction 9

Literature review 10

Knowledge mobilisation and brokering 11

Cartography, knowledge mobilisation, and policy making 12

Advantages and limitations of maps 12

Critical cartography and participatory mapping 13

How the critical cartography and participatory mapping perspectives can benefit knowledge mobilisation 14

The environmental and planning policy context 16

Potential mapping methods for knowledge mobilisation 16

The current study 19

Methods 20

Approach 20

Documentary analysis 20

Semi-structured interviews 20

Participants 21

Structure 21

Coding 22

Findings 23

Documentary analysis 23

Semi-structured interviews 24

Maps support evidence use, communication, and collaboration in policy making 24

Cartography enhances knowledge accessibility but faces institutional constraints 27

Mapping approaches involve trade-offs between accessibility, engagement, and resources 29

Discussion **32**

Perceived to convey credible and authoritative evidence **32**

Integrating different forms of knowledge **33**

Facilitating knowledge exchange among stakeholders **34**

Improving the accessibility and understandability of knowledge **34**

Conclusion **36**

Key factors **36**

Future research **37**

Recommendations **37**

Bibliography **38**

Annex **45**

Annex 1 **45**

Table 1: Welsh government and local authority documents consulted 45

Table 2: Natural Resources Wales documents consulted 46

Annex 2 **47**

Interview structure and questions 47

Annex 3: **52**

Table 3: Mapping resources used during interviews 52

Annex 4 **54**

Table 4: Mapping related terms 54

Author Details 56

Summary

- **Research gap**: This study examines how and to what extent maps function as useful tools for knowledge mobilisation (KM) in Welsh policy making. KM brings together different forms of evidence and expertise to inform decision-making. Despite the growing importance of KM and the widespread use of maps in policy contexts, little research has explicitly connected cartography (the study of maps and map making) and KM. This study addresses that gap by examining maps not only as visual representations of spatial information, but also as tools and processes that support the exchange, integration, co-production and application of knowledge in policy making.

- **Literature review**: The literature review highlights important similarities between the two fields. Contemporary KM research emphasises relationship building, facilitating interactions, contextual understanding, and integrating different forms of knowledge. Likewise, cartographic research demonstrates that maps can communicate complex information, support decision-making, and facilitate collaboration through approaches such as participatory Geographic Information Systems (GIS), story maps, and walkable floor maps. However, maps are rarely discussed explicitly as a tool for KM. This study therefore makes a novel contribution by bringing together these two areas of research.

- **Methods**: The research combined documentary analysis of Welsh Government and Natural Resources Wales policy related documents with semi-structured interviews involving mapping specialists, KM and research practitioners, data scientists, and development and project staff.

- **Findings**: The documentary analysis found that policy making in Wales relies heavily on static quantitative maps, while qualitative and participatory mapping approaches do not seem to be widely utilised. This pattern was echoed by interview participants. The interviews further suggest that maps are effective KM tools because they communicate complex spatial information in accessible ways and help policy makers identify patterns, relationships, and place-based issues. Maps support policy making processes by enabling spatial analysis and exploration of relationships between places, communities, and policy initiatives. Interactive maps in particular offer greater context and analytical depth.

Participants also emphasised the value of maps in integrating multiple forms of knowledge, including quantitative data, local knowledge, narratives, and lived experience, bringing together diverse sources of evidence to inform decision-making. Maps were also seen as important tools for knowledge exchange, particularly when developed through participatory approaches that foster discussion, collaboration, and shared learning. Participants argued that the process of producing a map can be as valuable as the final map.

- **Challenges**: The study identifies several challenges to the use of maps for KM. Limited time, funding, GIS expertise, training, and software costs can constrain the use of innovative mapping approaches. Participants also noted that some policy makers remain more comfortable with traditional forms of quantitative evidence. In addition, the literature review highlighted how maps are not neutral representations of reality, as the choices made during their creation can influence how evidence is interpreted. The literature review also highlighted that the meaning and influence of maps are shaped not only by their design but also by users' interpretations and the wider social contexts in which they are used.

- **Conclusions**: The study concludes that maps can function as useful KM tools, but their effectiveness depends on the alignment of four key factors:

  1) Maps are used in ways that **communicate evidence clearly** while also **encouraging critical engagement** with their assumptions, limitations, and uncertainties.

  2) The chosen mapping method provides the functionality needed to **integrate diverse forms of knowledge** within the intended decision-making process.

  3) Organisations and individuals are **willing and able to engage with mapping methods** appropriate to the policy context.

  4) The selected mapping method aligns with the aims of the exercise and the **resources, skills, and needs of intended users**.

- **Overall**, this research develops a novel conceptualisation of the relationship between cartography and KM. It shows that maps are not simply visual outputs but tools that support communication, collaboration, knowledge exchange, and knowledge integration, offering new insights into how maps support policy making processes in Wales.

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Introduction

Knowledge mobilisation (KM) focuses on bringing together different forms of evidence and expertise, including research evidence, professional expertise, and lived experience to inform policy (Durrant et al., 2024; Havers et al., 2026). While KM is widely recognised as a relational and context-dependent process, less attention has been paid to the practical tools that support it (Durrant et al., 2024; Smith et al., 2026).

Maps are widely used in environmental management, planning, and policy to communicate spatial information and support decision-making. Research shows that cartography, Geographic Information Systems (GIS), and participatory mapping can facilitate knowledge exchange, collaboration, and the integration of diverse knowledge types (Arciniegas et al., 2013; Bishop et al., 2022; Eikelboom and Janssen, 2017; Gourmelon et al., 2014; Molina Rodríguez-Navas et al., 2021; Shrestha et al., 2019). However, maps have rarely been examined explicitly as tools for KM.

This study addresses that gap by linking cartography and KM. Rather than viewing maps solely as visual representations of data, it investigates how and to what extent maps support KM in Welsh policy making. It explores how policy makers use and understand maps, how cartography affects evidence accessibility and usability, and how different mapping approaches facilitate communication and knowledge integration.

Drawing on KM and participatory cartographic scholarship, a documentary analysis, and semi-structured interviews, this report shows that maps can function as effective tools for communication, knowledge exchange, collaboration, and integration within policy processes. It contributes to both KM and cartographic scholarship while offering insights into the role of maps in policy making in Wales.

Literature review

There is growing pressure on universities and research organisations to demonstrate their societal impact. This has contributed to increasing interest in KM (Vallance et al., 2025), which can be understood as a process of bringing together different forms of evidence and expertise to support decision-making (Durrant et al., 2024; Havers et al., 2026). However, despite the growing prominence of KM, there remains limited understanding of the practical tools and activities through which knowledge is mobilised in policy making contexts (Durrant et al., 2024; Smith et al., 2026).

At the same time, technological developments are transforming how knowledge is produced, communicated, and used by knowledge brokering organisations (KBOs) and policy makers (Shaxson et al., 2025). Cartography and Geographic Information Systems (GIS)[1] are such technologies that could present opportunities for KM efforts as they have become increasingly important tools for representing, analysing, and communicating complex information (Li et al., 2025; Sowmiya & Manimaran, 2024)[2]. While maps are widely used in planning, environmental management, and policy development, their role as KM tools has received comparatively limited attention, despite their unique ability to represent and communicate information within a spatial context. Unlike text, tables, or many other visualisations, maps help users identify patterns, relationships, and differences across geographic areas. This makes them particularly valuable for understanding place-based issues such as environmental management, planning, and public policy, where location is central to how knowledge is interpreted and applied.

Consequently, this literature review examines the relationship between KM and cartography, focusing on how maps can support policy making processes. Drawing on literature relating to KM, participatory GIS, critical cartography, and environmental and planning policy, it explores the extent to which maps can support the communication, integration, and co-production of knowledge while contributing to more informed and inclusive policy decisions (Elwood, 2006a; Elwood, 2006b; Durrant et al., 2024; Havers et al., 2026).

[1] Geographic Information Systems are “integrated software tools for handling and analysing spatially referenced data.” (Castree, et al., 2013; p. 180).

[2] Cartography is the practice of making maps, while GIS is the technology used to collect, analyse, and display geographic data. Maps are the main outputs of GIS.

Knowledge mobilisation and brokering

The term KM does not have a universally accepted definition. Furthermore, terms associated with moving research into action, such as brokering, transfer, translation, exchange, dissemination, and sharing, are often used alongside KM to describe the research-to-action process, further complicating efforts to define the concept (Barhouche, et al. 2025; Havers et al. 2026; Ward, 2017; Ziam, et al. 2024)[3]. One of the most widely cited definitions of KM is provided by the Social Sciences and Humanities Research Council of Canada (SSHRCC):

> **"Knowledge mobilization is an umbrella term encompassing a wide range of activities relating to the production and use of research results, including knowledge synthesis, dissemination, transfer, exchange, and co-creation or co-production by researchers and knowledge users." (SSHRCC, 2026)**

While this definition provides a useful overview of KM as a concept, it should not be regarded as a universally accepted definition. There remains ongoing debate about what KM means and what it encompasses. Despite its growing popularity, there remains little consensus regarding the meaning, scope, and application of KM (Durrant et al., 2024; Smith et al., 2026). Much of the existing literature has contributed to understanding the role of KM within research, policy, and practice. However, Durrant et al. (2024) note that there remains limited understanding of the everyday practices through which knowledge is mobilised. They suggest that KM is increasingly understood as a non-linear and iterative process involving interactions between diverse actors and forms of knowledge, rather than a linear process of transferring research evidence into policy and practice.

Durrant et al. (2024) identify three key features of KM, arguing that it is: 1) relational, 2) integrative, and 3) contextual. KM therefore involves developing and maintaining relationships between researchers, policy makers, and practitioners, integrating different forms of knowledge, and engaging with the contexts in which knowledge is produced and used. Similarly, Smith et al. (2026) contend that linear descriptions of knowledge brokering fail to capture the realities of practice, noting that evidence needs are often co-determined through ongoing interaction between knowledge brokers and policy makers.

[3] For the purposes of this report, the terms 'knowledge mobilisation' and 'knowledge brokering' are used interchangeably, reflecting the overlap between these concepts in the literature.

Recent work by Havers et al. (2026) builds on this perspective by examining what KM looks like in practice. They identify several practices that support KM, including relationship building, facilitating interactions, developing contextual understanding, considering representation, and integrating different forms of knowledge. Their findings highlight that KM is enacted through engagement with diverse stakeholders, the development of trust, continued awareness of policy developments, and the bringing together of research, professional expertise, and lived experience. Importantly, these practices are often informal, iterative, and relational, making them difficult to capture through conventional models of KM processes.

These characteristics reflect the realities of policy making processes, which are often complex rather than straightforward applications of research evidence to decision-making (Cairney & Oliver, 2017; Durrant et al., 2024). Consequently, KM practices need to be flexible and responsive to different policy contexts and evidence needs. Recent literature emphasises the importance of activities such as relationship building, facilitating interactions, creating opportunities for dialogue, and integrating different forms of knowledge across research and policy communities (Breckon et al., 2025; Havers et al., 2026; Smith et al., 2026). Therefore, rather than viewing KM as the transfer of research evidence into policy, it is increasingly conceptualised as a set of collaborative practices through which knowledge is developed, interpreted, and applied across research and policy boundaries (Breckon et al., 2025). Examining these practices therefore provides a valuable means of understanding how KM is implemented within specific policy contexts.

Cartography, knowledge mobilisation, and policy making

The rapid advancement of technology is a key factor affecting KM practices, reshaping how knowledge is generated, integrated, shared, and used (Shaxson, et al. 2025). This includes technologies such as GIS, which has seen a rapid development over the last few decades (Li, et al. 2025. Sowmiya & Manimaran, 2024). Yet, despite their widespread use for representing and analysing spatial information, they are rarely discussed in terms of their role in mobilising knowledge. This study explores the relationship between cartography, GIS, and KM and argues that cartography and GIS can be understood as important tools for KM.

Advantages and limitations of maps

One reason cartography may be valuable for KM is its ability to communicate spatial information effectively. Unlike textual information, tables, and other non-spatial visualisations, maps show geographic relationships directly, helping users

understand spatial patterns, distributions, and connections. Consequently, cartography has long served as a tool for knowledge dissemination (Crampton, 2010). For example, maps are considered powerful communication tools that can help identify and frame complex problems, making them valuable for planning activities. Furthermore, maps can facilitate informed policy making through improved policy design, targeting, and cost-effectiveness (Hauck et al., 2013). Similarly, Arciniegas et al. (2013) argue that maps and GIS help bridge the gap between scientific knowledge and policy making, making them ideal tools for policy makers.

Despite these advantages, there are important limitations and concerns associated with using maps solely as objective and scientific representations of reality. One of the most notable is the argument that maps can never be neutral or objective representation of reality. Harley (1989) attributes this to maps being bound to power and social relations and Monmonier (1996) argues that it's because the mapping process requires the simplification and distortion of geographic data. These attributes can lead to maps being biased (Hauck et al., 2013) and deceptive (James et al., 2021). Therefore, it is important to use maps with caution, especially as they have an air of authority surrounding them (Hauck et al., 2013). For example, maps can make certain criteria appear more important rather than facilitate better decision-making (Ferretti & Geneletti, 2020). This is especially significant because the choice and representation of data on a map can influence how users perceive and interpret that information (Engel et al., 2022). As a result, maps may inadvertently contribute to harmful outcomes, including the stigmatisation of particular geographic locations (Hauck et al., 2013).

Recent research further suggests that the value and impact of maps are shaped by how they are interpreted by different audiences. Meyer et al. (2024) argue that people's understandings of maps are influenced by their experiences, beliefs, social backgrounds, and interactions with others. This highlights the importance of considering not only how maps are produced, but also how they are understood and applied in different contexts. Consequently, this highlights the importance of critically engaging with maps and recognising that their meanings are shaped by both their design and the contexts in which they are interpreted.

Critical cartography and participatory mapping

The context dependence of map creation and use highlight the need for critical engagement with maps. This concern has been a central focus of critical cartography for several decades (Crampton, 2010; Pickles, 1995), with critical GIS also included within this concept (O'Sullivan, 2006; Pavlovskaya, 2006). Critical cartography is concerned not only with questioning maps as representations of reality, but also with examining how power relations shape what knowledge is mapped, how it is

represented, and whose perspectives are privileged (Harley, 1989). From this perspective, critical engagement should arguably be applied not only to the map itself but also to factors such as the attitudes, beliefs, skills, and knowledge of the map user (James et al., 2021).

Beyond questions of map interpretation, critical cartography also draws attention to what maps can and cannot represent. Abstract concepts and experiential forms of knowledge can be difficult to represent spatially (Hauck et al., 2013; Schroth et al., 2015). In response, Flynn et al. (2019) emphasised the importance of community engagement in hazard map development, arguing that participation can improve not only the maps themselves but also wider processes of planning, knowledge sharing, and decision-making. However, they found that community engagement alone does not necessarily ensure meaningful representation and recommended moving beyond Western science-driven mapping approaches to better incorporate local and community knowledge.

These ideals align with the concept of participatory mapping, which can be understood as a process through which local communities create and use maps to represent their own knowledge, experiences, and priorities, thereby enabling greater participation in decision-making and knowledge production (Chambers, 2006). Participatory mapping not only helps address some of the limitations identified by critical cartography but may also support KM by enabling the integration of diverse forms of knowledge and fostering collaboration among stakeholders.

How the critical cartography and participatory mapping perspectives can benefit knowledge mobilisation

The relationship between participatory mapping and KM becomes particularly apparent in Participatory GIS (PGIS), which supports the collection, integration, communication, and application of community knowledge within decision-making processes (Craig et al., 2002; Sieber, 2006). PGIS combines GIS technologies with participatory approaches to incorporate local knowledge into the production and use of spatial information. By recognising that GIS technologies can both empower and marginalise different groups, PGIS promotes more inclusive mapping practices that incorporate diverse forms of knowledge and participation (Elwood, 2006a). Several studies demonstrate the KM functions of PGIS. Bishop et al. (2022) show how the co-production of maps can facilitate knowledge exchange between Inuit communities and scientific researchers. Similarly Molina Rodríguez-Navas et al. (2021) demonstrate how interactive mapping supports the generation and sharing of social knowledge. Together, these examples illustrate how maps can function as cross-boundary instruments that can facilitate policy makers' engagement with community-based knowledge.

Critical mapping approaches help making community-based knowledge accessible to policy makers by combining statistical representations with personal narratives. They provide a means for capturing forms of knowledge that might otherwise remain invisible. For example, Niederdeppe et al. (2016) found that pairing an individual narrative with a statistical map increased support for certain policy interventions and reduced counterarguing among policy makers by situating individual experiences within broader patterns of quantitative evidence. Narrative and personal experience are central to the lived experience perspective (Frechette et al., 2020), which has become a “hot topic” for KBOs (MacKillop et al., 2020, p. 958). The growing interest among KBOs in incorporating lived experience alongside other forms of data reflects a central concern of KM, which is to bring together different forms of evidence to inform decision-making. This is consistent with what Havers et al. (2026) describe as the creation of an ‘evidence mosaic’. It also shares common ground with participatory mapping approaches informed by critical perspectives, which have attempted to incorporate multiple forms of knowledge (including local, expert, and official knowledge) within mapping processes (Elwood, 2006b). As such, critical and participatory mapping approaches may be particularly relevant to KBOs, as both are concerned with how diverse forms of knowledge can be brought together and represented in ways that support understanding and decision-making. KBOs, and by extension KM, may therefore be receptive to mapping approaches informed by critical cartography and PGIS. Both are concerned with bringing together multiple forms of knowledge to support knowledge sharing and decision-making.

Although it can be argued that KM efforts and practices would benefit from critical cartography and participatory mapping, an important question concerns how this could be implemented in practice. Beyond providing alternative means of communicating evidence, these approaches present both opportunities and challenges for KM. They may encourage reflection on how knowledge is represented, whose perspectives are included, and how evidence is assembled and interpreted (Crampton, 2010; Elwood, 2006a. Elwood, 2006b). However, their implementation also raises questions about how different perspectives and forms of knowledge are selected, represented and negotiated, particularly given that policy making relies on multiple forms of knowledge rather than research evidence alone (Head, 2008; Durrant et al., 2024; Havers et al., 2026).

This has implications for how maps are used within policy making. To be of value in practice, emphasis lies not only on maps’ ability to communicate information clearly, but also on their capacity to integrate different forms of knowledge according to the policy context. This integration goes beyond the unidirectional communication of evidence, creating opportunities for dialogue and collaboration between multiple stakeholders and forms of knowledge.

The environmental and planning policy context

We use the environmental and planning policy literature in this research to assess the potential for cartography and GIS to act as KM tools. Numerous studies have demonstrated the value of GIS in environmental management, land-use planning, and urban planning. These studies highlight the capacity of GIS, cartographic visualisation, and spatial data to support the integration of interdisciplinary information, facilitate the communication of complex environmental and social issues, and strengthen evidence-based decision-making among planners and policy makers (for example see: Maliene et al., 2011; van Maarseveen et al., 2019; Wu et al., 2025). The following section examines several examples from the environmental and planning literature that employ different mapping methods. These studies illustrate how cartographic tools can support KM efforts. They also respond to several concerns raised by critical cartography, particularly in policy development.

Potential mapping methods for knowledge mobilisation

Several mapping methods arguably address the need for accessibility and diverse forms of information, while also functioning as deliberative tools that facilitate dialogue and the exchange of knowledge between different stakeholders.

The first mapping method example is walkable floor maps. Walkable floor maps are large topographical maps laid on the floor during workshop-based activities. They are used to directly engage policy makers and stakeholders, facilitating dialogue and generating qualitative insights related to the mapped area and the topic under discussion (Petersen et al., 2024; Petersen, et al. 2025). Research has shown that the participatory and qualitative nature of walkable floor maps plays an integral role in facilitating productive policy learning and effective knowledge collaboration (Petersen et al., 2024). This suggests that walkable floor maps are accessible, interactive, and a potential way for stakeholders' values, experiences, and narratives to inform decision-making processes.

The potential usefulness of interactive maps is also highlighted by Gourmelon et al. (2014), who found that digital interactive mapping tools can facilitate knowledge exchange between researchers and stakeholders. Furthermore, these tools can enhance stakeholders’ understanding of complex spatial information and management issues. Similar findings were reported by Eikelboom and Janssen (2017) and Shrestha et al. (2019), both of whom combined interactive GIS-based mapping tables with participatory workshops. Their studies found that these approaches supported stakeholder dialogue, knowledge co-production, and social

learning by enabling participants to collaboratively explore spatial information, share perspectives, and develop a shared understanding of complex climate adaptation and environmental health issues.

Similar findings were reported by Arciniegas et al. (2013), who integrated face-to-face collaboration with an interactive touch-table and digital mapping tools to support land-use decision-making. Their study highlighted the value of digital maps and GIS for presenting integrated knowledge in collaborative planning contexts. However, the research also found that the tool providing the most detailed quantitative information was perceived as the least useful and produced the poorest planning outcomes, whereas qualitative information presented on a single digital map was rated as the most useful and supported the highest-quality decisions. The authors concluded that more precise information is not necessarily more effective and that lower-complexity qualitative information may better for supporting collaborative decision-making. Indeed, Schroth et al. (2015) note in their study that digital interactive mapping platforms, which were virtual globes in their case, can cause heavy cognitive loads, which may explain why more information on a map does not always make it more useful. However, as Arciniegas et al. (2013) highlights, that does not mean that integrating qualitative data on a map necessarily causes a heavy cognitive load, for example if qualitative information is displayed in a simple manner.

Arguably, one way to simplify qualitative data is through creating a narrative, which can be achieved by using story maps. Story maps combine maps with narrative text, images, and other multimedia content to communicate spatial information through storytelling. By linking geographic information to personal experiences, histories, or community perspectives, they can help create a deeper understanding of places and the relationships people have with them (Caquard, 2013). An example of how story maps can simplify qualitative data is provided by Vollstedt et al. (2021), who argue that climate information is often complex and difficult to communicate in a user-friendly way. They therefore developed a story map to demonstrate how this format can make information about sea-level rise and coastal flooding more accessible, engaging, and understandable for the general public. These findings are consistent with those of Oubennaceur et al. (2021), who also found that story maps were an effective tool for making complex information more accessible to the public and decision makers.

Among the various platforms available for creating story maps, ArcGIS StoryMaps (Esri UK, 2026) is a widely used platform for developing web-based narrative maps. While it is not the only method for creating story maps, its accessibility and user-friendly design may contribute to its widespread use for communicating spatial information through narratives to diverse audiences. Unlike broader academic conceptions of story mapping, ArcGIS StoryMaps is a commercial platform

developed by Esri that provides pre-designed templates for creating structured web-based narratives (Esri UK, 2026). Lung-Amam and Dawkins (2020) demonstrate the platform's potential by using participatory story mapping as an example, which combines community storytelling with digital mapping technologies. Their study highlights how story maps can support more inclusive planning by amplifying the voices of marginalised communities and presenting local knowledge in an accessible format. This emphasises the potential of participatory story mapping to inform more inclusive policy making.

The current study

This literature review has explored the relationship between KM and cartography. It has conceptualised KM as a relational and context-dependent process, yet there remains limited understanding of the practical tools through which knowledge is mobilised in policy making.

The literature also suggests that cartography can function as a KM tool by supporting communication, knowledge exchange, and the integration of diverse forms of knowledge. Interactive and participatory mapping approaches appear particularly well suited to these purposes. However, critical cartography highlights that maps are not neutral representations of reality and that their value depends on how knowledge is produced, represented, and interpreted.

Overall, the literature indicates that maps have the potential to function as valuable KM tools. However, there remains limited understanding of how maps are used within policy making; how their usefulness is perceived; and how different mapping approaches support or constrain KM activities. This study intends to address these gaps by answering this main research question:

> *How and to what extent do maps function as useful tools for knowledge mobilisation for policy making in Wales?*

This question will be explored through three sub-research questions:

1) *How are maps used within policy making in Wales? How are their usefulness and influence perceived by those involved?*
2) *In what ways does cartography enhance or limit the accessibility, timeliness, and usability of knowledge for policy making in Wales?*
3) *How do different types of maps support knowledge mobilisation for policy making in Wales?*

By addressing these questions, this study contributes to KM and cartographic scholarship by examining how maps function within Welsh policy making and their potential to support knowledge exchange, collaboration, and the integration of diverse forms of knowledge.

Methods

Approach

Documentary analysis and semi-structured interviews were conducted to collect data for addressing the research questions. The documentary analysis examined how maps are used and presented in policy-related documents in Wales, while semi-structured interviews provided insights into stakeholders' experiences and perceptions of maps in policy making. Together, these methods enabled an assessment of both the intended role and the practical value of maps as tools for KM.

Documentary analysis

The documentary analysis used content analysis to examine maps within selected policy documents. Content analysis involves categorising and interpreting textual and visual content (Clark et al., 2019). In this study, maps were classified according to their data and map types.

A mix of eight Welsh government, local authority and Natural Resources Wales (NRW) policy, strategy, and planning documents were analysed. These were selected because they formed part of Welsh policy making processes, related to environmental or planning policy, and contained at least one map. NRW was included due to its significant role in environmental policy development in Wales (Natural Resources Wales, 2026). This focus aligns with the environmental and planning themes identified in the literature review (see Annex 1 for a full list of documents).

To ensure rigour and transparency, consideration was given to the documents' original purpose, the context in which they were produced, and their intended audience (Bowen, 2009).

Semi-structured interviews

A total of seven semi-structured interviews were conducted with nine participants. This method was chosen because its open and flexible format enables participants' experiences and perceptions of maps as KM tools to be explored in depth, while remaining responsive to the aims of the research (Clark et al., 2019). Ethical approval for this research was granted by Aberystwyth University (Reference number: 31993Ha).

Participants

The criteria for participation in the research were that individuals had to be involved in, or connected to, policy making processes in Wales and have created or used maps within that process. Participants who met these criteria were contacted directly, making this a form of purposive sampling. Some snowball sampling also occurred, with some participants referring other potential participants (Clark et al., 2019).

The roles of the participants are listed below, along with the organisations or projects for which they worked:

- Roles:
    - Co-director of mapping project
    - Development officer
    - GIS Specialist
    - Knowledge mobilisers
    - Performance and research officer
    - Policy and research advisor
    - Research and GIS team leader
    - Senior Data scientist
- Organisations and projects:
    - A National Landscape of Wales
    - Arts and Humanities Research Council funded research project
    - Community development charity
    - Knowledge Brokering Organisation
    - Parliamentary research service
    - Two Welsh councils

Structure

The semi-structured interviews consisted of two sections (see Annex 2 for interview schedule). The first part asked questions on the role of maps in policy making and KM, followed by flexible follow-up questions based on participants' responses. The second section involved discussing examples of different mapping methods, or exploring methods participants were already familiar with, and examining their potential applications and usefulness. The interview questions and example maps were informed by the literature review.

Annex 3 lists the mapping methods presented to participants, while Annex 4 provides descriptions of each method.

Coding

Following transcription, the interviews were analysed using a thematic analysis with a hybrid deductive-inductive coding approach (Fereday & Muir-Cochrane, 2006; Proudfoot, 2023). Deductive codes were derived from the literature review and documentary analysis, while inductive codes emerged from recurring themes in the interview data. These codes were then grouped into broader themes, which informed the analysis of the research questions.

Findings

This section is divided into four parts. The first part discusses the results of the documentary analysis. The three following parts address each of the sub-research questions using data collected from the semi-structured interviews.

Documentary analysis

The documentary analysis examined the use of maps in Welsh Government, local authority and Natural Resources Wales (NRW) plans, strategies, and policy documents to assess their value as KM tools. Three main findings emerged.

First, most maps were static, reflecting the PDF format of the documents. Some reports (including the Flood Risk Management Plan, Welsh National Marine Plan, and State of Natural Resources Report 2025; see annex 1) provided links to interactive maps that offered more current information. While the first two included accessible embedded links, the latter only cited the maps in the bibliography, making them harder to locate. Access was further restricted by the requirement for an ESRI account.

Second, quantitative maps, particularly thematic, choropleth[4], and planning maps, dominated the documents. These were mainly used to present environmental and demographic data, risk assessments, and spatial designations, highlighting their role in technical planning, analysis, and decision-making.

Third, qualitative and creative mapping approaches were largely absent. The main examples were the ‘Map of Dreams’ in the Future Generations Report 2025 and the spatial strategy map in Future Wales: The National Plan 2040 (see Annex 1). However, neither made substantial use of qualitative data or participatory methods such as story mapping. This may reflect the constraints of PDF-based reports and the need for policy documents to project objectivity, credibility, and authority through more traditional mapping formats.

Overall, the analysis suggests that qualitative and interactive maps remain underutilised in Welsh policy making. Their potential as tools for communication, engagement, and KM is therefore explored further through the interview findings.

[4] “A thematic map where areas are shaded according to the value of a variable, such as population characteristics or political voting behaviour.” (Castree, et al. 2013; p. 58).

Semi-structured interviews

The interview findings are organised according to the three sub-research questions. The analysis highlights the varied roles of maps in Welsh policy making; the opportunities and constraints affecting their use as KM tools; and the ways in which different mapping approaches support policy making processes.

Maps support evidence use, communication, and collaboration in policy making

The analysis identified four interconnected themes that address the first sub-research question: *How are maps used within policy making in Wales? How are their usefulness and influence perceived by those involved?* These themes were: 1) maps as tools for quantitative evidence and decision-making; 2) maps as communication and KM tools; 3) the contextual nature of map usefulness and influence; and 4) mapping as a collaborative process.

Maps as tools for quantitative evidence and decision-making

The documentary analysis revealed that maps are primarily used to analyse and communicate quantitative and scientific data, while also supporting administrative and technical decision-making. This finding was reinforced by the interviews, with almost all participants reporting that the maps they produce for policy makers, or encounter in policy making contexts, are predominantly quantitative in nature:

> **"I think a lot of policy and decision-makers, particularly at civil service level, are very traditional in their outlook. They value the harder evidence and that often comes down to economic figures rather than anything else." (Policy and research advisor)**

> **"They're always quantitative." (Knowledge mobiliser referring to the type of maps used in their work)**

Furthermore, most participants highlighted the usefulness of maps in supporting policy makers' administrative and practical decision-making. Reflecting on the use of maps in assessments of childcare provision and related early years initiatives, one participant explained:

> **"So, it's quite useful for that spatial understanding and that obviously allows decision-makers to quickly identify where those needs and services do not align to find those gaps." (Performance and research officer)**

These findings suggest that maps help policy makers interpret quantitative spatial information and identify patterns relevant to decision-making.

Maps as communication and knowledge mobilisation tools

Beyond their analytical function, participants consistently described maps as highly effective communication tool. Maps were perceived as valuable because they simplify complex spatial information and present it in an accessible format that policy makers can quickly understand:

> **"… on a map you can understand it very quickly, which is a big thing." (GIS Specialist describing how maps aid the understanding of data in their work)**

Furthermore, participants frequently argued that maps can communicate information that would otherwise require lengthy textual explanations:

> **"They [decision makers] don't like reading long reports of just words. If they can have some imagery or mapping, I think it always helps the overall balance of a piece of work." (Research and GIS team leader)**

These comments suggest that maps are perceived as useful tools for translating complex evidence into more accessible forms of knowledge. However, participants rarely discussed the limitations or biases of cartographic representations.

The contextual nature of map usefulness and influence

Although participants generally viewed maps as useful and influential, they emphasised that their usefulness depended on audience needs and information requirements. While static maps were seen as effective for communicating broad trends, they were considered less suitable for conveying detailed contextual information:

> **"… each job is different and each audience is different as well" (Research and GIS team leader describing their production of maps)**

> **"They're [static maps] a starting point, which is good, but they don't give me enough information." … "if I was a policy maker, this would give me the high-level trend, but I potentially would want the granular detail" (Policy and research advisor)**

These comments indicate that different mapping methods may be appropriate for different decision-making contexts. While static maps can effectively communicate

high-level trends, they may be insufficient where policy makers require more detailed analysis.

Overall, participants viewed maps as context-dependent tools whose usefulness depends on the audience and decision-making context in which they are used.

Mapping as a collaborative process

A further theme emerging from the interviews was that the value of mapping extends beyond the final map itself. Participants frequently described mapping as an iterative and collaborative process involving ongoing interactions between map makers and users:

> **"… there's again an iterative process of working with them [committee clerks] to get it [a map] right, so they're happy to publish it." (Senior data scientist)**

The co-director of a mapping project echoed this sentiment that the process of mapping is important in its own right.

These views were illustrated through the co-director's description of 'fast mapping' workshops:

> **"… they [stakeholders and decision-makers] get a digital map, but they also get the insights of how that map was produced and how that then can be used to improve their services, […] it's not just the map on its own." (Co-director of a mapping project)**

These workshops facilitated discussion, knowledge exchange, and the co-production of useful spatial outputs. These findings indicate that maps can function as efficient processes for facilitating knowledge exchange and collaborative problem-solving.

Despite these benefits, participants suggested that some policy makers remain reluctant to engage with such alternative mapping methods and continue to favour more traditional forms of evidence presentation:

> **"… [some mapping approaches can be] a hard sell often until there's kind of widespread change within civil service, public bodies, policy and decision makers" (Policy and research advisor)**

Cartography enhances knowledge accessibility but faces institutional constraints

Two main themes emerged in relation to the second sub-research question: *In what ways does cartography enhance or limit the accessibility, timeliness, and usability of knowledge for policy making in Wales?* These themes were balancing accessibility and usability with complexity and institutional resources, skills, and constraints shape map use.

Balancing accessibility and useability with complexity

Although maps can function as *"a process that can bring people together"* (co-director of a mapping project), most participants suggested that they are more commonly produced as static outputs for policy makers. Despite their limited interactivity, participants highlighted their usefulness within reports, workshops, and presentations:

> **"… maps are a vital sort of visualisation for us to use. It's very unlikely for us to do a presentation and us not have a map involved" (Performance and research officer)**

Participants believed maps improved accessibility and usability by presenting complex information in a concise and understandable format. However, participant also noted that it isn't always possible to access a maps data source, which limits the ability for a decision-maker to investigate spatial data further. The documentary analysis also reflected this finding, with very few documents providing data sources used to create maps. This hinderance to transparency also negatively affects the accessibility and useability of a map:

> **"I think one of the limitations of [static] mapping …, and I guess maybe with any mapping, is that the data quality matters." (Performance and research officer)**

> **"… if you want to dig further, you need that time and that capacity to do so. You might need further information that isn't currently available." (Policy and research advisor)**

The usefulness of including further contextual information was highlighted by participants believing the use of multi-media within a map enhancing its accessibility and useability for policy makers and other decision makers. For example, a GIS specialist described the usefulness of multi-media within story maps for a Cardiff based project:

> **"It feels a bit more personal rather than just factual. It's kind of like a bit more of an understanding in that way with videos and media and a bit more interesting for a lot of people." (GIS specialist)**

Participants also suggested that maps can support communication between communities and decision-makers and improve access to lived experience. However, such qualitative and multimedia approaches were perceived as uncommon in policy making:

> **"Maps being the […] lexicon of planning. So, you speak in the same language as planners, so it helps to communicate their ideas." (Co-director of a mapping project)**

> **"That's not to say I don't think that lived experience and qualitative evidence isn't valid, but I think it's a harder sell often for policy and decision makers." (Policy and research advisor)**

This suggests that qualitative multimedia-based maps have the potential to enhance cartography as a tool for KM, yet this potential appears to remain largely unrealised in policy making contexts. However, participants indicated that much of cartography's potential for supporting deeper engagement with complex issues remains underutilised.

Institutional resources, skills, and constraints shape map use

Participants suggested that making greater use of diverse mapping methods, particularly qualitative multimedia mapping, could enhance the accessibility and usability of cartographic information in policy making. We now explore possible reasons for this limited use.

Participants noted that their institutions faced constraints in terms of time, funding, and human resources, which hindered their ability to produce and utilise maps to their full potential:

> **"… time is like just the biggest barrier for anyone working in the civil service currently." (Policy and research advisor)**

Participants also suggested that limited opportunities to apply GIS skills can reduce confidence and expertise over time:

> **"We don't have the resources for a GIS member who we can pass everything map related over to. So, we do it ourselves and whilst training would be useful, is it the best use of resources and time?" (Development officer)**

Moreover, participants also noted that retaining a member of a team that has the necessary GIS skills is a struggle, as they tend to leave for other roles. This is especially prevalent within the domain of community mapping:

> **"… community mappers is a profession […] It could be a full-time job. … we've lost four community mappers too; they've been poached by the people we work with." (Co-director of a mapping project)**

Overall, the findings suggest that institutional resources, GIS skills, and organisational constraints limit the use of cartography as a KM tool. Time pressures, skill shortages, and the costs of software and expertise restrict organisations' ability to develop and utilise maps effectively.

Mapping approaches involve trade-offs between accessibility, engagement, and resources

Three mapping approaches emerged in relation to the third sub-research question: *In what ways do different types of maps support KM for policy making in Wales?* These were digital maps, story maps, and walkable floor maps (see annex 4 for descriptions). Participants highlighted distinct strengths and limitations associated with each approach. Static maps are not discussed further, as their role has already been examined in previous sections.

Digital Maps

Although used less frequently than static maps, digital interactive maps (see annex 4 for description) were identified as valuable tools for policy making, as they enable users to explore data more deeply and interact with spatial information directly:

> **"… it's good as well […] for local government that you've got the ability to select a specific ward. So, you know, a councillor of a specific ward would obviously look for their own area." (Research and GIS team leader talking about their use of digital maps)**

However, it was also noted that these types of maps can be difficult for some users to navigate, as they require a certain level of digital literacy. Without this, their effectiveness as a KM tool may be reduced:

> **"I do think the static map sometimes is a lot easier to use for people that might not be as tech savvy. Not that you have to be tech savvy with interactive maps, but you know, it can be quite confusing if you're turning filters on and off and that kind of thing." (Performance and research officer)**

Story Maps

Participants generally regarded ArcGIS StoryMaps (Esri UK, 2026) (see annex 4 for description), one digital form of the story mapping method, as a highly effective KM tool because it guides users through evidence while clearly communicating complex spatial information. As a result, it was perceived to make knowledge more accessible to policy makers:

> **"[story maps are] a very guided and structured approach to conveying that information." (Senior Data scientist)**

Although, participants also noted that story maps require specialist skills to create and can be costly to commission:

> **"You'd have to know the right person who you could commission [to make a story map], and also it would cost money." (Knowledge mobiliser)**

Furthermore, one participant distinguished between commercial digital story maps, such as ArcGIS StoryMaps (Esri UK, 2026), and more participatory forms of story mapping. They argued that the latter better incorporate lived experience and personal narratives:

> **"… ArcGIS story maps are choropleth maps, which you zoom in and out and you basically have a narrative around them, but it's not really a personal narrative, […] There's no idea of someone's lived experience" (Co-director of a mapping project)**

Walkable Floor Maps

An in-person mapping approach discussed with participants was the walkable floor map method (see annex 4 for description). Participants valued its collaborative and face-to-face nature, which facilitated discussion and knowledge sharing among stakeholders, making it a useful tool for KM:

> **"Anyone can do that type of thing [walkable floor mapping] … and to be able to talk and discuss ideas in that way and use a big map as a group of people is a lot better to kind of get ideas flowing, rather than on the computer." (GIS Specialist)**

However, participants also noted that the workshop outputs seem to be difficult and time-consuming to interpret and convert into formats suitable for policy making:

> **"I can see it [walkable floor maps] being a nightmare for the person trying to interpret it at the end of the day." (Development officer)**

Moreover, some participants further argued that walkable floor mapping can be resource intensive and may not be suitable in all policy making contexts:

> **"We don't really do that sort of thing in the committee element topics. […] we don't have this sort of like projects where you start from the very basics and trying to get lots of different opinions and gather lots of information in in this way" (Senior Data scientist)**

Discussion

The findings for the three sub-research questions help answer the main research question: **How and to what extent do maps function as useful tools for Knowledge mobilisation for policy making in Wales?** The analysis identified four key components that enable maps to support KM.

Perceived to convey credible and authoritative evidence

Participants viewed maps as authoritative forms of evidence because they communicate complex information in a concise and accessible manner. This aligns with previous research highlighting maps as effective communication tools and reflects policy makers' preference for information that can be understood quickly (Arciniegas et al., 2013; Brownson et al., 2006; Cairney & Oliver, 2017). It further reflects Hauck et al.'s (2013) argument that maps have an air of authority to them. However, participants rarely discussed how maps are selectively produced and interpreted.

According to participants, the most widely used map type within policy making processes were quantitative static maps. This interpretation is further supported by the documentary analysis, which found that most maps included within Welsh Government and NRW policy documents were static and quantitative in nature. Their prominence within formal policy documents suggests that such maps are perceived as appropriate tools for presenting authoritative and credible evidence to support policy decisions.

This preference for quantitative static maps aligns with Head's (2008) argument that one of the three primary types of knowledge drawn upon by policy makers is 'scientific and systematic research evidence'. However, it is important to recognise that the persuasive power of maps can also have unintended consequences. Maps may, for instance, contribute to the stigmatisation of specific geographic places (Hauck et al., 2013) or emphasise certain information over others (Ferretti & Geneletti, 2020). These concerns stem from the fact that maps require the simplification and selective representation of spatial data (Monmonier, 1996) and are therefore not neutral depictions of reality (Harley, 1989). Moreover, map interpretation is a complex process shaped by users' experiences, beliefs, social contexts, and public discourse, rather than being determined solely by map design or the mapmaker's intentions (see e.g., Meyer et al., 2024).

These findings highlight the potential of maps as tools for KM. Their perceived trustworthiness and ability to communicate complex information efficiently may make them particularly effective in policy settings. However, this authority also places a responsibility on map makers and knowledge brokers to communicate uncertainty, assumptions, and data limitations transparently. At the same time, maps can encourage discussion and support communication between stakeholders. In this way, they can support not only communication but also reflection and debate within policy making.

Integrating different forms of knowledge

The interviews suggest that cartography can enhance evidence-based decision-making by communicating complex information, supporting deeper data analysis, and facilitating collaborative knowledge sharing. However, this effect depends on the mapping method employed, its quality, the cartographic context, and policy makers' capacity to critically engage with the evidence presented.

Participants viewed digital interactive maps as opportunities to explore spatial information in greater detail and engage more critically with evidence, which is consistent with previous research (Eikelboom & Janssen, 2017; Gourmelon et al., 2014; Shrestha et al., 2019). However, such engagement was perceived to be uncommon in current policy making practice.

Participants also identified maps as having the potential to be valuable tools for knowledge integration, particularly through their capacity to combine spatial narratives and lived experiences with statistical and spatial data. This aligns with KM literature, which emphasises the integration of diverse forms of knowledge as a core practice of effective KM (Durrant et al., 2024; Havers et al., 2026). Previous research similarly highlights the value of narratives and lived experiences in contextualising policy issues (Niederdeppe et al., 2016; Frechette et al., 2020). Rather than simply communicating information, maps therefore can function as tools for bringing together and interpreting multiple forms of knowledge, supporting more informed policy making processes.

Despite the opportunities identified by participants, the documentary analysis suggests that mapping's potential for knowledge integration is not yet fully realised in formal policy documentation. Quantitative, thematic, and planning maps dominated the documents analysed, with little evidence of maps being used to incorporate qualitative knowledge, lived experiences, or spatial narratives. Although the static format of PDF-style reports may constrain more interactive or participatory forms of mapping, there are still opportunities to include links to digital mapping platforms and to frame mapping as an ongoing process of knowledge co-production. Their limited

use both in the documentary analysis and based on participants' accounts suggests a gap between the opportunities participants identified and current mapping practices in Welsh policy making.

Facilitating knowledge exchange among stakeholders

The findings from the interviews suggest that greater recognition of mapping as a collaborative process, rather than simply a final output, could benefit policy makers by facilitating discussion, shared understanding, and knowledge exchange. This aligns with previous research, which has similarly highlighted the capacity of maps to facilitate knowledge exchange and emphasised the importance of mapping as a collaborative process (e.g., Bishop et al., 2022; Molina Rodríguez-Navas et al., 2021).

Walkable floor mapping workshops were perceived as useful tools for facilitating dialogue, collaboration, and knowledge exchange between policy makers and stakeholders. This aligns with previous research highlighting the value of participatory mapping approaches for social learning and collaborative decision-making (Petersen et al., 2024; Petersen, et al. 2025; Arciniegas et al., 2013; Eikelboom & Janssen, 2017; Gourmelon et al., 2014; Shrestha et al., 2019).

A notable concern raised by multiple participants was that some policy makers remain reluctant to move beyond traditional methods of presenting statistical evidence, let alone adopt participatory mapping approaches. Participants also highlighted that the resource and time intensive nature of these methods may discourage their use in policy making contexts. Furthermore, it was noted that participatory mapping approaches may not be suitable across all policy domains. Therefore, the overall usefulness of maps in facilitating knowledge exchange, and as a broader KM tool, depends on selecting a mapping method that aligns with the resources, needs, context, and receptiveness of the intended policy making audience.

Improving the accessibility and understandability of knowledge

Participants viewed maps as valuable KM tools because they improve the accessibility and understandability of complex spatial information. Their ability to reveal spatial patterns and relationships align with previous research highlighting

their value for communication and decision-making (Hauck et al., 2013; Arciniegas et al., 2013).

Participants also described maps as a common language through which different stakeholders can communicate and develop shared understandings of policy issues. This resonates with KM literature that emphasises accessible forms of evidence and knowledge exchange (Havers et al., 2026; Durrant et al., 2024).

Participants viewed qualitative multimedia mapping approaches as particularly valuable because they can integrate quantitative evidence, narratives, lived experience, and social context within a single format. This aligns with research on story maps and participatory mapping approaches (Vollstedt et al., 2021; Oubennaceur et al., 2021; Elwood, 2006b).

Participants also identified several practical barriers associated with commercial mapping methods designed to improve knowledge accessibility, including time constraints, resource demands, software costs, and training requirements. These findings suggest that, although maps may have considerable potential as KM tools, their effectiveness can be constrained by organisational and technical barriers that limit access to both the tools themselves and the knowledge they intend to mobilise.

Conclusion

This study set out to examine how and to what extent maps function as tools for KM in Welsh policy making. The findings suggest that maps can support communication, evidence-informed decision-making, knowledge exchange, and the integration of research evidence, professional expertise, and lived experience. In doing so, they align closely with contemporary understandings of KM as a relational, integrative, and contextual process.

The findings suggest that maps should be understood not only as representations of spatial knowledge, but also as processes that support collaboration, learning, and knowledge integration. They also highlight the importance of communicating uncertainty, assumptions, and data limitations transparently.

Key factors

The extent to which maps successfully mobilise knowledge depends on the alignment of four key factors. The four themes identified in the discussion highlight different ways in which maps can support KM. However, whether these benefits are realised in practice depends on several underlying factors. Failure to align these factors can limit their usefulness within policy making. These key factors are:

1) Maps are used in ways that **communicate evidence clearly** while also **encouraging critical engagement** with their assumptions, limitations, and uncertainties.
2) The chosen mapping method provides the functionality needed to **integrate diverse forms of knowledge** within the intended decision-making process.
3) Organisations and individuals are **willing and able to engage with mapping methods** appropriate to the policy context.
4) The selected mapping method aligns with the aims of the exercise and the **resources, skills, and needs of intended users**.

This study therefore concludes that maps function as useful tool for KM in policy making, but their effectiveness depends on the alignment of these four key factors. Maps should not be seen as just visual outputs of spatial information. They are tools and processes whose usefulness depends on their design, the organisation using them, the policy making process, and how people use and interpret the information they show.

Future research

Future research should examine whether the four key factors identified in this study are transferable across different policy sectors, governance settings, and organisational contexts beyond Wales. Further research should also explore the role of KBOs in the creation, interpretation, and use of maps within policy making. Finally, subsequent research could investigate how policy makers interpret credibility, uncertainty, and bias in mapped evidence.

Recommendations

- Match mapping methods to the objectives of the exercise and the forms of knowledge being mobilised.
- Combine quantitative spatial data with qualitative narratives and lived experience where appropriate.
- Consider treating map development as a participatory process that supports co-production and knowledge integration. This could include the use of participatory and interactive mapping methods where knowledge exchange and stakeholder engagement are key aims.
- Invest in training, skills development, and organisational capacity to support the creation, interpretation, and use of maps.
- Ensure maps are accompanied by clear information on their data sources, assumptions, uncertainties, and limitations.

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Annex

Annex 1

Table 1: Welsh government and local authority documents consulted

Document name	Retrieved from
Collections Blueprint 2025	**https://www.gov.wales/sites/default/files/publications/2025-06/collections-blueprint-2025.pdf** (Accessed: 20/07/26).
Future Generations Report 2025	**https://futuregenerations.wales/cym/wp-content/uploads/2025/05/Future-Generations-Report-2025.pdf** (Accessed: 20/07/26).
Future Wales: The National Plan 2040	**https://www.gov.wales/sites/default/files/publications/2021-02/future-wales-the-national-plan-2040.pdf** (Accessed: 20/07/26).
Newport City Council, Local Development Plan	**https://www.newport.gov.uk/planning/planning-policy/local-development-plan** (Accessed: 20/07/26).
Welsh National Marine Plan	**https://www.gov.wales/sites/default/files/publications/2019-11/welsh-national-marine-plan-document_0.pdf** (Accessed: 20/07/26).

Table 2: Natural Resources Wales documents consulted

Document name	Retrieved from
Forest Resource Plans	**https://naturalresources.wales/about-us/what-we-do/strategies-plans-and-policies/forest-resource-plans/?lang=en** (Accessed: 20/07/26).
Natural Resources Wales Flood Risk Management Plan: National overview	**https://cdn.cyfoethnaturiol.cymru/iacpsksr/frmp-cycle-2-national-section.pdf** (Accessed: 20/07/26).
State of Natural Resources Report 2025 (SoNaRR 2025): An assessment of Wales' sustainable management of natural resources	**https://cdn.cyfoethnaturiol.cymru/f45ehjei/sonarr2025-final-report.pdf** (Accessed: 20/07/26).

Annex 2

Interview structure and questions

Total time: 1 hour

Introduction: 5mins

Part 1: Questions relating to Sub Research Questions (SRQs) 1 and 2
Time: 30mins. Roughly 15mins for each SRQ question).

SRQ1:

- How do you use maps in your work? (/reflect on the use of maps in your work)
    - Why are maps used in that way? For what purpose?
    - What types of maps do you commonly encounter? (e.g., GIS outputs, interactive dashboards, static reports)
    - Who produces these maps (internal teams, external consultants, agencies)?
- What makes a map persuasive or impactful to you?
    - Can you give an example of a persuasive or impactful map from your own work?
- What types of data do you think maps are most and least useful at communicating, and why?
- To what extent do maps influence decisions that you and your colleagues make in your work?
    - Can you give an example of a specific time when a map influenced your work?
- Can you share an example of a time when maps were misinterpreted or misused in your work or by a colleague? / Can you describe a time when maps were a hindrance in your work, and why?
    - What type of map was misinterpreted/misused/a hinderance?
    - What data was this map trying to represent?

- Can you give an example of a time when a map could have communicated the data more effectively?
    - If so, how do you believe it could've been communicated better?
    - What was the data that was being represented?
    - What type of map was being used?
- What have maps been most useful for in your work, and why?
- How valued are maps in your organisation?
    - If they are valued, why? / If they aren't valued, why not?
- What improvements would you like to see in how maps are designed or used in your own work?

SRQ2:

- In what ways and to what extent do you find the maps you use accessible, easy, or difficult to use?
    - Can you provide an example of a map that was accessible, easy, or difficult to use in you work?
    - What types of maps are accessible, easy, or difficult to use?
    - Is there a specific type of data that make maps more accessible, easy, or difficult to use?
- Can you describe your experience in terms of the speed at which you can access the information you want from the maps you use?
    - What map types increase the speed at which you can access the information you want, and which map types slow this process?
    - What types of data are maps good for accessing quickly and what types are they less useful for?
- How useful have maps been in your work as a tool for making academic findings or complex data more understandable?
    - Can you share an example of when a map made academic findings or complex data more understandable?

- What type of map made academic findings or complex data more understandable?

- Can you share an example of how maps have helped a colleague or stakeholder without GIS expertise better understand complex or academic information?
  - What type of map helped a colleague or stakeholder without GIS expertise better understand complex or academic information?
  - What data was that map representing?
- Can you think of a time where a map helped to inform your work or your colleagues work?
  - If so, how did it help inform?
  - What kind of work did it inform?
  - What type of map was it?
- Have you ever found a map hard to use or interact with?
  - If so, why was it hard to use or interact with? / If not, what has made maps easy to use?
  - What could've made the map easier to use?
  - What sort of map was it?
  - What data was the map trying to represent?
- Can you tell me a time when you were sceptical of a map, and why?
- Can you tell me a time when a map surprised you, and why?
- What skills or support do you and your colleagues need to use maps more effectively?

Part 2: Questions on example maps and relating to SRQ3

Time: 25mins. 5mins per map type.

Questions for stimulating discussion around the maps:

1. Quantitative Interactive Maps (provide link to example map)

- What is your initial reaction to using this type of map? What are your first thoughts?
- How do you find using the interactive features of this map when exploring the data?
- Do you feel you need any additional context or explanation to interpret this type of map?
- To what extent do you think this map could be used independently, both by yourself and by non-specialists?
- To what extent does this map provide the context and information you would need, for you work/decision-making?
- When and with who do you think this type of map would be most useful and least useful?

2. Qualitative Interactive Maps (provide link to example map)
    - What is your initial reaction to using this type of map? What are your first thoughts and impressions on its usefulness?
    - Do you use this type of mapping in your own work? If so, how?
    - What impact, if any, does the qualitative information in this map have on how you understand the spatial data?
    - How engaging do you find this type of qualitative interactive map compared to more traditional and purely quantitative interactive maps?
    - When and with who do you think this type of map would be most useful and least useful?
3. ArcGIS Story Maps (provide link to example map)
    - What is your initial reaction to using this type of map? What are your first thoughts?
    - Could you see yourself and your colleagues using this type of map in your work?
        - If so, why and how? / If not, why not?
    - When and with who do you think this type of map would be most useful and least useful?

- In what ways, if any, does the narrative element of this map add to or detract from your understanding of the spatial data shown?

- How useful is the concept of a digital story map, and what are its advantages and disadvantages as a mapping tool?

4. Walkable Floor Maps (show pictures of examples of map type)

    - What is your initial reaction to this type of map? What are your first impression to this type of mapping?

    - In what ways, if any, does engaging with this map in person differ from a digital maps in terms of benefits and limitations?

    - How does incorporating in-person qualitative input (such as discussion and annotation) influence the usefulness of spatial data and for decision-making?

    - Can you think of a real scenario in your work where this type of mapping would or wouldn't be helpful?

5. Static Maps (show pictures of examples of map type)

    - How do static maps compare to the interactive maps you've used and seen just now?

    - When do you think static maps would be more useful and less useful than the interactive maps shown?

Annex 3:

Table 3: Mapping resources used during interviews

Mapping method	Map names or descriptions	Reference/Sources
Quantitative Interactive Map	Tree Map of London	Greater London Authority (2026) **'London's Public Realm Trees'**. Available at: **https://apps.london.gov.uk/public-realm-trees/explore** (Accessed: 02/08/26).
Qualitative Interactive Maps	Leeds Culture Map	MapMe (2026a) **'Leeds Culture Map'**. Available at: **https://viewer.mapme.com/7ef27eea-697a-45e5-8c62-5266ea166ad5** (Accessed: 02/08/26).
Qualitative Interactive Maps	Batemans Bay Bridge replacement	MapMe (2026) **'Batemans Bay Bridge replacement'**. Available at: **https://viewer.mapme.com/batemans-bay-bridge-replacement** (Accessed: 02/08/26).
ArcGIS StoryMaps (Esri, 2026)	Nelson climate adaptation: Preparing our coastal communities for a changing climate	ArcGIS StoryMaps (2026) **'Nelson climate adaptation: Preparing our coastal communities for a changing climate'**. Available at: **https://storymaps.arcgis.com/stories/ade9358709ab4af39c7fc5de610279eb** (Accessed: 02/08/26).
ArcGIS StoryMaps (Esri, 2026)	Opportunity on two wheels: Analysing access to low-stress bicycling in Washington,	ArcGIS StoryMaps (2021) **'Opportunity on two wheels: Analyzing access to low-stress bicycling in Washington, D.C. and why it matters. ArcGIS StoryMaps'**. Available at:

	D.C. — and why it matters	**https://m365.cloud.microsoft/chat/conversation/8dcfb947-18bd-4ff0-8526-c96d0a145588?fromcode=edgentp&redirectid=6a5ca432b8654e59930ae76dcc2cb0f2&auth=2&handinClickTs=1784538994236** (Accessed: 02/08/26).
Walkable floor map	Three pictures depicting walkable floor mapping workshops in Denmark, Croatia, and France.	Source: Petersen, et al. (2024; p. 5-7).
Static maps	Two maps from the Future Wales the National Plan 2040. One map of commuting patterns in Wales. The other map of Future Wales spatial strategy.	Source: Welsh Government (2021; p. 31, 61).
Static maps	Map labelled 'Tourism and Recreation – Areas of natural beauty or enjoyment: Indicative map relating to Policy areas'	Source: Welsh Government (2019; p. 142)
Static maps	Map of tranquillity and place in Wales	Source: Natural Resources Wales (2025; p. 714).

Annex 4

Table 4: Mapping related terms

Map Method	Description
Quantitative Interactive Map	A map depicting quantitative data which **"users can manipulate to change the style or format, zoom, search, filter, or view pop-ups."** (Esri, 2026a).
Qualitative Interactive Maps	A map depicting qualitative data which **"users can manipulate to change the style or format, zoom, search, filter, or view pop-ups."** (Esri, 2026a).
ArcGIS StoryMaps (Esri, 2026)	Esri (2026b) describes ArcGIS StoryMaps as **"a web-based content-creation and communication tool that allows you to share maps, apps, and multimedia in the context of a narrative"**.
Walkable floor map	Petersen et al. (2024, 2025) describe walkable floor maps as **interactive, participatory mapping tools that enable stakeholders to physically engage with spatial representations of their local environment, supporting collaborative learning, policy discussion, and the co-development of nature-based solutions**.
Static maps	**"A static map is a non-interactive map image" and they "are designed for applications that do not require user interaction such**

as panning or zooming" (Esri, 2026c).

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