FUTURELAKES

For Nature, Climate and People

Stakeholder Mapping:

Analysis of Stakeholder Involvement in Lake Restoration in Six European Countries

Deliverable 2.1

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1 PU = Public
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Summary

The report is an output from Work Package 2 – Public mobilisation, engagement, and lake governance. The main objectives of this deliverable are:

- To identify the stakeholder groups connected to lake restoration and governance at 6 FutureLakes Demo lake basins
- To identify any relevant downstream stakeholders
- To assess current engagement levels for the project case-studies, using the OECD framework for stakeholder engagement and a semi-structured questionnaire from the Water Governance Assessment Tool
- To categorize stakeholders by applying a Power/Interest matrix
- To help project partners plan their engagement activities by providing a comprehensive stakeholder analysis of each Demo Site
- To reflect on the stakeholder analysis results in the context of lake restoration and management

This report has been written for two purposes. The first for an internal project audience (for all case-study and task leads to look at their stakeholder landscape from a broad and comparative perspective, guiding further project activities). Secondly, for external audiences of researchers and lake practitioners to provide them with theoretical and methodological toolkits for stakeholder mapping and analysis. The report has the following structure:

Building on the fundamentals of Stakeholder Theory, Section 1 gives some necessary introductions on stakeholder engagement in water governance, its increased importance in research and applied projects. Here, we define the basic terminology and discuss the benefits and challenges related to stakeholder involvement. Finally, we briefly present the Ladder of Participation framework, as the theoretical entry points for the report. Section 2 presents the methodological considerations for stakeholder mapping and analysis. We discuss some methodological approaches, to finally present the templates and data collection procedure for the task. Section 1 and 2 are also important building blocks for the final deliverable of WP4 (FutureLakes Blueprint) outlining the theory and methods for stakeholder mapping and analysis for lake restoration programmes. This approach is transferrable to all ecosystem restoration projects and is, therefore, of relevance to Member States considering their "public participation" plans for their National Restoration Plans for the new EU Nature Restoration regulation.

Section 3 presents the stakeholder mapping and analysis results from the six Demo lake basins: Lake Karla (Greece), Kartuzy Lakes (Poland), Lake Vesijärvi (Finland), Lake Vansjø (Norway), Loch Leven (UK), and Lake Ijssel (the Netherlands). Section 4 summarizes the report, reflects on the results in a comparative perspective and provides conclusions.

The results from the six Demo lake basins highlight a complex landscape of diverse stakeholder groups and categories. Effective lake management involves diverse stakeholders with varying roles and interests, depending on the lake's ecological, social, and economic functions. Governance institutions and stakeholder involvement mechanisms differ significantly across cases, with varying levels of centralisation and ownership models. Stakeholder engagement evaluation against the OECD framework shows that all cases are already relatively high on the engagement level and show an ambition to "climb up the ladder" by looking for new stakeholder involvement strategies. Three cases (Lake Vesijärvi, Lake Vansjø and Lake Ijssel) already represent the highest level of engagement

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with co-decision and co-production of knowledge and a balanced share of power between the stakeholders involved. The Power/Interest framework was applied to divide lake stakeholders into four groups depending on the levels of time, influence and resources they can, and are, dedicating to lake management. Although there are some patterns for more powerful and interested stakeholders (with public authorities of various levels dominating this group), each case has also some specific local stakeholder constellations, including unique stakeholders who are pivotal in lake management.

Abbreviations

BPIJ – Bestuurlijk Platform IJsselmeergebied (Administrative Platform IJsselmeer Region)
DNT – Den Norske Turistforening (Norwegian Trekking Association)
DUTH – Democritus University of Thrace
EKBY – Ελληνικό Κέντρο Βιοτόπων-Υγροτόπων (Greek Biotope/Wetland Centre)
EOE – Ελληνική Ορνιθολογική Εταιρεία (Hellenic Ornithologic Society)
ERDF – European Regional Development Fund
EU – European Union
FL – FutureLakes
ICPR – International Commission for the Protection of the Rhine
ILBM – Integrated Lake Basin Management
ILEC – International Lake Environment Committee Foundation
IUCN – International Union for Conservation of Nature
KIMA – Kennis en Innovatieprogramma Marker Wadden (Marker Wadden Knowledge and Innovation Programme)
LBMG – Lake Basin Management Group
LTO – Land- en Tuinbouw Organisatie Nederland (Netherlands Agricultural and Horticultural Association)
LUKE – Natural Resources Institute Finland
LUT – Lappeenranta–Lahti University of Technology
MOVAR IKS – MOsseregionen Vann, Avløp, og Renovasjon Interkommunalt selskap (Moss Region Water, Sewage, and Renovation Intermunicipal Utility Company)
MTK – Maa- ja metsätaloustuottajain Keskusliitto (The Central Union of Agricultural Producers and Forest Owners)
NECCA – Οργανισμός Φυσικού Περιβάλλοντος και Κλιματικής Αλλαγής (Natural Environment and Climate Change Agency)
NGO – Non-governmental organization
NIBIO – Norwegian Institute of Bioeconomy Research
NIVA – Norwegian Institute for Water Research
NMBU – Norwegian University of Life Sciences
NRR – Nature Restoration Regulation
NVE – Norges vassdrags- og energidirektorat (Norwegian Water Resources and Energy Directorate)
OECD – The Organization for Economic Cooperation and Development
PAMU – Protected Area Management Unit
PFAS – Perfluoroalkyl and Polyfluoroalkyl Substances
PFOS – Perfluorooctane Sulfonic Acid
PZW – Polski Związek Wędkarski (Polish Angling Association)
RBD – River Basin District
RSPB – Royal Society for the Protection of Birds
SABIMA – Samarbeidsrådet for biologisk mangfold (Norwegian Biodiversity Network)
SEPA – Scottish Environment Protection Agency
SER – Society for Ecological Restoration
SYKE – Finnish Environment Institute

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TWSC – De Trilaterale Waddenzee Samenwerking (The Trilateral Wadden Sea Cooperation)
UKCEH – UK Centre of Ecology & Hydrology
UKRI – UK Research and Innovation
UTH – University of Thessaly
UWM – University of Warmia and Mazury in Olsztyn
WWF – World Wide Fund for Nature
WWQA – World Water Quality Alliance

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1 Introduction

Europe's lakes face significant environmental challenges, with nearly half failing to meet Water Framework Directive (WFD) good ecological and chemical status benchmarks due to issues like nutrient pollution and climate change impacts. The EU Nature Restoration Law and European Green Deal have the ambition to increase lake restoration efforts across Europe. In addition to technical and scientific knowledge, this requires a good understanding of the stakeholder perspective in planning, implementing and monitoring the restoration efforts.

Stakeholder mapping is a crucial process in research projects, offering several benefits that enhance project outcomes and public engagement. Stakeholder mapping and analysis enable researchers to navigate complex governance landscapes, optimise engagement strategies, and ultimately produce more valuable and impactful research outcomes. Stakeholder mapping and analysis also identifies marginalised stakeholders in lake management that should be given more possibilities to interact with lake governance.

Stakeholder engagement is a fundamental pillar of good water governance. Technical solutions alone are not able to deliver desirable outcomes if they are not coupled with the participation of engaged stakeholders (ILEC, 2005; Poikane et al., 2024). Engaging various stakeholders in project management, decision-making, and policy development has gained momentum in recent years, with increasing recognition of the value of involving diverse stakeholders in various processes.

The findings from this report underscore the critical importance of understanding the diverse stakeholder dynamics. By recognizing the challenges posed by complex stakeholder settings, varying levels of knowledge and competence and examples of governance landscapes in six ambitious lake restoration projects in Europe, policymakers and practitioners can better navigate the intricacies of lake restoration and conservation.

1.1 The participatory turn

Poor public engagement has been identified among the key barriers in effective restoration by the World Water Quality Alliance (WWQA) Global Survey of Lake Restoration Practitioners. Engagement with stakeholders has been stressed as a key factor decisive for the success of restoration projects by over half of the respondents (Poikane et al., 2024). Interestingly, most respondents perceived public engagement as the most important factor in determining the success or failure of lake restoration programs, ranked before governance, knowledge and resources (Poikane et al., 2024).

These observations are in line with a broader shift in thinking about public policy, environmental protection, and project management, which has occurred since the 1980s. The need for broader engagement emerged as part of the fundamental shift "from government to governance", in which public management has replaced hierarchical decision-making with more diverse and horizontal relationships between state institutions and non-governmental actors, especially civil society organizations or local communities (Lo, 2017). This broadening of the types of actors involved in decision-making resulted in the introduction of the concept of a 'stakeholder' as someone who has a legitimate claim to taking part in decision-making by virtue of being affected by the outcome. A 'participatory turn', the emphasis on greater inclusiveness in governance processes, is also very visible in environmental governance of recent decades. Stakeholder Theory should be seen as a

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theoretical framework for understanding the significance of stakeholder engagement in project management and its potential impact on project success metrics.

Including stakeholders in decision-making not only increases the legitimacy and societal acceptance of outcomes, which is important e.g. in costly environmental policies or deployment of new infrastructure; it also leads to more effective and better decisions. Involving local stakeholders is a necessary bridge to anchor any intervention in the local context and settings, to make it resonate with the local knowledge, culture, and practices in natural resource management, and understand site specific context (Phillipson et al., 2012; Raymond et al., 2010). Appropriate stakeholder involvement can make research more responsible and the research outcomes more meaningful (Hollmann et al., 2022). Ensuring the inclusion of multiple perspectives can reduce conflicts, build trust and facilitate learning (Reed et al., 2018).

The 1992 Rio Declaration stated in Principle 10 that “environmental issues are best handled with participation of all concerned citizens, at the relevant level” (Ebbesson, 2015). This approach was further institutionalized with the 2001 Aarhus Convention, stating that citizens must have access to information, participation in decision-making, and justice in environmental matters. Inclusion of civil society actors and stakeholders through public consultation and the ideal of participatory governance are important principles of the European Union (Bendtsen et al., 2021).

The participatory turn is also very visible in water management, where the traditional role of governments has in many cases been enriched with multi-level or poly-centric governance. This shift acknowledges the important roles of stakeholders contributing to effective, efficient and inclusive water management (Akhmouch & Clavreul, 2016). Strong connective capacity within such networks has been proven to deliver better outcomes of the governance processes (Edelenbos et al., 2013).

As mentioned earlier, inadequate stakeholder engagement has been recognized as one of the primary obstacles to successful lake restoration efforts. Participation has been included by the International Lake Environment Committee Foundation (ILEC) in the six fundamental pillars for governance improvement, together with Institutions, Policies, Technology, Innovation, and Finance. The ILEC promotes the concept of Integrated Lake Basin Management (ILBM) for a better future of lakes and other water bodies that are now under serious threat of degradation, particularly caused by human activities and climate change. Similarly, International Principles and Standards for the Practice of Ecological Restoration developed by the Society for Ecological Restoration (SER) start with the fundamental role of participation and stakeholder involvement in Principle 1 (Gann et al., 2019).

1.2 Who are stakeholders?

The concept of ‘stakeholders’ has been developing in parallel in various disciplines, such as strategic planning, systems theory, or organizations theory, since the 1960s. These early examples of thinking in terms of stakeholders were systematised in the 1980s by Robert Edward Freeman, whose seminal book “Strategic Management: A Stakeholder Approach” can be seen as the foundation of Stakeholder Theory (Freeman, 1984). Freeman identifies ‘stakeholders’ as a broader group in comparison to the typical reference of management in capitalist firms: ‘shareholders,’ and stresses the need to consider them in the decision-making process. Stakeholders are defined as “any group or individual who can affect or is affected by the achievement of an organisation’s purpose” (Freeman,

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2010). It is emphasised that engaging stakeholders creates value and contributes to achieving more sustainable outcomes.

In the lake management and restoration context, stakeholders encompass a diverse group of individuals and organizations with varying interests in the lake's ecological, social, and economic functions.

1.3 Benefits of stakeholder involvement

Benefits of involving stakeholders include generation of results directly relevant to society and decision-makers, enhanced communication of data and results to broader audiences, increased stakeholder understanding of, and trust in, science, active citizenship, and increasing adaptive capacity (Smyth et al., 2021). The OECD report (Figure 1) on stakeholder engagement for inclusive water governance also adds the benefits of acceptability and sustainability (with more effective implementation and ownership of decisions and outcomes), social equity and cohesion (by building trust and confidence), more capacity and knowledge (awareness) and finally a better economic efficiency (cost and time saving and better coherence) (OECD, 2015).

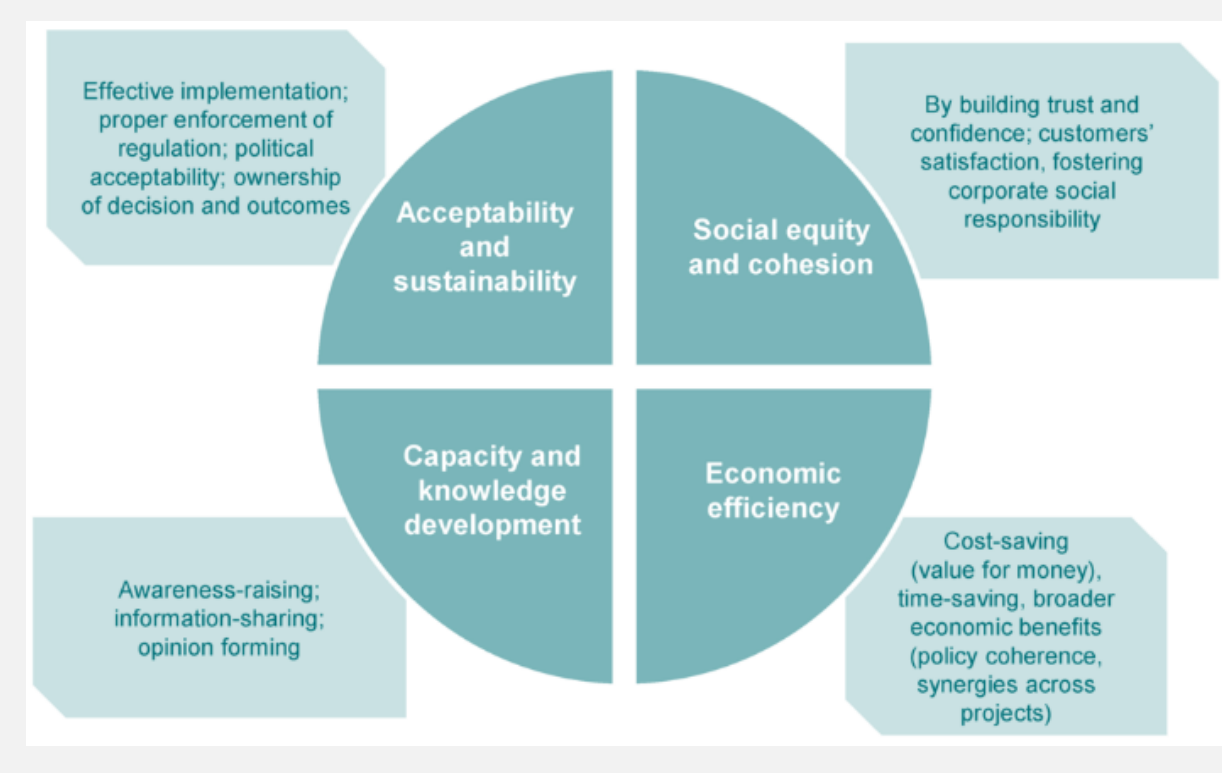

Figure 1 – Benefits of stakeholder participation from the OECD framework (OECD, 2015: 157)

For Esmail et al. (2015), one of the major hypothesised impacts of stakeholder engagement is better quality research, as stakeholders apparently bring "a unique perspective, sometimes with direct knowledge and experience, which has the potential to promote more useful evidence that is more relevant […] to stakeholders' needs". Another crucial impact is the expanded applicability of research, for example through reaching marginalized populations. Other impacts include

empowering stakeholders, increased dissemination and uptake of research results, contributions to democracy and accountability and fulfilling moral obligations related to social justice.

Smyth and colleagues (2021) list the following benefits of including stakeholders:

(1) generation of results directly relevant to society and decision makers,

(2) enhanced communication of data and results to broader audiences,

(3) increased stakeholder understanding of and trust in science

(4) active citizenship, and

(5) increasing adaptive capacity.

However, the authors are also very clear that these positive outcomes are not guaranteed and that teams face many challenges related to stakeholder engagement. There are no panacea for involving stakeholders in lake and basin management (Bell et al., 2013) and the process of stakeholder engagement should be carefully planned, evaluated, and prepared to address typical and unexpected challenges.

1.4 Challenges in stakeholder involvement

Unfortunately, many engagement processes fall short of their envisaged goals. Smyth et al. (2021) provide a typology for most frequently encountered barriers to stakeholder engagement (Figure 2) and reflect on various factors that can hinder stakeholder engagement. Their list encompasses issues related to lack of expertise, insufficient time for engagement activities, lack of people motivated to carry out engagement activities, problems that are related to existing conflicts, disinterest from the stakeholder side, diverse perceptions, etc.

Figure 2 – Typical barriers to stakeholder engagement (Smyth et al., 2021)

Stakeholder engagement is inherently resource- and time-intensive with some methodologies requiring specialised expertise that may not be available at all research sites. Some of the challenges and limitations to stakeholder engagement can be already addressed in drafting the proposal, e.g.

stakeholder fatigue, biased representation, missing stakeholders, power imbalances, short-term engagement, unrealistically high expectations etc. (BiodivERsA, 2014). Proactive application of tools like the split ladder can help research teams and networks find this balance by clarifying differences in the conditions for engaging stakeholders across sites and deploying resources and methodologies accordingly (Smyth et al., 2021).

1.5 Ladder of participation

After Freeman's book, the 'stakeholder' concept has received much scholarly attention. According to Reed (2008) approaches to stakeholder participation evolved from awareness raising in the 1960s, through incorporating local perspectives since the 1970s, attention to local knowledge since the 1980s, up to bringing participation as a norm in the global sustainability agenda in the 1990s. Stakeholder engagement can be seen as an umbrella term for various stakeholder interactions. It is a broad concept with diverse processes and various intentions, that can refer to basic communication and consultation with stakeholders, but also describes more advanced forms of participation, representation, partnerships with co-decisions, co-production, and knowledge co-creation as the most ambitious form of stakeholder engagement (OECD, 2015).

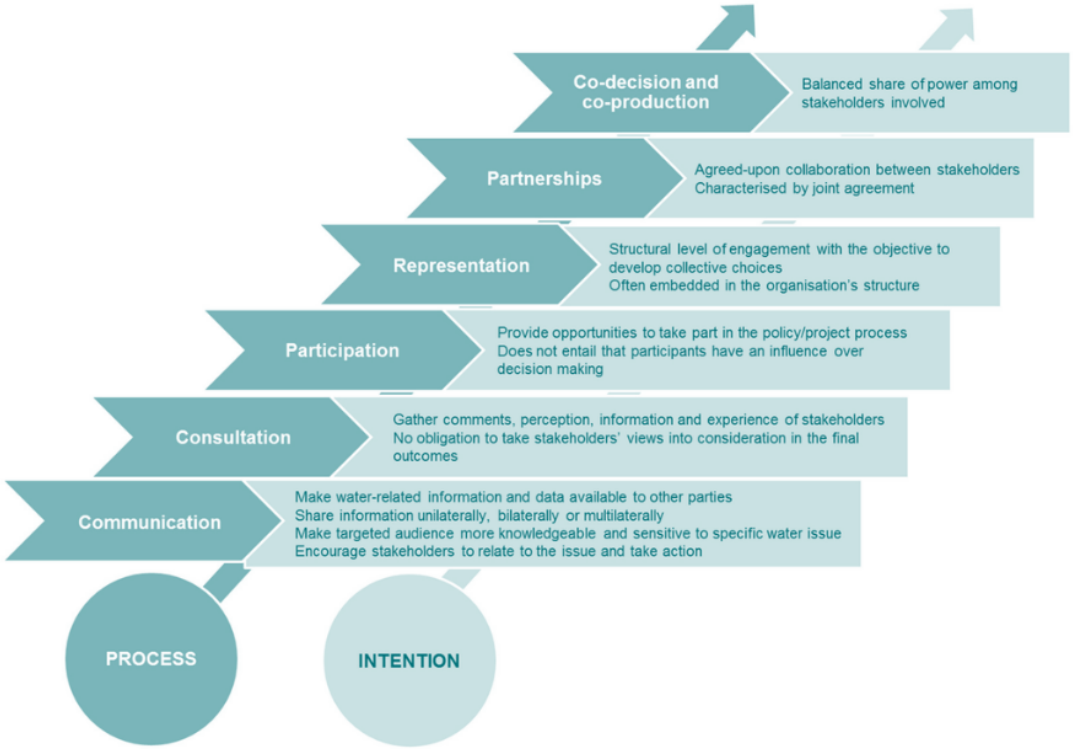

Figure 3 – Levels of stakeholder engagement from the OECD framework (OECD, 2015)

Stakeholder engagement can be evaluated with reference to its ambition. The OECD framework (Figure 3) is clearly rooted in Sherry Arnstein's "ladder of citizen participation", created already in 1969 to capture citizen involvement in planning processes in the United States to show participation ranging from high to low (Arnstein, 1969).

Although Arnstein's ladder of participation does not provide concrete guidelines for reaching the stages, it is an established concept in stakeholder engagement research and can be helpful to develop typologies based on stakeholder engagement ambition. Hurlbert and Gupta (2015) developed a framework with pathways of "climbing" the ladder based on current levels of trust and participation among targeted stakeholders (Figure 4) (Hurlbert & Gupta, 2015). This ladder can help the team to plan engagement depending on the levels of participation and trust and allow different cases for "climbing their own ladder".

To make the participation ladder more relevant to lake governance context, we use selected indicators from the Water Governance Assessment Tool (Bressers et al., 2013) as parts of our FutureLakes templates presented in Section 2.1.2 of this report.

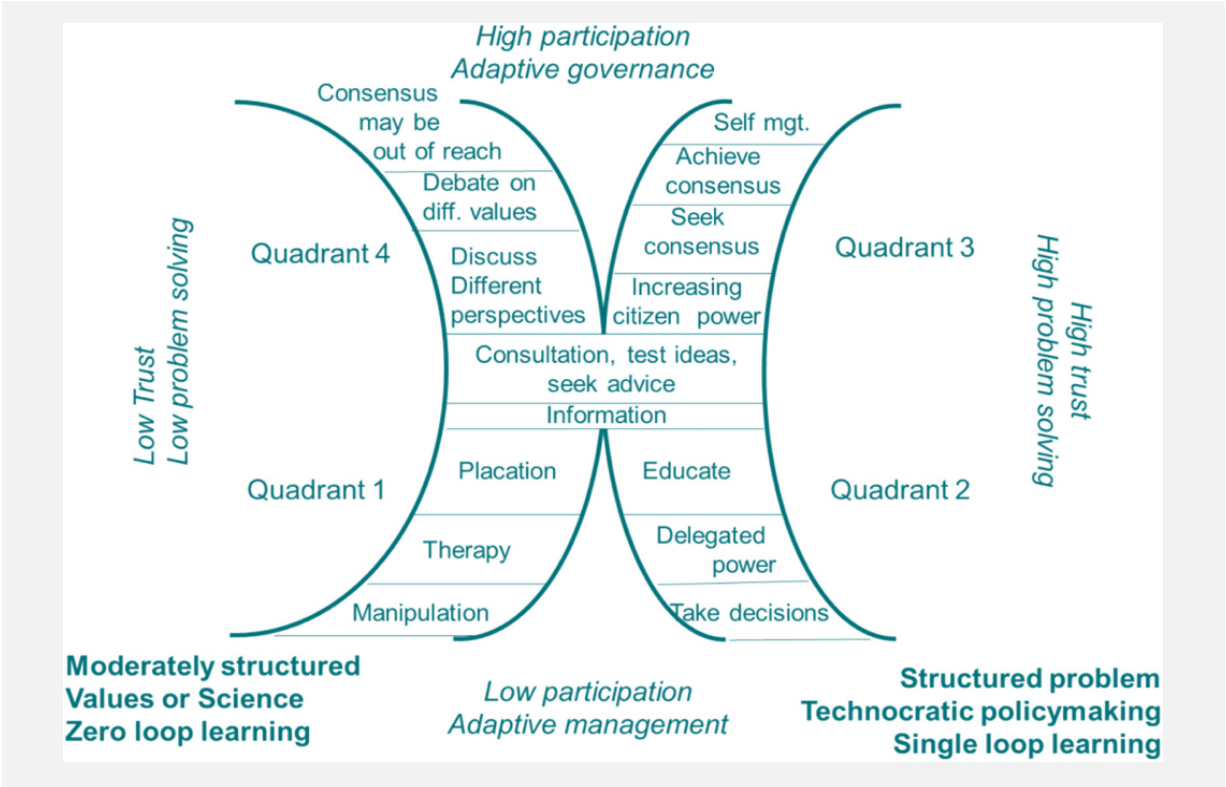

Figure 4 – Split Ladder of Participation (Hurlbert & Gupta, 2015, 2024)

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2 Methods for stakeholder mapping and analysis

Water management, like natural resource management in general, often involves conflicting stakeholder interests due to shared resource use. Stakeholder mapping and analysis are important to understand their perspectives, facilitate learning and understanding to reach some common consensus. Although stakeholder analysis will not solve the problems, it can help create platforms for negotiation, recognizing diverse perspectives and needs.

A first and fundamental exercise before stakeholder engagement activities is understanding the complexity of actor constellations in the given area. This should be done by a thorough stakeholder mapping approach.

2.1 Stakeholder mapping approaches

Stakeholder mapping can serve different purposes. It allows project teams to gain a comprehensive understanding of the stakeholder landscape. Depending on the purpose of the engagement activities, it allows the identification of stakeholders relevant for the project activities but also helps to develop communication strategies. Furthermore, it can help to identify possible risks associated with stakeholder engagement in the given area, field and time.

Stakeholder mapping is a process of systematic identification and evaluation of possible actors that can influence and can have an interest in the project.

A range of methods exist to map and analyse stakeholders. According to Reed et al. (2009), three types of stakeholder mapping are common:

- The *descriptive approach* aims to reconstruct and understand the stakeholder landscape.
- The *instrumental approach* focuses on stakeholder mapping and management for a specific purpose.
- The *normative approach* focuses on the legitimacy of stakeholder involvement and empowerment in the decision-making.

All three perspectives are important for FutureLakes. The stakeholder mapping exercise is firstly *descriptive* and a goal in itself, to provide a description and understanding of stakeholders in the Demo basins than can serve all interested audiences. Secondly, many project activities engaging stakeholders should use the stakeholder mapping more *instrumentally*, targeting specific stakeholder groups to achieve the desired project outcomes. Finally, the *normative* approach is also important as the stakeholder mapping will allow teams to identify marginalised groups in lake management. Empowerment of those groups and bringing them closer to lake governance arenas is a long-term project goal, that fits with the goal of the Mission Restore our Ocean & Waters to enhance public participation and water literacy (European Commission, 2025).

Reed and colleagues (2009) have also introduced a typology of steps in stakeholder mapping and analysis (Figure 5), with examples of specific methods associated with each step:

- *Methods for identifying stakeholders;*

- *Methods for differentiating between or categorising stakeholders;*
- *Methods for analysing relationships between stakeholders*

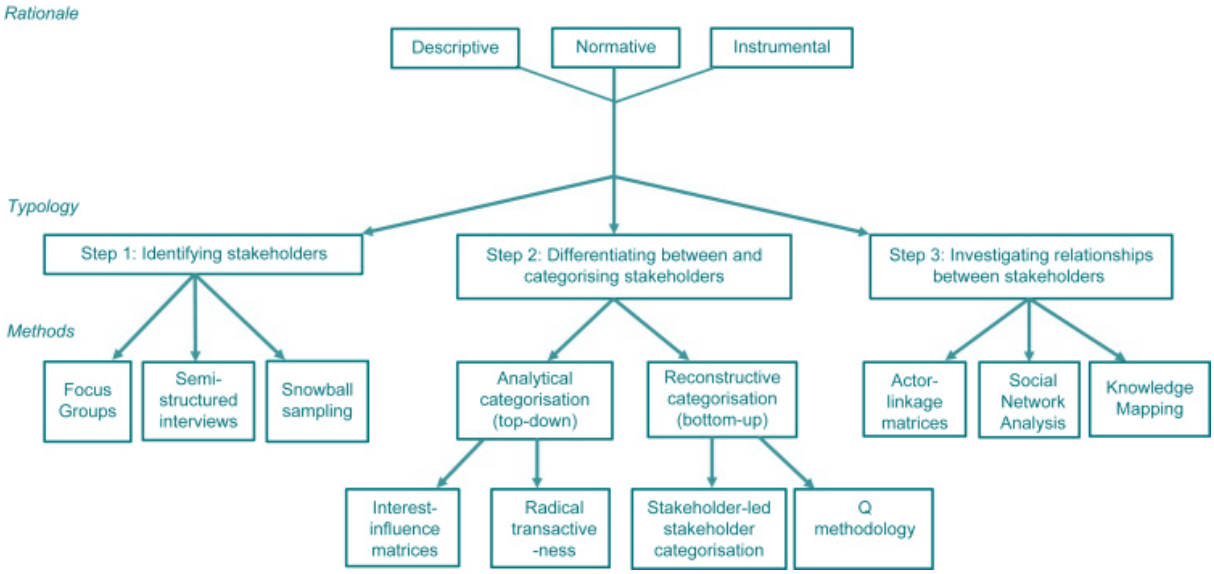

Figure 5 – Schematic representation of rationale, typology and methods for stakeholder analysis (Reed et al., 2009)

Identifying stakeholders can be seen as an iterative process, in which new stakeholders are added as the analysis continues, for example, using expert opinion, focus groups, semi-structured interviews, snow-ball sampling, or a combination of these (Reed et al., 2009).

Another study reviewed methods for the identification of stakeholders and listed snowball-sampling, following a predetermined list, and expert nomination for stakeholder identification. The authors conclude that expert knowledge is a reliable technique if enough experts are included to address potential biases (Bendtsen et al., 2021).

Selecting appropriate methods is case specific, largely depends on the boundaries of the case studies and availability of knowledge about the cases.

If the boundaries of the phenomenon are clearly defined (in our context the boundaries would be in relation to the Demo Site lakes), then stakeholders can be identified relatively easily.

Similarly, where there is considerable expertise and knowledge to which the researchers have access, the stakeholder analysis can be conducted more easily. In that case, focus group discussion or expert interviews are adequate. However, active participation in stakeholder mapping may be needed if there is incomplete knowledge, inconsistencies and uncertainty (Reed et al., 2009).

2.1.1 Analytical categorizations

Stakeholder mapping can start with reconstructive (bottom-up), or analytical categorisations (top-down) for stakeholder categories. Many researchers and projects have already elaborated analytical stakeholder categorisations for various water management case-studies. Based on several relevant

typologies (Akhmouch & Clavreul, 2017; Grimble & Wellard, 1997; OECD, 2015; Smyth et al., 2021) and the specific lake restoration context, we have developed a predefined set of stakeholder categories to be included in the stakeholder mapping process (Table 1). The categories should be seen as a reference point in stakeholder mapping, however, all FutureLakes' Demo sites are welcome to introduce more categories and modify those, if necessary, to make them resonate with the local context.

Table 1 – Stakeholder categories in lake restoration (own elaboration)

Level	Categories of stakeholders
Global and international	International agencies EU International NGOs
National	Governments Ministries and public agencies NGOs National media Research Restoration contractors
Regional	Regional authorities Regional branches of public agencies Downstream actors
Local	Lake Basin Management Groups (LBMGs) Residents Seasonal residents Local government Environmental groups Recreational users Tourism actors Fishing actors Agricultural actors Forestry Local schools Water agencies Wastewater Local media Local industry Landowners, land managers

2.1.2 FutureLakes templates for stakeholder mapping

The following templates have been developed for FutureLakes stakeholder identification. Apart from the standard template, we proposed a special template for 'downstream stakeholders'. These 'downstream stakeholders' are a specific group for some targeted activities within the project. In the context of water management, this group could be omitted in the standard stakeholder identification. However, as downstream stakeholders are influenced by upstream water

management, we propose to expand the framework and make a specific reference to the importance of including such actors.

Table 2 – Template: Stakeholder Identification

Name	Stakeholder category	Sector/ fields of interest	Stakeholder level (local, regional, national, international)	Website/ additional info	Comments

Any personal data from the stakeholder mapping exercise was handled carefully, safeguarding individual privacy. The deliverable has anonymized individuals by providing only their functions, sectors, associations etc. Some information from the Tables has been stored as internal project material in the FutureLakes Teams. The stakeholder category column has been defined in Table 1, giving some freedom to the Demo Sites to expand the predefined categories if needed. Sectors and fields of interest aimed to map issue areas corresponding to the stakeholder (e.g. nature conservation, tourism, birdwatching etc.). Stakeholder level has four categories: local, regional, national and international. Some stakeholders could also represent more levels, and we asked the Demo Sites to use the most important and typical level representing given stakeholders or to add the same stakeholder separately for the different levels (e.g. a government agencies can have local, regional and national offices).

2.1.3 Template for downstream Stakeholder identification

Table 3 – Downstream stakeholder identification

Name	Location	Stakeholder category	Sector/ fields of interest	Stakeholder level (local, regional, national, international)	Website/ additional info	Comments

For better clarity in presenting the results, in Chapter 3 we have combined data from Table 2 and Table 3 to report one Table for each Demo Site. Having a separate template at this stage was nevertheless important, to bring a special attention to the downstream stakeholders and their role in lake governance and restoration issues.

2.2 Stakeholder analysis

Stakeholder analysis is a natural and crucial next step after stakeholder mapping, building upon the initial identification of stakeholders. By conducting thorough stakeholder analysis after mapping, projects can move from simply identifying stakeholders to understanding how to effectively manage and engage them throughout the project lifecycle. Stakeholder analysis can collect additional

attributes for the mapped stakeholders. It is also common to conduct semi-structured interviews with questions on the identified stakeholders and their interactions.

2.2.1 Power/Interest Matrix

A common framework for stakeholder analysis is also the Power-Interest Matrix, also known as Mendelow's Matrix (Figure 6). It categorizes stakeholders based on two key dimensions: their level of power (or influence) and their level of interest.

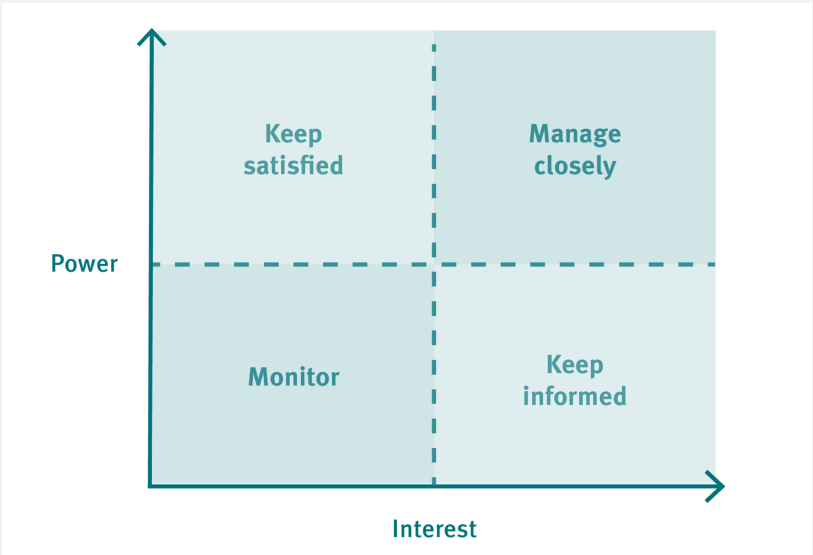

Figure 6 – The power/interest matrix for stakeholder mapping (Grygoruk et al., 2014; Mendelow, 1991)

As a result of the power/interest matrix, four distinctive groups of stakeholders are identified:

- ***Key players (KP)*** have high interest and influence, can affect the restoration work and have a strong interest in doing so.
- ***Context setters (CS)*** have high influence but low interest in the process, can influence restoration but currently have little interest in the process.
- ***Subjects (S)*** have high interest but little influence on the overall process but show much interest in participating.
- ***Bystanders/Crowd (B)*** have neither much direct influence nor interest. Grygoruk & Rannow (2017) suggest that this group should be, instead, incorporated into the communication process.

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2.2.2 Stakeholder analysis with the Water Governance Assessment Tool

Bressers et al. (2013) have developed a tool for water governance assessment. Some of the proposed questions in the assessment refer directly to the actors and network and can be a valuable tool for stakeholder analysis in water governance.

We have modified their framework to propose a list of tentative questions important for the FutureLakes stakeholder analysis. We have also included some additional questions by integrating the OECD framework. We believe that this can not only provide important information at the case study level but also help to provide a comparative assessment of the six Demo sites. Assessing engagement should also be repeated over time to evaluate impacts of project's interventions and activities targeting stakeholders.

Table 4 – Assessing engagement

Questions and Indicators	
Which level of stakeholder engagement from the OECD framework (Figure 3) do you consider most accurate for lake restoration in your Demo site?	
How do you assess the level of trust between stakeholders in the Demo site? Do you think trust is a barrier for lake restoration?	
What mechanisms are used for stakeholder engagement in the restoration context by LBMGs?	
What are the reporting obligations of LBMGs and how is information communicated with other stakeholders?	
Are there any actors' coalitions in the Demo site related to lake restoration?	
Are all relevant stakeholders involved? Are there any stakeholders not involved or even excluded?	
What is the strength of interactions between stakeholders? In what ways are these interactions institutionalised in stable structures? Do the stakeholders have experience in working together?	
Is it possible that new actors are included or even that the lead shifts from one actor to another when there are pragmatic reasons for this? Do the actors share in 'social capital' allowing them to support each other's tasks?	
Is there a strong pressure from an actor or actor coalition towards behavioural change or management reform?	

2.3 Methods and data collection process for D2.1

Below we provide a description of the methods, timeline and the data collection process for stakeholder mapping and analysis for the FutureLakes deliverable 2.1, involving a co-production process for developing the Guidelines document (M2.1), internal drafts creation, a series of meetings between WP2 and the Demo sites and the internal and external review process.

- November 2024: V1 of the Guidelines for Stakeholder Mapping (M2.1) prepared by NIVA

- Early December 2024: Consultation and revisions of the Guidelines, V2 circulated for more feedback and comments
- Late December 2024: Final template (M2.1) circulated
- January 2025: Each Demo Case fills in the template, the first draft should be prepared internally at the Demo site level by the local research team and involve/ consult FL stakeholders
- February 2025: WP2 organizes meetings with all Demo sites' experts to discuss the results and fill in potential gaps, meetings of appx. 2 hours have been conducted with Lake Karla (5.02), Lake Ijssel (7.02), Lake Vansjø (10.02), Kartuzy Lakes (11.02), Lake Vesijärvi (12.02), and Loch Leven (27.02). Altogether 24 people participated in the meetings, representing the research team and key stakeholders.
- February 2025: WP2 collects the mapping results and finalizes the stakeholder mapping and analysis report (D2.1)
- March 2025: internal and external review of the report
- March 2025: submission to the portal

3 Stakeholder mapping results

Stakeholder mapping was conducted for all six FutureLakes Demo Sites (Figure 7). As our lakes represent a variety of diverse biogeographical regions, and different European countries, and each has a unique history of initial problems and stakeholder collaboration to address them, we start each case study with an introduction. In the introduction we provide some background characteristics, try to explain the historical problems and legacies through the stakeholder perspective. After the sketch, we provide a paragraph of assessing engagement activities, based on the information we have received in the templates presented above and based on a WP2 meeting with the lake representatives, including team members and local stakeholders. Later, each case study continues with an extensive table illustrating a stakeholder list along with the characteristics developed in the templates. The case study description ends with a matrix listing stakeholders according to their interest and power. In the conclusion section, we discuss the case studies in comparative perspective.

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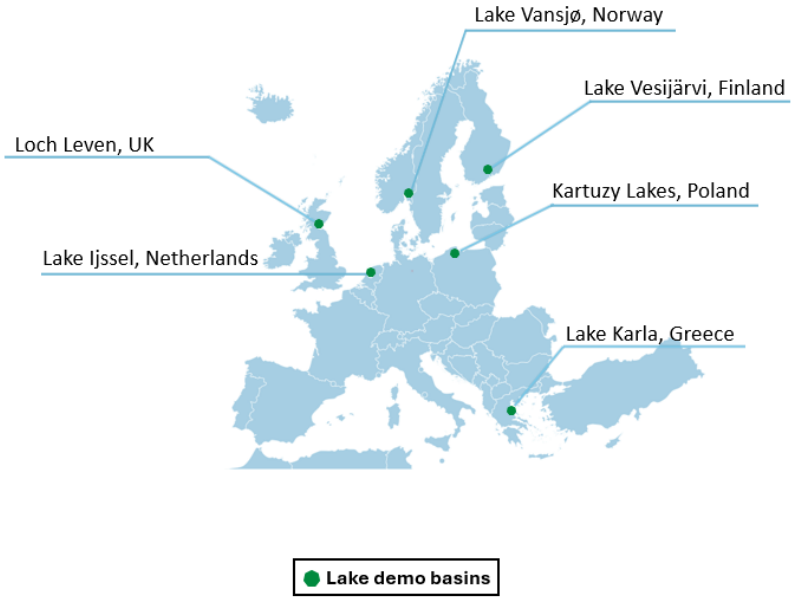

Figure 7 – FutureLakes Demo Sites

3.1 Lake Karla

Lake Karla is located at the northern end of the Magnesia regional unit in the Pineios basin, in the Thessaly region of Greece. The Pineios River is the primary source of water for Lake Karla. A tunnel system connects Lake Karla to the river, allowing for water supply during winter months. The connection between the Pineios River and Lake Karla is part of a broader water management system in the region (FutureLakes, 2025c).

Lake Karla's history reflects the complex interplay between human intervention and natural ecosystems but also illustrates the potential for ecological restoration. Over centuries, Lake Karla's fisheries were a significant economic activity and an important tradition in the region. This was dramatically stopped by a drainage project that was seen as a developmental opportunity for agriculture and a health-related measure (malaria control). Lake Karla was drained in the 1960s, but the gigantic project led to numerous environmental and socio-economic problems. Agriculture proved unsuccessful due to saline soils and environmental issues. After several decades, a restoration project was initiated by the Greek government with the support from the European Regional Development Fund (ERDF) (Sidiropoulos et al., 2017). In 2010, after more than 30 years of groundwater over-abstraction, Lake Karla was re-filled, an endeavor described as “one of the most important restoration projects in Europe” (Ibidem). Diverse restoration measures have been applied, including buffer strips and collector channels, an artificial wetland, and an irrigation network (FutureLakes, 2025c). Lake Karla is included in the biodiversity protection of a Natura 2000 site, particularly for migratory and overwintering waterbirds and foraging birds of prey (KBA, 2025).

Restoring the lake had the ambition to offer multiple services, with social, economic and ecological sustainable development to the region. However, the area suffers from many pressures which limit

potential sustainable use. Challenges include nutrient excess, poor ecological status of the lake, and water balance problems (Bobori et al., 2018). The Thessaly region, with the main basin of Pineios river and the sub-basin of Lake Karla, is a region in central Greece facing significant water shortage issues (Spiliotis et al., 2022). Due to intensive agriculture with water-demanding crops, together with severe, extreme, and persistent droughts, water scarcity remains an important problem around Lake Karla. Additionally, weather extremes associated with climate change have accelerated in the area. Storm Daniel, which struck Greece in September 2023, was the deadliest storm in Mediterranean history, with storm intensity and rainfall driven by unusually high sea surface temperatures in the Mediterranean (Argüeso et al., 2024). This storm had a significant and long-lasting impact on Lake Karla and the surrounding region, causing unprecedented flooding, hydrological changes and changes to water quality, turbidity and oxygen levels. Many challenges also relate to compromises between environmental restoration and local societal needs (water for agriculture), and promotion of new activities around the Lake (e.g. ecotourism) (Pavlis, 2025). Despite the unique natural and cultural heritage, tourism activities and infrastructure are not developed around the lake, apart from limited bird-watching activities organized by individuals.

Assessing engagement

Lake Karla management takes place at a central level with ministries having key roles, as the Ministry of Environment, the Ministry of Rural Development along with the Region of Thessaly. At the local level, a special agency of the Ministry of Environment and Energy is the Management Unit of Protected Areas of Thessaly /Natural Environment and Climate Change Agency (NECCA). It is supervised by the Ministry but has some administrative and financial autonomy and operates for the benefit of the public interest according to the rules of private sector economy. NECCA integrates 24 Protected Area Management Units (PAMUs), encompassing all Greek areas of EU and international interest for the protection of habitats and species. In Lake Karla it focuses on Natura2000, Bird Habitat Directives, but also on the primary sector (agriculture), human activities and their effects on Natura 2000 sites, it provides databases on water quality, quantity, species and habitats.

Main stakeholder groups around Lake Karla are related to agriculture, fisheries, water supply, biodiversity, civil protection and tourism. Our experts (two local project members and two key stakeholders) discussed the open question templates internally and shared their thoughts in a dedicated meeting presented in the timeline in section 2.3. They evaluated stakeholder engagement and interactions against the OECD (2015) framework (Figure 3) and concluded that the current form of collaboration among stakeholders can be best characterised as “participation”. In this, there are some opportunities for different stakeholders to take part in the policy/project processes, especially when this is incentivised, but there are no mechanisms for inclusions of stakeholders in the decision-making process. Due to the multiple pressures and challenges facing the lake, the evaluation pointed to low levels of trust among the mainland- and water users and some mistrust toward governance arrangements. Historically, Lake Karla has been used by fishing communities that have been forced to change their profession and became farmers. Many have been disappointed. They started their lives in other places and those who settled as farmers in the area are now again threatened by water scarcity. Current forms of interactions among stakeholders can be linked to the obligatory (by legislation) consultations for Programme of Measures under the 2000 Water Framework Directive (WFD). Reporting obligations are towards the central authorities and the EU and not widely shared

and discussed between the stakeholders. Interactions among stakeholders are weak and influenced by political views (Personal communication, 5.02.2025). There are no established structures for true stakeholder collaboration and not much experience in working together. In theory, all stakeholders are free to engage in lake governance, and no one is excluded, but engagement opportunities are not used and promoted. New actors may be included, and leadership may be shifted depending on events. The already mentioned Storm Daniel is such an example, where new institutional collaboration has been formed (Organization for Water Management in Thessaly) and this might lead to more interactions among stakeholders and more social capital (understood as shared values, norms, trust and frequent interactions and relationships between actors) in Lake Karla management. This new unit is expected to become a key-player for water management in the area, linking the legal issues and state authorities, for more effective water management. Some critical issues to address are the future role of the agricultural sector, whose current model became too vulnerable to water scarcity and climate extremes. Agricultural production in the area would require a sustainable transition towards more circular economy solutions on wastewater, and salt-tolerant species.

Table 5 – Stakeholders: Lake Karla

Stakeholder name	Stakeholder category	Sector/ fields of interest	Stakeholder level	Interest	Power
EU	EU	EU legislation and funding	International	H	H
Ministry of the Environment and Energy	Ministry	Water EU Directives implementation	National	H	H
The Greek Biotope/Wetland Centre EKBY	Research	Lakes and wetlands	National	H	L
WWF Hellas	NGO	Nature, human, economy, energy	National	H	L
Hellenic Ornithologic Society EOE	NGO	Birds	National	H	L
University of Thessaly (UTH)	Research	Department of Ichthyology & Aquatic Environment (DIAE) School of Agricultural Sciences, and Dep. Civic Engineering	National	H	L
ERT Volos	National media	Radio and television	National	H	H
Military base	Government	Ministry of Defence	National	H	H
Organization for Water Management in Thessaly	Regional Authority	New unit after the Daniel disaster	Regional	H	H
Basin management, Technical works Department (DTE)	Regional Authority	Thessaly Region	Regional	L	L
Basin management, Fisheries Department (DAOK)	Regional Authority	Magnesia Perfecture	Regional	L	L
European Regional Development Fund (ERDF)	Regional Authority	Programme management	Regional	L	L

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Division of Water, part of the Ministry of the Environment but decentralized unit, local branch	Regional Authority	Water uses & economy	Regional	H	L
Bank of Thessaly	Business	Financial Institution	Regional	L	L
Civil protection	Regional Authority	Thessaly Region	Regional	H	H
Management Unit of Protected Areas of Thessaly /Natural Environment and Climate Change Agency – NECCA	Government	Management Conservation of Protected area	Local	H	H
TOEV Water Irrigation Company	Agricultural actor	Irrigation works and irrigation water rights	Local	H	H
Folklore museum, Kanalia village (KEMEVO)	NGO	Societal, cultural, environmental and historical aspects	Local	H	L
Development Agency AEDEP	Development mediators /facilitators	prepare proposals, admin support, guidance	Local	L	L
Development Agency ANDIA	Development mediators /facilitators	prepare proposals, admin support, guidance	Local	L	L
Anglers cooperation	Fishing actors	fish	Local	H	L
Kanalia Farmers union	Agricultural actor	agriculture	Local	H	L
Technical chamber New Commitee for the Region of T., mayors, coastguards, NECCA (TEE)	Local industry	business	Local	H	H
Gegonota	Media	Radio and online	Local	H	H
Rigas Feraios Municipality	Government	Municipality	Local	L	L
Agricultural Union from Rigas Feraios	Agricultural actors	agriculture	Local	H	H
Citizens of Magnesia Group for Health and the Environment Public Fb group	NGO	Environmental initiative	Local	H	L
Makrinitsa Environmental Education Center	Local schools	Env. Awareness & education	Local	H	L
Kanalia Highschool	Local schools	Env. Awareness & education	Local	H	L
Agricultural cooperative	Agricultural actors / Downstream stakeholders	Agriculture	Local/ Downstream	L	H
Municipality of Agia	Downstream stakeholders	Municipality	Local/ Downstream		

Table 6 – Power/Interest Matrix: Lake Karla

	Low Interest	High Interest
High Power	Agricultural cooperative	EU Ministry of the Environment and Energy ERT Volos Military base Organization for Water Management in Thessaly Civil protection NECCA TOEV Technical chamber Gegonota Agricultural Union from Rigas Feraios
Low Power	Basin management, Technical Works Department (DTE) Basin management, Fisheries Department (DAOK) European Regional Development Fund (ERDF) Bank of Thessaly Development Agency AEDEP Development Agency ANDIA Rigas Feraios Municipality	EKBY WWF Hellas Hellenic Ornithologic Society EOE University of Thessaly Division of Water Folklore museum, Kanalia Anglers' cooperation Kanalia Farmers union Citizens of Magnesia Group for Health and the Environment Makrinitsa Environmental Education Center Kanalia Highschool

3.2 Kartuzy Lakes

The Kartuzy Lakes are a group of lakes located in the town of Kartuzy, which is situated in the Pomeranian Voivodeship of northern Poland. The lakes in the Kartuzy complex include: Mielenko Lake, Karczemne Lake, Klasztorne Duże Lake and Klasztorne Małe Lake. The lakes are connected by Klasztorna Struga Stream, forming a lake-river system. The Kartuzy Lakes complex is not directly part of the Natura 2000 network, but it is in proximity to Natura 2000 sites in northern Poland: Zatoka Pucka (Puck Bay) Natura 2000 Special Bird Protection Area and the Kashubian Lakeland including several Natura 2000 sites. Restoration of the lake complex may therefore indirectly benefit biodiversity in nearby protected areas by improving overall ecological conditions of freshwater habitats in the region.

In the 20th century, Kartuzy Lakes were subjected to massive pollution from the inflow of raw domestic and industrial wastewater, which led to the deterioration of their water quality (FutureLakes, 2025a). With the proximity of the city, they were transformed into municipal and industrial sewage receivers in the mid-1950s (Grochowska et al., 2024). A sewage treatment plant was established in 1982, but until 2013, the lakes still received storm sewage through 23 shore outlets (Ibidem). The Kartuzy lake restoration included several comprehensive activities, starting with the construction and reconstruction of the stormwater and combined sewerage networks, retention reservoirs for rainwater, pre-treatment devices at existing stormwater outlets, modernization of the pumping station for excess rainwater (Grochowska et al., 2024).

In 2018, the Department of Water Protection Engineering and Environmental Microbiology at the University of Warmia-Mazury prepared a multi-step restoration project (J. Grochowska & Łopata, 2018). The lakes were restored by phosphorus inactivation method. The restoration brought about

an innovative approach to handling polluted sediments, transforming them into a valuable fertilizer for agricultural use. This process represents a significant step towards a circular economy solution in lake restoration (FutureLakes, 2025a).

To maintain the effects of chemical restoration, biomanipulation was also applied. Predatory fish were introduced to the lake (Augustyniak-Tunowska et al., 2024). All restoration activities were completed in 2023. Current goals include monitoring of the restored lakes and boosting the local economy with the new value of the restored lakes, including fisheries and angling sectors, leisure and recreation.

Assessing engagement

Lake ownership in Poland is primarily governed by the Polish Water Law, with most lakes classified as public inland flowing waters owned by the State Treasury. The State Water Holding 'Polish Waters', established in 2018, is the main entity responsible for water management, including many other lakes. The Kartuzy Municipality, as a local government unit, has a specific scope of responsibility for the management of the lakes, especially in relation to spatial planning and environmental protection. Additionally, one lake in the complex, the Karczemne Lake, has a private owner.

Our experts (3 local project members and one key stakeholder) evaluated stakeholder engagement around the Kartuzy Lakes against the OECD (OECD 2015) framework (Figure 3) and see the current form of collaboration among stakeholders is best characterized as "partnerships" where there is agreed collaboration by different stakeholders, characterised by join agreement. According to the evaluation, the level of trust is considered high, and it was important that the project had a clear goal and a common level of expectation among the stakeholders.

The restoration project was comprehensive, initiated by the local authorities, with a high collaboration and personal engagement of the researchers from the University of Warmia-Mazury in Olsztyn. Additionally, some initial conflict over the competences with the Polish Angling Association (Polski Związek Wędkarski - PZW), finally led to a common front, where the association changed lease agreements and became a partner and beneficiary of the project. The association actively engaged in the project execution, enthusiastically "hijacked" the project by adopting its own management plans and activities. Members of the local branch – angling circle no. 57 – were on site and took an active part in the restoration measures related to fish manipulation.

An important part of the engagement activities was dedicated to the civic dialogue and environmental education. The local Kartuzy Culture Centre was a meeting place for the project discussion, along with a dedicated project website. An important element were clear and shared goals to improving the water quality, environmental status and recreational values of the lakes.

Lake restoration needs to bring together many institutions, with diverse competences. For the Kartuzy Lake restoration, intensive collaboration between the authorities, research and the PZW as well as the local public could be observed. Less engagement was documented from the State Water Holding 'Polish Waters', that can be explained with competence division and some institutional barriers. The institution is relatively new (established in 2018), its branch suffered from personnel discontinuation, with the dialogue on the project and issuing the necessary permits taking more than expected by the project partners.

Table 7 – Stakeholders: Kartuzy Lakes

Stakeholder name	Stakeholder category	Sector/ fields of interest	Stakeholder level	Interest	Power
EU	EU	EU legislation and funding	International	H	H
Consortium INORA	Business	Contractor for restoration	Polish-Latvian	H	L
Czerwony Szkwał Maritime Works	Business	Contractor for restoration	National	H	L
National Fund for Environmental Protection and Water Management	Governmental	Environmental protection, funding	National	H	H
University of Warmia-Mazury in Olsztyn	Research and development	Lake water quality and restoration	National, regional	H	H
National Water Holding – 'Polish Waters', Regional Board of Water Management	Governmental	Surface water management	Regional (Gdańsk)	L	H
The General Directorate for Environmental Protection	Governmental	Environment protection	National	H	H
Regional Directorate for Environmental Protection	Governmental	Environment protection	Regional (Gdańsk)	H	H
Chief Inspectorate for Environmental Protection	Governmental	water quality monitoring, environmental intervention	Regional (Gdańsk)	H	H
Polish Forests	Governmental	Forest management	Regional (Gdańsk)	L	L
Polish Angling Association PZW	NGO	Angling on surface waters	Regional (Gdańsk)	H	H
Kartuzy Municipality	Local authorities	Responsible for lake management, initiated lake restoration	Local	H	H
Kashubian Landscape Park	NGO	Tourist service	Local	L	L
Private owner of Karczemne Lake	Private person	Karczemne Lake	Local	H	H
Kartuzy Water and Sewerage Company	Municipal	water and sewage management	Local (Kartuzy)	H	H
Residents	Permanent residents	Accommodation & amenities	Local	H	L

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Tourists	Seasonal residents	Accommodation & amenities	Local	H	L
Kashubian Tourist Association	Governmental	Management of protected Kashubian landscape area	Local	H	L
Kartuzy Culture Center	Municipal	Culture	Local	H	L
Express kaszubski	Media	Articles	Local	H	L
Community fisheries guard/ Spoleczna straz rybacka	Citizen	Fish	Local	H	L
Collegiate Church in Kartuzy/ Kartuska Kolegiata	NGO	Religious	Local	H	L
SOS for Kartuzy Lakes/ SOS dla Kartuskich Jezior	Citizen	Environment, culture	Local	H	L
Grzybno	Downstream stakeholders	a village in the administrative district of Gmina Kartuzy	Downstream		

Table 8 – Power/Interest Matrix: Kartuzy Lakes

	Low Interest	High Interest
High Power	National Water Holding – Polish Waters	EU National Fund for Environment Protection and Water Management University of Warmia and Mazury in Olsztyn The General Directorate for Environmental Protection Regional Directorate for Environmental Protection Chief Inspectorate for Environmental Protection Polish Angling Association Kartuzy Municipality Private owner of Karczemne Lake Kartuzy Water and Sewerage Company
Low Power	Polish Forests Kashubian Landscape Park	Residents Tourists Kashubian Tourist Association Kartuzy Culture Center Express kaszubski Community fisheries guard Collegiate Church in Kartuzy SOS for Kartuzy Lakes Consortium INORA Czerwony Szkwał Maritime Works

3.3 Lake Vansjø

Vansjø Lake is located in the municipalities of Moss, Råde, Rygge, and Våler in Østfold county, in south-eastern Norway. It has two main sub-basins: Storefjorden Eastern Basin that flows into a shallower Vanemfjorden Western Basin, that then drains into the nearby Oslo fjord (FutureLakes, 2025d). Vansjø Lake is part of the Mossevassdraget watershed, stretching from Østmarka in Oslo to the Raet in Østfold. Its catchment is dominated by forestry and agriculture with substantial grain production (FutureLakes, 2025d). Vansjø serves as a vital source of drinking water for around 60,000 people in the Moss region, it is also used extensively for boating, bathing and other recreational activities, and is a popular spot for fishing. The catchment is considered as one of the most affected catchments by agricultural runoff in Norway and has been selected as a pilot catchment for the implementation of the EU Water Framework Directive (Skarbøvik & Bechmann, 2010).

Stakeholders include agriculture, water supply and sanitation, and forestry (timber) sectors. There are also many visitors for recreation (fishing, boating, bathing). Two nature reserves exist in Lake Vansjø to preserve important wetland areas, one is located in the western basin in the municipalities of Moss and Rygge; the other at Moaskjæra/Danskebukta in the municipality of Råde (Skarbøvik & Bechmann, 2010).

This lake has a history of high levels of phosphorus and phytoplankton biomass, since the 1970s it has experienced several cyanobacterial blooms that have led to beach closures and restricted water use (Haande et al., 2011, 2016; Moe et al., 2016). A long-term programme of restoration has aimed to reduce nutrient loading to the lake to ensure more sustainable water use (Lyche Solheim et al., 2001).

In 1999, the Morsa Project started as a cooperation initiative between the local counties, regional authorities and stakeholder interests with the main objective of improving the water quality of the catchment. The Morsa Project was transferred to the Morsa River Basin District Organization in 2007, under the Glomma River Basin Authority. Three working groups have been appointed: sewage/drainage; agriculture; and forestry (Stokke, 2006).

During the last decades a great effort has been made to restore Lake Vansjø by implementing various measures in different sectors. The government funded a holistic project to improve the water quality of Lake Vansjø. Several small-scale wastewater treatment plants have been installed, huge efforts were made to reduce sewage from scattered dwellings.

As agriculture has been identified as one of the main contributors of nutrients to the lake, new mechanisms have been developed to introduce agricultural measures. Starting with education, information campaigns, farmers' meetings, field trips, agricultural advisory for environmental planning on individual farms, farms visits, ending with a system of legal contracts signed with individual farmers combing incentive measures (Skarbøvik & Bechmann, 2010). Concrete measures included: use of less P fertilizer, no use of manure, no soil cultivation during autumn, no cultivation on fields that are frequently flooded, establishment of 10-meter buffer zones, grassed waterway, constructed wetlands. By 2008, 30 out of the 40 farmers in the catchment signed such contracts (Skarbøvik & Bechmann, 2010).

In addition, fish manipulation was carried out in the lake, such as fish catching of large pike to increase the number of plankton-eating fish.

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A more recent development is the recognition that Lake Vansjø has been severely affected by PFAS (per- and polyfluoroalkyl substances) pollution. The main source of PFAS contamination has been identified as Rygge Airport, where PFOS (perfluorooctanesulfonic acid) was used in fire extinguisher foams. This led to substantial inflow of PFOS into the lake, resulting in concerning levels of the substance. The Norwegian Food Safety Authority (Mattilsynet) has conducted assessments of PFAS content in fish from Lake Vansjø and now advises against consuming fish caught in the lake. This recommendation highlights the severity of the PFAS contamination in the aquatic ecosystem (NTB, 2020). Despite the concerns about PFAS in the lake's fish population, it's important to note that there is currently no acute drinking water quality concern regarding Vansjø (MOVAR, 2020). However, the presence of PFAS in the lake ecosystem remains a long-term environmental issue of growing national and international concern that requires ongoing monitoring and management.

Vansjø's history and nature have been well documented, not only in academic outlets, but also for wider audiences. Nature photographer, Øyvind Martinsen, has published photos of the lake from the air, on land and at sea. His books contain pictures, facts and history of life around the Vansjø area (Martinsen et al., 2007).

Assessing engagement

Our experts (two local project members and one key stakeholder) evaluated stakeholder engagement around Lake Vansjø against the OECD (O2015) framework. This shows the current form of collaboration among stakeholders can be best characterized between a partnership and co-production of knowledge (Figure 3). The level of trust can now be considered high, although there were visible conflicts when the restoration work was first initiated (with agriculture, wastewater etc.). Now a common goal is clear, and everyone has a good knowledge of where the process is heading. It helps that the collaboration has been institutionalized and has a defined structure, through meetings of the Morsa River Basin District Organisation, and the thematic groups meeting several times per year. It brings the main stakeholders together but also gives observer status to diverse interest groups. This allows information sharing on measures, how to implement measures, use of extension services, advisory services, workshops and collaboration with research institutions. Furthermore, Morsa is a sub-district within the wider regional context of the WFD's Glomma River Basin District (RBD).

It is noted that the success of the organization of the Morsa catchment "relates to a complex of factors, including openness of practices and active involvement of key actors, strong but inclusive leadership, and a knowledge based 'hybrid' type of multi-level network combining horizontal and vertical network governance" (Naustdalslid, 2014). From an organisation that aimed at harmonising municipal and farming practices it evolved to become a "consensus-oriented network, based on negotiations and bargaining" and "has succeeded in mobilizing collective action across municipal borders upstream and downstream the Morsa catchment" (Ibidem).

Table 9 – Stakeholders: Lake Vansjø

Stakeholder name	Stakeholder category	Sector/ fields of interest	Stakeholder level	Interest	Power
Norwegian Environment Agency (Miljødirektoratet)	National authorities	The Norwegian Water Regulation	National	H	H

Norwegian Agriculture Agency (Landbruksdirektoratet)	National authorities	Agricultural regulations	National	H	H
The Norwegian Water Resources and Energy Directorate (NVE)	National authorities	Hydropower	National	L	L
The Norwegian Defence Estates Agency		Norwegian Armed Forces	National	H	L
The Norwegian Food Safety Authority - Mattilsynet	National authorities	PFAS, drinking water	National	H	L
The Norwegian Agricultural Advisory Service	National authorities	Agriculture	National	H	L
Norges Naturvernforbund (Friends of the Earth Norway)	NGO	Environmental protection	National	H	L
The Norwegian Biodiversity Network (SABIMA)	NGO	Biodiversity	National	H	L
Norwegian Institute for Water Research (NIVA)	Research	Research	National	H	L
Norwegian Institute of Bioeconomy Research (NIBIO)	Research	Research	National	H	L
Norwegian University of Life Sciences (NMBU)	Research	Research	National	H	L
The Morsa River Basin District Organisation	Lake Basin Management Group	Water management	Regional	H	L
County govenor Østfold, Buskerud, Oslo og Akershus	Regional authorities		Regional	H	H
Østfold County Municipality	Regional authorities		Regional	H	H
Akershus County Municipality	Regional authorities		Regional	H	H
Forum for nature and outdoor life	NGO	Recreational users	Regional	H	L
Østfold hunter and fish association	NGO	Hunters and fishing	Regional	H	L
Østfold Agrarian Association	Agricultural actors	Agriculture	Regional	H	H
Østfold Farmers' and Smallholders' Association	Agricultural actors	Agriculture	Regional	H	L
Water Utility Company (MOVAR IKS)	Water agency, Wastewater, company of 4 municipalities	Drinking water and wastewater	Regional and Local	H	L
Moss municipality	Local authorities		Local	H	H
Råde municipality	Local authorities		Local	H	H
Våler municipality	Local authorities		Local	H	H
Indre Østfold municipality	Local authorities		Local	H	H
Nordre Follo municipality	Local authorities		Local	H	H

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Enebakk municipality	Local authorities		Local	H	H
Glommen og Laagens Brukseierforening (GLB) Hydropower association	Energy sector	Hydropower	Local	L	L
Local associations hunter and fish	NGO	Hunters and fishing	Local	H	L
The Norwegian Trekking Association (DNT) Vansjø	NGO	Recreational users	Local	H	L
Mossefossens og Vansjø Venner	NGO	Environmetnas group	Local	H	L
Moss and Surroundings Ornithological Association	NGO	Birdwatchers	Local	H	L
Grandparents' Climate Action Moss and Surroundings	NGO	Environmetnal group	Local	H	L
Vansjø landowners' association	Landowners	Landowners	Local	H	L
Farmers	Agricultural actors	Agriculture	Local	H	H
Local Agrarian Association	Agricultural actors	Agriculture	Local	H	L
Vansjø boat association	Water sports	Recreation	Local	H	L
Moss paddling club	Water sports	Recreation	Local	H	L
Rygge Scout Association	Recreational users	Recreation	Local	H	L
DNT Vansjø	Tourism actors	Tourism	Local	H	L
Østre Kjærnes gård alpaca farm	Tourism actors	Tourism	Local	H	L
Vestre Kjærnes	Tourism actors	Tourism	Local	H	L
Tour operator Utidetfri	Tourism actors	Tourism	Local	H	L
Oksnøen camp site	Tourism actors	Tourism	Local	H	L
Dillingøy motorhome parking	Tourism actors	Tourism	Local	H	L
Bjørnerådvannet private wastewater treatment	Wastewater	Wastewater treatment	Local	H	L
Author of books and materials	Private person	Author of books, photographs and dissemination material about Vansjø	Local	H	L
City of Moss	Downstream stakeholders		Downstream		
Oslofjord	Downstream stakeholders		Downstream		

Table 10 – Power/Interest Matrix: Lake Vansjø

	Low Interest	High Interest
High Power		Norwegian Environment Agency Norwegian Agriculture Agency County governor Østfold, Buskerud, Oslo og Akershus Østfold County Municipality

		Akershus County Municipality Østfold Agrarian Association Moss municipality Råde municipality Våler municipality Indre Østfold municipality Nordre Follo municipality Enebakk municipality Farmers
Low Power	The Norwegian Water Resources and Energy Directorate (NVE) Glommen og Laagens Brukseierforening (GLB) Hydropower association	The Norwegian Defence Estates Agency The Norwegian Food Safety Authority – Mattilsynet The Norwegian Agricultural Advisory Service Norges Naturvernforbund (Friends of the Earth Norway) The Norwegian Biodiversity Network (SABIMA) NIVA NIBIO NMBU The Morsa River Basin District Organisation Forum for nature and outdoor life Østfold hunter and fish association Østfold Farmers' and Smallholders' Association Water Utility Company (MOVAR IKS) Local associations hunter and fish DNT Vansjø Mossefossen og Vansjøs Venner Moss and Surroundings Ornithological Association Grandparents' Climate Action Moss and Surroundings Vansjø landowners' association Local Agrarian Association Vansjø boat association Moss paddling club Rygge Scout Association DNT Vansjø Østre Kjærnes gård alpaca farm Vestre Kjærnes Tour operator Utidetfri Oksnøen camp site Dillingøy motorhome parking Bjørnerådvannet private wastewater treatment Author of books and materials

3.4 Lake Vesijärvi

Lake Vesijärvi lies on the area of three municipalities, Lahti, Hollola, and Asikkala in southern Finland. It is part of the Kymijoki water system and flows into Lake Päijänne. Its catchment is dominated by forestry and agriculture. Some of the Vesijärvi's bay areas are designated Natura 2000 sites due to their importance for waterfowl (FutureLakes, 2025e).

Between 1960s and 1980s Lake Vesijärvi was among the most polluted and eutrophic lakes in Finland, without possibilities for recreational use. It suffered from severe external nutrient loading

originating from industrialisation and urban growth, which led to eutrophication with extensive blooms of cyanobacteria since the 1960s (FutureLakes, 2025e). The main pollution sources were sewage, industrial wastewater and agriculture. Due to the poor condition of the lake, the city of Lahti had to decide in the early 1970s whether to restore the lake or fill it in. Fortunately, the choice was restoration, which developed the City of Lahti into a key centre for lake restoration expertise in Finland and beyond. Since then, the city has been pioneering lake management and taking care of environmental issues for decades (Personal communication, 12.02.2025). Biomanipulation efforts started in the late 1980`s as part of a pioneering lake restoration project "Lake Vesijärvi project".

In the early 1990s, the condition of the lake visibly improved but started to deteriorate again at the beginning of the 21st century. As state funding was limited, a decision was made in 2007 to establish a dedicated Lake Vesijärvi Foundation for the protection and restoration of the lake. It was established by the three municipalities, and three private sector bodies (Kemppi Ltd, a society of industrial enterprises in Lahti and the press company Hämeen media). The foundation was established to receive funds from the municipalities and the private sector, and work on project acquisitions. The Vesijärvi Foundation receives 60-70% of its budget from the municipalities and "is a unique Finnish initiative that combines public and private resources to secure funding for research, maintenance, and management efforts focusing on Lake Vesijärvi and its catchment area. The foundation also works to improve the public's awareness of Lake Vesijärvi and its condition and to promote all efforts to improve its water quality" (Lake Vesijärvi Foundation, 2025). There are currently three foundations for inland waters in Finland, with Lake Vesijärvi Foundation as the only one organising fundraising activities (Personal communication, 12.02.2025).

Lake Vesijärvi's slow recovery from eutrophication began with a new water treatment plant and diversion of sewage inputs since the mid-1970s. Sewage inputs in the twentieth century caused deoxygenation of the lake (Jilbert et al., 2020) and one of the restoration measures also included oxygenation of deep water in the lake. Biomanipulation was carried out, including a mass removal of planktivorous and benthivorous fish and the stocking of predatory pikeperch (Anttila et al., 2013; Salonen et al., 2020). Restoration measures also included buffer zones, two-stage channels, bottom dam series, wetlands and sedimentation ponds established across the catchment. The ecological status of the largest basin has been improved to good; the other basins to moderate ecological status (FutureLakes, 2025e).

Assessing engagement

From the beginnings of lake restoration efforts, ways of working were cooperative with wide stakeholder engagement. Our experts (two local project members and one key stakeholder) evaluated stakeholder engagement around the Vesijärvi Lake against the OECD framework (OECD 2015) and see the interactions between the main stakeholders as following the co-decision and co-production of knowledge, with a balanced share of power between the stakeholder involved (Figure 3). Trust is a strength in Finland in general, and the Lake Vesijärvi collaboration cultivated it and accumulated significant social capital (with shared values and resources building lasting networks and relationships) during the last decades.

The Lake Vesijärvi Foundation, with its administrative bodies, actively collaborates with stakeholders like municipalities, consultants and water area owners to promote the restoration of Lake Vesijärvi, for example, by organising water management measures in the lake and its catchment area and by arranging events like invasive species removal and making fishing gear. The academic expert group,

created by the Foundation collaborates with universities and research organizations. All in all, the Foundation organises or participates in various events that promote water management in various ways with different stakeholders about a hundred times annually. The Vesijärvi Foundation has also been involved in establishing a water restoration network organised by the state's environmental administration in the Häme region. The main goal of that network is to share the experience gained from large and long-term restoration sites, such as Lake Vesijärvi, with other smaller lakes. The regional ELY Centre also regularly organizes working group meetings related to the implementation of the Water Framework Directive, to which representatives of stakeholders are invited.

Monitoring of the lake is complex, apart from the required WFD monitoring, there are also automatic monitoring stations around the lake, with municipalities, environmental administration and universities conducting their monitoring activities. All data is gathered into a database managed by the Lake Vesijärvi Foundation. It collects and shares such data on a voluntary basis, for example by publishing a report entitled 'State of Lake Vesijärvi' at the International Water Day in March. Additionally, Lahti Lakes Symposium is organized every three years bringing together around a hundred researchers from all continents to discuss lake management issues (Personal communication, 12.02.2025).

The Vesijärvi Foundation has a key role in arranging arenas and forums, where competing interests can be approached (e.g. between nature conservations vs. recreational use). Here, education can play a big role (for example to sensitise the landowners to protect shoreline vegetation that is important for birds). From the very beginning, the local media have supported the Foundation, creating an important channel for public discussions and increasing the general understanding of the lake's problems and restoration measures. The Vesijärvi Foundation receives lots of interest as an innovative institutional model for lake management. Although there are only five-six people working for the Foundation, it combines the expertise and resources of more than sixty organisations with the research and management of Lake Vesijärvi, including the state's environmental administration, municipalities, universities, business life and consultants as well as fishermen and water and landowners' organisations.

Table 11 – Stakeholders: Lake Vesijärvi

Stakeholder name	Stakeholder category	Sector/ fields of interest	Stakeholder level	Interest	Power
Ministry of the Environment	Ministries	Protection of waters and marine areas, biodiversity, nature conservation	National	H	H
Ministry of the Agriculture and Forestry	Ministries	Sustainable use of renewable natural resources	National	L	H
Finnish Environment Institute (SYKE)	Research	Research and expert services related to climate change, loss of nature, overconsumption, pollution and eutrophication	National	L	L

Natural Resources Institute Finland (Luke)	Research	Sustainable use of renewable natural resources	National	H	H
University of Helsinki	Research	Research	National	H	H
University of Jyväskylä	Research	Research	National	H	H
Lappeenranta–Lahti University of Technology LUT	Research	Research	National	H	H
Pro Agria Southern Finland	NGOs	Counseling and development of the agricultural sector	National	L	H
The Central Union of Agricultural Producers and Forest Owners (MTK)	NGOs	Advocacy of farmers, forest owners and rural entrepreneurs	National	L	L
Forest Centre	Indirect state administration organisation	Sustainable forestry	National	L	L
Central organisation of Finnish recreational fishermen	NGOs	Sustainable fisheries, water protection	National	L	L
Finnish Freshwater Foundation	NGOs	Water protection	National	L	L
WWF	NGOs	Water protection, water management	National	L	H
ELY Centre (Häme)	Regional authorities	Regional authority	Regional	H	H
Päijät-Hämeen Kalatalouskeskus / Regional Fisheries Center of Päijät-Häme	Regional Fisheries Center	Fishery	Regional	H	L
Kalatalousalue (Salpausselkä) / Fishery area of Salpausselkä)	Fishery area	Fishery	Regional	H	L
The Regional Council of Päijät-Häme	Governments	Provincial advocacy	Regional	L	H
The Finnish Association for Nature Conservation / South-Häme nature conservation district	NGOs	Nature conservation	Regional	H	L
The Water Protection Association of the River Kokemäenjoki	Water protection association	Water protection	Regional	H	L
YLE Häme	Media	TV, Newspapers, radio, digital media	Regional	H	L

Vesijärvi Foundation	Lake Basin Management Groups	Water protection, water restoration	Local	H	H
City of Lahti	Local government	Environmental protection, water protection, the comfort of the living environment	Local	H	H
Municipality of Hollola	Local government	Environmental protection, water protection, the comfort of the living environment	Local	H	H
Municipality of Asikkala	Local government	Environmental protection, water protection, the comfort of the living environment	Local	H	H
Kemppi Oy	Local industry	Industry	Local	H	H
Hämeen media	Local company	Newspapers, radio, digital media	Local		
Lahti Industrial Society (Lahden Teollisuusseura ry)	Local industry	Industry	Local	H	H
Farmers	Agricultural actors	Agriculture	Local	The level of interest depends on the farmer	The level of power depends on the farmer
Professional fisherman	Fishing actors	Fishery	Local	H	L
Recreational fisherman	Fishing actors	Fishery	Local	H	L
Landowners	Landowners	Recreational use of athe lake	Local	H	H
Forest owners		Forestry	Local	The level of interest depends on the individual	The level of power depends on the individual
Residents	Residents	Recreational use of the lake	Local	H	L
Seasonal residents	Seasonal residents	Recreational use of the lake	Local	H	L
Recreational users	Recreational users	Recreational use of the lake	Local	H	L
Koulutuskeskus Salpaus /Further Education Salpaus	Local schools	Education	Local	H	L
The Water and Air Protection Association of Eastern Uusimaa and River Porvoonjoki	Downstream stakeholders		Downstream		

Table 12 – Power/Interest Matrix: Lake Vesijärvi

	Low Interest	High Interest
High Power	Ministry of the Agriculture and Forestry Pro Agria Southern Finland WWF The Regional Council of Päijät-Häme	Ministry of the Environment LUKE University of Helsinki University of Jyväskylä Lappeenranta–Lahti University of Technology LUT ELY Centre Vesijärvi Foundation City of Lahti Municipality of Hollola Municipality of Asikkala Kemppi Oy Hämeen media Lahti Industrial Society Landowners
Low Power	SYKE The Central Union of Agricultural Producers and Forest Owners (MTK) Forest Centre Central organisation of Finnish recreational fishermen Finnish Freshwater Foundation	Regional Fisheries Center of Päijät-Häme Fishery area of Salpausselkä The Finnish Association for Nature Conservation / South-Häme nature conservation district The Water Protection Association of the River Kokemäenjoki YLE Häme Professional fisherman Recreational fisherman Residents Seasonal residents Recreational users Further Education Salpaus

3.5 Lake IJssel

Lake IJssel, also known as the IJsselmeer, is a significant freshwater lake located in central Netherlands. It borders the provinces of Flevoland, North Holland, and Friesland. Lake IJssel has a history that reflects the Netherlands' innovative water management and land reclamation efforts. Lake IJssel became an inland freshwater lake in 1932, when a dam was constructed to close off the Southern Sea (Zuiderzee) from the North Sea (Verschuuren, 2020). The flow of fresh water from the river IJssel, the main river entering Lake IJssel and one of the branches of the river Rhine, soon flushed out the salt water. In 1975, part of the lake was later closed off by another dike forming Lake Marker (Markermeer) (FutureLakes, 2025b). Lake IJssel became the most important reservoir for water supply for drinking and for agricultural irrigation (Verschuuren, 2020). The lake complex is also protected under both the Ramsar Convention and the EU's Natura 2000 framework. Moreover, the area has a critical function in preventing floods and droughts in the Netherlands. Lake IJssel discharges water during low tide into the downstream Wadden Sea (Talsma et al., 2016).

The lake complex is relatively shallow, with accumulated sediment making the water very turbid. The deterioration in water quality, blocked habitat connectivity, and low biodiversity and vulnerability in the food chain are important problems of the lake complex (FutureLakes, 2025b; Grotenbreg &

Altamirano, 2017). Over the years, diverse programmes, research projects and policy plans were developed and executed to address those issues (Grotenbreg & Altamirano, 2017). For the Lake IJssel area, all plans fall under the broader development policy 'Agenda Lake IJssel area 2050', addressing nature conservation, water safety, drinking water supply, water quality, fisheries, sustainable energy, infrastructure and transport, sand extraction, landscape conservation, culture, recreation and tourism (Verschuuren, 2020). The first phase was implemented between 2017 and 2023 and focused on restoring habitats by improving marshes on the edges of the lake for breeding reed birds, creating new sandy breeding areas for water birds that breed on beaches, improving the availability of food for birds, enlarging certain habitat types and creating more space and tranquillity for birds (Ibidem). In Lake Marker a hydraulic engineering project has been initiated in 2012 to improve water quality and create new habitats known as 'Marker Wadden' (FutureLakes, 2025b). This is an innovative artificial archipelago project aiming to revitalise the lake's ecosystem and boost biodiversity. It aimed at introducing various missing elements that are typical for natural lakes: gradual land–water transitions, more heterogeneity in water depths, decreasing turbidity by creating shelter and deep sinks and reducing fine-sediment resuspension by the wind (van Leeuwen et al., 2021). The results appear promising; the project has been successful in increasing the number of habitats for numerous bird and fish species in Lake Marker and acts as a steppingstone to other areas in the vicinity (FutureLakes, 2025b; KIMA, 2022; van Leeuwen et al., 2021).

The Marker Wadden project has been unique in terms of governance and participation. It has been executed by an NGO (Dutch Society for Nature Conservation) with cooperation between the public (governmental) Department of Waterways and Public Works, resembling a form of public-private partnership. It further led to the emergence of a joint platform for learning and research activities around Marker Wadden known as the Marker Wadden Knowledge and Innovation Programme (KIMA), bringing together the authorities, NGO and research sector (KIMA, 2022).

Assessing engagement

Netherlands has a long tradition of collaboration and consensus-building between various stakeholders (Verschuuren, 2020). Our experts (two local project members being in dialogue with their local stakeholders in the template phase) evaluated stakeholder engagement around the IJssel Lake complex against the OECD framework (OECD 2015) and characterise them as co-decision and co-production of knowledge, with a balanced share of power between the stakeholders involved (Figure 3).

Governmental bodies engaged in lake management and restoration have different levels of expertise and competences, with the central government (coastal defence systems and flood defence systems, complying with EU-law requirements), provincial governments (nature conservation, water management and spatial planning), water district boards (water management), and municipal governments (local spatial planning) (Ibidem). Non-governmental stakeholders, such as environmental NGOs are also widely involved in lake management and restoration. Residents, businesses, farmers and recreational users represented by various interest organizations are also important in the process.

Multiple pressures and diverse management interests combined with very high pressure on available space, brings many conflicts in lake management (e.g. between wind farms and nature protection, recreation and habitat enhancement, fishing and biodiversity). This is also visible in the two coalitions that have been formed around Lake IJssel management: the first centred around the

Administrative Platform IJsselmeer Region (BPIJ) and the second known as "Coalitie Blauwe Hart Natuurlijk" (Blue Heart Natural Coalition).

Administrative Platform IJsselmeer Region (BPIJ) is a special institutional unit for administrative cooperation of all authorities involved with Lake IJssel, bringing all the relevant Ministries and authorities: Ministry of Agriculture, Food Quality, Fishery and Nature, Directorate General for Public Works and Water Management, Ministry of Interior and Kingdom Relations, Ministry of Climate and Green Growth, Ministry of Housing and Spatial Planning, regional authorities (Province of Drenthe, Province of Flevoland, Province of Friesland, Province of Groningen, Province of North Holland, Province of Overijssel, Water Board of Amstel, Gooi and Vecht, Water Board of Drenthe Overijssel Delta, Water Board of Friesland, High Water Board of Hollands Noorderkwartier, Water Board of Hunze and Aa's, Water Board of Noorderzijlvest, Water Board of Vallei and Veluwe, Water Board of Zuiderzee Land, Municipality of Lelystad, Municipality of Medemblik, Municipality of Southwest Friesland) and the Provincial Water Company of North Holland. The BPIJ is working in three thematic areas: future-proof lake, a world-class landscape and a vital economy. The BPIJ plays a crucial role in coordinating efforts to ensure the sustainable management and development of the IJsselmeer region, balancing various interests such as water security, ecological preservation, and spatial planning.

The "Coalitie Blauwe Hart Natuurlijk" (Blue Heart Natural Coalition) is a collaborative initiative among the NGOs in the Lake IJssel region. It is a partnership of seven organizations (Dutch Society for Nature Conservation, Dutch Forestry Commission, Society for the Protection of Birds, Sport Fishing in the Netherlands, Provincial Water Company of North Holland, It Fryske Gea, Flevo Landscape, and Landscape North Holland) focusing on restoring ecological balance, improving water quality, and creating breeding grounds and habitats for wildlife.

BPIJ management represents multiple use rights, while the Blue Heart Coalition advocates for environmental issues. However, the division lines between the coalitions are not always set, one member organization (Provincial Water Company of North Holland) is a member of both organizations. The Blue Heart coalition's efforts align with broader initiatives like the IJsselmeer Area Agenda 2050 and the Delta Programme, which involve multiple governmental and non-governmental stakeholders. Coalitions visit various meetings, sometimes they work together e.g., to protest against wind farms or sand mining in the lake.

Experts who participated in the stakeholder engagement assessment pointed out that with so many different stakeholders and in limited space, it is difficult to take decisions, which results in considerable challenges for the sustainability transition hindered by a grid-lock situation. The Delta Program IJssel is a promising initiative that is trying to take a leadership role for the future of the lake, through financing measures and initiatives as a way forward to enabling nature-based solutions.

Specific measures restricting harmful human activities seem necessary for more lake restoration but are difficult to implement. More restrictions could involve redistribution of existing fish permits, closing off certain parts of the lake for fishing, limitations on shipping and agriculture, creating more connections between the lakes, for enhancing the resilience of the area (Verschuuren, 2020). The current approach of “small steps” towards a more natural ecosystem seems effective for now but can be ineffective when faced with tougher decisions, impacts of climate change, or when clear negative economic side effects become visible (Verschuuren, 2020).

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Table 13 – Stakeholders: Lake IJssel

Stakeholder name	Stakeholder category	Sector/ fields of interest	Stakeholder level	Interest	Power
EU	EU	EU legislation and funding	International/ Downstream	L	H
ICPR – International Commission for the Protection of the Rhine	IOs	Water quality, ecological quality of waters in Rhine basin, flood protection/prevention	International	L	L
The International Union for Conservation of Nature (IUCN)	NGO	Science-led approach, informing policy on biodiversity, climate change, NBS, freshwater and water security	International	H	L
WWF	NGO		International / Downstream	L	L
The Trilateral Wadden Sea Cooperation (TWSC)	Coalition	Protection of the Wadden Sea	Important downstream stakeholder	L	L
van Oord	International company	Sustainable dredging, NBS; earning money and improving competences	International / Downstream	H	L
Koninklijk Smals	International company	Sustainable dredging, NBS; earning money and improving competences	International / Downstream	H	L
Boskalis	International company	Sustainable dredging, NBS; earning money and improving competences	International/ Downstream	H	L
Ministry of Infrastructure and Water Management	Ministries	Water management, WFD, Delta Program, NL2120 funding	National/ Downstream	H	H
Directorate General for Public Works and Water Management	National agency	Operational part of the Ministry of Infrastructure and Water Management	National/ Downstream	H	H
Ministry of Agriculture, Food Quality, Fishery and Nature	Ministries	Agriculture and nature protection (Natura 2000)	National/ Downstream	H	H
Ministry of Interior and Kingdom relations	Ministries	Good governance	National/ Downstream	L	L
Ministry of Climate and Green Growth (KGG)	Ministries	New Ministry	National/ Downstream	L	H
Ministry of Housing and Spatial Planning	Ministries	Housing, planning, compensations	National	L	H
Minstry of Defence	Ministries	Designated lake areas for military training	National/ Downstream	L	H

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Ministry of Economic Affairs	Ministries	Economic development in the area	National/ Downstream	L	H
Dutch Society for Nature Conservation /Natuurmonumenten	NGO	Nature conservation	National/ Downstream	H	H
The Dutch Forestry Commission/ Staatsbosbeheer	Government organisation for forestry	Forestry	National/ Downstream	H	H
HISAW-Recron	NGO	Water sports	National/ Downstream	H	L
Society for the Protection of Birds	NGO	Birds	National/ Downstream	H	L
Royal Netherlands Watersport Association/ Watersportverbond	NGO	Water for recreation	National/ Downstream	H	L
Dutch Fishermen's association/ Nederlandse Vissersbond	NGO	Commercial fishing	National/ Downstream	H	L
The Netherlands Agricultural and Horticultural Association/ LTO	Association	Agriculture	National	H	L
Sport Fishing in the Netherlands/ Sportvisserij Nederland	NGO	Recreational fishing	National/ Downstream	H	L
Dutch Association of Tour Sailors / Nederlandse Vereniging De Toerzeilers	Association	Sailing	National/ Downstream	H	L
Association of Professional Charter Boaters	Association	Charter boats, harbors	National/ Downstream	H	L
The Dutch Association of Suppliers of Construction Raw Materials/ NVLB	Association	Sand mining	National/ Downstream	H	L
Dutch skippers' association/ Schuttevaer	Association	Shipping	National/ Downstream	H	L
Administrative Platform IJsselmeer Region /BPIJ Bestuurlijk Platform Ijsselmeergebied	Administrative cooperation of all authorities involved with Lake IJssel	Lake management	Regional	H	H
Province of Drenthe	Authorities		Regional		
Province of Flevoland	Authorities		Regional		
Province of Friesland	Authorities		Regional/ Downstream		
Province of Groningen	Authorities		Regional/ Downstream		

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Province of Noord Holland	Authorities		Regional/ Downstream		
Province of Overijssel	Authorities		Regional		
Water Board Amstel, Gooi en Vecht	Authorities		Regional		
Water Board Drents Overijssels Delta	Authorities		Regional		
Water Board Fryslan	Authorities		Regional		
High Water Board of Hollands Noorderkwartier	Authorities		Regional		
Water Board Hunze en Aa's	Authorities		Regional		
Water Board Noorderzijlvest	Authorities		Regional		
Water Board Vallei en Veluwe	Authorities		Regional		
Water Board Zuiderzeeland	Authorities		Regional		
Municipality Lelystad	Authorities		Regional		
Municipality Medemblik	Authorities		Regional		
Municipality Sudwest-Fryslan	Authorities		Regional		
Provincial Water Company North Holland/ Provinciaal Waterbedrijf Noord-Holland	Public company	Drinking water	Regional	H	H
The Wadden Sea Association/ Waddenvereniging	Association	protection of the Wadden Sea	Regional/ Downstream	L	H
It Fryske Gea	NGO	Nature conservation	Regional	H	L
The Flevo Landscape/ Flevolandschap	NGO	Nature conservation	Regional	H	L
Landscape North Holland/ Landschap Noord-Holland	NGO	Landscape, nature, cultural history protection	Regional	H	L
Nature and Environment Federation of North Holland/ Natuur en Milieufederatie Noord-Holland	Group of NGOs	Nature conservation	Regional	H	L
Nature and Environment Federation/ Natuur en Milieufederatie Flevoland	Group of NGOs	Nature conservation	Regional	H	L
Nature and Environment Federation/ Natuur en Milieufederatie Fryslan	Group of NGOs	Nature conservation	Regional	H	L
The Netherlands Agricultural and	Association	Agriculture	Regional	H	L

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Horticultural Association/ LTO Noord					
IJsselmeer Association/ de IJsselmeervereniging	NGO	Nature conservation	Local	H	H
Blue Heart Natural Coalition/ Coalitie Blauwe Hart Natuurlijk	Foundation	Nature conservation	Local	H	H
Windpark Fryslan	Industry	Wind farm	Local	L	L
Wind Plan Blue/ Windplanblauw	Industry	Wind farm	Local	L	L
Maxima Centrale - Engie	Industry	Power station	Local	L	L

Table 14 – Power/Interest Matrix: Lake IJssel

	Low Interest	High Interest
High Power	EU Ministry of Climate and Green Growth (KGG) Ministry of Housing and Spatial Planning Minstery of Defense Ministry of Economic Affairs The Wadden Sea Association/ Waddenvereniging	Ministry of Infrastructure and Water Management Directorate General for Public Works and Water Management Ministry of Agriculture, Food Quality, Fishery and Nature Dutch Society for Nature Conservation /Natuurmonumenten The Dutch Forestry Commission/ Staatsbosbeheer Administrative Platform IJsselmeer Region /BPIJ Bestuurlijk Platform Ijsselmeergebied Provincial Water Company North Holland/ Provinciaal Waterbedrijf Noord-Holland IJsselmeer Association/ de IJsselmeervereniging Blue Heart Natural Coalition/ Coalitie Blauwe Hart Natuurlijk
Low Power	ICPR – International Commission for the Protection of the Rhine WWF The Trilateral Wadden Sea Cooperation (TWSC) Ministry of Interior and Kingdom relations Windpark Fryslan Wind Plan Blue/ Windplanblauw Maxima Centrale - Engie	The International Union for Conservation of Nature (IUCN) van Oord Koninklijk Smals Boskalis HISAW-Recron Society for the Protection of Birds Royal Netherlands Watersport Association/ Watersportverbond Dutch Fishermen's association/ Nederlandse Vissersbond The Netherlands Agricultural and Horticultural Association/ LTO Sport Fishing in the Netherlands/ Sportvisserij Nederland Dutch Association of Tour Sailors / Nederlandse Vereniging De Toerzeilers Association of Professional Charter Boaters The Dutch Association of Suppliers of Construction Raw Materials/ NVLB Dutch skippers' association/ Schuttevaer It Fryske Gea

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		The Flevo Landscape/ Flevolandschap Landscape North Holland/ Landschap Noord-Holland Nature and Environment Federation of North Holland/ Natuur en Milieufederatie Noord-Holland Nature and Environment Federation/ Natuur en Milieufederatie Flevoland Nature and Environment Federation/ Natuur en Milieufederatie Fryslan The Netherlands Agricultural and Horticultural Association/ LTO Noord

3.6 Loch Leven

Loch Leven, located in Perth and Kinross, Scotland, UK, is a shallow lake with a high nature conservation value, protected as a National Nature Reserve, a Natura 2000 site and a Ramsar wetland. Loch Leven has experienced numerous human interventions throughout its history, significantly altering its ecosystem and surrounding landscape. Due to the canalization of the River Leven and partial draining of the lake in 1826-36, followed by the installation of sluice in 1839 to ensure a more stable water supply for downstream industry, Loch Leven was significantly changed (FutureLakes, 2025f). This draining exposed several small islands and increased the size of existing ones. Loch Leven suffered serious degradation primarily because of nutrient enrichment, resulting from sewage discharges, textile industry and intensive agriculture in the catchment. It has a history of water quality problems caused by anthropogenic eutrophication (May et al., 2012). Damaging algal blooms began to occur in the late 1970s/early 1980s. The main sources of the limiting nutrient, phosphorus, were found to be runoff from farmland, effluent from wastewater treatment works and the textile industry, and seasonal releases from the lake sediments.

During the late 1980s, blooms of cyanobacteria caused fish kills and reduced recreational value, so a catchment management group was formed to implement a long-term programme of restoration. This aimed to enable restoration targets to be met by reducing the amount of nutrients (especially phosphorus) entering the lake by about 50 per cent (FutureLakes, 2025f). The restoration efforts focused on improving water quality, enhancing biodiversity, and creating a more sustainable ecosystem. Between 1985 and 1995, wastewater treatment works were upgraded to tertiary treatment, industrial effluent was diverted, and buffer strips were installed along field margins, especially in erosion sensitive catchments. In addition, a new planning regulation was introduced to ensure that any new or upgraded rural properties did not increase the phosphorus input to the lake. Known as the “125% rule” is an innovative planning policy implemented in the catchment area to manage phosphorus pollution and improve water quality. This rule aims to ensure that new developments requiring private sewage systems do not cause a net increase in phosphorus entering Loch Leven but provide a 125% reduction as a buffer against potential increases in phosphorus, acknowledging uncertainties in measurement and estimation (SNH, SEPA, Perth and Kinross Council, 2016).

The restoration targets set by the catchment management group had been met by 2007 but despite compliance continued algal blooms returned some years later. This is due to on-going diffuse pollution from agriculture and storm overflows of untreated sewage. As it also appears to be, in-part, an effect of climate change, new restoration and sustainable management goals focus on the

combined mitigation of eutrophication and climate change impacts. Several technical innovations and nature-based interventions are being considered to achieve this.

Assessing engagement

The lake is privately owned but publicly managed, reflecting its cultural, ecological, and recreational importance. Loch Leven management is shared between NatureScot, who manage most of the Natural Nature Reserve, Perth & Kinross Councils, representing the regional authorities, Department of Environmental Health responsible for water safety, the Scottish Environment Protection Agency (SEPA) monitoring pollution incidents and the River Leven Trustees responsible for managing the loch's water levels (SNH, 2015). UK Centre for Ecology & Hydrology researchers' engagement is very important part of the catchment management group helping shape the plans for lake restoration and management.

Stakeholders include the agricultural and wastewater sectors, an environmental NGO (bird protection) and the tourism industry. The lake also provides recreational facilities such as angling, wildlife/bird watching, rambling and cycling.

Our experts (two local project stakeholders being in dialogue with their key stakeholders in the template phase) evaluated stakeholder engagement around Lake Leven against the OECD framework (OECD 2015). They identify the current form of collaboration among stakeholders is best characterized by "partnerships" where there is agreed collaboration by different stakeholders characterized by join agreement (Figure 3). Loch Leven has had its catchment management group since 1980s, when first nutrient loading studies started. Despite significant progress in lake restoration and multiple organisations having a history of working together, the level of trust between the stakeholders' groups is relatively low, problems are defined, but with little action and execution as there are no clear responsibilities and no one "owns the problem" (Personal communication, 27.02.2025). Currently the catchment management group suffers from discontinuation of key personnel and this group can be seen as informal, without reporting obligations, with meeting summaries only shared internally within the group. The general public is not actively involved in lake management and restoration, although regular annual Lake Discovery Days try to mobilise local engagement.

Table 15 – Stakeholders: Loch Leven

Stakeholder name	Stakeholder category	Sector/ fields of interest	Stakeholder level	Interest	Power
NatureScot	Government	Conservation	National (Scotland)	H	H
Public Health Scotland Department of Environmental Health	Government	Loch water quality risks to human health	National (Scotland)	H	L
Royal Society for the Protection of Birds (RSPB)	NGO	Birds	National (UK)	H	L
Scottish Water	Government	Wastewater treatment	National (Scotland)	L	H

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Scottish Environment Protection Agency (SEPA)	Government	Water quality monitoring and reporting	National (Scotland)	L	H
UK Centre for Ecology & Hydrology (UKCEH)	Research	Lake water quality and restoration	National (UK)	H	H
Historic Environment Scotland	Public body	Historic environment	National (Scotland)	H	H
Forth Rivers Trust	NGO	River conservation	Regional	H	L
Perth & Kinross Council	Government	Regional authority	Regional	H	H
Private owner of the lake	Private person		Local	H	H
Loch Leven Fisheries	Fishing	Recreational fishery	Local	H	L
Farmers	Agriculture	Arable crops & livestock	Local	H	L
Loch Leven Trustees	Local industry/ Downstream stakeholder	Water level management	Local/ Downstream	L	H
TRACKS (Loch Leven Heritage Trail)	NGO	Rural access	Local	L	L
Residents	Permanent residents	Accommodation & amenities	Local	L	L
Residents	Seasonal residents	Accommodation & amenities	Local	L	L
Community Councils	Voluntary organizations	Representing communities	Local	L	L
CATCH Loch Leven	Environmental group	Green energy	Local	H	L
Kinross-Shire Climate Café	Environmental group	Climate change	Local	H	L
The Leven Growing with the Flow Programme	Downstream communities	Water and communities	Local/ Downstream	H	L

Table 16 – Power/Interest Matrix: Loch Leven

	Low Interest	High Interest
High Power	Scottish Water Scottish Environment Protection Agency (SEPA) Loch Leven Trustees	NatureScot UK Centre for Ecology & Hydrology Historic Environment Scotland Perth & Kinross Council Private owner of the lake
Low Power	TRACKS (Loch Leven Heritage Trail) Residents (permanent) Residents (seasonal) Community Councils	Public Health Scotland Department of Environmental Health Royal Society for the Protection of Birds (RSPB) Forth Rivers Trust Loch Leven Fisheries Farmers CATCH Loch Leven Kinross-Shire Climate Café The Leven Growing with the Flow Programme

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4 Conclusions

Diverse Approaches to Lake Management and Stakeholder Engagement

The analysis of six European lake management cases reveals a complex landscape of governance structures, stakeholder involvement, and environmental challenges. This analysis provides valuable insights into the complexities of actors' constellations, and the interactions of different stakeholders across diverse European contexts. It emphasizes the importance of tailored, collaborative approaches that can adapt to changing environmental, social, and institutional landscapes. As lake management continues to evolve, these lessons will be crucial for developing more effective, inclusive, and sustainable governance models. Here are some of the most important conclusions we can draw from the comparative analysis of our cases.

We can place all cases high on the OECD ladder (OECD 2015) presented in Figure 3 and discussed in the Section 1.5. Three cases (Lake Vesijärvi, Lake Vansjø and Lake IJssel) already represent the highest level of engagement with co-decision and co-production of knowledge and a balanced share of power between the stakeholders involved. Two cases resemble "partnerships" (Loch Leven, Kartuzy Lakes) while our analysis assessed Lake Karla as reflecting rather the "participation" level. The levels of participation reflect historical legacies and path-dependencies and are not static but evolve over time. Even the highest levels of engagement do not prevent conflicts. Moreover the Lake IJssel case illustrates that even at the highest level of engagement, with such a large actor variety and representation, it is difficult to make ambitious decisions for restoration and climate adaptation. By contrast, Loch Leven with a lower level of participation but representing a smaller catchment with less stakeholders and conflict lines, illustrates an ambitious restoration project and an innovative restoration policy. Therefore, the OECD categories should be seen as ideal types, providing ideas for enhanced engagement but not necessarily leading to most effective decision-making and restoration planning. On the contrary, Lake Karla has the lowest level of engagement amongst the six demo sites, but decisions can be made quickly by national authorities because of less participation in decision-making. The risk of such decision-making is however limited local understanding and acceptance, problems in policy implementation and evaluation phases.

The Power/Interest analysis was applied to divide lake stakeholders into four groups depending on their ability to exert influence in lake management but also the degree of interest. Although there are some patterns reagrding more powerful and interested stakeholders (with public authorities of various levels dominating this group), each case also displayed some specific local stakeholder constellations, including unique stakeholders with various power and interest in lake management.

Diverse Stakeholders and Governance Arrangements

Effective lake management involves a variety of stakeholders whose roles and interests vary depending on the lake's ecological, social, and economic functions. The six case studies demonstrate significant diversity in lake governance institutions and mechanisms for stakeholder involvement. Altogether, we have identified 220 stakeholders, between 20 and 60 in each Demo Basin.

Overall, the case studies illustrate the variety of actor levels, from international to local, who are involved in such locally grounded governance problems. The degree of centralisation in lake management varies: Finland and Norway involve more local authorities, while the Netherlands, Poland and UK display moderate centralisation, and Greece remains relatively centralised. These levels do not

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necessarily correspond to national decision-making cultures in other public policy areas, and appear to be sector-specific, sometimes even contingent on historical legacies, like in the Scottish case.

There is also some important variation in terms of ownership. In many European countries, lakes are considered public property with regulated private use rights, emphasizing conservation and public access. However, private lake ownership in the UK and one lake in the Polish lake complex introduces a more varied stakeholder constellation. The Loch Leven case does, however, show that private ownership does not necessarily hinder participatory lake basin management, with the owner having both a high interest and a high influence on implementing some in-lake restoration measures.

The report clearly shows that stakeholder mapping is a crucial step for effective actor involvement, guiding engagement activities with specific tasks targeting issues and audiences. The analysis identified new categories of actors, including ones not initially listed, such as the military, diverse energy sector actors (including hydropower, wind, and solar energy interests), and influential individuals like photographers and book authors who engage the public.

Innovative Governance and Collaboration

Several cases demonstrate novel approaches to lake management. The Lake Vesijärvi Foundation in Finland is an innovative institutional governance model, emphasizing public participation and education. Established in 2007, it has garnered significant attention and support from local media, enhancing public dialogue and awareness about the lake's challenges and restoration initiatives. It has been also recognized internationally for good governance (MacGregor-Fors et al., 2021) and for showcasing best practices in lake restoration through the Lahti Lakes international symposium.

Innovations also include local norms and rules for lake restoration accepted by stakeholders. For example, research results at Loch Leven led to the successful implementation of the "125% rule" to manage phosphorus pollution and improve water quality. This rule ensures that new developments requiring private sewage systems do not cause a net increase in phosphorus entering Loch Leven but provide a 125% reduction as a buffer. A different approach was chosen for Lake Vansjø, where individual contracts with agricultural stakeholders were implemented, providing specific measures and individual incentives.

Institutional innovation can be the result of longer learning processes but also shock events – which might be important in the context of the climate crisis. The Storm Daniel disaster in Greece is such an example, where new institutional collaboration has been created in the form of the Organization for Water Management in Thessaly and might lead to more interactions among stakeholders and more social capital in Lake Karla management. This new unit is expected to become a key-player for water management in the area, linking the legal issues and state authorities, for more effective water management.

Even without shock events, new institutions important for lake management and restoration were formed in several cases, such as the Ministry of Climate and Green Growth in the Netherlands, and State Water Holding ‘Polish Waters’ in Poland. This reflects the evolution of water governance, shifting policy goals and priorities on the national level, but also increasing awareness of environmental problems.

Pressures and Challenges

Lakes are subject to different pressors and to the influence of different sectors of human activity. The Netherlands has an extremely high population density (exceeding 400 people per square kilometre), compared to medium densities in Greece, Poland, and the UK (78, 131, and 277, respectively), and low densities in Finland and Norway (16 and 17) (WorldAtlas, 2025). Population density in the area surrounding the lakes constitute the context for management challenges and objectives, but we have to bear in mind that average density in larger regions does not reflect the realities: for instance, the Finnish and Norwegian lakes are located near relatively large urban areas and in consequence also experience high use pressures, similar to those in other, more densely populated countries. Two Demo sites have a small population in their catchment area (only approx. 2000 in Lake Karla and approx. 5600 in Loch Leven). Catchment population is bigger for the Kartuzy Lakes (approx. 14000) and Lake Vansjø (approx. 40000) while it is high for the Vesijärvi Lake catchment (approx. 130000) and extremely high in the IJssel catchment (approx. 7 millions) (FutureLakes 2025).

All lakes experienced significant problems that mobilised stakeholder collaboration. Common issues include water quality, habitat loss, eutrophication, water quantity issues, and algal blooms. Some problems are more case-specific, such as PFAS in Norway, flood management in the Netherlands, and extreme drought and floods in Greece.

Conflict Resolution and Community Engagement

External pressure from a variety of actors with divergent interests inevitably spawns conflicts. All cases have histories of conflicts over lake uses. Some historical conflicts turned into long-term collaborations, such as with farmers around Vansjø in Norway and the Polish Angling Association PZW around Kartuzy. Some conflicts have been institutionalized, with two actor coalitions formed at Lake IJssel, maintaining constant dialogue and potential collaboration.

While institutional innovation is important, it should not obscure the possibilities for using existing institutions for stakeholder dialogue. This may be particularly important at community level. In the case of Kartuzy Lakes, civic dialogue and environmental education were key engagement activities. The local Kartuzy Culture Centre served as a meeting place for the restoration project discussions, along with a dedicated project website. Clear and shared goals for improving water quality, environmental status, and recreational values were important elements for wide stakeholder acceptance.

Outlook: Future Directions and Challenges Ahead

In environments with numerous interest groups and collaborative governance, ambitious decisions regarding lake restoration or climate adaptation can be extremely challenging to implement. The dense and complex stakeholder settings can lead to grid-lock situations, where progress is hindered by the difficulty of reaching consensus among diverse parties.

Restoration projects are initiated and driven by various actors, ranging from high-level decision-makers in Greece to local municipalities in Poland. Once decisions are reached, implementation starts, and in case of lake restoration, it is a highly technical issue which requires expertise and knowledge. However, knowledge levels, local competence, and technology available for lake restoration vary significantly across regions. All our case studies showcase a very strong presence of diverse research institutions.

Practical expertise in lake restoration seems more diversified among the cases. In the Netherlands, many multinational companies of local origin possess diverse competencies, contributing to effective restoration efforts. Conversely, in Poland, the initial contractor for restoration was replaced due to inadequate competencies and failure to deliver the required work, highlighting the importance of selecting capable partners.

The findings from this report underscore the critical importance of understanding the diverse stakeholder dynamics, governance mechanisms, and innovative approaches to lake management. By recognizing the challenges posed by complex stakeholder settings, varying levels of knowledge and competence, and the evolving roles of actors, policymakers and practitioners can better navigate the intricacies of lake restoration and conservation. The EU Nature Restoration Regulation (NRR) is set to bring more lake restoration efforts across Europe (European Commission, 2024). The NRR explicitly requires public participation in the development of national restoration plans and assessment of co-benefits of restoration. These aspects alone will require more effective stakeholder engagement and participation in restoration planning for the NRR to succeed. The experiences and successes documented here provide learning and inspiration for Member States to support good practices in implementing the NRR.

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