



OPTAIN

Optimal Strategies to Retain Water and Nutrients

D1.3: Report on actor involvement, MARG activities and experiences

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Summary

This OPTAIN deliverable D1.3: “Report on actor involvement, MARG activities and experiences” is an output of OPTAIN’s Work Package (WP) 1: Case studies and harmonised multi-actor approach. It complements two other reports on stakeholder engagement in OPTAIN: D1.1 “Stakeholder mapping report, covering the case studies” and D1.2 “Workshop and workshop report on how to establish and nurture MARG for constructive engagement in water – agriculture -environmental conflict related issues”. While the first two reports focused on the preparatory phase for stakeholder engagement, this report sheds light on the implementation and evaluation phases. This deliverable should also be seen in connection with other OPTAIN deliverables, particularly those adding a social scientific component to the project, such as D4.5: “Attractiveness and socioeconomic assessment of NSW RMs” (Monaco et al., 2024), and all the four deliverables from the WP6: Synthesis and policy recommendation.

This report presents the stakeholder engagement activities that were carried out between late 2021 and the end of 2025. It deepens understanding of how stakeholders co-produce knowledge by examining both researcher and stakeholder perspectives, tracking progress against established benchmark objectives, and evaluating the impacts of engagement efforts. The report demonstrates that meaningful involvement depends on relevance, added value, and trust among participants. The engagement process itself is evaluated using nine benchmark criteria developed by Rowe & Frewer (2010). The analysed achievements of the benchmark criteria are based on the logged interactions, interviews with the case study leaders about meaningful engagement, and responses to the stakeholder questionnaire. Furthermore, the report discusses typical tradeoffs in stakeholder engagement and possible strategies to address them. By bridging the gap between theoretical and empirical knowledge on stakeholder engagement in research projects, this deliverable provides valuable resources for future planning, implementation, and assessment of stakeholder involvement in knowledge co-creation projects.

Chapter 1 provides an introduction and presents the OPTAIN project objectives and research activities. Chapter 2 offers a theoretical anchoring for the report by reviewing relevant literature on stakeholder engagement in research projects. Chapter 3 presents the methods and evaluation frameworks used for organizing the data. Finally, Chapter 4 presents empirical results from monitoring of the engagement activities across the 14 case studies over the five-year duration of the project. Chapter 5 discusses tradeoffs in stakeholder engagement in environmental modelling research projects. Chapter 6 presents the concluding remarks and lessons learned. Important additional materials such as data, templates and questionnaires are provided in the Annexes.

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Abbreviations

CAP	Common Agricultural Policy
CS	Case Study
CSR	Corporate Social Responsibility
CLS	Case Study Leader
DSPA	Dviete Valley Municipalities
EU	European Union
JSC	Joint Stock Companies
LLC	Limited Liability Companies
MARG	Multi-Actor Reference Group
NGO	Non-governmental Organisations
NSWRM	Natural/Small Water Retention Measures
OVF	General Directorate of Water Management
OECD	Organization for Economic Co-operation and Development
SWAP	Soil Water Atmosphere Plant
SWAT+	Soil Water Assessment Tool
WOCAT	World Overview of Conservation Approaches and Technologies
WP	Work Package

1 Introduction

Involving stakeholders in research projects is widely acknowledged as essential for ensuring that the results have a meaningful impact on both environment and society (Newig et al., 2023; Reed, 2008; Reed et al., 2009, 2018; Smyth et al., 2021). In the project OPTAIN (*OPTimal strategies to retAIN and re-use water and nutrients in small agricultural catchments across different soil-climatic regions in Europe*), stakeholders have been part of the research process from the start until the end of the project. Partners from environmental and social sciences worked together with stakeholders for five years to identify optimal spatial allocation and combinations of Natural/Small Water Retention Measures (NSWRM), considering environmental and socio-economic modelling results, policies, and environmental and economic sustainability indicators. It was part of the project strategy to involve stakeholders as co-creators of knowledge to better understand the benefits of spatial combinations of NSWRM for resilient agriculture and to increase the legitimacy of the project's modelling results. In OPTAIN, co-creation refers to a collaborative process in which researchers and stakeholders jointly defined relevant challenges and interpreted modelling outcomes that contributed to the project's optimization process. This process aimed to create shared understanding and ownership of results, ensuring that the scientific outputs reflect the perspectives and practical experiences of farmers, advisors, and decision-makers. Stakeholders, including decision makers at different governance levels, agricultural advisors, water managers, farmers and land managers, have been providing input on a regular basis as part of multi-actor workshops, bilateral discussions, and surveys in the project. The arena for stakeholder engagement has been the Multi-Actor Reference Groups (MARGs), which were established during the first half year of the project following an initial stakeholder mapping exercise in the 14 case studies across 12 countries in Europe (Van den Brink, De Vries, Nesheim, et al., 2022). The mapping exercise was undertaken to identify the stakeholder community, referring to actors affected by the decisions and actors influencing the decisions being made (Freeman, 1984). Based on this exercise, six stakeholder categories were identified: farmers / land managers, national authorities, local authorities, experts / scientific advisors, private companies commercial, NGOs / associations. It was argued that effective collaborative processes between researchers and stakeholders (OECD, 2015) depend on the extent to which the actors (project researchers and the involved stakeholders) perceive the engagement as meaningful.

This report concludes the work package (WP1) "Case studies and harmonized multi-actor approach", documenting the engagement activities carried out during the project period from late 2021 to the end of 2025. To provide a more detailed understanding of stakeholders as co-producers of knowledge, the report explores both researchers' and stakeholders' perspectives on meaningful engagement, reviews the progress made toward stakeholder benchmark objectives, and examines the impact of these engagement efforts. We understand that meaningful engagement depends on a perception that the topic is relevant, that there is added value, and that there is trust among the actors (Nesheim et al., 2021; Van den Brink, De Vries, Nesheim, et al., 2022). The benchmark objectives reported

on refer to an evaluation framework for public participation developed by Rowe & Frewer (2000), which consists of a set of evaluative criteria to address the acceptance and effectiveness of such processes. The report offers practical insights and knowledge about stakeholder engagement and research on engagement processes, while also discussing challenges and opportunities for engagement in research projects. By presenting specific frameworks and their use in engagement assessment, as well as discussing existing challenges, the report aims to promote more effective, inclusive, and flexible approaches for engagement. Furthermore, by systematically documenting and analyzing engagement activities, the report adds to the collective knowledge base, providing valuable resources for others seeking to enhance the planning, execution, and evaluation of stakeholder involvement across various cases.

Section 1.1 of the report provides an overview of OPTAIN's objectives and key research activities. Chapter 2 contains a brief literature review on stakeholder theory and literature strands on engagement. Chapter 3 presents the OPTAIN case studies, the methods and data collection. Chapter 4 presents the analysed results for: (i) the logged stakeholder interactions, (ii) the stakeholder questionnaires, (iii) the interviews with case study leaders on meaningful engagement, and (iv) the benchmark achievements for fair and effective engagement. Chapter 5 discusses the tradeoffs involved in engagement. Chapter 6 contains concluding remarks and recommendations.

1.1 The OPTAIN project objectives and research activities

During the period 2020-2025, partners in the OPTAIN project have worked together to identify efficient measures for the retention and reuse of water and nutrients at farm and catchment levels in small agricultural catchments across regions in Europe. Within the scope of the project, efficient measures or techniques refer to the optimized spatial allocation and combination of measures known as Natural / Small Water Retention Measures (NSWRM), which are based on indicators of environmental and economic sustainability. Fourteen case studies, each involving local research teams, collaborated within their respective case study areas and across cases on data collection, participation processes and various modelling analyses within the framework of the project. Five main tasks representing can be described, (i) identifying existing and eligible NSWRMs (Lemann et al., 2022; Magnier et al., 2024), (ii) collecting environmental variables such as topography, soil properties, land use, land cover, stream channels, water flow and water quality data, sediments, and socio-economic data such as crop yields, agricultural management practices, production costs and granted subsidies (Szabó et al., 2022, 2024), (iii) selecting indicators and locations in the landscape for the measures to be modelled (Krzeminska & Monaco, 2022), (iv) modelling including, - calibration of field-scale soil-hydrological/nutrient/crop models (SWAP) and catchment scale models (SWAT+), - modelling the effectiveness of single NSWRMs at field scale, and modelling optimal implementation schemes for NSWRM, including their combination and allocation on catchment-scale, tailored to the characteristics and management of a specific agricultural system (Farkas et al., 2023; Honzak & Pogačar, 2022; Monaco et al., 2024; Piniewski et al., 2024, 2026),

(v) identifying and incentives to encourage the implementation of underutilized NSWRM at farm and catchments levels (in prep., Nesheim et al. 2026). Pareto-optimal implementation schemes were applied to identify the potential of NSWRM in their effectiveness to retain and reuse water and nutrients while ensuring the most favourable socio-economic results (Strauch & Schürz, 2024; White et al., 2025; Wittekind et al., 2025). The project also included the development of a platform called “Learning Environment”¹, which serves to communicate the results and highlight all important improvements in NSWRM knowledge (Amorsi et al., 2025). Figure 1 below illustrates the core elements of the project.

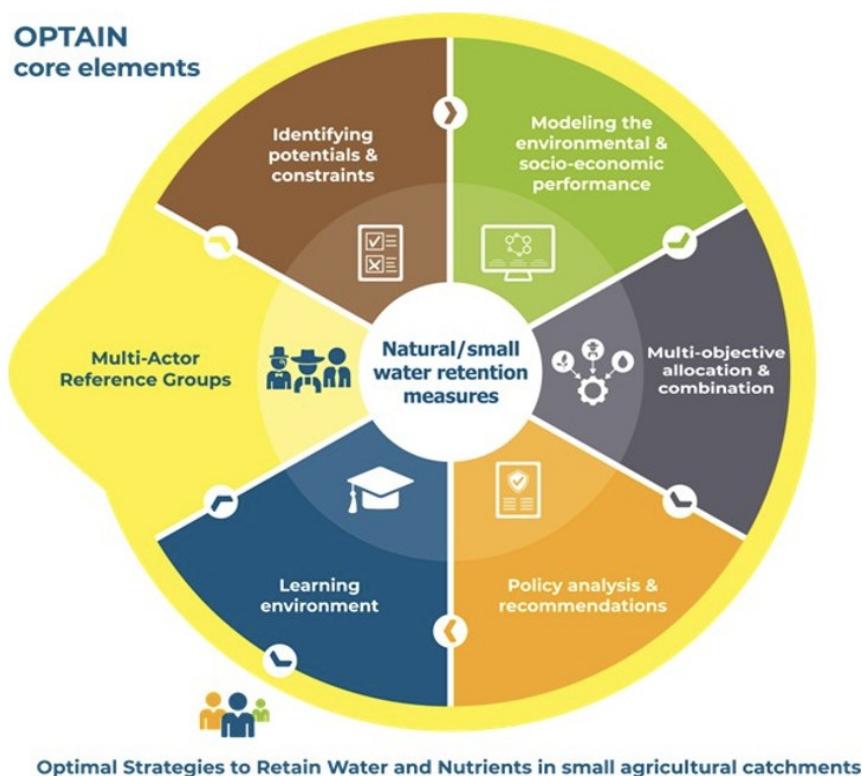


Figure 1. Project cycle and core elements of OPTAIN

Stakeholders were involved in data collection, defining measures, indicators and scenarios, and providing feedback on modelling assumptions and results, and discussing policy recommendations. WP1 was responsible for nurturing the engagement activities and ensuring a harmonized engagement process across case studies in the project (Van den Brink, De Vries, & Nesheim, 2022; Van den Brink, De Vries, Nesheim, et al., 2022). WP1 has overseen a harmonised approach to engagement, organized fora to discuss experiences from various cases, and developed guidelines and reporting templates for MARG activities, as well as an evaluation framework, which is presented in more detail this report. The arena for internal project information exchange entitled “InterVision meetings” was an important activity promoting a harmonised process. The InterVision meetings were organized every six weeks to enhance the exchange of experience and

¹ Link to the OPTAIN Learning Environment: <https://le.optain.eu>

knowledge between Case Study Leaders (CSLs) and task leaders. During these meetings, task leaders presented draft surveys, protocols and workshop guidelines, while CSLs presented challenges and best practices to discuss solutions and share knowledge.

2 Literature review and theoretical approach to engagement

In recent decades, increasing emphasis has been placed on integrating stakeholder involvement into research processes, with the involvement of experts and the public deliberation becoming a priority on the political agenda, particularly in Europe (Andersen et al., 2021). This strategy is considered more effective in addressing the complexity of current sustainability issues than top-down approaches that leaves no room for stakeholder engagement. As a result, the role of the 'stakeholders' has become crucial, recognizing anyone affected by a decision as having a legitimate right to participate in the process. Global science organizations, funding agencies, and research practices increasingly advocate for diverse participation and knowledge co-production approaches where academics collaborate with non-academics to address sustainability challenges.

In this chapter, we provide a theoretical anchoring for this report by drawing in section 2.1 attention to stakeholder theory, tracing the growing attention towards various forms of stakeholder engagement. We present in section 2.2 diverse avenues of stakeholder related research, including on evaluation.

2.1 The participatory turn and stakeholder theory

Stakeholder engagement has gradually entered the sustainability agenda. Approaches to stakeholder participation have been evolved from raising awareness in the 1960s to incorporating local perspectives since the 1970s and paying attention to local knowledge since the 1980s, finally becoming a norm in the global sustainability agenda since the 1990s (Reed, 2008). This illustrates a "participatory turn", referring to the significant shift in approaches to public policy, environmental protection, and project management that has taken place since the 1980s, moving away from traditional, top-down models of governance of planning for people, towards planning with people and by people (Bherer et al., 2016). It has been a shift for more inclusive and collaborative forms of planning and decision-making, a transition often described as moving "from government to governance" (Mayntz, 2017). It follows that governance in the participatory paradigm increasingly relies on horizontal and diverse relationships between state institutions and a multitude of non-governmental actors, in particular civil society organizations and local communities (Lo, 2017). A participatory approach refers to processes by which individuals and groups of people come together in some way to communicate. However, the quality of participation may range along a continuum from one way flow of information to an exchange of information to a situation where stakeholders have full control of the issues and decisions (Arnstein, 1969).

Research on stakeholder engagement typically aims to advance the understanding of stakeholder processes and the way in which such engagement can influence the success of projects. As early as 1969, Sherry Arnstein created the framework known as “the ladder of citizen participation”, which shows that participation can range from high to low, and how levels of citizen agency, control, and power can be increased to encourage citizen involvement in planning processes (Arnstein, 1969). The foundations for stakeholder theory, however, were provided by Freeman (1984) in his book “Strategic Management: A Stakeholder Approach”. Freeman identifies stakeholders as “any group or individual who can affect or is affected by the achievement of an organization’s purpose”, and hence opposite to the previously emphasized shareholders. He stresses the need to consider stakeholders in the decision-making process, emphasizing that engaging them creates value. Since the publication of this book, the stakeholder concept has received much scholarly attention. Along with the participatory turn, stakeholder concepts developed in various disciplines, including strategic planning, systems theory, organizations theory, and Corporate Social Responsibility (CSR). Particularly since the 2000s, research and literature on stakeholder engagement has significantly increased, and the theoretical construct has received great prominence (Andriof & Waddock, 2002; Kujala et al., 2022). This expansion of participation is especially evident in the field of environmental governance in recent decades, where inclusivity has become a central principle. Fragmented research on stakeholder engagement, however, has led to a wide range of terminological discussions and interpretations (Lawrence, 2006). Hence, despite the advances in the field, it can be argued that we lack a clear and established terminology to adequately characterize and analyse stakeholder engagement (Jolibert & Wesselink, 2012; Kujala et al., 2022). It is an ongoing discussion about what are the right mechanisms and forms of participation, and what should be the authority of the public in the decision-making process (Renn et al., 1993). The increased practice of stakeholder involvement has brought some disillusionment over limitations and failings in participation practices, highlighting the need to pay attention and to learn from best practices and studies that addresses impacts of stakeholder engagement (Almond & Verba, 2015; Pollock, 1983).

2.2 Research streams for studying and evaluating engagement

Stakeholder research employs a wide range of terms to describe engagement, including mechanisms, levels, strategies, methods, steps, forms, interventions, approaches, types and degrees (Jolibert & Wesselink, 2012; Mitter et al., 2020; Novoa et al., 2018; Pucci et al., 2020; Shackleton et al., 2019; Viglia et al., 2017). A variety of stakeholder interactions are described, such as communication, collaboration, consultation, dialogue, and joint decision-making. These activities can be one-sided, such as providing information to stakeholders, or two-sided, involving mutual and reciprocal engagement (Kujala et al., 2022). Stakeholder engagement can have diverse ambition and driving forces. It can be part of the policy process cycles where broad public engagement enhances the democratic processes; it can also be part of diverse (research) projects and initiatives. While stakeholder engagement in broad democratic processes enhances legitimacy, accountability, and inclusiveness in decision-making, stakeholder engagement in research processes typically focuses more on improving research relevance, quality,

acceptance and societal impact. Although the scope of the engagement differs, the forms and methods of engagement, its impact, risks and evaluation can have many similarities.

An ambitious form of stakeholder involvement is participatory modelling (Knaggård et al., 2019). It refers to a collaborative approach that actively involves stakeholders in developing models to address socio-environmental challenges. Voinov & Bousquet (2010) defines participatory modelling as engaging stakeholders' implicit and explicit knowledge to create formalized and shared representations of reality. Models of varying size, complexity, and scope are increasingly used in environmental management to enhance decision-making. These models serve multiple purposes; providing system understanding, facilitating learning, offering platforms for stakeholder engagement, projecting system behaviour and enabling virtual testing of management strategies (Fulton et al., 2015). Participatory approaches in environmental modelling can be connected to various stages of the modelling work, including concept development, goal setting, model formulation, validation, application, evaluation, and ensuring transparency throughout the research process.

Here we focus our review on stakeholder engagement in research projects, although some elements and frameworks can also be universal in wider engagement processes. Then we address frameworks for evaluating engagement. Literature shows that there can be various approaches to categorizing stakeholder engagement research, following the scientific focus and the disciplines that advance it, and based on diverse epistemological stances, methodological toolkits. Kujala et al. (2022) distinguishes research on engagement related to scientific discipline listing fields as business and society, management and strategy, environmental management and environmental policy, innovation, and entrepreneurship. (Blackstock et al. (2007) present a typology of stakeholder engagement, referring to normative (emphasizes the process and ethical and democratic principles ideals), substantive (provides valuable information that improves quality of decisions) and instrumental (engagement is a strategic input into the project) dimensions. Kujala et al. (2022) present a typology that is similar to the one by Blackstock et al., emphasizing its moral, strategic, and pragmatic dimensions. They further point out that studies on environmental management and environmental policy are often practice oriented, aiming to explain the processes through which various stakeholders can be included for enhancing benefits of engagement, and to avoid pitfalls and limitations (Graversgaard et al., 2021; Reed, 2008; Reed et al., 2009; Shackleton et al., 2019). Practice oriented research can be strategic and focus on organizational performance and risk minimization or have a pragmatic focus on problem-solving and consensus in decisions. Then other streams of literature focus on engagement, for example Calton & Payne, (2003), Corus & Ozanne (2012), Dawkins (2013), Goodman & Arenas (2015), Noland & Phillips (2010), Passetti et al. (2019). Fiorino (1990) focuses on the moral and normative reasons for engagement, such as it being a democratic right, and the components of representation, transparency, legitimacy of processes, trust, and fairness. The two dimensions, the pragmatic and practice oriented, and the normative components, are not exclusive, and studies on stakeholder engagement often combine two or more components.

In their work, which examines engagement in six countries in North and South America, Smyth et al. (2021) identify five main objectives for stakeholder engagement, which together bridge many moral/strategic and pragmatic dimensions. These include achieving results that are directly relevant to society and decision makers, improved communication of data and results to a wider audience, better understanding of and trust in science among stakeholders, active citizenship, and increased adaptability. They argue that “careful planning, implementation and evaluation” are needed to ensure the willingness of stakeholders to participate in research, for the maintenance and improvement of participatory processes, and for avoiding unintended effects.

Stakeholder guidelines are the result of research on stakeholder engagement, drawing on best practices, core principles, and theoretical frameworks to inform effective approaches and actions. Various guidelines have been produced, including the Organisation for Economic Co-operation and Development (OECD) framework for engagement, the World Bank guidelines, the Global Development Goals standards, etc. The OECD framework refers to the principles, guidelines, and practices clearly rooted in Sherry Arnstein’s “ladder of citizen participation”, promoting meaningful stakeholder engagement by starting with basic communication, consultation, participation but further reaching representation, partnerships and co-production (OECD, 2015). They conceptualize knowledge co-production and co-decision as the ultimate levels of stakeholder engagement characterized by a balanced share of power over the policy or project decision-making process. The highest level of engagement transforms the relationships between stakeholders by creating common ownership of the problems and aligning projects’ outcomes with the stakeholders’ goals and needs (Ibidem). Hurlbert and Gupta (2015) developed a framework with pathways for “climbing” the ladder, based on current levels of trust and participation among the targeted stakeholders (Hurlbert & Gupta, 2015).

2.2.1 Evaluating participatory approaches

Several different frameworks have been proposed to evaluate the impact of stakeholder engagement on value generation, knowledge creation, for corporate social responsibility, and for sustainability (Kujala et al., 2022). Other evaluation frameworks aim to address the degree that the engagement is fair or just, reflecting a normative perspective (Rowe et al. 2008). However, and according to systematic reviews (Esmail et al., 2015; Ray & Miller, 2017), data on the impact of stakeholder engagement are generally qualitative and limited. In several studies, the evaluation results are called into question by lack of prior terminological consensus and a framework for planning, studying and reporting on stakeholder engagement (Ray & Miller, 2017). Evaluating engagement requires appropriate criteria, methods and data, defining the context and setting boundaries.

Below, we describe some examples of frameworks for assessing the impact of engagement on selected topics, including academic impact, societal impact, impact on social learning, on sector coordination, on economic value generation, and frameworks for evaluating the engagement process itself. The studies and the frameworks presented were selected as they address topics relevant for research projects with academic, environmental and societal objectives. Hence, frameworks

for addressing the impact on economic value generation (e.g. Freudenreich et al., 2020) are not included here. These studies also shed light on how the relationship between stakeholder engagement and project goals are conceptualized in different studies.

Academic impact: Huzzard (2021) presents a framework for stakeholder engagement and discusses how engagement might be linked to scientific, policy and practitioner impact as part of the Horizon 2020 project QuInnE². As part of the project, stakeholders collaborated with the research team to develop the project (e.g. project design and bidding), implement it (e.g. advising on national databases, assisting with case study selection, gaining access and organising interactive workshops) and shape and disseminate the project results (e.g. by assisting with the design of diagnostic and development tools for practitioners at workplaces). The impact of stakeholders on academia, policy, and practitioners is discussed qualitatively.

Societal impact: Gerlak et al. (2023) define societal impact as “the changes that occur in people, communities, and/or environments outside of academia as a result of the research process or findings”. They present a framework for evaluating societal impacts from stakeholder engagement. Applying this framework in their review, they assess the effects of stakeholder involvement. The most common type of impact that Gerlak et al. found in their review, is impact of engagement on changes to knowledge, awareness, attitudes and ideas across the analyzed case studies (65%). The second typical impact, called “connectivity”, relates to relationships in networks, like changes to trust and mutual understanding (30%). The third category lists instrumental impacts when changes are observed in plans, practices or policies. This was observed in 24% of their cases analysed. Further capacity-building impacts, which describe changes in skills and expertise, were recorded in 12% of case studies. According to Gerlak et al. (2023), the most difficult were social change impacts (changes to social systems, structures, behaviors) and environmental change impacts (changes in natural resources and ecosystems), which were reported by 6% and 3% of the case studies, respectively.

Impact on social learning: Garmendia & Stagl (2010) present a framework for a systematic description of elements of social learning that are relevant for the transition to sustainability. The authors refer to Arnstein’s ladder of participation and present a framework with different steps representing gradual learning processes. The first stage is about learning and exploring stakeholders’ reasons for their behaviors. They further develop several hypotheses how engagement impacts changes in knowledge, fact appraisal, refining views and finally institutional setups. Blackstock et al. (2007) also address social learning in their paper and found that the exchange of multiple perspectives fostered social learning, but numerous obstacles hindered turning this learning into new practice.

Sector coordination: Sandkjaer Hanssen & Falleth (2014) studied the impact of engagement on coordination between actors, which was inspired by Arnstein (1969) and Bouckaert et al. (2010). They defined a ladder with steps representing different levels associated with a coordinated approach. Step 1 considers

² <http://quinne.eu/>

information, experience and knowledge sharing, development of a common worldview and problem understanding across sectors, change in actual behaviour and practice in their own sector, and development of common actions across sectors and levels of authority. Information about what is being coordinated and the degree of mutual impact, and the dependence between actors increase for each step. The study by Sandkjaer Hanssen & Falleth (2014) aimed to assess whether coordination between sectoral authorities was achieved through the new water management system. A related approach is the focus on network achievements by Hauge et al. (2018). Hauge applied Arnstein's ladder to assess the impact of engagement on network achievements. The steps capture the degree of dependency within the networks, starting with information and knowledge sharing, through development of joint worldviews, adjusting behaviours to the development and realization of joint goals.

Evaluating stakeholder processes: Rowe & Frewer (2000) developed a comprehensive and holistic assessment framework for evaluating the quality stakeholder engagement processes. The framework serves to assess the degree that engagement is fair and effective by focusing on nine benchmark themes: representativeness, independence, early involvement, influence on policy, transparency, resource accessibility, task definition, structured decision making and cost-effectiveness. Indicators and benchmarks for the nine themes are suggested Row & Frewer (2000; 2013). According to these authors, the specific evaluation benchmarks should be selected considering what is desirable and then used to measure the presence or quality of these aspects. While a checklist of potential indicators would be useful, organizers need to recognize that the choice of indicators is specific to each context. It can also be relevant to consider that stakeholders' perspectives on the criteria for a good process may vary (Webler et al., 2001). A framework approach for evaluating participatory research is suggested by Blackstock et al. (2007). This involves framing the evaluation, i.e. setting boundaries on the subject within its social, political, environmental and institutional context and selecting appropriate criteria, methods and data sources.

Evaluating meaningful engagement: The concept of "meaningful engagement" refers to an engagement process where individuals or groups (stakeholders) are actively involved in a decision-making process, not just passively informed reflecting both a democratic and an instrumental, practical perspective on engagement (Lavallee et al., 2012; Liu et al., 2017; Santos & Chess, 2003). These authors emphasize the design of the stakeholder deliberation process and the quality of the facilitation and recommend the evaluation of six normative meta-criteria: respect, trust, legitimacy, fairness, competence and accountability, and place. The meta-criteria are defined, and practical considerations are reflected upon and suggested. Few studies, however, were found to systematically define and evaluate meaningful engagement.

Unintended impacts of engagement: Engagement does not necessarily lead to positive effects; unintended effects may also occur. Engagement can also lead to or increase conflicts and unequal power relations. Conflicts that emerge by mistakes, misconducts, where stakeholders can be misused and when negative impact of such engagement are documented. Many authors (Graversgaard et al.,

2021; Kochskämper et al., 2018; Musch & von Streit, 2020; Reed, 2008; Warner, 2006) point out the promises of participatory approaches, but also some of the pitfalls and limitations. Although there is some evidence of negative impacts, it has not been systematically researched in the engagement literature (Kujala et al., 2022).

3 Method for stakeholder engagement and evaluation

From the outset, the OPTAIN project adopted an ambitious stakeholder engagement strategy. The project involved a broad group of stakeholders in all case study areas. Stakeholders have been invited to participate in joint fact-finding and co-creation activities to model the effects of NSWRM and for conducting policy analysis. The success of OPTAIN's engagement processes heavily relied on the ability of the project and the local research teams to facilitate meaningful engagement, related with relevance, the building of relationships and trust, added value and procedures for fair and effective engagement situations.

This chapter is divided into four main parts. In section 3.1 we introduce the project's approach to stakeholder engagement. In the following section 3.2 we present all the case studies that have been part of OPTAIN and implemented the engagement activities. Further, in section 3.3., we present the evaluation frameworks that have been used to implement and assess engagement activities. Finally, section 3.4 presents the data collection for assessing stakeholder engagement in OPTAIN.

3.1 The project engagement structure and approach

At the case study level, case study leaders (CSLs) were responsible for establishing engagement platforms known as Multi-Actor Reference Groups (MARGs). These groups primarily consist of actively engaged stakeholders such as decision-makers from both public and private sectors (agriculture, environment, river basin management), individual farmers and NGOs. Stakeholders with infrequent contact, those participating primarily as survey informants, are considered the 'outer circle,' while those who participated in the MARG workshops form the 'inner circle.' The CSLs coordinated a series of MARG workshops for multi-actor exchange, alongside bilateral activities such as surveys and interviews (see Figure 2 below). These workshops, held at regular intervals, have served as forums for information sharing, multi-actor exchange and input to modelling activities. The initial workshops focused on identifying local environmental challenges and existing and eligible NSWORMs. Subsequent workshops gave input on indicator selection, where in the landscape to place the NSWORMs to be modelled, presented performance assessments, and gathered feedback on modelling assumptions and results. The last workshop organized the final year (2025) focused on presenting results from the project on modelling of the efficiency of measures, presenting the tool developed in the project, ParetoPick-R, and on the Learning Environment Platform.

Surveys and interviews have collected additional data on coherence, policy gaps, and environmental and socio-economic variables, such as in D2.2; D4.5) (Krzeminska & Monaco, 2022; Monaco et al., 2024).

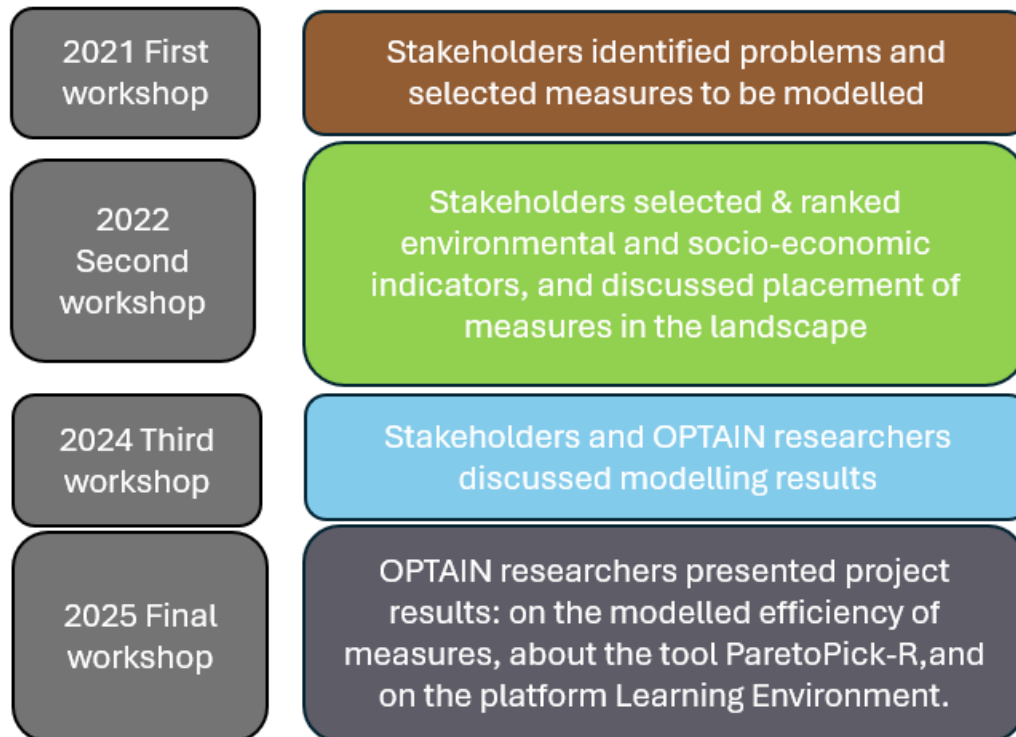


Figure 2. MARG workshop series and the main topics addressed

3.2 The OPTAIN case studies

OPTAIN has been working in 14 case study locations covering three European biogeographical regions, the continental, the Pannonian and the boreal regions (Figure 3). The case studies cover a wide range of soil-climatic zones and agricultural systems. The sizes of the case study catchments are rather small (21-250 km²) and the predominant project-relevant problems are nutrient loss, pollution and, frequently, problems with both floods and droughts. For each case study we provide a brief description of the environmental context and the main types of stakeholders in the case area. The different case studies are presented in an alphabetical order (by case study country). More description of the case study areas can be found on the project website³ and in other project deliverables (Glavan et al., 2022).

³ <https://www.optain.eu/case-studies-and-actors-involvement/general-presentation>

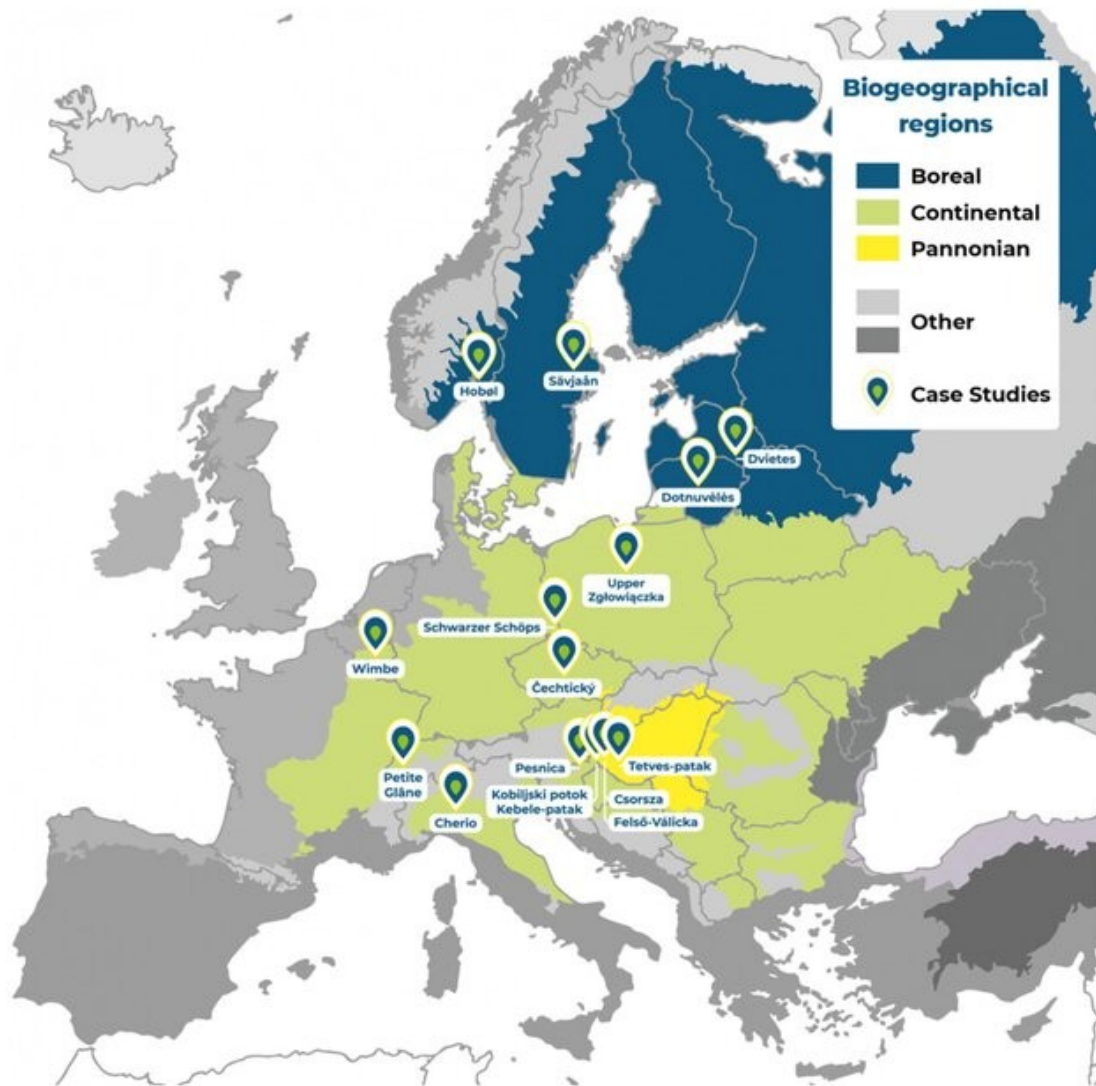


Figure 3. Location of OPTAIN case studies

Belgium: La Wimbe catchment (112 km²) is in the Wallonne Region. The area is dominated by forest, followed by agriculture and is sparsely populated with small villages. 45% of the catchment is a Natura 2000 site. The catchment is designated as a nitrate-vulnerable zone, which is an allocated area for protecting groundwater and surface water from agricultural nitrate contamination. Other environmental pressures include floods, low flows, soil degradation and erosion. The yield of the crops within the basin is also affected due to flooding or drought. The main local actors are farmers, farmers associations (non-profit private advisory services), government agencies and local authorities. Most of the farmers lease the land. The CSL team had not worked in the area prior to OPTAIN and did not know any of the stakeholders from before. The main stakeholders represented in the MARG included: the river basin authority, farmers associations (advisory services/NGOs that provide agricultural advice (Natagriwal and Protect'eau), province authorities, and municipal authorities.

Czech Republic: The Čechtický catchment (72km²) is located within the Želivka river basin in the Central Bohemian Region. The area is characterized by a rural

landscape with small to middle sized villages and relatively low population density. Agricultural land is the dominant land use, while other land cover types are forests and urban areas. The Švihov drinking water reservoir is located in the basin, there are restrictions on land use such as industrial activity and farming in the area around the reservoir. There are persistent problems of unstable water quality (phosphorus, nitrogen, pesticides pollution), as well as risks of soil erosion on sloped fields. Land managers in the area are mainly agricultural cooperatives (farmers' coop), agricultural joint stock companies (JSC) and a few private farmers. The CSL were very familiar with the area prior to the project, as the team has worked in the region with experimental sites and monitoring activities for many years. This access to data was also a reason for choosing this catchment as a case study in OPTAIN. The CSL had been in contact with many of the stakeholder groups through previous projects, including collaboration with farmers and local watershed authorities. The main stakeholders represented in the MARG included: Ministry of Agriculture, the Vltava River Board, local authorities from the Czech Čechtice Municipality, local farmers, Keblov Agricultural Cooperative, Křivsoudov Agricultural Cooperative and Association of Private Farming.

Germany: The Schwarzer Schöps catchment (136 km²) is in Saxony in the east of Germany. The main land use in the catchment area is cropland, followed by forest, grassland and urban areas. 19% of the area are protected under either German law or different EU directives. Agriculture production in the catchment is dominated by cropland and grassland. Crop yield stability is negatively affected by increasing floods, soil erosion and droughts. The downstream reservoir faces challenges with low water tables and high phosphorus pollution that cause blue-green algae bloom. The agricultural land in the area is mostly rented, and it is managed by farmers' cooperatives (co-ops), limited liability companies (LLCs), civil law partnerships and sole proprietorships. The Schwarzer Schöps was chosen as an OPTAIN CS due to its specific environmental challenges, and the suggestion came after consulting with the water department of the regional environment agency. The CSL team had not worked in this specific area before. Key stakeholders represented in the MARG are the water department of the regional environment agency, the water reservoir administration and the farmers' advisory service which has been central for communication with farmers and to arrange the MARG workshops.

Hungary: The Csorsza catchment (21 km²), **Felső-Válicka catchment** (131 km²) and **Tetves catchment** (68km²) are all part of the catchment of Lake Balaton, which is Central Europe's largest lake and a tourist destination. The three separate case studies therefore have much in common. The management of nutrients and water in the smaller catchments directly affect water quantity and quality in the lake. Agricultural land is the main land use in addition to forested areas. As the area is important for biodiversity objectives, there are more requirements for agricultural management. The CSLs had experience from working in Tetves and in Csorsza as part of other projects, while Felső-Válicka area was new to the CSLs. Key stakeholders represented in the MARG included farm advisors, local water authority, experts of the Hungarian Agricultural Chamber, farmers, WWF Hungary, Ministry of Agriculture, General Directorate of Water Management, Institute of

Agricultural Economics, experts from the Balaton-felvidéki National Park, majors, researchers from universities and other experts in water management.

Hungary/Slovenia: The Kebele catchment is located partly in Hungary (Kebele-patak, 209 km²) and partly in Slovenia (Kobiljski potok, 247 km²), with a transboundary water cooperation between Hungary and Slovenia since 1994. The catchment is dominated by agricultural land use. It is also part of a Natura 2000 site. About 60% of the area is agricultural land, typically with wheat, barley, corn cultivation and pasture management. The Kebele Valley and Szentgyörgyvölgyi stream valley is Natura 2000 classified. Main challenges identified in the area: management of nitrate-sensitive areas, prevention and mitigation of soil erosion, flash floods and more and more prominently drought. The main local actors are farmers, farmers associations, government agencies representatives and others. 'Hungarian and Slovenian project partners did not have detailed knowledge of the Kebele catchment in advance. Key stakeholders represented in the MARG are the representatives of the West-Transdanubian Water Directorate, Órség National Park, farmer advisors, farmers, mayors at the local level, the Institute of Agricultural Economics and National Chamber of Agriculture with its regional bodies at national and regional level.

Italy: The Cherio River catchment (153 km²) is in the Lombardy Region, north in Italy. It covers a densely populated territory. The upper part of the catchment is predominantly covered with forest with a few smaller protected zones that are part of Natura 2000. The lower part of the catchment is characterized agricultural activities. Surface waters have poor ecological status as they are affected by wastewater discharges and leaching of nutrients from agriculture. The territory is vulnerable to flood events, increasing water withdrawals and climate-induced water shortages. The agricultural land is mainly managed by small-sized farms who operate for cereal and fodder production, as well as a few larger business companies in the field of protected horticulture. The CSL are new to the case study area but were already in contact with the Reclamation and Irrigation Board 'Consorzio di Bonifica della Media Pianura Bergamasca (CBBG)' operating in the area. The CBBG was central to providing data and suggestions for stakeholders to contact. The main groups represented in the MARG have been land and water managers (CBBG), regional and local authorities within environment, landscape management and area prevention from hydrogeological risk, farmers' associations and agricultural advisory services and local associations.

Latvia: The Dviete catchment (254 km²) is in southeastern Latvia. Agriculture dominates land use, and the main challenges are flooding and nutrient loss. The Dviete floodplain area is a Nature 2000 site with eutrophic floodplain meadows and several rare bird species. Local partnership building: The Union of the Dviete Valley Municipalities (DSPA) was founded by five municipalities: Bebrene, Dviete, Eglaine, Pilskalne and Sedere parishes. Many projects have developed in close cooperation between the Daugavpils University and this NGO. Key stakeholders represented in the MARG are DSPA, Ilūkste municipality/Daugavpils district municipality, which includes the Nature Resources Administration Unit (responsible for several nature protection territories and lakes), farmers, local landowners and farmer advisors.

Lithuania: The Dotnuvėlė catchment (193km²) is in the central lowlands of Lithuania. The land use is dominated by agriculture, followed by forests and other natural areas. The main challenges for the ecological status of the Dotnuvėlė river are P and N losses from agriculture and dispersed sewage. Other problems are flooding, erosion, and droughts. There are several smaller protected areas in the catchment: Dotnuva-Josvainiai forest biosphere polygon, Dotnuvėlė Landscape Reserve and Strazdyne Botanical Reserve. The catchment is characterised by a rural landscape with small to middle sized villages. The average size of the farms in the area is about 40 ha; however, the farm size varies from small-sized farms (~15 ha) to large family farms of up to 700 ha. Key stakeholders represented in the MARG include the farm advisory services, farmers and authorities from the Ministry of Environment and from the Environmental Protection Agency, local authority from the Kėdainiai Municipality, and from the Baltic Environment Forum (NGO).

Norway: The Kråkstad river catchment (51 km²) is part of the Hobøl river watershed in the south-east of Norway. Forest covers nearly half of the area, while the rest is dominated by agricultural land, mainly for cereal production and grassland. There are frequent floods in spring and autumn. Main challenges in the area include low water quality due to high phosphorus pollution and soil erosion related to riverbank erosion and quick-clay landslides. There is strong local involvement in water management dating back to 1990. The catchment has been studied in several research projects, and the CSL has established long-lasting relationships with local stakeholders. Central stakeholders participating in the OPTAIN MARG are agricultural and environmental advisors, local authorities, farmers and landowners, and private companies.

Poland: The Upper Zgłowiączka catchment (150 km²) is in the Kuyavian-Pomeranian province in central Poland. The catchment is characterized by a very flat landscape. Nearly 90% is arable land, with some small forest patches and the Głuszyńskie lake with some small wetland areas in the lower part of the area. The ecological status of water bodies is poor, due to exceeding levels of nutrients, predominantly caused by leaching from agriculture in addition to watercourse straightening. Other environmental pressures include frequent climatic and agricultural droughts. The catchment is dominated by medium-sized family farms in addition to single large farms, cooperative farms and farms managed by the National Support Centre for Agriculture. Key stakeholders represented in the MARG are farmers, farmer advisors, local authorities, Radziejów county office, Radziejów Municipal Office, politician, water managers and water law companies (private company).

Slovenia: The Pesnica catchment (137 km²) is in the north-east of Slovenia. The area is characterized by intensive agricultural production, mainly animal breeding and arable farming. The main challenges to the ecological status of the Pesnica stream are herbicide pollution and high levels of N and P from agriculture. The area includes sites of ecological importance. Other challenges are erosion, drought in spring and summer and severe precipitation events in autumn and winter. The CSL team have been working in the area and with local stakeholders for several years. Also, the CSL team includes the farmer extension service office responsible for this area. The main stakeholders represented in the MARG are farmers, farmer advisors, water managers, local authorities and nature conservationists.

Sweden: The Sävjaån catchment (125 km²) is in the southeastern part of Sweden. The area is dominated by agriculture 60%. The catchment is a lowland mixed land use catchment characteristic of central Sweden. Headwaters in the catchment drain a mixture of forest and agricultural land. Streams draining agricultural land are general deepened and straightened to promote drainage. Key stakeholders represented in the MARG are landowners, local municipal authorities, national agencies (regional offices).

Switzerland: The Petite Glâne catchment (101 km²) is part of the Broye catchment in the western part of Switzerland. The catchment is strongly characterized by agriculture, mainly pastures and cropland. There are increasing water shortages in the region during the summer, which affects irrigation. In addition to droughts, phosphorus loss is a key challenge. The lower parts of the river Petite Glâne is partly canalized and straightened. The CSL team have not worked in the area previously. The area was chosen based on access to data and information related to former work of another project partner responsible for field scale modelling. The CSL team collaborates with an agricultural advisory and extension service who helped to recruit and communicate with MARG participants as they are familiar with the stakeholders in the region. The main stakeholders represented in the MARG are farmers, AGRIDEA farmer advisors (crop production, plant production, rural development), authorities (Canton of Vaud Department of Agriculture, Viticulture and Veterinary Affairs, Grangeneuve - Fribourg Canton Centre of Excellence for Training, Advice and Enforcement in Agriculture), scientific experts (University of Basel) and a private company.

3.3 Analytical framework for assessing engagement

OPTAIN aims to increase the adoption of effective Natural Small Water Retention Measures (OPTAIN, 2025). Stakeholder engagement plays a crucial role by enabling joint fact-finding, co-designing research features for increased relevance and reliability, and supporting widespread communication to researchers, policymakers, and the public. These collaborative activities are expected to directly contribute to achieving OPTAIN's goals (Nesheim et al., 2021; Van den Brink, De Vries, Nesheim, et al., 2022). As we have shown in Chapter 2, diverse frameworks exist for assessing stakeholder engagement. We draw on this literature for developing the framework for assessing engagement in OPTAIN. To present a holistic picture of the engagement undertaken in OPTAIN, we seek to evaluate (i) the impact of engagement, (ii) the process criteria for a fair and effective engagement process and (iii) the meaningfulness of the engagement process for researchers and practitioners. The three evaluation frameworks chosen are presented in the subsections 3.3.1 and 3.3.2 below, while the methods and data collection are discussed in 3.4.

3.3.1 Evaluating meaningful engagement

For evaluating the outcomes for meaningful engagement, we draw on the framework of Nesheim et al. (2021), which is based on three criteria: relevance, trust and added value (Table 1). *Relevance* refers to the perception that the project

addresses relevant problems for the stakeholders (farmers, landowners, and advisors) and reflects the urgency of environmental challenges. *Trust* is another key factor determining successful participation, as it is a common key factor for facilitating successful co-creation and engagement (Hurlbert & Gupta, 2015; Polman & Slangen, 2008). The *added value* of engagement evaluates benefits of participation and how these can extend beyond achieving the conceptual impacts to bring more tangible, long-term impacts for nature and society (Gerlak et al., 2023).

Table 1 - Criteria for addressing meaningful engagement in OPTAIN

Themes /criteria	Meaningfulness engagement criteria operationalized in OPTAIN
Relevance	The actors' perception of relevance about the environmental challenges being addressed. The CSLs' perspectives on the relevance of engaging stakeholders in the case study.
Trust	The development of relations and trust between the project researchers and the stakeholders. Stakeholders were asked if they expect and experience that their voice is heard and that the project will help solve environmental challenges. The CSLs were asked about the development of relationships, and on strategies to promote trust.
Added value	Added value refers to benefits of engagement. The stakeholders were asked what benefits they gain from participating in OPTAIN workshops. The CSLs were asked about the added value of engagement for their perspective on the engagement process, what is the added value experience.

3.3.2 Evaluating the engagement process

For evaluating the stakeholder engagement process we took the comprehensive list of criteria proposed by (Rowe & Frewer, 2013, 2000). In Table 2 below, we operationalize the framework by defining all criteria and explaining how they were applied throughout the project (Van den Brink, De Vries, Nesheim, et al., 2022).

Table 2 - Engagement benchmark criteria in OPTAIN (adapted from (Rowe & Frewer, 2000).

Benchmarks	Process benchmarks operationalized for OPTAIN		
Representativeness	Stakeholders should comprise a representative sample of the population of affected actors. In OPTAIN, representativeness has been designed to assure a variety of perspectives, including farmers, authorities, experts, companies and NGOs. The table presents identified benchmark criteria for the involvement of stakeholders according to an adopted inner and outer MARG concept. An inner circle refers to stakeholders more closely involvement, the outer circle refers to stakeholders more loosely involved in the project.		
	<i>Categories</i>	<i>Inner circle number of cases</i>	<i>Outer circle number of cases</i>
	Farmers	3-4	6-8
	National authorities	2	4
	Local authorities	4	8
	Experts - scientific advisors	2-4	4-6
	Private companies commercial	2-4	4-6
	NGOs, associations	2-6	2-6
Independence	The participation process should be conducted in an independent, unbiased way; there should be no conflicts of interest in the project, i.e. information given to the participants should be fair and balanced.		
Early involvement	Stakeholders are involved as early as possible in the process as soon as value judgments become salient.		
Influence	Stakeholders should be invited to provide knowledge, input, the input should have a genuine impact on the research process.		
Transparency	Information about the project should be available in the native languages, case study specific leaflets, information sheets, consent forms for engagement. Agenda for meetings should be shared upfront and minutes shared post events. Project objectives, tasks, methods should be transparent for the stakeholders.		
Resource accessibility	Public participants should have access to the appropriate resources to enable them to successfully fulfil their brief. Human resources a limiting factor, this is considered by being respectful to stakeholders' time constraints.		
Task definition	The nature and scope of the participation task should be clearly defined. Prior to engagement events, protocols and agendas should be developed across the cases and shared.		
Structured decision making	The participation exercise should use/provide appropriate mechanisms for structuring and displaying the decision-making process.		
Cost-effectiveness	The procedure should in some sense be cost-effective, maximizing impacts and minimizing expenses.		

3.4 Data collection for assessing engagement

A triangulated approach was used for data collection. WPI developed standardized templates for case study leaders to record engagement activities, created a semi-structured interview guide for conversations with case study leaders, and designed a stakeholder questionnaire to capture stakeholders' perspectives on

engagement. Additionally, direct observation during MARG workshops provided insights and helped understanding the distinct contexts of each case study. Figure 4 below summarizes the process of data collection for evaluating stakeholder engagement activities in OPTAIN. Three elements require some additional explanation and will be briefly presented in the next paragraphs.

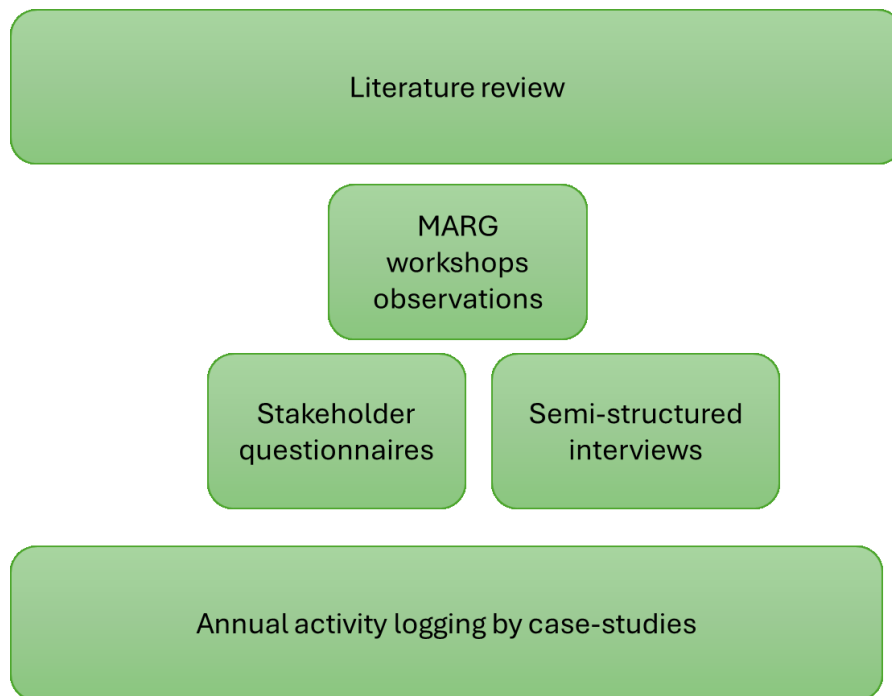


Figure 4. Data collection for evaluating stakeholder engagement

Logging templates to document the engagement activities

A template to report activities and results from MARG workshops across case studies was developed. It included five elements (i) general information about the workshop, such as date, case study, number and types of participants, and meeting format, (ii) descriptions of preparations for the workshop, including what information participants received in advance, what was presented in the meeting and questions to stakeholders, (iv) results from discussions and stakeholders' feedback and inputs related to the content and theme of the specific workshop, (v) other information, such as challenges, deviations from the suggested guidelines, engagement level of different stakeholder groups and other comments.

A logging template for all stakeholder activities was also developed. Case study leaders were encouraged to report each interaction with stakeholders (except emails and short phone calls) during the entire project period. This enabled work package 1 to monitor the development and level of activity in each case study. The logs were compiled into annual milestone reports that presented general trends, as well as detailed overviews of activities and different stakeholder groups involved. The template included pre-defined categories to make it easier to fill in and to

allow for comparison and simple statistics, as well as open categories for comments. The logging template included information about the date, duration and location of the interaction; purpose of the meeting (including link to relevant project task), type of meeting and type of engagement, types and number of each stakeholder category participating and outcome of the interaction and other remarks. The original logging template for recording stakeholder engagement in case studies was created in 2021. Updates to the template were made in 2022 and 2023; with each revision designed to improve how stakeholder interactions were captured and analyzed. Instructions have been given for when a phone call must be logged, but it can be assumed that there are different opinions on when an interaction must be logged. The template was discussed in InterVision meetings with all partners to gather feedback. Follow-up measures were taken at bilateral level to clarify the instructions, but only to a limited extent.

Interviews with researchers in the respective case studies

Work package 1 also conducted interviews with the case study leads / researcher teams in each case study to get their perspective on the relevance of engagement activities and situation of trust in the MARGs. The interviews followed a semi-structured format and were conducted two times for each case study – one interview after the first MARG workshop (2022) and a second after the third MARG workshop (2024/25). An interview guide was developed to document the baseline for the engagement situation in the respective case studies, and for understanding the case-specific situation affecting engagement activities.

To assess the baseline engagement, case study leaders were interviewed in 2022 to document their initial knowledge about stakeholders, the local environmental context and divergent interests among stakeholders in their areas. Researcher perspectives on the engagement process were captured through follow-up interviews after the MARG workshops in 2022 and again in 2024/2025. These semi-structured interviews explored the relevance of engagement, the development of trust, and the added value for research tasks. During each interview, case study leaders shared their observations and stories. Responses were guided by an interview protocol, lasted approximately 1.5 hours with notes written on a shared screen for transparency, and participants received a summary of noted responses for review. For the interviews in 2025, the leaders were also given their previous answers so that they could reflect on any changes or shifts in perspective over the course of the two years. As trust issues are very difficult to capture in the interview, we asked case study leaders to share stories from their stakeholder interactions.

Questionnaire for MARG stakeholders

Work package 1 developed a short questionnaire for participants, which was translated into local languages and distributed during the MARG workshops. While the questionnaire was adapted to each workshop, it also contained some of the same questions in order to detect any changes over time.

The questionnaire for participants included questions related to the following topics: (i) relevance of different environmental challenges in their catchment, (ii) trust in the project and the participatory approach, (iii), added value of

participating, (iv) obstacles to engagement and potential solutions, (v) general questions on attendance, preferences and general satisfaction. The questionnaire also included possibilities to add qualitative information (See: Annex C). The questionnaire for the final MARG workshop did not address the topics, relevance and development of trust. The questionnaire aimed to gain more information on added value of engagement, and asking stakeholders to inform on insights received from engaging.

One weakness of the approach was that the questionnaire was administered at the end of the meeting, resulting in many participants completing it quickly and providing limited information about their perspectives. Additionally, there is a gap in data regarding stakeholders who did not attend the MARG workshops, as their reasons for non-participation remain undocumented.

4 Results: Stakeholder engagement in OPTAIN

This chapter presents a summary of stakeholder engagement in OPTAIN. The different engagement activities have been undertaken for joint fact finding and for co-creation of the research results. We present in section 4.1 the logged engagement interactions including the frequency and the type of events, and different types of stakeholder categories involved. This enables a reflection on how engagement has varied along the course of the project and across case studies. In section 4.2 perspectives and achievements on meaningful engagement as well as challenges and obstacles from the perspective of stakeholders and researchers are presented. Section 4.3 presents the achievements against the benchmark criteria for fair and effective engagement.

4.1 Logged Records of Stakeholder Interactions

This section presents the engagement activities logged by the case study leaders regarding the number of interactions, the type of meetings undertaken and the stakeholder categories involved during the project years 2021-2025. Below we present the analysis of the logged engagement activities. The presented numbers are aggregated across all the 14 OPTAIN case studies. The results show that there are great variations both across and within the case studies over time in the number of activities. For more details, see Annex A.

The logging of engagement has been challenged by the differential use and understanding of terms. For example, one third of the selected stakeholders were categorized as “other” in logging templates. It was also learned that some stakeholders have several roles making it challenging to fill templates (analyse results). A stakeholder may be both a farmer, a politician and employed by the administration. Overall, the logging of interactions has contributed to awareness raising among partners on the engagement undertaken during the project. Moreover, documenting stakeholder interactions has been important for ensuring a transparent process regarding the involvement of different stakeholder

categories and for understanding how this varies across WPs and research tasks during the project. This documentation also enables a discussion of the engagement undertaken for creation of results.

4.1.1 The frequency and types of stakeholder events and interactions

The results from logging stakeholder activities show that interactions varied over the years with more interactions for some years and less for other years. As shown in Figure 5, the number of events varied from the highest (189) in 2022, to the lowest (74) in 2024. The frequency and types of engagement over the years reflect the different phases of the project and the tasks within the respective work packages. In the initial years, the number of interactions was relatively high in many cases due to the establishment of the MARG and data collection; activities that involved several bilateral interactions adding to the total number of interactions. For example, in 2022 several activities were related to the collection of data on environmental variables (WP2 and 3), as well as interviews and information on NSW RM policy gaps and challenges (WP6). Data collection activities continued in 2023 for the socio-economic data (WP4). In 2024 the project entered a phase with intense internal modelling activities to assess the efficiency of measures which involved less interaction with stakeholders. Then, in 2025, the number of interactions increased due to interviews with stakeholders regarding the “identification of preferred solutions from actors' perspective” (WP5), and due to tasks in WP7 communication and dissemination. Figure 7 illustrates how this situation mirrors tasks in different work packages and Figure 6 shows the variations in types of meetings throughout project years.

Considering the frequency of interactions on case level, some reported several interactions, others less for specific years. The total number of interactions varies from 74 in 2024 to 189 in 2022 (Figure 5). The deviation regarding interactions across cases is particularly high for the year 2021 reflecting the situation that some cases were able to establish their MARG in early phase of the project while others established the MARG later (Annex A). As project stakeholder engagement only began in 2021, and due to strict COVID regulations, few cases started engaging with stakeholders that year. The average number of interactions across years for the different case studies reported varies from 2.7 to 13.6 interactions per year. The large difference in the number of engagement activities across the cases may reflect different practices, and cultures of engagement of institutions and in the case study countries (Annex B). It may also reflect different access to data. Case studies that relied mostly on databases for data tended to have less interactions in the initial years. In the last years of OPTAIN the variation of interactions across cases is lower (Figure 5).

The primary focus of this report is on activities in the 14 case-study catchments and on-the-ground activities throughout the project. However, particularly in the final year of OPTAIN, additional stakeholder engagement focused on disseminating results and targeted regional, national and international level stakeholders. This has been the case during the three Regional Dialogues held for each biogeographical region (Pannonian, Boreal and Continental), bringing together diverse communities and fostering regional dialogue for NSW RMs' implementation. OPTAIN researchers attended numerous conferences,

presenting both the modelling and social-scientific work conducted in the project. A good example of an interdisciplinary conference with several OPTAIN presentations was the LuWQ2025 (Land Use and Water Quality 2025), an international interdisciplinary conference on land use, agriculture, and water quality impacts, held in June 2025, at the Aarhus University in Denmark. Moreover, 18 stakeholders representing the water, agriculture and nature conservation sectors from 10 European countries participated in the last project's General Assembly held in Berlin in October 2025, enhancing visibility and knowledge sharing of the project outcomes.

Three different meeting formats were logged, physical (26), virtual (36), and phone interactions (26) (Figure 5⁴). The duration of meetings varied between less than an hour, half a day and the whole day, depending on whether the interaction was a bilateral meeting for specific expert inputs or a MARG workshop. Figure 6 illustrates that there were more virtual meetings at the beginning of the project, and relatively more physical meetings in the end. The higher number of virtual meetings in the early project phases reflects both the COVID situation and the need for collecting data. The relatively equal distribution of physical, virtual and phone interactions may indicate that each format served its purpose. It may be considered that some cases were more diligent in logging phone calls with stakeholders. It can perhaps be assumed that in some cases, the number of interactions, in particular the number of conversations over the phone, were higher than the numbers logged.

Four different types of interaction were logged, with bilateral meetings being by far the most common. These were followed by MARG workshops, farm visits, and external workshops. Bilateral meetings were usually phone calls or virtual interactions for data collection and discussion. A MARG workshop was defined as multi-actor arenas for presenting project results and providing feedback. With regard to MARG workshops, the log shows that, in some cases, more than four MARG workshops were logged as planned. Interviews and presentations during the project general assembly indicate that in some case studies, physical workshops were organized for local and regional actors, while a virtual workshop was additionally organized to engage national and some regional authorities. Some cases also engaged with stakeholders on their farms for interviews. The lowest number of interactions was recorded for "external workshops"; apparently this was not such a relevant arena for interaction.

⁴ For some of interactions logged, the format of meetings was not specified, hence the column with total number of interactions is not the sum of physical, virtual, phone interactions.

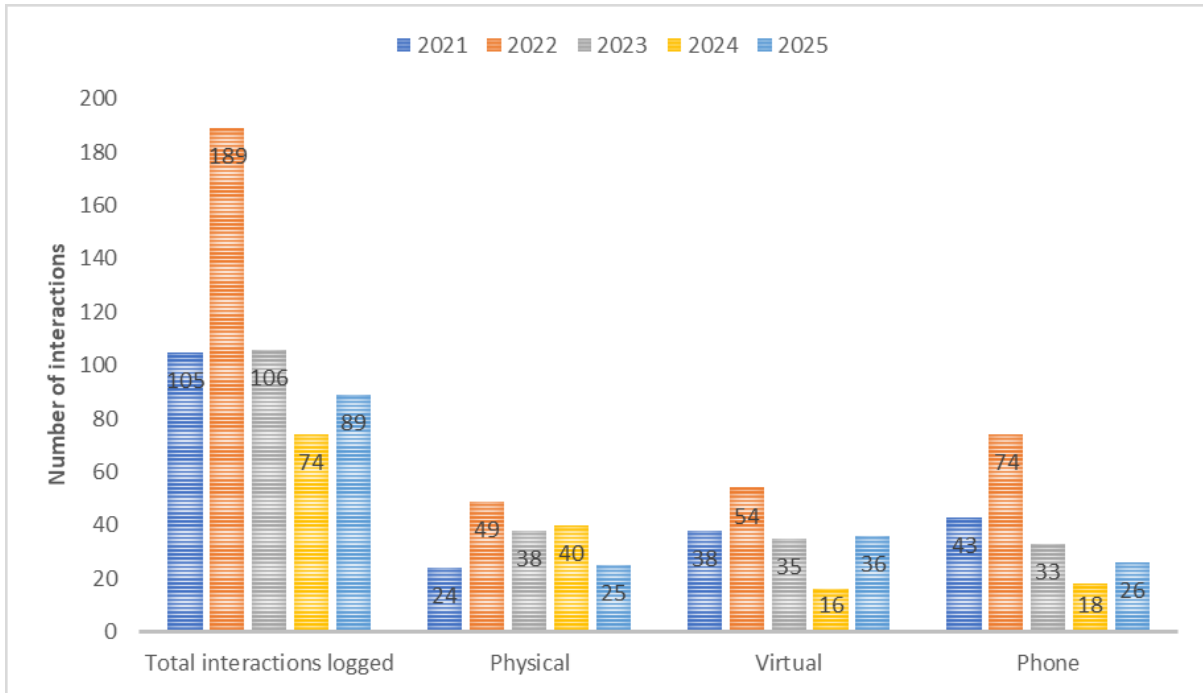


Figure 5. Total number of stakeholder interactions across cases and years

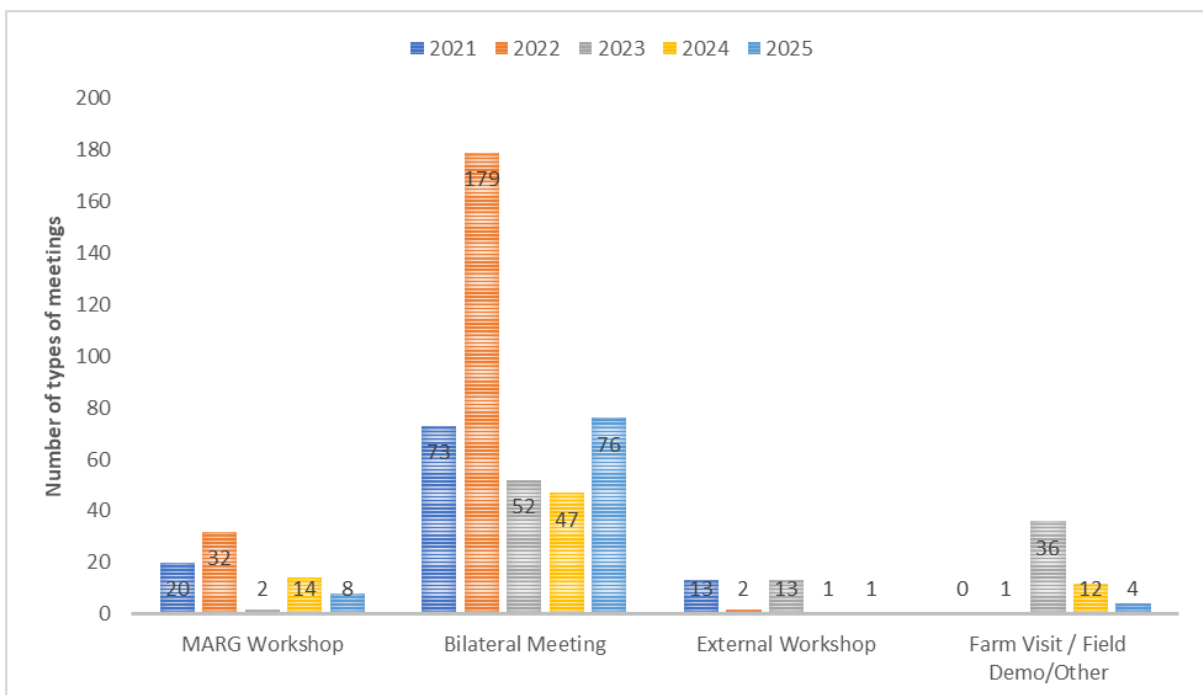


Figure 6. Types of meetings for stakeholder interaction

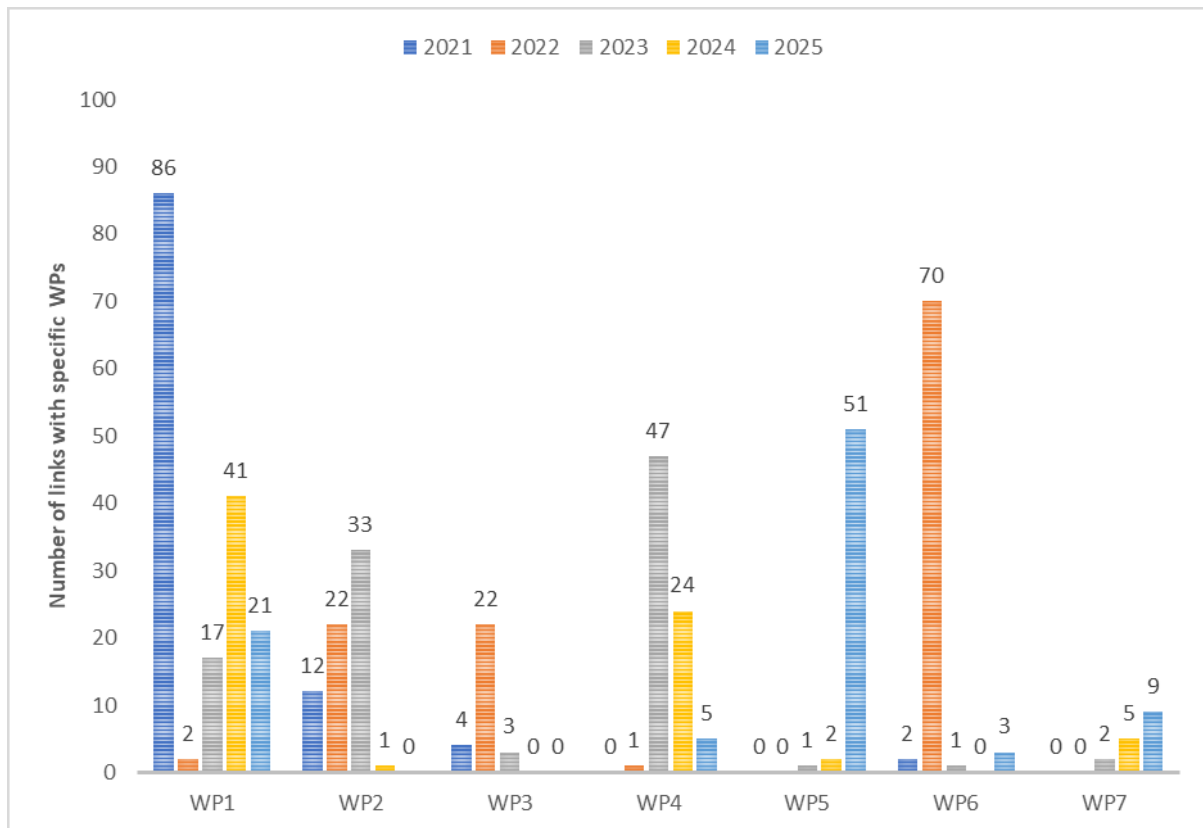


Figure 7. Engagement interactions per year with link activities in WPs.

4.1.2 The engagement with different types of stakeholder categories

The reports show that all the stakeholder categories identified as important actors in the project during the stakeholder mapping exercise (Van den Brink, De Vries, Nesheim, et al., 2022) - namely farmers, agri-advisors, scientific experts, private actors / companies, NGOs / associations and politicians have been engaged in the project (Figure 8). They also demonstrate that stakeholders involved represented actors at the local municipality, river basin, regional and national levels (Figure 9).

Regarding the engagement of authorities on local municipal, river basin, state /regional and national levels as shown in Figure 9, the range differs substantially across categories and years. Throughout years involvement of actors, on local municipal level ranges between 7 (2025) and 84 (2022); on river basin level values range between 8 (2023) and 35 (2021), on region /state values range between 18 (2025) and 92 (2024). For national level, values range between 3 (2021) and 180 (2024). The logging indicates a tendency for the involvement of state regional /national level authorities to increase over the years, reflecting a higher level of involvement of such actors for presenting project results. In contrast, the engagement of authorities on the local level was higher during the first years of the project, and particularly the year 2022 (the year of extensive data collection).

Figure 8 illustrates a high variation in the involvement of different types of actors across the case studies. In particular, the degree of farmer involvement differs

across case studies, ranging from 1 farmer for some cases to as many as 20-30 for others during certain years. Also, regarding the involvement of NGOs, the numbers for individual cases show that, while the total number indicates the engagement of a relatively large number of NGOs, the case studies show that the high value in both 2023 and 2024 is caused by a situation in two case studies, one in each year. Most cases did not include politicians in their MARGs, therefore lower number of politicians were included. Considering the average value of different stakeholder categories, all case studies logged involvement of agri-advisors and different scientific experts, while for the other participant categories this was highly variable.

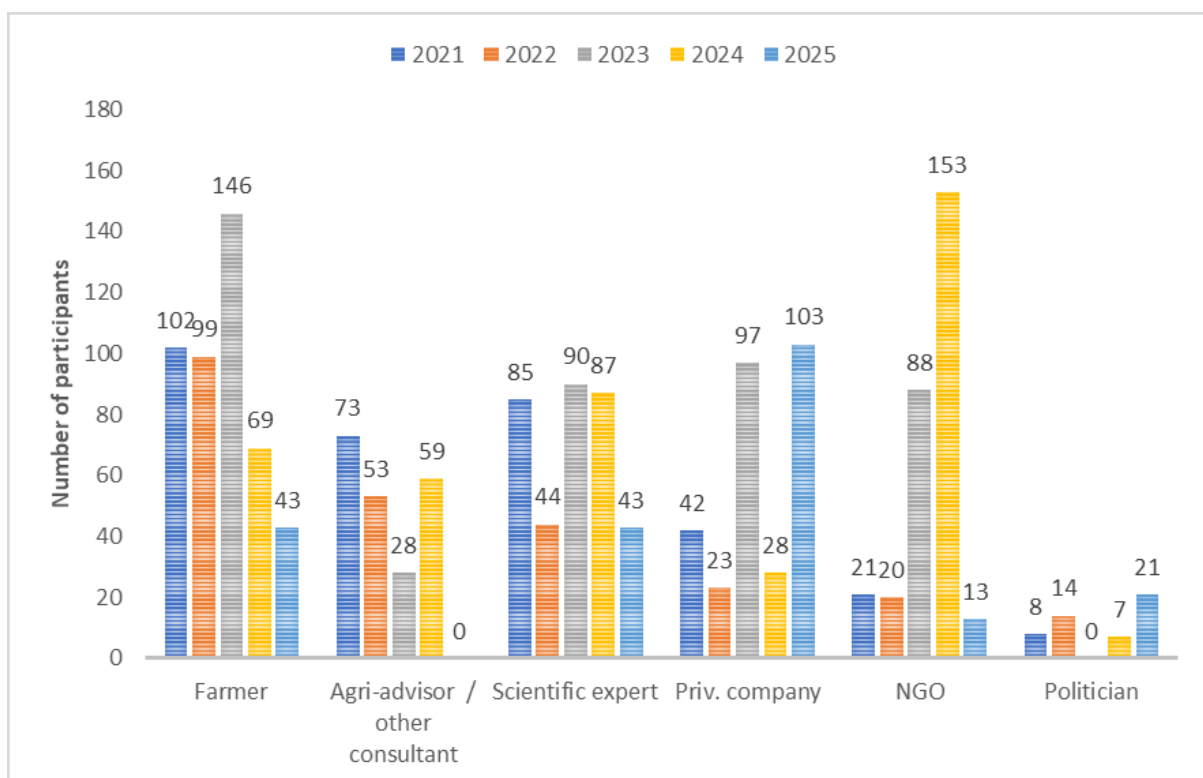


Figure 8. Interactions with different types of stakeholders

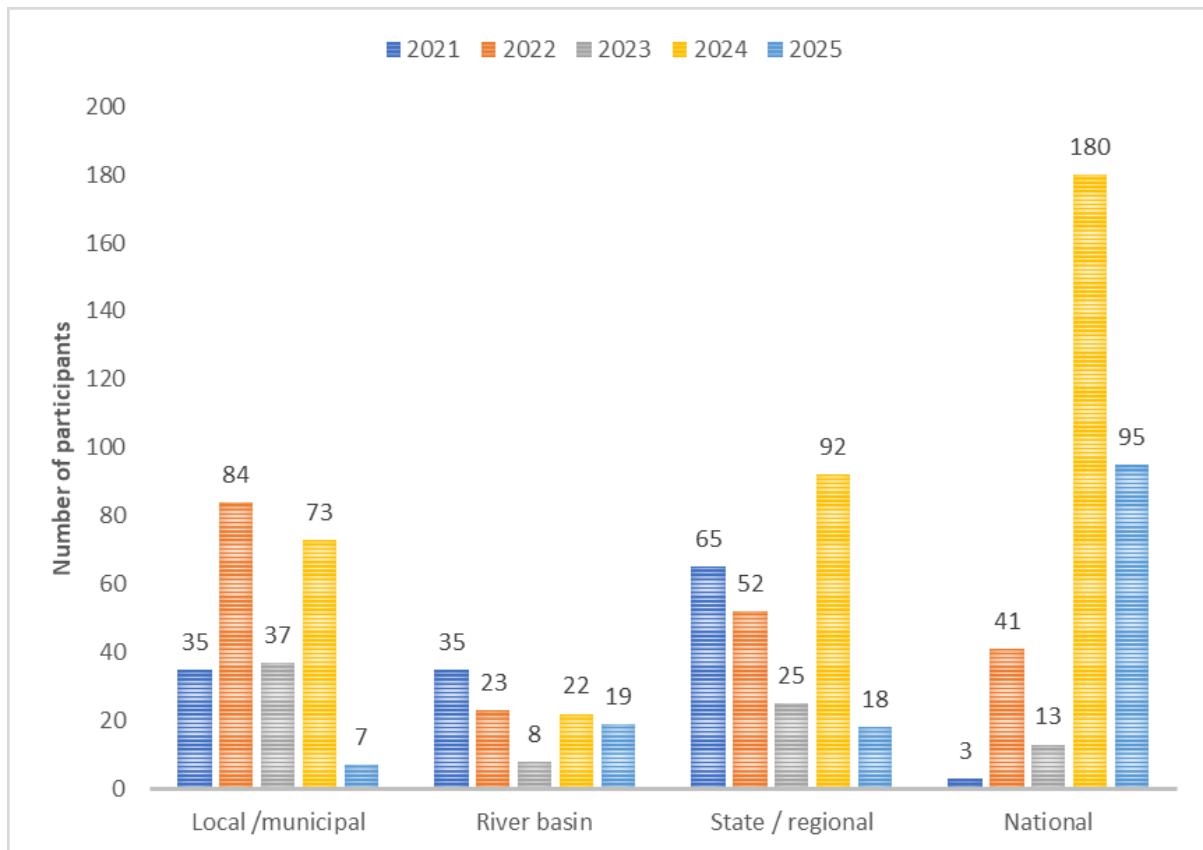


Figure 9. Interactions with stakeholders on different governance levels

4.2 Perspectives on meaningful engagement

In this chapter we present views on the meaningful involvement of stakeholders, including relevance, trust and added value, from both the perspectives of stakeholders and researchers. The first section presents results from surveys conducted among participants in the MARG workshops. In the second part, we share findings from semi-structured interviews with researchers or case study leaders (CSL) in the different case studies.

4.2.1 Stakeholders' perspective on meaningful engagement

Here, we present the results of the stakeholder surveys undertaken during the case study meetings of the 1st MARG workshop (2021), 2nd MARG workshop (2022), 3rd MARG workshop (2023 and 2024), and 4th MARG workshop (2025). The surveys addressed meaningful engagement from the perspective of stakeholders. The survey responses were provided by 11 cases in 2022, 12 cases in 2024, and 10 cases in 2025. The questionnaires for 2022 and 2024 explored perspectives on relevance, trust and added value related to the engagement. The questionnaire for the final (fourth) MARG workshop focused on added value and learning. The questionnaires are included in Annex C. For all questionnaires there were opportunities for providing qualitative responses and general remarks. However, not many participants filled these parts.

When interpreting the results and considering the differences between years, it should be noted that in most case studies, the MARGs represented a dynamic group with new participants. Hence, the persons responding to the surveys differed between years. It can be noted that the results are biased toward those who chose and had opportunity to participate. Hence, it can be expected that the challenges for participation are not properly documented.

4.2.1.1 Relevance of the environmental pressures addressed

The environmental pressures addressed in the project - flooding, drought, nutrient runoff and erosion – were found to be relevant problems in all case studies by most stakeholders in 2022 and in 2024 (Figure 10). While the proportion of participants who considered the challenges to be highly relevant did not vary significantly, the number of participants who described the challenges as “not so relevant” was higher in 2024 than in 2022. This could be because different participants responded to the questionnaire reflecting different perspectives. It may also reflect stakeholder experiences.

Drought was seen as the most relevant challenge across the case studies (Figure 10), while flooding was deemed slightly less relevant. However, these challenges are of course very different from one case study to another. The findings also showed that the views on what challenges are most relevant differ within case studies, more in some case studies and less in others. The difference in perspectives within case studies may indicate differences in local soil or climate conditions in different parts of the catchment areas, but it may also indicate that differences in practices could have an impact on how stakeholders are affected and what issues they see as more important. In 2022, participants were also asked whether it was useful for them to identify optimal measures for water retention and reduced runoff. These results correspond quite well to the questions about the challenges: 96% said it was very or somewhat relevant for them to identify water retention measures and 95% said it was very or somewhat relevant to identify measures for reduced runoff.

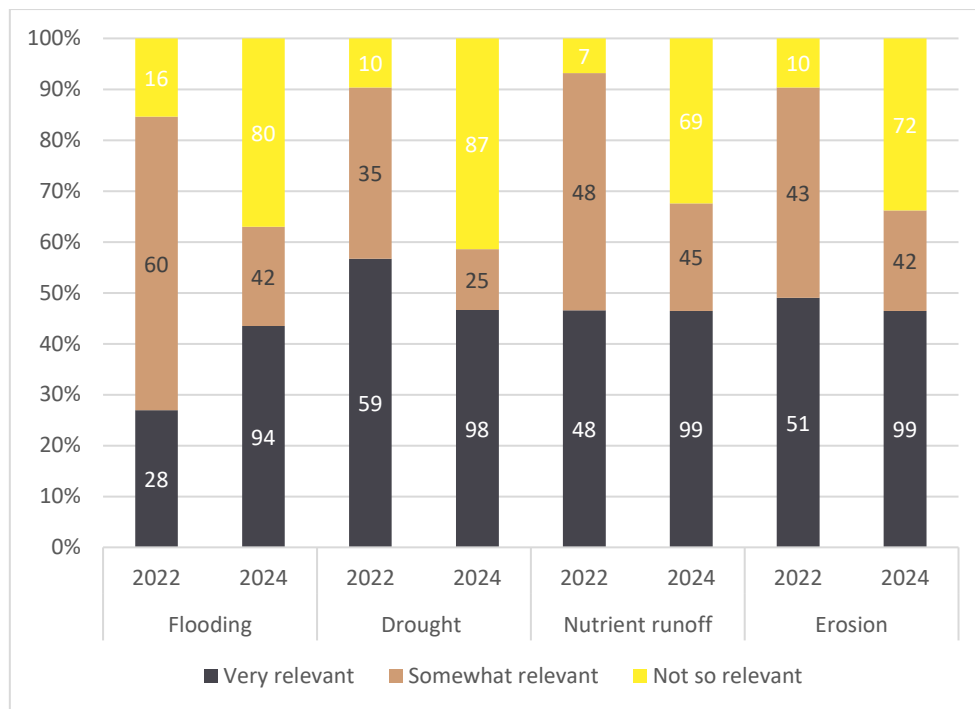


Figure 10. Stakeholders' perspective on relevance of environmental challenges

In 2024, the participants were asked whether they had experienced changes in environmental challenges over the last years (N=108; Figure 11). The majority informed that the level of challenges had remained similar in recent years, but some informed that the challenges had been increasing. Drought was reported to be more challenging by participants in the Hungarian case studies, and by some participants in Germany, Poland, Belgium and Lithuania.

Some participants also gave an explanation as to why they believed the problems had changed in recent years. Many highlighted the increasing effects of climate change and the need for adaptation as a reason for this, and that the challenges have therefore become more relevant. Others also pointed to the increasing need to change agricultural practices to tackle these challenges. Some said that their view had changed as they gained more understanding of the challenges and potential measures. One person said their view had changed simply because they had moved to a different location, illustrating that the perceived relevance of measures can also vary within case studies depending on local conditions in different parts of the catchment.

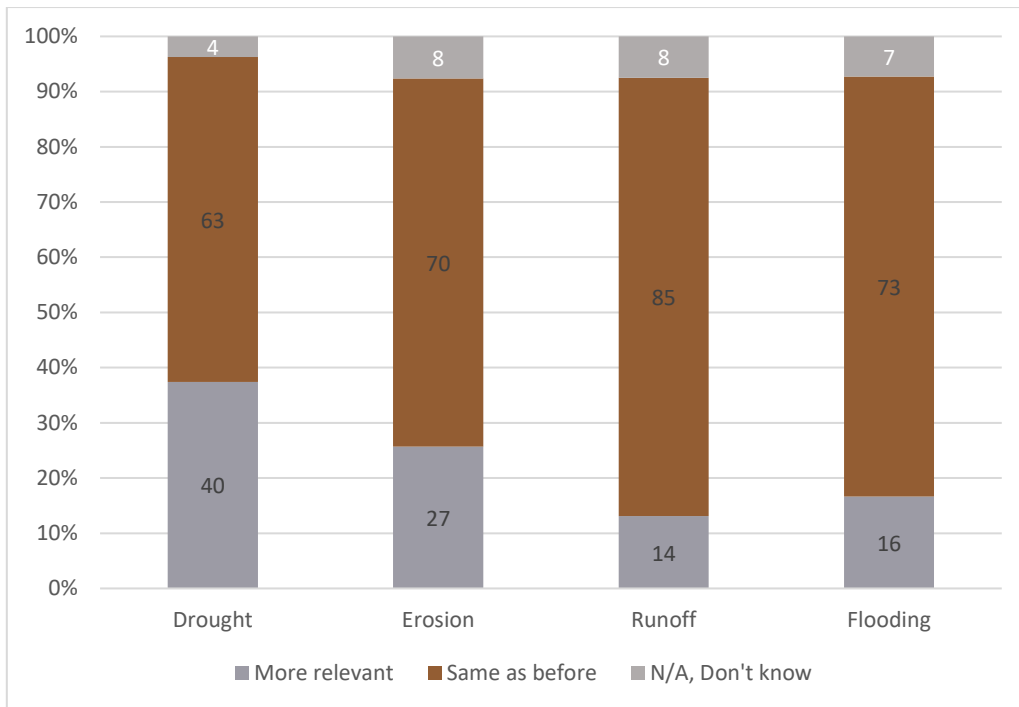


Figure 11. Stakeholders' perspectives on changes in environmental challenges

4.2.1.2 Trust in the project

To address the issue of trust and relationships in the MARG, stakeholders were asked in 2022 about their expectations on engaging in the project (Figure 12). The questions addressed were: 1) Whether the project could contribute to problem solving in their area, 2) Will they be able to influence the project approach, and 3) if they would be able to contribute to the project objectives.

As Figure 12 shows, more than 90 percent of respondents stated that they believe the project could contribute fully or at least to some degree to solving the problems in their area. The majority also said they thought they could influence the project approach and contribute to the project objectives, but there was a larger share of stakeholders who were uncertain about this in the first half of the project period. The results from 2022 may reflect that the stakeholders, when first introduced to a project, are a bit uncertain what to expect and more information and interactions are needed before trust can be achieved.

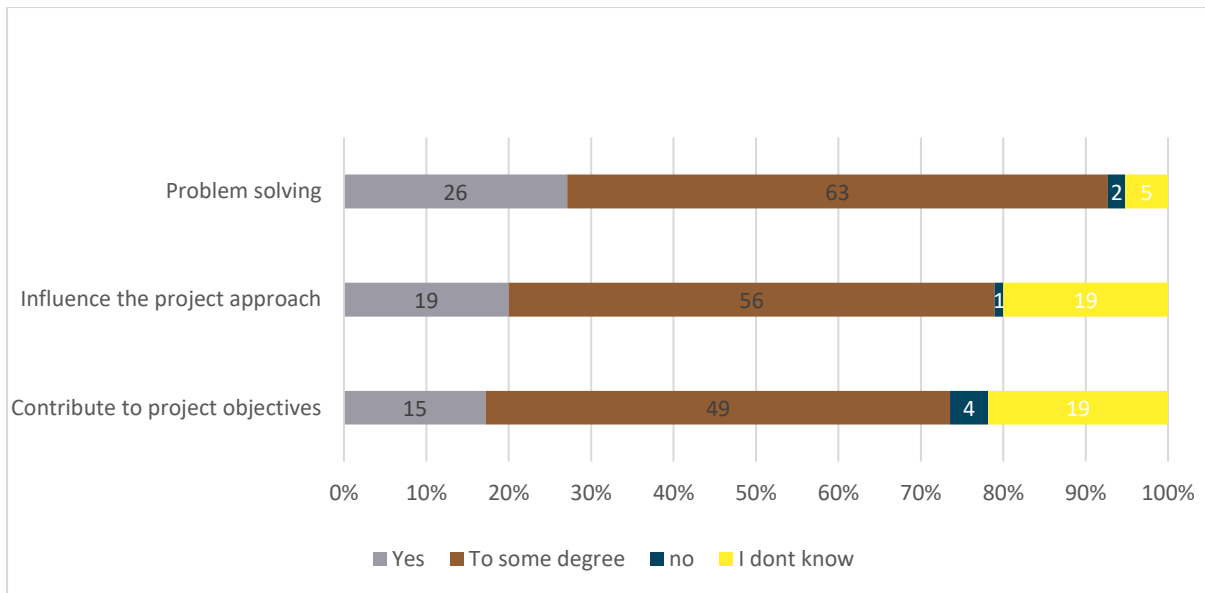


Figure 12. Stakeholder response to questions on expectations and trust (2022).

In 2025, the analysis of the questionnaire results shows that 97% of respondents said they trusted that the project would deliver useful knowledge fully or to some degree. 90% also said that they fully or to some degree trusted that their opinion would be taken into account (Figure 13). No one said “no” to these questions and the number of respondents saying “I don’t know” was also relatively low. Very few said that their opinion on this had changed during the project.

The respondents who stated their opinion had changed (4) also provided qualitative answers to explain why. Two said that they had gained increased knowledge and understanding of environmental and climate problems. One said that it was due to the provision of new specific information, and one said they supported the project activities as they contribute to awareness raising as well as the opportunity to exchange experiences.

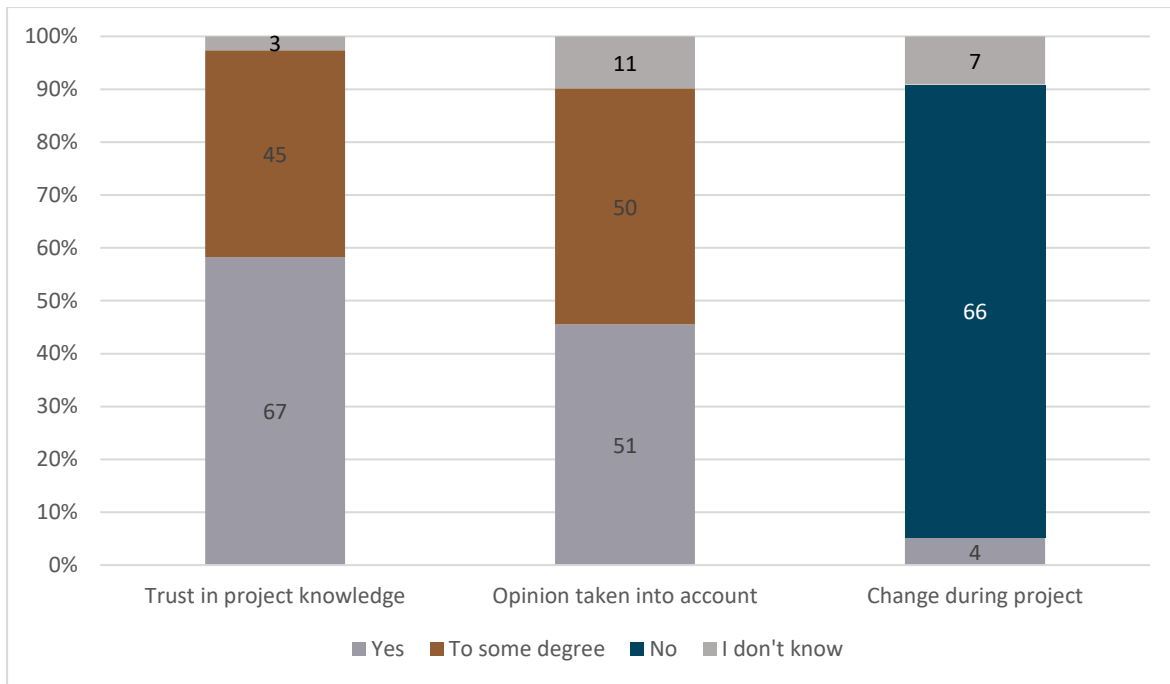


Figure 13. Stakeholder response to questions addressing trust (2024)

4.2.1.3 Added value of participating in the MARGs and satisfaction levels

To address the added value of participating in the MARGs, attendants were asked in the questionnaire in 2024 whether they found it valuable to participate in the stakeholder workshops. 72% answered “yes” and 25%, “to some degree”, while the rest said either “don’t know” or “no” (109 participants answered the question).

At the final MARG workshop in the case studies in 2025, participants responded to three questions exploring different elements of added value. Figure 14 presents the stakeholders’ perception of benefits from attending MARG workshops. Access to information was seen as a benefit by most (88%) of the respondents, followed by meeting experts and authorities (70%), opportunity to voice opinion was emphasized by 47%, meeting other farmers (47%), and general networking (44%). Some also added qualitative replies: “I support activities because they help raise awareness of the problem”; “I value to possibility to exchange experiences”; “I understand better why it is important to focus on environmental outcomes.”; “I received increased knowledge of environment and climate issues.”

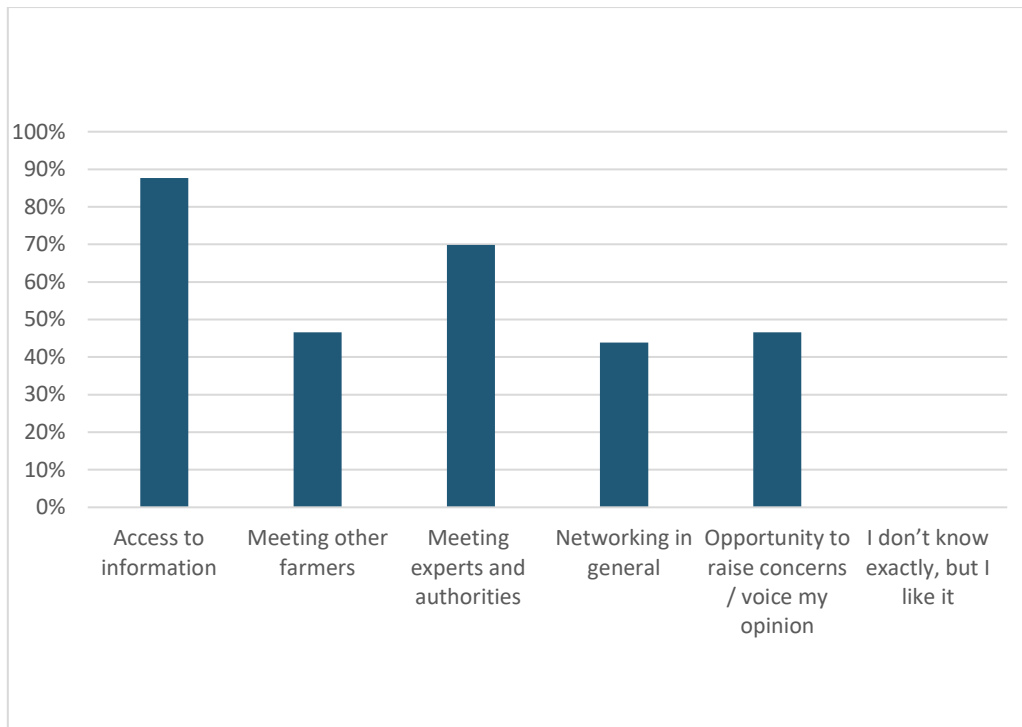


Figure 14. Stakeholders' perception on benefits of engaging (final MARG workshop 2025)

At the final MARG workshop, stakeholders provided information about their interest in different topics (Figure 15). Most of the informants indicated interest in the topics, “Effect of measures for retention”, and “Scientific results on effective measures”. Several also appreciated information on modelling approaches, while there was comparatively less interest in topics such as socioeconomics, farm practices and policy. This result might reflect the situation that overall, relatively few farmers participated in the workshops.

Figure 16 presents information on insights gained from being a MARG member. Here, the participants highlighted, “effects of measures for water and nutrient retention” but also increased understanding of different perspectives.

Figure 17 shows the occasions when the information and knowledge gained from being a MARG member may be useful. The occasion, “General discussions with other actors” received highest scores, followed by “For planning and practical farming and/or land management work”. Knowledge gained was also seen to be useful when discussing matters with farmers and local authorities.

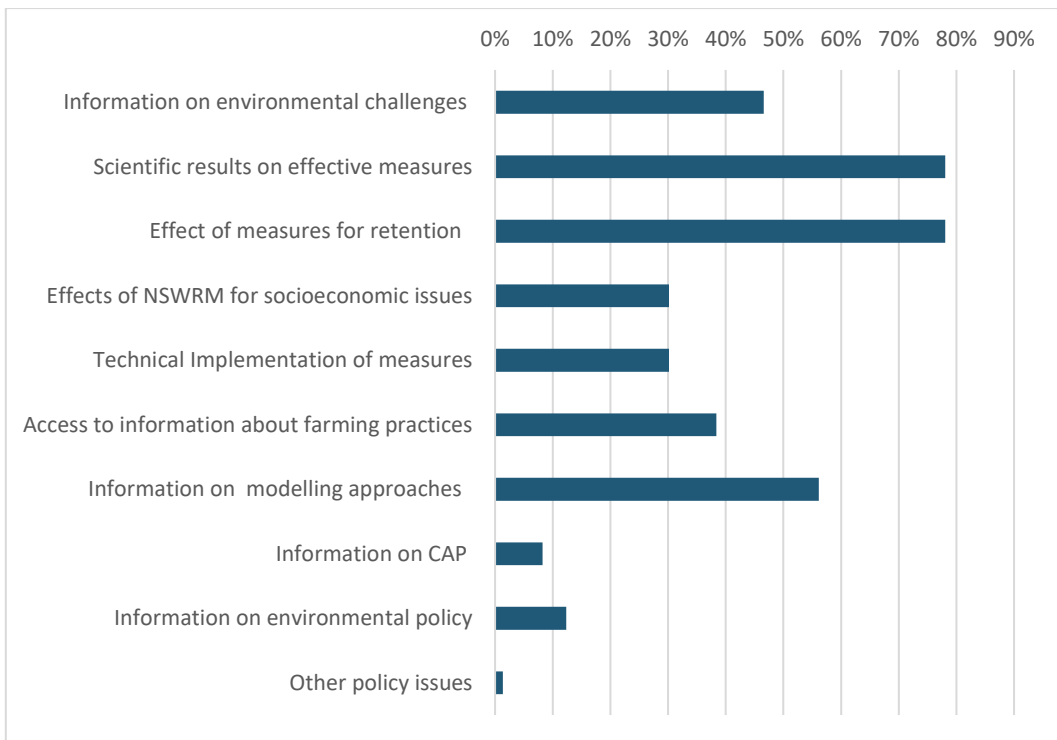


Figure 15. Stakeholders' responses to questions on information received from engaging

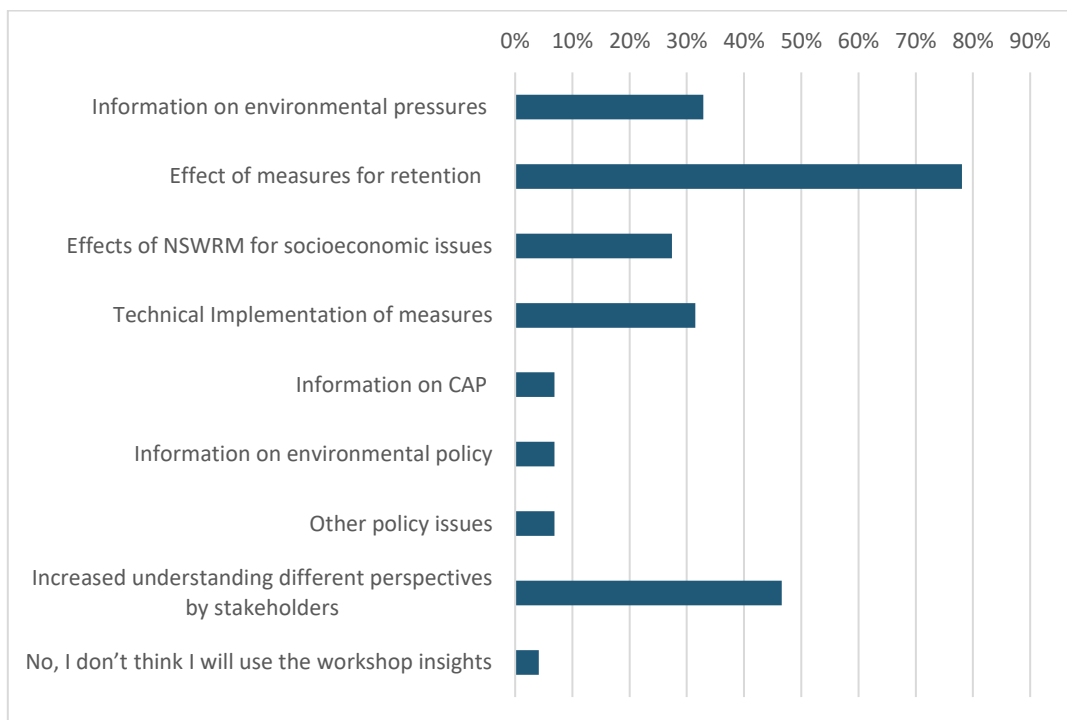


Figure 16. Other insights gained from being a member in the MARG

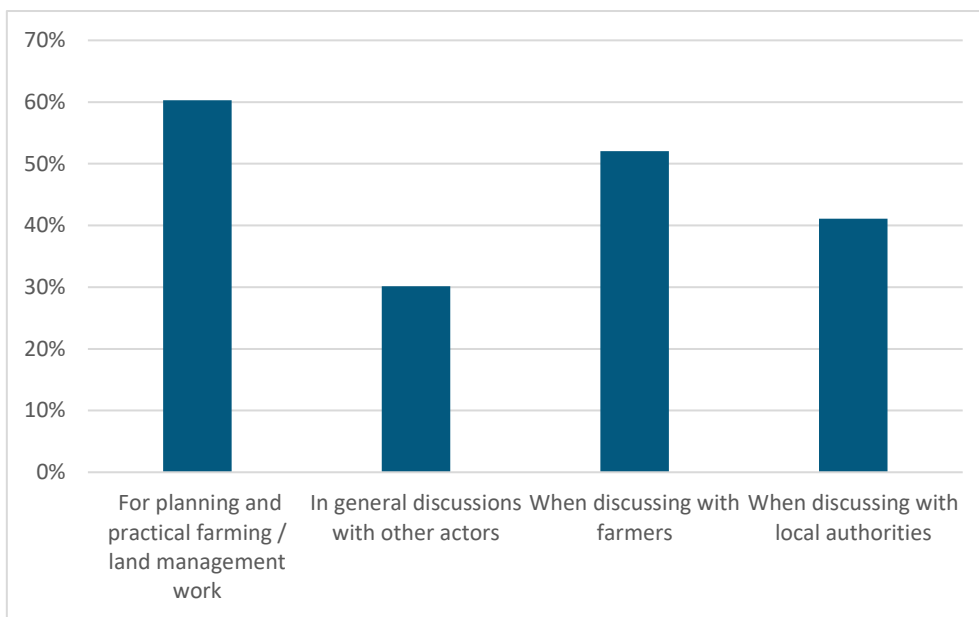


Figure 17. Stakeholders' perceptions on occasions when information received can be useful

Satisfaction with MARG workshops: In 2024 and 2025, attendees of the MARG workshops were asked to rate their level of satisfaction (on a five-point scale from “very high” to “very low”). In 2024, 43% said that they were “very highly” satisfied with the workshop, 50% were “highly satisfied”, while 7% shared a “intermediate” state of satisfaction. In 2025, 55% of participants were “very highly” satisfied, 34% “highly satisfied”, and 7% “intermediately” satisfied. These results indicate that satisfaction levels slightly increased from 2024 to 2025. One stakeholder in one case said, “OPTAIN delivered three times more than initially expected”.

4.2.1.4 Challenges

While the surveys mainly focus on what makes engagement meaningful for stakeholders, we also know that there are various obstacles that can still hinder participation. In 2022, the survey included a question on whether the participants preferred physical or virtual MARG meetings. The majority (61%) preferred physical meetings, while 35% preferred a combination and only 3% said they preferred virtual meetings. Although the survey only reached those who attended the meetings, the questionnaire in 2024 included more detailed questions on potential challenges to participation and suggested ways to solve them. Table 3 shows the results for these questions.

Table 3 - MARG participants perception on obstacles to participation and potential solutions⁵.

MARG participants view on obstacles to participation and potential solutions							
a) Were there any challenges related to your engagement in the workshop / the project? (N=86)							
No challenges	General time constraints	Inconvenient time for the meeting	Inconvenient place for the meeting	Difficult to understand the model approach	Difficult to understand the "researcher language"	I don't think that my input will matter	Other
68%	20%	0%	1%	6%	5,8	4%	1%
(58)	(17)	(0)	(1)	(5)	(5)	(3)	(1)
b) Would it be helpful for your engagement in the project with the following? (N=89)							
Allow virtual engagement	A more convenient time	A more convenient place	Simpler / easier language by the presenters	Bilateral meetings or in small groups	More regular updates after my inputs and project progress	I don't know	Other
33%	4%	1%	2%	11%	29%	17%	2%
(29)	(4)	(1)	(2)	(10)	(26)	(15)	(2)

Looking at challenges (question a), the majority (68%) said that there were no challenges for their attendance. It needs to be noted that information from non-attending stakeholders who may have larger challenges hindering them, was not obtained. Several participants (20%) still mentioned time constraints as an important obstacle. Very few said there were other challenges to their engagement. Another issue that was mentioned in the qualitative reply that it was "travel cost".

For the potential solutions or enablers for engagement (question b), allowing virtual engagement (33%) and more regular updates (29%) were the most popular options. Bilateral or small group meetings were also favoured by some (11%) of the respondents. In the qualitative answers, one said, "more targeted meetings with farmers".

4.2.2 Researchers' perspectives on meaningful engagement

This section presents the perspectives of case study leaders' (CSL)⁶ on the following topics: (i) the relevance of stakeholder engagement, (ii) relationships and trust with stakeholders, and (iii) the added value of engagement. Next, the views of CSLs on the challenges and situations that hinder stakeholder engagement are presented.

The information presented is based on the results from interviews with CSLs in the case studies. Two rounds of interviews were undertaken: One in 2022 after the

⁵ Results in percentages with actual numbers in brackets.

⁶ The teams working in the respective case studies include several members and researchers. The interviews were conducted with one, two or up to three central members of each team. In the report we write CSL.

second MARG workshop, and a second round in 2024/25 after the third MARG workshop (section 3.3). The first round of interviews focused on the relevance of stakeholder engagement in the project, establishment of the MARGs (including their history) and initial trust between the CSLs and the stakeholders. The second round of interviews addressed continuity of stakeholders in the MARGs and strategies for building trust. Added-value engagement was discussed at both the first and the second interviews. Quantitative and qualitative results are presented to show the importance of engagement and its added value for certain pre-defined topics. Content analysis (Krippendorff, 2025) was undertaken to summarize the qualitative interview information. Stories and quotes from the interviews across cases are included to illustrate and enhance the findings presented in Boxes 1-4. Information from MARG workshop reports prepared by the CSLs supplements the interviews.

4.2.2.1 Relevance of stakeholder engagement in the project

All of the CSLs' surveyed stated in 2022 and again in 2024/2025 that stakeholder's engagement had been either very important (eight CSLs) or important (four CSLs). The CSLs' views on the relevance of engagement remained consistent between the first and second interviews. The importance of engagement for providing legitimacy, motivation, relevant results and anchoring of results was highlighted. "Since we involved actors from multiple sectors, involving stakeholders in bilateral meetings, joint discussions, gave us different perspectives from different actors and sectors on topics; it allowed us to learn from different points of view on the same topics." (CSL Italy, 2025). "Stakeholders have local understanding of the situation, possibilities, constraints, and expectations. They understand the situation in the case study area, which we could never know by ourselves. We can only learn about it from them." (CSL Poland, 2022). "Modelling tools are seen as useful part of decision-making processes. If we did it without contacting stakeholders, no one would take results into account in the end" (CSLs Switzerland, 2024). "Meetings with the stakeholders really motivates the work; the MARGs provide information on real-world problems. What is or isn't manageable is very interesting and cannot be found through modelling alone." (CSL Germany, 2025).

When discussing variation in relevance of engagement for different stakeholder types, we were informed (interviews (2024/2025) that the importance of stakeholders depended on their competence and interest, and that this was a mutual relationship – i.e. stakeholders who were interested and competent showed more interest in their respective research tasks. Not all stakeholders were interested in model development; one CSL informant said this was a topic for discussion with farmer advisors and water management experts. CSLs also said that national-level authorities showed little interest in attending meetings to discuss problems in the initial phases of the project but showed a lot of interest in attending workshops when results were available.

4.2.2.2 Relationships and trust with stakeholders

Establishing the MARGs: Initially, the context for establishing the MARG differed across the cases. In five cases - in the Czech Republic, in Hungary (Csorsza, Tetves), Latvia, Norway and in Slovenia (Pesnica) - the CSLs had previous experience of collaborating with stakeholders from the area. For these cases, relationships and trust with local actors, including regional and municipal authorities, farmer advisors, and water managers, had already been established prior to the OPTAIN project.

For eight case studies from Belgium, Germany, Hungary (Felső- Válicka, Kebele), Italy, Poland, Sweden, and Switzerland, MARGs were established by the respective CSLs without prior collaboration with stakeholders in the area. Several CSLs first introduced the project to the regional or local farmer extension service, before requesting for assistance to identify and contact other relevant stakeholders. But other approaches were also identified. In Germany the CSL first contacted the water directorate making use of existing connections. The water directorate then facilitated contact with the farmer extension service and other stakeholders. In Kebele (Hungary) OVF used their contact between the regional water directorate and farmers, national park representatives based on water related issues. In the Italian case the 'Reclamation and Irrigation Board' assisted the CS team in getting contact with other stakeholders in the area. "The board was an effective intermediary for establishing and nurture contacts with farmers' associations." The CSL in Sweden also made use of previous relationships, "We can rely on our municipal partners to recruit people to stakeholder events – people come because they are invited by people in the municipality with whom we have a long-standing relationship" (CSL Sweden, 2025). In Norway and in Poland, established platforms were useful for MARG meetings. In Norway, the agricultural group under the river sub-basin district served for MARG meetings. The CSL in Norway shared that, "based on the experience so far, participating in already established arenas (meetings in the agricultural group in the river sub-basing districts) works best from the perspective of stakeholders. Parts of these meetings were dedicated for the MARG". In Poland, the case study team joined the "Local Water Partnership". Both the CSLs in Norway and in Poland emphasized the need to align with ongoing engagement initiatives. They argued that arranging additional OPTAIN MARG platforms would have been inefficient and would contribute to stakeholder fatigue.

After initial contact had been made with one or two key contacts in the area, further contacts were established with other stakeholders, using a snowball approach whereby each new stakeholder potentially leads to the identification of further interest groups, i.e. "snowball" effect is created (Savin-Baden & Major, 2023). The CSLs from Hungary said: «First find the right people to get involved in this project. If you can find just a few people who are specific to the local area, you can get entire regions and local areas behind you». Overall, however, the farmer extension service / farmer advisories were key to establishing contact with other agricultural actors. CSLs reflected that contacting actors as farmers is inappropriate without first being introduced by either a local authority or an advisor. In Lithuania and in Slovenia the farmer extension service institution were

OPTAIN partners, and in Hungary (Csorzsa, Felső-Válicka, Kebele and Tetves) OVF (General Directorate of Water Management) was a project partner and being a national coordinating body could easily involve regional water directorates operating in the area of all the Hungarian case studies. Having local authorities as partners in the project facilitated a two-way exchange of information with farmers and other actors in agriculture and nature protection (Box 1).

Box 1. Farmers' extension services, the water directorate as project partners

OPTAIN included farmers' extension service institutions, and the water directorate as partners in the project. In the Lithuanian, and in the Slovenian case study, farmer advisors were partners. In the Hungarian case study Kebele, OVF (General Directorate of Water Management) was a project partner. Involving these institutions as partners facilitated engagement in the case studies, and the institutions helped connect researchers with experience from real-world agricultural practice and policy. Some selected quotes illustrate the benefit experienced with including farmer extension service and the water directorate as partners in the project.

- “Without the agricultural advisory service, it would be difficult for us as a university. The farmer advisors in the project knew a lot of stakeholders from before, while we were new in this field”. (*Lithuanian case study, 2022*).
- “Presented results are more understandable for farmers and policy makers because we put together the agriculture thinking (from the advisory service) and the scientific thinking (from the university)” (*Lithuanian case study, 2024*).
- “I know the farmers and area there well. I have knowledge of farmers that like to be involved, and I they interact with farmers also on other occasions” (*Farmer advisor, Slovenia, 2022*).
- “Since our second MARG meeting, I got more connected with some of the stakeholders, not only on OPTAIN matters, but also other matters working together. Not only farmers, but also water managers. Got some contacts there now and we are working easier on some topics and areas of concern in that area” (*Farmer advisor, Slovenia, 2024*).
- “Also contact with regional authorities in the OPTAIN project through OVF (the national water directorate partner) – the water directorate (local), the national park, the agricultural chamber, agricultural court experts (soil specialised) – regional level, Lake Balaton Development Council” (*CSL in Hungary, 2024*).
- “The water directorate also focus on erosion and have located the most problematic fields; they are in contact with farmers. For example, if they need info about soil we provide it, and they help us with data or info about the catchment. A good relation” (*CSL in Hungary, 2024*).

Representativity and continuity of stakeholders at the MARG workshops: The interviews revealed that all MARGs included local authorities representing farmer extension services, water management. The level of involvement of farmers, NGOs,

and national authorities in the MARG varied across cases (see section 4.1 the logged stakeholder engagement interactions, and Box1). The engagement of farmers was perceived as challenging for most cases (or not included) (Box 2).

Box 2. Involving farmers in the MARGs

CSLs in the OPTAIN case studies explained that there were constraints or hindrances in engaging farmers. Three levels of farmer engagement in the project are described.

Close interaction with farmers (five cases): Interaction with farmers occurred throughout the project. Farmers attended MARG workshops. Informal, bilateral discussions occurred regularly with a minimum of two to three farmers. Quotes from informants: - “We met several times to exchange information, I told him to consider focusing on that field that may be threatened by erosion and so on, these informal interactions were important for access to data” (CSL, Czech Republic, 2024). – Farmers contact us directly to inform if there are problems or issues with the equipment that we have installed on their land (*CSL Hungarian case, 2024*). “We have a core group with the farmers that we can connect with if we have questions. 3 farmers that are very active and are happy to answer questions, they are helping a lot” (*CSL, Lithuania*). - “After the WOCAT interview I got more connected with a farmer, we went through specifics on costs and impacts of measures in Pesnica, we worked closer as I saw he was prepared to help us.” (*Informant, Slovenia 2024*).

Some involvement of farmers (six cases): Most of the cases interacted with farmers mainly as part of surveys. A few farmers attended some MARG workshops. Bilateral discussion with farmers by CSLs did not occur or rarely occurred. In some MARGs, a local authority being member of the MARG was also a farmer.

Farmer advisors provided farmers’ perspectives (four cases): Direct interactions with farmers did not occur. Farmer perspectives were provided mostly through advisors in the area. One informant explained, “It is much easier to get stakeholders like government, institutes and agencies to come than someone from private sector like farmers, they are harder to get to participate. For farmers you need the right connections, know who to contact and ask to come”. Another informant said, “decided to work more with municipalities – «they have more land and resources”.

The MARGs mostly can be characterized as dynamic platforms with low continuity of individual stakeholders. Only the German and Norwegian cases included the same seven to eleven members throughout the project. The other MARGs typically varied in size from around 10 to around 20 members, with new stakeholders appearing and others stopped attendance. The CSL in Slovenia said, “For the third MARG, we decided to invite many more farmers to this meeting. We expanded the number of farmers so they could hear what interested them” (CSL, Slovenia 2024). The CSL in Lithuania said, “It was very good to have different groups in different meetings. When we discussed problems, it was beneficial to have farmers participate as they have a more critical view of environmental pressure than

decisionmakers do. Then, at the last meeting, there was more participation by decision-makers. This was also interesting for the farmers, as they received answers about environmental measures. Other stakeholders were invited when discussing the model” (CSL Lithuania, 2025).

All informants mentioned that it had become easier to arrange MARG activities during the project. For one case, it was explained that it became less easy to organize workshops with several actors, while bilateral meetings were easy. It was emphasized that the flexible use of physical and vertical meeting spaces promoted interaction with stakeholders and encouraged continued involvement (Box 3).

Box 3. The use of physical and virtual meeting arenas

The first MARG workshops were mostly organised as virtual meetings due to the Covid-19 restrictions in 2021. Some CSLs decided to wait until physical meetings could be organized as this was considered better the initial building of relationships (Informants, 2022). Physical MARG workshops were later organized in all the cases. The use of virtual meetings however continued as they were found useful for enabling contact with more actors. It was informed that virtual meetings allowed flexibility in approaches for discussing issues and for getting feedback. The quotes below illustrate different benefits experienced related with physical and virtual meetings.

Physical meetings: “Farmers and stakeholders at local level really like f-2-f meetings; Hands on exercises should be physical” (CSL, Hungary, 2024). MARG meeting was personal and creating possibilities for networking; we could share some materials, flyers, it was useful as most of us didn’t know each other (CSL Italy, 2025). Much more valuable for local stakeholders than online meetings, they take it more seriously. And you can create a more constant group to work with” (CSL, Slovenia 2022). “High value in meeting face-to-face as much as possible, if they meet in person, they can start to discuss other issues and make connections also before and after the meeting. Stakeholders appreciate opportunities for networking and dialogue among themselves in these meetings. We have a dialogue since we have met physically several times” (CSL, Sweden, 2025).

Virtual meetings. “For questionnaires and getting other info, at least from agencies, institutes and companies it was much better to do online meetings, to save time for them”. Most of the stakeholders preferred virtual meetings, as it is not so time consuming, less trouble. For the high level, busy people it is more feasible to attend these meetings. Not always a good format but experienced that it is very useful in this setting. Virtual can have its place, but can lead to one-way presentation (CSL, Hungary, 2024). “Virtual meetings were more fruitful and effective; people can reserve a timeslot in their schedule, for this case, this was for several interactions the best way to proceed (CSL Italy, 2025).

Strategies for developing trust⁷: None of the CSLs reported to have an explicit strategy for developing trust with stakeholders. In some of the cases, e.g. in the Czech, the Slovenian, and Norwegian case, trust has been developed through their collaboration over several years. The CSL in the Norwegian case said, “is mutual understanding and respect for what each other (researchers and stakeholders/agricultural group) do that has led to the development of trust, trust is not something that just happens, it comes from good collaboration over a long period of time.” *All CSLs however explained that relationships and trust with stakeholders developed as part of the project.* Based on information from the interviews across the cases, the following four common principles that guided stakeholder interaction were identified:

Honesty and transparency: All CSLs informed that they sent out e-mails prior to the MARG workshops sharing the agenda, and after the workshops minutes and presentations were shared. The CSL in Belgium explained, “It is like a standard here that after a meeting, you should send a report to the participants”. Several CSLs also emphasised honesty as important for trust: “It is important for all of us as scientists to try to be honest, brokers of the facts we believe are true (CSL Germany, 2022). “Being honest, transparent, important that this is not something we have to do because it is stated in the project, but they see that you really try hard to have the slides well prepared, that you are interested in their voice. This is the only way I see in the project” (CSL Sweden, 2024).

Personal engagement and continuous communication: An emphasis on the need for personal engagement was highlighted by the CSLs in Belgium, Czechia, Hungary, Lithuania, Poland and Slovenia, among others. The following selected quotes reflect this perspective: - “I would also do a personal call (if an important person couldn’t attend) – to explain the importance of his contribution, and afterwards go physically to him to explain and for example add his opinion to the minutes, or similar” (CSL Czech Republic, 2024). “I think we promoted trust with involvement, personal meetings with them” (CSL Hungary, 2024). “The big action to promote trust is to answer stakeholder emails and get engaged, it is a mutual thing getting engaged, the more you interact, the more trust there is” (CSL Poland, 2024). “Before the MARG meeting, I called those who were not present in previous meeting personally. I said what we were doing, what we would present, convincing them of the relevance for them come and to cooperate. It always needs some thinking, and we need to show the different stakeholders exactly what they want and that it is relevant” (CSL Slovenia, 2024). “Moreover, MARGs can bring important motivation for both researchers and practitioners (...) We also get real motivation. Meetings with the actors really motivates the work, which is also an aspect of this” (CSL Germany, 2025).

Being Responsive: The need to respond and be attentive to the spoken and unspoken needs of stakeholders were referred to by some CSLs. “Every time I ask

⁷ At the project level, continuous communication was maintained through a yearly seasonal greeting card that summarized the project's status, achievements, and upcoming plans, providing stakeholders with a clear and concise update.

them something, like fill out a survey – I give them reports” (CSL Belgium, 2022). “When introducing the survey for WOCAT and similar requests, there are many questions about why this is important, farmers don’t really understand. But if you introduce the importance and other benefits of the measures in the right way, not trying to force them to change or introduce measures in a policy for example, but that we want their comments, opinions and thoughts on this. They accepted my involvement in that quite well” (CSL Slovenia, 2025). “We are trying to make the events and engagement about what we think people are interested in, based on what they told us last time make it worthwhile and present and ask about what is important to them” (CSL Sweden, 2025).

Delivering results: All the CSLs highlighted that trust was promoted by delivering results that are beneficial for the stakeholders’ work, for the region. The CSL in Lithuania elaborated “during the previous (the third) MARG meeting when we presented modelling results on the efficiency of measures, as it was useful results, this created trust between stakeholders and the project team, now they see in which direction it goes”. The CSL in Germany (2024) said “they are very curious about the results, where are the hotspots where the measures can be effective”. The majority emphasised the importance of sharing information and providing results as the approach needed to reduce the risk of stakeholder fatigue. However, this perspective implied challenges, as results were only available in the final year of the project. The project cycle implied the need for input from stakeholders for input of data, input of information to decide on measures, with modelling results only later in the project. The CSL from Italy (2025) said “They were interested in the communication tools, in getting in contact with other people, exchange experiences from different sites, from different actors. We approached them by emails and by bilateral meetings. We summarized results in presentations, and when discussing the results, they provided useful comments”. It was also expressed by some CSLs that not being able to deliver results could negatively affect trust. An informant said, “We weren’t confronted by such opinions by stakeholders, but it is my opinion that it might come to their mind – like “we are here for the third time, and you show us again what you have done, but we don’t see any profound steps somewhere”.

4.2.2.3 Perspectives on added value of engagement for the project

This section presents CSLs’ perspectives on the added value of the engagement for the different research activities. The CSLs ranked contribution of stakeholders to different research tasks from low to intermediate or high value in 2022 and in 2024/25 (Figure 18). It indicates some changes in perspective from the initial project years to later project years. Qualitative reflections on added value are presented below in a qualitative summary for each task respectively. Box 4 and Box 5 present selected stories indicating added value for society resulting from engagement in OPTAIN.

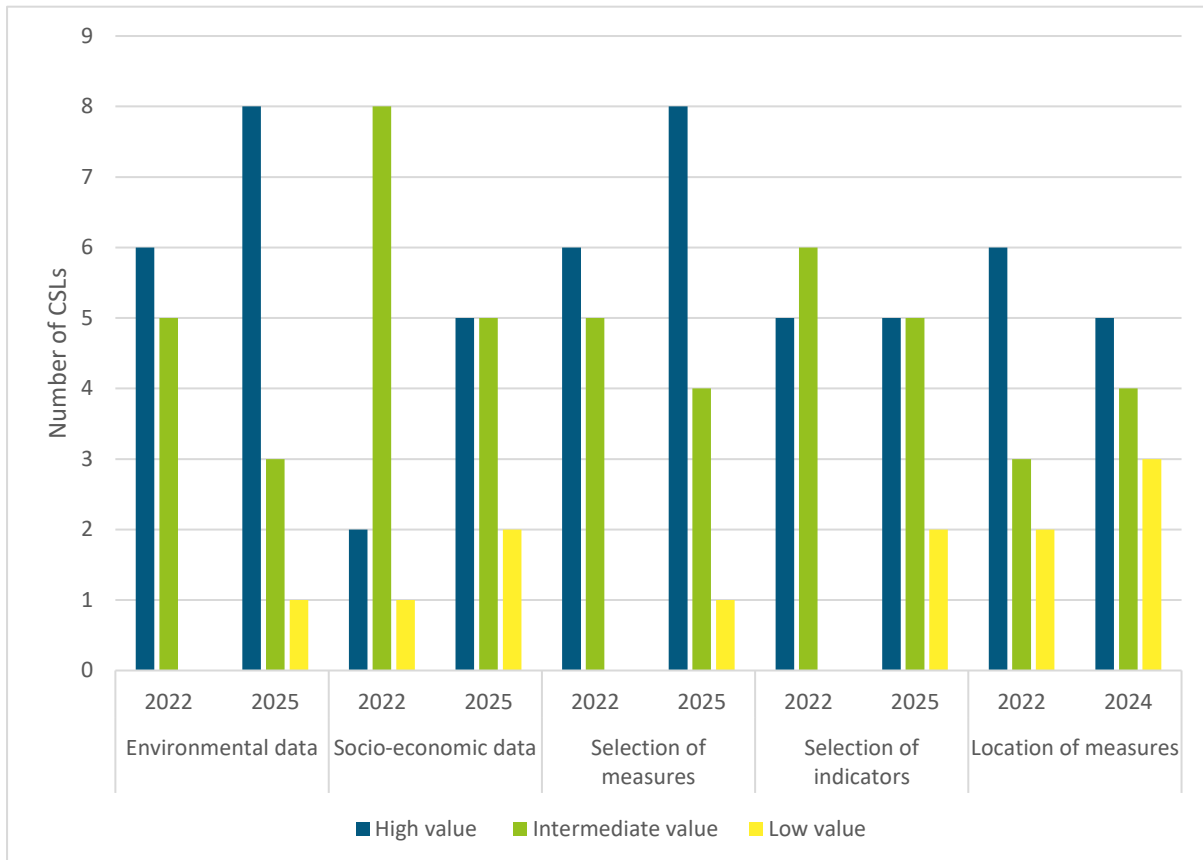


Figure 18. CSLs' perspectives on input from stakeholders to the different decision-making issues⁸

Local environmental data: All CSLs emphasised the general value of stakeholders for providing environmental context information and understanding (Figure 18). The degree however that stakeholder contributed with environmental data differed across cases. Stakeholders were important for the collection of local environmental data for the case studies in Belgium, Hungary, Italy, Latvia, Lithuania and Switzerland. The CSL in Lithuania explained, “Modellers really need information from the field and ministries to set up the model”. The CSL in Lativa explained, “We get this from environmental and nature protection agencies; we don’t have so much in databases from this area; some additional information also came from the university from previous work in the area”. Other case studies as those in, Czechia, Poland, Slovenia explained that environmental data were achieved from data bases. Relatively more CSLs found stakeholders to be important for environmental data in 2024 than in 2022, this may be because in 2022 the modelling work had not been that advanced.

Socio-economic data: The relatively high scores shown for this topic (Figure 18) reflect the added value of information on socio-economic conditions provided by stakeholders. Several CSLs informed, however, that socio-economic data were provided from databases as stakeholders did not easily share such data due to

⁸ The information is based on interviews with 11 cases in 2022, and 12 cases in 2024/45.

sensitivity issues. This varied depending on whether the data is represented in open online databases (for example cases in Belgium, Hungary), or information from municipal documents (cases in Poland, Slovenia, Latvia, Lithuania). It was also mentioned by some CSLs that stakeholders provided more accurate data on crop yields and operational cost.

Several CSLs described a mixed approach as information on local level is limited. “I cooperated with a farmer to get those, concerning the costs of implementing the measures. I used literature and databases – and then presented it so we could talk about that” (CSL Slovenia, 2025). To get access to local, individual socio-economic data was difficult as due to the sensitivity of socio-economic issues. The CSL in Italy (2022) reflected, “It is very difficult to get this info from the MARG members. They are aware of the economic conditions in the area, especially farmers are aware of the financial situation, subsidies, etc. But the quantification of economic aspects is up to scientists rather than MARG members. We can get opinions, but not data”.

Selection of measures: Several CSLs informed in interviews that there had been high value of stakeholders for the selection of measures (Figure 17). However, it was evident in the interviews that stakeholders only to some extent selected the measures to be modelled. The measures were selected based on whether they were seen as potentially interesting, and if data for modelling was sufficient.

In the German, the Latvian, the Italian and in the Swiss case, the CSL first selected measures and then asked for feedback from stakeholders. In Switzerland the CSL said, “We base the selection on their inputs”. The CSL in Latvia informed, “we had a voting session in the MARG, it was not just simple “yes” and “no” voting, but going stepwise until we more or less agree to reach a compromise. So not a simple majority vote”. In Czechia, Norway, Sweden, the CSL selected the measures. The CSL in Czechia explained, “we suggested structural measures related to drainage, such as wetlands, swales, ponds that were expected to improve rainfall runoff situation, especially episodic rains. These measures are not easily implemented due to the complex land user/owner situation, we still suggested those measures, because we would like the model to show how effective they are to farmers and landowners; such measures could diminish some of the future climate effects”. The CSL in Sweden informed, “It was decided upfront to focus on wetlands and ponds because the larger group finds these measures interesting and feasible, and this is also interesting to the stakeholders”. The CSL in Norway (2025) informed, “We selected measures based on survey results with more than 200 farmers from another project. The measures were selected as they receive funding and as they are relevant. The measures must be effective and feasible from the perspective of farmers. The CSL continued, “It is important to get feedback on what they think about measures, which ones they think are good/that they think they are useful measures, they know the land/their problems/their needs”.

Selection of indicators: In most of the cases indicators were pre-selected by CSL and then ranked by stakeholders. In two cases selection of indicators was undertaken by the CSLs alone. However overall, CSLs found value in input from stakeholders on indicators. In the interviews in 2024 /2025, informants explained not all indicators could be quantified with models.

The CSL in Czechia (2025): “the final selection was our decision based on the parameters that we are able to quantify, that are implementable in the model”. The CSL in Norway said, “Initial review and selection of indicators done internally by the research group, while the final selection/prioritization done by the MARG meeting”. The CSL in Switzerland explained, “We promised to look at some indicators, but we were not able model all, we were not aware that we didn’t know how to measure it and deliver results, had to focus on the ones we could model; there were also some uncertainties on the price data used in economic models”. The CSL in Germany explained, “When we discussed the socio-economic indicators in the last MARG – they were not interested in comprehensive / complex economic models including market prices and production costs as such data are uncertain, and the results can’t be trusted”.

Deciding the location of the measure: Some CSLs stated that they worked with stakeholders to model the impact on erosion, water and nutrient retention when deciding where in the landscape to “place” the measure, taking into account local topography and soil characteristics. For these cases the decision could be characterised as co-creation process. Other CSLs explained that a presentation on placement of measures was prepared for feedback by MARG. A few did not consult / did not get input from stakeholders. Information on criteria for deciding on the location of a measure, such as local topography and soil properties, was provided upfront to the stakeholders. The CSL in Czechia (2025) explained, “Some measures, like the agronomical measures (tillage, soil protection related measures) we discussed with the farmers quite deeply and heavily, they are very connected with their operations, - older stakeholders by age could remember how the landscape looked like 50 years ago. There were changes in the socialist era, small rivers were straightened or deepened, and they could remember the landscape and topography, allocation of fields, shrubs, forests”. The CSL in Germany informed (2025) “We indicated on a map the different potential locations were to place the measures and sent this map to the stakeholder before the workshop. At the MARG, we discussed the method we used to identify these locations. A lot of good information came from this: which data we should use and how to improve the approach”. In Latvia, the location of measures was decided based on a vote “Mainly in contact with local farmers, but also, some people from the nature conservation board, as ca 1/3 of the Dviete catchment is a Natura 2000 site”. The CSL from Slovenia explained a physical map-based approach where farmers moved around and talked about the topics and modelling results. The modelling results were explained, “not in such a “strict” way showing graphs, and like sitting in a classroom. This hasn’t been so appealing to farmers. The CSL in Norway (2025) explained, “The modelers decide the location, but we involve and consult with a core group from the MARG”. The CSL in Switzerland (2024), “Important to have the placement validated by the stakeholders, they inform about the good placements and where it is not so favourable.” Low input from stakeholders on this issue was the situation in Italy, Lithuania, Poland, Sweden. The CSL in Lithuania explained (2024), “Where to place the measures we also did mostly ourselves as the stakeholders were not so confident about the placement they chose, not so clear what they thought”. The CSL in Poland said, “we built scenarios after meeting with stakeholders, but they did not influence this much”. The CSL in Sweden said (2025),

“Have discussed where measures could be placed to improve nutrient retention efficiency, we discussed challenges on where to place them based on landowner willingness, but the actual implementation is administered largely by entrepreneurs who come and dig the holes”.

Feedback on modelling results: The main purpose of the third MARG workshop was to gain feedback on modelling results. “We wanted to discuss if modelling results are reasonable from stakeholders’ perspective and if they contain expected information/interpretation” (CSL Norway, 2025). A general interest in modelling results by authorities in the workshop were highlighted by several CSLs: “A high level the deputy state secretary who works with CAP found that what we are doing is very important and interesting to them. They want more info about results and are happy to use it in future discussions and design of the Hungarian CAP strategy. So good feedback from high level” (CSL Hungary, 2025). “Feedback on modelling was very useful, discussion about modelling results and optimization platform, both irrigation board and farmers advisors interested (irrigation board for using the model), further collaboration between the modellers and the irrigation board was discussed” (CSL Italy, 2025). Several CSLs, however, explained that MARG requests and input could be difficult to consider. “For example, asking about ecosystem services or biodiversity, it is not within the scope of our project” (CSL Belgium, 2024). Others explained that, while relevant, some issues could not be included properly in the model. “At certain extreme events, we see super high peaks in sediment and phosphorus at the catchment outlet. Stakeholders told us that this is a known behaviour of their catchment: sediments and phosphorus are deposited in the catchment and with the storm events they are mobilized. However, this is something we cannot mimic with the model” (CSL Germany, 2025).

Box 4. Selected stories of added value

Below some quotes from CSLs illustrating added value gained from the MARG approach.

Exchange of information and services with authorities: - “Data were provided by a stakeholder from an experiment that is important for model calibration; The federal government are aware of OPTAIN and have requested other collaboration tasks” (CSL Belgium, 2024). - “Local authorities ask us as researchers to provide information - we provided info on incentives and sources for data and info on hydrology on wastewater treatment options for pond implementation” (CSL Czech Republic, 2025). - “The Ministry of Agriculture, high level – deputy state secretary, requested more info about results” (CSL Hungary, 2025). - “We received good feedback from high level, it seems it was realized that project can be indeed beneficial for their work, for the region; after discussion on measures in Lithuania, I got an email from Ministry of Agriculture, they asked me to forward it to the farmers (CSL Lithuania, 2025).

Exchange of information with farmers: “The farmer showed me some fields where he does some soil conservation approaches, and we provided paper designs of the drainage and were able to tell them exactly where drainage pipes are located and what is possible to do to repair them” (Czech Republic). “Whenever we put out instruments for monitoring, farmers are looking for us – told us if something happened to sensors, vandalism by humans or animals they call us and let us know; When we collect water samples, they tell us if there are issues as cleaning of stream bed, turbidity issues, etc., they want us to have reliable data, and they want the project to succeed” (CSL Hungary, 2025).

Strong relationship with stakeholders developed: All cases reported strong relationships with certain MARG stakeholders explaining that this was important for information exchange and co-creation processes. “We asked him (bilateral exchange, phone, meetings) for information on agricultural management of different crops, how the soil is managed, fertilized, crop specific questions, costs. When we showed we have problems with estimating costs, he offered us help again and had email exchange on changing to low tillage” (CSL Germany, 2024). “Since our second MARG meeting, I got more connected with some of the stakeholders, not only farmers, but also water managers, we are working easier on some topics and areas of concern in that area” (CSL Slovenia, 2025).

Multi-actor arenas and awareness of different perspectives: The MARG workshops functioned as arenas for multi-actor exchange promoting mutual understanding in all cases. “Measures like wetlands, ditches, structural measures need agreement from both landowner and operating farmer, in larger groups they don’t have opportunity to talk directly to river basin authorities etc., but we have a freer atmosphere with less people, and we try to set a friendly, informal atmosphere, this creates a potential to solve problems, different stakeholders perceive diverse issues differently, MARG is a platform for talking to each other, share opinions and approaches, for example, some representatives of the municipality would not meet the river basin authority on that level” (CSL Czech Republic, 2024).

Box 5. Value of engagement for awareness, learning and future collaboration

The MARG final year workshop reports include information from CSLs that engaging with stakeholders in multi-actor platforms contributed to increased awareness of diverse perspectives, fostered mutual learning through knowledge exchange, and facilitated for more collaboration in the future. Below are some lines from workshop reports indicating a short-to-long-term impact of the engagement.

Increased awareness and learning:

- *Knowledge exchange among local farmers, a mayor, and water management professionals, contribute to the co-development of tailored strategies for water and nutrient retention in the catchment.*
- Farmers suggested that the modelling results should be presented during their mandatory annual training for wider communication.
- Several organisations working in the fields of drought management, water retention, and sustainable agriculture contributed to the workshop to showcase their related activities. It was a good experience to open the workshop to other projects and organisations working in the same thematic area.
- The workshop provided the stakeholders that is representatives from water management professionals, local water law companies, farmers, and local authorities from both the community and county levels with insight and information that can aid in designing and planning the case study-based strategies and actions for water and nutrient retention.
- OPTAIN results were connected with broader national, regional and local efforts.

Future collaboration:

- *Workshops also created space to explore opportunities for future collaboration discussing net steps, and potential avenues for future and sustained, long term collaboration.*

4.2.2.4 Challenges for stakeholder engagement

Below we provide a summary of CSLs' perspectives on challenges for engagement. Highlighted are time constraints, delivery of results, replacement of actors, technical language, stakeholder fatigue.

Time, resource constraints, delivery of results: Several CSLs mentioned that it could be difficult to find a suitable time for a MARG meeting. They emphasised the need

to adjust, to be flexible and for targeted communication to attract busy stakeholders. Due to delays in the modelling work, MARG workshops were delayed. The CSLs did not want to ask the stakeholders to use more time on the project without “giving something back”, and providing tangible and useful results in time was a challenge experienced by several CSLs. “For the 3rd MARG we were unlucky, two farmers were sick, and the mayor couldn’t attend” (CSL Czechia, 2025). “The main obstacle for farmers was the timing – high activity in the field at this time, difficult to come to the meeting; We tried to have the meetings in the wintertime, it is always an obstacle whether they will take time to come to the next meeting, or if they have something more important prioritize the project - the ministry has a lot of different meetings and projects, so you have to be very specific in the invitation about what will be the topic and content in the meeting. But if they see that they can get some information, they are keener to participate” (CSL Lithuania, 2024). “It depends on different kinds of stakeholders, for some agricultural companies, it was quite hard to convince them to come to a MARG meeting. Easier to connect bilaterally; It is always an obstacle whether they will take time to come to the next meeting, or if they have something more important. The (stakeholders’) belief that our project results will be helpful is enough for them to prioritise it” (CSL Slovenia, 2025).

Availability of stakeholders, replacement of actors: Several cases experienced a replacement of MARG members during the years of the project. It was referred to that new people in the ministries, and on municipality level caused discontinuity of stakeholders, or “their work/function changed”. This resulted in the need for more explanation; it was not clear what we had done before. “We had to go back and show the model calibration again because they didn’t trust the model” (CSL Lithuania, 2025). Replacement, or people leaving could also imply loss of input: “We had an issue that one person who was willing to share good info with us retired and he was not replaced, therefore part of the info became much harder to retrieve” (CSL Hungary, 2025). A CSL formulated, “Several of the stakeholder groups, NGOs and civil society organizations are informal groups without designated contact persons, when we did not know anyone in the network, this made it was difficult to make contact”. Guidance was provided (WP1 and WP7), but we saw obstacles when we put in practice the guidelines. Another CSL said, “lack of farmers’ association in the area makes it more challenging to reach farmers”.

Communication and technical language: None of the CSL expressed that technical language represented a challenge for communication. Several CSLs highlighted the need to set aside time for translation and to use the language and the words used by stakeholders. “Not difficult but would like to highlight the importance of the translation of questionnaires and so on (not English to Hungarian, but the stakeholders’ “language” (CSL Hungary, 2025). “When we explained modelling approach, we tried to keep the language as simple as possible as our stakeholder are not that familiar with the technical language, we didn’t go into the complexities of the modelling approach” (CSL Italy, 2025).

Stakeholder fatigue: The risk that the engagement processes could lead to stakeholder fatigue was a perspective in all discussions regarding engagement activities. The third round of MARG workshops was delayed until results were

available. Some CSLs argued that the long surveys in the project were leading to fatigue. The CSL in Italy explained that fatigue could be noticed when stakeholders were filling in questionnaires. “It depended on the information we required. For short questions, they replied quickly. For bigger request, it was more difficult for them to reply on time. We also noticed fatigue when we approached stakeholders to get in contact with farmers”. It was also noted that the expectation from CSLs that research results would be incorporated in the policy approach, could have a negative effect (while this is not realistic within a project period). In contrast to this are the information from the stakeholder questionnaire, where some informants asked for more frequent meetings and more information (subsection 4.2.1).

CSLs also shared their solutions to the risk of stakeholder fatigue: “We try to include discussions, proposals, side results and so on in every meeting, to keep interest and keep telling them that modelling results will come; If there are too many requests and there is no balance that they see that they can benefit from supporting research” (CSL Germany, 2024). “It took a while to get interest, but once interest came, we don’t have problems with getting people involved, fatigue is not an issue - it was elaborated. We moved from a reference group model where we ask people to come and judge what we have done, to a model of more peer-to-peer dialogue” (CSL Sweden, 2025). “Nature protection persons are interested anyway, so their interested is not decreasing, they are happy about any activity going on, but without practical demonstration cases – it is very important that everything is very well-prepared and to have locally tailored information about the measures in a nice and easy to understand format; Need to tailor the format to different stakeholder groups; Farmers and local municipalities are interested in practical results” (CSL Latvia, 2025).

4.3 The benchmark criteria for fair and effective engagement

The analysed achievements of the benchmark criteria for stakeholder engagement are based on the logged stakeholder interactions (section 4.1), the stakeholder questionnaire responses (4.2.1) and the interviews on meaningful engagement with the case study leaders (CSL) (4.2.2). Table 2 presents the benchmarks defined for the project adopted from the framework by Rowe & Frewer (2000) and adapted to the OPTAIN context. Table 4 presents the achievements for nine benchmarks after five years. The analysis shows that the benchmark criteria are achieved for the topics relating to independence, early involvement, transparency, task definition and cost effectiveness, and partly achieved for representativeness, influence, structural decision making and resource accessibility. Below the analysis of each of the nine benchmarks is presented.

Representativeness of stakeholders: The analysis of stakeholder interactions (section 4.1) shows that this benchmark was not reached by all. To address this criterion, we considered the stakeholder categories defined during the first years of the project (Van den Brink, De Vries, & Nesheim, 2022): farmers, authorities, national and local level, experts / scientific advisors, private companies

commercial, NGOs / associations⁹. The benchmark criteria for the outer circle (referring to interactions mostly as part of surveys) was reached by most cases for the different categories, but the benchmark criteria for the inner circle (continuous engagement of stakeholders in the MARG) was only reached by some cases. As the distinction between experts, private companies (often private public companies), NGOs, associations were a bit blurred, these categories were merged (Table 4).

The benchmark criteria for local authorities were reached by all cases. Regarding the other stakeholder categories, i.e. farmers, national authorities, experts, private companies, NGOs / associations, their involvement in the MARG differed. In most cases, there was contact with national authorities, but this usually took place during occasional bilateral meetings rather than during MARG workshops (subsection 4.2.2). Not all CSLs found that it was custom to invite national authorities to MARG workshops. Concerning scientific experts / private companies / NGOs associations, their relevance due to different degrees of interest and influence differed across cases. For example, in some cases (e.g. the Belgium case) NGOs / associations were central advisory institutions, but not in other cases.

The interviews with CSLs on meaningful engagement (section 4.2.2) revealed that it was challenging to engage farmers in several cases. In cases where local farm advisors were partners in the project i.e. in Lithuania and in Slovenia, this facilitated engagement of farmers in these case studies. Even in cases where researchers had collaborated with farmer advisors in previous projects, the advisors remained an important channel for establishing contact with farmers. It was explained that the advisors interact with the farmers also on other occasions and that they have knowledge of farmers that are willing to engage. For cases where farmers were not part of the MARG, the CSLs stated farmer's perspectives were provided by the farm advisor in the area (see Box 1, 4.2.2).

Independence: The analysis of information regarding the criterion that certain categories of stakeholders should not be over-represented (Van den Brink, De Vries, & Nesheim, 2022), and that the participation process should be conducted in an independent and unbiased way (Rowe and Frewer, 2008) show achievement.

The logging reports from the case studies show that there has been a balanced engagement of actors from water management, nature conservation and agricultural sectors (Annex A). While the interviews on meaningful engagement indicate that the protocols for the MARG workshops and other engagement activities promoted unbiased participation processes. The protocols were prepared by task leaders and then presented for feedback at the projects' "InterVision meetings", a process that facilitated for an effective and harmonized engagement approach across case studies. For documentation, reports from the MARG workshop were prepared and shared.

There were no conflicts of interest in the research team, the modelers are independent specialists from relevant fields. Additionally, the project and its

⁹ Quantitative benchmark criteria (Table 2.1) for representativity of stakeholder types were discussed and agreed, listening to the perspectives of CSLs (InterVision meeting; June 1st 2022).

deliverables underwent external evaluation, ensuring transparency and independence in the research process.

Early involvement: The analysis of this benchmark criterion, that stakeholders shall be involved early in the project to have a role in shaping objectives and research decisions, show achievement. The result is documented in the logs of interactions (section 4.1), which show that the establishment of a multi-actor reference group in all case studies was a milestone after 10 months, and CSLs in all cases informed in interviews that stakeholders were involved in initial project work tasks.

The project grant description specified the need for engagement in initial work tasks in the project, i.e. identifying main challenges and identification of measures (Van Brink et al. 2022 workshops report).

Influence: Taking into account the interviews with CSLs on the added value of stakeholders for research activities, the criterion that stakeholders should have genuine impact on research decisions was partly fulfilled. Stakeholders were asked to take part in the selection of measures to be modelled, selection of indicators, placement of measures in the landscape (topography, soil parameters) in the modelling, and feedback on model results. Stakeholders also provided input on policy gaps and incoherence for NSWORMs in a survey (Glavan et al., 2022), and on the appropriateness of incentives to promote NSWORM implementation (Nesheim et al. 2026, in prep).

The involvement of stakeholders in these research decisions was described in the project grant agreement. The degree and how stakeholders have been engaged in research decisions varied across cases. In some cases, measures for modelling have been decided by stakeholders, in other cases they have been identified by stakeholders and researchers, sometimes by researchers. The main hindrance for responding to stakeholders' input to research decisions was the ability of the model to calculate indicators for certain measures. Researchers needed to weigh many factors, model constraints, but also the project timeframe, description of deliverables etc. being predefined factors.

The interviews on meaningful engagement with the case study researchers document that it was not always possible to consider input from stakeholders in the research. For example, stakeholders could ask to get information on the effect of a measure for an economic indicator such as effect for production yield, while the model and the data available did not allow this (Monaco et al., 2024; Praprotnik Kastelic et al., 2025). Also, requests for the project to consider issues outside of the scope of the project could not be addressed (section 4.2.2).

Transparency: This benchmark theme, which defined by having no hidden agenda and ensuring that stakeholders have access to project information, has been achieved as justified by the following five elements. (i) stakeholders were provided with information material relevant for the respective workshops upfront, and (ii) that minutes from workshops were provided to the stakeholders after the meetings (Interviews and MARG workshop reports). (iii) It was shown to stakeholders how input from previous engagement activities were considered in the project. (iv) Project information has been presented in the local language, using

case study specific leaflets and information sheets, and (v) country specific websites making information accessible for the larger audience where developed. (vi) Consent forms from engaged stakeholders were ensured.

Task definition: The benchmark referring to clearly defined activities and expectations was achieved. The project grant document has been a reference document for all task definitions, partners responsibilities and timeframes. Clearly defined activities and expectations and a harmonized approach across case studies were facilitated for by the organised InterVision meetings (sections 1.1 and 3.4). The InterVision meetings, held every six weeks, helped to coordinate the case studies by providing a forum for general discussions on the planning, progress and evaluation of project activities. WPI developed, in collaboration with task leaders, protocols and guidelines for the MARG workshops that were presented and discussed in the InterVision meetings. CSLs also shared their experiences from organized workshops, undertaken research activities. These discussions across cases and partners ensured common understanding of engagement tasks in the project, and thereby clearly defined activities and expectations.

Structural decision making: This benchmark, which is defined as displaying the decision-making process to enable clear understanding and acceptance of the research decisions, can be seen as only partly achieved. When developing the protocols for the workshops there was an overall agreement in the project consortium that workshops should not require too many hours of stakeholders' time. Respect for stakeholder's availability of time implied strong prioritization of topics on the agenda. Protocols and guidelines did not prioritize time for detailed explanation and justification of all research decisions. Structural dialogue with stakeholders in MARGs was ensured in all MARG workshops. Time for open discussion and questions from stakeholders was a priority.

Resource accessibility: This criterion, which is defined by the consideration of participants' access to information, human resources material resources and time, was partly achieved. While resource accessibility, referring to stakeholders' available time, was a recurring topic in project and InterVision meetings, information from CSLs in some cases indicates that the availability of "human resources" and time was still not sufficiently considered. The need for information on project tasks, perhaps in particular on the understanding of policy gaps, laws and regulation, institutions and sector responsibilities, did in some situations represent high demand on stakeholders' time. Also, the timeline of research did not always correspond well to the availability of some stakeholders, this was the case for farmers who have heavy workloads in certain periods of the year.

The project tried to distribute stakeholder engagement activities along the project timeline, aligning them with local events and platforms, and adjusting MARG formats, etc. Many of the tasks have been adjusted to the stakeholders that are already part in several research projects, etc. However, it was not always possible to use information from previous projects for current and local information on specified questions to enable comparison of results across cases.

Cost-effectiveness: This criterion, defined by the degree to which engagement activities entail low attendance costs for stakeholders and efficient use of

resources, has been met. The interviews and the logging of stakeholder interactions show that all cases implemented solutions for how to keep costs of engagement low, indicating fulfilment of this objective. Some cases (Norway and Poland) used already existing multi-actor platforms to optimize time and avoid stakeholder fatigue. The Polish CSL emphasized the need to avoid the establishment of a competing platform. Existing platforms allowed meetings / workshops that focused on OPTAIN topics and questions. The most common solution for keeping costs of attendance low was to organize physical workshops in the local study area, which local actors could easily access, and a virtual workshop for national and regional level actors. Also, hybrid meetings were organized (see section 4.2.2 and Box 3). While different workshops platforms compromised the objective of multi-actor interactions across different governance levels, solutions for cost-effective approaches involved bilateral engagement, both physical and virtual. This was experienced as a solution that adapted to the situation and the needs of stakeholders, in particular policy makers and farmers.

Table 4 - Benchmark criteria¹⁰

Themes, definitions	Defined benchmark objectives			Achievement of benchmarks after 5 years of the project		
	<i>Categories</i>	<i>Inner-circle nr cases</i>	<i>Outer-circle nr cases</i>	<i>Categories</i>	<i>Inner-circle nr cases</i>	<i>Outer-circle nr cases</i>
Representativeness Engaged stakeholders are a representative sample of actors that may affect or be affected.	Farmers	3-4	6-8	Farmers:	Some	Majority
	National authorities	2	4	National authorities	Some	Some
	Local authorities	4	8	Local authorities	Majority	All
	Experts, scientific advisors	2-4	4-6	Experts (scientific com.)	Some	Majority
	Private companies commercial	2-4	4-6	Private companies		
	NGOs, associations	2-6	2-6	NGOs, associations		
Independence	Participation process is independent, unbiased Information to participants is fair and balanced.			Achieved: Protocols and guidelines for participation ensured unbiased processes. MARG workshop reports documented unbiased process. Modelers are independent specialists. Deliverables are evaluated by external experts.		
Early involvement	The project grant description determines the research focus and work tasks, and about early engagement.			Achieved: Milestones specify MARG establishment. Internal workshop on training facilities for early involvement. Mapping of stakeholders undertaken in the first 6 months the project (D1.1).		
Influence	Stakeholders should be invited to provide knowledge, input, the input should have a genuine impact on the research process.			Partly achieved: CSLs - the degree that the input from stakeholders had a genuine impact on the research process varied.		
Transparency	Project information in native language, specific leaflets, consent form for engagement, agenda for meetings shared upfront, minutes are shared post events, open process.			Achieved: All cases reported MARG workshops and surveys other relevant documents were translated into local language. All cases shared invitation and agenda to meetings upfront and minutes post events.		
Resource accessibility	Human resources are a limiting factor; this is considered by being respectful to stakeholders' time constraints (duration and time).			Partly achieved: The timeline of research did not always correspond well to the availability of some stakeholders.		
Task definition	The nature and scope of the participation task should be clearly defined. Prior to engagement events, protocols and agendas should be developed across the cases and shared.			Achieved: Developed protocols and guidelines specified nature and scope of participation for how to organize the event. Reports to document the organization of workshops and discussions at workshops were prepared.		
Structural decision making displayed	The participation exercise should provide appropriate mechanisms for structuring and displaying the decision-making process.			Partly achieved: the protocol for workshops did not include this point. Only to some extent was the researcher decision making processes displayed.		
Cost-effectiveness	The procedure should maximize impacts and minimize expenses.			Achieved: CSLs organized for flexible approach to minimize costs including hybrid meetings, and bilateral meetings, and aligning with other platforms and projects.		

¹⁰ van den Brink, et al. (2022). Due to country-specific variations in how advisors, NGOs, companies, and associations are defined and connected, we present them together rather than detailing the specificities of each case. Sources are stakeholder logging reports, and interviews with case study leaders.

5 Discussion, balancing trade-offs in engagement processes

The OPTAIN approach to stakeholder engagement brought an ambitious framework for monitoring engagement, focusing its content on the three criteria of relevance, trust and added value and bringing a special emphasis on the process itself by building on the benchmark criteria developed by Rowe & Frewer (2000). In general, engagement processes, especially those aimed at multiple objectives simultaneously, inevitably involve trade-offs that must be carefully weighted. The application of benchmark criteria underscores that, in practice, fairness and effectiveness often conflict. Representativity collides with cost and time efficiency, stakeholder influence must be balanced against scientific defensibility, and engagement intensity risks causing fatigue. These realities suggest that documenting trade-offs, clarifying the principles used (strategic vs. normative engagement) and being transparent about the limits of engagement are just as important as striving to achieve ideal benchmarks. These trade-offs illustrate that meaningful engagement is not just about maximizing participation, but also about balancing relevance, representation, trust, and feasibility. Transparent reporting of who was involved, how, and to what degree, helps to counter potential bias and strengthen legitimacy. Recording and reporting on engagement can counteract biased information by making it clear who contributed to the discussions (and who did not). Ultimately, fostering trust—even if only with a subset of stakeholders—remains the most essential and most demanding outcome of collaborative research.

In the next paragraphs, we organize some of the most relevant issues by grouping them into concrete trade-offs. Trade-offs in stakeholder engagement identified and managed during the OPTAIN project are valuable as empirical testing of the stakeholder theory but are also highly relevant for any project managers and practitioners when designing, implementing and managing engagement processes and navigating possible dilemmas.

5.1 Dynamic open vs. continuous engagement platforms

The continuous involvement of stakeholders throughout the project has been shown to be important for building trust and for social learning (Blackstock et al., 2007; Kujala et al. 2022). Moreover, authors such as Lemos & Morehouse (2005) argue that successful co-creation processes are favoured when stakeholders are involved in multiple stages of research. In OPTAIN, the benefit of continuous cooperation with stakeholders to build trust and understanding was appreciated, but the involvement of other stakeholders on a more irregular bases was also seen as an advantage. It was acknowledged that it would have been unrealistic to have continuous large-scale engagement due to external factors (e.g. replacement of actors), general resources constraints, and the risk of stakeholder fatigue.

Continuous engagement refers to stakeholders attending all the MARG workshops. For most MARGs continuous engagement occurred only with a portion (around 4 – 6 stakeholders) of the total number of engaged stakeholders in each respective case (around 15- 50 stakeholders). The discontinuity of engaged stakeholders in the MARGs was partly due to the replacement of staff in agencies or staff not being unable to attend, which is reported on also in other studies (Huzzard, 2021). However, what may be

described as “discontinuous engagement” also resulted from the wish, and or the possibility to engage with groups that had previously not attended the MARG. “Wish” could refer to the benefit of, for example, discussing the models with experts on the field. “Possibility” could refer to the opportunity of getting in contact with new stakeholders, for example by combining meetings in different projects. Several CSLs explained that the relevance of input or interaction with different groups of stakeholders depended on the research activity, and some CSL highlighted that flexibility of interacting with different stakeholders were advantageous as the interest in research activities differed among stakeholder groups (subsection 4.2.2). Also, other studies such as that by Basco-Carrera et al (2017) on collaborative modelling of river basin territory in Indonesia have reported high levels of participation for some key stakeholders and reduced involvement of other stakeholders.

5.2 Bilateral engagement vs. multi-actor workshops

Bilateral engagement, which usually involves one-on-one meetings or small-group discussions with key stakeholders such as farmers or extension officers, offers practical benefits. It is easier to arrange, ensures focused input, and strengthens trust through repeated contact. Interviews with CSLs revealed that for example agricultural companies, and national authorities preferred bilateral meetings over broader multi-actor workshops, as these fit better with their schedules and direct interests. Bilateral approaches can be especially effective for detailed technical discussions, trust-building, and navigating sensitive topics or personal priorities.

In contrast, multi-actor workshops can bring together diverse groups of stakeholders, as farmers, governance actors, NGOs, authorities etc. Stakeholder engagement theory highlights that the opinions of affected groups of people are important for successful outcomes (Calliera et al., 2021; Haddaway et al., 2017). Platforms that include different types of actors can contribute to actors’ awareness and understanding of different perspectives of actors (Nesheim et al. 2021). Moreover, multi-actor discussions can bring knowledge and ideas to the table that otherwise may not have been shared (authors’ observation, MARG workshop, Slovenia 2023). Such platforms enrich dialogue but introduce complexities in logistics, representativity, and relevance for all diverse participants (subsection 4.2.2). Multi-actor platforms foster inclusiveness, shared learning, and collaborative decision-making, which are vital for systemic change, but may face lower engagement when topics lack universal importance or when time demands and stakeholder fatigue become problematic. Moreover, some actors may find that it is not so comfortable to share opinions and experiences in a multi-actor arena due to existing power dynamics, hierarchies or other sensitive issues. Hence, in practice, the willingness of stakeholders to engage in multi-actor platforms varies and may be challenging to achieve (Andersen et al., 2021; Trammell et al., 2025). A tailored approach should be taken that is suitable for the project goals and resource constraints (Rogge, 2024).

Both approaches have their benefits and limitations, neither is universally optimal. Several CSLs in OPTAIN managed to balance both strategies by having a flexible approach to engagement. Stakeholders were invited to the OPTAIN multi-actor workshops. For influential and interested stakeholders who were reluctant or not able to attend workshops, bilateral meetings were organized. The interdisciplinary MARG

workshops were essential to address complex challenges of legitimacy, social learning and inclusive decision making.

5.3 Close cooperation with key stakeholders vs. broad but shallow

Projects engaging diverse stakeholders have higher success rates due to enriched input and collaboration. The principle of representativity, which implies that members of all affected communities should be consulted (Rowe & Frewer, 2000, 2013; Stirling et al., 2017) is in line with this statement. However, broad and representative engagement can make it more difficult to build strong relationships with stakeholders that fosters deep trust and yields actionable insights, suggesting a potential trade-off.

Results from OPTAIN, which are supported also by other studies, show that the development of trust between actors is associated with iterative face to face interactions, and the ability to be responsive to needs of stakeholders. While these efforts can result in increased insight and understanding it is also dependent on the willingness of different stakeholders to use time and resources on the project. The issue of willingness to engage is reported in several other studies. Anderson et al. (2021) found in their review paper of European projects that several articles reported on challenges securing responses to the invitation to participate in the workshops. Recruiting a wider stakeholder group to participate in project activities depends strongly on whether they perceive research topics as relevant. Ensuring broad representation (farmers, extension officers, governance actors) can enrich the discussion but may lower engagement when topics are not equally significant to all. The challenge lies in balancing inclusivity with focus on issues meaningful to each group. Moreover, the willingness to engage of an agricultural extension officer, who has a mandate to engage with research, can be expected to be essentially different from the willingness of a farmer or landowner, who cannot use “office hours” for engaging. For farmers the issue may not be a lack of willingness to engage, but rather the need to prioritize work on the farm. Carlsson et al. (2015) reported that business representatives found it difficult to allocate time for participation. For enabling and motivating stakeholder groups that may be practically or otherwise constrained from engaging, research projects may consider other alternatives. Contacting farmers by means of farmer unions may be an alternative (Aarts et al., 2014). Positive farmer response and interest have also been reported on from projects in e.g. Northern Ireland and England, when engagement of farmers was combined with interactive events that included field demonstrations for practical learning and discussions (Nesheim et al. 2021).

In OPTAIN, deep, continuous collaboration often developed with a small “inner circle” (extension officers, water authorities, a few farmers), with interest and capacity for close interaction. This fostered trust and targeted input, but risked underrepresentation. Interaction with a broader set of stakeholders were ensured by surveys and questionnaires. The close engagement with a few stakeholders may imply some bias or insufficient representation by affected stakeholders. How to handle the multiple and layered considerations of different stakeholder groups, needs to be discussed in the respective projects and then properly accounted for in reports. Recording and reporting engagement can counteract biased information by making it clear who contributed to the discussions (and who did not).

5.4 Influence vs. technical rigor

Collaborative modelling and scenario development can enhance knowledge co-production, but are time intensive for researchers and participants alike. Limited time, but also constraints in the model, may shift the balance towards researcher-led technical processes, reducing the participatory dimension. Voinov & Bousquet (2010) argue in their paper on collaborative modelling that it is difficult to engage many people in a co-construction process.

Participatory depth can relate to the benchmark “influence”, defined as the genuine impact of engagement activities on research decisions, can be assumed to be a challenge in most research projects due to the research partners’ need to comply with the grant agreement upon which the funding is provided. In OPTAIN, stakeholders were consulted on specific issues such as selection of measures, selection of indicators, definition of scenarios, and the degree that stakeholders influenced the research decisions differed across cases (Figure 15). However, while stakeholders’ opinions were considered and valued, the possibilities of the models and inherent model constraints, for example the inability to model a preferred indicator, implied that in several situations, stakeholders’ expectations and input could not be met. The results of Schneider & Buser (2018) show that different levels of stakeholder interaction are advantageous depending on a project’s sustainability goals, desired knowledge, issue complexity, diversity of actors, interests, and established partnerships. A systematic reflection on these six factors helps to tailor engagement processes to project objectives and context. Voinov & Bousquet (2010) stress that researchers taking the stakeholders input need to make sure that the scientific components of the model adhere to standard scientific practice and objectivity. Thus, while participants may determine the questions that the model should answer and may supply key model parameters and processes, the structure of the model must be scientifically sound and defensible.

5.5 Extensive data needs vs. stakeholder fatigue

Research projects that require extensive data collection frequently encounter challenges related to stakeholder fatigue, which leads to disengagement, or lack of enthusiasm among stakeholders who are expected to actively participate. This fatigue often occurs when stakeholders are repeatedly asked to provide input across multiple deliverables, resulting in overburdening.

Frequent demands can overwhelm stakeholders, especially farmers balancing project participation with farm work. In OPTAIN some CSL mentioned that long surveys caused fatigue. Challenges for representativity of perspectives (few respondents) are also reported in deliverables involving extensive stakeholder surveys. Stakeholder fatigue is widely discussed in literature among the key challenges in stakeholder involvement (Gramberger et al., 2015; Turner et al., 2016). The consequences can include lower quality feedback, reduced active involvement, decreased motivation, and growing scepticism or mistrust toward the project. The Biodiversa Handbook on Stakeholder Engagement recommends avoiding working with communities suffering from stakeholder fatigue. Where this is not possible, reduced fatigue can be achieved by ensuring there will be tangible benefits for stakeholders (BiodivERsA, 2014). Regardless of any constraints, it is important to capture the perspectives and inputs of affected actors. Rather than aiming

for true representativity in data collection, the important focus may be to clearly describe which stakeholders have been involved (and which have not, or only to a limited extent).

6 Concluding remarks, recommendations

This report provides a comprehensive account of stakeholder engagement activities during the OPTAIN project, from late 2021 to 2025, drawing on rich empirical data across 14 case studies. By bridging the theoretical anchoring in stakeholder research with OPTAIN project data and experience, this report provides a practical foundation for advancing stakeholder engagement in environmental research projects.

Engaging stakeholders is an important part of many environmental projects worldwide. Furthermore, it has been shown that the adoption of research findings by non-academic practitioners is directly related to their involvement in the knowledge production process associated with such findings (Bracken et al., 2015; Huzzard, 2021). As in the study by Gerlak et al. (2023), stakeholder involvement in research projects can mostly achieve impact on knowledge, awareness, attitudes and ideas. The second typical impact is referred as “connectivity” and relates to relationships in networks, increased trust and mutual understanding. A third common impact category lists instrumental impacts when changes are observed in plans, practices or policies. Further capacity-building impacts describe changes in skills and expertise.

Most difficult impacts to achieve are social change impacts (changes to social systems) and environmental change impacts (changes in natural resources and ecosystems). Chapter 4 presents positive feedback from researchers and stakeholders on the meaningful engagement in the three categories (relevance, trust and added value), where impacts of stakeholder engagement towards NSWORMs mainstreaming have been very visible in knowledge dissemination, creation of networks, new skills and expertise among MARG members. Some MARGs have also been successful in reaching policy making actors and feed into possible farmer advice, provide relevant CAP feedback, etc. However, achieving the kinds of social change that would allow to mainstream NSWORMs solutions and result in environmental change are still a far-off goal for the case study catchments.

By setting ambitious goals around stakeholder engagement related to NSWORMs modelling, policy inputs, and incentives, the OPTAIN project aimed to achieve high levels of the participation ladder (Arnstein, 1969), reaching co-production of knowledge. The Multi-Actor Reference Groups (MARGs) established in each of the 14 case studies served as a structured mechanism for stakeholder interaction, facilitating co-creation of knowledge between researchers and stakeholders. Regular engagement through workshops, bilateral discussions, surveys, field trips and newsletters has maintained engagement. Engagement was planned, delivered, and evaluated through multiple perspectives using established benchmarks, with a focus on relevance, added value, and building trust among participants. Rigorous documentation of interactions and feedback, coupled with careful assessment of trade-offs, ensures that the insights presented bridge theory and practice, equipping future projects with tested approaches for effective knowledge co-creation and meaningful stakeholder involvement.

The OPTAIN project experience provides several key lessons applicable for co-creation strategies in environmental modelling research activities. Recommendations emphasize planning of engagement, value of clear benchmarks for meaningful engagement and for the quality of the engagement processes. They also stress the need for flexibility in those engagement processes, which involve many case studies and platforms for monitoring and discussions of engagement processes within the project team.

- **Carefully planned process:** There is no one-size-fits-all method for involving stakeholders, but the process should be carefully planned and evaluated, with a pre-engagement phase, undertaking the engagement activities and post-engagement evaluation. There is a need for a harmonized engagement approach across case studies while allowing adaptation to the local realities, as distinct natural and human systems require some specific approaches for interacting with local stakeholders. It is key that all team members understand why and how to engage stakeholders from the beginning. In larger projects with several different stakeholder platforms, a common understanding of different terms and engagement activities is essential. This will create a basis for collaboration, ensure a similar approach in different case studies and reduce the risk of misunderstandings. It is important that all project members have reflected on how stakeholder engagement relates to their work, including when and how stakeholders will be involved in different tasks.
The planning phase in OPTAIN included a stakeholder mapping and workshops on how to establish MARGs and has been published as deliverables D1.1 and D1.2. This report D1.3 sheds light on the phases of engagement implementation and evaluation.
- **An inner and an outer circle of stakeholders** to ensure engagement covers both breadth and depth. OPTAIN introduced an “inner circle” and “outer circle” of stakeholders. Stakeholders with infrequent contact, those participating only as survey informants, were considered the ‘outer circle,’ while those who regularly interact and participate were considered the ‘inner circle.’ Inner circle stakeholders in MARGs have mostly been farmer advisory services, and in some cases also farmers.
- **Enabling meaningful engagement**, i.e. a participatory process in which stakeholders are actively involved in the decision-making process and not just passively informed, ensures a democratic and an instrumental, practical perspective to engagement. In OPTAIN, making engagement meaningful for both stakeholders and researchers, is built on three pillars: relevance, trust and added value. Those categories are introduced in section 3.3 and discussed in the OPTAIN context in section 4.2. We have emphasized both a researcher and stakeholder perspective in the evaluation and show how it evolved in the project’s years.
- A just and effective engagement process requires **clear benchmarks for evaluation**. OPTAIN adapted a comprehensive framework from Rowe and Frewer (2000, 2013). The framework consists of nine benchmark criteria defined and adjusted to the OPTAIN project context: representativeness, independence, early involvement, influence, transparency, task definition, structured decision making, resource accessibility and cost-effectiveness. Overall, many cases have been successful in adhering to the benchmark standards, but not all criteria have been achieved to the same degree. For OPTAIN, benchmark themes and criteria have effectively supported the documentation and monitoring of engagement but tailoring these themes more closely to the project's unique context, taking into account existing

relationships and ensuring fairness and effectiveness, have been essential for securing stakeholder commitment to the results.

- **Dialogue between WPI and Case Study Leaders:** Case study leader meetings (called “InterVision meetings” in OPTAIN) were organized to ensure communication and understanding between the case study leaders, which were responsible for stakeholder engagement in the different case studies, other team members and task leaders. WP 1 arranged these regular digital meetings approximately every 6 weeks. The attendance was typically around 25 people at each meeting. This worked as a platform for providing information and discussing upcoming tasks, as well as to facilitate communication directly between the cases. This dialogue contributed to common understanding and learning about stakeholder engagement both in the initial planning phase and throughout the project.
- **Flexible approach:** Flexibility is important but makes intra-case comparisons and evaluation more difficult. The different cultures, norms, and practices around engagement in the case studies, combined with researchers’ differing prior experiences, demanded a flexible approach. Adapting engagement to the specific needs of local and national actors was essential for success, a necessity also emphasized in the Biodiversa Handbook for Stakeholder Engagement (Biodiversa, 2014). The degree of flexibility, however, compromises the possibilities of comparisons and evaluations between the cases. Therefore, a harmonious approach can be a balance to assure some project level standards and local case flexibilities.
- **Consistent monitoring by stakeholder logging templates:** In OPTAIN specific templates have been developed to (i) report activities and results from MARG workshops across case studies and (ii) a logging template for all other stakeholder activities. This enabled WP 1 to monitor the development and level of activity in each case study. The logs were compiled into annual milestone reports that presented general trends, as well as detailed overviews of activities and different stakeholder groups involved. Annexes to this report show the templates used.
- **Overburdening stakeholders and resource efficiency:** Stakeholder fatigue is a common phenomenon in projects with extensive stakeholder engagement that can bring a gradual decline in engagement, motivation, or responsiveness among individuals or groups repeatedly asked to participate in project activities. Addressing stakeholder fatigue requires more strategic, focused engagement that demonstrates tangible outcomes and values participants’ time and contributions. OPTAIN has addressed it by monitoring stakeholder engagement activities, with surveys for stakeholders on the indicators for meaningful engagement (relevance, trust and added value). Case study leaders have been given flexibility on timing, duration and tools used in their activities to minimize the risks of stakeholder fatigue. Also, in some countries MARG activities have been linked to existing platforms, trying to find synergies with ongoing work and not duplicating similar engagement fora.
- **Managing engagement trade-offs:** The discussion part in Chapter 5 has brought many relevant trade-offs that are necessary to manage in research projects putting emphasis on stakeholder engagement. Such trade-offs are an inherent part in active work with stakeholders. As there is no panacea for managing the trade-offs and solutions can depend on the project goals, timeframe and local context. What is however universal, is that trade-offs should be made explicit and discussed in the project teams. This report documents how the defined trade-offs have been dealt within OPTAIN.

This report presents a stakeholder engagement framework that has been designed for an environmental modelling research project. It shows both the advantages of the framework, but also the unavoidable dilemmas, trade-offs and even contradictions in stakeholder engagement work. Not all benchmarks' criteria for the engagement process could be met within the project. Closer work with farmers as stakeholders in the inner circle has been also difficult for many case studies, especially for those who had no prior relationships with their stakeholders. Balancing trade-offs involved necessary compromises, such as those between breadth and depth, bilateral and multi-actor engagement, and continuous and dynamic platforms, while assuring technical modelling rigour and stakeholders' influence.

Annexes

A. The annual logs of stakeholder interactions

A.1 Logg of stakeholder interactions for 2021¹¹

Case nr.	Total nr. interactions logged	Location			Duration			Type of meeting				Type of engagement				Link to task							
		Physical	Virtual	Phone / email	~1 hour (or less)	1-4 hrs (half day)	>4 hrs (whole day)	MARG workshop	Bilateral meeting	External workshop	Farm visit / field demo	Open disc.	Focus group	Semi-struct. interviews	questionnaire	1.1	1.2	2.1	2.2	3.1	6.2	6.3	
1	2		2			2		2				2						2					
2	1	1				1		1					1					1					
3a	14	6	6	2	6	2	6	2	10	2		10			4	14							
3b	11	3	6	2	6	2	3	2	7	2		7			4	11							
4	6	4	1	1	2	4		1	2	3		6			4		4	1					
5	1	1				1		1					1		1	1							
6	11	3	6	2	6	2	3	2	10	2		7			4	11							
7	38		6	32	37	1		1	37			38				27		2		3	2	4	
8	2	1	1			2		2		1		1	1		2								
9	2		2			2		1	1			2					1		1				
10	4		2	2	4			1	3			2				4							
11	11	3	6	2	6	2	3	2	7	2		7			4	11							
12	1	1				1		1				1					1						
13	-																						
14	-																						

Case nr.	Participant category						Authority participants										Tot. number of stakeholder interactions ³	Number of participants pr. Interaction
							Level					Type						
	Farmer	Agri-advisor / consultants	Scientific expert ¹	Priv. company	NGO	Politician	Local /municipal	River basin	State / regional	National	Agriculture	Environment	Water mgmt.	Cultural heritage	Other			
1		3		1	3				6		1		5			13	9; 4	
2	5	1	2						3							11		
3a	13	5	10	8	3		x		x	x	x		x			56		
3b	13	5	10	8	3		x		x	x	x		x			56		
4	7	8	16	few	few		x	x	x		x	x	x			100	17	
5		5	3	2	1	2			1					1		14	14	
6	13	5	10	8	3		x		x	x		x				56		
7	1	26	0	0	4	3	5	31	RA 23/ SR 30	1	x	x	x			132		
8	3	4	7			3	1		1							16	11;5	
9	1		6				4		1		1	2	1			13	4;9	
10	25	x	6	1			24			1						52	23;12;15;2	
11	13	5	10	8	3		x		x	x		x				56		
12	6	1					1	2		1	1		1			11	11	
13																		
14																		

¹¹ The project started in September 2020, but first stakeholder logging reports were collected at the end of 2021. No logs were received for case 13 and 14. The activities represented in emails and phone calls with stakeholders have not been equally logged in cases. There is some unclarity regarding the total number of participants in the different cases, which makes these numbers not directly comparable. Letters refer to types of production: F – forest; G – grains; L – livestock; R – root crops; T – tuber; V – vegetables; VI – vineyard.

A.2 Logg of stakeholder interactions for 2022¹²

Case nr.	Total nr. interactions logged	Location			Duration			Type of meeting				Type of engagement				Link to task						
		Physical	Virtual	Phone	~1 hour (or less)	1-4 hrs (half day)	>4 hrs (whole day)	MARG workshop	Bilateral meeting	External workshop	Farm visit / field	Open disc.	Focus group	Semi-struct. interviews	questionnaire	1.1	2.1	2.2	2.3	3.1	4.4	6.2
1	2	1	1			2		1	1			2							1		1	
2	10	2	8			10		1	8		1	1	1		8							8
3a	23	6	4	13		16	38	1	46			13			4		1			12		5
3b	9	2	3	4		8	1	1	7	1		5		2	3		1			4		3
4	12	3		9	9	2	1	1	11			9		1	2							2
5	10	2	8			10		1	9			1			9							9
6a	9	1	7			9		1	7			1			7							7
6b	5	4		1	2	1	2	2	2								1					2
7	11	3	6	2	8	2	1	1	10			7	1	3		1	4	1		3		2
8	3	2	1		2	1		1	2			2	1									
9	6	3	3		5		1	1	4			4			2		1	1				2
10	17	1	16	5	5	8	9	1	21				1		15							
11	9	4	2	3		8	1	1	8			6		3	1					3		5
12	22	2	2	18	20	2		1	20			3	1		18							18
13	27	11		16	16			7 ?	16			11			16		11					16
14	14	2	9	3	12	1	1	6 ?	7	1		13										

Case nr.	Participant category															TOTAL no. of participants					
								Authority participants													
	Farmer	Production type ⁶	Agri-advisor / consultants	Scientific expert	Priv. company	NGO	Politician	Level				Type				Sum all					
Local /municipal								River basin	State / regional	National	Agriculture	Environment	Water mgmt.	Cultural heritage	Other						
1						3		1		6		2		3							10
2	3	L, G	2			3				3	3	1	1				3				15
3a	24	G; VI	1	5				4		2	2			3			3				37
3b	5	G	3					1	3	2		1	1	3			1				18
4	1	Mixed	8	1	1	1			1					1							31
5	8	L, R, Other	3	2	1	3	2	7	2	3	8										27
6a	6	Other	1		3	1	6	8	3	4	5										25
6b	6	VI, G	5	4		1		3		7	2		1	8			3				27
7			7	4	4	1	1	1	5	4											27
8	5			10	4																19
9	2		2	3	4	5	4	4		7		1	2	4							19
10	12	G	11	6	1			24	2	5	2										39
11	8	G	5	2	1			3	3	1		1		3			3			3	23
12	12	G	1	2	3	2		11	4	2	2	7	2	11			7				28
13	1	L						2		1	12	3	5						2		16
14	6	G, L	4	5	1		1	15		5	5										27

¹² Letters refer to types of production: F – forest; G – grains; L – livestock; R – root crops; T – tuber; V – vegetables; VI - vineyard

A.3 Logg of stakeholder interactions for 2023¹³

Case nr.	Total nr. interactions logged	Location			Duration			Type of meeting				Type of engagement					Link to WP						
		Physical	Virtual	Phone	~1 hour (or less)	1-4 hrs (half day)	>4 hrs (whole day)	MARG workshop	Bilateral meeting	External workshop	Other	Open disc.	Focus group	Semi-struct. interviews	questionnaire	Other	1	2	3	4	5	6	7
1	5	4	1			5			5					5			5						
2	4	2	2		1	3			2	2				4			4						
3a	7	2	1	4	5		2		4		3	3		1		3	1		6				
3b	9	1	1	7	8	1			7		2	3		2	1	3	2		7				
4	6	1		5	5	1			5	1				5		1	2		4				
5	8	3	2	3	3	3	2	1	2		5		1		7		1	4	3				
6a	4	1	2	1	1	3		1			3	3	1				1	3					
6b	5	1		4	5				5					1		4	1	1	3				
7	6	1	5		6				6					6			2	2	2	1			
8	3	3				3			1	1	1	1	1			1	1	1	1				
9	6	3	3			6					6	4			1	1		1	5				
10	19	4	13	2	13	4			2	1	14	1			14	2	7		1				0
11	9	3	2	4	6	2	1		7		2			1		9	6	3					
12	6	2	1	3	4	2			4	2				3		1	2	1	3				2
13	5	3	2		2	3			2	3				5			3	1					1
14	4	4				2	2		1	3				1		3	3						

Case nr.	Participant category														Tot. number of stakeholder interactions	Total number of participants		
	Authority participants																	
	Level							Type										
	Farmer	Production type ¹⁴	Agri-advisor / consultants	Scientific expert ¹⁵	Priv. company	NGO	Politician	Local /municipal	River basin	State / regional	National	Agriculture	Environment	Water mgmt.	Cultural heritage	Other		
1	3	G	2			2				1		x				x	5	8
2	15	N/A	1	3								x					4	18
3a	5	N/A	1	1		1						x					7	8
3b	5	N/A	2	1		1				1		x		x			9	10
4	18	O						5		4			x	x		x	6	27
5	15	G, L, V, O	2	14								x					8	31
6a	30	O	8	16								x		x			4	54
6b				2						4	2	x		x			5	8
7			1	3	2							x					6	6
8	12	V	5	3								x					3	20
9								4		2			x	x			6	13
10	25	G		11				3		2	1	x				x	17	44
11			1	1	3			3	2			x		x			9	10
12	14	G		4	3			3	3	1	2	x					6	30
13	2	L	1	12	2	12		8		2		x	x	x			5	39
14	2	X	4	19	87	72		11	3	8	8	x					4	216

¹³ There are unclarities regarding the total number of participants in the different cases, which makes comparison challenging. This is due to the format of the logging forms, which makes it difficult to distinguish individuals,

A.4 Logg of stakeholder interactions for 2024¹⁴

Case nr.	Total nr. interactions logged	Location			Duration			Type of meeting				Type of engagement					Link to WP								
		Physical	Virtual	Phone	~1 hour (or less)	1-4 hrs. (half day)	>4 hrs. (whole day)	MARG workshop	Bilateral meeting	External workshop	Other	Open disc.	Focus group	Semi-struct. interviews	questionnaire	Other	1	2	3	4	5	6	7		
1	2	2				2		1	1						1	1			1	1					
2	5	4	1		1	4		1	4					3				3							
3a	5	3		2	4	1		1	4						4	1				3					
3b	3	1		2	2	1		1	2						2	1				3					
4	9	1		8	8	1		1	8					1				8			2				
5	8	8				7	1	1	6		1			6	1			1		1		6		1	
6a	1	1				1		1							1					1					
6b	8	2	4	2	5	2	1	2	6						1			7	5	1		1		1	
7	2	1	1		1		1	1	1						1	1				1		1			
8	7	6	1			2	5	1		1	5			6	1					3					
9	3		3		3						3							3				3			
10	5	2	2	1	4	1		1	3		1				1			4	3			1		1	
11	5	1	1	3	3	2		1	4						3	2				5					
12	3	3			1	2			2		1				1					2			2		1
13	4	1	3		2	2		1	2		1				1			3			1		3		
14	4	4					4		4						4						4				

Case nr.	Participant category															Tot. number of stakeholder interactions	Total number of participants		
	Authority participants																		
	Level							Type											
	Farmer	Production type ^{2,3}	Agri-advisor / consultants ^{2,3}	Scientific expert ^{2,3}	Priv. company	NGO	Politician	Local /municipal	River basin	State/reg.	National	Agriculture	Environment	Water mgmt.	Cultural heritage	Other			
1		N/A	1				1	2	3			x	x	x			2		7
2	5	G, L	5	2								x					5		12
3a	7	G	4		8		4					x	x	x			5		10
3b	4	G	4					4				x	x	x			3		12
4	4	G, V	9		3		10	2					x	x			9		28
5	1	F, L, G		2			3					x	x				8		13
6a		N/A	2			3	2					x	x				1		3
6b		N/A	5	25			1		29	34		x	x	x			8		104
7		N/A	4	1		2	2	3	4			x	x				2		15
8	4	G	25			142	4	2	24	13	6	x	x	x			7		212
9	7	L, O	2									x					3		7
10	7	G	6	6	2		3	3	1	1		x	x	x			5		24
11	4	G	7	19	9	1	3					x	x	x			5		77
12	4	N/A					3	4	1	1		x		x			3		13
13	1	L, O	4	7	2	3	5	1	1			x	x	x			4		27
14		N/A	6	25	4	2	2	37	1	29	8	x	x	x			4		114

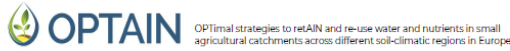
¹⁴ The total number of logged interactions differs from the number of links to WPs, since some logged multiple WP links per interaction (other case studies have not logged the link to WPs). There is some unclarity regarding the total number of participants in the different cases, which makes these numbers not directly comparable. Some participants resented more than one category (e.g. one person representing agri-advisor and authority).

B. Interactions different case studies (range)

Case number	Range in the number of annual interactions
1	2-13
2	4-15
3A	5-56
3B	6-56
4	6-100
5	8-27
6A	4-25
6B	5-56
7	2-132
8	1-19
9	3-19
10	5-52
11	5-56
12	3-28
13	4-16
14	4-4

C. Template stakeholder questionnaires

C.1 MARG workshop questionnaire template from 2024



Multi-actor Reference Group workshop 2024

Questions for participants at the workshop

We kindly ask you to fill out the few questions below regarding participation in the OPTAIN project. The questions are similar to those prepared for the previous MARG workshop because we would like to monitor development of your perspectives regarding: (i) that the relevance of topic addressed, and the stakeholder workshops, (ii) the situation of trust, and (iii) that there is added value for you to take part in these MARG workshops / meetings. The questionnaire is fully anonymous, and the data will be used for the OPTAIN project. You can find more information on the OPTAIN project website at www.optain.eu. Thank you for your time and valuable input, The Norwegian Institute for Water Research and the case study leader's institution (OPTAIN project partners)

1. Relevance

- a) Do you think that problems related to: flooding, drought, nutrient runoff and/or erosion are relevant to address in your catchment? (same question as after workshop 2022)

	Very relevant	Somewhat relevant	Not so relevant
Flooding			
Drought			
Nutrient runoff			
Erosion			

- b) Do you see any change in the problems over the last 1-2 years?

	More relevant	Same as before	Less relevant	I don't know
Flooding				
Drought				
Nutrient runoff				
Erosion				

- c) If you have changed your view on relevant problems, can you briefly explain why?

2. Trust in the project and the participatory approach

- a) Do you trust that the project will bring useful knowledge to address the environmental challenges related to flooding / drought / nutrient runoff and/or erosion?

Yes	To some degree	I don't know	No

- b) Do you trust that your opinion will be taken into account?

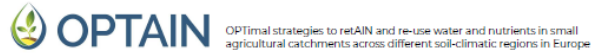
Yes	To some degree	I don't know	No

- c) Has this changed during the course of the project? Yes ___ / No ___

- d) If yes, why? _____

3. Added value for participants

- a) Do you find it valuable to participate in the projects stakeholder workshops?



Yes	To some degree	I don't know	No

- b) What are the benefits for you when participating in this workshop?

Access to information	I learn about research on effective measures	Meet other farmers	Meet experts and authorities	Networking	I don't know exactly, but I like it

- c) Other reasons that you would like to specify? _____

4. Obstacles and options

- a) Were there any challenges related to your engagement in the workshop / the project?

No challenges	General time constraints	Inconvenient time for the meeting	Inconvenient place for the meeting	Difficult to understand the model approach	Difficult to understand the "researcher language"	I don't think that my input will matter	Others (please specify)

- b) Would it be helpful for your engagement in the project with the following?

Allow virtual engagement	A more convenient time	A more convenient place	Simpler / easier language by the presenters	Bilateral meetings or in small groups	More regular updates after my inputs and project progress	I don't know

- c) Other comments? _____

General questions

How many OPTAIN workshops have you attended? _____

How many physical meetings? _____ / How many virtual meetings? _____

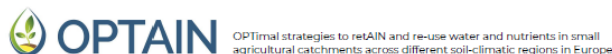
Satisfaction level of this meeting:

Very high ____, High ____, intermediate ____, low ____, very low ____.

Filled by Case study leader

Date....., Place....., Country.....

C.2 MARG workshop questionnaire template from 2025



Multi-actor Reference Group workshop

Questions for workshop participants

We kindly ask you to fill out the few questions below regarding participation in the OPTAIN project. The questions address added value for stakeholders from engaging in the OPTAIN project.

The questionnaire is fully anonymous, and the data will be used for the OPTAIN project. You can find more information on the OPTAIN project website at www.optain.eu. Thank you for your time and valuable input!

Kind regards,

The Norwegian Institute for Water Research and the case study leader's institution (OPTAIN project partners)

Added value of engaging in OPTAIN

1. Did you find it valuable to participate in the project's stakeholder workshops?

Yes	To some degree	No	I don't know

2. How did you benefit from taking part in the (MARG) workshops? (you can choose more than one option)

Access to information	Meeting other farmers	Meeting experts and authorities	Networking in general	Opportunity to raise concerns / voice my opinion	I don't know exactly, but I like it	No benefits

Other comments on the benefits of participating (optional):

Access to information when engaging in OPTAIN

3. What type of information did you receive by participating in the project workshops and meetings?

Information on environmental status and challenges	Access to scientific results on effective measures	Effect of measures for water and nutrient retention	Effects of NSWRM for socio-economic issues	Technical Implementation of measures	Access to information about farming practices	Information on modelling approaches to address effects of measures	Information on CAP	Information on environmental policy	Other policy issues	Other information /please specify

Other comments on the information you received by participating (optional):

4. Are there any of the insights from the workshops that you will use / take into account in your own work or other occasions? (If yes – please specify)

Information on environmental pressures	Effect of measures for water and nutrient retention	Effects of NSWRM for socio-economic issues	Technical Implementation of measures	Information on CAP	Information on environmental policy	Other policy issues	A general increased understanding different perspectives by stakeholders	No, I don't think I will use the workshop insights	Other information /please specify

Comments: _____

5. In what type of occasions can information received from OPTAIN be useful?

For planning and practical farming and/or land management work	In general discussions with other actors	When discussing with farmers	When discussing with local authorities	Other occasions / please specify

Comments: _____

General questions

How many OPTAIN workshops have you attended? _____

How many physical meetings? _____ / How many virtual meetings? _____

Satisfaction level of this meeting:

Very high ____, High ____, Intermediate ____, Low ____, Very low ____.

Information to be filled by the case study leader / OPTAIN partner:

Date....., Place....., Country.....

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