

Reports of the Finnish Environment Institute 21en | 2026

Catchment-based planning and digitalisation of water sector in Finland

Experts' insights

Alexandra Malmström, Mirjami Lantto Klein, Mia Pihlajamäki,
Lauri Ahopelto, Mika Marttunen, Marko Keskinen

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Built environment solutions

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Abstract

Catchment-based planning and digitalisation of water sector in Finland: experts' insights

This report presents the results of a study that was primarily directed at public sector actors in water-related tasks. The study addresses two broad themes: 1) the state of catchment-based planning in Finland, and 2) the current use of and needs for information, tools, and services among water sector professionals. The results are presented both for all experts collectively as well as clustered for key public sector actors, i.e. ELY Centres and municipalities. The study was conducted as part of the Finnish Academy–funded *Digital Waters* flagship project within Research Theme 5, "Transformative Water Management," in 2025.

The results show that the main challenges of integrating catchment-based planning are related to fragmented land ownership, lack of resources, as well as difficulties in reconciling differing goals and unclear divisions of responsibility. Catchment-based planning requires closer coordination among key authorities and stakeholders, more predictable and comprehensive funding, greater transparency in the information produced by different organizations, and closer cooperation among stakeholders. With regard to digitalization, the challenge is rather in fragmentation of different sources and tools, limited access to them, and insufficient expertise in using them. However, the development of data sources and services is a key prerequisite for effective water management and governance.

Better data, tools, and services can directly support tasks in the water sector by providing more targeted and comprehensive evidence, such as compiled and integrated datasets on biophysical phenomena coupled with societal information (land ownership and land use, regulation, organizational responsibilities, and/or other stakeholder information). In addition, improved modelling and simulation of the impacts of measures are needed, as well as the identification and prioritization of areas that are important for interventions in the water sector and other sectors. As the knowledge base strengthens and tools develop, public sector resources can be directed even more towards strategic work and closer collaboration with stakeholders.

Note: the study was carried out in 2025, prior to the reform of the state regional administration, which dissolved ELY Centres and transferred their functions to the newly established Economic Development Centres and to the Finnish Supervisory Agency.

Keywords: catchment-based planning, water governance, digitalization, data use, sustainability

Sammandrag

Avrinningsområdesbaserad planering och digitalisering i Finland: experternas insikter

Denna rapport presenterar resultaten från en undersökning som huvudsakligen riktade sig till aktörer inom den offentliga sektorn med vattenrelaterade uppgifter. Undersökningen behandlar två övergripande teman: 1) statusen för avrinningsområdesbaserad planering i Finland och 2) nuvarande användning samt behov hos yrkesverksamma inom vattensektorn gällande data, verktyg och tjänster. Resultaten presenteras både för alla experter och uppdelat enligt de centrala offentliga aktörsgrupperna, det vill säga ELY-centralerna och kommunerna. Undersökningen genomfördes som en del av den finländska Akademins finansierade flaggskeppsprojekt *Digital Waters*, inom forskningsämne 5 ”Transformativ vattenförvaltning” år 2025.

Resultaten visar att de största utmaningarna med avrinningsområdesbaserad planering hänger samman med splittrat markägande, resursbrist samt svårigheter att samordna olika mål och oklarheter i ansvarsfördelningen. Planering och genomförande baserat på avrinningsområden kräver bättre samverkan mellan centrala myndigheter, mer förutsägbar och omfattande finansiering, bättre transparens i den information som produceras av olika organisationer samt närmare samarbete mellan intressenter. När det gäller digitalisering ligger utmaningen inte i första hand i brist på information och verktyg, utan snarare i fragmenterade och svårtillgängliga av källor och verktyg samt otillräcklig kompetens. Utvecklingen av datakällor och tjänster är dock en central förutsättning för effektiv vattenförvaltning och vattenhantering.

Bättre data, verktyg och tjänster kan direkt stödja uppgifter inom vattensektorn genom att tillhandahålla mer riktad och mer heltäckande kunskapsbas, såsom sammanställda och integrerade data om biofysiska fenomen i kombination med samhällelig information (markägande och markanvändning, reglering, organisationers uppgifter och/eller annan intressentinformation). Dessutom behövs bättre modellering och simulering av åtgärdernas effekter samt identifiering och prioritering av områden som är viktiga för åtgärder inom vattensektorn och andra sektorer. När kunskapsbasen och verktygen förbättras kan det samtidigt frigöra resurser inom den offentliga sektorn för strategiskt arbete och samarbete med intressenter.

Nyckelord: avrinningsområdesplanering, vattenförvaltning, digitalisering, användning av data, hållbarhet

Tiivistelmä

Valuma-aluesuunnittelu ja digitalisaatio Suomessa: asiantuntijoiden näkemyksiä

Tämä raportti esittelee tulokset tutkimuksesta, joka kohdistettiin pääasiassa vesialan julkisen sektorin toimijoille. Tutkimus käsittelee kahta laajaa teemaa: 1) valuma-aluelähtöisen suunnittelun tila Suomessa sekä 2) vesialan ammattilaisten nykyinen tiedon, työkalujen ja palveluiden käyttö ja tarpeet. Tulokset esitetään sekä kaikkien asiantuntijoiden osalta että eriteltyinä keskeisten julkisen sektorin toimijaryhmien (silloiset ELY-keskukset ja kunnat) mukaan. Tutkimus tehtiin vuonna 2025 verkkopohjaisen kyselyn ja validoivan työpajan avulla. Tutkimus toteutettiin osana Suomen Akatemian rahoittamaa Digitaaliset vedet -lippulaivaa ja sen tutkimusteemaa 5 ”Muuntautuva vesienhallinta”.

Tulokset osoittavat, että valuma-aluelähtöisen suunnittelun suurimmat haasteet liittyvät maanomistuksen pirstoutuneisuuteen, resurssipulaan sekä erilaisten tavoitteiden yhteensovittamiseen ja vastuunjaon epäselvyyksiin. Valuma-aluelähtöinen suunnittelu ja toteutus edellyttävät tiiviimpää koordinointia keskeisten viranomaisten välillä, nykyistä ennakoitavampaa ja kattavampaa rahoitusta, eri organisaatioiden tuottaman tiedon parempaa läpinäkyvyyttä ja tiiviimpää yhteistyötä sidosryhmien kesken. Digitalisaation osalta haasteena ei niinkään ole tiedon ja työkalujen puute, vaan niiden pirstaleisuus, rajallinen saatavuus ja puutteellinen osaaminen. Tietolähteiden ja -palveluiden kehittäminen on kuitenkin keskeinen edellytys tehokkaalle vesienhoidolle ja -hallinnalle.

Parempi data, työkalut ja palvelut voivat suoraan tukea vesialan tehtäviä tuottamalla kohdennettua ja aiempaa kattavampaa tietopohjaa, kuten koottuja ja integroituja aineistoja biofysikaalisista ilmiöistä yhdistettynä yhteiskunnalliseen tietoon (maanomistus ja maankäyttö, sääntely, organisaatioiden tehtävät ja/tai muu sidosryhmätieto). Lisäksi tarvitaan toimenpiteiden vaikutusten parempaa mallintamista ja simulointia sekä toimenpiteiden kannalta tärkeiden alueiden tunnistamista ja priorisointia vesialalla ja muilla sektoreilla. Tietopohjan vahvistuessa ja työkalujen kehittyessä, julkisen sektorin resursseja voidaan suunnata entistä enemmän strategiseen työhön ja sidosryhmien kanssa tehtävään yhteistyöhön.

Huom: tutkimus on toteutettu vuonna 2025 ennen valtion aluehallinnon uudistusta, joka lakkautti ELY-keskukset ja siirsi niiden toiminnot elinvoimakeskuksiin ja lupa- ja valvontavirastoon.

Asiasanat: valuma-aluesuunnittelu, vesienhallinta, digitalisaatio, tiedon käyttö, kestävyys

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Highlights of this report:

- **Catchment-based thinking is common in the water sector**
- **The biggest challenges for catchment-based planning are the fragmentation of landownership, lack of resources, as well as reconciling different goals and unclear division of responsibilities**
- **Catchment-based planning would be further enabled through better coordination among key authorities, more predictable and comprehensive financing, transparency of information produced by different organisations, and closer stakeholder collaboration**
- **Fragmentation of, limited access to, and limited expertise in the use of existing data sources and tools are common challenges in catchment-based planning**
- **Better data, tools and services can directly support water-related planning by producing tailored and more comprehensive evidence**

Preface

This research has emerged from two premises. First, there are significant efforts to integrate the principles of catchment-based planning into various tasks in water sector in Finland. These efforts are, among others, guided by the Finnish Government's *Roadmap for Catchment Planning 2030* (2024), which defines principles and measures for multi-objective river catchment-based planning and its mainstreaming. Second, digitalisation of water resources management is advancing rapidly in Finland, as reflected in increased research and development funding. This study examines how the needs of water sector in catchment-based planning can be better supported with digital services.

This research has been conducted as part of the "Digital Waters" (DIWA) flagship funded by the Research Council of Finland. DIWA is a research ecosystem that seeks to develop new digital innovations for water governance and management in Finland. DIWA aims to ensure the societal impact of the research by identifying and taking into account the needs of stakeholders and by linking to ongoing water management processes, such as the implementation of the Roadmap for Catchment Planning 2030, water management planning and implementation, and flood risk management. Through advancing water-related digital data, tools and services, DIWA promotes "source-to-sea" water governance, with the aim of improving water management at river catchment scale. The source-to-sea approach forms the basis for the established principles of catchment-based planning, an approach that is currently mainstreamed in the Finnish water sector.

This study presents the results of an expert survey and a workshop on "Catchment-based planning" held during Flood, Dam and Water Management Days, which took place in 2025. The survey has been developed in collaboration with the experts from Ministry of the Environment, Ministry of Agriculture and Forestry, ELY Centres, and Finnish Environment Institute. We thank Tapio Tuukkanen, Antton Keto, Milla Torkkel, Markus Saari, Mari Lappalainen, Anne-Mari Rytkönen, Pasi Valkama and Sini Olin for their comments on the survey as well as for their help in distributing the questionnaire to relevant water professionals. We thank Petri Nissinen, Eeva Nuotio, Mari Lappalainen, and Pasi Valkama for facilitating the workshop during the Flood, Dam and Water Management Days as well as Vilma Ristikangas, Venla Isomäki, and Tiia Westerberg for their assistance in data collection during the workshop. We thank all DIWA colleagues for their support in carrying out this research. Finally, we sincerely thank all survey respondents and workshop participants for participating in this research.

Helsinki, April 2026
Authors

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1 Introduction

Catchment-based planning, as the name suggests, is planning based on delineated catchment areas, with a particular focus on water-land nexus and multi-objective planning. The principle is not new and takes roots from the established Integrated Water Resources Management and River Basin Management approaches (Räsänen et al. 2026). The notion is that water governance and management should be based on the catchment areas and should not be limited to water sector only, but extend to agriculture, forestry, and other land use. Further, environmental governance should tackle multiple challenges simultaneously, including water quality and quantity, biodiversity loss, ecosystem deterioration, climate change adaptation and mitigation. This means that catchment-based planning principles need to be mainstreamed beyond the water sector.

In Finland, catchment-based planning is steered by the *Roadmap for Catchment Planning 2030* (2024), which defines principles and measures for multi-objective river catchment-based planning. The roadmap highlights that catchment-based planning should extend beyond land use and ownership borders and reconcile multiple views and interests. The Roadmap particularly focuses on steering catchment-based planning as a means to respond to the challenges of climate change mitigation and adaptation (Rytkönen et al. 2024).

The study was developed with the aim to gain perspectives on catchment-based planning and digitalisation from the Finnish water sector professionals, particularly in the public sector. The key aims of the study were:

1. to inquire into the current state of and needs in catchment-based planning in the water sector, and
2. to better understand the current practices and needs regarding digital information sources, services, and tools in the water sector.

This report first presents methods and materials used to conduct the study. Results start with the findings on the current status of catchment-based planning and management in the water sector. Next, challenges and enablers of integrating catchment-based planning are examined, followed by the current practice and future needs regarding digital information and services. Finally, conclusions elaborate on the findings and offer key messages.

2 Methods & materials

This study has been conducted using an online survey and a workshop to validate, deepen, and contextualize the results. The study was targeted mainly at the public sector actors involved in water management and planning at the regional and municipal levels, complemented by actors from other sectors (research institutions, private sector, consultancies, water associations). Thus, the key actors in the public sector are municipalities and regional authorities.

The survey has been carried out in 2025 prior to the reform of regional administration that took place from January 1st, 2026. At that time, the ELY Centres were responsible for advancing the implementation of national regulation at the regional level. There were 15 ELY Centres in Finland, and their administrative boundaries spanned across regional (Maakunta) boundaries, and across multiple river catchments. Central functions of the ELY Centres in relation to water included:

- supervision and steering of national regulation of inland waterways (ensuring that water levels and flows are in line with the objectives in water use and state of the environment);
- safety of dams;
- restoration of water areas by steering project planning and implementation in co-operation with municipalities and other organisations;
- flood protection and prevention (through encouraging construction outside flood zones and carrying out preventative measures during floods);
- supervision of water supply, guidance of planning, and targeting of financial support within own areas.

The municipalities, in turn, are responsible for:

- the organisation and development of water supply;
- sewerage;
- pluvial (stormwater) flooding;
- waste management;
- good state of environment[1].

The survey was conducted in Finnish language using Webropol (see Annex 1) in June-August 2025. The survey was distributed through several channels: 1) the networks of the Ministry of Agriculture and Forestry and The Ministry of Environment to experts working on water-related issues; 2) participants of the course "Catchment-based water management planning" organised by ELY Centres in spring 2025; 3) to the municipalities by the Council of Finnish municipalities; and 4) by the Finnish Environment Institute to water experts. The survey questions can be found in Annex 1. The answers were analysed using Webropol statistical tools for descriptive statistics (aggregation, clustering).

The survey collected 51 response, which were clustered into groups based on the organisations' role and capacity in planning & implementation (Table 1). ELY Centres' (Centre for Economic Development, Transport, and the Environment) answers are grouped with the answer from the ministry, as ELY Centres were responsible for advancing the implementation of national regulation at the regional level. Similarly, municipalities are grouped with the regional council of municipalities, as both perform functions at the

[1] https://www.localfinland.fi/functions-municipalities-and-joint-municipal-authorities

municipal level. Multiple responses were allowed from any given organisation as the survey invited respondents with different water-related functions.

Table 1. Number of responses, clustered into actor groups

Group	Organisation	Nr. of responses	Total
National / regional level (ELY Centers)	ELY Centres (10)	13	14
	Ministry (1)	1	
Municipalities	Municipalities (16)	16	17
	Regional council (1)	1	
Water associations	Water associations (3)	9	9
Research and education	Universities (2)	2	4
	Research institutes (1)	2	
Private sector, sectoral organisations & others	Private companies, consulting	3	7
	Associations & sectoral organisations	3	
	Others	1	

Respondents were also asked which areas their tasks are related to. They were allowed to select multiple options, as their job descriptions may include a variety of responsibilities. Other tasks (12%) included duties related to fisheries, stormwater management, and water body restoration (Fig. 1).

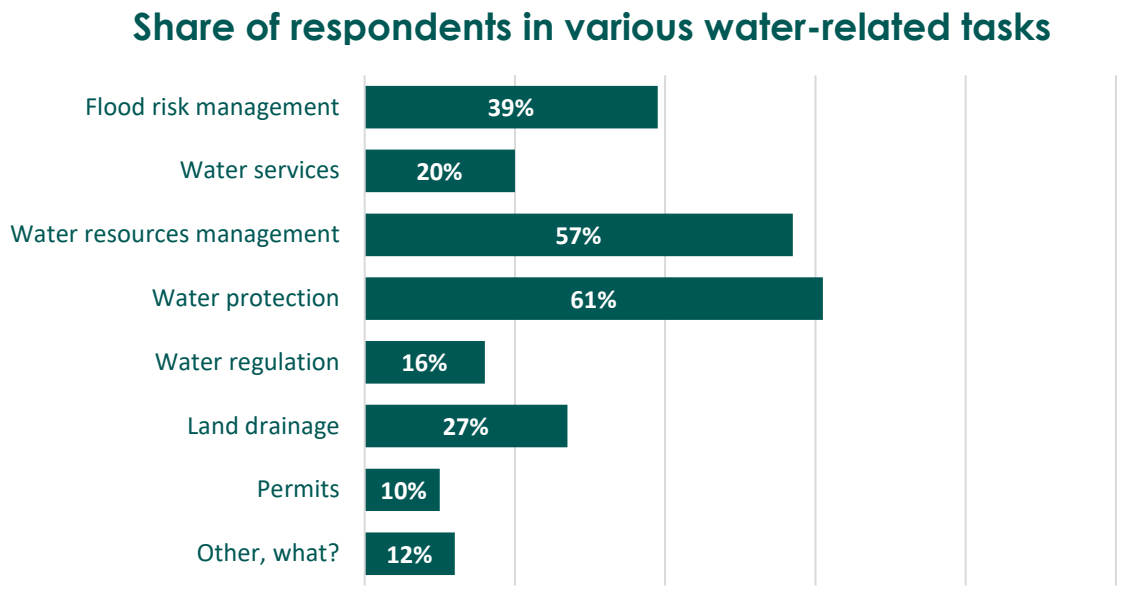


Figure 1. Respondents' tasks and areas of work. Most of the respondents, almost 60%, work in water resources management and water protection. Almost 40% of the respondents work in flood risk management. Other tasks, such as water services, water regulation, land drainage, as well as permits, belong to the work tasks of 10-25% of respondents.

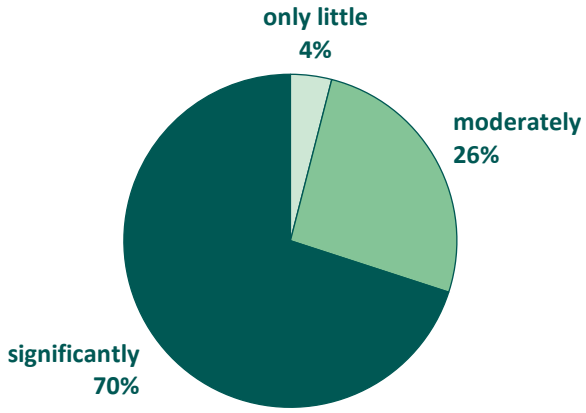
The survey results were presented and validated in the "Catchment-Based Planning" workshop, which was organized as part of the Flood, Dam and Water Management Days on November 12–13, 2025. The results were presented to the participants, after which they were divided into three groups. To support the group discussions, facilitators presented questions arising from the survey results, with the aim of validating and deepening the findings (Annex 2). Each group had one facilitator (experts from the ELY Centres and Finnish Environment Institute) and one note-taker. The discussions were recorded for data collection and analysis. Each group included 4–6 participants, and all survey respondent groups were represented, except for water associations.

3 Catchment-based approaches: current status

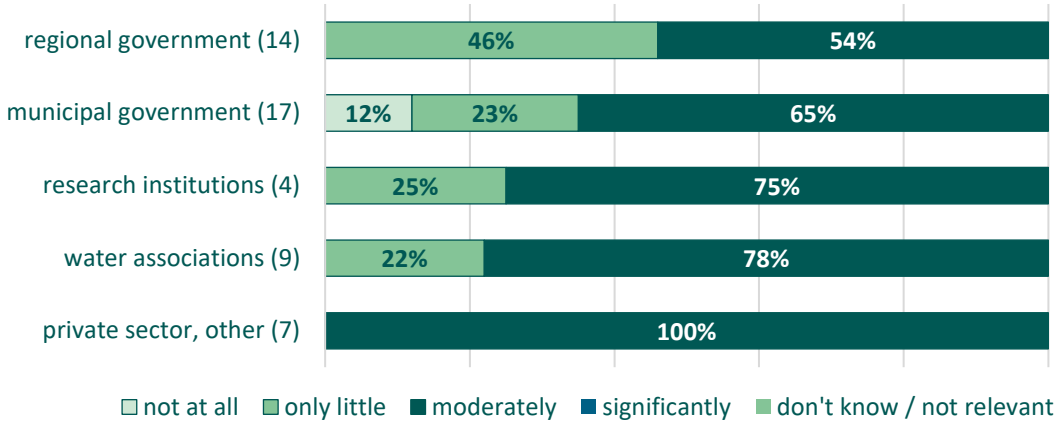
The study sought to understand the current state of and needs in river catchment planning and management in the water sector. This was done primarily through surveying related challenges and enablers, with both including the role of digital solutions.

The survey found that catchment-based thinking is already common in the water sector, and this finding has been validated in the workshop. It has to be noted, that there may be a potential bias due to survey and workshop self-selection and survey sampling channels (particularly, participants of the "Catchment-based planning" course, organised by the ELY Centres). When asked to estimate how much a catchment-based approach guides their work, 70% of respondents answered "significantly", 26% "moderately", and 4% said "only little" (Fig. 2a). There have been no responses "don't know / not relevant" nor "not at all".

a. All respondents



b. By actor group



Figures 2a and 2b. Responses to question: "How much does a catchment-based approach guide your work in the water sector?"

Among the key actor groups (ELY Centres and municipalities) catchment-based planning is a significant guiding approach (average score 3,5) with significance growing from regional level (46% responded moderately and 54% significantly) to municipal level (24% moderately and 65% significantly). While the

number of responses from other actor groups was small, most respondents noted that catchment-based planning guides their work significantly: research institutions (75%), water associations (78%) and 100% for the private sector, interest groups and consultancies (Fig. 2b). Only municipalities responded “only little” (12%) and there were no responses “not at all”. Note here that some of the respondents have been sourced through the “Catchment-based water management” course organised by ELY Centres in Spring 2025, and thus the sample maybe biased towards the participants particularly interested in catchment-based approaches.

Of all respondents, 75% reported having participated in the preparation of catchment plans (Fig. 3a). Of those 75%, most (82%) had been involved in general catchment area plans (Fig. 3b). Other responses (16%) concerned small-scale projects, for example, identification of hot spots of nutrient load or local water restoration, as well as planning of specific water management solutions.

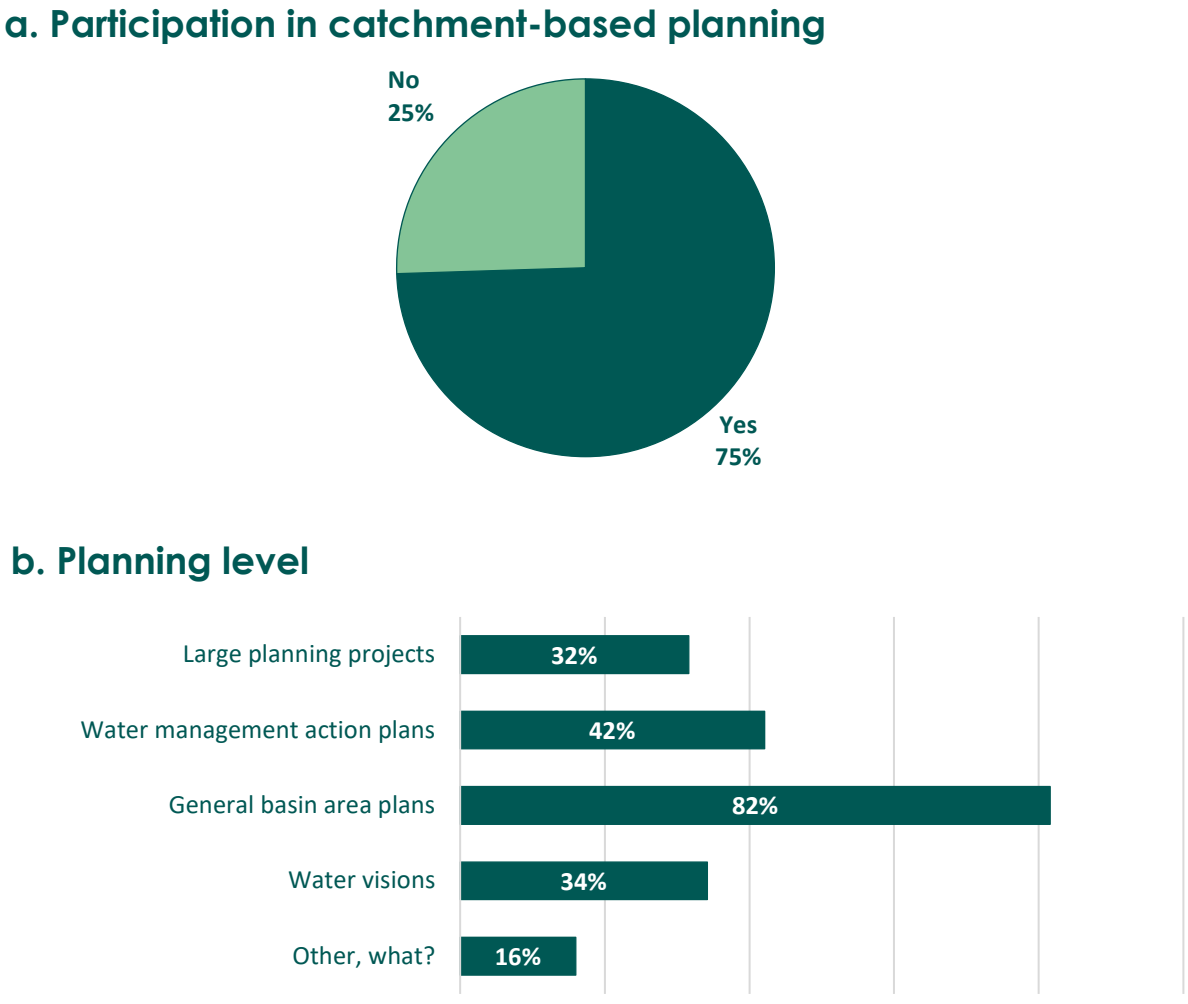


Figure 3a and 3b. Responses to questions: A) “Have you participated in the preparation catchment plans in your work?” and B) “If yes, at what level?”

In terms of key actors, there is not much difference in division, with both ELY Centres and municipalities having mainly participated in general basin area plans, followed by water management action plans and water visions (Fig. 4).

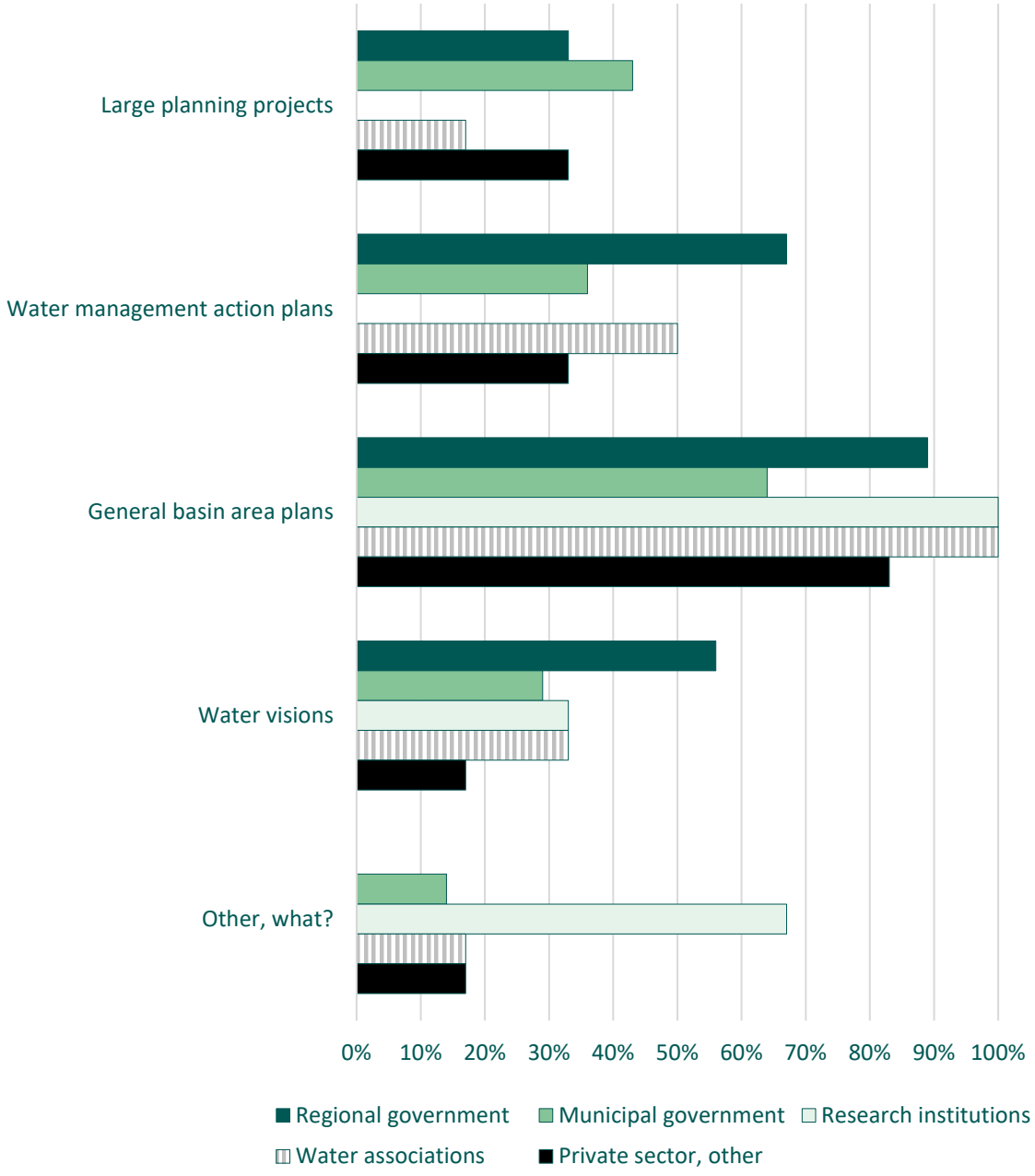


Figure 4. Actor-clustered responses to question: “At what level/what kind of catchment-based plans have you participated in”?

A key issue raised in the workshop was the scale of catchment-based planning and the need to clarify it, particularly when discussing the implementation of large-scale water management plans. More specifically, the scale varies depending on the actors and the questions involved (e.g. river basin district, sub-catchment area, etc.). It has been considered important that the principles of catchment-based planning are applied at multiple levels, ranging from individual wetlands up to the entire upstream catchment area. Scale is important from many perspectives, including resources, coordination and leadership responsibility, cooperation with landowners, multi-objective planning, and the diversity and extent of activities within the area.

4 Challenges and enablers of integrating catchment-based planning into water-related work

4.1 Challenges

The survey asked respondents to rate 15 key challenges of integrating catchment-based approaches into their work in the water sector. Most challenges were considered significant (Fig. 5) except for occupational limitations (37% of respondents reporting “no effect”).

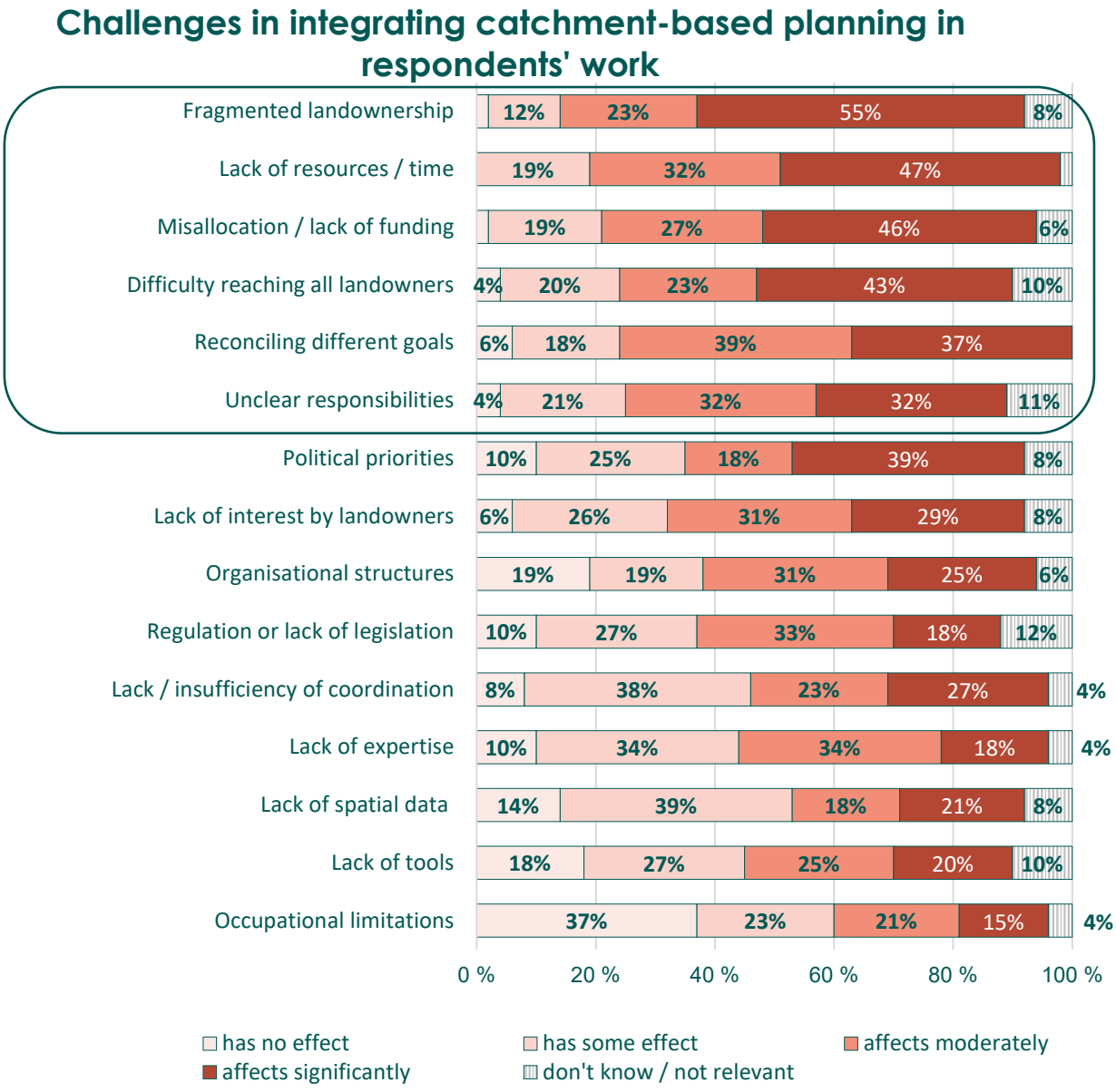


Figure 5. Responses to question: “Which of the following are key challenges in integrating catchment-based planning into your work on water issues?” Included inside the box are the challenges that averaged 3 (affects moderately) or more. Value labels under 3% have been removed from the chart for improved readability.

The most significant challenges (Fig. 5 in the box) are related to various aspects of water governance, and specifically to:

- **fragmented landownership** (with related communication and collaboration challenges),
- **lack of resources** (incl. funding and time), as well as
- **reconciling different goals and unclear division of responsibilities**.

Note, however, that the differences in ranking were rather small. These results were also validated in the workshop, where participants particularly emphasized the role of challenges related to fragmented landownership, the lack of resources, as well as insufficient coordination and unclear responsibility for advancing the work.

The biggest challenges for catchment-based planning/management are governance-related: the fragmentation of landownership (with related communication and collaboration challenges), lack of resources (incl. funding and time, and short-term projects), as well as reconciling different goals and unclear division of responsibilities

Answers to open questions have further shown that the challenges are closely interrelated, for example, the **lack of funding** did not only mean that there is not enough financial or human resources, but also that there is not enough time to establish long-term collaboration with stakeholders and land owners, as these processes are slow and strategic: "*Work related to catchment area management in my current position is based on engaging with landowners at a very early stage. In practice, this requires a great deal of trust and is therefore often slow. Since all development projects nowadays take place within a maximum timeframe of 2.5 years, it is often difficult to fit this process into that time window*". This also depicts the challenges associated with the **timescale of funded projects**, which are rarely sufficient to support the process of catchment-based management, from communication with landowners to execution of measures: "*Project financing instruments rarely support the possibility of designing AND building a site during the same project."*

At the same time, **fragmented landownership** was considered one of the key challenges. At the same time, close collaboration with landowners is considered a prerequisite for catchment-based planning by all respondents and workshop participants, for which sufficient time resources should be allocated from the start. Furthermore, workshop participants highlighted that diverging needs and goals of the landowners need to be taken into account. As a respondent from a water association exemplified in the survey answers, the site selection for water management measures (such as water retention) is complicated, because potential sites often span across several plots, of which some or all may have reluctant landowners: "*The perfect water management location and the perfect landowner rarely exist on the same plot, so compromises often have to be made in practical work*." Both survey respondents and workshop participants noted that communication with landowners is challenging also due to the difficulties in outreach: "*Reaching landowners in larger areas, for example for public or discussion events, is becoming more challenging as people's media habits have become fragmented. The local newspaper no longer goes to every hamlet, there are several social media channels, TV is not the right channel and no one knows everyone's email addresses. The regulation of the processing of personal data makes almost all 'mass communication' even more challenging, and sharing information digitally is clearly more rigid than before*." Finally, landowners might have disappointing experiences

with previous collaboration: "*Landowners certainly remember the existence of old plans and consider new initiatives to be equally unlikely to lead to anything concrete.*"

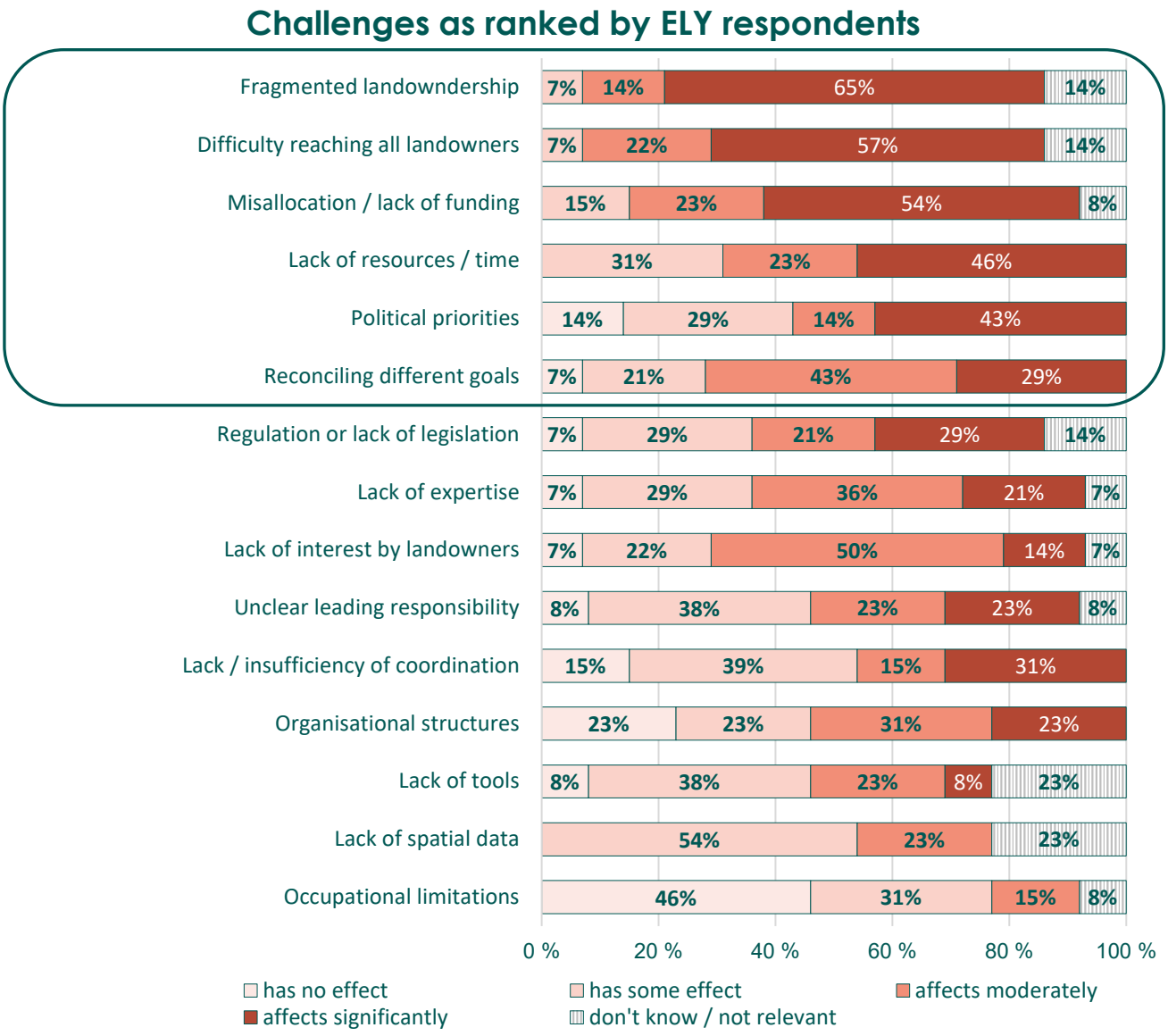


Figure 6. Challenges as ranked by the ELY Centres' respondents. Included inside the box are the challenges that averaged 3 (affects moderately) or more.

Lack or misallocation of resources has been ranked as the most significant challenge by all actor groups, and this is visible in multiple ways, as elaborated through the open answers. Lack of human resources combined with the short frames of water-related projects and data fragmentation makes it challenging for the actors to find and integrate multiple datasets and learn to use a multitude of services and tools: "*There is various data in several different sources and even available, but there is not enough time to learn these systems and familiarise oneself with their content*". It was also noted in the workshop that staff at municipalities and ELY-centres do not have sufficient time to undertake training alongside their other duties, and that internal training requires time that is not available in short-term projects.

Furthermore, **existing funding instruments** have also been criticised for supporting diverging goals rather than aiding their reconciliation: "*A significant problem is the bureaucracy of the current funding*

channels and the fact that they still guide sector-specific activities, not comprehensive river catchment planning. The funding channels in part even create obstacles to broad activities: for example, implementing a larger-scale two-stage channel project is practically impossible for a drainage association due to problems related to the eligibility of value-added tax. There are also problems with METKA, which in its current form does not promote peatland restoration, as the income from timber sales effectively cancels out the restoration subsidy provided through the incentive system. There are several similar problems related to the usability and functionality of funding channels — meaning that even the existing funding channels cannot be fully utilised."

For **actor-group specific insights**, we examined the challenges ranked by respondents from ELY Centres and municipalities. The most significant challenges identified by **ELY Centres' respondents** include fragmented landownership, difficulty reaching all landowners, and misallocation or lack of funding, resources and time (Fig. 6). Additionally, ELY Centres have brought forward the difficulty of changing the existing ways of working: *"It is difficult to change old practices and models. In theory, catchment area planning is viewed positively, but putting theory into practice and creating new operating models is challenging. Authorities also sometimes have difficulty operating at different interfaces. In other words, if it is not exactly within their own job duties, they do not take a position on it."*

Municipalities have ranked the lack of resources and time, reconciling different goals, and misallocation or lack of funding as the most significant challenges (Fig. 7). According to open answers, diverging interests are present both at the larger sectoral scale, as well as at the level of individual landowners. For example, municipalities highlighted that catchment-based planning should start with zoning and land use planning, otherwise, it is difficult to steer the issue in a holistic manner*: "Catchment-based planning starts with land use and zoning planning, and within our organisation, there should be more cooperation between different sectors. Zoning should identify the catchment areas already at the beginning of the planning process."; "Different goals guide actors and funding in opposite directions. For example, the goals of water management, climate policy, energy production, food supply, forestry and land use target the same river catchments".*

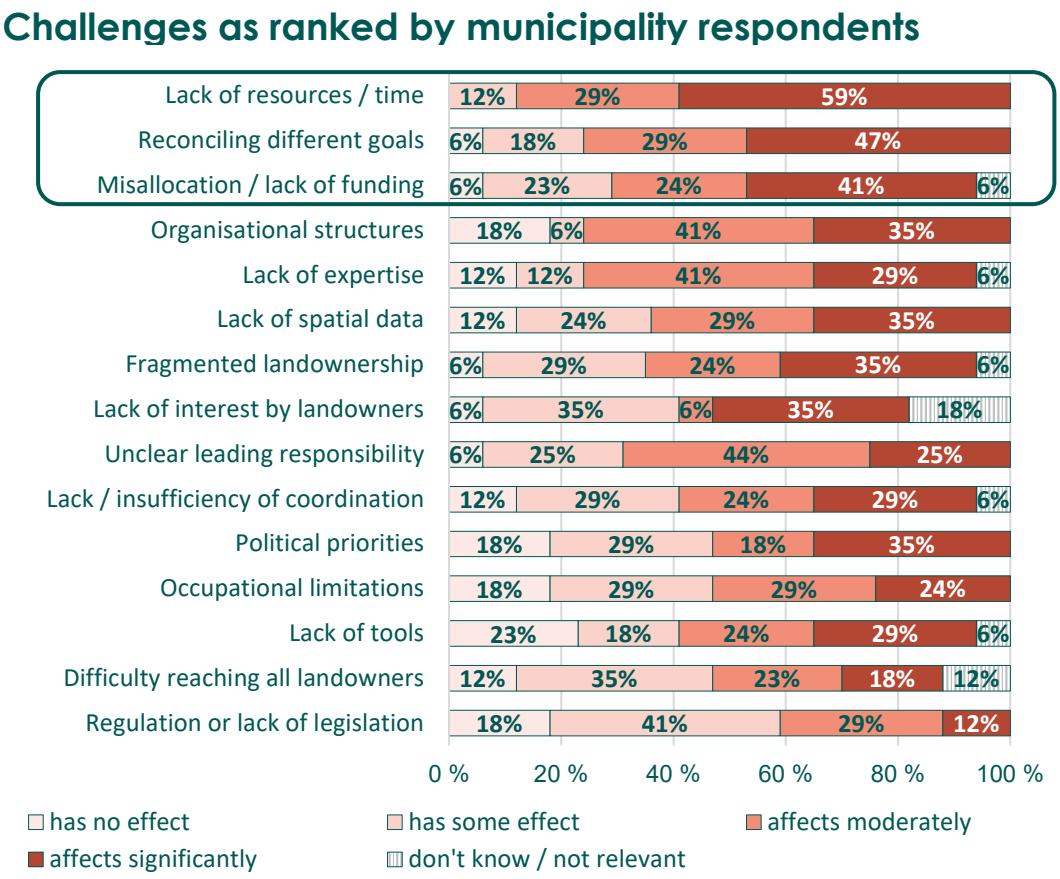


Figure 7. Challenges as ranked by the municipalities' respondents. Included inside the box are the challenges that averaged 3 (affects moderately) or more.

4.2 Enablers

The survey also asked respondents to rate 14 key enablers for integrating catchment-based planning into the respondents' own water-related work. Generally speaking, all of the enablers were rated relatively highly (Fig. 8), with the exception of changes in ways of working.

Mirroring the identified challenges, **open responses** regarding enabling factors highlighted **the importance of long-term funding** for ensuring effectiveness of measures: "*The most important thing is securing long-term funding for promoting the theme [catchment-based planning] and for broad coordination at the regional level, thereby ensuring local and regional knowledge and its preservation. The current funding channels practically change every 4 years, which enables fully productive work for a maximum of 2-3 years, taking into account the delays associated with funding systems. It is not possible to achieve impacts at catchment-scale with such time frames.*"

Catchment based-planning would be further enabled through better governance, including coordination between key authorities, more predictable and comprehensive financing, transparency of information produced by different organisations, and stakeholder collaboration.

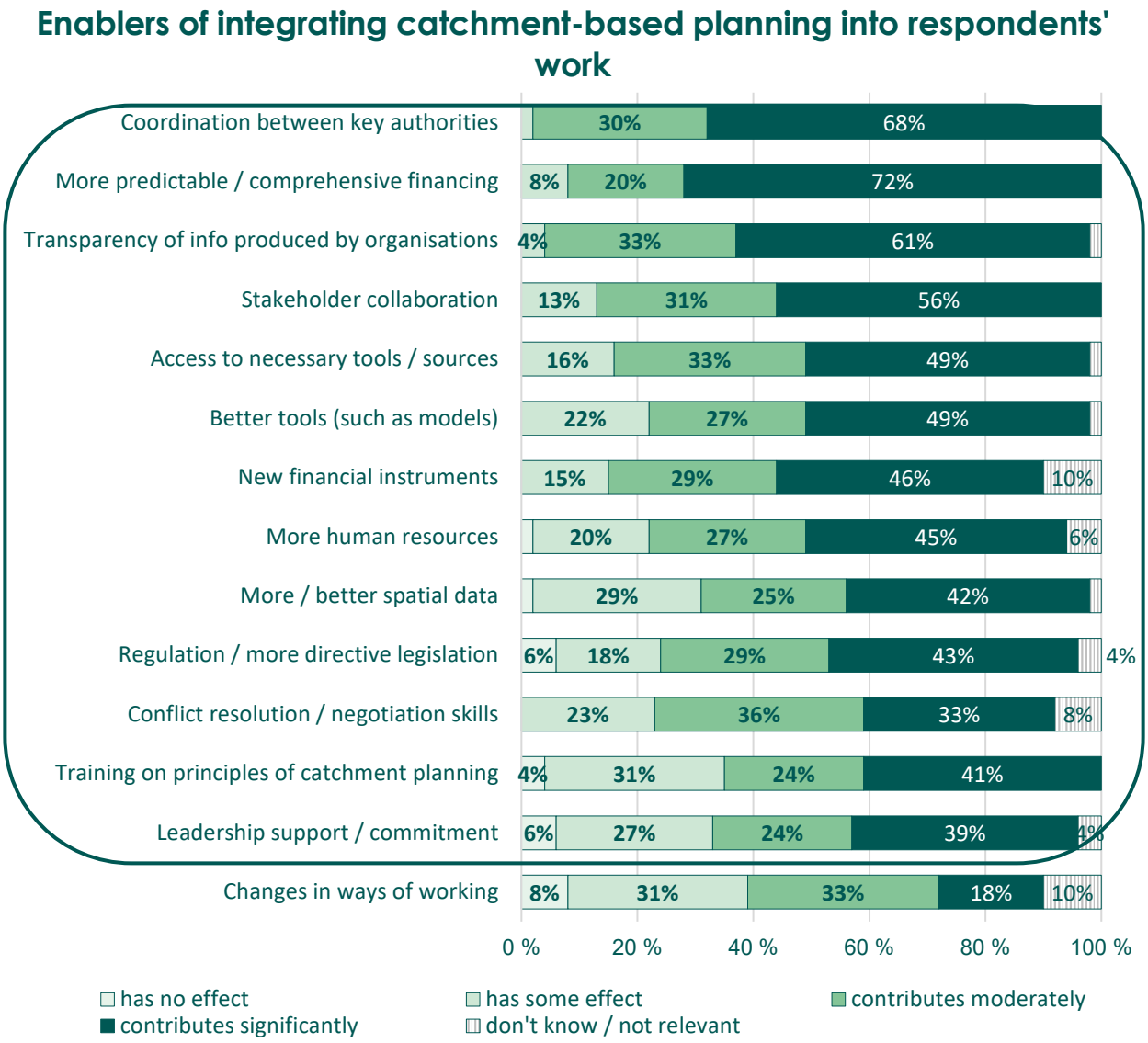


Figure 8. Responses to question: "Which of the following factors would promote the integration of catchment-based planning into your work on water issues?" Included inside the box are the challenges that averaged 3 (affects moderately) or more. Value labels under 3% have been removed from the chart for improved readability.

Open answers also illustrated the **complexity of enabling factors**, which require in-depth knowledge of the particular and localised issues affecting catchment-based planning and management. For instance, better coordination and collaboration requires the identification of key points of friction and responsibilities: "*National and regional cooperation networks seem to be working very well. Problems appear to arise especially at the intersections related to the guiding legislation and the activities of different authorities. If responsibilities and obligations are not clear, or if activities considered useful are not eligible for funding for one reason or another, nothing will happen. Continuous improvement of cooperation opportunities facilitates catchment-based planning*". Further, collaboration is not merely a matter of facilitating closer contact, but also of negotiating a culture of conflict: "*Closer cooperation and common goals between different organisations/stakeholders. We must get rid of confrontation and blame*".

Regarding factors that promote landownership-related aspects, the workshop emphasized the importance of **landowner-oriented planning**, which is reflected, for example, in understanding landowners' goals and priorities as many land-owners can have both forest and agricultural lands. In particular, the harmonization of funding instruments was highlighted, as navigating between different support schemes is

challenging, and many instruments support differing objectives, as was also noted in the survey responses.

For **actor group-specific** insights, we examined the enablers ranked by respondents from ELYs and municipalities. On average, ELY Centres prioritised enablers related to funding, stakeholder collaboration, coordination between key authorities, as well as transparency of information produced. All factors have been ranked as contributing significantly by at least some of the respondents (Fig. 9). In the workshop, experts from the ELY Centres highlighted the importance of integrated planning and internal cooperation. For example, water quantity and management, water quality, nature conservation, and regional economic development are often addressed separately, whereas broader, more holistic planning could encompass all of these and thereby better serve the catchment area by enhancing overall benefits and impacts.

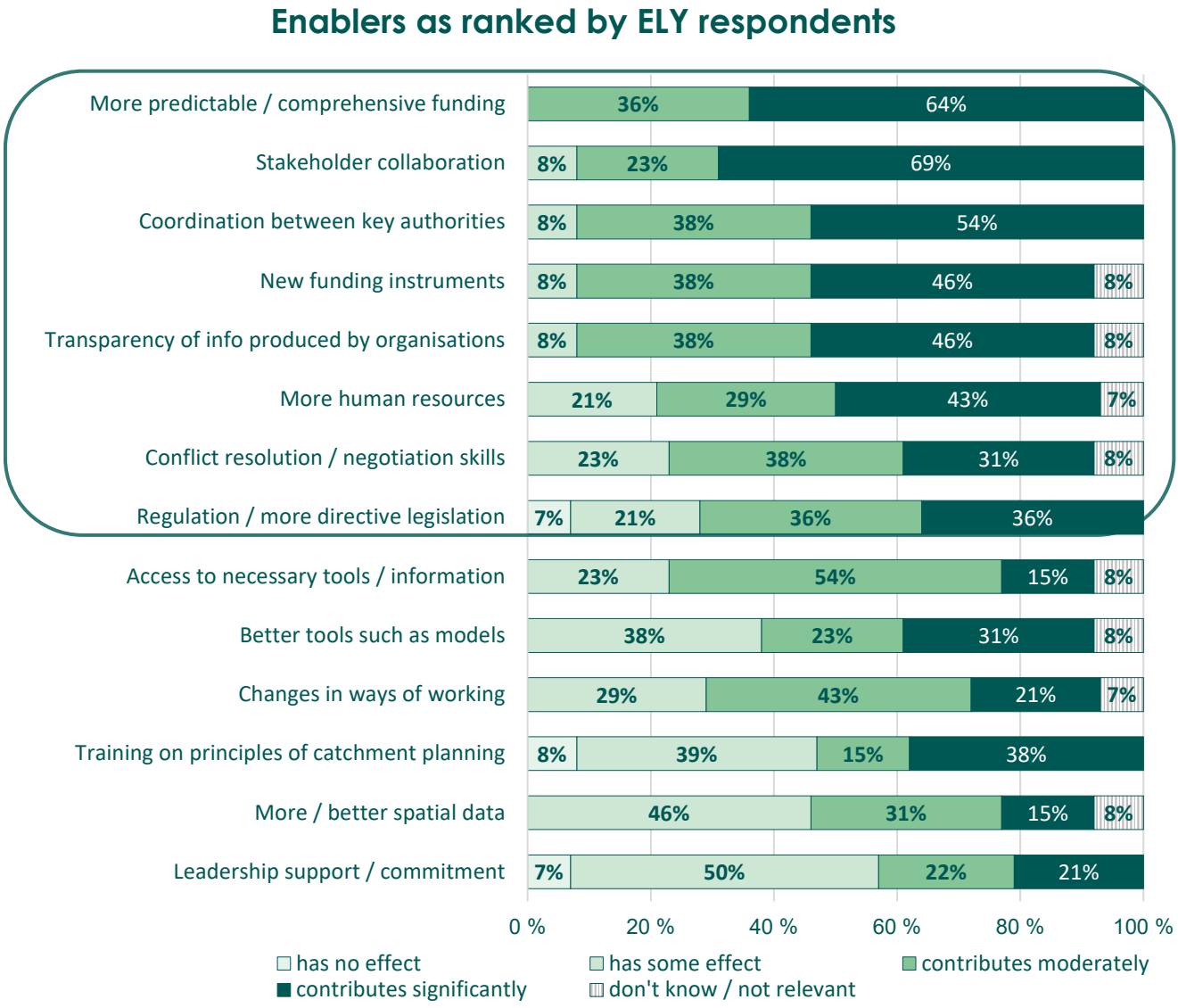


Figure 9. Ranking of the enabling factors by the ELY Centres. Included inside the box are the enablers that averaged 3 (contributes moderately) or more.

As for the **municipalities**, the coordination between key authorities is the most important factor, followed by transparency, availability and quality of information, data, and tools (see Fig. 10). It needs to be noted that the difference in rankings is quite marginal, and all factors have been ranked as having significant contribution by at least some respondents. The open answers highlight the multi-layered complexity of the highest-ranking enabler: *"Cooperation is strength, but reconciling different interests can be very difficult. By ensuring the long-term adequacy of personnel resources and funding, and through political commitment, it would be possible to launch projects that create real impact".*

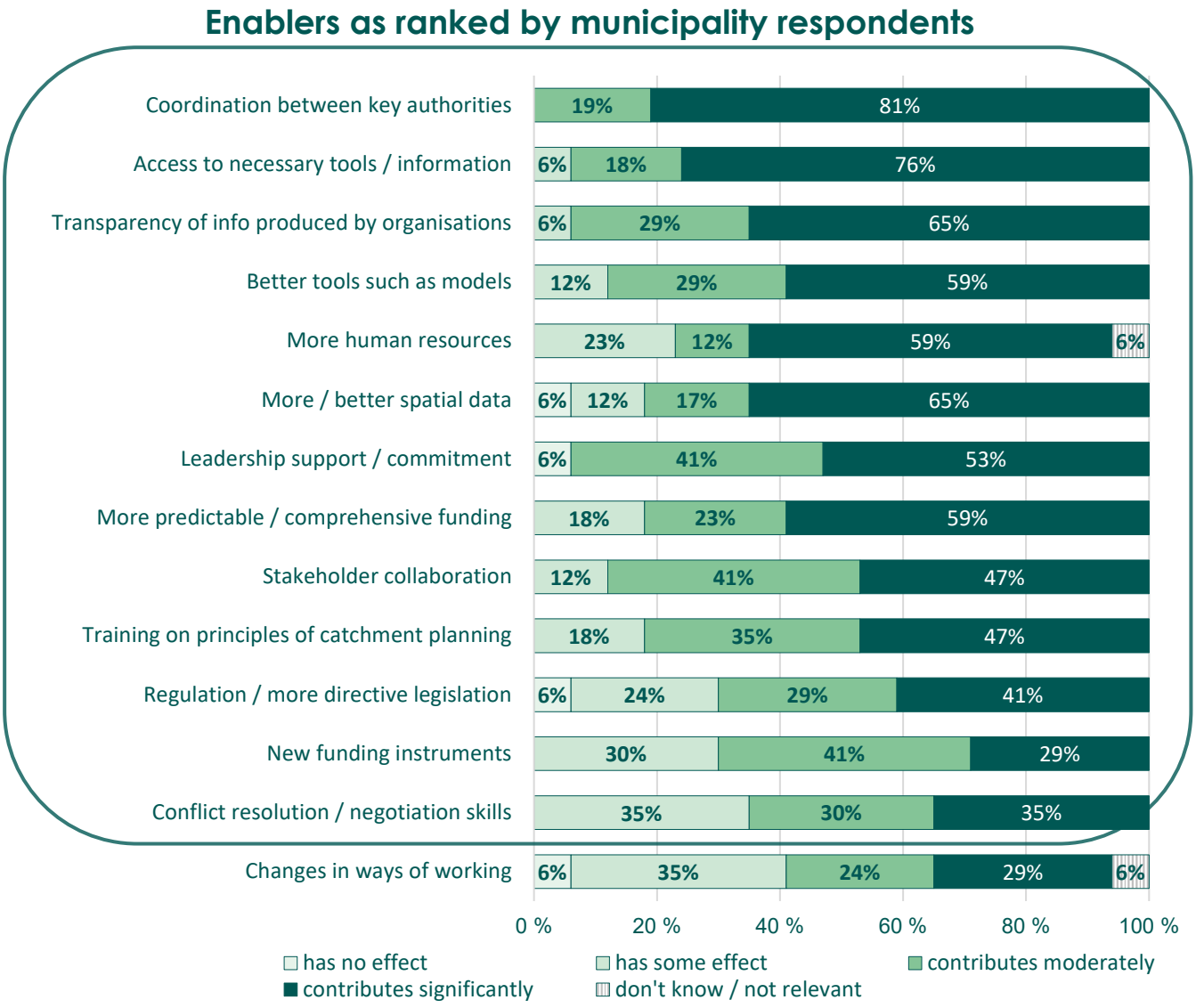


Figure 10. Ranking of the enabling factors by respondents representing the municipalities. Included inside the box are the enablers that averaged 3 (contributes moderately) or more.

While "more human resources" is ranked as a significant enabling factor, it is not only about hiring but also about the kinds of resources should be mobilised. The open answers especially highlight the need for diverse expertise: *"We need more personnel resources in order to utilise multidisciplinary expertise and conduct more in-depth analysis of the catchment area's hydrology, land use, and ecological status. Additional staff would enable faster and more efficient implementation of measures, systematic monitoring and evaluation, and better coordination between different actors (municipalities, ELY Centres, and associations)".*

4.3 Challenges and enablers related to information sources and services

The lack of data and tools was not ranked as a significant challenge by most survey respondents and workshop participants (Fig. 11a), with other challenges overshadowing their impact. However, respondents considered the availability of better data and tools to be a significant enabler (Fig. 11b).

Open responses clarified this result. Survey respondents and workshop participants specified that issues were less to do with the lack of data and tools, and more to do with **the fragmentation** of information sources and tools (especially for municipalities and water associations), **limited access** to data sources and tools, and **limited expertise** in the use of existing datasets and tools: "*There is a variety of data in several different sources and even available, but there is not enough time to self-study these systems and familiarise yourself with the content"; "Open spatial data is fragmented online and is very difficult to find and add. It requires expertise and dedication"; "The use of several modelling tools or services may require official status, hence not all the necessary information is available for planning."*

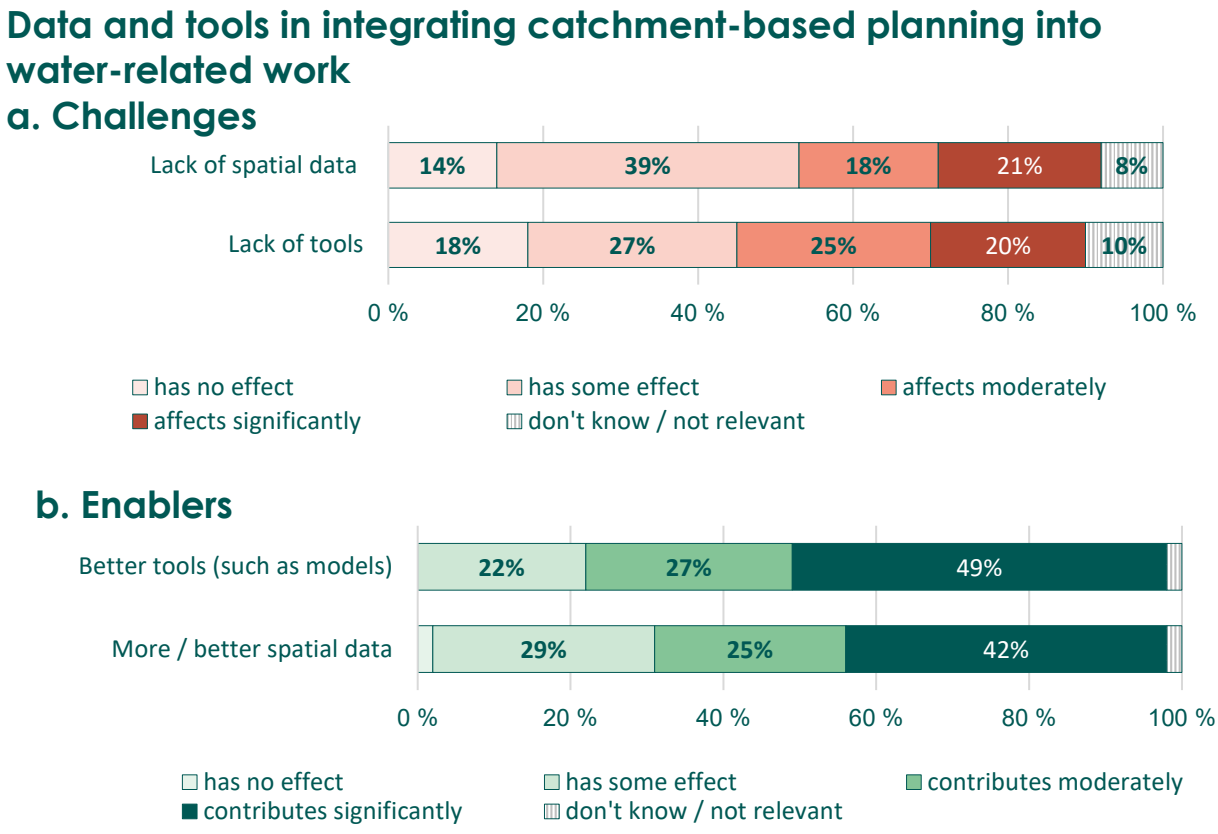


Figure 11a and 11b. Data and tools in the questions related to challenges and enablers in integrating catchment-based planning. Value labels under 3% have been removed from the chart for improved readability.

Beyond the potential of more accessible data and tools, **open responses** noted that certain tools targeting key tasks would advance the uptake of catchment-based principles. For instance, tools demonstrating the effects of implemented or potential measures were highlighted: "It would be important to have models/tools that could easily show how making a water retention structure affects water retention/flooding occurring below. That is, what effect the measure has". Further, tools enabling the overlaying of different kinds of data were mentioned: "*Our organisation would need a relatively easy-to-*

use program that would allow us to simultaneously look at river catchment areas and stormwater systems" (see also section 5.2).

Regarding the role of digital information sources and services in catchment-based planning, challenges are less to do with the lack of data and tools, and more to do with the fragmentation of, limited access to, and limited expertise in the use of existing data sources and tools. While lack of data and tools is not a limiting factor, availability of better and more accessible data and tools is considered a significant enabler of successful catchment-based planning and management.

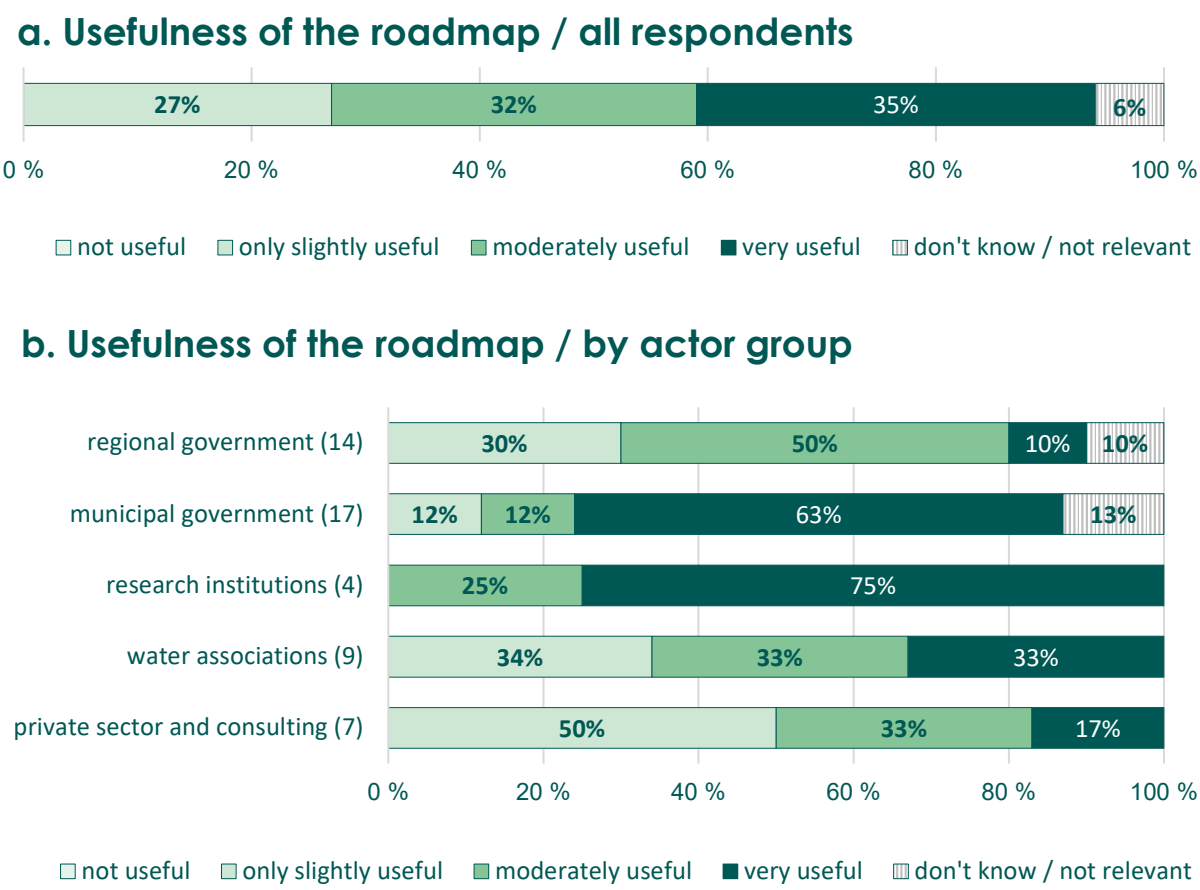
4.4 Roadmap for catchment-based planning 2030

A Roadmap for catchment-based planning 2030, published in 2024 by the Finnish Government, defines principles for multi-objective river catchment-based planning and measures to mainstream catchment-based planning. Its three key objectives by 2030 are:

- River catchment-based planning is an established practice. River catchment plans are prepared based on needs and guide practical actions (Rytkönen et al. 2024, p. 19).
- The expertise in catchment-based planning has increased. Comprehensive data resources and planning tools are available to all actors (Rytkönen et al. 2024, p. 26).
- Steering and financial instruments enable cost-effective, equitable and multi-objective targeting and implementation of actions in the catchment area (Rytkönen et al. 2024, p. 31).

Of all respondents, 68% were familiar with the roadmap. Of those, 35% considered the roadmap "very useful" and 32% "moderately useful" (Fig. 12a). None of the respondents considered it "not useful". As for the central actors, the roadmap was considered very useful by over 60% of respondents from the municipalities, while half of the respondents from ELY Centres considered it moderately useful and 10% very useful (Fig. 12b).

Many of the **open responses** highlight that in principle/theory the roadmap is useful and has recognised correct measures, but in practice it requires further funding and resources: *"The roadmap includes essential points, but in my opinion, it has not advanced the implementation of water management on a national level. Promoting water management requires sufficient resources and actors with the capacity to coordinate practical implementation."; "Partly correct measures. The Water Act and other related legislation currently allow the gradual deterioration of water bodies over time. There are not enough resources for monitoring land use. Roadmaps and plans can and should be created, but they lose their significance if land use by landowners within the catchment area cannot be adequately monitored and, when necessary, misuse sanctioned. Examples include agriculture, forestry, and peat production."*



Figures 12a and 12b. Responses to question: “How useful do you find the roadmap?”.

5 Information sources and services: current state and needs

5.1 Information sources and services: current state

The second part of the survey concerned current practices and needs regarding the role of digital information sources, services, and tools in catchment-based planning. The goal was to understand what sources, services, and tools water sector professionals utilise, what they find most useful, and what further needs they have in tasks advancing catchment-based principles.

When asked to rate the usefulness of ten different sources of information in tasks related to catchment-based planning (Fig. 13), most of the sources were considered relatively useful, with the exception of policy briefs (15% responded “don’t use at all”, and 39% “not very useful”).

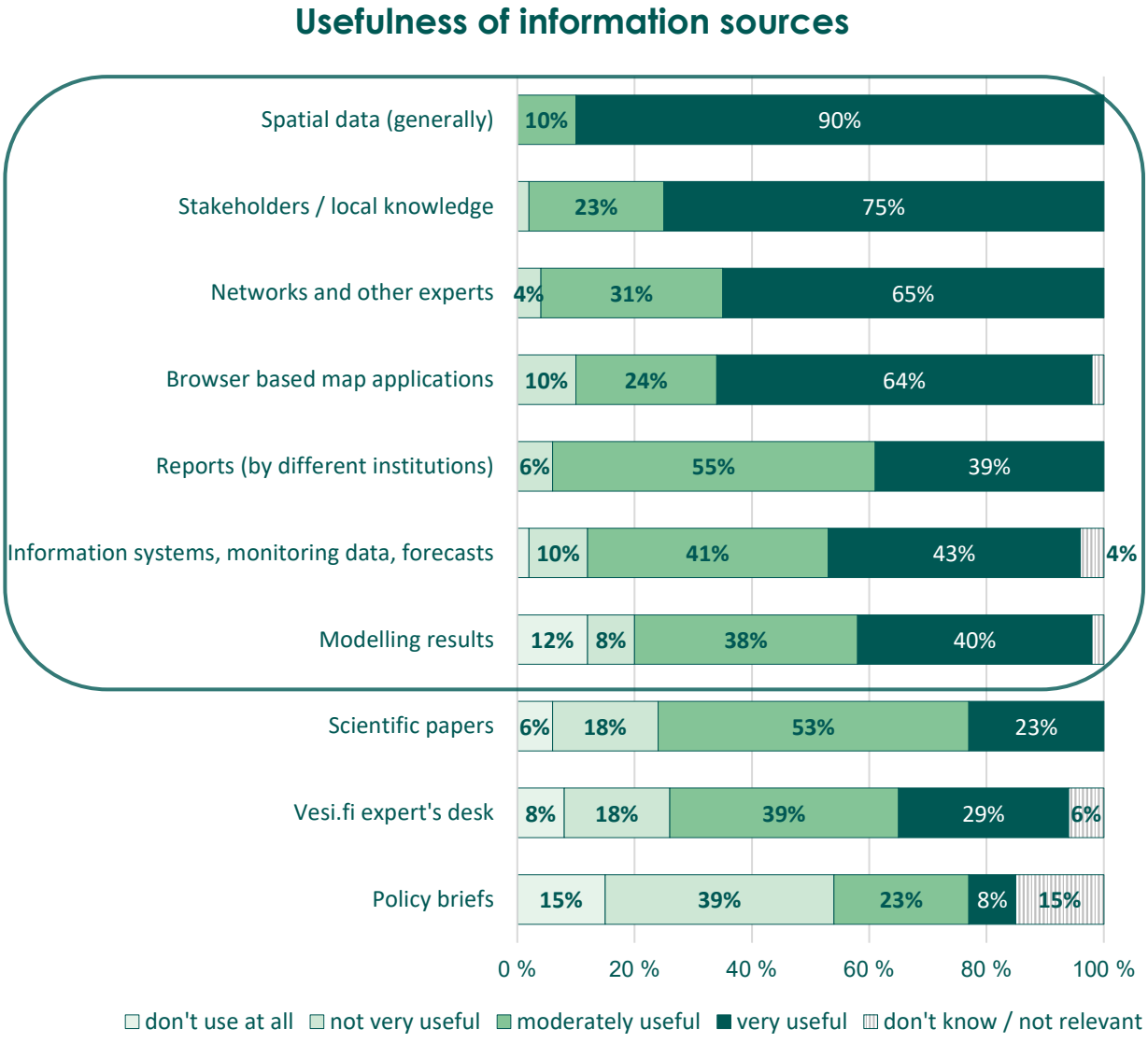


Figure 13. Responses to question: “Which of the following sources of information do you use in your work? Rate their usefulness in your tasks related to catchment-based planning”. Included inside the box are the challenges that averaged 3 (affects moderately) or more. Value labels under 3% have been removed from the chart for improved readability.

Spatial data (in a general sense) was considered the most useful source, with 90% of respondents ranking it "very useful". When asked to specify the most important spatial datasets used (open question), respondents reported a wide variety of information sources (from e.g., GTK, MML, Syke, Luke, Metsäkeskus), primarily datasets on:

- catchment areas,
- property borders and landownership,
- land use and land cover,
- soil characteristics,
- various ecological indicators, species and protected areas,
- flood maps and stormwater sewer systems (especially municipalities),
- water quality/load,
- water discharge,
- groundwater,
- sensitivity to erosion, and
- elevation.

In addition to spatial data, the usefulness of stakeholders, networks and other experts, as well as browser-based map applications was pronounced. Reports by different institutions, information systems, monitoring data, forecasts, and modelling results also averaged above 3 (moderately useful). The different user groups generally ranked the usefulness of sources in a similar manner.

Regarding the usefulness of information sources in catchment-based planning, spatial data (in a general sense) is the most useful, closely followed by stakeholders, networks and other experts, as well as browser-based map applications. While many water sector professionals utilise the results of various environmental models/digital tools in their work, only a fraction of them are operating these tools themselves. This highlights the importance of modelling outputs (e.g., scenario reports and analyses).

When asked about the use of five common environmental models and digital tools, few respondents reported using these themselves, but many reported utilising the results of different models (Fig. 14). WSFS (8% used themselves, 55% utilised results) and WSFS-VEMALA (10% used themselves, 61% utilised results) were the most utilised, followed by SCALGO Live (17% used themselves, 35% utilised results). It is worth noting that while SCALGO was only the third most utilised tool, several open responses underscored its usefulness and called for its wider uptake: "*SCALGO is a good tool for [demonstrating the effects of actions] but needs a bit more development"; "The use of SCALGO could be made more efficient on a wider scale"*. Workshop participants also emphasized the usefulness and practicality of SCALGO Live. SWAT and HEC-RAS were both very little utilised, with over 70% of respondent not using these tools at all. The reported use of models and tools highlights that comprehensive outputs based on environmental models (e.g., scenario reports and analyses) would enhance their usefulness for water sector professionals.

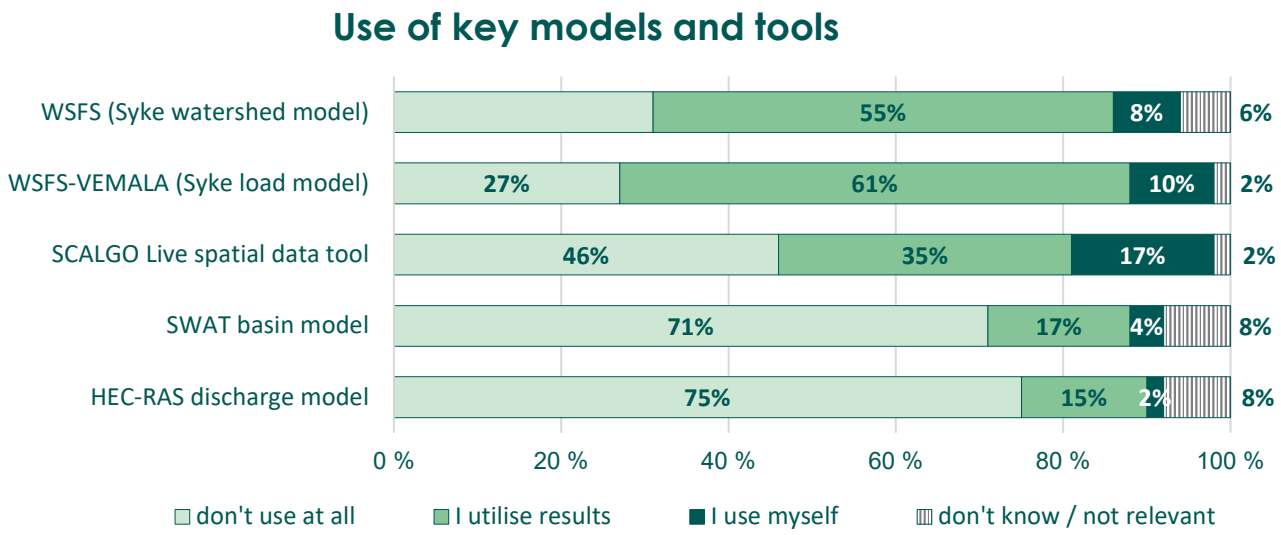


Figure 14. Responses to question: "Below is a list of various watershed and environmental models and tools used in water management. Do you use these models or their results in your work?"

5.2 Information sources and services: needs

Open questions inquired into what additional information sources and materials or digital tools and solutions respondents would find useful. Responses in all user groups emphasised a need for assembling sources and services into a single platform or source/tool library: *"[Sources] should be either in one package or linked. Now there are too many different databases and programs".* Indeed, many respondents highlighted that the lack of information and tools was not a limiting factor, but rather that problems arose with finding, accessing, and operating existing data and tools: *"The materials are quite comprehensive. Finding them might be difficult for someone just starting out"; "I don't think there is a shortage [of data], but there is a lack of expertise".* In addition to the demand for assembled sources and services, a need for the integration of data was identified, specifically in the form of tools that would allow the examination of different spatial data sets together at a river catchment level: *"A tool is needed that can combine spatial data on water quality, catchment areas, soil, land ownership, etc."; "Information about activities carried out in the catchment area, such as forest logging, cultivated species, vegetation cover, soil and nutrient data of the field parcel".*

When it comes to information and service needs, the demand for the assembly of information and services under one platform or source/tool library was highlighted. Further demands include spatial information regarding ongoing, planned, or implemented activities and measures, easier access to information regarding landowners, tools that would support the planning of water management measures (e.g., helping with the identification of potential measures and locations or through modelling scenarios), and tools enabling the visualisation and demonstration of action impacts to stakeholders. There is a demand for basic level training regarding what sources and tools exist and how they can be utilised.

A demand for spatial information regarding ongoing, planned, or implemented activities and measures in a specified area (e.g., catchment area) was identified by all user groups: *"A map service that would allow you to see what kind of measures are planned and underway in each catchment area and find the contact information of the implementing party [is needed]".* In addition, easier access to information regarding landowners was emphasised by water associations and private sector respondents, though challenges with open personal data were recognised.
Responses also called for tools that would support the planning of water management measures, e.g., through helping with the identification of potential measures and locations *"[there is a] need for a tool that identifies the most cost-effective structures in the most suitable locations in the catchment areas",* or through modelling scenarios: *"automatic analyses and impacts of e.g. ditch damming or wetland construction, pipe dams, etc. "[would be useful]".* Tools enabling the visualisation and demonstration of impacts of measures to stakeholders were also frequently mentioned: *"Various easy-to-use modelling tools would be suitable for demonstrating the benefits of actions to landowners".*

Regarding spatial datasets, respondents called for among other:

- automatic/continuous water quality/load monitoring,
- more accurate elevation measurements/modelling (laser-scanned), and
- better ecological and environmental data (e.g., protected species and areas).

Needs for better tools and models enabling particular functions were also identified, primarily tools for:

- discharge/hydrology/flood risk modelling,
- water quality/load modelling, and
- definition/delineation of catchment areas (especially municipalities).

5.3 AI-related needs for water resources management and governance

Both survey respondents and workshop participants were asked how could artificial intelligence (AI) manifest in water management, and how they think it could be better utilised. Responses to this question strongly echoed previously identified themes, with an overarching vision of all catchment-related information and tools necessary for planning "behind one button". Particularly, respondents and participants hoped that AI could support decision-making and planning by:

- Centralising information: "Well-programmed AI can find and combine data related to a specific location, for example",
- Improving the processing of geospatial data and training AI to recognize specific land surface features (e.g. from satellite imagery) for the planning and targeting of various measures,
- Integrating spatial data with other types of data for further analysis of hot-spots or locations for interventions: "AI could determine potential locations for water protection structures in the catchment area",

- Modelling and assessment of impacts and scenarios related to different measures, as well as long-term effects of actions in the area (for example, long-term land use change according to zoning or master plans),
- Running cost/benefit analyses of measures to support location and prioritisation of measures,
- Estimates and forecasts, and alerts or proposed interventions based on these (for example, in flood risk prediction): "AI could be better utilised in flood risk prediction by combining weather forecasts, land use, and hydrological models", and
- Integrating non-biophysical data (e.g. land ownership, authorities' responsibilities, legal requirements, standards, recommendations and other useful information) into the same platform with biophysical data.

The negative impacts of AI use have also been highlighted, with particular relevance to the water sector: "*The use of artificial intelligence consumes a significant amount of water for cooling, and this would also be a good thing to consider in a water-responsible industry*". It was also noted that the errors and generalisations associated with AI use must be mitigated through, for instance, proper referencing of sources.

5.4 Training needs

Finally, when asked about training needs in the use of information sources and tools, 78% of respondents affirmed a general need (Fig. 15). Open responses expressed a demand for basic level training via workshops or webinars, starting from what sources and tools already exist and how they can be utilised: *"For example, morning coffees for catchment restoration workers could include an informational presentation on the materials that are currently freely available to everyone and short demos of their use"; "Going through various practical case studies in collaboration with experts in different fields, in a workshop-style manner".*

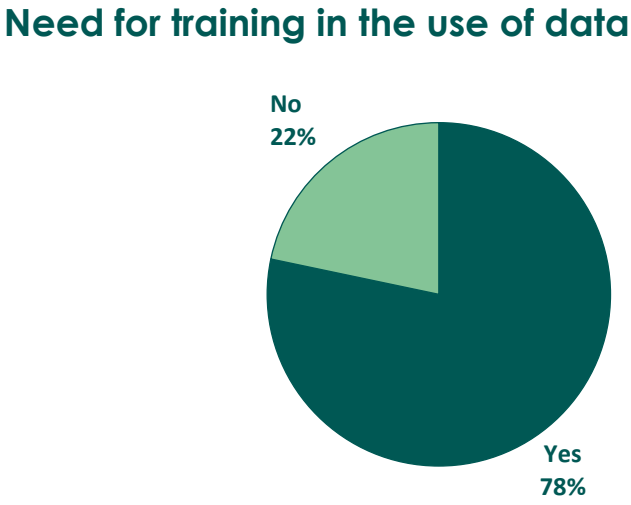


Figure 15. Responses to question: "Does your organisation need training in the use of information sources or tools?"

6 Conclusions

This study gathered insights from Finnish water sector professionals regarding the current state of catchment-based planning and management, as well as the current and potential role of digital information sources, services, and tools in this work.

The findings confirm that catchment-based thinking is common in the water sector. It should be noted, however, that there may be a certain bias in the answers, as the survey respondents and workshop participants could have participated in the research because they are already interested in or working with the subject. The biggest challenges identified for catchment-based planning and management were governance related: the fragmentation of landownership (with related communication and collaboration challenges), lack of resources (incl. funding and time, as well as short-term projects), the need to reconcile different goals and an unclear division of responsibilities. Conversely, respondents found that catchment-based planning/management would be aided through better governance, including coordination between key authorities, more predictable and comprehensive financing, transparency of information produced by different organisations, and stakeholder collaboration. Open answers further highlighted the complexity and interrelatedness of these challenges and enablers.

Regarding the role of digital information sources and services in catchment-based planning, respondents found that challenges were less to do with the lack of data and tools, and more to do with the fragmentation of information sources and tools, limited access to data sources and tools, and limited expertise in the use of existing data sources and tools. However, while the lack of data and tools was not considered a limiting factor by most respondents, the availability of better (and easily accessible) information and tools was considered as a significant enabler of successful catchment-based planning and management.

Regarding the usefulness of information sources in catchment-based planning, spatial data (in a general sense) was considered the most useful, closely followed by stakeholders, networks and other experts, as well as browser-based map applications. While many water sector professionals reported utilising the results of various environmental models and digital tools in their work, only a fraction of them reported operating these models and tools themselves. This highlights the importance of modelling outputs (e.g., scenario reports and analyses) in enhancing the usefulness of models for water sector professionals.

When it comes to information and service needs, the demand for the assembly of data sources and services under one platform or library seems most pressing. Further needs include spatial information regarding ongoing, planned, or implemented activities/measures, easier access to information regarding landowners, tools that would support the planning of water management measures (e.g., helping with the identification of potential measures and locations or through modelling scenarios), and tools enabling the visualisation and demonstration of the impacts of measures to stakeholders. Some needs regarding particular datasets and tool functions were also identified.

Finally, there is a demand for basic-level training in the use of digital services. Indeed, to achieve wider impact in the water sector with new digital solutions, accompanying training events, workshops, and user guides are necessary. Guides and training related to existing sources and tools would also benefit water sector professionals, starting with guidance on what sources and tools are available (and where), and how they can be used at a basic level.

Overall, this study suggests that measures that would directly support catchment-based planning and management in the water sector require high-level decision-making (related to e.g., resourcing and incentive mechanisms). However, improving information sources and services is an important

enabler of effective water management and governance by, for instance, producing tailored and more comprehensive evidence, such as integrated datasets on biophysical phenomena coupled with non-biophysical data (landownership and land use, regulation, organisational mandates and/or other stakeholder information), enabling better modelling and simulation of the outcomes of specific measures in water and other sectors, and allowing the identification and prioritization of “hot-spot” areas for measures. In addition to better evidence, these data, tools and services can also free up resources from public sector officials for strategic work and stakeholder collaboration.

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Annex 1 Survey questions

Expert Survey: Catchment-Based Planning and Use of (Digital) Information

This survey maps the current state and development needs of water management and catchment-based planning, as well as the key related information sources and tools. We examine water management more broadly, taking into account both water resource management and water protection.

The survey has three sections: catchment-based planning, information sources and digital tools, and finally background information. In addition to the questions on this page, only the background questions are mandatory (*).

You may skip questions that do not seem relevant to your own duties. Survey responses will be treated anonymously for research and development purposes.

Additional information:

The survey is part of the DIWA flagship research project and Aalto University's and Finnish Environment Institute study on "Water Resource Management and Its Changes." Thank you in advance for your response!

1. I have read the study's privacy notice *
Yes

2. I consent to the processing and use of my data as described in the privacy notice *
Yes

Catchment-based planning

Catchment-based planning refers to planning that goes beyond land-use and ownership boundaries, aligning various objectives and interests across the catchment area.

3. To what extent does catchment-based planning guide your tasks related to water issues? (single-choice question)

- Not at all
- Only a little
- Moderately
- Significantly
- Don't know / Not relevant

4. Have you participated in developing catchment-based plans in your work?

- Yes
- No

5. At what level? *(*Multiple choice; only for those who answered "Yes" to question 4)

- Large planning packages
- Water management action programs
- General catchment plans
- Water body visions
- Other, specify

6. Which of the following are key challenges to integrating catchment-based planning into your water-related tasks? *(*Matrix question; scale: "does not affect at all" – "affects somewhat" – "affects moderately" – "affects significantly" – "don't know / not relevant")

- Organizational structures
- Constraints related to own job description
- Lack of expertise
- Lack / incompleteness / availability of spatial data
- Lack of tools
- Misallocation / lack of funding
- Political priorities
- Lack of regulation or legislation
- Fragmented land ownership
- Difficulty reaching all landowners
- Lack of interest from landowners
- Lack of resources / time
- Lack / insufficiency of coordination
- Conflicting objectives
- Unclear responsibility for advancing planning
- Other, specify

7. In your own words, how do these challenges affect the integration of catchment-based planning into your tasks? (Open-ended)

8. Which of the following factors would promote the integration of catchment-based planning into your water-related tasks? (Matrix question; scale: "does not promote at all" – "promotes somewhat" – "promotes moderately" – "promotes significantly" – "don't know / not relevant")

- Training on the principles of catchment-based planning
- More / better spatial data
- Availability of required tools / data
- Better tools, such as models

- Regulation / more directive legislation
- Leadership support / commitment
- Changes in work practices or responsibilities
- Additional personnel resources
- More predictable / comprehensive funding
- New types of funding instruments
- Stakeholder cooperation
- Coordination among key authorities
- Conflict resolution / negotiation skills
- Openness / availability of information from different organizations
- Other, specify

9. In your own words, how do these factors promote the integration of catchment-based planning into your tasks? (Open-ended)

10. The 2024 catchment planning roadmap aims to define principles for multi-objective catchment-based planning and measures to mainstream catchment-based planning. Are you familiar with this roadmap?

- Yes
- No

11. How useful do you consider the roadmap? (For those who answered "Yes" to question 10)

- Not useful
- Only a little useful
- Moderately useful
- Very useful
- Don't know / Not relevant

12. Does the roadmap identify the right measures? What new contributions has it made or could make to water management? (Open-ended)

Information sources and digital tools

13. Which of the following information sources do you use in your work? Please rate their usefulness for your tasks related to catchment-based planning. (Matrix question; scale: “not used at all” – “not very useful” – “somewhat useful” – “very useful” – “don’t know / not relevant”)

- Spatial data (general)
- Various reports (ELY Centres, research institutes, ministries, etc.)
- Scientific articles
- Stakeholders / local knowledge
- Policy briefs / recommendations
- Networks or other experts
- Vesi.fi expert workspace
- Information systems, monitoring data, forecasts (e.g., flood monitoring systems)
- Model results
- Various browser-based mapping applications
- Other, specify

14. Which spatial datasets are most important in your work? (Open-ended)

15. What other information sources or datasets would be useful in your water-related tasks? What data or information do you lack? *(Open-ended)*

16. Below is a list of water and environmental models and tools used in water management. Do you use these models or their results in your work? You may list other models or tools you use. (Matrix; scale: “do not use at all” – “use results” – “apply myself” – “don’t know / not relevant”)

- WSFS (SYKE water body model)
- WSFS-VEMALA (SYKE load model)
- SWAT catchment model
- SCALGO Live GIS tool
- HEC-RAS flow model
- Other, specify

17. What other digital tools or solutions would be useful in your water-related tasks? (Open-ended)

18. How would you like to see artificial intelligence used in water management? How could it be utilized more effectively? (Open-ended)

19. Does your organization need training on the use of information sources or tools?

- Yes
- No

20. What type of training would be useful? (Open-ended; only for those who answered "Yes" to question 19)

21. Do you have any other observations or comments? Suggestions for relevant publications, projects, or experts for this survey are also welcome.

Background information

22. Which organization do you work for?*

- Ministry, specify
- ELY Centre, specify
- Regional State Administrative Agency, specify
- Municipality, specify
- Regional Council, specify
- Private sector, specify organization
- Water management association, specify
- Research institute, specify
- University or other educational institution, specify
- Other, specify

23. Which areas does your work specifically relate to? (Select all that apply)*

- Flood risk management
- Water supply
- Water management
- Water protection
- Water body regulation
- Land drainage / ditching issues
- Licensing
- Other, specify

24. What proportion of your annual work time is spent on water-related tasks?*

- Less than 20%
- 20–40%
- 40–60%
- 60–80%
- Over 80%

25. How long have you been working on water-related topics?*

- <1 year
- 1–3 years
- 5–10 years
- 11–20 years
- >20 years

26. At which geographical level or area do you work in water-related tasks? (Select all that apply)*

- National
- Region / Province, specify
- Municipality, specify
- Catchment area, specify
- Baltic Sea
- Other, specify

Annex 2 Workshop questions

Group discussion questions: Each group may choose which theme to start with, but both themes should be covered.

Theme 1: Catchment-based planning

- **Challenges and enabling factors**
- **General comments:** Have the challenges and enabling factors been correctly identified in the survey?
- **Interconnectedness and interaction:** How do the challenges/enabling factors interact with each other? (e.g. limited funding means too little time for training/stakeholder engagement; data does not solve problems but can free up resources for strategic work?)
- **From planning (roadmap) to implementation** (how to concretely advance catchment-based planning? A solution-oriented and forward-looking discussion)
- **Practical level:** What small steps would help advance catchment planning in your own organization/work?
- **Strategic level:** What concrete actions are needed? Many open survey responses emphasize that, in principle, the catchment planning roadmap is useful and identifies the right measures, but requires additional funding and resources → What does resourcing mean in practice? For example: policy instruments, financial/human resources, legislation, training?

Theme 2: Digital services (data sources and tools) in catchment-based planning

- **General comments:** Has the role of data sources and tools been correctly identified in the survey? (e.g. challenges relate less to the lack of data/tools and more to their fragmentation, accessibility, and lack of expertise – further reflections?)
- **Aggregation and integration of data and tools:** According to the survey, there is a strong need to compile/integrate data and tools – what could this mean in practice? (e.g. a collection of links to different sources/tools, or everything under a single platform/tool?) Bottlenecks? Is having just one platform unequivocally a good thing, or should validation through other sources be required? Too much authority concentrated in a single source/model? Stakeholder perspectives?
- **Other needs:** Have these been correctly identified in the survey? Is anything essential missing? (identified needs include: information on ongoing, planned, or implemented measures; easier access to landowner-related data; tools to support the planning of water management measures (e.g. by helping identify potential actions and locations or by modeling impacts and scenarios); tools that enable visualization and communication of impacts to stakeholders)

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