Demand analysis with focus on Collaborators

Deliverable D4.4

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Abstract (for dissemination, 100 words)	This report synthetizes the results of the analysis of demands of RECONECT Collaborator cases, which are in the co-planning and assessment stage of NBS co-creation. It includes an overview of their needs in terms of knowledge, methodologies, visions and expectations. It also considers addressing some of the knowledge gaps. The report can serve as an input to design of different exchange and learning activities between RECONECT Demonstrators and Collaborators, as well as an assistance to the researchers interested in co-creation approaches.
Keywords	Co-creation, social innovation, learning, knowledge

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Executive Summary

Co-creation is being increasingly promoted as one way to foster social innovation related to nature-based solutions (NBS) for hydrometeorological risk reduction. However, co-creation is also a highly resource-intensive and challenging approach. The multifunctional role of NBS imposes that holistic approaches to responding to the identified challenges should be applied in all stages of NBS co-creation.

This deliverable includes an overview of the needs – in terms of knowledge, methodologies, visions, and expectations – in RECONECT Collaborator cases, which are the cases in the co-planning and assessment stage of the NBS co-creation process. The Collaborator cases are also envisaged to be inspired by the Demonstrator cases and to share their experience and knowledge.

The purpose of this report is to present results from the demand assessment amongst RECONECT Collaborators and gather baseline data to monitor RECONECT's co-creation approach. Some of the results provide the basis for organizing twinning activities with RECONECT Demonstrator cases and other project partners based on potential topics of interest. These include specific cases for deeper collaboration, exchange of experiences on the process of establishing NBS, identification of multiple benefits and indicators, guidance on selecting appropriate NBS, how to prepare a business plan that build upon visions and prioritizations of benefits.

The outputs from this report could serve as input to design different exchange and learning activities to match the Collaborators with specific demands to one or more partners in the RECONECT Consortium who could be able to supply the expertise needed to overcome some of the identified needs.

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1 Introduction

1.1 Background

Implementation of nature-based solutions (NBS) for hydro-meteorological risk reduction offers the possibility to break away from traditional practices and enable to reconnect our land management practices and developments with nature in order to achieve multiple benefits to services and functions of ecosystems. According to Olsen & Bishop (2009) and van der Nat et al. (2016), such measures are potentially more cost-effective and adaptable than traditional hard engineering measures. However, cost-effective design and implementation of NBS is only part of the answer. Of equal importance is the ability to effectively place them in diverse local and cultural contexts and integrate them into broader land and risk management strategies. It is therefore of crucial importance to understand the complexity of each case and to design the NBS in a way that minimizes social and economic losses and environmental impacts, increases resilience to hydro-meteorological hazards while achieving multiple co-benefits, and ensures upscaling, business models and financial viability of any interventions. Examples of large scale NBS for disaster risk reduction (DRR) which can provide proof-of-concept for their upscaling and replication is currently lacking and there is a clear need to enhance their evidence base through demonstration within the European reference framework.

RECONECT is an interdisciplinary international project that aims to contribute to European reference framework on NBS by demonstrating, referencing and upscaling large-scale NBS and by stimulating a new culture for land-use planning that links the reduction of risks with local and regional development objectives in a sustainable way. Furthermore, an important element in RECONECT is its social innovation approach, underpinned by co-creation as the means for effective stakeholder participation in different stages of the NBS implementation process: co-assessment and planning, co-design and implementation, co-monitoring, and co-evaluation.

In order to contribute effectively to the EU reference framework on NBS, to generate higher impacts across Europe, and enable learning and upscaling internationally, RECONECT draws upon a number of Demonstrator and Collaborator sites (Figure 1). These have been carefully selected to cover a range of local criteria including (1) climatic and geographic conditions, (2) type of hydro-meteorological hazards (floods, storm surges, droughts, landslides), (3) vulnerability to these hazards, and (4) governance structures and social/cultural settings. Besides these criteria, the potential for collaboration and upscaling has also played a role in the selection process. The Demonstrators type A are the cases where the co-creation of NBS will be carried out during the project, while Demonstrators type B are the cases where such works are already implemented and will serve as the reference cases.

The Collaborator cases in RECONECT are envisaged as the cases inspired by the Demonstrator sites. The pool of Collaborator cases consists of European and International Collaborators. By sharing the RECONECT knowledge and experience with the Demonstrators, the main activity of the Collaborators is the development of the pre-feasibility studies for implementation of NBS in their focus areas. The Collaborators' prefeasibility studies will explore application of potential NBS and their benefits and co-benefits compared to the baseline conditions, also by incorporating RECONECT knowledge on co-planning and co-design. These studies are aimed at providing a proof-of-concept for NBS in local environmental and societal settings in each Collaborator site while also serving as a primer in replication in the Collaborator countries.

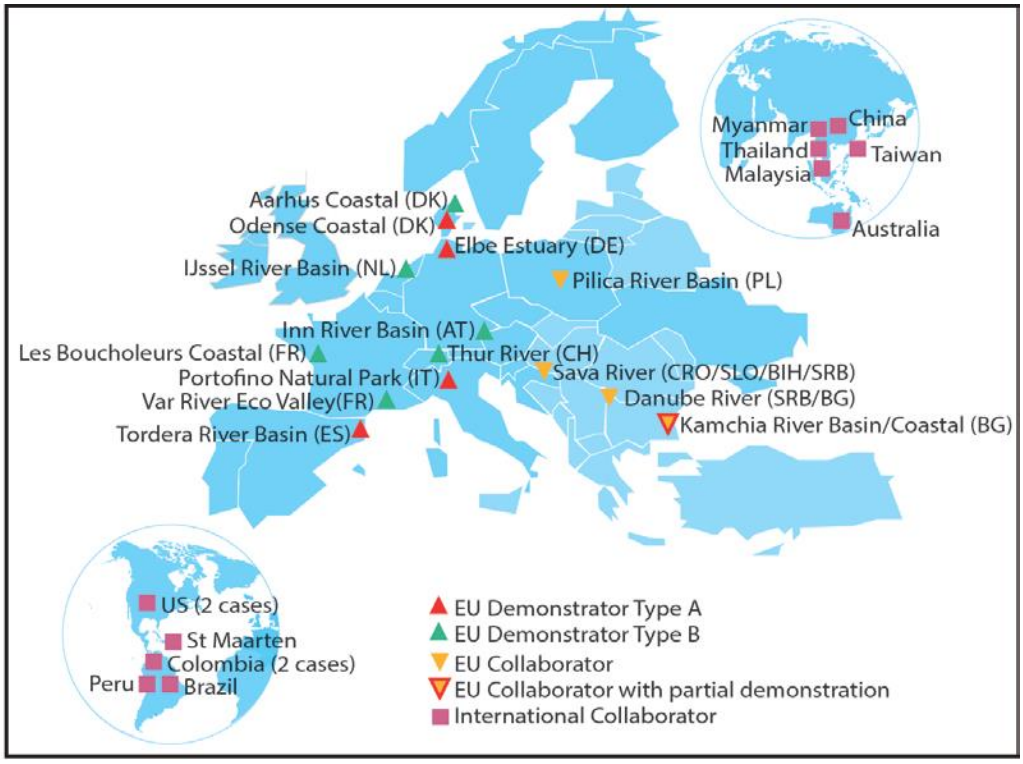


Figure 1. RECONECT network of cases

This deliverable, D4.4 Demand analysis with a focus on Collaborators, presents results from a series of co-creation activities carried out among Collaborators and their stakeholders between 2019 and 2020. The deliverable is part of RECONECT's WP 4 "Overcoming barriers, upscaling and synergies with Collaborators".

1.2 About this report

Purpose. The purpose of this report is to present results from the demand assessment amongst Collaborators and gather baseline data to monitor RECONECT's co-creation approach. Co-creation is an ongoing process in RECONECT's social innovation approach to NBS (a detailed description of the NBS cycle can be found in deliverable D1.2). The co-creation cycle (Figure 2) inherently aims at continuous assessment whether the social innovation approach and corresponding co-creation activities adopted in the project have foster learning and led to change.

Who is this report for? The report is for researchers (within and beyond RECONECT) who are interested in co-creation approaches, as well as implementing actors working with aspects related to water governance, risk management, hydrometeorological hazards, and spatial planning.

How to read the report. Section 2 of the report provides a summary of RECONECT's Collaborator sites. In section 3 the reader is introduced to the three surveys that were used to collect the data. Section 4 present the results from the surveys. Section 5 presents an overview of two virtual activities that followed up on some of the results from the surveys and which aimed at addressing some of the identified demands and knowledge gaps. The report presents some concluding remarks in section 6.

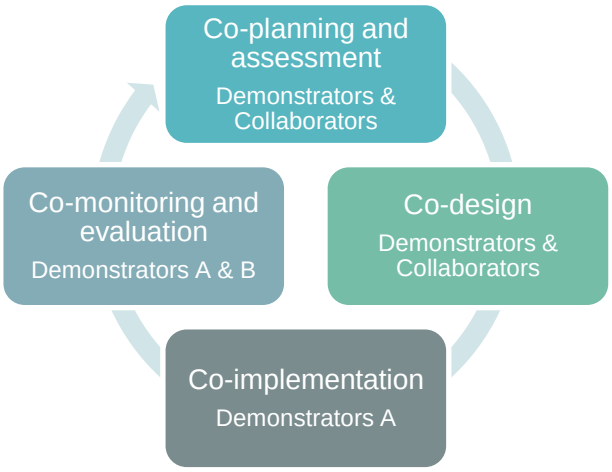


Figure 2 Co-creation cycle underpinning the social innovation approach to NBS implementation in RECONECT.

2 Overview of RECONECT Collaborator sites

Given the geographical location of their catchments, European Collaborators share many common physical and political characteristics among the sites such as climate, soil type, hydro-meteorological hazards affecting their basins and regional policies. This means that knowledge exchange between and across the cases is possible and can help in the successful development of their management plans. Nevertheless, there are certain characteristics that are unique to each site and that need to be addressed individually, such as public acceptance, financial opportunities, national regulations, and stakeholder engagement, among others.

The network of European Collaborators consists of four countries with five sites:

- Bulgaria Kamchia River Basin
- Croatia Bregana River Basin
- Poland Pilica River Basin (Luciaza)
- Serbia Jadar River Basin
- Serbia Kolubara River Basin (Tamnava)

The international Collaborators belong to different regions of the world, the physical characteristics of their catchments as well as the social and political conditions differ significantly. Nonetheless, there are still commonalities among them that can help in the process of knowledge exchange and the development of management plans. Climate conditions, soil type, and types of flood events affecting their basins are some of the common characteristics among these cases.

The network of International Collaborators consists of the following 6 sites:

- Taiwan Nangang River Basin
- Thailand Chao Prhaya River Basin
- Malaysia Cameron Highlands
- Myanmar Chindwin River Basin
- Colombia (Cali) CaMeLi River Basin
- Colombia (Medellin) Heliodora River Basin

A summary of the characteristics of European and International Collaborators is provided in and Table 1 and Table 2, respectively.

Table 1 RECONECT European Collaborators

 **EUROPEAN COLLABORATORS** Floods are the main hydro-meteorological hazard affecting these areas.	
 Bulgaria Kamchia River Basin	The Kamchia River, located in eastern Bulgaria, is the longest river on the Balkan Peninsula which flows directly into the Black Sea with a length of 325 km and drainage area of 5357 km². The focus area includes the villages of Dabravino and Grozdyovo and the town of Dalgopol, and the estuary of the Kamchia River. The main risk is riverine and coastal flooding.
 Poland Pilica River Basin (Luuciąża)	The Luciąża River is the largest left tributary of the Pilica River located within in central Poland, with a length of 53.7 km and drainage area of 760 km², characterised mainly by agricultural land. The focus area is the 23 km long Bogdanowka River with a drainage area of 180 km². Arable land and forests characterize the basin. The runoff is fast, but there is a high potential for water retention in the landscape to mitigate both floods and droughts.
 Croatia Bregana River Basin	The Bregana River has a watershed area of 92 km² with steep slopes and dense hydrographic network, while the main course is 26 km long. It is prone to frequent flooding and considerable erosion processes. It is a transboundary tributary of the Sava River in its middle course (about 300 km from the source) and flows along the border between Croatia and Slovenia.
 Serbia Jadar River Basin	The Jadar River belongs to the Sava River basin. It is a tributary of the Drina River with a length of 81.7 km and drainage area of 990 km². The Jadar River has a wide valley prone to significant floods, with a considerable number of tributaries characterised by flash floods. The specific focus area is the watershed of the Likodra River, left tributary to the Jadar River, and the municipality of Krupanj, exposed to significant erosion problems.
 Serbia Kolubara River Basin	The Kolubara River is the most downstream right tributary of the Sava River, having a notable fan-type shape with numerous torrential tributaries, known for fast and frequent floods. The focus is on the Tamnava River basin in the lower Kolubara course, with a drainage area of about 720 km² and the main course length of 70 km. It has a notable history of floodings and significant contribution to propagation of flood waves in the lower Kolubara River course.

Table 2 RECONECT International Collaborators

	**INTERNATIONAL COLLABORATORS** Floods are the main hydro-meteorological hazard affecting these areas.
 Taiwan Nangang River Basin	Nangang River is located in central Taiwan. Its basin is dominated by mountains and steep landscape. The river is narrow with a riverbed mostly V-shaped. The river is about 20 km long and the catchment area is about 136 km^2.
 Thailand Chao Phraya River Basin	Rangsit community is located in the Rangsit irrigation canal network which receives water supply from lower Chao Phraya River basin and Pa Sak Jolasid Dam. The main water usage is agriculture and total community area is 54.48 km^2.
 Malaysia Cameron Highlands	Cameron Highlands is a region in Pahang, Malaysia. It is considered to be one of the most extensive mountain stations in the country, covering an area of 712 km^2. The main towns within Cameron Highlands are Ringlet, Tanah Rata, Brinchang and Kampung Raja.
 Myanmar Chindwin River Basin	Chindwin River, a major tributary of the Ayeyarwady River, it is the third largest river in Myanmar. It has a drainage area of 114 km^2 comprising of forest area, farming area, mining, villages, and shrub lands. The length of the Chindwin River from its headwaters to the Ayeyarwady confluence is approximately 1,200 km.
 Colombia CaMeLí River Basin	Cañaveralejo, Meléndez and Lili Rivers (CaMeLí), is located in the southwest of Valle del Cauca department, on the eastern flank of the western mountain range of Colombia. The basin includes the townships of Los Andes, La Buitrera, Villacarmelo, Navarro and Hormiguero, and the urban area of Santiago de Cali.
 Colombia Heliodora River Basin	Heliodora river flows The into La Mina River that discharges into the Medellin Aburra Valley. Heliodora stream has natural riverbanks. Landslides and flash floods are frequent threats in the basin, which have caused several damages to the sewer system.

3 Methodology

Three surveys were carried out during 2019 and 2020 to collect data on 1) initial expectations amongst Collaborators; 2) demands from Collaborators regarding tools, capacities and resources required to develop hydro-meteorological risk assessments and feasibility assessments of NBS; and 3) monitoring co-creation activities in WP4. The data collected in these three surveys serves as the basis for this deliverable. A description of the structure and specific objectives of each survey is included in the subsections below.

3.1 Survey 1: Baseline assessment of expectations

The first survey amongst Collaborators was conducted in 2019. The aim of this survey was to understand Collaborators' expectations of the project, to inform the twinning process (carried out in WP2), and to explore the best approaches for executing the co-creation activities. This baseline provides material for comparing initial expectations and subsequent follow-up assessments that will be conducted for mid-term progress and final reports. These results can indicate progress in the project and the extent to which RECONECT increased learning amongst the Collaborators.

The survey consisted of 11 multiple choice and open-ended questions (see Annex A) and was distributed to all Collaborators in September 2019, however, only seven of them responded. The questions collected information on:

- The activities and cases within the project that were perceived to be of highest interest and relevance for Collaborators.
- Benefits expected from NBS in their respective sites.
- Preferred activities for engagement in RECONECT.

The outcomes and reflections of this survey are described in Section 4.1.

3.2 Survey 2: Collaborators' demand analysis

To understand Collaborators' needs with regards to tools, capacities and resources required to successfully design management plans for NBS (D4.8), SEI developed and distributed an online survey titled "Demand Analysis with Focus on Collaborators". The survey was carried out online via Google surveys and included both open-ended and multiple-choice questions. The questionnaire was divided in the following sections:

- Section 1: Collaborators' data
- Section 2: Hydro-meteorological risk assessment
- Section 3: Feasibility Assessment
- Section 4: Co-creation

The online survey consisted of 35 questions, divided in the four sections mentioned above. Annex A provides an overview of the questions included under each section. Most questions had a multiple-choice format, however, at the end of each section an open-ended question was added with the aim of allowing Collaborators to flag concerns or add extra information regarding the topic of the section.

The questions from this online survey were designed to help understand the needs and barriers of Collaborators in relation to hydro-meteorological risk assessment and feasibility assessments. By overcoming these barriers Collaborators will be able to successfully complete sections 3 and 4 from the latest outline of D 4.8 “Potential Management Plans in Collaborators”.

Furthermore, to build on RECONECT’s co-creation strategy, a section on co-creation was added to this survey. The purpose of this section was to measure the extent and level of co-creation prior to and during the project between Collaborators and local authorities in their basins.

Ten out of the 12 active Collaborators in RECONECT answered the survey. The outcomes and reflections of the needs on hydro-meteorological risk assessment and feasibility assessments are described in section 4.2. The outcomes of the questions on co-creation are presented under section 0.

3.3 Survey 3: Assessment of co-creation activities in WP 4

To assess how different co-creation methodologies may incentivize a more participatory process – before and during – the implementation of NBS in Collaborators sites, SEI developed a survey for assessing the impact of specific co-creation activities carried out between Collaborators and their stakeholders in the past year.

In line with the methodology outlined in D1.2, the survey contained four questions that helped evaluate the following aspects:

1. Ease of completion
2. Effectiveness
3. Credibility
4. Replaceability

Each question had five options from which the respondent could choose according to his/her personal experience and perception of the co-creation activity being assessed. By collecting views from both Collaborators and stakeholders, different perceptions can be analysed, and conclusions can be drawn. The survey is intended to evaluate each co-creation activity that happens in WP4 (see Annex A). Stakeholders may be different for each activity and should correspond to the ones included in the stakeholder map of deliverable D4.1. It is important to highlight that due COVID 19, this survey was not applied to stakeholders. Therefore, the results of this survey only reflect Collaborator’s responses. It is advised to share this survey among stakeholders in order to have a complete overview from both sides.

The survey was distributed among the 12 active Collaborators, yet only six of them completed it. The outcomes and reflections of this survey are described under section 4.3.

4 Results

4.1 Survey 1: Baseline assessment of expectations

Collaborators were asked to identify the RECONECT cases they deemed most relevant to their site. Table 3 presents the RECONECT cases that were of most interest to the seven respondents (Poland, Croatia, Medellin, Thailand, Serbia, Cali, Bulgaria).

At the time this first survey was carried out, most Collaborators had not yet identified the specific site of focus within their basin. Therefore, there are some discrepancies in the names of the basins. To avoid confusion, the analysis of results refers to the country and not the basin (e.g., Poland instead of Pilica River Basin).

Table 3 Sites of interest to Collaborators

DEMONSTRATORS	Poland	Croatia	Medellin Colombia	Thailand	Serbia	Cali Colombia	Bulgaria
Tordera Deleta (Spain)	x			x	x		x
Elbe Estuary (Germany)	x			x			x
Seden Strand Odense (Denmark)				x			
Portofino Natural Park (Italy)							
Var River Eco Valley (France)			x	x	x		x
Les Boucholeurs (France)				x			
Inn River Basin (Austria)		x	x	x			
Thur River (Switzerland)	x			x	x		
Ijsel River Basin (Netherlands)	x	x	x	x	x		
Aarhus Coastal (Denmark)	x	x					
COLLABORATORS							
Chao Phraya River Basin (Thailand)							x
Greater Tainan Coastline (Taiwan)				x			
Rio do Couves (Brazil)							x
Tarago River Basin (Australia)				x			
Klang River Basin (Malaysia)			x				
Yangtze River Basin (China)							
Chindwin River Basin (China)				x			
Trinity River Basin (USA)							
San Francisco Bay Delta (USA)							x
Piura River Basin (Peru)							x
Rio Frio (Colombia)			x			x	
Lili and Melendez River Basin			x			x	
St. Marteen (The Caribbean)							
Kamchia River Basin (Bulgaria)				x	x		
Pilica River Basin (Poland)					x		
Sava River Catchment- Bosut River Basin (Croatia)				x	x		x
Sava River Catchment- Drina River Basin (Serbia)			x	x			
Sava River Catchment- Kolubara River Basin (Serbia)				x			x

Figure 3 presents results related to Collaborators' main interests on the activities planned in the project. These results informed the first round of twinning activities which took place through online webinars on selected topics and methodologies as part of WP2. Task 1.4 "Enhancement of NBS for multiple benefits" and Task 1.3 "Knowledge and Practice Database" scored highest followed by Task 3.4 "Data Analysis and Evaluation of Demonstrated NBS".

Table 4 shows potential NBS or types of interventions of relevance for the catchment area in each collaborator. Some Collaborators focused exclusively on NBS whilst others named hybrid infrastructures (green/grey). For instance, Varna, a more urbanized context with existing infrastructure, has a need to adapt future solutions to existing grey structures.

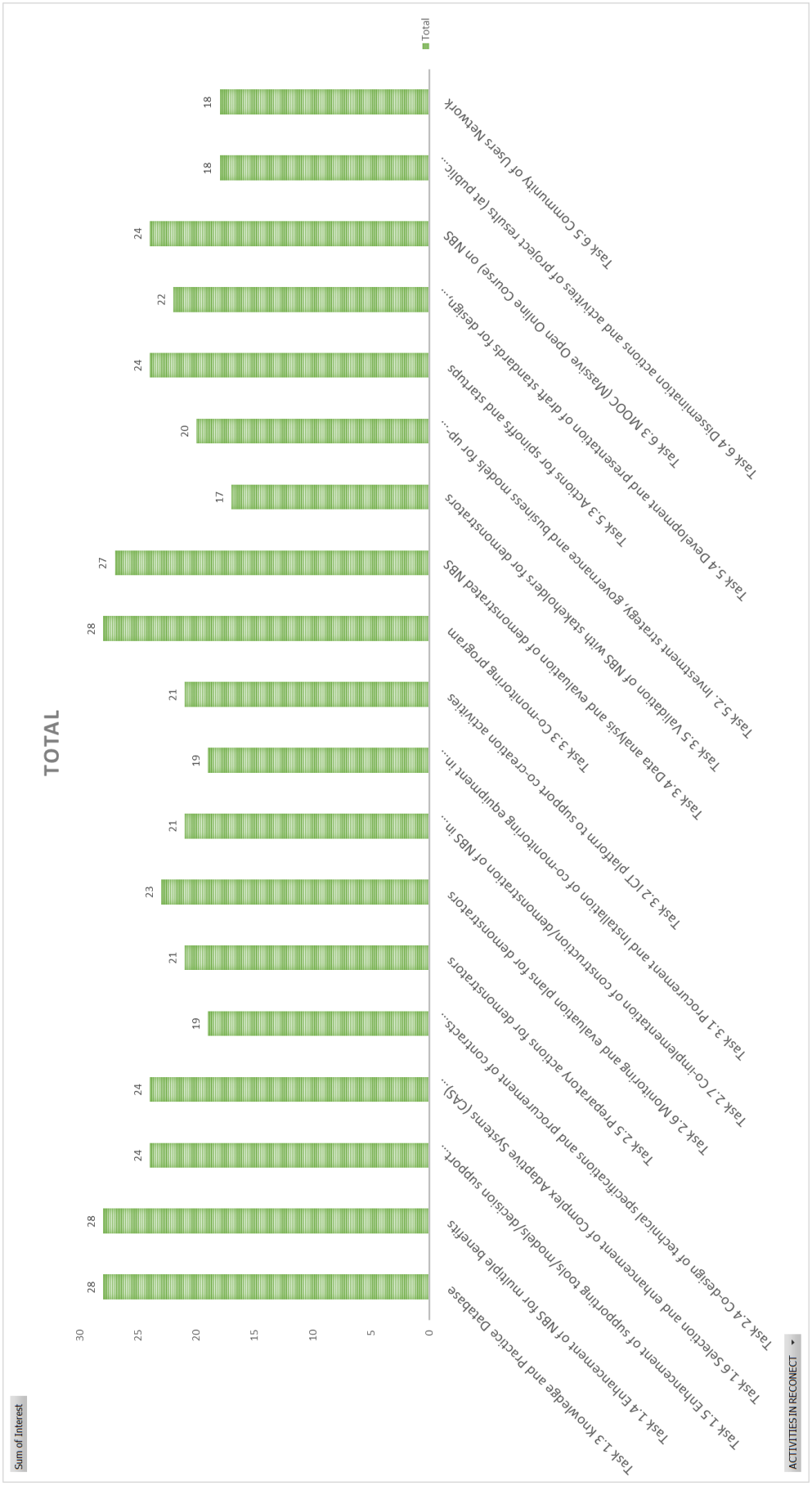


Figure 3 Collaborators' interest in RECONECT activities

Table 4 NBS under consideration in Collaborators

COLLABORATOR	NBS
Medellin, Colombia	Sustainable urban drainage system
	Green works for stability of soil
	Environmentally friendly flood protection
Thailand	Rethinking the concept for mutual benefit of retention area and room for river
	Rethinking the overall concept for water resource management by community
Croatia	New retention areas
	Afforestation
	Re-meandering of rivers
	Creation of riparian buffer zones
Poland	different types of wetlands;
	room for river;
	water storage areas
	hybrid solutions for drained area;
Serbia	retention basins
	channel widening
	bypass/diversion channels
Cali, Colombia	providing technical assistance to small food producers to migrate to technical irrigation and abandon flood irrigation in banana and palm
	reduce losses in irrigation canals
	boost access to drinking water and basic sanitation in the region.
Bulgaria	Strenghtening dikes: Planting vegetation (recommended option);
	Strenghtening dikes: by additional filling and by stacking gabion baskets;
	Strenghtening dikes: by additional hard-engineering structures;
	Removing obstacles blocking the bed of the water body
	Using urban and peri-urban green areas as retention plains for flood waters
	Slowing down the storm waters by means of vegetation – grasses, bushes, large trees along the banks of the gullies and rivers in their upper reaches
	Providing for a high water drainage conductivity of the gullies/rivers in their lower reaches
	Modifying existing dykes and building flood gates to let waters go to zones designated for controlled flooding in order to avoid flooding of sensitive areas
	Building pumping plants for re-pumping the waters in case of dangerously increased water levels, into retention plains on a higher altitude
	Installing sensoring systems for monitoring the water levels of the risky water bodies and early warning of an approaching flood risk
	Making use of innovative monitoring systems coupled with large area risk modelling capabilities

Figure 4 shows the perceived relevance of different co-benefits in relation to NBS. The definition of each co-benefit is included in the description of Survey 1 in Annex A. The highest scores were given to green space followed by water management, and on third place climate adaptation.

Table 5 summarizes the objectives that each organization representing a Collaborator aimed to achieve through RECONECT. Two priorities mentioned by most Collaborators are the possibilities to learn and exchange knowledge and inform local processes towards the planning of NBS.

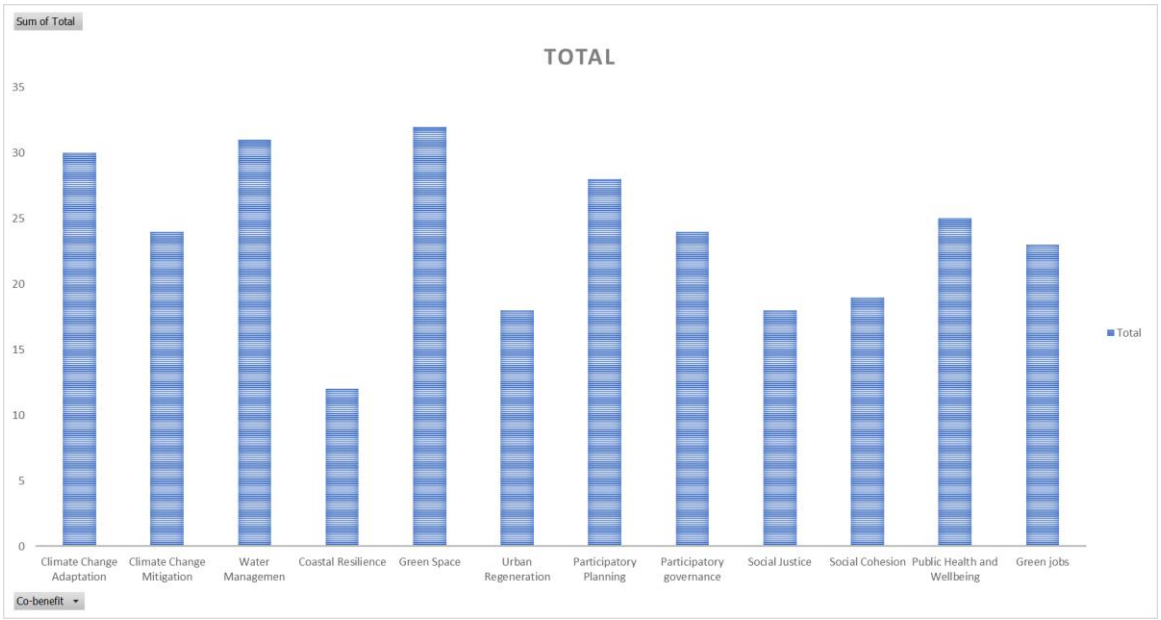


Figure 4 Perceived relevance of co-benefits from NBS in Collaborators

Table 5 Objectives of partner organizations representing a Collaborator in RECONECT

PRIORITY	Poland	Croatia	Cali, Colombia	Thailand	Serbia	Medellin, Colombia	Bulgaria
1	Learn about planning and design of NBS	Potential to learn	To find new alternatives for the protection of the networks close to streams	To apply the use of Science and Technology (S&T) and information systems to help communities collect important data, identify the root causes of local problems and develop local land use planning that suited their circumstances.	knowledge and know-how transfer	To optimize and preserve the optimal sanitary conditions of water sources, and systems for human use and consumption, improve the excreta sanitary disposition and improve the solid waste sanitary management.	Develop a Kamchia River Basin Management Plan called "Plan RECONECT" aimed
2	Exchange of experiences with Partners in term of conversion of grey infrastructure into hybrid solutions	Interaction with other partners, knowledge sharing	To learn new skills	To solve flood and drought problems and stimulate land use planning,	work in the international environment	To reduce the hydrometeorological risk of rural and natural areas of Río Frio's basin.	Provide direct support for implementing the NBS included in the Fluvial Risk Management Plan of the Black Sea River Basin and in the National Operational Programme "Environment" 2014-2020
3	Using project inputs to develop and implement the NBS concept for the Luciaza River basin (sub-basin of Pilica River) to mitigate drought and flood risks.	References to be used for next similar projects in the future	The interaction with other partners	To develop Rangsit community to be an "Income-Booster Retention Area" where the water retention in the furrow would promote palm oil and other cultivation as well as boosting the community income.	wider visibility and recognition of the university	To involve the Río Frio's basin community in the strategic and management processes of planning to enhance the planning, developing, distributing, and managing the water resources use.	Implement a Pilot project on developing a land management plan for a region with a high level of flood hazard in the Kamchia River basin (the beneficiary being a municipality or a group of municipalities) aiming

- *Come to a methodology on reaching out and up-scaling beyond the project*
- *Get an inventory of the methods which have been used by the project collaborators for developing their NBS land management plans*
- *The title of the WP4 is perfect to describe our expectations: Overcoming barriers, upscaling and synergies with collaborators.*
- *Standard indicator to measure the success from NBS.*
- *I hope to know more information and with that make decisions.*
- *Know the different case studies, their applicability, the lessons learned, the indicators, costs, implementation times, advantages and others*
- *Support for cooperation; exchange of experience and knowledge*

Figure 5 Collaborators' expectations of WP4

4.2 Survey 2: Collaborators' demand analysis

Besides understanding the physical characteristics of the catchment of each Collaborator, it is also essential to recognize the barriers or enablers that Collaborators may face based on their area of expertise. Most of the people that serve as Collaborators come from institutions/organizations that have different backgrounds and therefore they can provide input and bring knowledge on a broad range of topics. However, this also means that Collaborators may have different needs when it comes to co-creation processes, software tools, and stakeholder interaction.

As can be seen from Figure 6, most Collaborators are from the academic sector (54.5%) while 27.3% are from government institutions, and 9.1% from the private sector.

The following sub-sections will provide further details on the needs beyond the physical characteristics of the catchment of Collaborators.

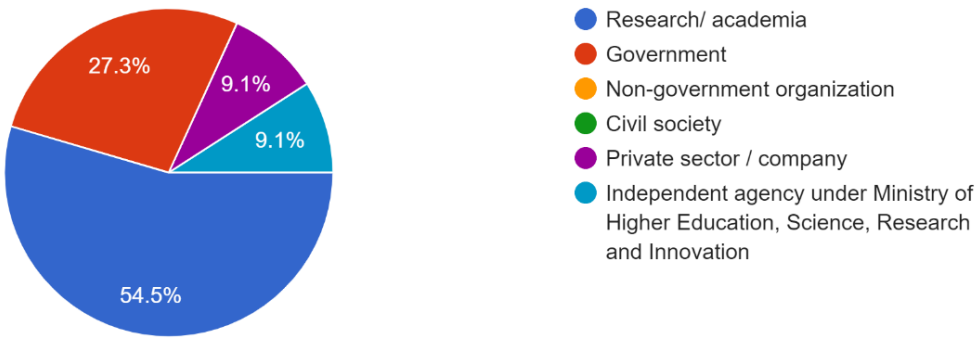


Figure 6 Collaborators´ background – represented sector

4.2.1 Knowledge gaps on hydro-meteorological risk assessment

This section presents results on the needs of Collaborators to be able to carry out hydro-meteorological risk assessments. Having clarity of future risks and the main hazards triggering them, gives planners and decision makers tools for executing urban and rural development plans where NBS and other climate change (prevention, adaptation, mitigation, or resilience) strategies may be taken into consideration.

Eight questions were formulated to assess knowledge gaps on information, tools, methodologies, or assistance to develop hydro-meteorological risk assessments. The results of these eight questions are presented in the following subsections:

- 4.2.1.1 Demands for hazard assessment (current and future)
- 4.2.1.2 Demands for vulnerability and exposure assessments (current and future)
- 4.2.1.3 Demands for carrying out risk assessments

Each subsection starts by showing its relation to D4.8, followed by an analysis of the responses. At the end of each section a summary on technical and assessment needs is added.

4.2.1.1 Demands for hazard assessment (current and future)

Three questions in the survey focused on gathering information regarding support that Collaborators require for hazard assessments:

- S2Q1 – Knowledge / records on current risk, future risks and hazard affecting their basin.
- S2Q2 – Records on hazard history and losses derived from their impact.
- S2Q3 – Knowledge on frequency of hazards affecting their basin.

Collaborators expressed that they do not have enough information about potential hazards affecting their selected catchment, nor about future risks in the area (Figure 7). Their main concerns refer to limited knowledge and data for setting up models.

CONNECTION TO D 4.8

The outcomes from this subsection contribute to section:

3.3 - Hazard assessment (current and future)

Identifying, understanding, and characterising the hazards that could lead to negative impacts inside a basin can be a first step towards undertaking hazard assessments. By assisting Collaborators overcome the needs expressed under this subsection, activities such as carrying out hazard maps can be put in place.

When asked about information on losses, results show that Collaborators do not have enough information regarding environmental and economic losses records. While information on total affected population and infrastructure disrupted seems to be available for most of them (Figure 8).

Based on personal experience and available historical data, most Collaborators perceived that the likelihood of hydro-meteorological hazards in their area is high (Figure 9).

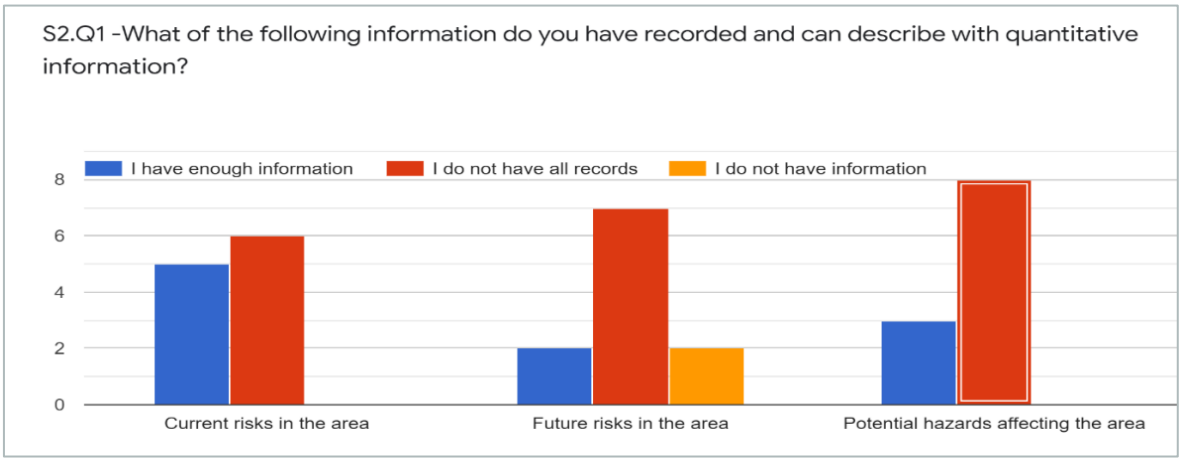


Figure 7 Collaborators' available information on current risks, future risks, and potential hazards

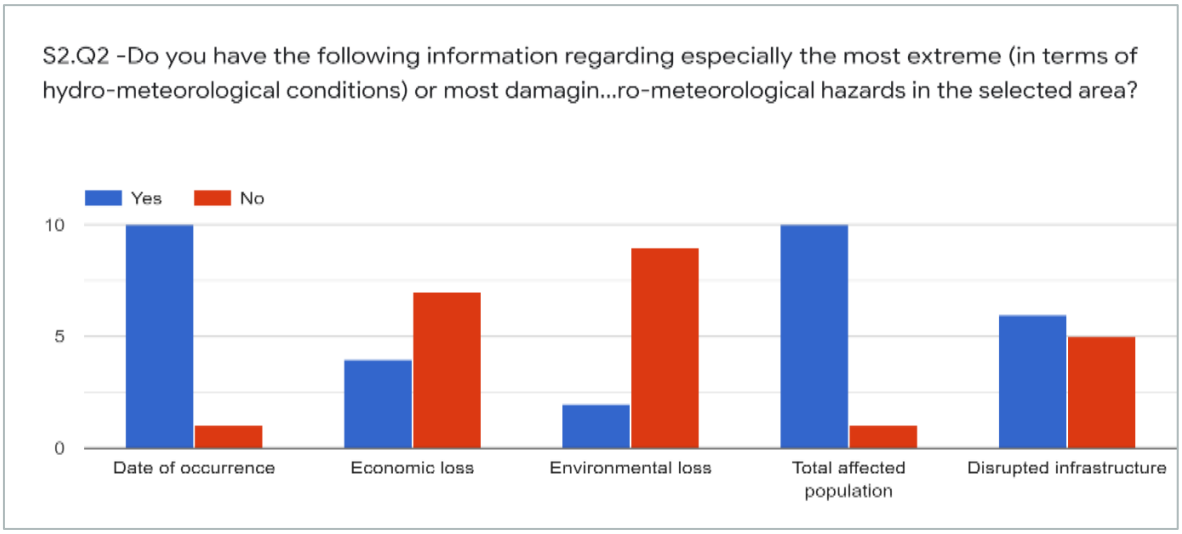


Figure 8 Available information on losses after hazard impacts in Collaborators' sites

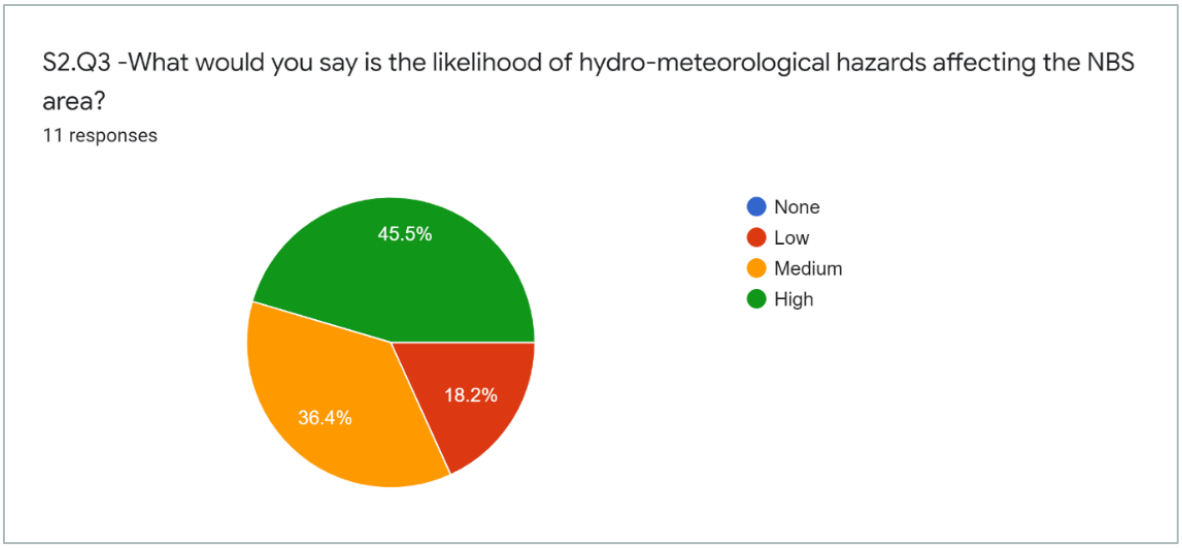


Figure 9 Likelihood of hydro-meteorological hazard affecting Collaborators' sites

4.2.1.2 *Demands for vulnerability and exposure assessments (current and future)*

Two questions in the survey focused on gathering information regarding support that Collaborators require to carry out vulnerability and exposure assessments. The questions aimed to get an overview on Collaborators' experience on the following:

- S2Q6 – Availability of data to carry out vulnerability and exposure assessments for their area.
- S2Q7 – Previous experience on vulnerability and exposure assessments.

As can be seen Figure 10, only around 20% of the Collaborators think they have enough data to carry out exposure and vulnerability assessments for their site area. While over 50% of the Collaborators need support to execute those assessments.

CONNECTION TO D 4.8

The outcomes from this subsection contribute to section:

3.4 – Vulnerability and exposure assessment (current and future)

By closing the knowledge gaps and assisting Collaborators overcome the needs expressed on vulnerability and exposure assessment, it can be easier to carry out activities towards generating vulnerability maps and assessing exposure.

When asked about the data they consider important to include when assessing exposure and vulnerability inside their basins, economic data ranked as the least important, while data on physical characteristics of the area is deemed as the most important.

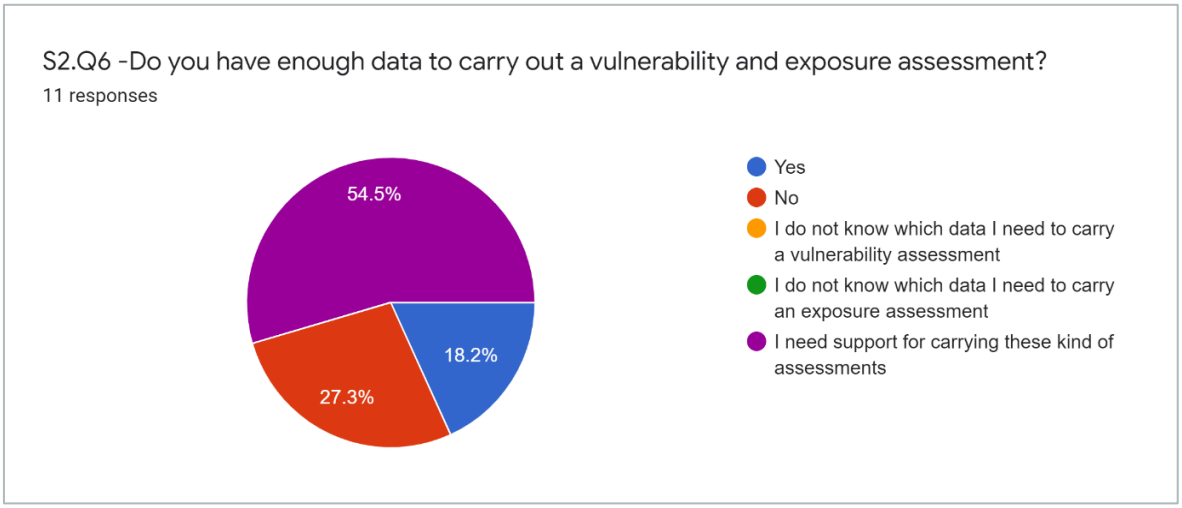


Figure 10 Availability of data for carrying out vulnerability and exposure assessment

4.2.1.3 *Demands for carrying out risk assessments*

Two questions in the survey focused on gathering information to assess whether Collaborators had enough information to generate tools such as risk maps. Both questions, evaluated their capacities either to process or perform actions to obtain essential data needed when carrying out Risk Assessments. The questions focused on the following:

- S2Q4 - Availability on maps and social data that could characterise the whole basin.
- S2Q5 – Hydraulic and hydrologic data, hazard, vulnerability, and risk maps are available for the selected site where they envisioned to implement NBS.

CONNECTION TO D 4.8

The outcomes from this subsection contribute to section:

3.5 –Risk assessment (current and future)

By closing knowledge gaps and assisting Collaborators' to carry out hazard, vulnerability, and exposure assessments (sections above) the data for developing Risk assessments can be strengthened. However, it is important to assess if Collaborators have enough information to generate tools such as risk maps, which can help them, and their stakeholders obtain a better overview of flood risks.

Collaborators' answers showed that they have available data to describe drainage systems, water bodies, terrain topography, climate and protected natural areas for the whole basin. However, they lack information on ground water characteristics and coastal conditions.

Regarding data availability at a sub-basin level – meaning the specific area inside the basin where NBS could be implemented- most Collaborators have available information on hydraulic aspects. However, many need support for carrying out processes that include modelling, especially for generating vulnerability and risk maps. Figure 11 and Figure 12 show in detail the categories in which Collaborators have availability of information.

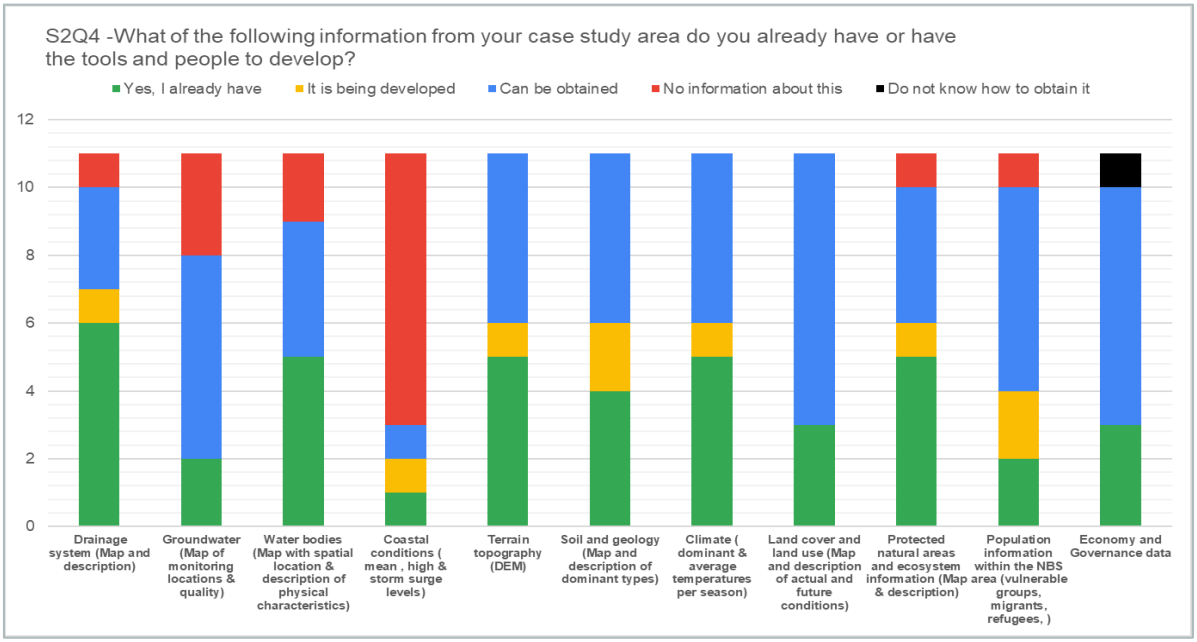


Figure 11 Collaborators available data and tools to characterize their basins

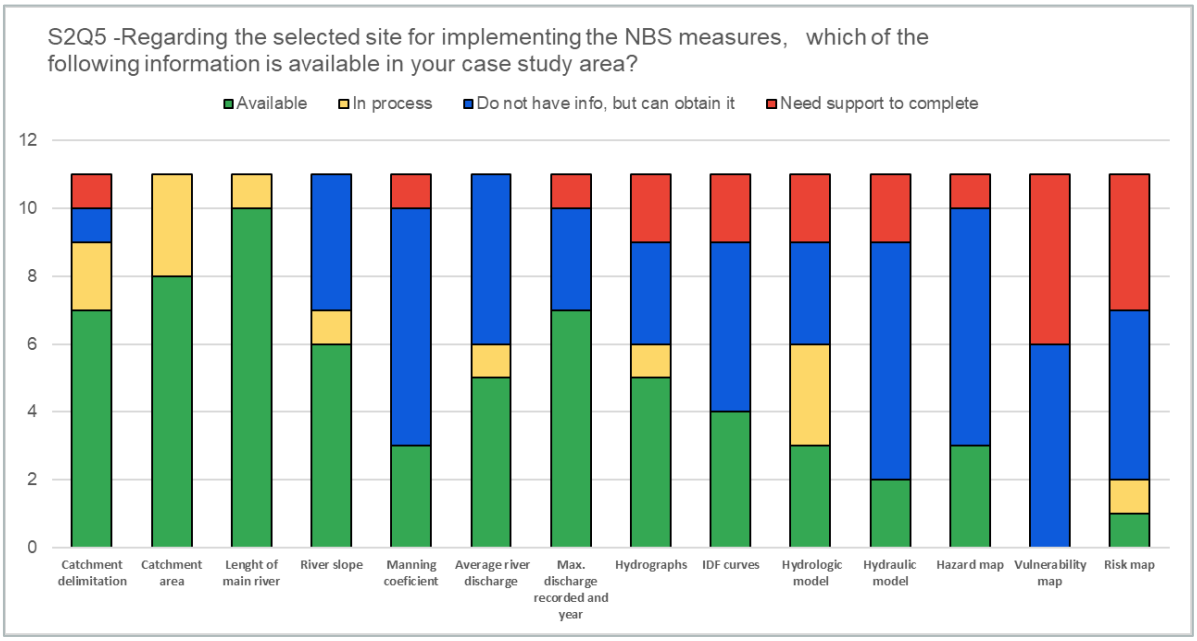


Figure 12 Data availability at sub basin level

SUMMARY OF DEMANDS ON HYDRO-METEOROLOGICAL RISK ASSESSMENT

Technical needs:

- Carrying out vulnerability and exposure assessments
- Generating Flood Risk Maps
- Hydraulic Modelling

Assessment on:

- How or where to obtain economic and environmental loss records from hydro-meteorological hazards in basins.
- How to measure or obtain information on groundwater quality
- Where to obtain data on river discharge or how to produce the data

4.2.2 Knowledge gaps related to feasibility assessments

This section contains results from the analysis of eleven questions that were formulated with the aim of assessing Collaborators' needs to complete Feasibility assessments of NBS. Feasibility studies are procedures that aim to assess the performance of different solutions for a specific problem, with the vision of selecting the option that best ensures a long-term success (Mukherjee & Roy, 2017). In the context of NBS, feasibility studies have been carried out for different objectives:

- For comparing NBS towards traditional grey solutions (The Metro Adapt project, 2018)
- For assessing location, benefits, impacts, economic benefits, and cost of different green options (Natural England, 2008)
- For comparing options by analysing community engagement, maintenance procedures and potential project sites (Rutgers Cooperative Extension Water Resources Program, 2015)

The results of the eleven questions are presented in the following subsections:

- 4.2.2.1 Demands on suitability analysis for spatial location of potential NBS
- 4.2.2.2 Demands on assessment of benefits and co-benefits of NBS
- 4.2.2.3 Demands on cost assessment of NBS
- 4.2.2.4 Demands on socio-political assessment of opportunities/barriers to implementation of potential NBS

Each subsection starts by showing its relation to D4.8, followed by an analysis of the responses. At the end of each section a summary on technical and assessment needs is added.

4.2.2.1 Demands on suitability analysis for spatial location of potential NBS

Three questions were formulated to get an overview of the most important aspects that Collaborators consider when evaluating and selecting NBS for their basins. Each of the three questions covered different aspects that are key when carrying out suitability analysis:

- S3Q1 – Tools used for deciding on the spatial location where NBS could be applied.
- S3Q2 – Knowledge on RECONECT´s catalogue of Measures
- S3Q3 – Existing and planned flood protection measures within their basins.

CONNECTION TO D 4.8

The outcomes from this subsection contribute to section:

4.1 – Suitability Analysis for spatial location of potential measures (within the focus area)

By closing knowledge gaps and assisting Collaborators overcome the needs expressed on suitability analysis for spatial location of NBS, better decisions on determining the best location of potential NBS measures in their basins can be taken.

Based on the answers from question S3Q1, it could be observed that most Collaborators selected their site area based on information from three main sources: Historical records of hazards in their basins, stakeholders' consultation, and flood extent maps. Risk maps and other tools were less commonly used as many of the Collaborators do not have such tools developed at a sub-basin level yet. Figure 13 shows the distribution of their answers.

To facilitate analysis of the potential NBS in Collaborators, a tool called "catalogue of NBS" is under development within RECONECT. The purpose of this tool is to assist actors in the process of selecting potential measures for their sites. Collaborators were asked about their interaction with the tool and 72% of them responded that they had not use it (Figure 14). It is important to mention that this may have changed by the time this report is published.

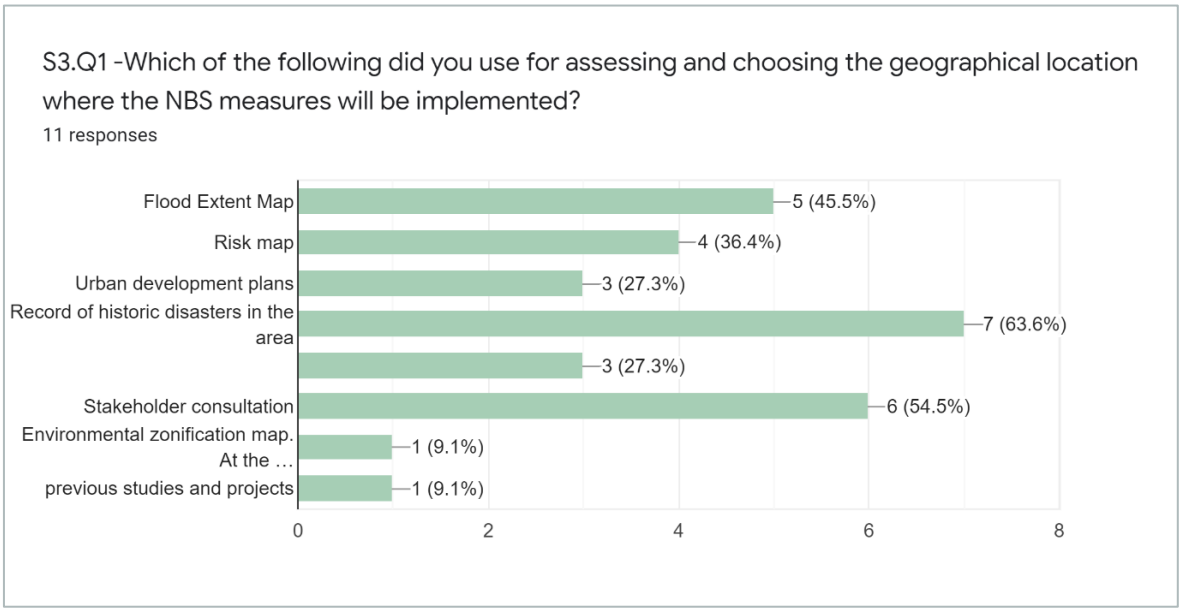


Figure 13 Tools used by Collaborators to assess NBS location

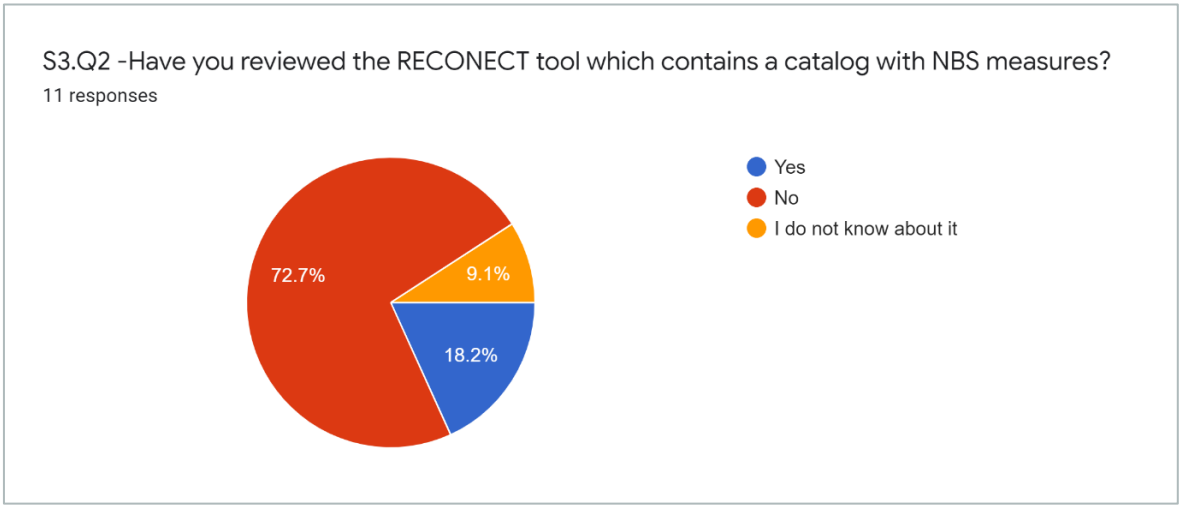


Figure 14 Knowledge about RECONECT´s catalogue of measures

Another important aspect to take into consideration when choosing a spatial location for NBS, is the presence of other measures in the area. For this reason, Collaborators were asked to mention if they had knowledge on the location of existing or planned green, grey or hybrid flood protection measures in their basins. Seven of the ten Collaborators answered that there are existing or planned flood protection measures in their basins. Retention basins were the most common measure among them.

4.2.2.2 *Demands on assessment of benefits and co-benefits of NBS*

At the time this survey was distributed among Collaborators, the catalogue of measures was not ready, and Collaborators had not yet narrowed down their selection of NBS. Most Collaborators only had a vague idea of potential NBS of interest, based on the baseline assessment carried out in 2019. The catalogue of measures, besides helping Collaborators narrow NBS options for their basins, would also give them a description of benefits and co-benefits of each NBS measure. Due to this, the demand analysis survey included only one question regarding NBS benefits and co-benefits. The purpose was to obtain an understanding of the level of knowledge amongst Collaborators on how they would assess benefits and co-benefits of NBS.

CONNECTION TO D 4.8

The outcomes from this subsection contribute to:

4.2 – Assessment of benefits and co-benefits

By closing knowledge gaps and guiding Collaborators on carrying out assessments on benefits and co-benefits of NBS, they will obtain tools to compare among measures and further explore and share NBS options with their stakeholders when carrying out feasibility assessments.

Question S3.Q4 focused on understanding whether Collaborators knew any methodologies that could help them assess benefits and co-benefits of NBS. Results illustrated in Figure 15 show that eight of ten, did not know. Only two Collaborators mentioned they had some ideas. Figure 15 show the distribution of their answers and some of additional comments are also shown.

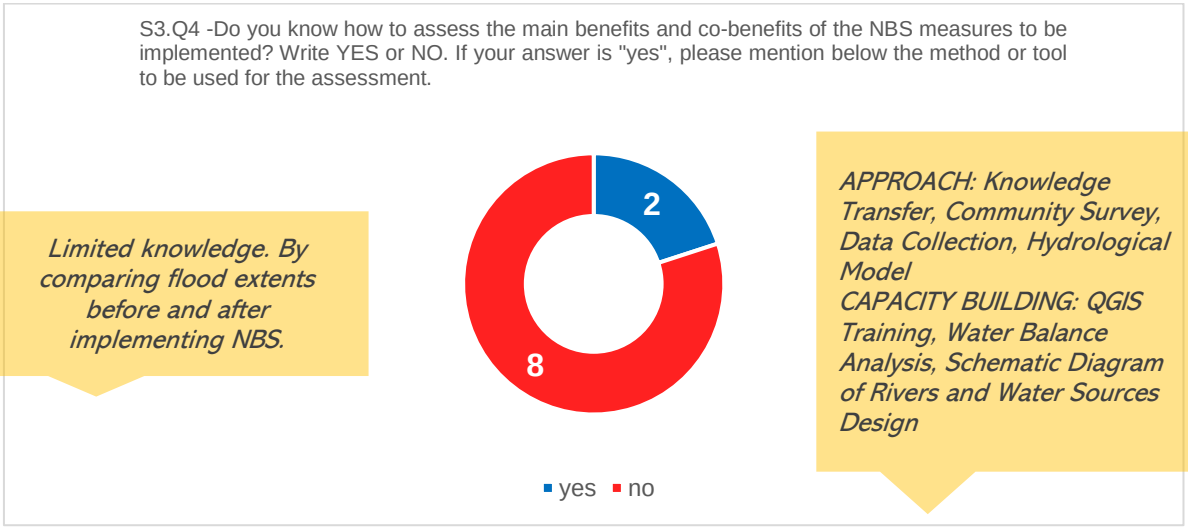


Figure 15 Collaborators´ knowledge on benefits and co-benefits assessment

4.2.2.3 *Demands on cost assessment of NBS*

Benefits and co-benefits, together with cost assessments are essential to draw comparisons between different measures. Question S3Q5 focused on exploring how many of the Collaborators had experience carrying out cost assessments of NBS. Answers showed that most Collaborators (8 out of 10) do not have knowledge to conduct cost assessments. Thus, knowledge on appropriate methodologies for carrying out cost and benefits assessments needs to be strengthened.

Figure 16 show the distribution of answers and some of their additional comments are also shown.

CONNECTION TO D 4.8

The outcomes from this subsection contribute to:

4.3 Cost Assessments

By closing knowledge gaps and guiding Collaborators carry out Cost assessments of NBS, they will obtain information that can help them compare economic aspects across measures. Rough valuations on life cycle costs of NBS can feed into feasibility assessments.

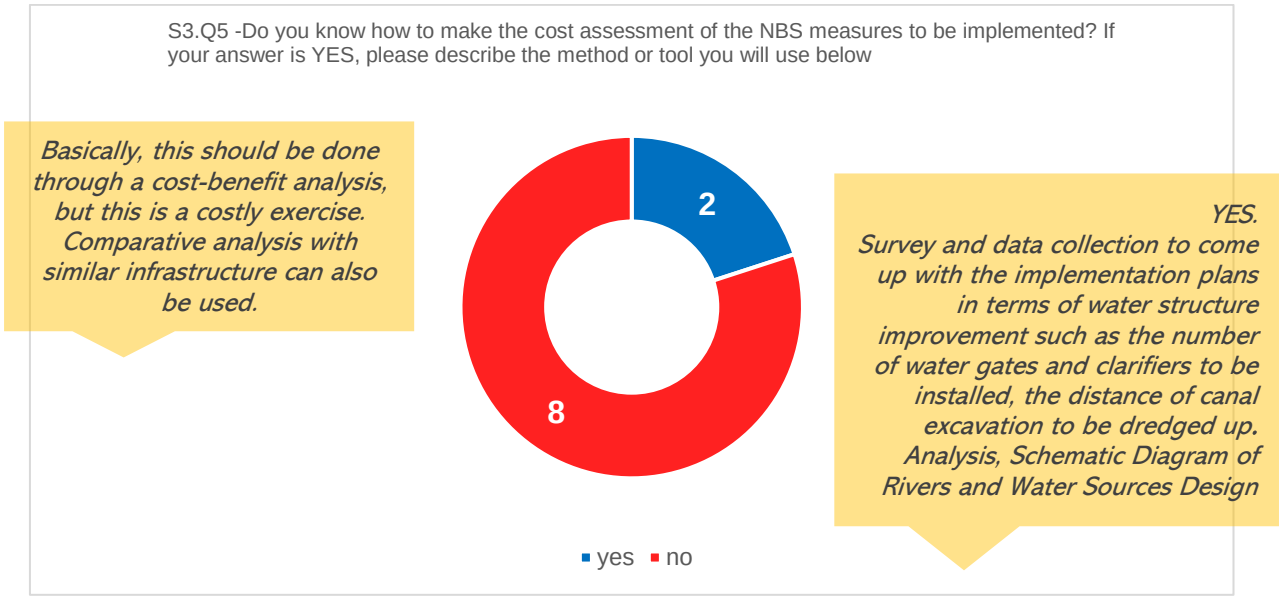


Figure 16 Collaborators´ knowledge on cost assessment of NBS implementation

4.2.2.4 *Demands on socio-political assessment of opportunities/barriers to implementation of potential NBS*

For assessing the needs on socio-political opportunities and barriers to implementation of NBS, Collaborators were asked two questions. The first one focused on potential barriers (S3Q6), while the second one (S3Q7) focused on their knowledge regarding existent political priorities that may support the implementation of the NBS in their basins.

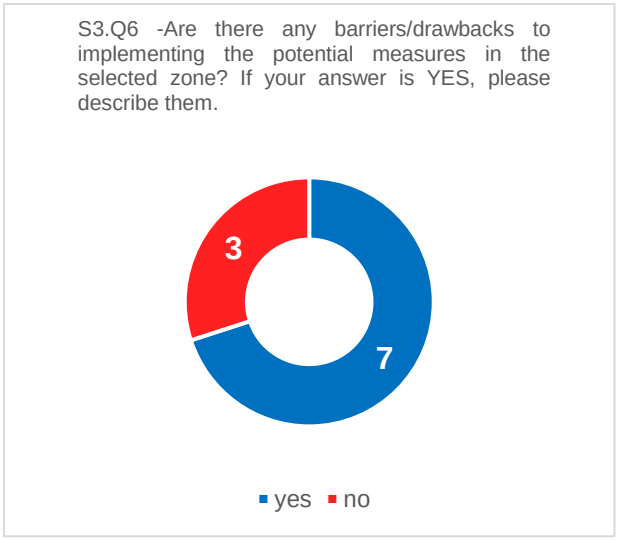
Regarding possible barriers, Collaborators were asked to describe whether they could foresee any situations that could limit the implementation of NBS in their basins. More than half of them voted yes, meaning that they can anticipate possible obstacles for NBS implementation (Figure 17). The boxes in the figure show some of their reflections on barriers.

CONNECTION TO D 4.8

outcomes from this subsection contribute to section:

Socio-political assessment of opportunities / barriers to implementation of potential measures

By closing knowledge gaps and guiding Collaborators through methodologies for assessing socio-political opportunities/ barriers to implementation of NBS, hurdles associated with regulatory frameworks will not come as a surprise.



YES
1) NBS are not readily understood by people (especially, by local authorities)
2) Right now, there are no funds available for implementing NBS. Such funds were envisaged in the National Operative Program "Environment" 2014-2020, however they were reallocated for other purposes/areas by the Government at the end of 2019. A written request was filed from our side to the Ministry of Environment and Waters for providing a part of this funding to the Kamchia River Basin. We are still waiting for an official response from the Ministry.

Yes, Lack of trust of decision makers and local communities in the effectiveness of NBS; low awareness, lack of good practice/ implementation in other areas

Difficulties of not having authorization to build works due to the declaration of environmental protection area y and that the municipality is not linked to carry out an integral intervention

Funding, inter-sectoral coordination, property rights, social acceptance

Figure 17 Barriers for implementing potential measures

When asked about political priorities that could ease the process of NBS implementation in their basins, the results showed that half of them know some institutions or strategies that could support NBS in their areas. The other half responded they do not know any (Figure 18). Some of the comments from Collaborators are also shown in the figure.

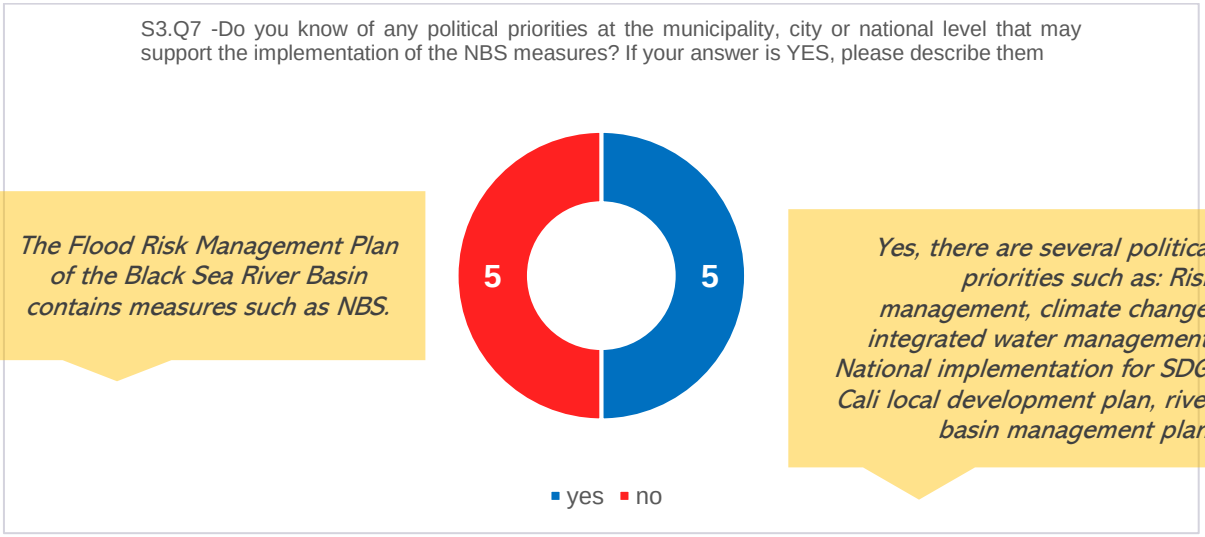


Figure 18 Knowledge on political priorities that could help in NBS implementation

SUMMARY OF DEMANDS ON FEASIBILITY ASSESSMENT

Technical needs:

- Cost – Benefit assessment of NBS projects
- Economic assessment of benefits and co-benefits of NBS

Assessment on:

- How to support the implementation of the potential measures in their cases study areas.
- Authorization /permits to build NBS (property rights)
- How to overcome the lack of trust from stakeholders (mainly citizens and decision makers) regarding the effectiveness of NBS
- How to overcome the lack of funding for NBS projects
- How to influence legislation in order to have tools to support the implementation of NBS

4.3 Survey 3: Assessment of co-creation activities in WP4

As part of the social innovation approach in RECONECT (Deliverable 1.2), the co-creation stage focuses on engagement with Collaborators, other consortium partners, and stakeholders in each collaborator case. This involved a range of participatory activities, as well as efforts to monitor and improve this process. A central component of the co-creation process involved guided work across the different collaborator cases following a template. This was supported by regular engagement with Collaborators and other WP4 consortium partners through facilitated monthly calls. Other activities included online sharing events such as webinars and workshops on particular topics. Due to Covid-19, co-creation activities were carried out online.

While co-creation is increasingly being used to identify more effective solutions, co-creation requires an investment of resources and it is important to understand which approaches are most effective (Durose, Richardson, and Perry 2018). This section outlines the results from the two main tools used to monitor co-creation activities in WP4 during 2020. First, reflections from last section of Survey 2 (Collaborators Demand Analysis survey) will be presented, next, results and reflection from Survey 3 will be shown.

4.3.1 Co-creation activities between Collaborators and stakeholders

Survey 3 was developed with the aim of assessing the impact of the co-creation activity that was held between Collaborators and their Stakeholders during 2020.

It is important to highlight that due to time limitations, the results shown below only reflect the responses of Collaborators. It is advised to share Survey 3 among stakeholders to make a complete analysis and compare how the same activity was perceived from both sides.

The assessed co-creation activity held between Collaborators and their stakeholders during 2020 consisted of a survey that helped gather information on the perceptions of the benefits and co-benefits that Stakeholders would like to obtain if NBS were constructed in their site areas. The activity was planned to be carried out in a face-to-face workshop format, however, COVID 19 made it impossible, and the activity had to be adapted to an online version.

The outcomes of the survey were analysed, and the results are presented under the four aspects mentioned in Section 3.3 (ease of completion, effectiveness, credibility and replaceability).

Ease of completion. Regarding the ease of completion of the co-creation activity, most Collaborators agree that the survey was moderately easy to undertake (Figure 19). Collaborators expressed that the instructions in the survey were well shaped. This meant the respondents had no complications when going through the survey. However, identifying which stakeholders would be eager to fill in the survey, and some of the technical terminology included in the questions, triggered complications for some of their stakeholders.

Effectiveness. In terms of effectiveness, only 16.7% of the Collaborators expressed that the co-creation activity was slightly effective. The rest of the Collaborators rated the activity as moderately and very effective in terms of involving and start engaging their stakeholders in RECONECT activities (Figure 20).

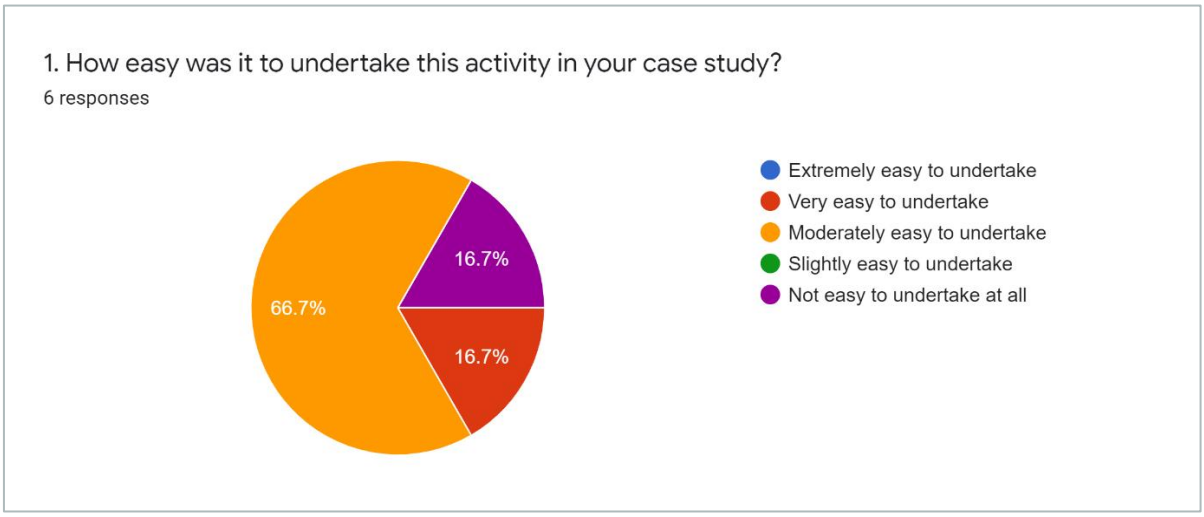


Figure 19 Ease of completion of co-creation activity in Collaborators sites

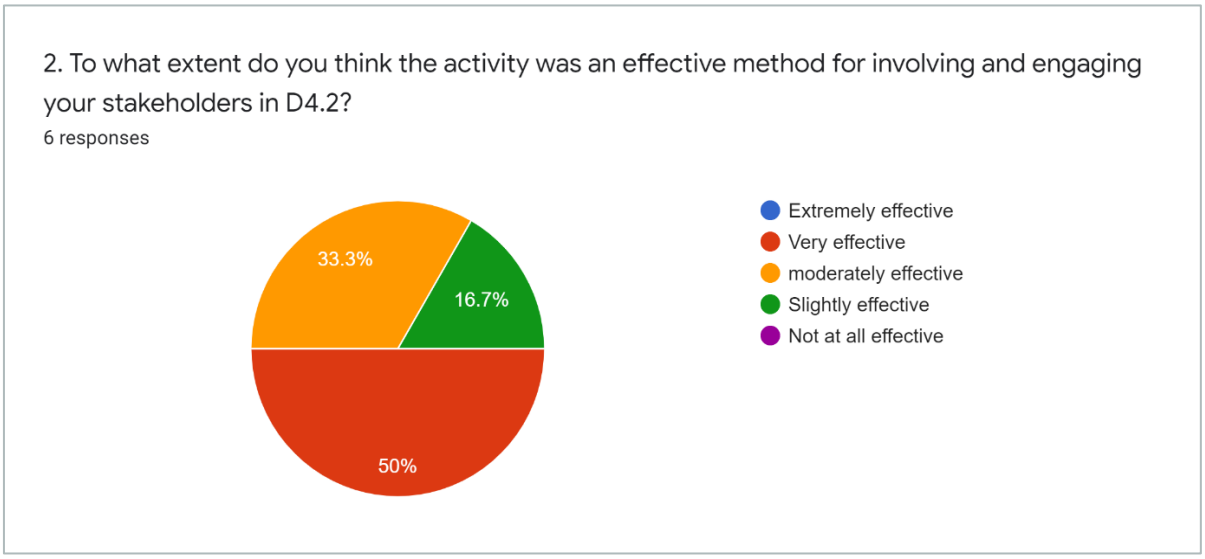


Figure 20 Effectiveness of co-creation activity for stakeholder involvement

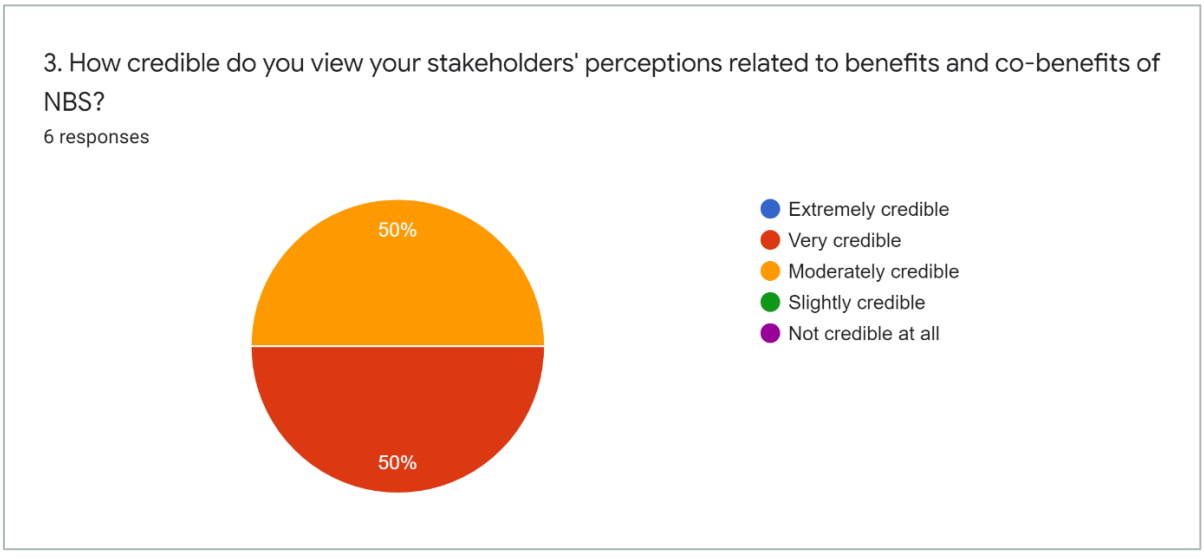


Figure 21 Credibility of stakeholders' perceptions regarding benefits and co-benefits of NBS

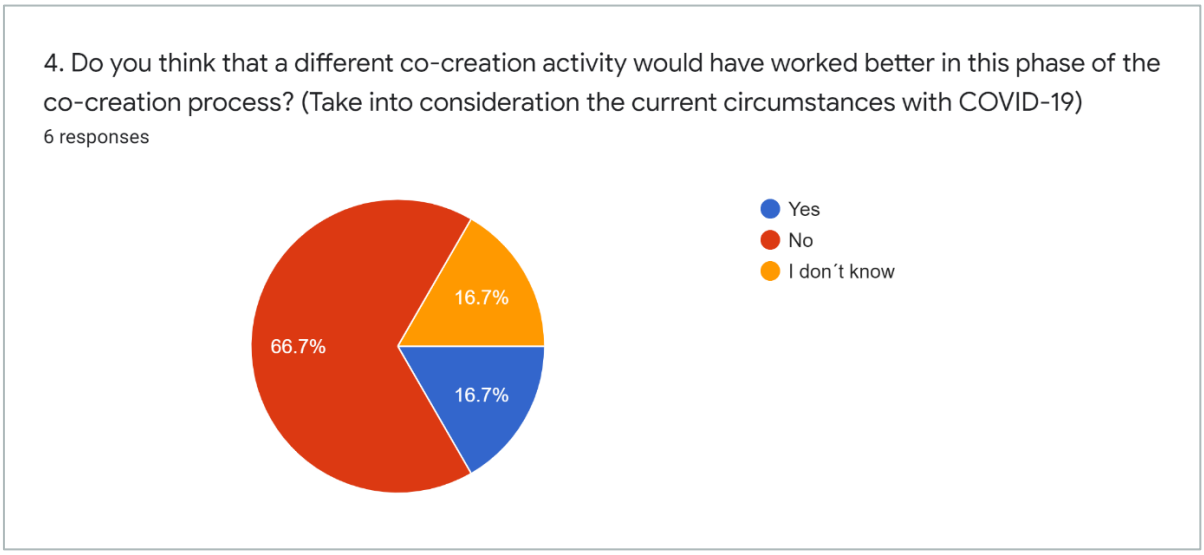


Figure 22 Replaceability of co-creation activity

Credibility. To reflect on how Collaborators perceive the results from the co-creation activity, they were asked to choose a level of credibility that best described the responses from their stakeholders. All Collaborators ranked the credibility with good scores. Half of them scored the activity as moderate credible and the other half as very credible (Figure 21).

Replaceability. The last indicator to be evaluated by Collaborators was the replaceability (Figure 22). For this, they were asked whether they considered that a different co-creation activity would have given better engagement results. They were asked to consider the COVID-19 situation and the stage of the current stage of co-creation process (co-planning) when giving an answer. The results show that most Collaborators do not feel that any other activity would have worked better. They also added that if circumstances were normal, they would have preferred a workshop or any other activity that could be undertaken face-to-face.

The results from the four indicators that were measured within this assessment provided evidence for improving co-creation activities in following steps of the project.

4.3.2 Co-creation activities between Collaborators and local authorities

Monitoring co-creation interactions between Collaborators and local authorities, was directly carried out using a set of questions (Section 4 of Survey 2) to measure the extent and level of co-creation prior to and during the project. RECONECT draws on existing co-creation indicators in the literature (Schuck-Zöller, Cortekar, and Jacob 2017; Bos, Brown, and Farrelly 2013), to identify a number of dimensions that are relevant to monitoring the success of co-creation (inclusion, credibility, relevance, learning opportunities). These indicators describe how the respondent perceives that other stakeholders value their contributions, the extent to which different actors are included and are on an equal footing, and the perceived credibility and relevance of information generated through stakeholder interactions. Learning among stakeholders is also evaluated, such as the time available for engagement with stakeholders, the availability of learning opportunities, and the knowledge and types of co-creation activities used.

Co-creation can be monitored regularly, such as on an annual basis. The results from the first annual assessment are described below according to the following indicators. Actions

towards implementing NBS were not measured at this baseline stage, but could be measured in future assessments.

- Inclusion
- Relevance
- Credibility
- Learning opportunities

While co-creation processes had begun when this survey was conducted, it is expected that the indicator scores will continue to increase during participation in the RECONECT co-creation processes.

Inclusion. Collaborators described their interactions with local authorities as on an even footing most of the time, meaning that different actors are included equally when collaborating in projects (Figure 23). However, in some cases local authorities are thought to have more say in collaborations. Importantly, two collaborator cases had no interactions between RECONECT, indicating the important role of RECONECT in promoting engagement between stakeholders. Regarding the type of interaction between Collaborators and relevant authorities in their basins (by the time the survey was distributed), most respondents (54%) reported being unsatisfied with existing interactions with local authorities and other stakeholders. For example, local authorities did not always respond to requests.

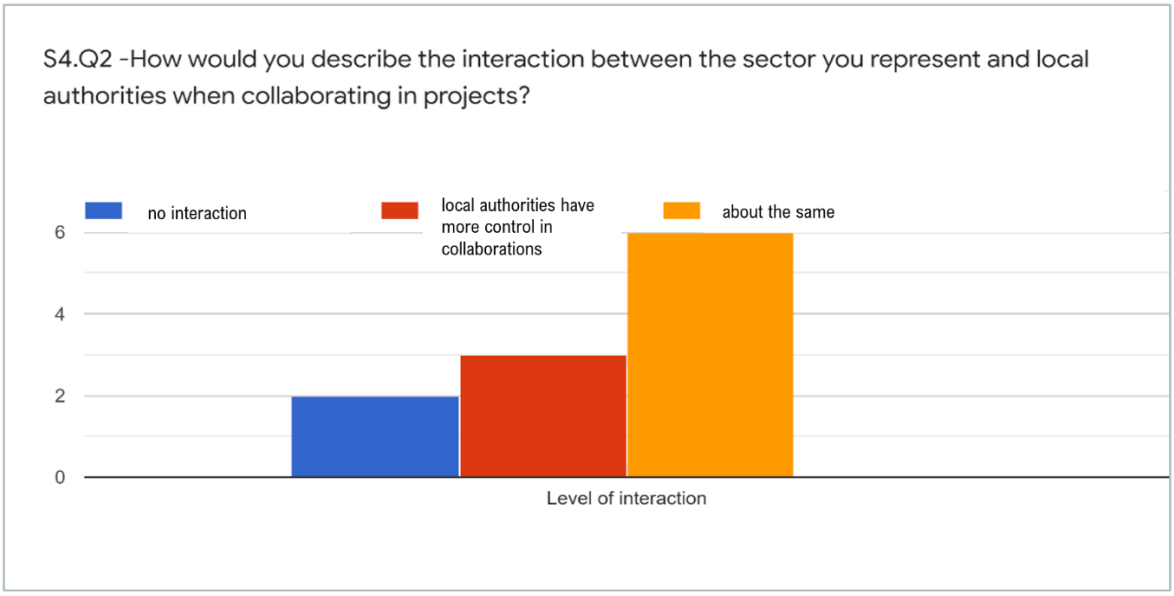


Figure 23 Extent of equal input into collaborations between Collaborators and local authorities

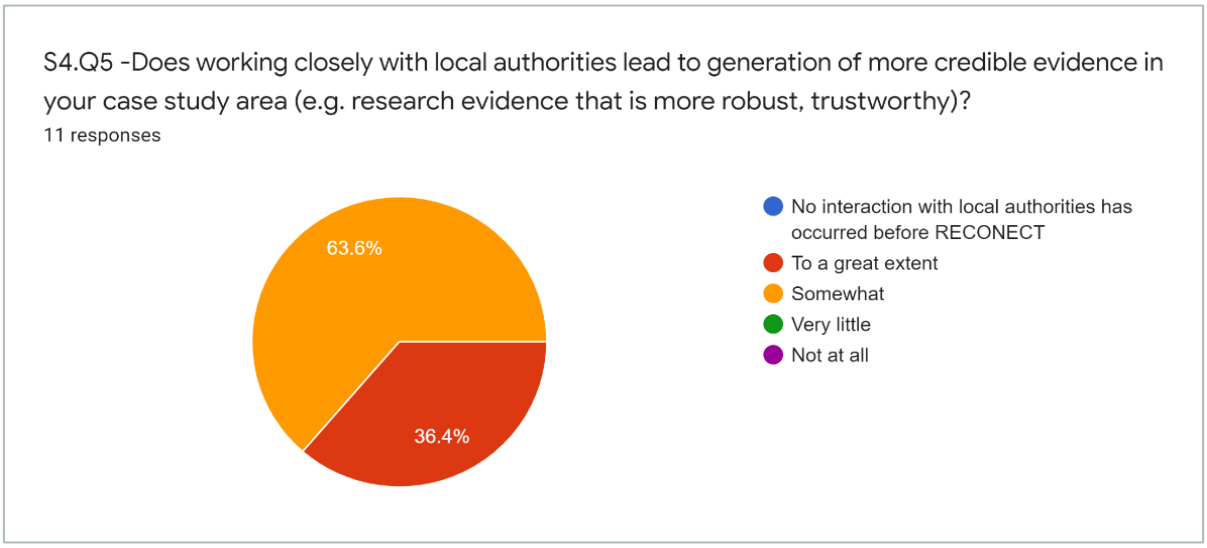


Figure 24 Credibility of information generated through co-creation

Credibility and relevance. From Figure 24, for the majority of cases it can be seen that interactions with local authorities were thought to lead to somewhat more credible evidence (64%) or much more credible evidence (36%). In 55% of cases, interactions with local authorities were thought to lead to much more relevant evidence. For the majority of cases, information provided to local authorities is somewhat valued (72%), while 18% reported that information was highly valued. This indicates potential for co-creation in RECONECT to increase the credibility and perceived value of information.

Learning opportunities. Overall, 72% of cases reported there were sometimes learning opportunities from local authorities, while 18% reported there were very often learning opportunities. With regards to the frequency of interactions with local authorities and other stakeholders which is required for learning, respondents reported that times for interaction are restricted. Only 9% (1 case) reported plenty of time for interactions between researchers and local authorities, and 45% reported restricted time for engagement. This presents a challenge for ensuring that high quality co-creation processes can occur, something that RECONECT may help address. It is also important to keep in mind that interactions with local authorities may need to be focused and limited in time, as they have many other demands on their time.

To understand knowledge of co-creation methodologies, a list of co-creation methodologies / activities was presented to Collaborators and they were asked to select the ones they had previously applied for stakeholder involvement. From the seven options (semi-structured interviews, participatory mapping, serious gaming, citizens science, local knowledge /traditions, design thinking, co-creation strategies) the most and the least known are shown in Figure 25.

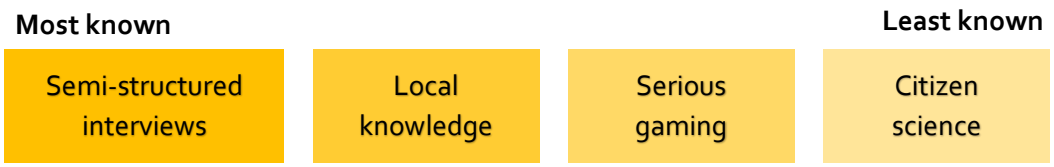


Figure 25 Knowledge on co-creation methodologies

Following the baseline assessment survey to evaluate these indicators, the co-creation monitoring questions should be conducted at regular intervals (e.g., annually), using the same set of co-creation indicators in order to ensure comparability over time, as well as including other aspects that are relevant to that phase of the project (e.g. actions towards NBS implementation, perceptions of co-creation initiation at the start of the project, or perceptions of change at the conclusion of RECONECT). A successful co-creation process should lead to increased credibility, relevance and value of the information generated.

SUMMARY OF DEMANDS ON CO-CREATION

- Assessment on how to choose and apply different co-creation methodologies to involve stakeholders along the project.
- Recognize in which steps / stages / activities to apply co- creation strategies and which stakeholders to involve.

5 Addressing identified demands

The following two sections present the methodology and results from two virtual parallel sessions carried out during RECONECT's General Assembly (GA) that took place in October 2020. The sessions summoned approximately 60 participants from the RECONECT project, and each session had a duration of approximately two hours.

The purpose of these sessions was to further capitalize from the consortium on potential ways forward for addressing some of the gaps identified through the surveys and in Deliverable 4.2.

5.1 Addressing knowledge gaps in hydro-meteorological and feasibility assessments

The outcomes from Survey 2 – Demand assessment with focus on Collaborators – helped summarize and narrow specific demands that most Collaborators shared regarding two main topics: hydrometeorological risk assessment and feasibility assessment. On the basis of these outcomes, a twinning session was organized and carried out during RECONECT 2020 General Assembly (GA 2020).

The session had four main objectives:

1. Assess the status of the twinning activities in RECONECT.
2. Obtain feedback on further twinning actions.
3. Identify potential twinning couples among Collaborators, Demonstrators and Knowledge service providers within the Consortium.
4. Identify partners and resources that exist within the Consortium and that could help Collaborators overcome barriers previously identified.

For the purpose of this deliverable, we will only be focusing on outcomes of objective three and four. An overview of the partners that attended the session can be seen in Figure 26.

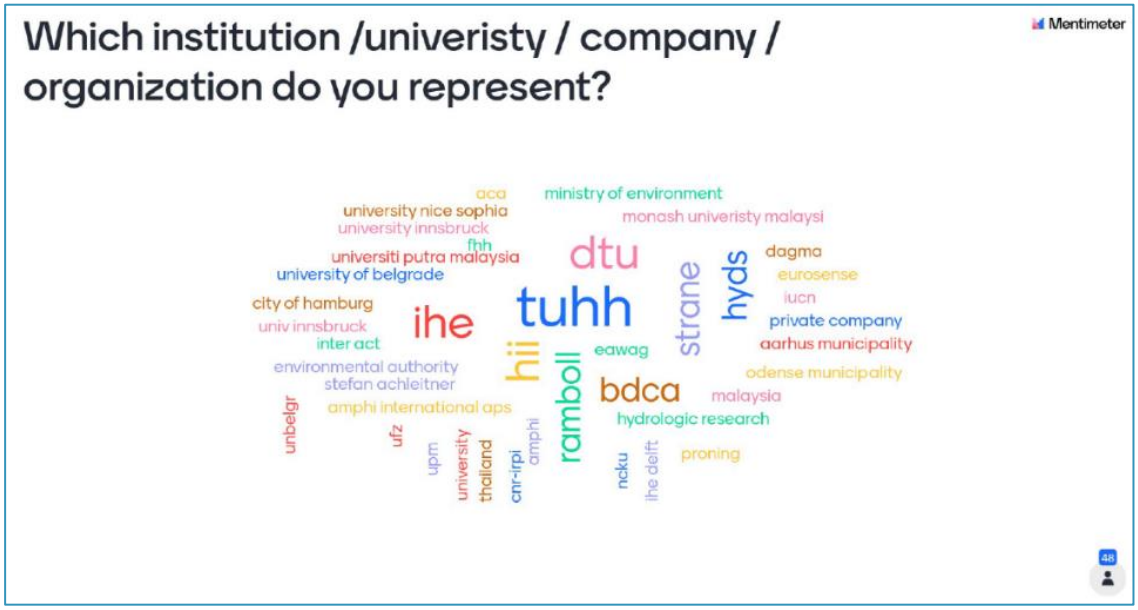


Figure 26 Attendees to twinning parallel session during GA

Table 6 Set of questions to cover objective 3 and 4

SET OF QUESTIONS TO COVER OBJECTIVE 3 AND 4
Hydrometeorological risk assessment
1. Which of the following areas would you say you have expertise or have worked with? (Hydrometeorological risk assessment, feasibility assessment of NBS, legal aspects of NBS)
2. Collaborators need technical support to develop risk assessment and hydraulic models. How could your organization help them?
3. Collaborators are facing difficulties with data collection on damage cost, groundwater quality, river discharge records. How could you help them?
Feasibility assessment
4. Collaborators need technical support regarding cost-benefit analysis and implementation of NBS. How could your organization assist them?
5. Collaborators foresee that they could face legislation barriers for the implementation of the project. How could you assist them overcome this?

To gather information that could feed into the results of objective three and four, a set of questions were asked to the attendees. The set of questions included five queries focused on identifying partners and resources that could assist Collaborators overcome barriers and demands, previously identified from Survey 2 on hydrometeorological risk assessment and feasibility assessment. Table 6 shows the five questions that were asked. Figure 27 shows that most participants have broad experience and knowledge on hydrometeorological risk assessment. However, expertise on the legal aspects, cost- benefit assessment and implementation of NBS is limited.

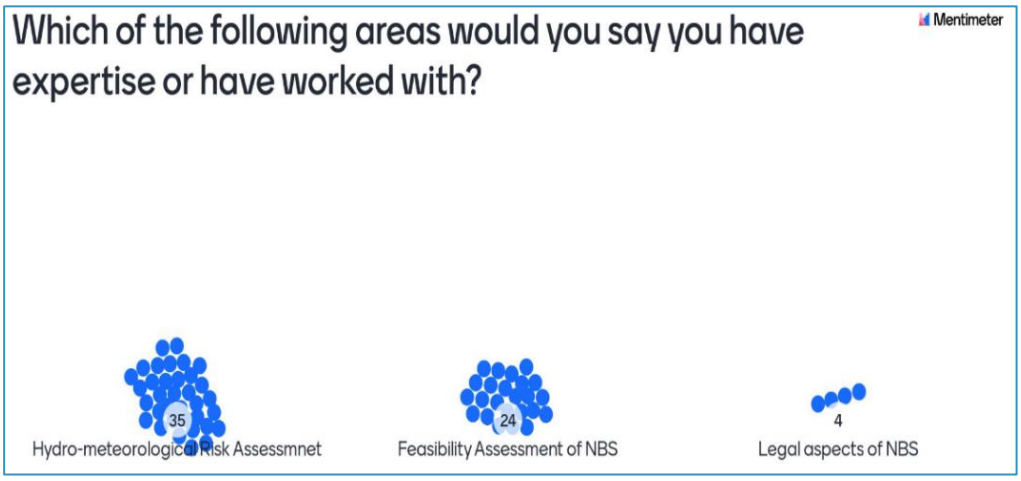


Figure 27 Expertise of RECONECT Consortium members

Table 7 shows the existing tools that have been either developed or used by some partners for RECONECT and other projects and that could help Collaborators fulfil the demands previously identified on hydrometeorological risk assessment and feasibility assessment. The first column lists the partners that could supply the expertise or tools. Column 2 presents the expertise or tool that could be offered, and the third column shows the demand that could be covered with this tool or expertise. The information in Table 7 could serve as

input to design different exchange and learning activities to match Collaborators with specific demands to one or more partner in the RECONCT Consortium that could be able to supply the expertise needed to overcome their needs.

Table 7 Tools and expertise that RECONECT Consortium members could provide to Collaborators

PARTNER	EXPERTISE OR TOOL	TOPIC
TUHH	Flood hazard and risk models	Hydrometeorological risk assessment
	Consultation on numerical modelling	Hydrometeorological risk assessment
	Tool for forecasting hydrometeorological events	Hydrometeorological risk assessment
	Consultation on hydraulic and hydrological modelling	Hydrometeorological risk assessment
IHE	Consultation on hydraulic modelling	Hydrometeorological risk assessment
	Tools and tutorials for risk assessment	Hydrometeorological risk assessment
	Consultation on installing monitoring equipment for data collection in rivers	Hydrometeorological risk assessment
DTU	Tools for calculation of expected annual costs based on hazard and value maps	Feasibility assessment of NBS
	Consultation for Decision Support System (DSS)	Feasibility assessment of NBS
	Consultation on international repositories to obtain data on damage cost	Feasibility assessment of NBS
	Assessment on method development for people indicators	Feasibility assessment of NBS
UIBK	Consultation on hydrological modelling and model calibration	Hydrometeorological risk assessment
Ramboll	Consultation on GIS, risk analysis and hydraulic models	Hydrometeorological risk assessment
	Valuation of co-benefits	Feasibility assessment of NBS
Inter Act	Consultation on groundwater and flow measurements	Hydrometeorological risk assessment
	Consultation on automation of measurements through sensors using their platform-Telecontrolnet	Hydrometeorological risk assessment
STRANE	Consultation on European data sources and damage cost curves	Feasibility assessment of NBS
	Assessment on flood mapping and flood models	Hydrometeorological risk assessment
HYDS	Consultation on early warning systems and decision support tools	Hydrometeorological risk assessment
EAWAG	Lessons learnt on legislation barriers in the THUR river- site specific	Legislation barriers for the implementation of NBS

5.2 Addressing knowledge gaps in the co-assessment and planning of NBS

Responses from Survey 2 “Collaborators’ Demand Analysis” as well as results from D4.2 revealed knowledge and information gaps amongst Collaborators regarding policy, socio-economic, and financial barriers and opportunities for NBS. The purpose of the session was therefore to discuss opportunities and challenges for addressing these gaps in order to feed in the co-assessment and planning stage of NBS. Outcomes of this session provide direction for the completion of Collaborators’ Management Plans (D4.8).

The session focused on exploring three separate issues related to co- assessment and planning:

- The first question examined approaches for obtaining data on damage costs in different contexts.
- The second question examined the potential barriers or enablers for implementation of NBS. Ways of overcoming identified barriers were also discussed.
- The third question examined how to evaluate NBS, including choice and use of indicators. This included how co-benefits can be monetized, and how to evaluate co-benefits associated with NBS which cannot be monetized.

A participatory approach was used to ensure inputs were received from all participants. The session was organized around 4 rounds to provide space for all participants. Google slides were used to apply the ‘think, write, share’ facilitation tool. A summary of results is presented below.

How to obtain data on damage costs?

Data availability and accessibility varies across countries. In some countries there is much more data readily available and in a format that can easily be used for making forecasts or models. In other countries, data might be available, but it is not accessible, and users might need to purchase it. Sometimes data can have a “security” classification and might therefore not be accessible at all. This is sometimes the case with data on critical infrastructures and other key assets.

It is also important to keep in mind that damage costs may include direct costs (from the hazard), and costs from cascading effects (indirect). Furthermore, while damage cost is a term that is often used to refer to tangible, physical, and quantifiable losses, there are also intangible losses, such as what is perceived as beautiful or important, and losses that are difficult to monetize, such as irreplaceable cultural heritage.

Wherever data is available, participants outlined the sources to obtain data from in Figure 28. In cases where no data is available and no previous studies have been conducted, information exchange with similar cases could provide proxies for some criteria. Figure 29 shows the expertise and tools in RECONECT related to damage costs.

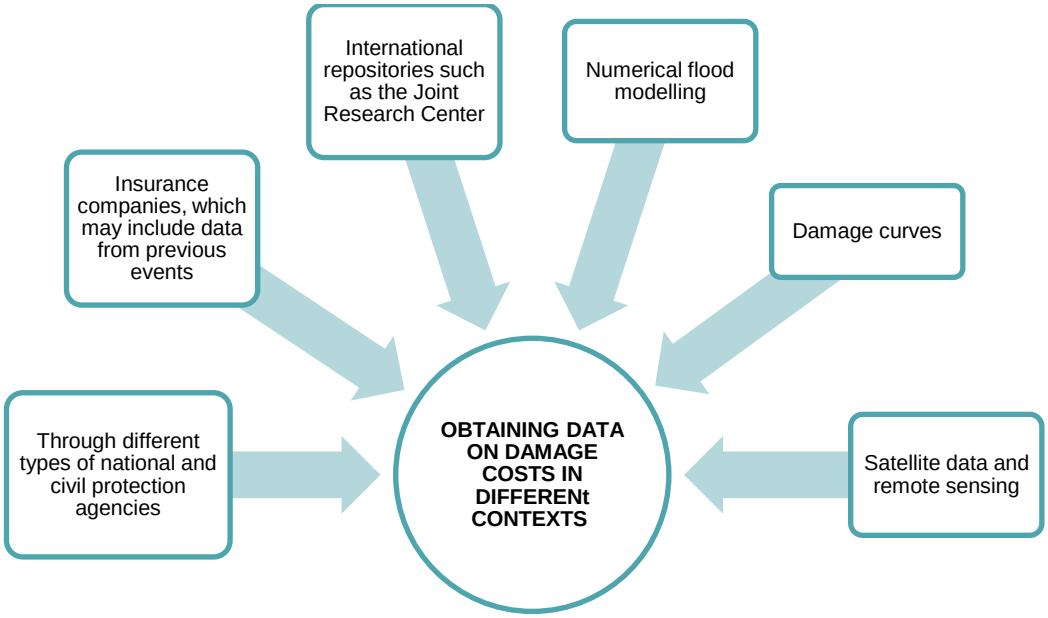


Figure 28 Data sources for damage costs

Addressing challenges for obtaining data on damage curves

RECONECT could facilitate the following:

- Internal database with resources
- Accessing databases from other EC projects
- Internal transfer of tools (within the project)
- Through twinning transfer skills
  - Online or IRL sessions
  - Bilateral consultations

Figure 29 Expertise and tools that could be obtained through RECONECT

What are potential barriers and enablers for implementation of NBS?

Participants listed several barriers for implementation of NBS:

- Land use: ownership and land use were brought up by several participants. This is particularly difficult to handle in settings where land areas are owned by multiple actors, alternatively in areas where most land is used in ways that are incompatible with the space required by NBS. This includes areas under some form of protection (e.g., NATURA2000) which would have implications for the type and design of the NBS.
- Societal acceptance: There are various issues affecting acceptance of NBS. One important aspect is the perception of lack of immediate benefits to stakeholders. Participants explained how sometimes it takes a long time to see tangible benefits, and therefore it is important to manage expectations by conducting projects with both short and long terms benefits.
- Knowledge and awareness: The image of grey infrastructure as superior and more reliable than other ecosystem-based options prevails in most spaces of society. There is a lack of knowledge and experience about the efficiency and effectiveness

of NBS to mitigate hazards. In some cases, this is due to the lack of studies that clearly show before-and-after results, or studies that compare effectiveness of NBS with grey infrastructure, particularly in relation to multiple benefits (and ecosystem services) provided by NBS.

- Political support and sense of urgency: Generally, there is a lack of experience with NBS which in turn prevents NBS from obtaining more political support. Additionally, NBS projects could take several years to get going, especially in areas where this is being done for the first time as the actors and processes required for its construction are not established (e.g., in cities' procurement routines). Changing operators and entrepreneurs is a complex process and therefore there is a tendency to go for what is "known".
- Legislation: Particularly in relation to water governance which in many cases prevents any type of development along the basins.
- Financing: how to? where from? This is related not only to lifecycle costs of NBS but also potential costs for dealing with land ownership, for instance compensation schemes, relocation programs, etc.

The enablers for implementation of NBS are summarized in Figure 30. It is relevant to mention that this is not an exclusive list, and a more comprehensive assessment needs to be carried out. However, this list provides a starting point for exploring in more depth these issues.

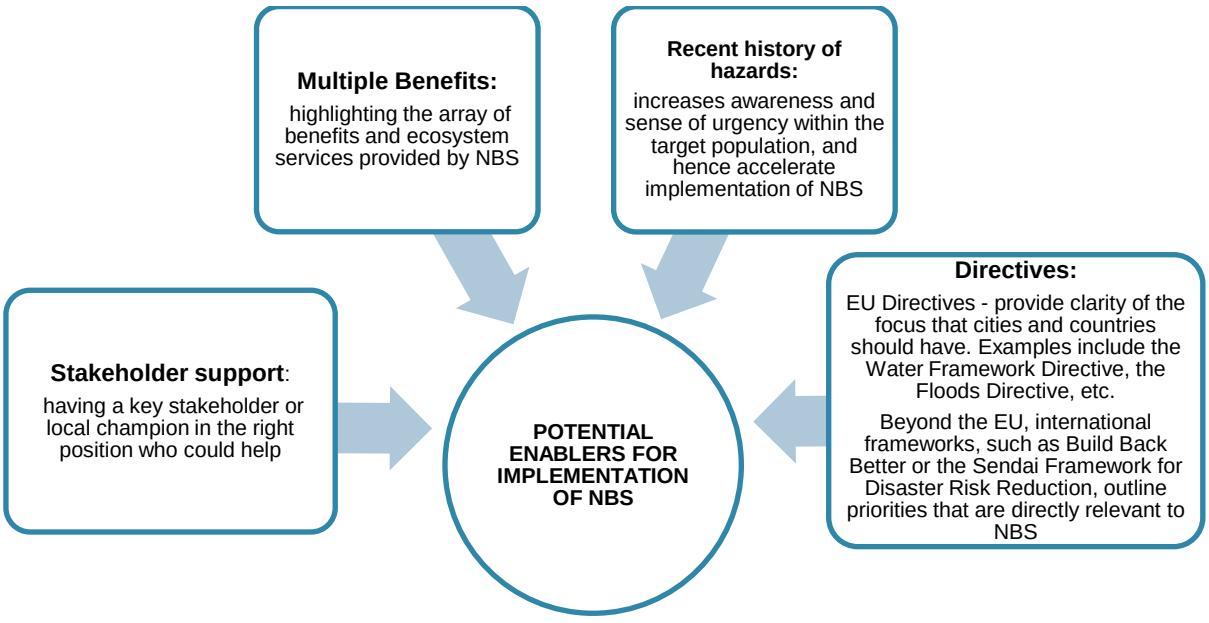


Figure 30 Potential enablers for NBS implementation

How to evaluate NBS? How to monetize co-benefits? What to do with those co-benefits which cannot be monetized?

Figure 31 highlights some options provided by participants regarding the evaluation of benefits and co-benefits of NBS.

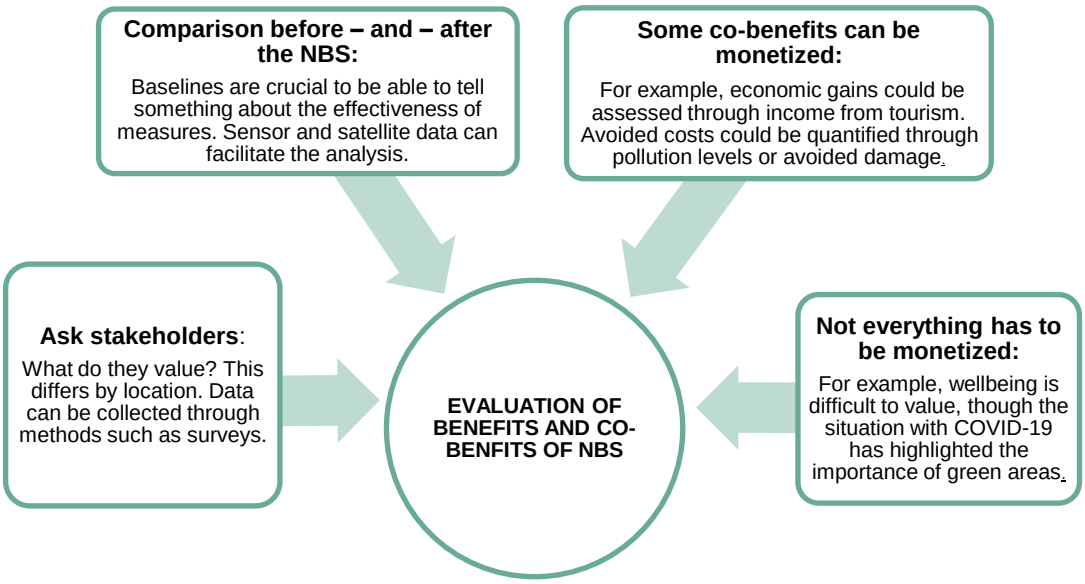


Figure 31 Evaluation options for benefits and co-benefits of NBS

6 Conclusions

This report presents results from three surveys that were designed to collect data that could contribute to identifying the demands of RECONECT Collaborators and potential supply side within the project. As such, the report is aimed at creating a basis for the upscaling process from Demonstrators to Collaborators, as well as at successful implementation of the planning stage of NBS projects in Collaborator sites.

Survey on Collaborators' expectations of RECONECT (Survey 1) was conducted in 2019 and helped to identify the main interests and objectives of Collaborators and inform the twinning process carried out with Demonstrators in WP2. The survey reveals that RECONECT is seen by the Collaborator partners as a vehicle to increase knowledge and inform local planning processes. The primary objectives of the partners are almost equally spread between getting access to knowledge on NBS and finding improved solutions to local challenges in implementing risk reduction projects. Methods for evaluating NBS effects, supporting tools and training (such as MOOC) are of the main interest to Collaborators. Knowledge exchange within the network of RECONECT cases through twinning activities is therefore considered as an important process to meet the identified needs.

Survey on knowledge gaps related to hydrometeorological risk analysis and feasibility assessment of NBS (Survey 2) helped to understand Collaborators demands specifically in relation to these assessments. Lack of data and information on losses related to specific risk was acknowledged by majority of Collaborators, some of which also did not know how and where to obtain the data. Lack of knowledge on environmental losses was particularly expressed. Carrying out vulnerability assessment and generating flood risk maps also represents major challenges for most Collaborators. While some Collaborators seem to have good knowledge on hydro-meteorological hazard assessment, some technical guidance is still needed for hydraulic and hydrological modelling.

For the feasibility assessments, the Collaborators are mainly interested in the economic assessment of NBS benefits and co-benefits, as well as in the cost-benefit analysis, for which they find their expertise very limited. Their interest also lies in getting assistance from other Consortium partners that could share best practices and experiences regarding policy, socio-economic, and financial opportunities for NBS implementation. The Collaborators seem to have solid knowledge on the local barriers to implementing NBS and a number of the most important ones was identified.

Survey on perceptions from co-creation activities (Survey 3) was related to activities carried out between Collaborators and their stakeholders in 2020 aimed at collection stakeholders' preferences on main challenges and goals of implementing NBS projects. These activities were mainly carried out online due to Covid-19 situation and were perceived as moderately easy to undertake and effective in terms of involving stakeholders. However, the Collaborators expressed their preference for face-to-face activities and more options on co-creation activities that can be carried out, indicating the need for support with the methods of stakeholder participation. The credibility of the results of virtual co-creation activities – especially online surveys shared with stakeholders – was perceived by Collaborators as moderate to high, but not as extremely high. The Collaborators expressed that it was difficult to develop questions that could be interpreted equally by all stakeholders. However, they all agree that the co-creation processes could lead to more relevant and credible evidence on NBS for the study area.

On the demand side, the results of this report clearly show the need for the knowledge exchange. Demonstrators and other Consortium partners can be seen as knowledge providers, while the twinning activities should be used to operationalize this process. In the area of risk and feasibility assessments, nine Consortium partners can provide tools and assessment that could help Collaborators fulfil their demands on hydrometeorological risk assessment and feasibility assessment. Expertise on legal aspects, cost-benefit analysis and implementation of NBS is limited among the Consortium partners. Also, the Consortium can also offer their experience in finding the enablers for the main barriers identified.

Twinning activities in RECONECT have been organized by WP2 and include different activities such as the site visits, workshops and webinars. A review of twinning activities from the early project stage can be found in deliverable D2.2. More recently, the twinning activities also included:

- Field visits of two Demonstrators B, Thur River Basin in Switzerland (May 2022) and Room for the River in the Netherlands (November 2022), as well as two Demonstrators A, Elbe Estuary in Germany (May 2023) and Seden Strand in Denmark (September 2023). More field visits are planned until the end of the project (Tordera River Basin, Portofino Natural Park, Kamchia River Basin).
- Twinning webinars on different topics were organized, especially the webinars on WATER, NATURE and PEOPLE indicators and their co-monitoring and co-evaluation in the NBS projects.
- Extensive webinars and workshops during the project meetings on co-creation methods were also organized in the course of preparation for tasks 4.5 and 4.6, which involve significant participation of stakeholders.
- To bridge the knowledge gaps on the use of different models for hazard and risk assessment, as well as for the evaluation of co-benefits, a survey on the modelling approaches was distributed among the project partners. This survey is aimed at helping Collaborators in preparing their prefeasibility studies (D4.8) as well as a guide for NBS projects beyond the project.
- A number of tools were developed that supported the work of Collaborators, including the measure selection tool, the tool for spatial analysis of NBS locations, and the tool for multicriteria analysis of measures with stakeholder preferences.

For the remaining part of the project, the following twinning activities are recommended to respond to the needs of the Collaborators and support their cases:

- Workshops dedicated to specific topics of hydrometeorological risk assessment (hazard, vulnerability and risk assessments), ex-ante evaluation of NBS benefits and co-benefits, and cost-benefit analysis.
- Development of more tools and guidelines for the planning stage of NBS implementation.
- Exchange of experiences on the barriers and enablers among Demonstrators and Collaborators, including the approaches for building financial strategies and overcoming major barriers such as lack of political will or lack of awareness on multifunctionality of NBS.

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Annex A. Surveys

SURVEY 1: Baseline Assessment of Expectations

Name of organization:
Site:

1. What objectives does your organization aim to achieve through your involvement in the RECONECT project (e.g., regarding the outcomes of the project, the interaction with other partners, potential to learn new skills, etc.)? Please provide your top three objectives in order of priority.

2. Why is a nature-based solution (NBS) being considered over other potential solutions in the site?

3. Please list the NBSs that are being considered or planned in the site you work with.

4. Please rate the relevance of the following (potential) co-benefits for the considered NBS (**1 = not relevant and 5 = very relevant):**

Climate Change Adaptation: to reduce the vulnerability of social and biological systems to relatively sudden change and thus offset the effects of global warming. (Farber, 2007)	
Climate Change Mitigation: actions to limit the magnitude or rate of long-term global warming and its related effects, including reductions in human (anthropogenic) emissions of greenhouse gases.	
Water Management: planning, developing, distributing and managing the use of water resources in the most efficient way. (Brooks, 2006)	
Coastal Resilience: a measure of the extent to which a coast is able to respond to external pressures without losing actual or potential functions. (Klein et al., 1998)	
Green Space: can have two meanings. The first, greenspace as nature refers to bodies of water or areas of vegetation in a landscape, such as forests and wilderness areas, street trees and parks, gardens and backyards, geological formations, farmland, coastal areas, and food crops. The second, greenspace in an urban setup, may include parks, gardens, yards, urban forests and urban farms. (Taylor and Hochuli, 2017)	

Urban Regeneration: a comprehensive and integrated vision and action which leads to the resolution of urban problems and which seeks to bring about a lasting improvement in the economic, physical, social and environmental condition of an area that has been subject to change. (Roberts, 2008)	
Participatory Planning: emphasizes involving the entire community in the strategic and management processes of planning; or community-level planning processes.	
Participatory governance: focuses on deepening democratic engagement through the participation of citizens in the processes of governance within the state or local community. The idea is that citizens should play more direct roles in public decision-making or at least engage more deeply with political issues. Participatory governance not only crosses public, private and associational sectors, but is also intra-organizational. (Lovan et al., 2017)	
Social Justice: the fair distribution of resources and decision-making power among countries and social groups.	
Social Cohesion: the willingness of people in a society to cooperate with each other. This, in turn, implies a capacity to cooperate. In addition, social cohesive societies incorporate diversity. Finally, there is an affinity between social cohesion and liberal social values (such as freedom, equality, tolerance, etc.). Note that just because a society is socially cohesive it is not necessarily equitable.	
Public Health and Wellbeing: Refers to promoting health and where we live, work, and play through organized efforts of society (e.g., vaccinations, nutrition programmes, access to open spaces). It focuses on the entire spectrum of health and wellbeing, not only the eradication of particular diseases. Wellbeing is a more holistic concept integrating mental health and physical health.	
Green jobs: Green jobs are decent jobs that contribute to preserve or restore the environment, be they in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency. (Ilo.org, 2016)	
Other (please explain):	

5. Please rate the tasks within the WPs that you feel are more relevant to your site **(1 = very relevant and 5= not relevant)**

Task 1	
Task 1.3 Knowledge and Practice Database	
Task 1.4 Enhancement of NBS for multiple benefits	
Task 1.5 Enhancement of supporting tools/models/decision support systems for NBS implementation and evaluation	
Task 1.6 Selection and enhancement of Complex Adaptive Systems (CAS) tools to support governance and policy formulation	
Task 2	
Task 2.4 Co-design of technical specifications and procurement of contracts for construction of NBS in demonstrators	
Task 2.5 Preparatory actions for demonstrators	
Task 2.6 Monitoring and evaluation plans for demonstrators	
Task 2.7 Co-implementation of construction/demonstration of NBS in demonstrators	
Task 3	
Task 3.1 Procurement and Installation of co-monitoring equipment in demonstrators	
Task 3.2 ICT platform to support co-creation activities	
Task 3.3 Co-monitoring program	
Task 3.4 Data analysis and evaluation of demonstrated NBS	

Task 3.5 Validation of NBS with stakeholders for demonstrators	
Task 5	
Task 5.2. Investment strategy, governance, and business models for up-scaling	
Task 5.3 Actions for spinoffs and startups	
Task 5.4 Development and presentation of draft standards for design, implementation, and management of large scale NBS to selected standardization institutions	
Task 6	
Task 6.3 MOOC (Massive Open Online Course) on NBS	
Task 6.4 Dissemination actions and activities of project results (at public events/ workshops, integration with OPPLA, media, scientific publications, special sessions alongside scientific conferences etc.)	
Task 6.5 Community of Users Network	
Comments:	

6. Please list any specific demonstrators/Collaborators you consider of most relevance to the site you work with. Please mark your answer with an X and next to it write your reasons of interest for working with this site.

Demonstrators A		
Case	**Interest**	**Reasons of interest**
Tordera Deleta (Spain)		
Elbe Estuary (Germany)		
Seden Strand Odense (Denmark)		
Portofino Natural Park (Italy)		
Demonstrators B		
Case	**Interest**	**Reasons of interest**
Var River Eco Valley (France)		
Les Boucholeurs (France)		
Inn River Basin (Austria)		
Thur River (Check Republic)		
Ijsel River Basin (Netherlands)		
Aarhus Coastal (Denmark)		
International Collaborators		
Case	**Interest**	**Reasons of interest**
Chao Phraya River Basin (Thailand)		
Greater Tainan Coastline (Taiwan)		
Rio do Couves (Brazil)		
Tarago River Basin (Australia)		
Klang River Basin (Malaysia)		
Yangtze River Basin (China)		
Chindwin River Basin (China)		
Trinity River Basin (USA)		
San Francisco Bay Delta (USA)		
Piura River Basin (Peru)		
Rio Frio (Colombia)		
Lili and Melendez River Basin		
St. Marteen (The Caribbean)		
European Collaborators		
Case	**Interest**	**Reasons of interest**
Kamchia River Basin (Bulgaria)		
Pilica River Basin (Poland)		
Sava River Catchment- Bosut River Basin (Croatia)		

Sava River Catchment- Drina River Basin (Serbia)		
Sava River Catchment- Kolubara River Basin (Serbia)		

7. What information would you like to receive from these sites?

8. In your opinion, what insights, methods, or topics does your case offer that might be of interest to other RECONECT cases? For example, your case might present particularly physical conditions for testing a specific NBS. Or it could be interesting from a socioeconomic point view to explore the piloting of NBS in a post-conflict context. It could also present interesting political opportunities, through for instance, the availability of financial support for NBS or innovative public policies addressing climate change adaptation and risk reduction.

9. What type twinning activities with the cases and partners of your interest do you think would be most beneficial? Please mark your answer with an X.

Webinars	
Skype calls	
Physical meetings once a year	
Physical meetings twice a year	
Workshops	
Field visits	
Other: Exchange of ideas, solutions, experiences.	

10. What are your expectations of WP4?

11. Do you have anything else that you would like to share with us/ask us at this point?

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SURVEY 2: Demand Assessment with focus on Collaborators

Section 1: Collaborator´s data

Purpose: General information from the responders

Questions:
- Collaborator site
- Name of the person filling in this survey
- Are you the Site Lead?
- If you are not the Site Lead, please describe here the reasons why you were assigned to fill in this survey.
- Official e-mail
- Name of institution / affiliation
- Which sector do you represent?

Section 2: Hydro-meteorological risk assessment

Purpose: This section aimed to get an overview of the available information that each Collaborator had in order to carry out hydro-meteorological risk assessments in their site areas.

Hydro-meteorological hazards are the most frequent natural events triggering disasters and causing the most economic losses in all Collaborators sites. Mitigation of impacts from hydro-meteorological hazards, can be achieved by understanding the hazard, exposure, and vulnerability aspects within a catchment. Risk assessments for Hydro-meteorological hazards are powerful methods that can help Collaborators taking decision on how and where NBS could potentially help mitigate hydro-meteorological hazard impacts inside their site areas. Therefore, it is important to have enough information (or be able to produce it) regarding technical, spatial and hydrological conditions from their catchments (e.g. discharge data, rainfall, sea level, frequency of hazards in the area, magnitude, probability, etc.). Having a clear knowledge of this information will give the Collaborators the tools to successfully carry out Risk Assessments.

Questions:
- S2.Q1 What of the following risk and hazard information do you have recorded and can describe with quantitative information?
- S2.Q2 Do you have the following information regarding especially the most extreme (in terms of hydro-meteorological conditions) or most damaging (in terms of loss of lives and/or increased costs) hydro-meteorological hazards in the selected area?
- S2.Q3 What would you say is the likelihood of hydro-meteorological hazards affecting the NBS area?
- S2.Q4 What of the following information (social, technical, hydrological, hydraulic, environmental) from your site area do you already have or have the tools and people to develop?
- S2.Q5 Regarding the selected site for implementing the NBS, which of the following catchment characteristics information is available in your site area?
- S2.Q6 Do you have enough data to carry out a vulnerability and exposure assessment?
- S2.Q7 Which of the following data have you considered carrying out for the vulnerability and exposure assessment in RECONECT?
- Write here any concerns or help that you may need regarding the collection, processing, or analysis of Hydro-Meteorological information to successfully complete 4.2 or 4.8 Working packages.

Section 3: Feasibility assessment

Purpose: The feasibility assessment expected to be carried out by each Collaborator includes from the selection and location of potential NBS to the acceptability by the stakeholders and the overcoming of socio-political barriers that could put in risk the implementation of NBS in their catchments.

The information obtained in this section aimed to get and overview of how far they were in the process of selecting a site area for potential implementation of NBS inside their catchments and whether they had previous experience with feasibility assessments of NBS. Additionally, questions

measuring their knowledge on stakeholder involvement methodologies and potential barriers for implementing NBS were included in order to understand their needs to carry out those activities.

Questions:

- S3.Q1 Which of the following information did you use for assessing and choosing the geographical location where the NBS will be implemented?
- S3.Q2 Have you reviewed the RECONECT tool which contains a catalogue with NBS?
- S3.Q3 Are there any existing or planned green, grey or hybrid flood protection measures within the catchment area where the NBS will be implemented? If your answer is YES or OTHER, please explain which ones.
- S3.Q4 Do you know how to assess the main benefits and co-benefits of the NBS to be implemented? Write YES or No. If your answer is "yes", please mention below the method or tool to be used for the assessment.
- S3.Q5 Do you know how to make the cost assessment of the NBS to be implemented? If your answer is YES, please describe the method or tool you will use below
- S3.Q6 Are there any barriers/drawbacks to implementing the potential measures in the selected zone? If your answer is YES, please describe them.
- S3.Q7 Do you know of any political priorities at the municipality, city or national level that may support the implementation of the NBS? If your answer is YES, please describe them.
- S3.Q8 Is your initial stakeholder mapping still relevant regarding the stakeholders that need to be involved in the decision-making process in order to select, implement and maintain the NBS? If your answer is NO, please explain why on the line.
- S3.Q9 At which stage of the process are you planning to involve, or did you involve the relevant stakeholders?
- S3.Q10 Please describe if you will involve stakeholders in the process by having meetings, calls, site visits, seminar knowledge, consultation, etc. to interact with them and to include their points of view when making decisions.
- S3.Q11 Which of the following methods for stakeholder participation are you familiar with or have applied in RECONECT or previous projects?
- Describe any concerns or help that you may need on any of the topics/questions in this section

Section 4: Co-creation

Purpose: Co-creation is an increasingly mainstream approach to collaboratively generate new knowledge, occurring at the interface of research and policy. It involves researchers and stakeholders in an iterative process that often includes steps of co-design, co-production, co-development, and co-evaluation.

The aim of co-creation is to increase the social relevance of the knowledge produced for policy and practice applications and to generate new research questions.

Questions:

- S4.Q1 Are your research findings, information and knowledge that come out of your work (e.g. scientific information, local knowledge, indigenous or traditional knowledge, etc.) used and valued by local authorities in your site area?
- S4.Q2 How would you describe the interaction between the sector you represent and local authorities when collaborating in projects?
- S4.Q3 Do you have adequate time to engage in interaction with local authorities (such as meetings, seminars workshops, consultations, etc.)?
- S4.Q4 Does working closely with local authorities generate more relevant evidence or research in your case (e.g. research that is more tailored to local challenges or needs)?
- S4.Q5 Does working closely with local authorities lead to generation of more credible evidence in your site area (e.g. research evidence that is more robust, trustworthy)?
- S4.Q6 Are you satisfied with the current level of interaction with local authorities in your site area? If your answer is NO, please describe what is lacking in your opinion.
- S4.Q7 Do you have opportunities for learning from local authorities (e.g. contributing with local challenges, policies, needs for information)?
- S4.Q8 From which sources do you get information related to hydro-meteorological hazards (flood prone areas, risks in the area, etc) affecting the site area?

SURVEY 3: Co-creation activity yearly assessment

	QUESTION	OPTIONS	
1	How easy was it to undertake this activity in your site?	• Extremely easy to undertake • Very easy to undertake • Moderately easy to undertake • Slightly easy to undertake • Not easy to undertake at all	Please support your answer above. Why was this activity extremely easy or not easy at all to undertake?
2	To what extent do you think the activity was an effective method for involving and engaging your stakeholders in D4.2?	• Extremely effective • Very effective • moderately effective • Slightly effective • Not at all effective	----------
3	How credible do you view your stakeholders' perceptions related to benefits and co-benefits of NBS?	• Extremely credible • Very credible • Moderately credible • Slightly credible • Not credible at all	----------
4	Do you think that a different co-creation activity would have worked better in this phase of the co-creation process? (Take into consideration the current circumstances with COVID-19)	• Yes • No • I don´t know	If you answered yes to the question above, which other co-creation activities do you think could have worked better in this phase (co-planning) of the co-creation process?
5	Would you change anything about how the activity ("preferences survey sent to stakeholders") was undertaken?	----------	----------