

# Data availability and GAP analysis

*Demonstrators A and B*

*D3.1*

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Abstract (for dissemination, 100 words)	The objective of Deliverable 3.1 is to present the data and model gaps based on the monitoring and evaluation plans that Demonstrators have presented in D2.6. The overall comparison shows that data gaps concerning PEOPLE indicators are largest when compared to data gaps in WATER and NATURE areas. The results from this work aims to support data collection and monitoring activities for Demonstrators A and B. The document also serves as a reference for various WP2 and WP3 activities. In addition, it also provides a useful reference for RECONNECT Collaborators in the development of their data collection and monitoring plans.
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# Executive Summary

The data GAP analysis in RECONNECT is conducted within the context of identifying which data are available (and fit-for-use) to assess relevant indicators in each demonstration A and B site.

The objective of Deliverable 3.1 is to present the data and model gaps based on the monitoring and evaluation plans that Demonstrators have presented in Deliverable 2.6. Therefore, this report is intended to mainly address the Demonstrators themselves by providing a clear and simplified view of those data/model gaps, which may facilitate the identification of the equipment, effort, and resources needed to further advance in their monitoring activities.

The first results of the data gap analysis show that overall, the area of NATURE contains the largest gap in the datasets. For both WATER and PEOPLE, this gap is about one third of the total datasets needed to assess the indicators.

In terms of the type of the demonstrators, Demonstrators B have more readily available data when compared to Demonstrators A.

In the area of WATER, the data gaps appear to be similar for both demonstrator types. In the area of NATURE, the gaps are also similar but overall larger when compared to the gaps in the area of WATER. In terms of PEOPLE indicators, the gaps are larger for Demonstrators A. The overall comparison shows that the data gaps concerning PEOPLE indicators are largest when compared to the data gaps in other areas.

This report aims to provide an overview of data availability in RECONNECT Demonstrators which in turn serves as a basis for the development of the monitoring plans. This document should be read in conjunction with Deliverable 2.6. The document also serves as a reference for various WP2 and WP3 activities. In addition, the report also serves as a useful reference for RECONNECT Collaborators in the process of developing their own data collection and monitoring plans.



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# 1 Introduction

A comprehensive data gap analysis is crucial for the planning of the monitoring activities in all demonstration sites. Once indicators have been selected to monitor the identified NBS impacts, the data/model that are required to assess those indicators need to be identified. Knowing the data/model already available is essential to avoid repeated work and to make efficient use of project resources.

Sometimes it is not sufficient to know whether data are available or not, but is also important to look in detail into the characteristics of these data and to determine whether the data fulfils the requirements to be used within a monitoring program. This includes judging, for example, whether the data is actual enough and whether the spatial and temporal data resolution fulfils the needs for indicators to monitor the impacts at the appropriate spatial and temporal scales. For example, for the Portofino demonstrator case, although there is a LiDAR dataset available, elevation data has been identified as a data gap, since the quality of these data is poor and outdated (> 10 years old). In this demonstration site, where precise height models are of high importance, it is therefore crucial to gather actual LiDAR data to be used in the monitoring and evaluation program.

Results from the data gap analysis are also used to make decisions on which equipment should be purchased for in-situ measurements within the demonstrator sites. Sometimes there is the need to prioritize the data gaps, since budgets to purchase new equipment and new survey activities may be limited. It is therefore important to closely link the outcomes of the data gap analysis to the local context and to the most relevant indicators.

Next to the in-situ data, geospatial datasets derived from remote sensing may be needed to assess indicators used in monitoring and evaluation programs. For small project sites, data from drones or unmanned aerial vehicles (UAVs) might be used. Instead, for larger project sites it may be required to obtain the data from fixed wing aircrafts or satellite imagery.

The data gap analysis in RECONNECT is conducted within the context of identifying which data are available (and fit-for-use) to assess relevant indicators in each demonstration A and B site. The data gap analysis process consist on the following steps.

- 1) At the beginning of the project, demonstrators were asked to present those indicators that had been identified as relevant to their NBS projects in consultation with stakeholders. Relevant indicators were identified using the RECONNECT Selection Tool (which is being developed within WP3) based on the objectives or sub-goals that the NBS intends to achieve.
- 2) A first general overview was compiled of available datasets and models to assess the different indicators (for the baseline and after NBS implementation situations). Such overview has been presented in D2.5 "Report describing preparatory actions for Demonstrators A and B". This is included in Annex A.

For demonstrators A, a further analysis was carried out in terms of the availability of geospatial datasets. First, an overview of datasets already available at the European level, e.g. from the COPERNICUS program, was produced. Next, an overview was produced of those geodatasets available at the national, state or city level in the demonstration sites and the related metadata describing the characteristics of these

data was gathered. This turned to be a rather challenging, and time consuming, task because the datasets are most of the times not all available within one department or institution.

- 3) As part of D2.6 “Co-monitoring and evaluation plans for Demonstrators A and B”, demonstrators have developed monitoring and evaluation plans to assess the performance of their NBS in achieving a selected number of sub-goals. In these plans, a focused set of indicators is presented together with the data/model that are required to assess those indicators. For each data/model required, characteristics such as the spatial coverage, temporal frequency, and the availability of the data/model to assess the indicator are described.
- 4) In addition to the more general characteristics in point three above, a further assessment is needed to determine whether the data is actual enough and/or of suitable quality to be used to assess the indicator. For example, a NBS site where landslide hazard is identified as the main indicator, requires a careful assessment of whether the available data is actual enough and has the required spatial resolution to be used as input to landslide hazard models.
- 5) Identification of the data gaps. In this step those missing, outdated, and/or of low quality are identified as a gap.
- 6) Finally, once a gap is identified, a strategy is sought to determine the technical requirements and specifications of the data to be acquired, hence bridging the gap.

The objective of this deliverable is to present the data and model gaps based on the monitoring and evaluation plans in step three above. Therefore, this report should be read in conjunction with D2.6.

The content herein provides a clear and simplified overview of the data gaps, which may facilitate the identification of the equipment, effort, and resources needed to further advance in the monitoring activities.

## 2 Dove/Gose Elbe Estuary, Germany - DA1

### 2.1 Summary data availability / data gaps

The following Table 1 provides a summary of the data available and gaps identified by applying the procedure described in Section 1. Most of the information was provided by responsible project partners which is to their current best knowledge. Table 1 presents a summary of information concerning indicators included in the monitoring plan described in indicators.

*Table 1 Summary of data/model availability (dark green) and data/model gaps (red) to assess the selected indicators (NA: not applicable). Column 5 refers to the situation after NBS implementation and column 8 refers to the reference/baseline situation*

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation
WATER	Flood risk reduction in urban areas and around rivers, lakes and water courses	Flood hazard	Water level	yes	yes	yes	yes
		Delay time to peak	Water level	yes	yes	yes	yes
		Flood peak reduction	Water level	yes	yes	yes	yes
NATURE	To maintain and enhance biodiversity	Species richness and composition	Number of species	no	NA	yes	yes
PEOPLE	Stimulate/increase economic benefits	Vulnerability / Economic damage cost	Police / Fire department and insurance reports	no	NA	yes	yes

In Table 1, Column 6 refers to the available model that will be used to assess the indicators, while Column 7 reflects the RECONNECT monitoring plan outlined in Deliverable 2.6. In terms of the gaps, the indicators related to Nature and People are not commonly measured and they represent the novel aspects of the project related to co-benefits.

# 3 Odense Coastal Area, Denmark-DA2

## 3.1 Summary data availability / data gaps

The following Table 2 provides a summary of the data available and gaps identified by applying the procedure described in Section 1. Most of the information was provided by responsible project partners which is to their current best knowledge. Table 2 presents a summary of information concerning indicators included in the monitoring plan described in indicators.

*Table 2 Summary of data/model availability (dark green) and data/model gaps (red) to assess the selected indicators (NA: not applicable). Column 5 refers to the situation after NBS implementation and column 8 refers to the reference/baseline situation*

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation
WATER	Coastal flood risk reduction	Coastal flood hazard index (Changes in flood risk of areas behind NBS-dikes)	Terrain model	no	yes	yes	yes
			Sea water level (flooding)	yes		yes	
	Improve water surface quality	The salinity of water in the surface, near ground water	Coastal flood hazard	no	NA	yes	yes
			Salinity	no		yes	
NATURE	Increase habitat area (quantity)	Habitat area	Vegetation map of the targeted habitats in the area	no	NA	yes	no
			Terrain elevation	yes		yes	
			Sea water level	yes		yes	
			Sea flooding extent and frequency	no		yes	
			soil type	yes		yes	
			salinity	no		yes	
	Habitat provision and distribution (quality)	location of habitat boundaries	habitat type	no	NA	yes	no
			Terrain elevation	yes		yes	
			Sea water level	yes		yes	
			Sea flooding extent and frequency	no		yes	
			soil type	yes		yes	
			salinity	no		yes	
	Maintain and enhance biodiversity	Species richness and composition	Number of species	no	NA	yes	no
			Terrain elevation	yes		yes	
			Sea water level	yes		yes	
			Sea flooding extent and frequency	no		yes	
			soil type	yes		yes	
			salinity	no		yes	

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation
PEOPLE	Increase in recreational opportunities	Number of people that visit or spend free time in NBS area	Number of people visit the area	no	NA	yes	no
		Enhancing attractiveness of places for living and working, and to visit	Number of people visit the NBS area	no	NA	yes	no
			Value of the area	No		yes	
			Knowledge that the NBS is present in the region	No		yes	

In Table 2, Column 6 refers to the available model that will be used to assess the indicators, while Column 7 reflects the RECONNECT monitoring plan outlined in Deliverable 2.6. In terms of the gaps, the indicators related to Nature and People are not commonly measured and they represent the novel aspects of the project related to co-benefits.

# 4 Tordera River Basin, Spain - DA3

## 4.1 Summary data availability / data gaps

The following Table 3 provides a summary of the data available and gaps identified by applying the procedure described in Section 1. Most of the information was provided by responsible project partners which is to their current best knowledge. Table 3 presents a summary of information concerning indicators included in the monitoring plan described in indicators.

*Table 3 Summary of data/model availability (dark green) and data/model gaps (red) to assess the selected indicators (NA: not applicable). Column 5 refers to the situation after NBS implementation and column 8 refers to the reference/baseline situation*

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation
WATER	Flood risk reduction	Flood hazard	Rainfall time series	yes	yes	yes	yes
			Discharge time series	yes		yes	
			Digital elevation model	yes		yes	
			Control structure	yes		yes	
			Roughness coefficient	yes		yes	
			Geometry of the channel	yes		yes	
		Economic damage cost	Flow Depth	yes	yes	yes	yes
			Land use/cover	yes		yes	
			Property value data	yes		yes	
NATURE	Shifts in land use and land cover (Structure of the riparian area)	Land use type (Land use in the riparian area)	Land use cover map	no	NA	yes	yes
			Habitat cartography	no		yes	
		Quality of the Riparian Forest	% of the riparian area covered with vegetation	no	NA	yes	yes
			Lateral connectivity of the riparian ecosystem	no		yes	
			Complexity of the riparian forest structure	no		yes	
			Diversity of vegetal species in the riparian forest	no		yes	
			Naturalness of the river channel	no		yes	

	Increase habitat area (quantity)	Habitat area	Cartography of natural habitats of community interest	no	NA	yes	
PEOPLE	Stimulate/increase economic benefits	Economic damage cost	Flow Depth	yes	yes	yes	yes
			Land use/cover	yes		yes	yes
			Property value data	yes		yes	yes

In Table 3, Column 3 refers to the available model that will be used to assess the indicators, while Column 7 reflects the RECONNECT monitoring plan outlined in Deliverable 2.6. In terms of the gaps, the indicators related to Nature are not commonly measured and they represent the novel aspects of the project related to co-benefits.

# 5 Portofino Regional Natural Park, Italy - DA4

## 5.1 Summary data availability / data gaps

The following Table 4 provides a summary of the data available and gaps identified by applying the procedure described in Section 1. Most of the information was provided by responsible project partners which is to their current best knowledge. Table 4 presents a summary of information concerning indicators included in the monitoring plan described in indicators.

*Table 4 Summary of data/model availability (dark green) and data/model gaps (red) to assess the selected indicators (NA: not applicable). Column 5 refers to the situation after NBS implementation and column 8 refers to the reference/baseline situation*

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation		
WATER	Landslide risk reduction	Landslide hazard	Digital elevation model	no	no	Yes	yes		
			Rainfall time series	no		yes			
	Floating transport in hydrographical network	Orthophotography and IR to evaluate vegetation conditions	Direct survey to quantify the presence of dead trees along the hydrographical network	no	NA	yes	yes		
				no		Yes			
			Vulnerability	Land use	yes	NA		yes	yes
				Roads	yes			yes	
	Building/ Cultural heritage	yes	Yes						
	Tourists presence	yes	yes						
	NATURE	Increase habitat area (quantity)	Habitat area	Initial surfaces of the habitat patches that will be expanded	no	NA	yes	no	
		Shifts in land use and land cover	Land cover area	Land Cover type and area	no	NA	Yes	no	
Maintain and enhance biodiversity		Species richness and composition	Species count data	no	NA	yes	no		
PEOPLE	Increase in recreational opportunities.	Number of people that visit	Number of visitors (count data)	yes	NA	yes	yes		



1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation
		or spend time in the NBS area.					
	Stimulate/increase economic benefits	Loss of cultural heritage due to hydro-metrological events	Number of visitors accessing the Abbey	no	NA	yes	no

In Table 4, Column 6 refers to the available model that will be used to assess the indicators, while Column 7 reflects the RECONNECT monitoring plan outlined in Deliverable 2.6. In terms of the gaps, the indicators related to Nature and People are not commonly measured and they represent the novel aspects of the project related to co-benefits.

# 6 Ijssel River Basin, the Netherland - DB1

## 6.1 Summary data availability / data gaps

The following Table 5 provides a summary of the data available and gaps identified by applying the procedure described in Section 1. Most of the information was provided by responsible project partners which is to their current best knowledge. Table 5 presents a summary of information concerning indicators included in the monitoring plan described in indicators.

*Table 5 Summary of data/model availability (dark green) and data/model gaps (red) to assess the selected indicators (NA: not applicable). Column 5 refers to the situation after NBS implementation and column 8 refers to the reference/baseline situation*

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation
WATER	Flood risk reduction	Flood Hazard	Rainfall time series	yes	no	yes	yes
			River discharge time series	yes		yes	
			Water level time series	yes		yes	
			Vegetation data	yes		yes	
			Digital elevation model	yes		yes	
			Control structures	yes		yes	
			Channel cross section (flood plains)	yes		yes	
			Flow velocity	yes		yes	
			Roughness coefficient	yes		yes	
NATURE	Shifts in land use and land cover	Land cover area	land cover type and area	yes	NA	yes	yes
	Maintain and enhance biodiversity	Number and type of protected species (animal)	Animal species count data	yes	NA	yes	yes
PEOPLE	Stimulate/increase economic benefits	Maintenance and management cost of NBS	Cost of vegetation removal and cost of dredging	yes	NA	yes	yes
		Land and/or property values	Price of land before and after NBS implementation	yes	NA	yes	yes

In Table 5, Column 6 refers to the available model that will be used to assess the indicators, while Column 7 reflects the RECONNECT monitoring plan outlined in Deliverable 2.6. In terms of the gaps, in this case there is enough information to calculate the indicators, also the ones related to NATURE and PEOPLE which are not so commonly measured.

# 7 Inn River Basin, Austria - DB2

## 7.1 Summary data availability / data gaps

The following Table 6 provides a summary of the data available and gaps identified by applying the procedure described in Section 1. Most of the information was provided by responsible project partners which is to their current best knowledge. Table 6 presents a summary of information concerning indicators included in the monitoring plan described in indicators.

*Table 6 Summary of data/model availability (dark green) and data/model gaps (red) to assess the selected indicators (NA: not applicable). Column 5 refers to the situation after NBS implementation and column 8 refers to the reference/baseline situation*

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation	
WATER	Flood risk reduction	Surface Run-off Reduction	Precipitation time series	no	no	yes	no	
			Meteorological parameters	no		yes		
			Run-off time series	no		yes		
			Roughness	no		yes		
			Soil moisture	no		yes		
			Digital elevation model	no		yes		
		Slowing and Storing Run-off	Precipitation time series	no	no	yes	no	
			Meteorological parameters	no		yes		
			Run-off time series	no		yes		
			Roughness	no		yes		
			Soil moisture	no		yes		
			Digital elevation model	no		yes		
		Flood Hazard	Runoff at catchment outlet	Runoff at catchment outlet	no	no	yes	no
				Historical flood events	yes		yes	
				Land use	no		yes	
climate scenarios	no			yes				
Landslide risk reduction	Landslide hazard	Land use	yes	NA	yes	yes		
		Corresponding risk of landslides	yes		yes			
NA TU	Increase habitat area (quantity)	Habitat area	Land use map	yes	no	yes	no	
			Land cover map	no		yes		

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation
	Habitat provision and distribution (quality)	Location of habitat boundaries	Habitat sizes	no	NA	yes	yes
			Land-use	no		yes	
			Land cover	no		yes	
	Shifts in land use and land cover	Land cover	Aerial pictures and satellite images for different periods	no	yes	yes	yes
			Old project reports that documented how much trees were bought, planted and labour hours	no		yes	
	To maintain and enhance biodiversity	Species richness and composition	Detect and determine typical species richness and composition	no	NA	yes	no
PEOPLE	Increase in recreational opportunities	Purpose of the visits to the NBS site	Statistical data on climate	yes	NA	yes	yes
			Water	yes		yes	
			Nature	yes		yes	
			Infrastructure	yes		yes	
			socio-demographic data of people	yes		yes	
			number of overnight stays	yes		yes	
	Stimulate/increase economic benefits	Damage costs	Existing flooding zones	yes	NA	yes	yes
	Building prices	statistical parcel and building prices	yes	NA	yes	yes	
		Existing flooding zones	yes		yes		

In Table 6, Column 6 refers to the available model that will be used to assess the indicators, while Column 7 reflects the RECONNECT monitoring plan outlined in Deliverable 2.6. In terms of the gaps, the indicators related to Nature and People are not commonly measured and they represent the novel aspects of the project related to co-benefits.

## 8 Aarhus, Egå Engsø and Lystrup, Denmark - DB3

### 8.1 Summary data availability / data gaps

The following Table 7 provides a summary of the data available and gaps identified by applying the procedure described in Section 1. Most of the information was provided by responsible project partners which is to their current best knowledge. Table 7 presents a summary of information concerning indicators included in the monitoring plan described in indicators.

*Table 7 Summary of data/model availability (dark green) and data/model gaps (red) to assess the selected indicators (NA: not applicable). Column 5 refers to the situation after NBS implementation and column 8 refers to the reference/baseline situation*

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation	
WATER	Flood risk reduction	Flood Peak Reduction	Rainfall time series	yes	yes	yes	yes	
			Discharge time series	yes		yes		
			Water level time series	yes		yes		
			Digital elevation model	yes		yes		
		Delay time to peak	Rainfall time series	yes	yes	yes		yes
			Discharge time series	yes		yes		
			Water level time series	yes		yes		
			Digital elevation model	yes		yes		
	Improve Coastal water quality	Pollution in coastal waters	Nitrogen load to coastal waters	yes	NA	yes	yes	
				yes				
	Improve water quality in rivers/watercourses, lakes/ponds	Temperature and dissolved oxygen concentration	Rainfall time series	no	NA	yes	no	
			Discharge time series	no		yes		
Water level time series			no	yes				
Digital elevation model			no	yes				
Temperature and dissolved oxygen concentration			no	yes				
Habitat provision and distribution (quality)	Location of habitat boundaries	Type of habitat	no	NA	yes	yes		
		Number and size of the habitat patches	no		yes			

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation
			Max. depth limit of the aquatic vegetation	no		yes	
			Environmental variables: e.g. depth of the lake (average/min/max, 0,5 m intervals), size of the lake, water level at the inlet and outlet of the lake, Secchi depth, total phosphorus concentration (TP), total nitrogen concentration (TN), chlorophyll a, alkalinity, terrain elevation (Danish Hight Model), flooding extent and frequency, soil type,	no		yes	
	Shifts in land use and land cover	Land cover area	land cover type and area	no	NA	yes	yes
	Maintain and enhance biodiversity	Species richness and composition	Species count data	no	NA	yes	yes
			Meteorological data: precipitation, wind speed	no		yes	
			Environmental variables: e.g. depth of the lake (average/min/max, 0,5 m intervals), size of the lake, Secchi depth, total phosphorus concentration (TP), total nitrogen concentration (TN), chlorophyll a, alkalinity, elevation (Danish Hight Model), flooding extent and frequency, soil type, etc.	no		yes	
		Number and type of protected species	Species count data	no		yes	yes
			Environmental variables: e.g. depth of the lake (average/min/max, 0,5 m intervals),	no		yes	

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation
			size of the lake, Secchi depth, total phosphorus concentration (TP), total nitrogen concentration (TN), chlorophyll a, alkalinity, elevation (Danish Hight Model), flooding extent and frequency, soil type, etc.				
		Restricted range species	Species count data	no	NA	yes	
			Environmental variables: e.g. depth of the lake (average/min/max, 0,5 m intervals), size of the lake, Secchi depth, total phosphorus concentration (TP), total nitrogen concentration (TN), chlorophyll a, alkalinity, elevation (Danish Hight Model), flooding extent and frequency, soil type, etc.	no		yes	
PEOPLE	Increase in recreational opportunities	Number of people that visit or spend time in the NBS area	Count data of number of people that visit or spend time in the NBS area	no	NA	yes	yes
		Enhancing attractiveness of places for living and working, and to visit	User/visitor survey in combination with the count data (the number of visitors, qualitative for the purpose of the visit)	no		Yes	

In Table 7, Column 6 refers to the available model that will be used to assess the indicators, while Column 7 reflects the RECONNECT monitoring plan outlined in Deliverable 2.6. In terms of the gaps, the indicators related to Nature and People are not commonly measured and they represent the novel aspects of the project related to co-benefits.

# 9 Thur River Basin, Switzerland - DB4

## 9.1 Summary data availability / data gaps

The following Table 8 provides a summary of the data available and gaps identified by applying the procedure described in Section 1. Most of the information was provided by responsible project partners which is to their current best knowledge. Table 8 presents a summary of information concerning indicators included in the monitoring plan described in indicators.

*Table 8 Summary of data/model availability (dark green) and data/model gaps (red) to assess the selected indicators (NA: not applicable). Column 5 refers to the situation after NBS implementation and column 8 refers to the reference/baseline situation*

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation
WATER	Flood risk reduction	Flood Hazard	Rainfall time series	yes	yes	yes	yes
			Evapotranspiration	yes		yes	
			River discharge time series	yes		yes	
			Digital elevation model	yes		yes	
	Groundwater management	Groundwater level	Digital elevation model	yes	NA	yes	yes
			Groundwater level in piezometers	yes		yes	
	Improve water quality in rivers	Water pollution caused by wastewater	Chemical concentrations	yes	NA	yes	yes
	Improve groundwater quality	Pollution in groundwater	Contaminant in Groundwater	yes	NA	yes	yes
			electrical conductivity	yes		yes	
			Pressure head (water level)	yes		yes	
Groundwater temperature			yes	yes			
NATURE	Increase habitat area (quantity)	Habitat area	Area if habitat	yes	NA	yes	yes
	To maintain and enhance biodiversity	Species richness and composition	Number of species	yes	NA	yes	yes



1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation
PEOPLE	Increase recreational opportunities	Number of people that visit or spend time in the NBS area	Number of people to visit the NBS	yes	NA	yes	yes
		Purpose of the number of visits to the NBS area	Number of activities during a visit at the NBS site	yes	NA	yes	yes
	Stimulate/increase economic benefits	Land and/or property values	Land and/or property values	yes	NA	yes	no

In Table 8, Column 6 refers to the available model that will be used to assess the indicators, while Column 7 reflects the RECONNECT monitoring plan outlined in Deliverable 2.6. In terms of the gaps, t in this case there is enough information to calculate the indicators, also the ones related to Nature and People which are not so commonly measured. Calculating indicator in the different challenge areas represent the novel aspects of the project related to co-benefits.

# 10 The Var Éco-Vallée, France - DB5

## 10.1 Summary data availability / data gaps

The following Table 9 provides a summary of the data available and gaps identified by applying the procedure described in Section 1. Most of the information was provided by responsible project partners which is to their current best knowledge. Table 9 presents a summary of information concerning indicators included in the monitoring plan described in indicators.

*Table 9 Summary of data/model availability (dark green) and data/model gaps (red) to assess the selected indicators (NA: not applicable). Column 5 refers to the situation after NBS implementation and column 8 refers to the reference/baseline situation*

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation
WATER	Flood risk reduction	Flood hazard	Discharge time series	yes	yes	yes	yes
			Meteorological parameters	yes		yes	
			Rainfall time series	yes		yes	
			Roughness	yes		yes	
			Digital elevation model	yes		yes	
			River geometry	yes		yes	
NATURE	Increase habitat area	Habitat area	Satellite, habitat area images that will be used for comparison	no	NA	yes	no
				no		yes	
	Habitat provision and distribution (quality)	Location of habitat boundaries (Changes in aquatic habitat, changes in flora and fauna in habitat)	Aerial pictures and satellite images for different periods of habitat	no	NA	yes	no
PEOPLE	Increase recreational opportunities	Number of people spending time in NBS	Statistic data of Number of people spending time in NBS	yes	NA	yes	yes
	Stimulate/increase economic benefits	Building prices in NBS area	Statistical data and building prices	no	NA	yes	yes

In Table 9, Column 6 refers to the available model that will be used to assess the indicators, while Column 7 reflects the RECONNECT monitoring plan outlined in Deliverable 2.6. In terms of the gaps, the indicators related to Nature and People are not commonly measured and they represent the novel aspects of the project related to co-benefits.

# 11 Les Boucholeurs, France - DB6

## 11.1 Summary data availability / data gaps

The following Table 10 provides a summary of the data available and gaps identified by applying the procedure described in Section 1. Most of the information was provided by responsible project partners which is to their current best knowledge. Table 10 presents a summary of information concerning indicators included in the monitoring plan described in indicators.

*Table 10 Summary of data/model availability (dark green) and data/model gaps (red) to assess the selected indicators (NA: not applicable). Column 5 refers to the situation after NBS implementation and column 8 refers to the reference/baseline situation*

1.Challenge	2.Sub-goals	3.Indicators	4.Data (variables)	5.Data available	6.Model available to assess the indicator	7. Planned for Monitoring during RECONNECT	8.Indicator/data available for reference/baseline situation
WATER	Coastal flood risk reduction	Coastal flood hazard	Discharge time series	yes	yes	yes	yes
			Meteorological parameters	yes		yes	
			Rainfall time series	yes		yes	
			Roughness	yes		yes	
			Digital elevation model	yes		yes	
			Sea water level	yes		yes	
			Geometry/ Bathymetry	yes		yes	
NATURE	Increase habitat area	Habitat area	Satellite, habitat area images that will be used for comparison	no	NA	yes	no
				no		yes	
	Habitat provision and distribution (quality)	Location of habitat boundaries (Changes in aquatic habitat, changes in flora and fauna in habitat)	Aerial pictures and satellite images for different periods of habitat	no	NA	yes	no
PEOPLE	Increase recreational opportunities	Number of people spending time in NBS	Statistic data of Number of people spending time in NBS	yes	NA	yes	yes
	Stimulate/increase economic benefits	Building prices in NBS area	Statistical data and building prices	yes	NA	yes	no

In Table 10, Column 6 refers to the available model that will be used to assess the indicators, while Column 7 reflects the RECONNECT monitoring plan outlined in Deliverable 2.6. In terms of the gaps, the indicators related to Nature and People are not commonly measured and they represent the novel aspects of the project related to co-benefits.

## 12 Summary

The first results of the data gap analysis show that the area of NATURE contains the largest gap in datasets. For both WATER and PEOPLE, this gap is about one third of the total datasets needed to assess the indicators.

In terms of the type of the demonstrators, Demonstrators B have more readily available data when compared to Demonstrators A.

In the area of WATER, the data gaps appear to be similar for both demonstrator types. In the area of NATURE, the gaps are also similar but overall larger when compared to the gaps in the area of WATER. In terms of PEOPLE indicators, the gaps are larger for Demonstrators A. The overall comparison shows that the data gaps concerning PEOPLE indicators are largest when compared to the data gaps in other areas.

This report aims to provide an overview of data availability in RECONNECT Demonstrators which in turn serves as a basis for the development of the monitoring plans. This document should be read in conjunction with Deliverable 2.6. The document also serves as a reference for various WP2 and WP3 activities. In addition, the report also serves as a useful reference for RECONNECT Collaborators in the process of developing their own data collection and monitoring plans.















## 2. Demonstrator A2 – Odense Coastal Area, Denmark

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?	
Water	Vulnerability	Land use	Land use map	YES								Derived map				
		Infrastructure	Infrastructure data	?												
		Population	Population	?												
		Building/housing	3D data/cadastral	?												
	Storm surge	Topography	DEM data	YES	Kysterne.kyst.dk								Remote sensors			
		Tidal variation	Tidal variation	?	A hydro dynamic model						m					
		Barometric pressure		?	A hydro dynamic model											
		Wave height		?	A hydro dynamic model											
		Spatial scale of storm		?	A hydro dynamic model											
		Amplitude of surges		?	A hydro dynamic model											
		Duration of surges		?	A hydro dynamic model											
		Length of coastline affected by the surge		?	A hydro dynamic model											
	Coastal hazard index	Historical flood events and consequences		?												
		Frequency of floods		?												
		Flood inundation		?												
		Distance and topography influences the territory being affected		?												
Flood depth		Flood depth	?									m				
Tidal variation		Tidal variation	?									m				



	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?
People	Change in location of habitat boundaries Changes in vegetation along watercourses	Wetland habitat	Aerial Images	?											
		habitat boundaries	variation of habitat boundaries	?											
		Vegetation along watercourses	remote sensing	?											
		Structure and function	remote sensing	?											
		Trends and status of the area	remote sensing	?											
		Trends and status of range	remote sensing	?											
	Conservation status of habitats Species richness and composition in respect to indigenous vegetation and local/national biodiversity targets	Cartography of habitats			?										
		Number of species			?										
		Protected species	Type of protected species		?										
	Number and type of protected species Diversity of species	Protected species	Number of protected species		?										
		Number of species			?										
		Number of individuals for each species			?										
	Increasing recreational opportunities of NBS area	Number of recreation activity in the area	Number of recreation activity in the area												
		Length of footpaths													
		Number of access points to NBS area										pedestrian/cycle			



	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?		
		Inundation map															
		Value maps															
		Change in land and/or property values	Price of land and/or properties								Euro						
		Mental well-being	Willingness to pay														
			Feeling happiness														
		Personal characteristics															

### 3. Demonstrator A3 – Tordera River Basin, Spain

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?	
Water		precipitation	precipitation data	YES	Catalan Meteorological Service		Automatic and non-automatic	historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes	mm	ASCII and XLSX	On-site sensors				
		soil type map	Soil type map													
		Slowing and storing runoff	land use	Land use map	YES	Landsat		Remote sensing	1987/1992/1993/1997/2002/2006/2007/2009/2012/2017	every 5 years		GEOTIF F	Remote sensing			
			topography	DEM												
			Roughness coefficient			YES	Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes	m <sup>3</sup> /s	tabular data			



	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstrati on area?	Good quality to use in indicator assessmen t?
Flood hazard		water discharge		YES	1) River gauging stations 2) Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes	m <sup>3</sup> /s	1) XLSX 2) tabular data	On-site sensors			
		water level		YES	1) River gauging stations 2) Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes	m	1) XLSX 2) tabular data	On-site sensors			
		water velocity		YES	Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes	m/s	tabular data				
		Flood peak		YES	1) River gauging stations 2) Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes	m <sup>3</sup> /s	1) XLSX 2) Tabular data	On-site sensors			
		Flood duration		YES	1) River gauging stations 2) Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes		1) XLSX 2) Tabular data	On-site sensors			
		Lag time		YES	1) River gauging stations 2) Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes		1) XLSX 2) Tabular data	On-site sensors			
		precipitation	precipitation data	YES	Catalan Meteorological Service (SMC)		Automatic and non-automatic	historical 30 years; automatic from 1995	historical data: hourly and automatic	mm	ASCII and XLSX	On-site sensors			

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?
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: 5 minutes

Vulnerability

Roughness coefficient  
Permeability  
topography  
channel networks

land use

Land use map

YES

Landsat

Remote sensing

1987/1992/  
1993/1997/  
2002/2006/  
2007/2009/  
2012/2017

every 5 years

GEOTIF  
F

Remote sensing

Infrastructure  
Population  
Building/housing

Infrastructure data  
Population  
3D data/cadastre

Discharge hydrograph

YES

River gauging stations/Data from hydraulic models

historical 30 years;  
automatic from 1995

historical data:  
hourly and automatic  
: 5 minutes

m<sup>3</sup>/s

tabular data

On-site sensors

Discharge time series

YES

Data from hydraulic models

historical 30 years;  
automatic from 1995

historical data:  
hourly and automatic  
: 5 minutes

m<sup>3</sup>/s

tabular data

Delay time to peak

Flood duration

YES

1) River gauging stations  
2) Data from hydraulic models

historical 30 years;  
automatic from 1995

historical data:  
hourly and automatic  
: 5 minutes

1) XLSX  
2) Tabular data

On-site sensors

Flood peak

YES

1) River gauging stations  
2) Data from hydraulic models

historical 30 years;  
automatic from 1995

historical data:  
hourly and automatic  
: 5 minutes

m<sup>3</sup>/s

1) XLSX  
2) Tabular data

On-site sensors

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?	
Flood peak reduction		Lag time		YES	1) River gauging stations 2) Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes		1) XLSX 2) Tabular data	On-site sensors				
		Discharge hydrograph		YES	River gauging stations/Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes	m <sup>3</sup> /s	tabular data	On-site sensors				
		Discharge time series		YES	Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes	m <sup>3</sup> /s	tabular data					
		Flood peak		YES	River gauging stations/Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes	m <sup>3</sup> /s	1) XLSX 2) Tabular data	On-site sensors				
		Flood duration		YES	River gauging stations/Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes		1) XLSX 2) Tabular data	On-site sensors				
		Lag time		YES	River gauging stations/Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes		1) XLSX 2) Tabular data	On-site sensors				
Change in Groundwater level/water table		Groundwater level	Dip wells	YES	Monitoring program of the WFD			2005 to present	Monthly	m	PDF XLSX XML	other instruments				

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?	
Nature	Attenuation of pollution in groundwater	Physicochemical quality and organic pollutants		YES	Monitoring program of the WFD			2005 to present	every 6 months		PDF XLSX XML	other instruments				
	Seawater intrusion	Salinity		YES	Monitoring program of the WFD			2005 to present	Daily		PDF XLSX XML	On-site sensors				
	Changes in riparian habitat	Riparian habitat	Habitat cartography	YES	Copernicus				2011-2013			Raster datasets				
		Riparian habitat	GPS													
		Riparian habitat	Aerial Images										derived map			
	Changes in aquatic habitat	Mesohabitats (IHF)		YES	Monitoring program of the WFD			2005 to present	once a year		XLSX Database	other instruments				
	Connectivity/fragmentation of habitat structural	Connectivity (ICF)		YES	Monitoring program of the WFD			2005 to present	once a year		XLSX Database	other instruments				
	Change in vegetation along watercourses	Vegetation along watercourses	remote sensing	YES	Monitoring program of the WFD			2005 to present	once a year			XLSX Database				
		Structure and function	remote sensing	YES	Monitoring program of the WFD			2005 to present	once a year			XLSX Database				
		Trends and status of the area	remote sensing	YES	Monitoring program of the WFD			2005 to present	once a year			XLSX Database				
		Trends and status of range	remote sensing	YES	Monitoring program of the WFD			2005 to present	once a year			XLSX Database				
		Riparian vegetation (QBR)		YES	Monitoring program of the WFD				once a year			XLSX Database	other instruments			
		Conservation status of habitats	Cartography of habitats	Habitat cartography	YES	Copernicus				2011-2013			Raster datasets			
		Change in land cover	Land Cover	Satellite imagery	YES	Landsat		Remote sensing	1987/1992/ 1993/1997/ 2002/2006/ 2007/2009/ 2012/2017	every 5 years			GEOTIF F	Remote sensing		
Number and type of	Number of protected species		YES	Monitoring program of the WFD			2005 to present	once a year			XLSX Database	other instruments				

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?	
People	protected species	Type of protected species		YES	Monitoring program of the WFD			2005 to present	once a year		XLSX Database	other instruments				
		Type of protected species		YES	Monitoring program of the WFD			2005 to present	once a year		XLSX Database	other instruments				
	Diversity of species	Weather data Data that allow to understand observed species counts Temporal species population data Maps of external variables														
	Number, area, location of invasive non-native animal and planted species that are threatening to ecosystem, habitats or species	EXOACUA		YES	Monitoring program of the WFD			2005 to present	once a year		XLSX Database					
		EXOCAT		YES	Monitoring program of the WFD			2005 to present	once a year		XLSX Database					
		Type of protected species		YES	Monitoring program of the WFD			2005 to present	once a year		XLSX Database	other instruments				
	Increasing recreational opportunities of NBS area	Number of recreation activity in the area Length of footpaths Number of access points to NBS area														
	Provision of NBS sites for education and research	Number of student benefiting from education and research about NBS														
	Reduced/avoided damage cost from hydro-meteorological risk reduction	Flood depth	Water level	YES	Data from hydraulic models				historical data: hourly and automatic : 5 minutes	m	ASCII and XLSX					
		Flood velocity	Water velocity	YES	Data from hydraulic models					m/s	ASCII					
	Land use	Land use map	YES	Landsat		Remote sensing	1987/1992/ 1993/1997/ 2002/2006/	every 5 years		GEOTIFF						

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?
		Infrastructure	Infrastructure data					2007/2009/2012/2017							
		Damage	Damage data												
		Inundation	Inundation map/data												
		Water level		YES	River gauging stations/Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes	m	tabular data	On-site sensors			
		Water velocity		YES	River gauging stations/Data from hydraulic models			historical 30 years; automatic from 1995	historical data: hourly and automatic : 5 minutes	m/s	tabular data				
		value map													

#### 4. Demonstrator A4 – Portofino Regional Natural Park, Italy

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?
Water	Landslide hazard	Slope angle	Slope angle data	YES	Liguria Region GIS vector data				2017			vector data pdf, other?			
		Geology	Geology Map	YES	Liguria Regio data										
		Land use	Land use map	YES	Liguria region GIS vector data			3 years	2012/2015/2018			vector data	Remote sensing		
		Earthquakes		?											
		Precipitation	Precipitation data	YES	Taken from ARPAL			Automatic weather station	hour	2009-2019	mm	text (.txt)	On-site sensors		

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstrati on area?	Good quality to use in indicator assessment t?
Nature	Vulnerability	Maintenance level of man-made terraces					LIDAR data and aero photo acquisition through drones					Remote sensing			
		Dead trees in 20 m buffer areas along the hydrographical network infrastructures										Survey and questionnaire			
		Streams													
		Land use	Land use map	YES	Liguria region GIS vector data			3 years	2012/2015/2018			vector data	Remote sensing		
		Infrastructure	Infrastructure data	YES	Liguria region GIS vector data				2007			vector data			
		Population	Population	YES	ISTAT census 2011		Survey	every 10 years	2011			.xls			
		Building/Housing	3D data/cadastre	YES	Liguria region GIS vector data				2007			vector data			
	Sediment Deposition	Suspended Solids (TSS)													
		Total dissolved solid (TDS)													
		Turbidity (NTU)													
	Possible source of debris	Sediment Composition													
		Sediment characteristics													
		Terrasses detection	LIDAR	NO											
		Precipitation	Precipitation data	YES	Taken from ARPAL		Automatic weather station	hour	2009-2019			text (.txt)			
		Land use	Land use map	YES	Liguria region GIS vector data			3 years	2012/2015/2018			vector data			
Changes in riparian habitat	Slope angle	Slope angle data	YES	Liguria Region GIS vector data				2017			vector data				
	Geology	Geology Map	YES	Liguria Regio data							pdf				
	Terrasses detection	Aerial Images													
Changes in riparian habitat	Riparian habitat	habitat cartography	YES	Portofino Natural Park Habitat cartography		Survey	every 2 years	2015			vector data	Survey and questionnaire			
	Riparian habitat	GPS	?												
	Riparian habitat	Aerial Images	?									Remote sensing			









	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?	
Nature		Flow velocity	Flow velocity	YES			Aerial drone with Global Navigation Satellite System (GNSS) GPS device total station and a high-end Global Navigation Satellite System (GNSS) GPS device	2 times (2 days)			XLSX	Other instruments				
		Cross sections		YES			Aerial drone with Global Navigation Satellite System (GNSS) GPS device	2 times (2 days)			XLSX			NO		
		Vegetation growth	Vegetation growth	YES	Rijkwaterstaat		Satellite data						Remote sensors			
	Change in location of habitat boundaries	Vegetation cover	Vegetation cover	YES	the State			Continuous	2011		GIS					
	Changes in vegetation along watercourses	Vegetation growth	Vegetation growth	YES	Rijkwaterstaat		Satellite data						Remote sensors			
		Vegetation cover	Vegetation cover	YES	the State			Continuous	2011		GIS					
	Shoreline characteristics and erosion protection	Vegetation growth	Vegetation growth	YES	Rijkwaterstaat		Satellite data						Remote sensors			
		Vegetation cover	Vegetation cover	YES	the State			Continuous	2011		GIS					
	Change in land cover	Vegetation growth	Vegetation growth	YES	Rijkwaterstaat		Satellite data						Remote sensors			
		Vegetation cover	Vegetation cover	YES	the State			Continuous	2011		GIS					
	Change in land use	Vegetation growth	Vegetation growth	YES	Rijkwaterstaat		Satellite data						Remote sensors			
		Vegetation cover	Vegetation cover	YES	the State			Continuous	2011		GIS					
	Changes in riparian habitat	Protected species and their habitat/feeding area	Location of protected species	YES	NDFP (national database flora and fauna)			Continuous	until 2018			GIS				
		Water quality and underwater ecoscan		YES	www.indymo.nl		underwater drone equipped with water	2 times (2 days)				XLSX				

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?
	Changes in aquatic habitat	Protected species and their habitat/feeding area	Location of protected species	YES	NDFD (national database flora and fauna)		quality sensors	Continuous	until 2018		GIS				
		Water quality and underwater ecoscan		YES	www.indymo.nl		underwater drone equipped with water quality sensors	2 times (2 days)			XLSX				
	Changes in wetland habitat	Protected species and their habitat/feeding area	Location of protected species	YES	NDFD (national database flora and fauna)			Continuous	until 2018		GIS				
		Water quality and underwater ecoscan		YES	www.indymo.nl		underwater drone equipped with water quality sensors	2 times (2 days)			XLSX				
	Changes in terrestrial habitat	Protected species and their habitat/feeding area	Location of protected species	YES	NDFD (national database flora and fauna)			Continuous	until 2018		GIS				
		Water quality and underwater ecoscan		YES	www.indymo.nl		underwater drone equipped with water quality sensors	2 times (2 days)			XLSX				
	Conservation status of habitats	Protected species and their habitat/feeding area	Location of protected species	YES	NDFD (national database flora and fauna)			Continuous	until 2018		GIS				
		Water quality and underwater ecoscan		YES	www.indymo.nl		underwater drone equipped with water quality sensors	2 times (2 days)			XLSX				



## 6. Demonstrator B2 – Inn River Basin, Austria

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy ...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?					
Water	Surface Run-off Reduction	Precipitation	Precipitation data	YES	Hydrological service		Rain gauge	daily basis	Since 1984	mm	txt	On-site sensors								
		Surface run-off					Weir	Minutes									txt	On-site sensors		
		Soil moisture					TDR type sensors / Cosmic ray Neutron sensors (CRNS)	Minutes / hourly basis									txt	point / 200-300m		
		Discharge time series	Measured discharge				Water level gauge	Minutes								m <sup>3</sup> /s	txt	On-site sensors		
		Discharge time series	Simulated discharge				Hydrological model	Minutes								m <sup>3</sup> /s	txt			
	Slowing and Storing Run-off	Precipitation	Precipitation data	YES	Hydrological service		Rain gauge	daily basis	Since 1984	mm	txt	On-site sensors								
		Surface run-off					Weir	Minutes										txt		
		Soil moisture					TDR type sensors / Cosmic ray Neutron sensors (CRNS)	Minutes / hourly basis										txt	point / 200-300m	
		Discharge time series	Measured discharge				Water level gauge	Minutes									m <sup>3</sup> /s	txt	On-site sensors	
		Discharge time series	Simulated discharge				Hydrological model	Minutes									m <sup>3</sup> /s	txt		
	Flood Hazard	Precipitation	Precipitation data	YES	Hydrological service		Rain gauge	daily basis	Since 1984	mm	txt									
		Topography/DEM	Digital elevation model	YES			Government Tyrol											GIS		
		Roughness coefficient																		
		Cross sections																		
		Discharge time series	River discharge														m <sup>3</sup> /s			
	Delay time to peak Flood peak reduction	Precipitation	Precipitation data	YES	Hydrological service		Rain gauge	daily basis	Since 1984	mm	txt	On-site sensors								
Precipitation		Precipitation data	YES	Hydrological service			Rain gauge	daily basis									Since 1984	mm	txt	On-site sensors
Surface run-off				Weir			Minutes										txt	On-site sensors		
Soil moisture				TDR type sensors / Cosmic ray			Minutes / hourly basis										txt	point / 200-300m		

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy ...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?
							Neutron sensors (CRNS)								
		Discharge time series	Measured discharge				Water level gauge	Minutes		m³/s	txt	On-site sensors			
		Discharge time series	Simulated discharge				Hydrological model	Minutes		m³/s	txt				
	Landslide hazard	Land use	Land use map	YES	Government Tyrol		Aerial images		Since 1945		jpg	Remote sensors			
		Topography/DEM	Digital elevation model	YES	Government Tyrol				2006		GIS				
		Infrastructure	Infrastructure data												
		Building/housing													
		Streams													
		Precipitation	Precipitation data	YES			Rain gauge	Minutes		mm	txt				
	Vulnerability	Land use	Land use map	YES	Government Tyrol		Aerial images		Since 1945		jpg	Remote sensors			
Nature	Changes in land use	Land use	Land use map	YES	Government Tyrol		Aerial images		Since 1945		jpg	Remote sensors			
	Change in land cover	Land cover	Land cover data												
People	Reduced/avoided damage cost from hydro-meteorological risk reduction	Hazard maps										On-site sensors			
		Value maps										On-site sensors			

## 7. Demonstrator B3 – Aarhus, Egå Engsø and Lystrup, Denmark

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy ...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?
Water	Surface Run-off Reduction	Precipitation	Precipitation data	YES	Danish Meteorological Institute (DMI)		automatic			mm		On-site sensors		NO	







## 8. Demonstrator B4 – Thur River Basin, Switzerland

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy ...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?
Nature	Flood Peak Reduction	Precipitation	Precipitation data	YES	Automatic Weather Stations of Cantons Federal and cantonal stations		Automatic	daily basis		mm	ASCII	On-site sensors			
		River discharge	River discharge	YES				Automatic	hourly basis	1975 - today	m3/s	ASCII	On-site sensors		
		Water level time series		?											
	Change in Groundwater level/water table	Electrical conductivity		YES	Federal and cantonal stations		Automatic	15 min to daily basis	1999 to today	m3/s	ASCII	On-site sensors			
		Groundwater level		?											
	Flood Hazard	River discharge	River discharge	YES	Federal and cantonal stations		Automatic	hourly basis	1975 - today	m3/s	ASCII	On-site sensors			
		Rainfall time series		?											
		roughness		?											
		permeability		?											
		topography		?											
	Attenuation of pollution in groundwater	Electrical conductivity		YES	Federal and cantonal stations		Automatic	15 min to daily basis	1999 to today	m3/s	ASCII	On-site sensors			
		Major ions		YES	Federal and cantonal sampling			four times a year	1975 - today	mg/L	ASCII	Survey and questionnaire			
		Micropollutants		YES	Federal and cantonal sampling			four times a year	2015 - today		ASCII	Survey and questionnaire			
	Shoreline characteristics and erosion protection	Change habitat area		NO	Areal evaluation				Once 2023		ASCII	Remote sensing			
		Number and type of protected species	Change habitat area		NO	Areal evaluation			Once 2023		ASCII	Remote sensing			
Changes in riparian habitat		Change habitat area		NO	Areal evaluation			Once 2023		ASCII	Remote sensing				

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy ...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?	
	Increasing recreational opportunities of NBS area	Changes in length of paths		?								Survey and questionnaire				
		Number of access points to NBS area		?								Survey and questionnaire				
	Number and value of people visit or spend free time in NBS area	Total number of visitors per day		?									Survey and questionnaire			
		Average duration of visit		?									Survey and questionnaire			
	Provision of NBS sites for education and research Change in land and/or property values	Activity during visit		?									Survey and questionnaire			
				?												

## 9. Demonstrator B5 – The Var Éco-Vallée, France

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy ...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?
	Flood hazard	Precipitation	Precipitation data	YES	Meteo France					mm	Table	On-site sensors			
		Land use	Land use map	YES	INSEE - Statistical Institute							Table	derived map		

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy ...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?	
Water	Vulnerability	Infrastructures data	Infrastructure data	YES	MNCA AquaVar project INSEE - Statistical Institute MNCA						Table	derived map				
		Population	Population	YES	AquaVar project INSEE - Statistical Institute MNCA						Table	derived map				
		Building/Housing	3D data/cadastre	YES	AquaVar project INSEE - Statistical Institute MNCA						Table	derived map				
		roughness		?	AquaVar project											
		permeability		?												
		topography		?												
		channel networks		?												
		Land use	Land use map	YES	INSEE - Statistical Institute MNCA							Table	derived map			
		Infrastructure	Infrastructure data	YES	AquaVar project INSEE - Statistical Institute MNCA							Table	derived map			
		Population	Population	YES	AquaVar project INSEE - Statistical Institute MNCA							Table	derived map			
Nature	Restricted-range species	Building/Housing	3D data/cadastre	YES	AquaVar project INSEE - Statistical Institute MNCA						Table	derived map				
		The numbers of restricted-range species		YES	AquaVar project The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR9312025">https://inpn.mnhn.fr/site/natura2000/FR9312025</a> If during the project we find additional source for monitoring we						Table	Survey and questionnaire				

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy ...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?
		The numbers of restricted-range the area		YES	will include it in the program. The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR9312025">https://inpn.mnhn.fr/site/natura2000/FR9312025</a> If during the project we find additional source for monitoring we will include it in the program. The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR9312025">https://inpn.mnhn.fr/site/natura2000/FR9312025</a>						Table	Survey and questionnaire			
	Number and type of protected species	Type of protected species		YES	will include it in the program. The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR9312025">https://inpn.mnhn.fr/site/natura2000/FR9312025</a> If during the project we find additional source for monitoring we will include it in the program. The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR9312025">https://inpn.mnhn.fr/site/natura2000/FR9312025</a>						Table				
		Number of protected species		YES	will include it in the program. The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR9312025">https://inpn.mnhn.fr/site/natura2000/FR9312025</a> If during the project we find additional source for monitoring we will include it in the program. The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR9312025">https://inpn.mnhn.fr/site/natura2000/FR9312025</a>						Table				
	Type, density of native species	Type of native species		YES	will include it in the program. The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR9312025">https://inpn.mnhn.fr/site/natura2000/FR9312025</a> If during the project we find additional source						Table				

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy ...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolutio n	Covering all demonstra tion area?	Good quality to use in indicator assessm ent?	
		Number of native species		YES	for monitoring we will include it in the program. The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR9312025">https://inpn.mnhn.fr/site/natura2000/FR9312025</a> If during the project we find additional source for monitoring we will include it in the program. The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR9312025">https://inpn.mnhn.fr/site/natura2000/FR9312025</a> If during the project we find additional source for monitoring we will include it in the program.						Table					
		Area that native species are located		YES	for monitoring we will include it in the program. The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR9312025">https://inpn.mnhn.fr/site/natura2000/FR9312025</a> If during the project we find additional source for monitoring we will include it in the program.					m <sup>2</sup>	Table					
People	Increasing recreational opportunities of NBS area	Number of recreation activity in the area	Number of recreation activity in the area	YES	MNCA (Metropole Nice cote dAzur)						Table					
		Changes in length of paths		?												
		Number of access points to NBS area		?												
	Reduced/avoided damage cost from hydro-meteorological risk reduction	Flood depth		YES	INSEE - Statistical Institute MNCA AquaVar project							Table				
		Flood velocity		YES	INSEE - Statistical Institute MNCA AquaVar project							Table				
		Land use map	Data collection, survey	YES	INSEE - Statistical Institute MNCA AquaVar project						Table					



	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy ...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?
Vulnerability		wave height		?											
		Rainfall time series		?											
		roughness		?											
		permeability		?											
		topography		?											
		channel networks		?											
		Water depth		?											
		Land use	Land use map	YES	INSEE - Statistical Institute							Table	derived map		
		Infrastructure	Infrastructure data	YES	INSEE - Statistical Institute							Table	derived map		
		Population	Population	YES	INSEE - Statistical Institute							Table	derived map		
Coastal vulnerability index (CVI)		Building/Housing	3D data/cadastre	YES	INSEE - Statistical Institute						Table	derived map			
		Shoreline rate		YES	EMODnet					m/yr					
Nature		The numbers of restricted- range species		YES	The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR5410013">https://inpn.mnhn.fr/site/natura2000/FR5410013</a> If during the project we find additional source for monitoring we will include it in the program.						Table				
	Restricted- range species	The numbers of restricted- range the area		YES	The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR5410013">https://inpn.mnhn.fr/site/natura2000/FR5410013</a> If during the project we find additional source for monitoring we will include it in the program.						Table				
	Number and type of	Type of protected species		YES	The data will be followed from						Table				



	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy ...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?
	protected species				given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR5410013">https://inpn.mnhn.fr/site/natura2000/FR5410013</a> If during the project we find additional source for monitoring we will include it in the program. The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR5410013">https://inpn.mnhn.fr/site/natura2000/FR5410013</a> If during the project we find additional source for monitoring we will include it in the program. The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR5410013">https://inpn.mnhn.fr/site/natura2000/FR5410013</a> If during the project we find additional source for monitoring we will include it in the program. The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR5410013">https://inpn.mnhn.fr/site/natura2000/FR5410013</a> If during the project we find additional source for monitoring we will include it in the program.										
		Number of protected species		YES								Table			
	Type, density of native species														
		Type of native species		YES								Table			
		Number of native species		YES								Table			

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy ...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?	
People		Area that native species are located (m <sup>2</sup> )		YES	The data will be followed from given link: <a href="https://inpn.mnhn.fr/site/natura2000/FR54100130/FR54100130/">https://inpn.mnhn.fr/site/natura2000/FR54100130/FR54100130/</a> If during the project we find additional source for monitoring we will include it in the program.						Table					
	Changes in riparian habitat		remote sensing	?								Remote sensing				
	Change in wetland habitat		remote sensing	?								Remote sensing				
	Increase green area		remote sensing	?								Remote sensing				
	Distribution of public green space		remote sensing	?								Remote sensing				
	Reduced need for management and maintenance	Maintenance and management cost of grey infrastructures (if implemented) Maintenance and management cost of NBS	Number of recreation activity in the area	?												
	Change in land and/or property values	Price of land and/or properties (euro)		?												
	Reduced / avoided damage cost from hydro-meteorological risk reduction	Willingness to pay		?												
		Flood depth		YES	INSEE - Statistical Institute							Table				
		Flood velocity		YES	INSEE - Statistical Institute							Table				
	Land use map	Land use map	YES	INSEE - Statistical Institute							Table					
	Infrastructure data	Infrastructure data	YES	INSEE - Statistical Institute							Table					
	Damage data		YES	INSEE - Statistical Institute							Table					
	Inundation map		YES	INSEE - Statistical Institute							Table					

	Indicators	Variables needed	Data	Data available	Data source	Data Owner	Sensor/ Accuracy ...	Frequency monitoring	Period of available data	Unit	Format	Type of data	Spatial resolution	Covering all demonstration area?	Good quality to use in indicator assessment?
		Value map		?											
	Increasing recreational opportunities of NBS area	Number of recreation activity in the area		YES							Table				
		Changes in length of paths		?											
		Number of access points to NBS area		?											
	Number of cultural events in NBS area	Number of cultural events		YES	INSEE - Statistical Institute						Table				

