RECONECT

Preparatory actions for Demonstrators A and B

Including copies of building permits / permissions of uses / commissioning works

Deliverable D2.5

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Acknowledgement

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 776866

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Document Information

Project Number	**776866**	Acronym	**RECONECT**
Full Title	RECONECT- Regenerating ECOsystems with Nature-based solutions for hydro-meteorological risk rEduCTion		
Project URL	http://www.reconect.eu/		
Document URL			
EU Project Officer	Laura Palomo Rios		

Deliverable	Number	D.2.5	Title	Preparatory actions for Demonstrators A and B
Work Package	Number	WP2	Title	Demonstration

Date of Delivery	Contractual	02.28.2019	Actual/Revised	09.04.2021
Status	version		final ☑	
Deliverable type*	R			
Dissemination level				

*R – Report, P – Prototype, D – Demonstrator, O – Other.

**PU – Public, PP – Restricted to other programme participants (including the Commission Services), RE – Restricted to a group specified by the consortium (including the Commission Services), CO – Confidential, only for members of the consortium (including the Commission Services).

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Abstract *(for dissemination, 100 words)*	This report describes Preparatory Actions of Demonstrators A and B for demonstration and up-scaling activities within the RECONECT Project. The main objective of this deliverable is to support activities related to demonstration activities for Type A (with a focus on forthcoming construction works) and for type B (with a focus on monitoring, evaluation and validation).
Keywords	Nature Based Solutions, Eco-Systems, Demonstrators, Preparatory actions

Version Log				
Issue Date	Rev. No.	Author	Change	Approved by
11.04.2019		V. Penchev, N. Manojlovic, B. Pérez-Lapeña, J. de Jager, A. Kirova, J. Knegt, F. Boogaard		Z. Vojinovic
09.04.2021	1	V. Penchev, N. Manojlovic, B. Pérez-Lapeña, J. de Jager, A. Kirova, J. Knegt, F. Boogaard, R. van Bruggen	Revised as per the recommendations of the Expert Panel	Z. Vojinovic

Executive Summary

This report presents the results of the activities carried out under Task 2.5 in accordance with the work plan of Project RECONECT H'2020-C5-08-2017-GA-776866.

The main purpose of this report is to gather and analyse important information upon actions carried out by Demonstrators A and B assisted by the RECONECT network, to prepare and launch demonstration activities in their NBS sites. For Demonstrators A, the report focuses on preparatory actions in the pre-construction phase, while for Demonstrators B the focus is put on evaluation and validation works. Both Demonstrators A and B have provided the following important information:

- Required permits, including approvals for commission, implementation and monitoring works
- Technical information regarding technology, equipment, monitoring programs
- Need and availability of data management infrastructure and services, and the use of these data for decision making.

Lessons learned by Demonstrators B from the planning and commissioning of their NBS projects are highlighted. Based on the present analysis, the report provides guiding information, and lays the groundwork for the next steps and appropriate actions for further development of the NBS sites of Demonstrators and Collaborators.

The information about national legal / permitting processes will be used and updated versus the new input from demonstrators within Task 2.4 (month 12) where some common approaches and differences between countries as observed in this early stage of the project will be summarised, and some recommendations upon the different types / groups of NBS will be drawn.

Information in this report, together with impressions, perception and opinions from stakeholders will be compiled and fed into the production of the RECONECT ICT monitoring platform (Task 3.2)

The gathered information, main findings and the lessons learned by Demonstrators, will serve as an important source to develop and deliver a MOOC (Massive open online course) on NBS, (Task 6.3), as well as to organize and conduct National Workshops in each Demonstrator and Collaborator clusters, Task 6.6

Finally, but perhaps most importantly, it should be noted that the information on the experience gained by the demonstrators in the preparation and implementation of their NBS will be an invaluable aid to all those stakeholders who intend to implement large-scale NBS to reduce hydro -meteorological risk, this way benefitting NBS implementation more widely.

The track record in implementing large scale NBS in natural and rural areas as have been indicated by Demonstrators B, and the provided information in relation to the permitting procedures is very valuable for Demonstrators A as they can perceive Demonstrators B as "advisors" in their respective projects.

All the information in this report (descriptions of NBS cases and relevant preparatory actions, main findings and lessons learned, recommendations and conclusions) together with the enclosed example copies of permits and commissioning works, will also assist Collaborators in their efforts to establish their NBS projects.

This information can also serve as a valuable guide for other stakeholders who intend to implement NBS projects.

Lessons learned by Demonstrators B from the planning and commissioning of their NBS were analysed in order to help Demonstrators A in their further efforts. An important lesson is that for the case of large-scale NBS (where usually standards are missing) environmental permitting is a very complex procedure that may take years (e.g. 8 years in the case of DB6 – Les Bouscheleurs).

Another important lesson shared is the need to involve the public, and especially the communities, into the planning and execution process of the NBS - that may facilitate overcoming legal barriers and speed-up permitting in the NBS implementation process.

Paying attention to different stages of development of the Demonstrator's NBS projects, this work underlines the need of high competence, as well as of modern technical means to carry out demonstration activities.

In the same time, the report puts the emphasis on the good prospective for Demonstrators A (and Collaborators) to benefit from lessons learned within RECONECT network, and also from contacts/synergy with other NBS projects and other established EU Monitoring Networks.

The final conclusion of this report is that all the Preparatory actions of Demonstrators A and B to launch demonstration activities at their NBS sites have been managed in an appropriate way and have been completed in line with the planned timeline.

The necessary basic conditions, supporting tools (baseline data, IT tools, software, etc.) and relevant competence are in place, in addressing the issues related to launch the demonstration activities in relation to monitoring and assessment of the NBS (for Demonstrators B), as well as to carry out permitting procedures necessary to start construction works for the Demonstrators A.

Within Task 2.5 Demonstrators A and B have been acquainted and prepared to share (all or part of) their monitoring data and make them accessible within the RECONECT ICT platform TeleControlNet. Furthermore, as part of Task 2.6 activities, demonstrators will develop monitoring and evaluation plans to assess the performance of their NBS in achieving the selected number of sub-goals.

Based on results of the preparatory actions undertaken By Demonstrators A and B, co-assisted by RECONECT network, this report recommends that all planed RECONECT demonstration activities shall continue in accordance to the initial work-plan of the project

More information can be found on RECONECT website: www.reconect.eu/network-of-cases/.

Web-links to example copies of permits/commissioning works are available in Annex A to this report.

Contents

Abbreviations

EU FD	EU Floods Directive
FRMP	Flood Risk Management Plan
HRU	Hydrological response units
ICF	Indicator to monitor and evaluate connectivity
ICT	Information and Communication Technology
IHF	Indicator to monitor and evaluate mesohabitats
KPI	Key Performance Indicator
MSFD	Marine Strategy Framework Directive
NBS	Nature Based Solutions
QBR	Indicator to monitor and evaluate vegetation
RBMP	River Basin Management Plan
SCHAE	Schéma de cohérence hydraulique et d'aménagement d'ensemble
WFD	Water Framework Directive

Organisations

AAKS	AARHUS KOMMUNE
ACA	Catalan Water Agency
BDCA	Black Sea - Danube Association of Research and Development
BFW	Austrian Research Center of Forests Department of Natural Hazards
BOKU-MET	Dept. of Meteorology, BOKU- University of Natural Resources and Life Sciences
DTES	Department of Territory and Sustainability of Catalonia
DTU	Denmark Technical University
EAWAG	Swiss Federal Institute of Aquatic Science and Technology
FHH	Free and Hanseatic City of Hamburg
FOEN	Swiss Federal Office for the Environment
HR	Hydrologic Research BV
IHE	Institute for Water Education, Delft, the Netherlands
InterAct	Inter Act Industrial Automation B.V.
IWA	International Water Association UK
SEI	Stockholm Environment Institute
TAUW	TAUW BV European consultancy and engineering firm
TUHH	Hamburg-Harburg University of Technology
UFZ	Helmholtz- Zentrum fuer umweltforschung GMBH
UIBK	University of Innsbruck
UNSA	University Nice Sophia Antipolis

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INTRODUCTION

Project RECONECT H'2020-C5-08-2017-GA-776866 is an interdisciplinary international project that aims to contribute to European reference framework on Nature Based Solutions (NBS) by demonstrating, referencing and upscaling large scale NBS and by stimulating a new culture for 'land use planning' that links the reduction of hydro-meteorological risks with local and regional development objectives in a sustainable way.

In order to contribute effectively to the EU reference framework on NBS and to generate higher impacts across Europe, RECONECT draws upon a number of Demonstrator Sites. They have been carefully selected to cover a range of local criteria including climatic and geographic conditions (1.); type of hydro-meteorological events (floods, storm surges, droughts, landslides) (2.) and vulnerability to these events (3.). Besides these criteria, the potential for collaboration and upscaling has also played a role in the selection process.

In order to capitalise on the existing knowledge and experiences on NBS within the RECONECT Consortium and initiate the knowledge sharing and upscaling process already in an early project stage, RECONECT bases its demonstration activities on two types of Demonstrators being A and B, which are at different stages in the NBS co-creation process.

In **Demonstrators Type A** the large scale NBS will include the full co-creation (i.e., *co-assessment, co-design, co-implementation, co-monitoring and co-evaluation*) and validation process during the project lifetime either by requesting co-funding from the EC and/or by deploying their own funds and resources.
The **Demonstrators Type B** cases have a considerable track record in implementing large scale NBS in natural and rural areas and particularly those that are sensitive ones (e.g. mountainous and coastal areas, at watershed/landscape scale) with high local/national/international visibility. In order to capitalise on their experiences on already implemented NBS, RECONECT will demonstrate their NBS by co-monitoring, co-evaluating and validating their multiple benefits.

In that sense, the Demonstrators B can make use and benefit from the already executed NBS within previous projects or initiatives and can provide the knowledge and experience on NBS implementation to the RECONECT Demonstrators A already in the early project phase. It especially relates to the experience on preparatory actions for the implementation, construction of NBS or overall project management activities (e.g. coordination, contracting or communication with the stakeholders). RECONECT draws upon **4 Demonstrators Type A** and **6 Demonstrators Type B**. The geographic spread of the RECONECT demonstrators is shown in Figure 1-1.

Demonstrators A:
DA1: The Elbe Estuary, DE
DA2: Seden Strand, Odense, DK
DA3: Tordera River Basin, ES
DA4: Portofino Park, IT
Demonstrators B:
DB1: IJssel River Basin, NL
DB2: Inn River Basin, AT
DB3: Greater Aarhus, DK
DB4: Thur River Basin, CH
DB5: Var River Basin, FR
DB6: Les Boucholeurs, FR

Figure 1-1 The geographic spread of the RECONECT Demonstrators

The RECONECT demonstration activities are coordinated and executed in **WP2 (*Demonstration*).** They cover the full span of the implementation activities starting from the preparatory actions, and stakeholder analysis over planning& design, construction to the preparation of the ground for co-monitoring and co-evaluation actions.

This report presents Deliverable D2.5: Report Describing Preparatory Actions of Demonstrators A and B. The work presented has been carried out within Task 2.5 *Preparatory actions for demonstrators Type A and B*, in parallel and in close cooperation with Task 2.3 *Co-assessment: Specifying baselines, scoping of detailed requirements.*

The main objective of Task 2.5 and the report D2.5 is to outline the preparatory actions for the demonstration activities in Demonstrators A and B addressing both, technological and non-technological aspects, for the purpose of co-creation. Due to different implementation stages of different Demonstrator types, the scope and focus of the preparatory actions differ for Demonstrators A and B. For Demonstrators type A the emphasis of the preparatory actions has been put on the forthcoming construction/implementation works, whereby Demonstrators type B are focusing on the preparatory actions for the co-monitoring and co-evaluation programs.

D2.5 also provides, for both Demonstrators A and B, an overview of non-technological preparatory actions for NBS implementation and evaluation activities, including permits and approvals for commission, implementation, and monitoring works. In addition, for Demonstrators B, the overview includes the lessons learned in carrying out these activities.

1. STATUS ANALYSIS. ASSESSMENT OF THE READINESS OF THE DEMONSTRATORS

Below is an analysis of the state of the NBS projects and the preparation of the Demonstrators to start demonstration activities, as summarized on the basis of the information presented in the questionnaires distributed to all of them. Information in the questionnaires include previous actions and current situation of the NBS demonstration projects, as well as some preliminary assessment of planned co-creation activities.

Both technological and non-technological aspects have been surveyed by the questionnaires. Links and synergies to other NBS projects, as well as to already established EU monitoring network/facilities were also investigated to assess opportunities for further replication and up-scaling of the NBS. The following information has been surveyed:

- Summary information on permitting and procurement procedures, including:
  - Procedure/Permit Topic
  - Procedure name
  - Public or private procedure
  - Competent authority
  - Information required in the application
  - Estimated preparation time (months)
  - Formal procedure time (months)
  - Which party should apply;
  - Copy available (Y/N)
- Copies of permits / approvals
- Geographical information (GIS data)
- Preparatory actions and data for monitoring
  - Baseline monitoring data
  - Variables that are/will be monitored during RECONECT, and used to evaluate NBS effectiveness
  - Preparatory actions to implement monitoring activities
- Links to other NBS projects
- Links / synergies to already established EU monitoring network/facilities
- Connection to the RECONECT Services Platform TeleControlNet

A complete overview of outcomes from the above questionnaires are included in Annex A attached to this report. Key observations from the Questionnaires are summarised below, highlighting preparatory actions of demonstrators A and B in both technological and non-technological aspects.

1.1 Overall assessment of preparatory actions for Demonstrators A

The preparatory works of Demonstrators Type A concern permitting, approvals, procurement and other non-technological aspects, as well as preparatory actions for technological developments (design, construction, monitoring) in preparation for NBS implementation and demonstration.

1.1.1 Demonstrator DA-1 Dove/Gosse Elbe Estuary, Hamburg

The Hamburg demonstrator is currently in the preparatory/design phase for both construction and monitoring activities.

For the actions undertaken in RECONECT, Demonstrator DA-1 has fulfilled the required procedures. Information on required permits is presented in Annex A. Building and construction as well as excavation permits are not needed for the Elbe Estuary NBS case. No new permits are anticipated.

Due to the Hamburg Transparency Law, a wide variety of documents of public interest – also regarding environmental regulations – are publicly available in the transparency portal: http://transparenz.hamburg.de

The conflicts with the aspects of spatial planning or disturbances of archaeological heritage sites are currently being assessed. The land acquisition might be needed to acquire some land adjacent to the water courses.

Depending on the magnitude of the alteration/modifications that are generated by the interventions, Environmental Impact Assessments (EIAs) may be needed as part of the environmental licensing procedures. The component Social Impact Assessment (if needed) is part of the EIA. There is an ongoing process to decide on it.

It is not envisaged to apply for any additional permits in the Ecology/Nature category as, for example, Natura 2000 areas and other protected ecological zones are already existing. The expected impacts of the actions prepared by this project are considered positive for the development and enhancement of the natural environment.

To facilitate the implementation of the monitoring program, full access to the monitoring data sources (public or private) is given by the commissioner of the project (Ministry for Environment and Energy of the City of Hamburg).

The monitoring plan is being developed, addressing technical and also organisational issues. There are baseline data from previous monitoring activities, concerning flood hazard, namely precipitation (mm), water level (m), and river discharge (m^3/s). This provides a good basis for evaluation of the NBS performance through the relevant Indicators: Surface Run-off Reduction; Slowing down and Storing Run-off; Flood Peak Reduction; Flood Hazard. These variables (within the WATER category) will continue to be monitored, as well as new ones will be added, in accordance to the RECONECT objectives, within categories NATURE and PEOPLE. Also, in relation to GIS data, there are multiple digital maps available for the NBS site (digital elevation models/ terrain, orthophotos, etc.), all accessible online.

For the demonstration activities, DA-1 will benefit from the contacts with the CLEVER CITIES and STUCK projects, where the City of Hamburg (FHH) and TUHH are partners.

Preparatory activities to link the (monitoring) systems/data with the RECONECT TeleControlNet Platform have been initiated. The contact person for aspects of monitoring/data management in the DA1 case has been appointed.

Demonstrator DA-1 Hamburg would acknowledge input from the other demonstrators related to monitoring of the “measurable success” of the project and the indicators derived to delineate plausible results in the field.

1.1.2 Demonstrator DA-2 Odense Coastal Area

Within the first six-month period of the RECONECT project, Demonstrator DA-2 has been actively involved in the process of implementing permitting procedures. Obtaining the relevant permits will take between 6 months up to 1 year (first half of 2020).

The project requires permits for changes in land use and the cultural heritage area. The area where the demonstration project will be established is privately owned and therefore, before the start of the project the Odense Municipality has bought the rights to changes in land use.

Part of the project area is laying within the Natura 2000 area at Odense Fjord and another part is also a protected nature area. A screening for Environmental Impact Assessment on the Natura 2000 site will be completed.

The project will need an environmental permit for changes on salt meadows.

Overall, no specific issues or barriers are foreseen that might hinder the permitting process.

DA-2 Odense is currently designing the monitoring program and working on the gap analysis for the baseline assessment.

Specification of the KPIs and variables that will be monitored in the demonstration phase has been provided, subject on refinement within the next months, in parallel with the development of the NBS project.

Basic information has been provided on the availability of GIS tools and data such as terrain maps, land use maps, vegetation cover etc. (Annex A).

The preparatory activities to link the (monitoring) systems/data with the RECONECT TeleControlNet Platform are in progress and the contact person for aspects of monitoring/data management in the DA-2 case has been appointed.

Demonstrator DA-2 would acknowledge input from the other demonstrators related to the key aspects to be considered in the implementation of different types of NBS.

1.1.3 Demonstrator DA-3 Tordera River Basin

By the end of the first six-month period of the RECONECT project Demonstrator DA-3 is in the planning phase of the project and once concluded (by January 2020) the design phase will follow. The design and the location of the NBS will be adapted and located (if possible) in order to minimize legal and non-technical issues/barriers that may arise. It is not expected to face any issues in obtaining the permits to construct the NBS, as ACA is the responsible authority for issuing permits within a distance of 100 m from the river bank.

The selected sites to construct the NBS will comply with current land-use legislation. DA-3 has identified land acquisition as a challenging phase in the project and has proposed ways forward to minimize issues and barriers that may arise.

Environmental permits might be required when NBS interfere with environmentally protected areas. A simplified Environmental Impact Assessment might be required for water retention areas with a storage capacity higher than 200.000 m^3. The middle and final reach of the Tordera river,

as well as most of the course of its tributary Riera de Santa Coloma – Estany de Sils, are classified as Natura2000 protected areas. A Social Impact Assessment is not required.

Most of the planned NBS will be located within a distance of 100 m from the river bank and therefore, no construction/excavation permit will be required. For areas located further away from the river, DA-3 will need to apply for a permit to the municipality. To facilitate collaboration in this regard, the main municipalities along the Tordera river have been identified as key stakeholders. Where the implementation of the NBS interferes with any existing infrastructure (public roads, railroad, cables, etc.), the executive project will include measures/actions required to minimize the interruption of the service, as well as to avoid its restitution whenever possible.

DA-3 is in the process of developing the Levee Management Plan of the Tordera River Basin, which is part of the planning stage of the NBS. The full scope and detailed activities of the monitoring and evaluation programs is still pending. Hydrological and hydraulic models will be used to establish the baseline, in terms of flood hazard and flood risk. DA-3 ACA has their own Monitoring Programme, in compliance with the EU Water Framework Directive (WFD), with its own well-defined indicators, monitoring points and schedule. There are also some automatic rainfall and river gauging stations located within the Tordera river basin that might be useful during the monitoring stage of the project.

Different sources of GIS data (such as orthophoto images, topography, land use/land cover and thematic cartography in relation to flood hazard, and ecological status of water bodies) for the Tordera river basin are available online.

GIS datasets identifying the location of heritage and archaeological sites are available for the area of study. These datasets will be taken into account during the NBS construction phase.

DA-3 is interested to exploit networking / synergies with other NBS projects, and/or established monitoring network/facilities, and are seeking RECONECT assistance on this subject.

The preparatory activities to link the (monitoring) systems/data with the RECONECT TeleControlNet Platform are in progress, and the contact person for aspects of monitoring/data management in the DA-3 case has been appointed.

Demonstrator DA-3 Tordera River Basin seeks advice from the other demonstrators on the strategies for land acquisition and/or reaching agreements with landowners, as well as on use of different data sources and tools to improve their monitoring and evaluation activities.

1.1.4 Demonstrator DA-4 Portofino National Park

By the end of the first six-month period of the RECONECT project Demonstrator DA-4 is currently working on several procedures, permits and public procurements within EU Directive 2004/17/CE (works) and 2004/18/CE (services and supplies) implemented with Italian law (DL) 18.04.2016, n. 50.

Further steps to be undertaken include the final design, environmental impact assessment, and public procurement of construction works.

All intervention areas are included in the Regional Natural Park and in a Natura2000 site. Two steps are therefore needed, i.e., approval from the Park Authority itself for fauna, flora and vegetation legislative aspects and a Natura2000 impact assessment for the project.

Regional environmental procedures (screening and assessment) may take more time than expected. A certified declaration of work beginning, SCIA, is needed. All the documents must adhere to the Municipalities standards for the audit.

The foreseen activities are coherent with the current land-use and no land acquisition is therefore needed. The existing infrastructures are not affected by the foreseen works.

Works on private property need a preliminary agreement with the respective owners. Particular attention will be paid to share the design with residents and other stakeholders, both for the project governance and to spread the NBS approach in order to promote its application in other close by private areas.

The most labour/time intensive preparatory procedure is the project scheduling, considering the different needs of the concurring subjects and the aim of the project in order to obtain the maximum efficiency and effectiveness.

The preparatory activities to link the (monitoring) systems/data with the RECONECT TeleControlNet Platform are in progress, and the contact person for aspects of monitoring/data management in the DA-4 case has been appointed.

The monitoring program for Demonstrator DA-4 Portofino has been designed. There is a large set of baseline data from previous monitoring activities, relevant to flash floods and landslide phenomena (that is the case for DA-4), within all categories WATER, NATURE and PEOPLE. These and more variables will continue to be monitored, in accordance to the RECONECT demonstration and evaluation objectives.

There is clarity on the monitoring equipment that will be used, including weather stations, hydrometers, and cameras. Monitoring will also require LIDAR data acquisition. All monitoring data will be made accessible in line with the technical specifications, standards and formats requested by the RECONECT ICT platform.

There are multiple relevant GIS datasets available for the NBS site (such as climatic data, land use and changes in vegetation), all accessible online.

One of the RECONECT sister projects UNALAB has a pilot NBS project in the Genoa urban area aiming at mitigating geo-hydrological risk and runoff. These two demonstration projects can be used as example to (profitably) upscale NBS throughout the Liguria region.

Demonstrator DA-4 Portofino would acknowledge input from the other demonstrators in relation to the key aspects to consider in the implementation of different types of NBS.

1.2 Overall assessment of preparatory actions for Demonstrators B

1.2.1 Demonstrator DB-1 IJssel River basin

The IJssel River basin project Stroomlijn is a sub-project in the ‘Room for the River’ program and aims to manage/remove vegetation (forest, shrubs) that forms a barrier to the discharge of river water.

Stroomlijn IJssel was part of the larger ‘Room for the River’ IJssel program. The project overlapped with dozens of other landscape/nature/water projects. They were all dealt with differently, in alignment with the commissioner, the Dutch water authorities (RWS).

The implementation works on the Stroomlijn project / IJssel river have been commissioned by the National Water Authority (Rijkswaterstaat). The final permits where applied for in 2017, while the last field works where delivered in 2018. At this point, all permitting procedures have been completed. Copies of (example) permits are presented in the attachment to Annex A of this report.

The biggest challenge faced was combining the protection of prevailing ecological values with the hydrological restrictions from the river basin while appropriately addressing the interests of the local landowners and other stakeholders.

The primary procedure which made the works possible is the *Project plan Waterwet*. Such procedure is needed under Dutch law if a structural change is intended in e.g. a river basin. Under Dutch legislation, the Project plan Waterwet can be preceded by an EIA, if a case-by-case assessment indicates that substantial environmental impact can be expected. Such a case-by-case assessment has been carried out for each of the five tranches that have been consequently filed for permitting.

One of the aims of the project was to formalize a vegetation map of the entire basin. On the basis of such a map, structural enforcement of pruning/cutting maintenance will become possible. In the past decades such maintenance had been neglected, partly from the point of view that a river basin also serves an important ecological purpose. As a result, the level of vegetation has developed to such an extent that the waterflow became obstructed in times of flooding.

A GIS database[1] was built to manage the project (including vegetation map of the entire basin, ecological and hydrological assessments, case-by-case assessments on ecological effects).

Within RECONECT project, demonstration activities are focused on monitoring and evaluation of the NBS within the project area. In terms of monitoring, private land owners needed to be asked for permission to gather data on their land. For detailed analyses of remote sensing possibilities the next monitoring methods are prepared and will be evaluated.

As the project involves many geographical sections, designs, stakeholders, legislations etc. the work process, and deliverable output (designs, reports, etc.) was automated. The input of data was streamlined by converting and linking all information into geographically tagged information in the implemented GIS system. The base data consisted of aerial photographs (2011-2018), historic maps (1850-2018), land use/land cover maps, digital elevation model (AHN2), and boundary datasets (province, waterboard, etc.).

The Stroomlijn IJssel project itself did not involve hydrological data. However, as part of RECONECT, additional innovative hydrological measurements are taking place.

The preparatory activities to link the (monitoring) systems/data with the RECONECT TeleControlNet Platform are in progress, and the contact person for aspects of monitoring/data management in the DB-1 case has been appointed.

Demonstrator DB-1 is experienced in development, implementation and maintenance strategies of NBS, high tech monitoring, NBS maintenance, multidisciplinary approaches, Building with Nature, and the Water Framework Directive. DA-1 is willing to share their experience and know-how with the Demonstrators A, as well as with the Collaborators within the RECONECT project.

1.2.2 Demonstrator DB-2 Inn River Basin

In the Geroldsbach catchment / Inn river basin, a number of measures were implemented over the last 100+ years. Among numerous installations and improvements of technical measure, NBS have been implemented.

The construction of the NBS was under the responsibility of the WLV (Wildbach und Lawinenverbauung; Torrent and Avalanche Control Unit of the Ministry). The most significant NBS dealt with in this project is the afforestation of parts of the catchment in the 1950ies.

The performed activities during the more than 100 years NBS history include: construction of a protection wall, construction of an 8m barrier at the valley exit, a gravity damn and greening of failure scars, 107 drainage creeks, 2 supporting structures, 8 walls, 3ha greened and fenced (to

[1] https://www.openearth.nl/vegetatiemonitor/

protect from animals), multiple river bed stabilization bands, rounding of fracture edges, sloping of failure scar surfaces, afforestation and greening with goat willows, 2 concrete barriers, reforestation with larches and fencing, increase of the debris retention barrier to 2.500 m³, and construction of 7 concrete barriers at the 'Bärenmaisblaike" subbasin.
Due to the long history of the NBS implementations (the construction of control structures of Geroldsbach started in 1908), rare information on permits and on issues during that implementation or commissioning procedures are available. In fact, most of the today legal actions associated with the implementation of such measures did not exist at that time. The current legal situation is here described as if the implementation procedures would take place today following today's legal requirement applying when WLV is realizing such projects.
For the afforestation and greening NBS measures no general requirement exists for the application of the Environmental Impact Assessment (EIA) procedure and is not subject to legal permitting. Also, no Natura 2000 or other protected area is in the catchment area nor in the close proximity. However, any ecologically adverse effects need to be compared to the benefit created by the flood risk reduction activities. In most cases, potential negative impacts on protected species need to be addressed with compensation measures. These compensation measures are part of the permitting procedure and are usually mandatory.
No public roads are included in the Geroldsbach/Götzens catchment which are interfering with the NBS.
In relation to monitoring activities, acquisition of water related data requires a permit according to the Water Act. Also, for data collected by drones, a permit application is required containing information related to the drone characteristics. For the acquisition of meteorological and nature related data no permit is required.
DB 2 has expertise concerning the legal boundaries of various aspects in the permitting process going beyond afforestation.

For the DB-2 Inn River Basin monitoring includes rainfall runoff experiments in the catchments, including permanent installation of equipment. The installations are planned to be used to continuously monitor meteorological parameters as well as resulting surface and subsurface runoff throughout the year. Runoff is planned to be as well measured at the main reach gauging the catchment outlet. At side tributaries temporal measurements are planned to identify the mean and low flows including potential source of flows. Similar measurements are the case in the urban part as a part of the integrated catchment. First installations have started and will be continued after snowmelt in spring / summer 2019.

There are baseline data from previous monitoring activities, including datasets on precipitation, land use, and digital terrain and surface models. These variables (within the WATER category) will continue to be monitored while some of them will be simulated. Within categories NATURE and PEOPLE land use, forest development, population, and spatial planning information were monitored.

Regarding GIS data, available datasets include current and historical aerial photos, land use datasets, digital elevation maps, and soil maps.

For the demonstration and evaluation activities DB-2 will benefit from the contacts with projects OPERANDUM, COST Action CA17133, and PHUSICOS. DB-2 will also investigate the applicability of INSPIRE datasets and those resulting from the SWICCA project - Service for Water Indicators in Climate Change Adaptation.

The preparatory activities to link the (monitoring) systems/data with the RECONECT TeleControlNet Platform are in progress, and the contact person for aspects of monitoring/data management in the DB-2 case has been appointed.

1.2.3 Demonstrator DB-3 Aarhus, Egå Engsø and Lystrup

All permitting procedures and construction works at Egå Engsø and Lystrup NBS cases (Aarhus), have been completed. Copies of permits/examples are presented in the attachment to Annex A of this report. No additional actions are planned for these NBS.

The Egå Engsø area was appointed as a potential wetland area in the municipality plan. Acquisition of land was provided through a land consolidation process in combination with a nearby motorway project.

Prior to the project an archeological survey was executed and the important areas were excavated.

A screening for EIA was necessary for both Egå Engsø and Ellebæk (part af Lystrup), which concluded that EIA was not needed. There is no Natura2000 area nearby.

Infrastructural actions included the removal of airborne electrical cables (in Egå Engsø) and a procedure for permanent construction of bumps on a road to lead surface water in the desired direction (in Lystrup).

The planning and design of the project took most of the time besides the land consolidation (land acquisition).

Demonstrator DB-3 has gained experience concerning permissions/dispensations that are necessary in the legislation and from landowners in order to create a timetable for the applications (some permissions are necessary prior to others) and to set the legislative and landowner framework for the project design.

By the end of the first six-month period of the RECONECT project Demonstrator DB-3 AAKS is in the process of preparing the design of the monitoring program, and in the process of choosing appropriate indicator/variables. The monitoring program will be mainly based on the existing monitoring design for the WATER and NATURE challenge categories. For the PEOPLE category, the monitoring plan will be designed from scratch.

Examples of available GIS datasets include digital thematic base maps (buildings, roads, sewer system etc.), historical maps and images, maps of protected areas (nature, ground water etc.), soil maps, wells, nature registrations, and socioeconomic datasets, aerial orthoimages, and digital elevation models based on laser scanning.

For the demonstration and evaluation activities, DB-3 will benefit from the contacts with DCE – Danish Centre For Environment and Energy – which monitored nitrogen turnover in Egå Engsø in 2017 and DTU Aqua – National Institute of Aquatic Resources – which monitored smolt loss in Egå Engsø in 2005 and 2006 (before the lake was established) and in 2007, 2009-2011 (after the lake was established).

The preparatory activities to link the (monitoring) systems/data with the RECONECT TeleControlNet Platform are in progress, and the contact person for aspects of monitoring/data management in the DB-3 case has been appointed. The contact person responsible for more specific technical aspects will be appointed shortly.

1.2.4 Demonstrator DB-4 Thur River Basin, Switzerland

The preparation of the project was executed between 1995 and 2002 (about 6.5 years duration), in accordance to the Switzerland law that requires involvement of the public, including public consultations after the project definition and planning phases.

Currently no additional action is planned for the specific NBS case which will be demonstrated within RECONECT (however, more NBS within the Thur catchment are currently in the planning phase).

All procedures for the NBS have been completed (preparation, tender for consulting engineer, technical surveys, project design, permits, land consolidation/acquisition and tender for contractor). A construction permit was required and granted by the Cantonal office. A re-zonation of the land from intensive to extensive agriculture was conducted. Permits are subject of restricted access and available only upon request.

No formal Environmental Impact Assessment (EIA) or Social Impact Assessment were required and performed. As a proof for improving environmental conditions, two protected species returned to the site after its restoration. The forest next to the channelized river was reconnected to become a riparian forest as it was before channelization.

Besides the removal of levees, no other infrastructure was affected by the restoration measures.

In relation to monitoring, no special permits were required.

By the end of the first six-month period of the RECONECT project Demonstrator DB-4 is in the phase of monitoring and evaluation activities. The baseline assessment at the Niederneunforn river restoration site within the Thur river catchment (Switzerland) is completed.

The monitoring program design is completed and all the necessary equipment has been purchased and all permits and approvals have been obtained. The collected data will be made available to the RECONECT project.

The existing data platform (a custom geodatabase and WebGIS platform) for water quantity will be further developed. It subdivides the Thur catchment into six sub-catchments and fully captures the hydraulic dynamics at the outlets of the sub-catchments. The goal is to generically include the groundwater flow system into the hydrological semi-distributed model for the entire Thur catchment. By constantly monitoring electrical conductivity (EC), water temperature and water level at a large number of locations throughout the catchment, an adaptive and event-based water quality monitoring scheme for selected locations will be developed.

For the Thur river catchment, a rich database is available. There exists a digital base map (Digital Elevation Model) from SWISS TOPO with a resolution of 25 m by 25 m and higher resolution models can be made available upon request. Maps on land use, soil and geology are also available. Aerial images of certain areas are available upon request from the federal government and cantonal authorities.

The NBS was part of the RECORD and RECORD Catchment projects. At the moment, the NBS is part of the larger-scale Swiss National Science Foundation (SNF) project Water Distribution.

The preparatory activities to link the (monitoring) systems/data with the RECONECT TeleControlNet Platform are in progress, and the contact person for aspects of monitoring/data management in the DB-4 case has been appointed.

Demonstrator DB-4 is experienced in economical evaluation of the restoration efforts, public perception of restoration measures, and success evaluation. An important lesson shared is to involve the public, and especially the communities, into the planning and execution process of the NBS. This has to be considered for a smooth implementation of the NBS, and DB-4 is available to share this experience with other Demonstrators and Collaborators.

1.2.5 Demonstrator DB-5 The Var Eco-Vallee

The NBS which will be demonstrated within the RECONECT project at Var River Éco-Vallée are already constructed. However, other NBS areas are still in construction phase. The Eco Vallee is a flagship project of France which started in 2007 and will last until 2035. Balance between the structural measures in the Var river, the reshape of its flood plains, and its transformation into a new ecological city are in progress.

The change in land use is significant in this NBS. The initial land use was mainly agriculture. Over the years the whole area was under development and slowly became less agricultural and more urbanized, aiming to develop eco-exemplarity and responsible urbanization.

The perimeter of the area mainly covers two Natura 2000 sites which constitute assets for the territory but also issues to be taken into account from the beginning of the project. The project development will have no negative influence on existing protected zones.

Further details on procurement and contracting procedures (already completed) will be provided to serve as a good example to all Demonstrators type A.

By the end of the first six month period of RECONECT, Demonstrator DB-5 is in the process of preparing the design of the monitoring program, and in the process of choosing appropriate indicator/variables. The monitoring program will be mainly based on the existing monitoring design for the WATER and NATURE challenge categories. For the PEOPLE category, the monitoring plan will be designed from scratch combining several sources.

Examples of available GIS datasets are digital thematic base maps (buildings, roads, sewer system etc), maps of protected areas (nature, ground water etc.) and socioeconomic datasets.

For the demonstration and evaluation activities DB-5 will benefit from previous connections with the AquaVar project. Demonstrator DB-5 plans to apply for a membership in the ECRINS network in order to monitor the river data.

The preparatory activities to link the (monitoring) systems/data with the RECONECT TeleControlNet Platform are in progress, and the contact person for aspects of monitoring/data management in the DB-5 case has been appointed.

Experience on past project phases like planning, design and construction is available to be shared with others, as well as information on the governance, ownership, and financing of the project. The lessons learned by Demonstrator DB-5 could be downscaled to fit the needs of other NBS cases within the RECONECT project.

1.2.6 Demonstrator DB-6 Les Boucholeurs

Demonstrators Type B had in most cases already completed the permitting process. In order to contribute to RECONECT network of Demonstrators and Collaborators, special attention is given to provide information on the lessons learned during commissioning and implementation, and during monitoring actions.

Following the storm Xynthia in 2010, the commune of Châtelaillon-Plage set up, with the communes of Yves, Aix and Fouras (neighboring communities), a plan PAPI (Program of Actions of Prevention against Floods). The main purpose of the program is to protect people, property and activities from the risk of coastal flooding, and the NBS presents one of the possible flood protection options for this area.

Planned work includes actions necessary to close the protection system of the village of Boucholeurs. This action was the subject of a very complex procedure taking into account environmental issues. Studies and consultation started in 2012. Work started with extracting the

clays necessary for the construction of the dike. Completion of the works is planned for the end of 2020.

The maritime works envisaged for the Boucholeurs are located within a NATURA 2000 environmental protection area. The area is one of the most representative examples of the large mid-Atlantic mid-shore swamps offering large areas of habitats - including meadowlands - remarkable for their originality (presence of salt in varying quantities) and their diversity (many related to water-logging). As a part of NATURA2000 (FR5410013) this site is valuable from an ecological point of view.

Before the planned construction works for this area, the conducted impact study in the NATURA2000 site concluded that disruption of flora and fauna in this area will not have a long-term effect. The content of the impact study is recorded in Article L.414-4 of the Environmental Code.

Demonstrator DB-6 Les Boucholeurs is now in the design process of the monitoring program and in the process of choosing appropriate indicator/variables. The monitoring program will mainly be based on the existing monitoring design for the WATER and NATURE challenge categories. For the PEOPLE category, the monitoring plan will be designed from scratch combining several sources.

Examples of available GIS datasets are digital thematic base maps (buildings, roads, sewer system etc), maps of protected areas (nature, ground water etc.) and socioeconomic datasets. Les Bouscheleurs project was a case study in two previous related projects: **CRISMA** - FP7project (2012-2015) and **PEARL** - FP7 project (2014-2017). The results obtained in these two projects will be used in RECONECT. With focus on modeling crisis management for improved action, preparedness and developing adaptive socio technical risk management and strategies, the use of lessons learned will be valuable.

Demonstrator DB-6 plans to apply for membership in the EMODNet network in order to obtain access to (available) marine data.

The preparatory activities to link the (monitoring) systems/data with the RECONECT TeleControlNet Platform are in progress, and the contact person for aspects of monitoring/data management in the DB-6 case has been appointed.

The lessons learned by Demonstrator DB-6 NBS could be downscaled to fit the needs to other NBS within RECONECT project.

More information on completed procedures will be additionally provided and shared with other demonstrators and collaborators.

2. PREPARATORY ACTIONS FOR CO-CREATION OF NBS'S.

RECONECT aims to co-create and demonstrate innovative NBS in rural and natural areas, by linking the reduction of hydro-meteorological risk with local and regional development objectives in a sustainable and financially viable way. Co-creation is understood here as the collaborative development of new value (concepts, solutions, products and services) together with experts and stakeholders (such as customers, suppliers etc.). In Demonstrators Type A the large scale NBS will include the aspects of co-creation (i.e., c*o-assessment, co-design, co-implementation, co-monitoring and co-evaluation*) and validation process during the project lifetime. The Demonstrators Type B cases have a considerable track record in implementing large scale NBS in natural and rural areas. Some projects have conducted extensive preparatory actions because of sensitive geographical features (e.g. mountainous or coastal areas, at watershed/landscape scale) or due to high local/national/international visibility. In order to capitalise on their experiences on already implemented NBS, RECONECT will demonstrate their NBS by *co-monitoring, co-evaluating*, and validating their multiple benefits.
Here below the preparatory actions for co-creation of NBS's within the first 6 months of the RECONECT project are presented, focusing on the established close relations with NBS developers and owners/managers of the NBS infrastructure and the involvement of stakeholders.

2.1 Establishing close relations with NBS developers and owners/managers of the NBS infrastructure

One of the first steps of the RECONECT project is to clarify the issues with the ownership, management, and financing of the NBS demonstration projects, and to establish close relations with the owners / managers / developers, of the NBS infrastructure. For this purpose, a specialized survey was conducted among the Type A and Type B Demonstrators, within the framework of the Questionnaires sent to them. Subsequently, some mutual meetings and discussions were organized, both on site in the demonstration areas, as well as through online conferences.

Land and infrastructure ownership

Land ownership is one of the key factors in project and site development and specific measures have been taken to identify the state of ownership. Having many different land owners of the site - usually mixed municipal and private ownership is the predominant case for the NBS Demonstration sites within the RECONECT project. In most cases municipalities proceed with buying back land which is of strategic importance (e.g., in terms of green space connectivity or accessibility), or in some cases buying certain specific rights from the land-owners.

The ownership of the infrastructure in the selected demonstration sites was also analysed. In the predominant case of the NBS demonstration projects within RECONECT the infrastructure is owned by the municipalities/local authorities.

Governance and funding

Governance in the Demo NBS sites is usually initiated and governed by state actors. Typical key players are ministries, municipalities, state agencies, river basin authorities. According to (Sekulova et al, 2017), one of the dominant visions on the governance of NBS rests upon the idea of sharing costs and risks between the private sector and the state - yet the mobilization of the private sector are particularly risky and expensive, leading to forms of social exclusion and the

need for the state to guarantee risk. The use of participatory evaluation schemes with multiple stakeholders combined with reflexive forms governance emerges as a key approach to success.

The level of finance models needed for different types of NBS within RECONECT Demonstration cases varies. The predominant funding is through state and municipal funds, in some cases supported through EU projects, in some cases the participation of NGOs and private sources of funding. The approach of Baroni et al. (2019) was used to categorize the municipal level of governance within two main options for implementing NBS, as shown here below in table 2.1.

Table 2.1 Categorisation of financing mechanism used by Demonstrators

Categorisation of financing mechanisms	**Applied in Demonstrator case**
Municipalities iimplement NBS projects or maintain existing NBS directly (especially on municipality-owned land); in this situation, the municipality pays for the intervention, either through funds it already has or by obtaining loans and revenues to finance the project.	DA1, DA2, DA3, DA4, DB1, DB3, DB6
Municipalities encourage other actors (e.g. residents, utilities, businesses) to implement NBS (especially on their private property) or to contribute to the maintenance of existing NBS in the public domain; in this case, the local authorities provide incentives to other stakeholders, or stimulate private finance by other means.	DB2, DB4, DB5

Interaction with Private sector

As a result of the study and the mutual meetings and discussions, it was found that despite the leading role of local government, special attention should be paid to clarify the role and establish contacts with the affected private sector:

- Landowners, farmers;
- Forest owners;
- Local shops & restaurants (tourist areas);
- Other private developers (concessioners, ski areas, beach areas).

The private sector is important, especially when it comes to achieving multi-beneficiary use of the NBS, that is one of the objectives of RECONECT NBS demonstration activities.

Interaction with "Gray" infrastructure

In most of the demonstration sites there is a "gray" infrastructure that will be affected in one way or another (e.g. removal, combination with green or blue infrastructure), therefore gray infrastructure has been also investigated. Ownership, management and maintenance have been clarified, and relevant contacts were established with the owners / managers (in the cases when they are different from managers of the NBS projects).

Summarising, it can be concluded that within the initial 6-month implementation period of the project, the demonstrators and the RECONECT project team were able to establish close links with the managers / owners / developers of the respective NBS projects, which is a good basis for the further process of co-creation in the development of NBS projects.

2.2 Involvement of Stakeholders and local communities

The RECONECT project has identified five phases where co-creation can take place: 1) co-assessment, 2) co-design, 3) co-implementation, 4) co-operation and co-maintenance as well as 5) co-evaluation and monitoring. Stakeholder involvement and engagement is a crosscutting issue that influences the success of each stage of the NBS decision-making process. What is essential for NBS sites is that most stakeholders have to be involved during the initial stages of the realisation process that is the case in Demonstrators A sites (compared to the phases of monitoring and evaluation, which are considered as being of lower relevance with respect to stakeholders engagement, that is the case in Demonstrator B sites). Within Task 2.5 some preparatory actions were undertaken to initiate the interactions between stakeholders in the demonstrator's A sites, building up on the lessons learnt in sites of Demonstrators B where NBS have already been implemented.

Each of the RECONECT Demonstrator's cases are taking a locally tailored approach to reach stakeholders that is right for them, however all decisions are being made upon evidence of previous co-design projects, attempting to learn and develop new approaches. The most noticeable aspects can be used as an example and can generate a reflection in terms of co-creation process for other cases (NBS projects).

All Demonstrators have effectively identified stakeholders that can contribute to a co-creation process. In total 121 stakeholders were mapped by Demonstrators (Study undertaken in Task 2.1 and reflected in Deliverable D2.1.). Generally, Demonstrators have identified stakeholder representing different groups and playing different roles. While representatives from "authorities" and/or "political representatives" are the dominant group of stakeholders, the dominant role stakeholders are attributed to "lobbyists" and "knowledge providers". The power to influence and take decisions, seems to rest among the representatives of governmental bodies. The constrain and determining factors are specific to each Demo case. Risks are also diverse, although they include those related to stakeholders' engagement, especially of vulnerable groups, or the barriers of legislative and construction standards to the inclusion of the local community.

A more detailed information focused on reporting the results of the stakeholder mapping exercise carried out in the demonstrator sites is delivered in Deliverable 2.1. "Preparing co-creation: stakeholder analysis". In line with D2.1, stakeholders are broadly defined as persons, groups, or organizations who have a concern in a process or in a geographical area through residence, employment, or interest. In the context of RECONECT, stakeholders are affected (positively or negatively) by: a) the hydro-meteorological event(s) they are exposed to, and/or b) the planned/implemented NBS in the case study area and beyond; or they affect c) either by increasing or decreasing the risk of turning the event into a disaster (e.g. in urban planning policies, and prioritisations of funding mechanisms for disaster risk reduction), and/or d) the choice and implementation of the NBS.

Various co-creation activities are planned, and relevant preparatory actions for their realisation took place in this early stage of the project: Questionnaires for receiving relevant stakeholders feedback; Bilateral face to face meetings between Demonstrators (twinning after matching Demonstrators according to their needs), between Demonstrators and Collaborators (twinning after matching Collaborators with Demonstrators according to their needs), between Demonstrators and expert consultancy companies from RECONECT Partners; Workshops; Online webinars, etc. The main supporting tool of the process will be the Innovative ICT Platform.

2.3 RECONECT assistance on overcoming legal barriers and permitting

The issuance of various permits (construction permit, environmental, monitoring, etc.) is key for any investment project - that is particularly valid for the NBS. Stakeholders are advised to perform a permit scan during the final stages of design to investigate the permits that may be required for a project's implementation, that may be required as 'license to operate', or that are needed for approval of monitoring actions and operations. For instance, NBS projects may well be required to perform an EIA (environmental impact assessment), including processes of stakeholder consultation to apply for environmental permits, building / construction permits, water permits, tree cutting permits, infrastructural permits, et cetera. Subsequently, EIA procedures and permit applications must be prepared and executed. And procedural times, for approval, may take months and sometimes even years, depending on project size and complexity and sensitivity. The time that is needed for preparing applications, including the necessary sub-studies, and for approval and consultation procedures needs to be built into a project's planning. And accompanying administrative fees (for issuing of permits) must be taken into account in project budgeting.

In many cases, this is accompanied by overcoming legal barriers or other obstacles.

NBS presents non-traditional solutions for which there are no specific standards and relevant provisions for their application. Therefore, Type A Demonstrators need to be assisted in their efforts to overcome legal barriers and issue permits that will allow the construction and commissioning of their NBS facilities. Although to a lesser extent, this also applies to Type B Demonstrators, who also need a permit regime for the deployment of equipment to monitor facilities already built.

Preparatory actions have started under activities T2.5 and T2.3 to assist Demonstrators in issuing permits. These activities are developing in two main directions:

a) providing assistance from the RECONECT network by:

- specific recommendations, based on the experience and lessons learned from other Demonstrators
- specialized consulting assistance from the experts in the RECONECT network such as RAMBOL, AMPHI, IHE, TUHH, etc.

b) providing assistance from local stakeholders and experts with experience and knowledge on the implementation of green infrastructure and NBS.

Although in this very early stage of RECONECT (the first 6 months of the project), the RECONECT network managed to help the Demonstrators, by discussing and giving specific recommendations, during:

- the working meetings and discussions held during the GA meeting in Portofino
- on-site visits and discussions, in the respective NBS locations (in DA2 Odense, DA1 Hamburg, DA3 Barcelona, DA5 and DA6 Nice)
- the monthly meetings and webinars organized with the participation of the Type A Demonstrators

An active role in providing assistance on overcoming legal barriers and permitting is assigned to the involvement of stakeholders, whose participation is described above in section 2.2 above, and in greater detail in the report D2.1.

2.4 Assistance on co-monitoring and co-evaluation (monitoring planning, sensor installation, data handling software)

At the beginning of the project, demonstrators were asked to present preliminary indicators that had been identified as relevant to their NBS projects after consultation with stakeholders. Relevant indicators were identified using the RECONECT Selection Tool (which is being developed within WP3) based on the objectives and sub-goals that the NBS intends to achieve. Goals represent themes/topics within the WATER, NATURE, or PEOPLE challenge area (e.g., water quantity, water quality, habitat structure, biodiversity, socio-economics and human well-being) whereas sub-goals are subthemes within those goals and reflect NBS project objectives (e.g., flood risk reduction within the water quantity goal).

A first study on available datasets and models to assess the different indicators took place within the first 6 months of the project, details for all Demonstrators are presented in Annex A of this report. Further, as part of Task 2.6 activities, demonstrators will develop monitoring and evaluation plans to assess the performance of their NBS in achieving the selected number of sub-goals. These monitoring plans will be presented in deliverable report D2.6 “Co-monitoring and evaluation plans for Demonstrators A and B”. In these plans, a focused set of indicators will be presented together with the data/model that are required to assess those indicators. In parallel the objective of deliverable D3.1 is to present the data and model gaps based on the monitoring and evaluation plans.

Most of the monitoring data will be displayed at the RECONECT Services Platform (Section 2.6), which is an ICT platform that combines a network distributed data, intelligent tools and standardized web-services, accessible through a centralized catalogue of network services. The platform is hosted by TeleControlNet (https://www.telecontronet.nl), which acts as a backbone for ICT services for data coming from NBS sites. The platform enables to receive both real-time and historical data, their storage, management and display (i.e., analytics). The platform consists of three types of distributed services: 1) data access services, 2) generic NBS network services, 3) tools for analysis feedback.

The assessment of baseline data availability in Demonstrator A sites shows that most demonstrators are either in possession of data from previous activities in related projects (e.g., in relation to hydro-meteorological risk reduction) or of relevant tools (e.g., numerical models and GIS tools) able to generate data and information relevant for their monitoring activities. However, a more detailed gap-analysis exercise is required to identify the full range of data needed in their co-monitoring activities based on the selected indicators.

The assessment of baseline data available in Demonstrators B sites has shown that most demonstrators are already in possession of monitoring data and information to provide a good basis for further co-assessment, co-evaluation, and validation activities in their NBS projects. Monitoring plans of Demonstrators B are at different stages of development and implementation given that in some NBS sites works have been already completed (e.g., IJssel case) whereas in other sites these are still in progress (e.g., Thur and Var cases).

Summarizing the information received from Demonstrators could be concluded that the needs of assistance come down to:

1) Collection of relevant information and data from previous projects and assessing the potential to use/ align them with the RECONECT activities/needs.
2) Learning more (and getting support) from other project partners, especially with regard to available sources of information (aerial images, remote sensing data, drone images, as well as information from already established EU monitoring networks) and tools that could help

improve the monitoring and evaluation of NBS without allocating much human and material resources for monitoring and evaluation.

3) Automatic access to the monitored data and to ensure that it is delivered and collected properly.
4) Co- assistance and sharing experience from other project partners from permitting procedures completed for installation of sensors and monitoring equipment.

2.5 Exploiting links/synergies to already established EU monitoring network/facilities, and similar NBS projects

RECONECT, OPERANDUM and PHUSICOS are the three key large-scale NBS demonstration projects concerning hydro-meteorological risk reduction that are currently under implementation within the H2020 programme.

OPERANDUM combines ten NBS sites, or Open-Air Laboratories (OALs) covering a wide range of hazards, with different levels of climate projections, land use, socioeconomic characterization, existing monitoring activities and NBS acceptance.

PHUSICOS focuses on demonstrating the effectiveness of NBS and their ability to reduce the impacts from small, frequent events (extensive risks) in rural mountain landscapes.

The RECONECT network of Demonstrators, covering diverse local conditions, geographic characteristics, institutional/governance structures and social/cultural settings, have already established links/synergies with several EU monitoring network/facilities, and similar NBS projects (Table 2.2). As a general source of data the demo cases usually rely on EMODNET and COPERNICUS networks and on their national governmental data monitoring structures. The review of NBS-related project shows more reports of evidence of other projects focused on the same goal, which have synergies on territorial aspect where the activities were performed before RECONECT project. Monitoring carried out on the same terrain is the most beneficial link reported by Demonstrators. Another benefit taken is from similarities with projects being implemented in parallel and sharing experience in permitting processes. Interesting are the cases in which common experts are hired in few related NBS projects. In general the established connections are mainly with local, national or regional small projects and programmes rather than big international projects.

Table.2.2 Links/synergies to already established EU monitoring Projects/ monitoring network

Demons-trator	**Links/synergies to already established EU monitoring Projects/ monitoring network**
DA-1	STUCK PROJECT- *monitoring of hydrologic and hydraulic parameters*; CLEVER CITIES- *aims to drive a new kind of nature-based urban transformation for sustainable and socially inclusive cities (Hamburg);*
DA-2	NOVANA- *a national monitoring and assessment program for aquatic and terrestrial ecosystems;*
DA-3	COPERNICUS - *EUROPEAN UNION'S EARTH OBSERVATION PROGRAMME*
DA-4	UNALAB- *aims to develop a 'living lab' of NBS sites and provide a robust evidence base to enhance the climate and water resilience of cities.* COPERNICUS;

	TRIG EAU PROJECT (INTERREG MARITIME)- *aims to strengthen the resilience of the territories in order to restore the water cycle, it promotes green infrastructure (open-air refurbishment, soil drainage, rainwater storage) in order to better manage water flow, promote infiltration and reduce the runoff effect;* H2020 TERRACE PROJECT- *INTEGRATING A RAFT OF NEW AND INNOVATIVE SCIENTIFIC TECHNIQUES THROUGH AN EXEMPLARY STUDY OF THE CREATION, OPERATION AND ABANDONMENT OF TERRACED LANDSCAPES*
DB-1	*STROOMLIJN- subproject of ROOM FOR THE RIVER PROGRAM- a government design plan intended to address flood protection, master landscaping and the improvement of environmental conditions;* INTERREG PROJECT WATERCOG- *water quality improvement achieved by improving governance.*
DB-2	EECOMER- *Equipment of Event based and Continuous Measurement of Runoff at plot and catchment scale*; OPERANDUM- *NBS sites, or Open-Air Laboratories (OALs);* COST ACTION CA17133- *Implementing nature based solutions for creating a resourceful circular city;* *PHUSICOS- demonstrating the effectiveness of NBS and their ability to reduce the impacts from small, frequent events (extensive risks) in rural mountain landscapes;* INSPIRE DATA SWICCA - *SERVICE FOR WATER INDICATORS IN CLIMATE CHANGE ADAPTATION*
DB-3	DCE- *Danish Centre For Environment and Energy monitored nitrogen turnover*; *DTU AQUA- National Institute of Aquatic Resources monitored smolt loss in Egå Engsø*
DB-4	*RECORD CATCHMENT PROJECTS- www.eawag.ch/en/department/wut/projects/record-catchment;* SNF- *Swiss National Science Foundation (SNF) NBS is part of the largerscaleSNF-project Water Distribution*
DB-5	AQUAVAR- *the main objective of the project was to develop a simulation tool for surface and underground flows in the lower valley of the Var, capable of reliably represent both the impacts of development projects, extreme hydrological situations and the evolution of hydroclimatic conditions (climate change in particular), as transfers of pollution (accidental) to fields capturing used for the production of drinking water;* ECRINS NETWORK- *river data monitoring network*
DB-6	CRISMA - FP7PROJECT (2012-2015)- *The overall aim of the project was to provide a simulation-based decision support system for modelling crisis management in both natural and man-made crisis, especially those complex ones with low probability and high impact;* PEARL - FP7 PROJECT- *addressed several aspects of flood risk reduction ranging from the early warning systems technologies to ecosystem-based (NBS) approaches that can be used for multiple-hazards and vulnerability assessment;* EMODNET NETWORK- *Data for the marine environment, access to reliable and accurate information;*

2.6 Preparation for integration with RECONECT Innovative ICT services platform for real-time information visualization, and open public /web-based access - TeleControlNet

One of the key preparatory actions for both Demonstrators type A and B is to plan their data management, especially in relation to the implementation of their co-monitoring programs. RECONECT envisages the development of a central data repository system (ICT Platform) that should support the whole co-creation process/cycle of NBS, from planning, over design and implementation to maintaining, monitoring and operation.

For that purpose TeleControlNet, a widely used central monitoring and control system with pre-defined functions for data monitoring, data analysis and control of remote installations, has been used as a basis.

TeleControlNet is a IoT/industry4.0 Software as a Service (SaaS), used for monitoring and controlling remote equipment. It combines real time and historical data into one system. It has a WEBscada user interface for technical oriented users and operators. User friendly and specialized user interfaces (such as those that will be required in RECONECT), are available in (third party) Apps or public websites.

In RECONECT TeleControlNet is being further enhanced with a number of services (such as dashboards, catalogue of measures and filtering tools) to enable visualisation, processing and reporting in different phases of the RECONECT co-creation cycle of NBS. The structure of TeleControlNet platform that will be further enhanced in Task 3.2, is presented in Figure 2-1.

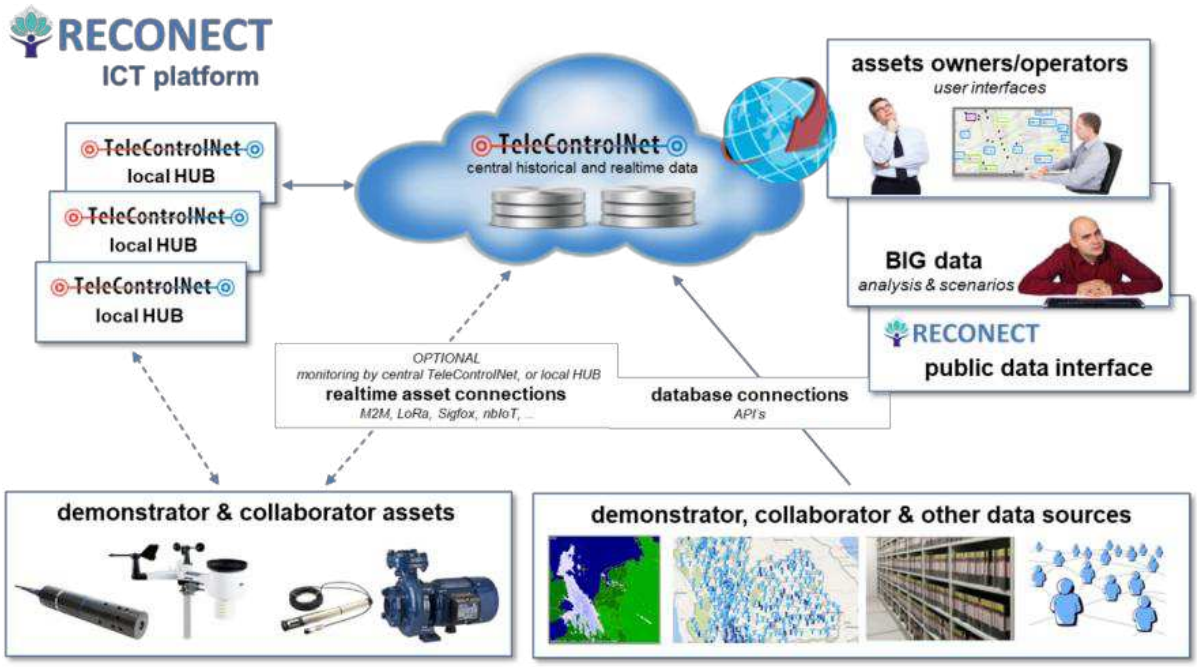


Figure 2-2 Illustration on TeleControlNet

Prior to the further enhancement of TeleControlNet with the RECONECT services, a survey of the existing monitoring data and platforms is conducted as a part of this report. The way they will be exchanged with the TeleControlNet platform will be defined in Task 3.2 (*Implementation and Enhancement of existing ICT Platform to support the Co-creation Activities*).

2.7 Summary on preparatory actions for Demonstrators A and B

Demonstrators A

The investigation on the preparatory works has shown that the four Demonstrators A are at different stages of planning/ design/permitting activities in their NBS pre-construction phase. For example, DA-4 Portofino is at the start of the construction works (recovery of stone terraces), while DA-3 Tordera River is still in the process of identifying which NBS are more suited for their site - for which they rely on assistance of RECONECT through knowledge sharing, experience and know-how between Demonstrators.

The status analysis of information on legal/permitting process and procurement procedures carried out in Tasks 2.4 and 2.5 shows that it is difficult to indicate some "unified" approaches in attacking legal barriers or issuing permits, because the issuance of permits is an exclusive function of the national legislation that is different in different EU states. Nevertheless, in general it can be concluded that all Demonstrators A are managing their permitting procedures and design works in due time, and there is a clear plan for the next steps in the implementation of their NBS projects.

The investigation on the available baseline monitoring data has shown that most of Demonstrators are either in possession of data from previous monitoring (relevant to hydro-meteorological risks), or are in possession of relevant tools (numerical models, GIS tools) to provide baseline information by calculations/simulation or processing of other information. This reflects climate hydrology, nature, as well as relevant digital elevation models, maps, etc. There are multiple digital maps available for the NBS sites, accessible also online. It provides a good basis for further assessment, evaluation and validation of their NBS cases, in line with the RECONECT objectives.

Demonstrators A are now preparing their monitoring plans, designing both the technical and organisational parts, in parallel with permitting procedures and design works. There are clear concepts for what/where will be monitored, and NBS Key Performance Indicators have been selected by most of them. As several projects are in the development phase, it is currently difficult to identify all elements of their monitoring plans. This is a critical issue that needs to be addressed by all Demonstrators A to avoid a negative impact on the demonstration activities

The analysis made for Demonstrators A (that is also valid for Demonstrators B) on the availability of ICT tools such as GIS tools, numerical modelling software, database systems etc. as well as on the availability of expertise to use them, has shown optimistic results as all Demonstrators have declared in their reports, and/or during meetings/conferences, that they are well equipped with relevant ICT tools. This is a basic precondition for further interactive exchange of data within the RECONECT ICT platform;

All Demonstrators A are preparing to share (all or part of) their monitoring data and make them accessible by the RECONECT ICT platform TeleControlNet, The necessary software basis is available (e.g., GIS tools, database software) and responsible persons to manage the data sharing with partner InterAct have been already appointed by most of Demonstrators. Interactive data exchange is underway, and will be finalized as soon as the technical specifications, standards and formats requested by TeleControlNet are finalized and, in particular for Demonstrators A, when they launch their monitoring activities.

There is a good prospective for Demonstrators A to benefit from contacts/synergy with other NBS projects, and/or other established EU Monitoring Networks. Some of them already exploit their contacts with other projects (e,g., DA1- Dove/Gose Elbe with CLEVERCITIES, DA-4 PARK Portofino with TRIGEAU), other (e.g., DA.-3 Tordera river basin) are interested to exploit networking / synergies to other NBS projects, and/or established monitoring network/facilities, and are looking for RECONECT assistance on this subject.

Demonstrators B

Demonstrators B were requested to provide information on permitting procedures, and also to provide copies of permits/permissions of uses/commissioning works for their already completed construction works, and where appropriate for the ongoing and forthcoming monitoring works. This information is of high value for Demonstrators A and Collaborators who are following a similar path in their procedures. It can be concluded that many good examples have been given in this report and are expected to facilitate further replication and up-scaling of NBS.

The investigation on the available baseline monitoring data at Demonstrators B sites has shown that most Demonstrators are in possession of data from previous monitoring activities to provide a good basis for further assessment, evaluation and validation of their NBS cases, in line with the objectives that RECONECT has within the demonstration phase. Data are available on climate, hydrology, nature, social parameters, etc.

Regarding the monitoring plans, Demonstrators B are at different stages of their definition as some of the NBS are completed (e.g. Stroomlijn project), while others are still quite dynamic, with ongoing design works for the new NBS (Thur river, Var River). In all cases there is control of the technical and organisational planning of the monitoring activities, which is a necessary condition for the success of the demonstration activities.

Demonstrators B (as well as Demonstrators A) are preparing to share (all or part of) their monitoring data and make them accessible by the RECONECT ICT platform TeleControlNet, The necessary software basis is available (e.g GIS tools, database software) and responsible persons to manage the data sharing with partner InterAct have been already appointed by most of Demonstrators. Interactive data exchange is underway, and will be finalized as soon as the technical specifications, standards and formats requested by TeleControlNet are finalized.

3. CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis of the state of Works and the required preparatory actions for the demonstration of NBS in RECONECT Type Demonstrators A and B, the following main conclusions can be derived:

- All Demonstrators A and B are at different stages of their NBS implementation, creating potential for knowledge sharing and interaction between their cases. The twinning of Demonstrators is a subject of consideration of Task 2.3 (on Specifying Baselines and Scope of Works), and is reflected in Deliverable report D2.3.
- In some cases, a limiting factor is that information on procedures and permits is subjected to limited access. This has impacted the assessment of the (non-technical) preparatory works and may impact the transfer of experiences between the Demonstrators, and later from Demonstrators to Collaborators. However, the overview of preparatory actions as presented in this report provides valuable information for the co-creation activities within the project.
- Demonstrators A are at diverse phases of permitting, planning, and design activities in their NBS pre-construction phases. All Demonstrators A have a clear plan for next steps in the implementation of their NBS projects.
- The assessment of baseline data availability in Demonstrator A sites shows that most demonstrators are either in possession of data from previous activities in related projects (e.g., in relation to hydro-meteorological risk reduction) or of relevant tools (e.g., numerical models and GIS tools) able to generate data and information relevant for their monitoring activities. However, a more detailed gap-analysis exercise is required to identify the full range of data needed in their co-monitoring activities based on the selected indicators.
- Demonstrators B have indicated a track record in implementing large scale NBS in natural and rural areas. Therefore, the provided information in relation to the permitting procedures is very valuable for Demonstrators A (and Collaborators) as they can perceive Demonstrators B as “advisors” in their respective projects.
- The assessment of baseline data available in Demonstrators B sites has shown that most demonstrators are already in possession of monitoring data and information to provide a good basis for further co-assessment, co-evaluation, and validation activities in their NBS projects. Monitoring plans of Demonstrators B are at different stages of development and implementation given that in some NBS sites works have been already completed (e.g., IJssel case) whereas in other sites these are still in progress (e.g., Thur and Var cases).
- An important activity within Task 2.5 was to acquire level of preparedness of Demonstrators to share their data with the innovative RECONECT ICT platform. Demonstrators A and B are now preparing to share (all or part of) their monitoring data and make them accessible within the Platform. The preparatory activities for such integration are in progress and the results will be reported in the corresponding deliverables in WP3 on Co-Evaluation and Validation.

From the analysis of preparatory works of Demonstrators A and B as presented in their reports, it can be stated for both types of demonstrators that:

- The major preparatory works have been completed, all the preparations are managed in an appropriate way, and they are in line with the timeline of the RECONECT work plan. The necessary supporting tools and basic conditions are in place (such as baseline data, IT tools, software, and competence in addressing the issues related to permitting procedures) to facilitate the start of the construction works (for the Demonstrators A) and to launch the demonstration activities in relation to monitoring and assessment of the NBS (for Demonstrators B).
- All planed RECONECT demonstration activities shall continue in accordance to the work-plan, building on the achievements of this first preparatory phase, as described in this report. However, the potential for twinning assessed in Task 2.3 and presented in D2.3, should be taken into account when planning and organising the activities in the respective Demonstrator cases.
- The preparatory works and the input provided by the Demonstrators will be further used within RECONECT to develop a number of supporting tools and documents to assist potential developers willing to use NBS:
  - a *Guidance document on integrating innovative technologies into existing landscape, maintenance issues and long-term sustainability* (deliverable report D1.4, month 30)
  - a *Catalogue of NBS Measures for reducing Hydro-Meteorological Risk*, & a *Multi-Criteria Analysis (MCA)* (Deliverable report D4.2, *Report describing baseline assessment and potential for NBS in Collaborators*, month 26)
  - *Draft Standards for design, maintenance, management of NBS* (deliverable report D5.4, month 50)
  - *Guidelines for design, construction and maintenance of large-scale NBS* (deliverable report D2.8, month 60)

Annex A: Individual Reports on Preparatory Actions by Demonstrators A and B

to Deliverable D2.5 "Preparatory actions for Demonstrators A and B, including copies of building permits / permissions of uses / commissioning works"

Acknowledgement

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 776866

Contents

List of Tables

I. REPORTS ON PREPARATORY ACTIONS BY DEMONSTRATORS A

1 Demonstrator DA-1: Elbe Estuary, Germany

1.1 Status analysis

At this moment, the Hamburg partners are in the process of planning the necessary steps to implement the new “smart” operation and controlling system optimising the use of retentions and floodplains, which will be undertaken in the next 18 months.

Due to the specific partner constellation in Hamburg, which also includes the Ministry of Environment and Energy, a competent authority for legal aspects as well as permits and approvals is represented in the RECONECT demonstrator case of Hamburg. The implementation of the operating and controlling system is embedded in a variety of existing regulations be it Natura2020, the Hamburg laws for the protection of nature and the according impact assessment procedures, permits and approvals or the Federal and Hamburg Water Laws (see table in chapter 1.2.1 for an extensive overview). At this point, no new permits are anticipated, except possibly Environmental Impact Assessments (EIA). EIAs focus on the impact on the following subjects of protection: people (especially health), animals, plants, biological diversity, climate and air, landscape, soil and surface, water, cultural heritage and other material assets.

Due to the Hamburg Transparency Law, a wide variety of documents of public interest – also regarding environmental regulations – are publicly available in the transparency portal: http://transparenz.hamburg.de.

1.2 Non-technical preparatory actions & legislative aspects

Non-technical preparatory actions & legislative aspects are described here below in table format, providing information on relevant legislative aspects, procedures and/or permits.

1.2.1 Summary information

Table 1-1 Elbe Estuary NBS summary information on procedures and/or permits

Topic	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
Spatial								
Spatial planning / land use change approval	Hamburgian Water Law	Public participation	Borough of Bergedorf				Commissioner	All approvals subject to transparency
Land acquisition		Not relevant						
Archeology / heritage		Not relevant					Commissioner	All approvals subject to transparency
Environment								
Environmental permit	Hamburgian Water Law	Public participation	Borough of Bergedorf				Commissioner	All approvals subject to transparency
Environmental Impact Assessment (EIA)	Hamburgian Water Law	Public participation	Borough of Bergedorf				Commissioner	All approvals subject to transparency
Social Impact Assessment	Part of EIA, see before	Public participation	Borough of Bergedorf				Commissioner	All approvals subject to transparency
Construction								
Building/construction permit	Hamburgian Construction Law	Private procedure	Borough of Bergedorf				Commissioner	All approvals subject to transparency
Excavation permit	Hamburgian Construction Law	Private procedure	Borough of Bergedorf				Commissioner	All approvals subject to transparency
Ecology/Nature								
Natura2000: protected area's	Hamburgian Laws for the Protection of Nature	Public participation	Ministry for Environment and Energy (MEE)					

Other protected ecological zones	Hamburgian Laws for the Protection of Nature	Public participation	MEE					
Protected species	Hamburgian Laws for the Protection of Nature	Public participation	MEE					
Tree felling permit	Hamburgian Laws for the Protection of Nature	Private procedure	MEE					
Infrastructure								
Public roads: Road permit (temp or permanent roads)		Not relevant						
Existing rail road		Not relevant						
Existing waterways		Not relevant						
Existing (electrical) cables		Not relevant						
Existing gas-pipes		Not relevant						
Any other relevant procedures		Not relevant						
Monitoring								
Data acquisition permits		Not subject to permits						
Lidar /fly over permit		Not relevant						
Water data/monitoring permit		Not subject to permits						
Nature data/monitoring permit		Not subject to permits						
Meteo data/monitoring permit		Not subject to permits						
Access to external data bases		Not subject to permits						
Drone permit		Not relevant						

1.2.2 Descriptive information

1.2.2.1 Spatial

The conflicts with spatial planning, land acquisition, or disturbances of archaeological heritage sites are expected during this project are currently being assessed along with the process of the assessment of the specific need for retention areas in the catchment Dove&Gose Elbe.

1.2.2.2 Environment

All alterations and modifications of water courses and their chemical/physical characteristics are subject to specific permitting procedures according to the legislative setting in Hamburg by the competent authorities being the Ministry of Environment and Energy (BUE), who is at the same time a partner in RECONECT.

Depending on the magnitude of the alteration/modifications that are generated by the interventions, the Environmental Impact Assessments (EIAs) are needed as part of the environmental licensing procedures. The component Social Impact Assessment (if needed) is part of the EIA. There is an ongoing process to decide on it.

1.2.2.3 Construction

Building and construction as well as excavation permits ware not needed for the actions undertaken in RECONECT.

1.2.2.4 Ecology

In the area of scope, all areas mentioned above (Natura2000, protected ecological zone, protected species, tree felling permits) are existing. It is not envisaged to apply for any additional permits in the corresponding areas. The expected impacts of the actions prepared by this project are considered all over positive for the development and enhancement of the natural environment.

1.2.2.5 Infrastructure

It is not envisaged to apply for any additional permits in the areas of public roads, infrastructure and monitoring/data; at this point, additional permits will not have to be addressed.

1.2.2.6 Monitoring

As the Ministry for Environment and Energy of the City of Hamburg is the commissioner of this project, full access to monitoring data sources being public or private is given.

As an advantage by the structure of the project, the Ministry for Environment and Energy of the City of Hamburg is the competent authority for environmental monitoring thus making arrangements (to facilitate monitoring) with third parties obsolete.

1.2.2.7 Other

The whole project is embedded into the legal framework/setting of the Federal Water Law and the corresponding Hamburg Water Law.

1.3 Planning of legislative prepatory actions

The commissioner of the project represents the responsible authority for a subsequent licensing considering the legal framework given.

1.4 RECONECT Knowledge exchange. Lessons learned.

Hamburg would acknowledge input from the other demonstrators related to the aspects of the monitoring of the “measurable success” and the indicators derived to delineate plausible results in the field.

1.5 Information on copies of permits / approvals

Not applicable at this moment

1.6 Preparatory actions for monitoring

1.6.1 Overal Assesment

The Hamburg demonstrator is currently in the preparatory/design phase for monitoring.

The monitoring plan is being developed, addressing technical and also organizational issues (e.g. how to organize monitoring onsite, where to place sensors). Whereby the Hamburg team possesses high level of knowledge and experience in monitoring and evaluation of the WATER parameters and has experience and expertise to monitor and evaluate the NATURE indicators, support from the RECONECT experts is needed to collect and analyse the PEOPLE data.

Also, the demonstrator can make use of the previous projects and activities that were undertaken in the area (e.g. STUCK Project).

1.6.2 Baseline monitoring data (available before RECONECT start)

Details regarding monitoring and evaluation aspects, available Information/Data/Tools, are presented here below in table format, Table 1-1.

Table 1-2 Elbe Estuary NBS available baseline (monitoring) data before RECONECT

	INDICATORS	PARAMETER / VARIABLE (Baseline data available) (Check"Indicator Selection Tool")	Please mention data source (measured/monitored by you, or taken from other source)	What kind of sensors have been used	Please provide the period of measurements	Please provide time interval of measurements	Please mention the format of data files	Any other important information relevant to monitoring /evaluation aspects
WATER	Surface Run-off Reduction	Precipitation (mm)	Data taken from official reports of German Weather Service (DWD)	Automatic Weather Station	Data available for the period from 1950 to 2018	Measured on daily basis and up to 5 min	Stored in XLS files	Statistics available for Extreme value/Return periods, applicable to flood hazard simulation/forecast
	Slowing and Storing Run-off	Precipitation (mm)	Data taken from official reports of German Weather Service (DWD)	Automatic Weather Station	Data available for the period from 1950 to 2018	Measured on daily basis and up to 5 min	Stored in XLS files	Statistics available for Extreme value/Return periods, applicable to flood hazard simulation/forecast
	Flood Hazard	River discharge (m3/s)	Data taken from reports of Reinbek hydrology station, located close to NBS site	Not known	Data available for 1970-2018	Data recorded on hourly basis	XLS and DAT (ASCII)	Rainfall-Runoff-Model (hydrologic model)) available to serve as evaluation tool
	Flood Peak Reduction	Precipitation (mm)	Data taken from official reports of German Weather Service (DWD)	Automatic Weather Station	Data available for the period from 1950 to 2018	Measured on daily basis and up to 5 min	Stored in XLS files	Statistics available for Extreme value/Return periods, applicable to flood hazard simulation/forecast
		River discharge (m3/s)	Data taken from reports of Reinbek hydrology station, located close to NBS site	Not known	Data available for 1970-2018	Data recorded on hourly basis	XLS and DAT (ASCII)	Rainfall-Runoff-Model (hydrologic model)) available to serve as evaluation tool
		Water level (cm NHN)	Data taken from several gauges and data sources, mainly Behörde für Umwelt und Energie Hamburg	Not known	Data available for 1970-2018	Data recorded on hourly basis and up to 5 minutes	XLS and DAT (ASCII)	Numerical models (river hydrodynamic) available to serve as evaluation tool
		Water depth (cm)	Data taken from several gauges and data sources, mainly Behörde für Umwelt und Energie Hamburg and will be related to DTM	Not known			XLS and DAT (ASCII)	Station exists already

NATURE	Species richness and composition in respect to indigenous vegetation and local/national biodiversity targets	Water depth (cm)	Data taken from several gauges and data sources, mainly Behörde für Umwelt und Energie Hamburg and will be related to DTM	Not known			XLS and DAT (ASCII)	Station exists already
		inquiry underway						

1.6.3 Geographical information, GIS data

In line with the Transparency Law of Hamburg, a lot of data is available online, open and free of charge. This data may be found in the transparency portal, in the database for metadata MetaVer or in the Geoportal. All three databases are linked with each other, so basically they should deliver the same results. Data are delivered in standardised interfaces (normally, WFS, WMS etc.), which means that we use an URL and have access to up to date information.

Here is a summary of available maps:

Digital Base Maps (Geobasiskarten):

Web-based map of the city of Hamburg: http://www.metaver.de/trefferanzeige?docuuid=61C8428E-6270-4AA0-B38D-C1DC9964AAEA&plugid=/ingrid-group:ige-iplug-HH&docid=61C8428E-6270-4AA0-B38D-C1DC9964AAEA

Digital map of the city of Hamburg 1: 5 000: http://suche.transparenz.hamburg.de/dataset/digitale-karte-1-5000-hamburg9?forceWeb=true

Digital map of the city of Hamburg (1:20 000 - 1:60 000): http://suche.transparenz.hamburg.de/dataset/digitale-stadtkarte-hamburg8?forceWeb=true

Digital map of the metropolitan region Hamburg 1: 250 000: http://suche.transparenz.hamburg.de/dataset/digitale-karte-der-metropolregion-hamburg-1-250-0007?forceWeb=true

OrthoPhotos (photogrammetric aerial images):

Digital Orthophotos 20cm (in full leaf) Hamburg: http://suche.transparenz.hamburg.de/dataset/digitale-orthophotos-20cm-belaubt-hamburg5?forceWeb=true

Digital Orthophotos 20cm Hamburg: http://suche.transparenz.hamburg.de/dataset/digitale-orthophotos-20cm-hamburg8?forceWeb=true

- Orthophotos without leafs are yearly renewed; the shooting date is documented in the metadata.
- Newly available in the Geoportal are oblique aerial images “Schrägluftbilder“ (below the zoom, click on the photo button). These images are not in the transparency portal yet, but will be there soon.
- Other remote sensing data could be found at national level, the Federal Agency for Cartography and Geodesy is delivering maps through their online portal

Digital elevation models :

Digital elevation model Hamburg DGM 1: http://suche.transparenz.hamburg.de/dataset/digitales-hohenmodell-hamburg-dgm-15?forceWeb=true

Digital elevation model Hamburg DGM 10: http://suche.transparenz.hamburg.de/dataset/digitales-hohenmodell-hamburg-dgm-105?forceWeb=true

Digital elevation model Hamburg DGM 25: http://suche.transparenz.hamburg.de/dataset/digitales-hohenmodell-hamburg-dgm-253?forceWeb=true

3D model of the city of Hamburg LoD1-DE: http://suche.transparenz.hamburg.de/dataset/3d-stadtmodell-lod1-de-hamburg1?forceWeb=true

3D model of the city of Hamburg LoD2-DE: http://suche.transparenz.hamburg.de/dataset/3d-stadtmodell-lod2-de-hamburg3?forceWeb=true

1.6.4 Preparatory actions for monitoring

Information on the (planned) monitoring / evaluation activities, referring to selected indicators and variables is presented in the following table:

Table 1-3 Elbe estuary NBS variables that will be monitored during RECONECT, and used to evaluate NBS performance

	INDICATORS	VARIABLE to be monitored/evaluated	Do you posses baseline data on this variable ? (Yes/No, acc., to table 1.1)	Will it be monitored by you, or taken from other source	If already known, please provide details. Either on your external data source, or on your monitoring program (sensor type, time-interval of measurements, data formats, etc).				Please mention any innovative tools/methods that will be used (satellite data, drones, remote sensing)	Are you going to share this data within RECONECT ICT platform	Any other substantial information relevant to monitoring /evaluation aspects
					Data/monitoring Approach, Technique, sensor type, equipment,	Time interval	Data format	When (pre-construction, construction, post-construction)			
WATER	Surface Run-off Reduction	Precipitation (mm)	Yes	Data will be taken from official reports of German Weather Service (DWD)	Not known	Measured on daily basis and up to 5 min	Stored in XLS files	Station exists already	-	Yes	
		To be decided (Soil Type, Land use, Topography/DEM , Radiation, Temperature, Evaporation, Wind speed, Roughness coefficient, Infiltration capacity)									
	Slowing and Storing Run-off	Precipitation (mm)	Yes	Data will be taken from official reports of German Weather Service (DWD)	Not known	Measured on daily basis and up to 5 min	Stored in XLS files	Station exists already	-	Yes	

		To be decided (Soil Type, Land use, Topography/DEM, Radiation, Temperature, Evaporation, Wind speed, Roughness coefficient, Infiltration capacity)									
	Flood Hazard	River discharge (m3/s)	Yes	Data will be taken from reports of Reinbek hydrology station, located close to NBS site	Not known	Data recorded on hourly basis	XLS and DAT (ASCII)	Station exists already	e.g. River discharge (m3/s)	Yes	
		To be decided (Water levels, Topography)									
	Vulnerability	Land use map			Taken from the existing databases including the online available Hamburg Transparenzportal						
		Infrastructures data									
		Population data									
		Building/Housing									
	Delay time to peak	River discharge (m3/s)	Yes	Data will be taken from reports of Reinbek hydrology station, located close to NBS site	Not known	Data recorded on hourly basis	XLS and DAT (ASCII)	Station exists already	e.g. River discharge (m3/s)	Yes	
		Water level (cm NHN)	Yes	Data taken from several gauges and data sources, mainly Behörde für Umwelt und	Not known	Data recorded on hourly basis and up to 5 minutes	XLS and DAT (ASCII)	Station exists already	-	Yes	

				Energie Hamburg							
		To be decided (Topography (DEM), Channel cross sections, Roughness coefficient)									
	Flood Peak Reduction	Precipitation (mm)	Yes	Data will be taken from official reports of German Weather Service (DWD)	Not known	Measured on daily basis and up to 5 min	Stored in XLS files	Station exists already	-	Yes	
		River discharge (m3/s)	Yes	Data will be taken from reports of Reinbek hydrology station, located close to NBS site	Not known	Data recorded on hourly basis	XLS and DAT (ASCII)	Station exists already	e.g. River discharge (m3/s)	Yes, as much as possible	
		Water level (cm NHN)	Yes	Data taken from several gauges and data sources, mainly Behörde für Umwelt und Energie Hamburg	Not known	Data recorded on hourly basis and up to 5 minutes	XLS and DAT (ASCII)	Station exists already	-	Yes	
		Water depth (cm)	Yes	Data taken from several gauges and data sources, mainly Behörde für Umwelt und Energie Hamburg and will be related to DTM	Gauge and DTM	Water level data recorded on hourly basis and up to five minutes, DTM will be generated every 10 years	XLS and DAT (ASCII)	Station exists already		Yes	
		To be decided (Topography (DEM), Channel cross sections, Roughness coefficient)									
	Changes in pollution caused by waste water	Pollutants as relevant (in preparation)			Existing measuring stations and reports if						

					applicable						
	Reduced pollutants coming from land to water	Pollutants as relevant (in preparation)			Existing measuring stations and reports if applicable						
	Attenuation of heavy metals and nutrients contamination in surface water				Existing measuring stations and reports if applicable						
	Sediment deposition	TSS			Existing measuring procedures						
NATURE	Species richness and composition in respect to indigenous vegetation and local/national biodiversity targets	Water depth (cm)	Yes	Data taken from several gauges and data sources, mainly Behörde für Umwelt und Energie Hamburg and will be related to DTM	Gauge and DTM	Water level data recorded on hourly basis and up to five minutes, DTM will be generated every 10 years	XLS and DAT (ASCII)	Station exists already		Yes	
		To be decided	Yes	Data will be taken from official reports and data bases e.g. reports related to the Water Framework Directive	On site assessment in the field	Monitoring intervals given by the WFD provisions	XLS and DAT (ASCII)	Stations to be selected		Yes	
	Distribution of public green spaces	To be decided			Official reports and existing procedures						
	Diversity of land use in the agricultural area	Land use map over period of time			Comparison between different time spans	Baseline scenario compared with given situation after NBS realisation		Area of scope selected		Yes	

	Change in land cover	Land cover data			Comparison between different time spans	Baseline scenario compared with given situation after NBS realisation		Area of scope selected		Yes	
PEOPLE	Increase Recreational opportunities of NBS areas	To be decided									All people indicators will be discussed with the RECONECT experts on social monitoring to set up the methodology
	Number of tourists	To be decided									
	Number of cultural events in NBS area	To be decided									
	Number and value of people spend time in the NBS areas	To be decided									
	Number of green jobs in the area	To be decided									
	Reduced/ avoided damage cost from hydro-meteorological risk reduction	To be decided									
	Economic benefit from the reduction of stormwater that typically needs to be treated in a public sewerage system	To be decided									
	Change in land and/or property values	To be decided									

	Number of people communicating in the area	To be decided									

1.6.5 Preparation of monitoring / evaluation

The Hamburg demonstrator is currently designing the monitoring program. One of the key aspects that is being addressed is how to enable automatic access to the monitored data and to ensure that during extreme hydrometeorology events (droughts and floods) plausible data is delivered and collected.

Also, a pre-screening of the area will be performed with the objective to identify the areas where additional monitoring activities are required (e.g. for the WATER parameters- additional gauging station). Regarding the NATURE and PEOPLE indicators, the preparatory activities are mainly related to collection of the information and data from previous projects and assessing the potential to use/ align them with the RECONECT activities.

1.7 Links / Synergies to other NBS project and already established EU monitoring network/ facilities

1.7.1 Synergy with other projects on the NBS site

Within the STUCK Project, the monitoring of hydrologic and hydraulic parameters has been performed and will be used in RECONECT. Also, experience has been gained in respect to the data collection.

1.7.2 Links to other NBS projects

Currently no specific activities have been discussed. However, the Hamburg demonstrator will benefit from the contacts with the CLEVER CITIES Project, given the fact that the same Hamburg partners are involved in CLEVER CITIES and RECONECT (BUE, Senate Chancellery, TUHH), whereby TUHH is leading the Local Monitoring Team of the Hamburg Demonstrator in CLEVER CITIES.

1.7.3 Links / synergies to already established EU monitoring network/facilities

No specific activities planned or undertaken at the moment, but the Hamburg Demonstrator team is open to liaise and connect to the relevant European initiatives.

1.8 Connection to the RECONECT TeleControlNet data platform

Brief Information about the TeleControlNet data platform is presented in Section II Methodology of the report. INTER ACT will contact all Demonstrators to facilitate linking (monitoring) systems/data to the platform. The questions / discussions will be of a highly technical nature.

Name of the project team staff member (to be contacted by INTER ACT)

Claudia Günther, Senate Chancellery Hamburg email: reconect@sk.hamburg.de

2 Demonstrator DA-2: Odense Coastal Area, Denmark

2.1 Status analysis

The preparation of the project at Seden Strand has started already before beginning of the RECONECT project. E.g. Agreements with landowners and compensation for land use rights have been already organized by Odense Municipality.

The project at Seden Strand will during the first 5 months of 2019 complete the designing of the demonstration project including design of dikes and the area in front of the dikes.

The Odense Municipality, who is also responsible for issuing the permit concerning restoration of watercourses send it already in 8 weeks public hearing before the permit can be granted.

Within the coming 4 months the other permits (see table in section 1.2.1) are also expected to be given.

2.2 Non-technical preparatory actions & legislative aspects

Non-technical preparatory actions & legislative aspects are described here below in table format, providing information on relevant legislative aspects, procedures and/or permits.

2.2.1 Summary information

Table 2-1 Odense NBS summary information on procedures and/or permits

Topic	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
Spatial								
Spatial planning / land use change approval	Act on area planning, Consolidation Act nr. 287 from the 16th of April 2018	Both public (NGO´s) and private	Odense Municipality		2	1	Odense Municipality	
Land acquisition								
Archeology / heritage	Act on Museums, Consolidation act nr.. 358 from the 8th of April 2014	Both public (NGO´s) and private	Odense Municipality		2	1	Odense Municipality	
	Act on coastal protection, Consolidation act nr.. 57 from the 21th of January 2019	Both public (NGO´s) and private	Odense Municipality		3	1	Odense Municipality	
Environment								
Environmental permit	The Nature conservation act. Consolidation act nr.. 1122 from the 3th of September 2018	Both public (NGO´s) and private	Odense Municipality		2	1	Odense Municipality	

Environmental Impact Assessment	Act on environmental assessment of plans and programs and of concrete projects. Consolidation act nr.. 1225 from the 25th of October 2018	Both public (NGO´s) and private	Odense Municipality		1	1		
Social Impact Assessment								
	Consolidation act on watercourse regulation and restoration. Nr. 834 from the 27th of June 2016	Both public (NGO´s) and private	Odense Municipality		3	1	Odense Municipality	

2.2.2 Descriptive information

2.2.2.1 Spatial

According to 1.2.1 the project needs permit for changes in land use and on cultural heritage area.

The area where the demonstration project will be established is privately owned. Before the start of the project Odense Municipality has bought rights to changes in land use.

2.2.2.2 Environment

The project will need an environmental permit for changes on salt meadows. A screening for Environmental Impact Assessment on Natura 2000 site will also be completed.

2.2.2.3 Construction

The project wants to develop a holistic approach looking at solutions which make (more) space for people, nature and water, at Seden Strand this includes:

- Removal of existing low coastal summer dikes and moving them inland to a higher location
- Promote rehabilitation of new habitats (salt meadows - 1330) outside the new dikes
- Recreation of meanders of existing streams

2.2.2.4 Ecology

Part of the project area is laying within the Natura 2000 area at Odense Fjord. Part of the project area is also a protected nature area.

2.2.2.5 Infrastructure

The area which will be affected (both nature, urban and cultivated area) covers locally approx. 0,8 km^2 and includes:

- Building and roads: 25 %
- Farmland:50 %
- Nature:25 %

2.2.2.6 Monitoring

We are currently designing monitoring program and working on gap analysis of the baseline. We do not have full overview yet of the current status of the data availability since we are working on selection of the relevant indicators.

2.3 Planning of legislative prepatory actions

The process of obtaining permits will take place during the first 6 months of 2019. In the worst-case scenario, if there will be any appeal raised, the construction works might be delayed up to 1 year.

2.4 RECONECT Knowledge exchange. Lessons learned.

We are looking for cooperation with other NBS projects, and we expect assistance from RECONECT in identifying such projects and appropriate partners.

2.5 Information on copies of permits / approvals

. Not available yet.

2.6 Preparatory actions for monitoring

2.6.1 Overal Assesment

We are currently designing monitoring program and working on the gap analysis for the baseline. We do not have yet the full overview of the current status of the data availability since we are working on selection of the relevant indicators.

We are looking for sharing experience with other Demonstrators within RECONECT.

2.6.2 Baseline monitoring data (available before RECONECT start)

Details regarding monitoring and evaluation aspects, available Information/Data/Tools are presented in the Table below.

Table 2-2 Odense NBS Available baseline (monitoring) data before RECONECT

	INDICATORS	PARAMETER / VARIABLE (Baseline data available) (Check"Indicator Selection Tool")	Please mention data source (measured/monitored by you, or taken from other source)	What kind of sensors have been used	Please provide the period of measurements	Please provide time interval of measure ments	Please mention the format of data files	Any other important information relevant to monitoring /evaluation aspects
WATER	All WATER	Oblique photos	Photos taken for Odense Municipality as part of preliminary project		2016		Jpg	Contact Odense Municipality
	All WATER	Geodata information (for instance flood risk zones)	https://www.geodata-info.dk/srv/eng/catalog.search;jsessionid=E677B186DBDF0AE1A9A6DE75DC2F7029#/home					
	All WATER	Orthophoto			1945 until 2018		Qgis	Contact Odense Municipality
	Vulnerability	**Land use maps** *(also, to be decided from: Infrastructures data; Population data; Building/Housing)*						
	Storm surge	Storm parameters (*to be decided: e.g. Tidal variation, Barometric pressure, Wave height, Spatial scale of storm, Amplitude of surges, Duration of surge, Length of coastline affected by the surge)*		A hydro-dynamic model				
NATURE	All NATURE	Geodata information (for instance protected nature, Natura 2000)	https://www.geodata-info.dk/srv/eng/catalog.search;jsessionid=E677B186DBDF0AE1A9A6DE75DC2F7029#/home					
	Diversity of species	Birds observations	https://dofbasen.dk/					Run by NGO
		Flora and fauna registrations	https://www.fugleognatur.dk/naturbasen.aspx					Run primarily by NGO
PEOPLE	All PEOPLE	Geodata information (for instance population, age and gender)	https://www.geodata-info.dk/srv/eng/catalog.search;jsessionid=E677B186DBDF0AE1A9A6DE75DC2F7029#/home					

2.6.3 Geographical information, GIS data

We have access to multiple Geographical Information Systems data, including bathymetry, digital elevation models of the area, and aerial photographs.

Data source: http://kysterne.kyst.dk/hoejvandsstatistikker.html

2.6.4 Preparatory actions for monitoring

We are currently designing the monitoring program and working on the gap analysis for the baseline. We do not have yet a full overview of the current status of the data availability since we are working on selection of the relevant indicators. Information on the (planned) monitoring / evaluation activities, referring to selected indicators and variables is presented in the following table:

Table 2-3 Odense NBS variables that will be monitored during RECONECT, and used to evaluate NBS performance

	INDICATORS	VARIABLE to be monitored/evaluated	Do you posses baseline data on this variable ? (Yes/No, acc., to table 1.1)	Will it be monitored by you, or taken from other source	If already known, please provide details. Either on your external data source, or on your monitoring program (sensor type, time-interval of measurements, data formats, etc).				Please mention any innovative tools/methods that will be used (satellite data, drones, remote sensing)	Are you going to share this data within RECONECT ICT platform	Any other substantial information relevant to monitoring /evaluation aspects
					Data /monitoring Approach, Technique, sensor type, equipment	Time interval	Data format	When (pre-construction, construction, post-construction)			
WATER	Vulnerability	Land use maps	YES					Pre-construction and post-construction		To be decided	Variables and evaluation method will be decided during setting up monitoring program
		To be decided (Infrastructures data; Population data; Building/Housing)									
	Storm surge	Storm parameters (to be decided: Tidal variation, Barometric pressure, Wave height, Spatial scale of storm, Amplitude of surges, Duration of surge, Length of coastline affected by the surge)	YES		A hydro-dynamic model			Pre-construction and post-construction		To be decided	Variables and evaluation method will be decided during setting up monitoring program
	Coastal Hazard index	To be decided (Historical flood events and consequences; Frequency of floods; Flood inundation; Distance and topography influences the territory being affected; Flood depth; Tidal variation)						Pre-construction and post-construction		To be decided	Variables and evaluation method will be decided during setting up monitoring program
	Exposed value index (EVI)	To be decided (Population density; Built density; Heritage; Potential damage; Land use maps)						Pre-construction and post-construction		To be decided	Variables and evaluation method will be decided during setting up monitoring program

	Coastal vulnerability index (CVI)	To be decided (Geomorphology, Coastal slope; Shoreline rate mean tide range; Mean significant wave height; Relative sea level rise rate; Historical flooding events and consequences; Land use maps)						Pre-construction and post-construction		To be decided	Variables and evaluation method will be decided during setting up monitoring program
	Change in Groundwater level/water table	Groundwater level									Groundwater level measured in dip wells
NATURE	Changes in riparian habitat	Riparian habitat area (km2)	Not assessed yet	Will be monitored by the project (Amphi International) – to be finally decided in monitoring programme	Not yet available No sensors			Pre-construction and post-construction		To be decided	Will be monitored by aerial images and visual observations.
	Changes in aquatic/wetland habitat	Aquatic/wetland habitat area (km2)	Not assessed yet	Will be monitored by the project (Amphi International) – to be finally decided in monitoring programme	Not yet available			Pre-construction and post-construction		To be decided	Will be monitored by aerial images and visual observations
	Change in location of habitat boundaries	Habitat boundaries for each habitat type	Not assessed yet	Will be monitored by the project (Amphi International) – to be finally decided in monitoring programme	Not yet available No sensors			Pre-construction and post-construction		To be decided	Will be surveyed on the site by mapping habitats or/and fixed-point photography. Historic data source: NOVANA monitoring program https://www2.dmu.dk/1_viden/2_Publikationer/3_fagrapporter/rapporter/FR537.PDF
	Change in vegetation along re-created watercourses	Vegetation along re-created watercourses	NO	Will be monitored by the project (Amphi International) – to be finally decided in monitoring programme	Not yet available No sensors			Pre-construction and post-construction		To be decided	Will be surveyed on the site by transect/square mapping. Historic data source: NOVANA monitoring program https://www2.dmu.dk/1_viden/2_Publikationer/3_fagrapporter/rapporter/FR537.PDF
	Conservation status of habitats	Structure of habitats, including presence of typical species	Not assessed yet	Will be monitored by the project (Amphi International) – to be finally decided	Not yet available No sensors			Pre-construction and post-construction		To be decided	Will be surveyed on the site by transect/quadrat survey. Historic data source: NOVANA monitoring program https://www2.dmu.dk/1_viden/2_Pu

				in monitoring programme							blikationer/3_fagrapporter/rapporter/FR537.PDF
	Species richness and composition in respect to indigenous vegetation (chosen habitats) and local/national biodiversity targets (to be decided)	Number of species and/or number of individuals for each species	Not assessed yet	Will be monitored by the project (Amphi International) – to be finally decided in monitoring programme	Not yet available No sensors			Pre-construction and post-construction		To be decided	https://www2.dmu.dk/1_viden/2_Publikationer/3_fagrapporter/rapporter/FR537.PDF
	Number and type of protected species (chosen groups: birds/vegetation/amphibians)	Type and number of protected species	Not assessed yet	Will be monitored by the project (Amphi International) – to be finally decided in monitoring programme	Not yet available No sensors			Pre-construction and post-construction		To be decided	Will be surveyed on the site by transect/quadrat survey. Historic data source: NOVANA monitoring program https://www2.dmu.dk/1_viden/2_Publikationer/3_fagrapporter/rapporter/FR537.PDF as well as other available
	Diversity of species	Number of species and/or number of individuals for each species	Not assessed yet	Will be monitored by the project (Amphi International) – to be finally decided in monitoring programme	Not yet available No sensors			Pre-construction and post-construction		To be decided	https://www2.dmu.dk/1_viden/2_Publikationer/3_fagrapporter/rapporter/FR537.PDF
PEOPLE	Increasing recreational opportunities of NBS area	Number of recreation activity in the area/						Pre-construction and post-construction		To be decided	Will be surveyed on the site by transect/quadrat survey. Possibility of using e-DNA method and Invertebrate species index. Historic data source: NOVANA monitoring program https://www2.dmu.dk/1_viden/2_Publikationer/3_fagrapporter/rapporter/FR537.PDF as well as other available
	Number and value of people visit or spend free time in NBS area	Number of people visiting the NBS area						Pre-construction and post-construction		To be decided	Variables and evaluation method will be decided during setting up monitoring program

	Number of tourists	Number of people visiting the NBS area						Pre-construction and post-construction		To be decided	Variables and evaluation method will be decided during setting up monitoring program
	Accessible NBS area per capita	NBS free space area Number of people that could access									Variables and evaluation method will be decided during setting up monitoring program
	Average journey time for people by foot to NBS area or average distance from home/public transport to NBS area	Time from home/public transportation to NBS area (by foot, bike)									Variables and evaluation method will be decided during setting up monitoring program
		Distance from home/public transportation to NBS area									Variables and evaluation method will be decided during setting up monitoring program
	Enhancing attractiveness of places for living and working, and to visit	Number of people visit the NBS area / will be obtained by setting up data loggers at the observation towers/paths which are going to be built in the project									Variables and evaluation method will be decided during setting up monitoring program
	Reduced/avoided damage cost from hydro-meteorological risk reduction	To be decided (Flood depth, Flood velocity, Land use map, Infrastructure data, Damage data, Inundation map)									Variables and evaluation method will be decided during setting up monitoring program
	Change in land and/or property values	To be decided (Price of land and/or properties (euro), Willingness to pay)									Variables and evaluation method will be decided during setting up monitoring program
	Mental well-being	To be decided (Feeling happiness, the satisfaction of desires, etc., Personal characteristics, Mental Well-being scales asking participants how they have felt over the previous four weeks in relation to a number of items (e.g., feeling relaxed, feeling useful), with responses rated on a 5 point scale from “none of the time” to “all of the time)									Variables and evaluation method will be decided during setting up monitoring program

2.6.5 Preparation of monitoring / evaluation

We are currently designing the monitoring program, both technical and organizational aspects, which is going to be financed by RECONECT.

2.7 Links / Synergies to other NBS project and already established EU monitoring network/ facilities

2.7.1 Synergy with other projects on the NBS site

This NBS site is not part of any other projects apart from RECONECT. We are investigating if any other party has ever carried out any monitoring or similar activities at this site.

2.7.2 Links to other NBS projects

We are looking for cooperation with other NBS projects, and we seek assistance from RECONECT in identifying such projects and appropriate partners.

2.7.3 Links / synergies to already established EU monitoring network/facilities

Since the area is designated as Natura 2000 site, the habitats and species of EU interest occurring in the site are subject to a national monitoring and assessment program for aquatic and terrestrial ecosystems NOVANA, which delivers data to the monitoring program due to Danish reporting obligations on implementation of EU Birds and Habitats Directives.

2.8 Connection to the RECONECT TeleControlNet data platform

Brief Information about the TeleControlNet data platform is presented in Section II Methodology of the report. INTER ACT will contact all Demonstrators to facilitate linking (monitoring) systems/data to the platform. The questions / discussions will be of a highly technical nature. Contact person Lars Kildahl Sønderby, Odense Municipality, lkis@odense.dk, Phone +45 23 28 97 19 or Skype or Whatsapp

3 Demonstrator DA-3: Tordera River Basin, Spain

3.1 Status analysis

We are still in the planning phase of our project, consisting in:

- A detailed assessment of the Tordera river basin response to events of heavy rainfall
- A cost-benefit analysis of different alternative NBS to be implemented within the basin with the main goal to help reduce flood risk in the most affected areas.

Thus, the design phase of the project will start right after the planning phase will be concluded (by January 2020) and once the different types and locations of NBS will be identified.

We have not addressed any legislative aspect yet as, given the type of NBS that are planned to be developed, we do not expect any issue in this regard. The most critical phase, in which we anticipate that issues may arise, is land acquisition. To try to minimize problems in that stage of the project, we will firstly explore the possibility to construct our NBS on publicly-owned land and/or on old gravel mining pits that have not been restored yet. Another possibility would be to establish stewardship agreements with landowners, although the agreement procedure might be more time consuming than any of the other two options.

We do not expect any issue in getting the permits to construct our NBS, as ACA is the responsible authority for issuing permits within a distance of 100 m from the river bank. In case a NBS will be located further away from the river, the municipality will be the responsible authority for granting the permit. In this sense, we plan to involve in the project as key stakeholders all municipalities in which NBS will be planned.

Participatory processes, as we envision them, will involve only key stakeholders (e.g. municipalities, regional government departments, NGO's, research centers). However, other key stakeholders as municipalities and/or NGO's may involve citizens in the decision-making process.

3.2 Non-technical preparatory actions & legislative aspects

Non-technical preparatory actions & legislative aspects are described here below in table format, providing information on relevant legislative aspects, procedures and/or permits

3.2.1 Summary information

Information provided in the table below is still tentative, as it is difficult , at this stage of the project, to anticipate all the permits that would be required in the implementation and monitoring of our NBS. However, and whenever possible, the design and location of our NBS will be adapted to minimize legal and non-technical issues/barriers that may arise.

Table 3-1 Tordera NBS summary information on procedures and/or permits (tentative)

Topic: (EXAMPLES, ADD EXTRA ROWS IF REQUIRED)	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
Spatial								
Spatial planning / land use change approval	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Land acquisition	Agreement with landowner (old gravel mining pits)	Private procedure	ACA/landowner	Not defined yet	Not defined yet	Not defined yet	n/a	Yes
	Stewardship agreement (different administrative options available)	Private procedure	ACA/landowner	Not defined yet	Not defined yet	Not defined yet	n/a	Yes
Archeology / heritage	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Environment								
Environmental permit	Environmental permit	Public participation	DGPAMN	Definition of the NBS and how they may affect the environment	15 days	1 month	ACA	Yes
Environmental Impact Assessment	A simplified EIA might be required	Public participation	DGPAMN	An environmental impact study	Not defined yet	3 – 4 months	ACA	Yes
Construction								
Contracting the executive project	Public contract	Public participation	ACA	Report specifying the works to be	15 days	4-6 months	ACA	Yes

Topic: (EXAMPLES, ADD EXTRA ROWS IF REQUIRED)	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
				conducted				
Building/construction permit	Building permit in ZP (100 m from the river bank)	Public participation	ACA	Executive project	Not defined yet	Automatically after the executive project is approved	ACA	Yes
Excavation permit	Building permit in ZP (100 m from the river bank)	Public participation	ACA	Executive project	Not defined yet	Automatically after the executive project is approved	ACA	Yes
Contracting the works	Public contract	Public participation	ACA	Executive project	6-12 months	6 months	ACA	Yes
Ecology/Nature								
Natura2000: protected area's	Environmental permit	Public participation	DGPAMN	Definition of the NBS and how they may affect the environment	15 days	1 month	ACA	Yes
Other protected ecological zones	Environmental permit	Public participation	DGPAMN	Definition of the NBS and how they may affect the environment	15 days	1 month	ACA	Yes
Protected species	Environmental permit	Public participation	DGPAMN	Definition of the NBS and how they may affect the environment	15 days	1 month	ACA	Yes
Tree felling permit	Environmental permit	Public participation	DGPAMN	Definition of the NBS and how they may affect the environment	15 days	1 month	ACA	Yes
Infrastructure								
Public roads: Road permit (temp or permanent roads)	Permits to be obtained, in case they are needed, during the development	Public participation	Not defined yet	A report/map showing how NBS interact with the different infrastructures that are present	Not defined yet	1-2 months	ACA	Yes
Existing rail road		Public participation	Not defined yet		Not defined yet	1-2 months	ACA	Yes
Existing waterways		Public participation	Not defined yet		Not	1-2 months	ACA	Yes

Topic: (EXAMPLES, ADD EXTRA ROWS IF REQUIRED)	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
	of the executive project			in the area.	defined yet			
Existing (electrical) cables		Public participation	Not defined yet		Not defined yet	1-2 months	ACA	Yes
Existing gas-pipes		Public participation	Not defined yet		Not defined yet	1-2 months	ACA	Yes
Any other relevant procedures		Public participation	Not defined yet		Not defined yet	1-2 months	ACA	Yes
Monitoring								
Data acquisition permits	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required
Lidar /fly over permit	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required
Water data/monitoring permit	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required
Nature data/monitoring permit	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required
Meteo data/monitoring permit	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required
Access to external data bases	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required
Drone permit	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required	Not expected to be required

3.2.2 Descriptive information

3.2.2.1 Spatial

The selected sites to construct NBS will comply with current land-use legislation. Planned measures to reduce flood risk may be considered of public interest under Spanish legislation. So in this case, compulsory expropriation may apply.

In order to minimize issues/barriers that may arise during the land acquisition phase of the project, we plan to take the following steps:

- Identify all the publicly-owned land available and suitable to implement NBS. We will prioritize the implementation of NBS in these areas.
- Identify those old gravel mining pits that have not been restored yet, and that are suitable to build water storage/retention areas. Legislation obliges gravel mining companies to restore the land to its initial condition once the extractive activity ends. In this sense, it may be easy to reach an agreement with these companies/landowners to convert the mining pit into a water retention area, as this solution is more cost-effective that to restore the land to its initial situation.
- If none of the above options are available/suitable for the implementation of our NBS, we will explore the possibility to sign stewardship agreements with selected landowners.
- As a final option, we may consider the compulsory expropriation of land.

GIS datasets identifying the location of heritage and archeological sites are available for the area of study. In this sense, we will avoid the construction of our NBS close to these protected areas.

3.2.2.2 Environment

Environmental permits might be required when NBS interfere with environmentally protected areas. ACA will apply for these permits, when needed, during the phase of development of the executive project. On the other hand, a simplified Environmental Impact Assessment might be required for water retention areas with a storage capacity higher than 200.000 m^3.

Social Impact Assessment is not required.

3.2.2.3 Construction

ACA is the authority responsible for issuing construction and excavation permits in the areas located within a distance of 100 m from the river bank. In this sense, we expect most of the planned NBS will be located in those areas, so no construction/excavation permit will be required.

For areas located further away from the river, we will need to apply for a permit to the municipality. To facilitate collaboration in this regard main municipalities along the Tordera river have been identified as key stakeholders.

3.2.2.4 Ecology

The middle and final reach of the Tordera river, as well as most of the course of its tributary Riera de Santa Coloma – Estany de Sils, are classified as Natura2000 protected areas. Other ecological protected zones (e.g. natural areas of special interest, fluvial natural reserves) can be also found in the Tordera river basin. In this sense, any NBS planned in those areas will meet the specific environmental requirements established by the environmental legislation. Permits required will be obtained during the phase of development of the executive project.

3.2.2.5 Infrastructure

All these issues (public roads, existing infrastructure) will be addressed during the phase of development of the executive project. In case the NBS interferes with any existing infrastructure, the executive project will include the measures/actions required to minimize the affectation of the service as well as its restitution once the construction works will be concluded. However, whenever possible, affectations to existing infrastructure will be avoided.

In relation to the monitoring and data acquisition permits, we do not expect they will be required.

3.2.2.6 Monitoring

We have not undertaken any action in this regard. However, we are very looking forward to share experiences with other project partners and to learn more about the different data sources and tools available that could help us improve our monitoring and evaluation programs.

3.3 Planning of legislative prepatory actions

It is difficult to anticipate at this stage of the project how legislative aspects may affect the planning and implementation of our NBS. However, as ACA is the responsible authority for most of the procedures that will need to be undertaken, we do not expect many problems in this regard. On the other hand, we will plan our NBS accordingly so the procedures and permits required will be minimized.

3.4 RECONECT Knowledge exchange. Lessons learned.

We would appreciate advise on:

- Different strategies for land acquisition and/or reaching agreements with landowners.
- Available datasets and tools that could help us improve our monitoring and evaluation programs.
- How to establish synergies with other projects and/or with other project partners.
- Synthetic information of key aspects to be considered in the implementation of different types of NBS.

3.5 Information on copies of permits / approvals

Not available yet.

3.6 Preparatory actions for monitoring

3.6.1 Overal Assesment

We are still developing the Levee Management Plan of the Tordera River Basin, which is part of the planning stage of our NBS. The Plan was started in November 2018 and it is expected to be concluded in May 2020. In this sense, we have not defined yet the full scope and detailed activities of our monitoring and evaluation programs. However, in the context of the Levee Management Plan we will develop detailed hydrological and hydraulic models to characterise the response of the basin to heavy rainfall events, in the current scenario as well as in the scenario where the NBS will be constructed. The results of the models will help us to establish our baseline, in terms of flood hazard and flood risk, as well as to assess the improvement/reduction of risk due to the implementation of NBS.

On the other hand, ACA has its own Monitoring Programme, in compliance with the EU Water Framework Directive (WFD), with its own well-defined indicators, monitoring points and schedule. Some of the indicators of the WFD are planned to be used to establish the baseline, as well as to monitor/assess the impact/benefits of the NBS. However, we still have to analyse how the time and spatial scales of the WFD Monitoring Programme align with the needs and requirements of the RECONECT monitoring activities.

There are also a few automatic rainfall and river gauging stations located within the Tordera river basin, that might be useful during the monitoring stage of the project. Besides, in the context of the H2020 project ANYWHERE, in which ACA is also participating as a partner, river level sensors will be installed in the Delta area. These sensors can be also used, if needed, to monitor the performance of the NBS.

Other than that, ACA does not have budget allocated for sensor purchasing. So, it might be difficult for us to conduct any other monitoring activity on a regular basis, besides the activities already described, as fieldwork is very time and resource consuming. In this sense, we are very interested in getting support/help from other project partners and to get access to any other available source of information (aerial images, remote sensing data, drone images, as well as information from already established EU monitoring networks) that may help us to improve the monitoring and evaluation of our NBS. Along the same lines, we found that crowdsourcing can be also an interesting tool to be used during the monitoring and evaluation stages of the project. In this sense, we look very much forward to share experiences and know-how with other Demonstrators, as well as to learn more about the platform and the tools that are being developed in WP3.

3.6.2 Baseline monitoring data (available before RECONECT start)

Details regarding monitoring and evaluation aspects, and available Information/Data/Tools are presented here below in table format, Table 1-1.

As mentioned before, we still have to analyse how the time and spatial scales of the WFD Monitoring Programme align with the needs and requirements of the RECONECT monitoring activities. In this sense, alternative/additional monitoring indicators/activities might be defined in subsequent stages of the project.

Table 3-2 Tordera River Basin NBS available baseline (monitoring) data before RECONECT

	INDICATORS	PARAMETER / VARIABLE (Baseline data available)	Please mention data source (measured/monitored by you, or taken from other source)	What kind of sensors have been used	Please provide the period of measurements	Please provide time interval of measurements	Please mention the format of data files	Any other important information relevant to monitoring /evaluation aspects
WATER	Slowing and storing runoff	Precipitation (mm)	1)Probable maximum daily precipitation data for different return periods taken from official reports of the Spanish Ministry of Public Works (1999) 2) Data registered by the official rainfall gauging stations of the Catalan Meteorological Service (SMC)	Automatic and non-automatic (historical data) rainfall gauging stations	1) Data series longer than 30 years (being the most recent year in record 1999) were used in the estimation of the robable maximum daily precipitation 2) Data from automatic rainfall gauging stations available from 1995 to the present day	Historical data may be measured on a daily basis. Data from automatic rainfall gauging stations is measured every 5 minutes.	Raster dataset (ASCII) XLSX data files	Statistics available for Extreme value/Return periods, applicable to flood hazard simulation/forecast
		Land use/ Land Cover	Data developed by the Cartographic and Geological Institute of Catalonia and by the research centre CREAF-UAB	Landsat images	Data available for 1987, 1992, (1993), 1997, 2002, (2002-2003), (2005-2007), 2007, (2009), 2012, 2017	Data updated every 5 years (approximately)	GeoTIFF	Data can be accessed on the following link: http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/usos-del-sol/
	Flood Hazard	River discharge (m^3/s)	1) Data taken from hydrological and hydraulic models developed by ACA and 2) ACA's river gauging stations Data taken from hydraulic models developed by ACA and	1)None 2) River level sensor None	2) Data from automatic river gauging stations available from 1995 to the present day (with gaps in the series of data)	2) Historical data may be measured on a daily basis. Data from automatic river gauging stations is measured every 5 minutes.	1) Tabular data in most cases 2) XLSX data files	Numerical models available to serve as evaluation tool Numerical models available to serve as evaluation tool Numerical models available to serve as evaluation tool
		Flood peak (m^3/s)						
		Flood duration						
		Lag time						
		Water level (m)					Raster dataset (ASCII) and tabular data	

		Water velocity (m/s)	Data taken from hydraulic models developed by ACA	None	–	–	Raster dataset (ASCII)	
	Vulnerability	Land use/ Land Cover	Data developed by the Cartographic and Geological Institute of Catalonia and by the research centre CREAF-UAB	Landsat images	Data available for 1987, 1992, (1993), 1997, 2002, (2002-2003), (2005-2007), 2007, (2009), 2012, 2017	Data updated every 5 years (approximately)	GeoTIFF	Data can be accessed on the following link: http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/usos-del-sol/
	Delay time to peak	River discharge (m^3/s)	1) Data taken from hydrological and hydraulic models developed by ACA and 2) ACA's river gauging stations Data taken from hydraulic models developed by ACA and	1)None 2) River level sensor None	2) Data from automatic river gauging stations available from 1995 to the present day (with gaps in the series of data)	2) Historical data may be measured on a daily basis. Data from automatic river gauging stations is measured every 5 minutes.	1) Tabular data in most cases 2) XLSX data files	Numerical models available to serve as evaluation tool
		Flood peak (m^3/s)						
		Flood duration						
		Lag time						
	Flood Peak Reduction	River discharge (m^3/s)	1) Data taken from hydrological and hydraulic models developed by ACA and 2) ACA's river gauging stations	1)None 2) River level sensor	2) Data from automatic river gauging stations available from 1995 to the present day (with gaps in the series of data	2) Historical data may be measured on a daily basis. Data from automatic river gauging stations is measured every 5 minutes	1) Tabular data in most cases 2) XLSX data files	Numerical models available to serve as evaluation tool
		Flood peak (m^3/s)						
		Flood duration						
		Lag time						
	Change in groundwater level/ water table	Groundwater level (m)	Data collected in the context of the Monitoring Programme of the WFD	–	Data available from 2005 to the present day	Monthly	PDF, XLSX, XML	Data can be accessed on the following link: http://aca-web.gencat.cat/sdim21/filtre.do
	Attenuation of pollution in groundwater	Physicochemical quality and organic pollutants	Data collected in the context of the Monitoring Programme of the WFD	–	Data available from 2005 to the present day	Every 6 months/ Once a year	PDF, XLSX, XML	Data can be accessed on the following link: http://aca-web.gencat.cat/sdim21/filtre.do
	Seawater intrusion	Salinity	Data collected in the context of the Monitoring Programme of the WFD	–	Data available from 2005 to the present day	Daily	PDF, XLSX, XML	Data can be accessed on the following link: http://aca-web.gencat.cat/sdim21/filtre.do

NATURE	Changes in riparian habitat	Riparian habitat area (m^2)	Data available from different sources: 1) Land cover data (CREAF-UAB) 2) Natural habitats of community interest (DGPA) 3) Delineation of riparian zones (COPERNICUS)	–	1) 1993, 2002-2003, 2005-2007, 2009 2) 1996-1997, 2008 3)2011-2013	–	Raster datasets and shapefiles	Data can be accessed on the following links: 1) http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/usos-del-sol/ 2) http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/vegetacio/ 3) https://land.copernicus.eu/local/riparian-zones
	Changes in aquatic habitat	Mesohabitats (IHF)	Data collected in the context of the Monitoring Programme of the WFD	–	Data available from 2005 to the present day	Once a year / Twice every 6 years	XLSX, DATABASE	
	Connectivity/ fragmentation of habitats	Connectivity (ICF)	Data collected in the context of the Monitoring Programme of the WFD	–	Data available from 2005 to the present day	Once every 6 years	XLSX, DATABASE	
	Change in vegetation along water courses	Riparian vegetation (QBR)	Data collected in the context of the Monitoring Programme of the WFD	–	Data available from 2005 to the present day	Once a year / Twice every 6 years	XLSX, DATABASE	
	Conservation status of habitats	Riparian habitat area (m^2)	Data available from different sources: 1) Land cover data (CREAF-UAB) 2) Natural habitats of community interest (DGPA) 3) Delineation of riparian zones (COPERNICUS)	–	1) 1993, 2002-2003, 2005-2007, 2009 2) 1996-1997, 2008 3)2011-2013	–	Raster datasets and shapefiles	Data can be accessed on the following links: 1) http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/usos-del-sol/ 2) http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/vegetacio/ 3)

								https://land.copernicus.eu/local/riparian-zones
	Change in land cover	Land use/ Land Cover	Data developed by the Cartographic and Geological Institute of Catalonia and by the research centre CREAF-UAB	Landsat images	Data available for 1987, 1992, (1993), 1997, 2002, (2002-2003), (2005-2007), 2007, (2009), 2012, 2017	Data updated every 5 years (approximately)	GeoTIFF	Data can be accessed on the following link: http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/usos-del-sol/
	Number and types of protected species	Number and type of taxons	Data collected in the context of the Monitoring Programme of the WFD	–	Data available from 2005 to the present day	Once a year / Twice every 6 years	XLSX, DATABASE	
	Diversity of species	Number and type of taxons	Data collected in the context of the Monitoring Programme of the WFD	–	Data available from 2005 to the present day	Once a year / Twice every 6 years	XLSX, DATABASE	
	Number, area, location of invasive non-native animal and planted species that are threatening to ecosystems, habitats or species	Number and type of taxons	Data collected in the context of the Monitoring Programme of the WFD	–	Data available from 2005 to the present day	Once a year / Twice every 6 years	XLSX, DATABASE	
PEOPLE	Reduced/avoided damage cost from hydro-meteorological risk reduction	Land use/ Land Cover	Data developed by the Cartographic and Geological Institute of Catalonia and by the research centre CREAF-UAB	Landsat images	Data available for 1987, 1992, (1993), 1997, 2002, (2002-2003), (2005-2007), 2007, (2009), 2012, 2017	Data updated every 5 years (approximately)	GeoTIFF	Data can be accessed on the following link: http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/usos-del-sol/
		Water level (m)	1) Data taken from hydraulic models developed by ACA and 2) ACA's river gauging stations	1) None 2) River level sensor	2) Data from automatic river gauging stations available from 1995 to the present day (with gaps in the series of data)	2) Historical data may be measured on a daily basis. Data from automatic river gauging stations is measured every 5 minutes.	1) Raster dataset (ASCII) and tabular data 2) XLSX data files	Numerical models available to serve as evaluation tool
		Water velocity (m/s)	Data taken from hydraulic models developed by ACA	None	–	–	Raster dataset (ASCII)	Numerical models available to serve as evaluation tool

3.6.3 Geographical information, GIS data

Different sources of GIS data are available for the Tordera river basin:

- Orthophoto images, Topography 1:5.000, DEM (2x2 m ; 5x5 m and 15x15 m), geology map, soil map. Datasets available to download from the following link: http://www.icgc.cat/Administracio-i-empresa/Descarregues
- Land use/Land cover. Data can be downloaded from the following link: http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/usos-del-sol/
- Natural habitats of community interest. Data can be downloaded from the following link: http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/vegetacio/
- Thematic cartography in relation to flood hazard and ecological status of water bodies in the Tordera river basin can be downloaded from the following link: http://aca.gencat.cat/ca/laigua/consulta-de-dades/descarrega-cartografica/

3.6.4 Preparatory actions for monitoring

Information on the (planned) monitoring / evaluation activities, refering to selected indicators and variables is presented on the following table:

Table 3-3 Tordera River Basin NBS variables that will be monitored during RECONECT, and used to evaluate NBS performance

	INDICATORS	VARIABLE to be monitored / evaluated	Do you posses baseline data on this variable ? (Yes/No, acc., to table 1.1)	Will it be monitored by you, or taken from other source	If already known, please provide details. Either on your external data source, or on your monitoring program (sensor type, time-interval of measurements, data formats, etc).				Please mention any innovative tools/methods that will be used (satellite data, drones, remote sensing)	Are you going to share this data within RECONECT ICT platform	Any other substantial information relevant to monitoring /evaluation aspects
					Data / monitoring Approach Technique, sensor type, equipment	Time interval	Data format	When (pre-construction, construction, post-construction)			
WATER	Slowing and storing runoff	Precipitation (mm)	yes	Data registered by the official rainfall gauging stations of the Catalan Meteorological Service (SMC)	Equipment of the Catalan Meteorological Service (SMC)	Every 5 minutes	.XLSX	Pre-construction, construction and post-construction	n/a	yes	Hourly data can be accessed on the following link: http://aca-web.gencat.cat/aetr/vishid#ara
		Land use/ Land Cover	yes	Data will be taken from official sources (ICGC, CREAF-UAB)	Data developed by a third party	Every 5 years	GeoTIFF	Pre-construction and post-construction	n/a	yes	Data can be accessed on the following link: http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/usos-del-sol/
		To be decided (Soil type, Topography/DEM, Roughness coefficient)									
	Flood Hazard	Precipitation (mm)	yes	Data registered by the official rainfall gauging stations of the Catalan Meteorological Service (SMC)	Equipment of the Catalan Meteorological Service (SMC)	Every 5 minutes	.XLSX	Pre-construction, construction and post-construction	n/a	yes	Hourly data can be accessed on the following link: http://aca-web.gencat.cat/aetr/vishid#ara

		River discharge (m^3/s) Flood peak (m^3/s) Flood duration Lag time	yes	Will be monitored by ACA's river gauging stations and simulated using hydraulic and hydrological models	1)River gauging stations 2)Hydrological/hydraulic models	1) Every 5 minutes 2) Models can be run whenever is needed	1) XLSX 2) Tabular data	Pre-construction, construction and post-construction	n/a	yes	HEC-HMS, HEC-RAS and IBER models will be used to simulate the current scenario (baseline) and the scenario in which the NBS will be implemented.
		Water level (m)	yes	Will be monitored by ACA's river gauging stations and simulated using hydraulic models	1)River gauging stations 2)Hydraulic models	1) Every 5 minutes 2) Models can be run whenever is needed	1) XLSX 2) raster data (ASCII)	Pre-construction, construction and post-construction	It would be interesting to use satellite data (COPERNICUS) during flood periods to assess the flooded area and to compare it with the output of the hydraulic models	yes	HEC-RAS and IBER models will be used to simulate the current scenario (baseline) and the scenario in which the NBS will be implemented.
		Water velocity (m/s)	yes	Will be simulated sing hydraulic models	Hydraulic models	Whenever is needed	Raster data (ASCII)	Pre-construction, construction and post-construction	n/a	yes	HEC-RAS and IBER models will be used to simulate the current scenario (baseline) and the scenario in which the NBS will be implemented.
	Vulnerability	Land use/ Land Cover	yes	Data will be taken from official sources (ICGC, CREAF-UAB)	Data developed by a third party	Every 5 years	GeoTIFF	Pre-construction and post-construction	n/a	yes	Data can be accessed on the following link: http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/usos-del-sol/
		To be decided (Infrastructures data, population data, building/housing)									
	Delay time to peak	River discharge (m^3/s)	yes	Will be monitored by ACA's river	1)River gauging	1) Every 5 minutes	1) XLSX 2) Tabular	Pre-construction, construction and	n/a	yes	HEC-HMS, HEC-RAS and IBER models will be used to simulate

		Flood peak (m^3/s) Flood duration Lag time		gauging stations and simulated using hydraulic and hydrological models	stations 2)Hydrological/hydraulic models	2) Models can be run whenever is needed	data	post-construction			the current scenario (baseline) and the scenario in which the NBS will be implemented.
	Flood Peak Reduction	River discharge (m^3/s) Flood peak (m^3/s) Flood duration Lag time	yes	Will be monitored by ACA's river gauging stations and simulated using hydraulic and hydrological models	1)River gauging stations 2)Hydrological/hydraulic models	1) Every 5 minutes 2) Models can be run whenever is needed	1) XLSX 2) Tabular data	Pre-construction, construction and post-construction	n/a	yes	HEC-HMS, HEC-RAS and IBER models will be used to simulate the current scenario (baseline) and the scenario in which the NBS will be implemented.
	Change in groundwater level/ water table	Groundwater level (m)	yes	Data collected in the context of the Monitoring Programme of the WFD	–	Monthly	PDF, XLSX, XML	Pre-construction, construction and post-construction	n/a	yes	Data can be accessed on the following link: http://aca-web.gencat.cat/sdim21/filtre.do
	Attenuation of pollution in groundwater	Physicochemical quality and organic pollutants	yes	Data collected in the context of the Monitoring Programme of the WFD	–	Every 6 months/ Once a year	PDF, XLSX, XML	Pre-construction, construction and post-construction	n/a	yes	Data can be accessed on the following link: http://aca-web.gencat.cat/sdim21/filtre.do
	Seawater intrusion	Salinity	yes	Data collected in the context of the Monitoring Programme of the WFD	–	Daily	PDF, XLSX, XML	Pre-construction, construction and post-construction	n/a	yes	Data can be accessed on the following link: http://aca-web.gencat.cat/sdim21/filtre.do
NATURE	Changes in riparian habitat	Riparian habitat area (m^2)	yes	Data available from different sources: 1) Land cover data (CREAF-UAB) 2) Natural habitats of community interest (DGPA) 3) Delineation of riparian zones (COPERNICUS)	Data developed by a third party	Unknown	Raster datasets (ASCII) and shapefiles	Unknown	We would be interested in getting support/help to access and process satellite images and/or remote sensing data in order to monitor this	yes	Data can be accessed on the following links: 1) http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/usos-del-sol/ 2) http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponi

									variable		mia/bases_cartografiques/medi_ambient_i_sostenibilitat/vegetacio/ 3) https://land.copernicus.eu/local/riparian-zones
	Changes in aquatic habitat	Mesohabitats (IHF)	yes	Data collected in the context of the Monitoring Programme of the WFD	–	Once a year / Twice every 6 years	.XLSX, DATABASE	We still need to analyse how the timeline of the WFD Monitoring Programme aligns with the needs and requirements of the RECONECT monitoring activities	n/a	yes	
	Connectivity/ fragmentation of habitats	Connectivity (ICF)	yes	Data collected in the context of the Monitoring Programme of the WFD	–	Once every 6 years	.XLSX, DATABASE	We still need to analyse how the timeline of the WFD Monitoring Programme aligns with the needs and requirements of the RECONECT monitoring activities	n/a	yes	
	Change in vegetation along water courses	Riparian vegetation (QBR)	yes	Data collected in the context of the Monitoring Programme of the WFD	–	Once a year / Twice every 6 years	.XLSX, DATABASE	We still need to analyse how the timeline of the WFD Monitoring Programme aligns with the needs and requirements of the RECONECT monitoring activities	We would be interested in getting support/help to access and process satellite images and/or remote sensing data in order to monitor this variable	yes	
	Conservation status of habitats	Riparian habitat area (m^2)	yes	Data available from different sources: 1) Land cover data (CREAF-UAB) 2) Natural habitats of community interest (DGPA) 3) Delineation of riparian zones	Data developed by a third party	Unknown	Raster datasets (ASCII) and shapefiles	Unknown	We would be interested in getting support/help to access and process satellite images and/or remote sensing data in	yes	Data can be accessed on the following links: 1) http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/usos-del-sol/ 2)

				(COPERNICUS)					order to monitor this variable		http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/vegetacio/ 3) https://land.copernicus.eu/local/riparian-zones
	Change in land cover	Land use/ Land Cover	yes	Data will be taken from official sources (ICGC, CREAF-UAB)	Data developed by a third party	Every 5 years	GeoTIFF	Pre-construction and post-construction	n/a	yes	Data can be accessed on the following link: http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/usos-del-sol/
	Number and types of protected species	Number and type of taxons	yes	Data collected in the context of the Monitoring Programme of the WFD	–	Once a year / Twice every 6 years	.XLSX, DATABASE	We still need to analyse how the timeline of the WFD Monitoring Programme aligns with the needs and requirements of the RECONECT monitoring activities		yes	
	Diversity of species	Number and type of taxons	yes	Data collected in the context of the Monitoring Programme of the WFD	–	Once a year / Twice every 6 years	.XLSX, DATABASE	We still need to analyse how the timeline of the WFD Monitoring Programme aligns with the needs and requirements of the RECONECT monitoring activities		yes	
	Number, area, location of invasive non-native animal and planted species that are threatening to ecosystems, habitats or species	Number and type of taxons	yes	Data collected in the context of the Monitoring Programme of the WFD	–	Once a year / Twice every 6 years	.XLSX, DATABASE	We still need to analyse how the timeline of the WFD Monitoring Programme aligns with the needs and requirements of the RECONECT monitoring activities		yes	

PEOPLE	Increasing recreational opportunities of NBS area	Number of recreation activity in the area	no	Not defined yet. Help from other project partners will be needed to define the monitoring approach.	Not defined yet	Not defined yet	Not defined yet	Not defined yet	Crowdsourcing can be an interesting tool to monitor this variable. However, we do not have the technology available, so any help we can get in this regard will be more than welcome.	yes	
	Provision of NBS sites for education and research	Number of student benefiting from education and research about NBS	no	Not defined yet. Help from other project partners will be needed to define the monitoring approach.	Not defined yet	Not defined yet	Not defined yet	Not defined yet	Not defined yet	yes	
	Reduced/avoided damage cost from hydro-meteorological risk reduction	Flood depth									Evaluation through Hydraulic Modelling and GIS processing
		Flood velocity									
		Land use map									
		Infrastructure data									
		Damage data									
		Inundation map									
		Water level (m)	yes	Will be monitored by ACA's river gauging stations and simulated using hydraulic models	1)River gauging stations 2)Hydraulic models	1) Every 5 minutes 2) Models can be run whenever is needed	1) XLSX 2) raster data (ASCII)	Pre-construction, construction and post-construction	It would be interesting to use satellite data (COPERNICUS) during flood periods to assess the flooded area and to compare it with the output of the hydraulic	yes	HEC-RAS and IBER models will be used to simulate the current scenario (baseline) and the scenario in which the NBS will be implemented.

									models		
		Water velocity (m/s)	yes	Will be simulated sing hydraulic models	Hydraulic models	Whenever is needed	Raster data (ASCII)	Pre-construction, construction and post-construction	n/a	yes	HEC-RAS and IBER models will be used to simulate the current scenario (baseline) and the scenario in which the NBS will be implemented.
		Land use/ Land Cover	yes	Data will be taken from official sources (ICGC, CREAF-UAB)	Data developed by a third party	Every 5 years	GeoTIFF	Pre-construction and post-construction	n/a	yes	Data can be accessed on the following link: http://territori.gencat.cat/ca/01_departament/12_cartografia_i_toponimia/bases_cartografiques/medi_ambient_i_sostenibilitat/usos-del-sol/

3.6.5 Preparation of monitoring / evaluation

We are still in the planning stage of our project, so we have not defined a detailed monitoring programme for our NBS yet. However, and as mentioned before, it might be difficult for us to carry out any additional monitoring activity on a regular basis, except for those within the scope of ACA's responsibilities (e.g. WFD monitoring programme, river gauging stations network, flood hazard assessment). In this sense, we are very interested in learning more (and getting support) from other project partners, especially with regard to available sources of information (aerial images, remote sensing data, drone images, as well as information from already established EU monitoring networks) and tools that could help us improve the monitoring and evaluation of our NBS without allocating much human and material resources (ACA does not have budget allocated for purchasing monitoring equipment).

Given this limitation in the design and scope of our monitoring programme, the alignment with other RECONECT demonstrators in terms of variable/indicators to be measured might be more complicated. However, we are open to explore any possibility of alignment, so common conclusions can be more easily drawn at the end of the project.

On the other hand, we do not anticipate any obstacle in obtaining permits for constructing and monitoring our NBS, as ACA is the authority responsible for issuing permits in areas located within a distance of 100 m from the river bank.

3.7 Links / Synergies to other NBS project and already established EU monitoring network/facitlities

3.7.1 Synergy with other projects on the NBS site

There are different projects that have been developed and/or are currently being developed in the Tordera river basin. In this sense, we have identified the main organizations (i.e. NGO's, research centers, etc.) that have conducted and/or are currently conducting research /monitoring in the Tordera river basin as key stakeholders, with the aim to create synergies with other projects whenever possible. However, at this stage of the project, we have not analyzed yet how the scope and goals of these research projects align with the ones set in the RECONECT project.

3.7.2 Links to other NBS projects

Along the same lines, we would be very interested in learning more about other European projects that are currently being developed and that share common goals with RECONECT. However, it is difficult for us at this stage of the project to identify possible synergies as we are not very familiar with the details of the aforementioned projects. We would appreciate any recommendation/advice that we can get from other project partners in this regard, so we can include it in the Levee Management Plan of the Tordera River Basin that we are currently developing.

3.7.3 Links / synergies to already established EU monitoring network/facilities

ACA is the basin authority for the river basin district of Catalonia. In this sense, some of the datasets available in the aforementioned EU monitoring networks have been developed by ACA and reported to the European Commission by the Spanish State. Nevertheless, we are very interested in using any available data, especially from COPERNICUS, that may help us to improve the monitoring and evaluation of our NBS. We would appreciate any recommendation/advice that we can get from other project partners in this regard, as we are not very familiar with the different datasets that are available in the EU monitoring networks.

3.8 Connection to the RECONECT TeleControlNet data platform

Brief Information about the TeleControlNet data platform is presented in Section II Methodology of the report. INTER ACT will contact all Demonstrators to facilitate linking (monitoring) systems/data to the platform. The questions / discussions will be of a highly technical nature.

Xavi Llort from HYDS (xavi.llort@hyds.es) will be the responsible contact for the technical aspects of monitoring/data management in the Tordera river basin pilot site. Later in the project and once the requirements of the platform will be defined, ACA staff will also participate.

4 Demonstrator DA-4 Portofino Regional Natural Park, Italy

4.1 Status analysis

- *What phase are you currently in? What is the status of the design?*

Appointment of the professionals, technical working group for designing NBS.

- *What legislative aspects have you already addressed ?*

Demonstration of interest by professional teams. Appointment of working groups (according to public procurements regulations).

- *What legislative aspects are you currently working on ?*

Public procurement, EU Directive 2004/17/CE (works) and 2004/18/CE (services and supplies) implemented with Italian law (DL) 18 April 2016, n. 50.

- *What (legislative / non-technical) steps still need to be taken prior to implementation of the NBS? (think of permits, approval, land acquisition, commissioning, participatory processes involving citizens, etc.)*

Final design, environmental impact assessment, public procurement of works.

- *Do you anticipate any specific (non-technical) barriers or issues in preparing for NBS implementation?*

Regional environmental procedures (screening and assessment) may take more time than expected.

4.2 Non-technical preparatory actions & legislative aspects

Non-technical preparatory actions & legislative aspects are described here below in table format, providing information on relevant legislative aspects, procedures and/or permits

4.2.1 Summary information

Table 4-1 Portofino NBS summary information on procedures and/or permits

Topic: (EXAMPLES, ADD EXTRA ROWS IF REQUIRED)	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
Spatial								
Spatial planning / land use change approval	No							
Land acquisition	Agreement	Private and public	Park	Agreement text	one	one	Park	Yes
Archeology / heritage	NO							
Environment								
Environmental permit	NO							
Environmental Impact Assessment	NO							
Social Impact Assessment	NO							
Construction								
Building/construction permit	d.l. 78/2010	Public	Municipality	SCIA	one	zero	Park	Yes
Excavation permit	NO							
Ecology/Nature								
Natura2000: protected area's	d.p.r. n.357/1997	Public	Liguria Region Authority	Nature2000 impact assessment	one	one	Park	Yes
Other protected ecological zones	YES	Public	Park	Project	one	one	Park	Yes
Protected species	YES	Public	Park	Project	one	one	Park	Yes
Tree felling permit	NO							
Landscape permission	YES	Public	Superintendence	Landscape impact Study	half	one	Park	Yes
Infrastructure								

Public roads: Road permit (temp or permanent roads)	NO							
Existing rail road	NO							
Existing waterways	NO							
Existing (electrical) cables	NO							
Existing gas-pipes	NO							
Any other relevant procedures								
	Governance							
Monitoring								
Data acquisition permits	No							
Lidar /fly over permit	Permit as for Drone fly							
Water data/monitoring permit	No							
Nature data/monitoring permit	No							
Meteo data/monitoring permit	No		ARPAL					
Access to external data bases	No		Regione Liguria					
Drone permit	YES	Private	Park	Licenses and time schedule	one	half	contractor	Yes

4.2.2 Descriptive information

4.2.2.1 Spatial

The foreseen activities are coherent with the current land-use and no land acquisition is needed.

Neither permits nor approvals are requested for the foreseen interventions in the pilot areas.

All the planned interventions are coherent with the basin master plan that is the planning tool for hydro geological risk mitigation.

4.2.2.2 Environment

EIA and SIA are not needed for the planned interventions.

Only Nature2000 impact assessment is needed

4.2.2.3 Construction

SCIA, that is a certified declaration of work beginning is needed and is prepared by the professional team that declare even the works conformity to the competing authorities (municipalities); the declaration includes the possible small excavation.

All the documents must fill the Municipalities standards for the audit.

4.2.2.4 Ecology

All the intervention areas are included in the Regional Natural Park and in the ZSC IT1332603, then two steps are needed: the approval from the Park Authority itself for fauna, flora and vegetation legislative aspects.

Then a Nature2000 impact assessment for the project will be redact fort the subsequent assessment procedure by the regional authority.

4.2.2.5 Infrastructure

No temporary or permanent road is necessary, nor the existing infrastructures are affected by the foreseen works.

The Park Authority itself is responsible for data monitoring permits.

4.2.2.6 Monitoring

Monitoring data not directly managed by the Park Authority, as actual meteorological data and Nature 2000, are of publicly accessible and property, respectively, of ARPAL (the regional agency for environmental protection) and Liguria Region Authority. Some more critical data regarding flora and fauna (property of the Park and Region Liguria) a specific request may be done.

4.2.2.7 Other

Works on private property need a preliminary agreement with the respective owners.

Particular attention will be paid to share the design with residents and other stakeholders, both for the project governance and to spread the NBS approach in order to promote its application in other private close areas.

4.3 Planning of legislative prepatory actions

The most labor/time intensive preparatory procedure is the consultation for time schedule, considering the different needs of the concurring subjects and the aim of the project in order to obtain the maximum efficiency and effectiveness.

The Park Authority does not need assistance for permits/approvals, apart the contribute from the professional team regarding the SCIA procedure, that is presented by the designer itself.

4.4 RECONECT Knowledge exchange. Lessons learned.

We would appreciate establishing synergies with other projects and/or with other NBS.

4.5 Information on copies of permits / approvals

Not available yet.

4.6 Preparatory actions for monitoring

4.6.1 Overal Assesment

The existing datasets comprise data from the Portofino Park Authority and from the Liguria Regional Information Systems and they include geospatial, environmental information and the number of tourists through some footpaths. These data will be collected with the monitoring program equipment that will include 3 weather stations that are necessary due to the peculiar morphology of the area, 2 hydrometers and 2 cameras. All the monitoring data will be accessible once the technical specifications, standards and formats requested by the platform will be known. All the equipment will be bought and installed once the indicator list will be approved.

Monitoring activity will also comprise LIDAR data acquisition to be performed in fall/winter 2019, when the vegetation disturbance is at its low.

LIDAR and monitoring data will allow the quantitative evaluation of the morphological features necessary to evaluate the potentially more susceptible source areas of debris flows, and the identification of thresholds in meteorological conditions.

All the assessments and estimation will be shared in particular with the Inn River Basin Demo B, due to the similarities in the morphological features of the two areas.

4.6.2 Baseline monitoring data (available before RECONECT start)

Details regarding monitoring and evaluation aspects, available Information/Data/Tools, are presented here in table format.

Table 4-2 Portofino NBS available baseline (monitoring) data before RECONECT

	INDICATORS	PARAMETER / VARIABLE (Baseline data available)	Please mention data source (measured/monitored by you, or taken from other source)	What kind of sensors have been used	Please provide the period of measurements	Please provide time interval of measurements	Please mention the format of data files	Any other important information relevant to monitoring /evaluation aspects
WATER	Landslide hazard	Precipitation (mm)	Data taken from official reports of ARPAL	Automatic Weather Station	Data available for the period from 2009 to 2019	Measured on hourly basis	Stored in txt files	Statistics for Extreme value to be performed.
		Slope angle	Liguria Region GIS vector data 1:5000 scale		2017	Not relevant	Vector data	
		Geology	Liguria Region data 1:10000 scale			Not relevant	pdf	
		Land use	Liguria Region GIS vector data 1:10000 scale	Aerial photo interpretation	2012, 2015, 2018	Not relevant	Vector data	
	Vulnerability	Infrastructure data	Liguria Region GIS vector data 1:5000 scale		2007		Vector data	
		Population	ISTAT census 2011	survey	2011	Every 10 years	.xls	Data are provided on administrative basis: proper elaboration must be performed.
		Building/Housing	Liguria Region GIS vector data 1:5000 scale		2007		Vector data	
NATURE	Changes in riparian habitat	Riparian habitat area (km2)	Portofino Natural Park habitat cartography	Survey	2015 (update in progress)	Every 2 years	Vector data	
	Changes in terrestrial habitat	Terrestrial habitat area (km2)	Portofino Natural Park habitat cartography	Survey + Aerial photo interpretation	2015 (update in progress)	Every 2 years	Vector data	
	Change in vegetation along watercourses	Vegetation along watercourses (survey)	None			Every 2 years		No specific survey has been taken in the area until now; dominant and relevant species are known but the vegetation was classified only at macro-scale
		Trends and status of range	None			Every 2 years		

		Trends and status of the area						
		Structure and function including typical species	None			Every 2 years		No specific survey has been taken in the area until now; dominant and relevant species are known but the vegetation was classified only at macro-scale
	Change in land cover	Land cover data	Liguria Region GIS vector data 1:10000 scale	Aerial photo interpretation	2012, 2015, 2018	Every 3 years	Vector data	
	Number and type of protected species	Type of protected species	Portofino Natural Park species cartography	Survey	"Historical" data, update in progress	Every 2 years	Bibliographic data	The occurrence of several relevant zoological species is known in very little temporary "ponds" but has to be confirmed
		Number of protected species	Portofino Natural Park species cartography	Survey	"Historical" data, update in progress	Every 2 years	Bibliographic data	The occurrence of several relevant zoological species is known in very little temporary "ponds" but has to be confirmed
PEOPLE	Increasing recreational opportunities of NBS area	Number of recreation activity in the area	Data taken from Tourist Information Office (Municipalities)		2018	Every year	.xls file	Data are provided on Municipalities and Park agendas
	Number of tourists	Number of tourists	Portofino Park Authority	Eco counter (in part)	2006	Every year	.xls file	
	Loss of cultural heritage due to hydro-meteorological events/due to land take	Economic and properties loss during hydro-metrological events	Budgets of municipalities and Park		2000	Every year	.xls file	
		Cultural heritage loss	Budgets of municipalities and Park		2000	Every year	.xls file	
	Reduced need for management and maintenance	Maintenance and management cost of grey infrastructures (if implemented)	Municipalities		2000	Every year	.xls file	
		Maintenance and management cost of NBS	Budgets of municipalities and Park		2000	Every year	.xls file	

4.6.3 Geographical information, GIS data

The following data are publicly available:

- vector:
    - Portofino and pilot areas borders;
    - hydrographical network 1:10000, year 2000;
    - land use 1:10000, year 2018;
    - forestry 1:25000, year 2013;
    - coast line, beach and anthropic elements (roads, buildings...) 1:5000, year 2007
- raster:
    - DTM 5m, year 2007;
    - LIDAR year 2008 definitively low quality due to problems in data acquisition and elaboration;

Satellite data (Copernicus Program) are also available but, due to the relatively small scale of the pilot areas, their spatial resolution is not suitable. Copernicus data may be useful for upscaling purposes.

LIDAR data acquisition has been already planned in the monitoring actions.

4.6.4 Preparatory actions for monitoring

Information on the (planned) monitoring / evaluation activities, refering to selected indicators and variables is presented in the following table:

Table 4-3 Portofino NBS variables that will be monitored during RECONECT, and used to evaluate NBS performance

	INDICATORS	VARIABLE to be monitored / evaluated	Do you posses baseline data on this variable ? (Yes/No, acc., to table 1.1)	Will it be monitored by you, or taken from other source	If already known, please provide details. Either on your external data source, or on your monitoring program (sensor type, time-interval of measurements, data formats, etc).				Please mention any innovative tools/methods that will be used (satellite data, drones, remote sensing)	Are you going to share this data within RECONECT ICT platform	Any other substantial information relevant to monitoring /evaluation aspects
					Data/monitoring Approach, Technique, sensor type, equipment,	Time interval	Data format	When (pre-construction, construction, post-construction)			
WATER	Landslide hazard	Precipitation (mm)	Yes	Data taken from official reports of ARPAL and from the new installations	Weather stations	hourly	.txt	Pre-construction and post construction phase	n/a	Yes	no
		Maintenance level of man-made terraces	No, only the extension of terraced areas is partially known	Will be monitored by project developer	LIDAR data to assess the real extension of terraced areas; aerial photo interpretation and field survey to evaluate conditions.		vector	Pre-construction and post-construction	LIDAR data and aero photo acquisition through drones	Yes	
		Dead trees in 20 m buffer areas along the hydrographical network	No	Will be monitored by project developer	Field survey		.	Pre-construction and post-construction		Yes	
		Land use	Yes	By the Regional Authority	Aerial photo interpretation			Post-construction		Yes	
		To be decided (slope angle, geology, Earthquakes)									
	Vulnerability	Land use	Yes	By the Regional Authority	Aerial photo interpretation			Post-construction		Yes	
		To be decided (Infrastructure									

		data, Population, Building/Housing)									
	Sediment deposition	To be decided (Suspended Solids (TSS), Total dissolved solid (TDS), Turbidity (NTU), Sediment Composition, Sediment Characteristics)									Evaluation by collecting samples and test in laboratory
NATURE	Changes in riparian habitat	Riparian habitat area (km2)	Yes	By the Park Authority and University of Genoa	Aerial photo interpretation and Field survey		vector	Pre-construction and post-construction		Yes	
	Changes in terrestrial habitat	Terrestrial habitat area (km2)	Yes	By the Park Authority and University of Genoa	Aerial photo interpretation and Field survey		vector	Pre-construction and post-construction		Yes	
	Change in vegetation along watercourses	Vegetation along watercourses (survey)	Yes	By the Park Authority and University of Genoa	Aerial photo interpretation and Field survey		vector	Pre-construction and post-construction		Yes	
	Conservation status of habitats	To be decided (Trends and status of range, Trends and status of the area, Structure and function including typical species, Future prospects)									
	Change in land cover	Land cover data		By the Regional Authority	Aerial photo interpretation			Post-construction		Yes	
	Change in land use	Compatible use of area			Remote sensing/land use map						

	Number and type of protected species	Type of protected species Number of protected species	Yes	By the Park Authority and the University Of Genoa	Field survey		.xls	Pre-construction and post-construction		Yes	
PEOPLE	Increasing recreational opportunities of NBS area	Number of recreation activity in the area	Yes	Will be monitored by project developer	Field survey		.xls	Pre-construction and post-construction		Yes	
		Length of improved path	No	Will be monitored by project developer	Field survey		.xls	Pre-construction and post-construction		Yes	
		water drainage improvement (n°)	No	Will be monitored by project developer	Field survey		.xls	Pre-construction and post-construction		Yes	
	Number of tourists	Number of tourists	Yes	Will be monitored by project developer	Automatic counter		.xls	Pre-construction and post-construction		Yes	
	Provision of NBS sites for education and research	To be decided (Number of student benefiting from education and research about NBS)									

	Reduced need for management and maintenance	Maintenance and management cost of grey infrastructures (if implemented)	Yes	Will be monitored by project developer	Survey		.xls	Pre-construction and post-construction		Yes	
		Maintenance and management cost of NBS									
	Loss of cultural heritage due to hydro-meteorological events/due to land take	Economic and properties loss during hydro-metrological events	Yes	Will be monitored by project developer	Survey		.xls	Pre-construction and post-construction		Yes	
		Cultural heritage loss									

4.6.5 Preparation of monitoring / evaluation

The monitoring program has been properly designed and when the indicators list will be approved, then the sensors will be purchased and installed.

Equipment have already been selected and installation sites decided.

Equipment acquisition requests the collection of 3 offers, according to public procurement rules and assuring the best value for money. RECONECT gives funds to the Portofino Park Authority to buy the sensors (depreciation over 5 years must be considered).

Permission for installation of sensors will be asked when needed, even if the installation has already been chosen even considering site properties and eventual limitations.

4.7 Links / Synergies to other NBS project and already established EU monitoring network/facitlities

4.7.1 Synergy with other projects on the NBS site

In the Portofino Park area are already installed two weather monitoring stations of the Regional Monitoring Network (ARPAL – Regional Environmental Agency). RECONECT is going to install additional stations in the catchments (and sub-catchments) where NBS interventions are implemented.

Since the Park is Regional Natural Park and Natura 2000 site, periodic monitoring of habitats and species is performed by Regional Authority for controlling and monitoring purposes.

Moreover, RECONECT is tightly connected with TRIG EAU project (INTERREG Maritime) working to decrease the geo-hydrological risk in the lower part of San Fruttuoso Basin. Hence collected data, results and experience from TRIG EAU are easily shared with RECONECT, in order to work in synergy and with a systemic approach.

Recently a link with the H2020 TerrACE project has been conducted and if they will include one of the pilot areas in their activities, all the data, information and evaluations will be shared.

4.7.2 Links to other NBS projects

One of the RECONECT sister project (UNALAB) is participated by the Municipality of Genoa and by IRE (Liguria Regional Agency for Energy and Insfrastructures), and has a pilot site in Genoa urban area (Lagaccio district). Genoa UNALAB demonstrator implies the requalification of an abandoned barracks (Gavoglio) in one of the most populated districts of the city, through the construction of an urban park adopting NBS also for mitigating geo-hydrological risk and runoff. RECONECT, focused on rural and peri-urban areas, is perfectly complementary to UNALAB. In such a way Genoa Metropolitan area is interested by two NBS demonstrators covering both problems of urban and peri-urban areas that can be taken as example and profitably reproduced in most of the Liguria Region.

4.7.3 Links / synergies to already established EU monitoring network/facilities

Copernicus (in particular Land Use services) provides data of interest for the monitoring and evaluation activities that will be carried out in the Portofino demonstrator. In particular data on land use, vegetation and related changes can provide useful information for monitoring over time.

However, the low spatial and temporal resolutions don't allow Portofino to use Copernicus data, since the Demonstrator works at a large scale and data won't be suitable to highlight changes and peculiarities considered in RECONECT.

But Copernicus data can be profitably tested and proposed for upscaling purposes and demonstration at Regional scale.

GIS-data source of potential interest:

- European data portal: https://www.europeandataportal.eu/data/en/dataset
- EU open data portal: https://data.europa.eu/euodp/data/dataset?
- INSPIRE geoportal: http://inspire-geoportal.ec.europa.eu/
- European Environment Agency: All physical geography and environmental topics (http://www.eea.europa.eu/data-and-maps#tab-datasets)
- EU-DEM: DEM covering the whole of Europe (https://land.copernicus.eu/pan-european/satellite-derived-products/eu-dem/eu-dem-v1.1?tab=mapview)
- European Climate Assessment and Dataset: Cloudiness, temperature, precipitation, humidity, pressure, snow and sunshine (http://eca.knmi.nl/)
- Gridded climatic data for North America, South America and Europe: (https://sites.ualberta.ca/~ahamann/data.html)
- Catchment Characterisation and Modelling: River basins, catchments and rivers (http://ccm.jrc.ec.europa.eu/php/index.php?action=view&id=24)
- JRC Water Portal: Water data from the EC Joint Research Centre (http://water.jrc.ec.europa.eu/)
- European Geological Data Infrastructure (EGDI): http://www.europe-geology.eu/map-viewer/
- OneGeology: http://portal.onegeology.org/OnegeologyGlobal/
- Corine Land Cover Map: Satellite derived land cover (https://www.eea.europa.eu/data-and-maps/data/clc-2000-raster-4)
- Copernicus land monitoring service: https://land.copernicus.eu/
- Copernicus atmosphere monitoring service: https://atmosphere.copernicus.eu/
- Copernicus emergence management service: http://emergency.copernicus.eu/
- Copernicus climate data: https://cds.climate.copernicus.eu/#!/home
- Sentinel Satellite Data: https://scihub.copernicus.eu/dhus/#/home
- ESPON Grid Data: Human geography indicators in gridded raster form across Europe (http://database.espon.eu/db2/resource?idCat=45)
- Europe in the World: Economy, demography and infrastructure (http://database.espon.eu/db2/resource?idCat=44)
- ESPON Urban Morphological Data: Urban areas for Europe including many attributes (http://database.espon.eu/db2/resource?idCat=43)
- European Urban Morphological Zones: Data derived from the CORINE land cover (https://www.eea.europa.eu/data-and-maps/data/urban-morphological-zones-2000-2)
- Esri Open Data: https://hub.arcgis.com/pages/open-data

- USGS Earth Explorer: http://earthexplorer.usgs.gov/
- OpenStreetMap: http://wiki.openstreetmap.org/wiki/Downloading_data
- FAO GeoNetwork: http://www.fao.org/geonetwork/srv/en/main.home

4.8 Connection to the RECONECT TeleControlNet data platform

Brief Information about the TeleControlNet data platform is presented in Section II Methodology of the report. INTER ACT will contact all Demonstrators to facilitate linking (monitoring) systems/data to the platform. The questions / discussions will be of a highly technical nature.

Name of the project team staff member (to be contacted by INTER ACT)

GISIG: r.molina@gisig.it (for ICT issues, considering also that GISIG is technical partner in WP3)

Parco Portofino: r.cavagnaro@parcoportofino.it

CNR-IRPI: gpaliaga@gmail.com

II. REPORTS ON PREPARATORY ACTIONS BY DEMONSTRATORS B

5 Demonstrator DB-1 Ijssel River Basin, The Netherlands

5.1 Status analysis

The river IJssel is in the east of the Netherlands and has a length of approximately 125 km. The National Water Authority (Rijkswaterstaat) started to commission the preparatory and implementation works on the Stroomlijn program in the IJssel basin in 2014. The contract was granted in November 2014 and aimed for all works to be completed in two years, before the end of 2016. In actual fact, the final permits where applied for in 2017, while the last field works where delivered in 2018.

The fieldworks mainly comprise of the removal of spontaneous growth of shrubs and trees that had developed over the years within the river banks, obstructing water flow in times of flooding. The works to be executed where geographically combined in more than 300 clusters. Initially an attempt was made to speed up the preparations by creating three different “tranches”. Clusters with little or no ecological constrains where combined in the first tranche. Clusters where extensive ecological fieldwork was anticipated where combined in the last tranche. Thus – in theory – allowing for a more or less continuous flow of work throughout the 125 km of the river basin.

However, because the planning for the total program was only two years, the advantages of the tranching did not occur. It would have been better if the total program had been split according to strict geographical boundaries, thus creating a more logical order in time and place of the works to be executed.

5.2 Non-technical preparatory actions & legislative aspects

Non-technical preparatory actions & legislative aspects are described here below in table format, providing information on relevant legislative aspects, procedures and/or permits

.

5.2.1 Summary information

Table 5-1 Ijssel NBS summary information on procedures and/or permits

Topic:	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
Spatial								
Spatial planning / land use change approval	Permit for divergent land use	public	municipality	Design of the works, check against current spatial plan	Couple of months	6 months; under coordination	contractor	Example-copy of municipal permit application is made available (NL1)
Land acquisition	Not applicable							
Archeology / heritage	Procedure integrated in regular permit	public	municipality	Design of the area where soil needs to be moved	Couple of months	6 months; under coordination	contractor	Example-copy of municipal permit application is made available (NL1)
Changing a waterworks	Projectplan Waterwet	public	National Water Authority (RWS)	Design of the works; assessment of (ecological impacts)	Couple of moths	6 months; under coordination	Commissioning agency	Example copy made available (NL2)
Environment								
Environmental permit	Not applicable							
Environmental Impact Assessment	Case-by-case assessment	public	National Water Authority (RWS)	Design of the works; assessment of (ecological impacts)	1 month	6 weeks, preceding the coordinated procedures	Commissioning agency	Is included as an appendix with the *Projectplan Waterwet (NL2)*
Social Impact Assessment	Not applicable							
Construction								
Building/construction permit	Not applicable							
Excavation permit	Excavation notification	public	Provincial authorities	Design of the excavations	1 month	2 weeks	contractor	No
Ecology/Nature								

Topic:	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
Natura2000: protected area's	Permit N2000	public	National and provincial authorities	Design of the works, elaborate ecological analysis	Out to 1 year	6 months; under coordination	contractor	Example copy made available (NL3)
Other protected ecological zones	National Nature Netwerk	public	municipality	Compensation plan	Couple of months	6 months; under coordination	contractor	No
Protected species	Exemption to disturb protected species	public	Provincial authorities	Species inventory and ecological impact assessment	Couple of months	6 months; under coordination	contractor	No
Tree felling permit	Permit to cut down trees	public	municipality	Design of the works	Couple of months	6 months; under coordination	contractor	No
Infrastructure								
Public roads: Road permit (temp or permanent roads)	Temporary use of driveway	public	municipality	Road map	1 month	6 months; under coordination	contractor	No
Existing rail road								
Existing waterways								
Existing (electrical) cables	Permission to work near E-cable	private	Electricity distributor	Design of the excavations	1 moths	Not regulated	contractor	No
Existing gas-pipes	Permission to work near gas-distribution grid	private	National gas distributor (gasunie)	Design of the excavations	1 month	Not regulated	contractor	No
Any other relevant procedures								
Contract that allows the use of the land	Approval to enter private property	private	Land owners	Description of the works to be carried out	Couple of months; subject to negotiations	Not regulated	contractor	Example copy made available (NL4)
Carrying out works near a dyke	Permit for working within the protective	public	Local water board	Description of the works to be carried out	Couple of months	6 months; under coordination	contractor	Example copy made available (NL5)

Topic:	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
	zone of a dyke							
Monitoring								
Data acquisition permits – private	Asking permission	Private land owners needed to be asked for permission to gather data on their land (e.g. for ecological field visits)	Owners	Na	Na	Na	Implementing party	no
Access to external data bases e.g. national database flora and fauna	Signing of suppliers conditions	Public. E.g. 'natuurloket'. Various institutions sharing data bases					Implementing party	
Drone permit	Required in the Netherlands but only in protected (or built) areas	Public. Not applicable in this project						

5.2.2 Descriptive information

5.2.2.1 Spatial

The primary procedure which made the works possible is the *Projectplan Waterwet*. Such procedure is needed under Dutch law if a structural change is intended in e.g. a river basin. In this case, the type of growth allowed in the river basin had not been regulated before, resulting in sometimes exuberant vegetative developments. One of the aims of the project was to formalize a vegetation map of the entire basin. On the basis of such a map, structural enforcement of pruning/cutting maintenance will become possible. In the past decades such maintenance had been neglected, partly from the point of view that a river basin also serves an important ecological purpose. As a result, the level of vegetation has developed to such an extent that the water flow became obstructed in times of flooding.

On the basis of the hydrological model of the river basin, the flowing zones where identified where abundant growth should be abolished and prevented. Outside the thus identified flowing zones, abundant vegetation can be present without substantial effects on the discharge capacity of the basin. In some cases, reshaping the outline of the bottom of the basin was needed to allow a lasting effect of the measures.

For each of the five tranches (with in total more than 300 clusters), a *Projectplan Waterwet* was written, describing the proposed work (cutting trees in some cases to be combined with local excavations) in combination with the outcome of the ecological and hydrological assessments. In addition, possible impact on landscape, archeological values and soil quality was reported.

5.2.2.2 Environment

Under Dutch legislation, the above described *Project plan Waterwet* can be preceded by an EIA, if a case-by-case assessment indicates that substantial environmental impact can be expected. Such a case-by-case assessment has been carried out for each of the five tranches that have been consequently filed for permitting.

The extent of the works anticipated has been summarized: in which clusters trees will need to be cut and where are excavation works anticipated that will ensure a lasting effect of the measures taken. The focus of the case-by-case assessments has been on possible ecological effects. The outcome of the ecological assessment has been that in some cases minor negative effects can not be excluded. However, in all cases measures could be taken to mitigate and/or compensate such effects. The execution of such measures is consequently ensured in the separate ecological procedures for each of the clusters involved. Apart from effects on protected bird nests, habitats of otters and/or beavers and the like, it was identified that excavation works to modify the basin-profile could in some cases affect the habitats of important invertebrate species such as slugs, crustaceans, dragonfly larvae, mosquito larvae and the like. In the course of the project an innovative technique was developed to mitigate such negative effects on invertebrates: submerged tree-trunks can serve as a good habitat for these species, thus preventing the negative effects of excavations on the quality of the aqua-ecological habitats.

5.2.2.3 Construction

In some area's the bottom of the basin of a meandering river is such that modern forestry equipment have limited or no access to the trees that need to be cut down. Part of the program was to identify the area's where a lasting accessibility needed to be created by reshaping the

basin's bottom locally. A formal excavation permit was not needed for these works. However, the effects of the proposed excavations on ecology, archeology and, especially the hydrological characteristics of the basin where investigated in the context of the *Projectplan Waterwet*.

Any change in the basin's profile may have an impact on the water flow characteristics, either adverse or beneficial. On the basis of expert judgments by an hydrological expert, sometimes supported by semi-quantitative assessments of the local effects of the proposed measures, the proposed measures were evaluated against the formal hydrological framework. Hydrological model calculations were not found relevant on this local scale.

The overall effects of the program, however, have been assessed using such model calculations.

5.2.2.4 Ecology

Ultimately, the Stroomlijn program in the IJssel basin comprised of works in more than 300 clusters. For each cluster a work-program was designed showing the current situation of the vegetation and the envisioned end-result. For the purpose of the ecological assessment of the proposed works, an ecological fact-sheet was made for each cluster, showing the ecological values present in the vicinity of the proposed works.

These fact-sheets have been the basis of all ecological evaluations. In case unacceptable ecological effects where foreseen, the scope of the works was adjusted in order to overcome such unintended ecological setbacks. Following the projects tranches, the applicable ecological dossiers where build up and shared with the appropriate authorities. Based on their initial evaluation of the ecological assessments, adjustments were made to the scope of the proposed works in order to meet the comments of the appropriate authorities.

Following this procedure, in all cases we have been successful in building files in which significant effects on Natura2000 were ruled out. Also unintended disturbance of the population of any protected species was either prevented or mitigated, based on the prevailing ecological protocols.

If needed, also a municipal permit for cutting trees was applied for.

5.2.2.5 Infrastructure

As part of the regular preparations, an inventory was made of the presence of (electrical) cables and pipelines, using the national database. Due to the high costs of restructuring such cables and/or pipelines, the presence of such infrastructure has dictated the proposed works: go around them instead of facing them.

The (de)mobilization of the equipment has also been an issue during the preparation. The contractor involved did not have much experience with (de)mobilization of the equipment by boot. Also, using temporary jetties for this purpose imposes severe restrictions in the planning of the works during the high water season. Therefore, all (de)mobilization was done on wheels, using as much as possible existing roads. In some cases, if no existing roads where nearby, (de)mobilization needed to take place using the main dykes of the basins winter bedding. For such activities permits have been applied for with the local water boards which have the authority to manage this part of the infrastructure.

5.2.2.6 Monitoring

Due to the extent of the project area (along the full 125 km of the river IJssel) and the number of locations (more than 300 clusters), a GIS database was built to manage the project. One of the main aims of the database was to manage the design proposals during the preparation phase. During the implementation phase, the database served as an on-line tool for the working instructions. Also, the applicable permits were filled in this database.

As with all administrative systems, the quality of the data-output is closely related to the quality of the data-input. During the course of the project it showed to be a challenge to keep the content of the database up-to-date.

5.3 Planning of legislative prepatory actions

The biggest challenge of the design process was to combine the protection of prevailing ecological values with the hydrological restrictions from the river basin while appropriately addressing the interests of the local landowners and other stakeholders.

The aim of the project was to clear the flowing zone of the Ijssel basin of its vegetation, unless other values were shown to be of preponderant interest. During the design process such preponderant interests were put forward by different stakeholders, resulting in the need to adjust several times the initial design. Issues to be solved were a) the hydrological effects of local excavations, b) the impact on invertebrate habitats caused by clear cut banks due to lack of shade, c) unexpected presence of protected species, d) impact of removing vegetation on historical landscape patterns.

It took a relative large effort to solve the hydrological issues. This is a very specific niche of expertise where the guidelines leave room for interpretation. To address the matter of the unwanted impact on the invertebrate habitats along the riverbanks that preferably be cleared of all vegetation took an innovative approach: leaving a limited number of single trees on the riverbanks allows for decreased flow resistance while the beneficial shading effects remain, preserving the habitat quality in the water.

5.4 RECONECT Knowledge exchange. Lessons learned.

In the initial plan of works, a period of two years had been made available for consequently the design process, the permitting process and the actual execution phase. In an attempt to create an early stock of work, a number of clusters was selected where little or no design restrictions were anticipated. The initial plan of works allowed for a three month interval between the sub-sequential tranches. During the permitting process, unexpected design restraints came up in some of the clusters. This disturbed the intended 3 months interval between the tranches. The permitting process thus resulted in a random order of execution within the basin. It would have been more transparent to the public (and the contractor as well as the authorities) if the complete program had been applied for on the basis of one single *Projectplan Waterwet*. Alternatively, to reduce the scope of work within each file, the transparency of the permitting process could have been improved by combining the clusters on the basis of their geographical position into three or four subsequent *Projectplannen Waterwet*.

5.5 Information on copies of permits / approvals

Examples and copies of permits are available attached to this document in Section III Copies of permits.

5.6 Preparatory actions for monitoring

5.6.1 Overal Assesment

The Ijssel River basin project ('Stroomlijn") is implemented under the banner of the 'Room for the River' Programme. Room for the River involves large scale (NBS) measures increase river discharge during periods of high water levels and improve water safety.

Stroomlijn 'Ijssel' is aimed at the removal of vegetation (forest, shrubs) which forms a barrier for the discharge of river water. If the water flows into the floodplains, vegetation can impede the water flow, leading to a raise in water levels and an increase of the flood risk. In project 'Stroomlijn' roughly 300 ha of vegetation types are removed / maintained at the river floodplains, and transformed into vegetation types that allow for better water discharge and reduce maintenance costs.

As the project involved many geographical sections, designs, stakeholders, legislations etc. the work process, and deliverable output (designs, reports, etc.) was automated. The input of data was streamlined by converting and linking all information into geographically tagged information, and data was managed in a 'Geographic information model' (GIM) using GIS software.

The GIS uses an SQL server, storing all info, including regular back-ups. Data-input was coordinated by GIS engineers, who assisted the 'specialist' (e.g. ecologist, stakeholder manager, and soil specialist) on importing and storing their data in the model. In GIS all data could be over-layed (e.g. legislative zones, nature protection areas the presence of landscape types, but also beavers, non-exploded ordinance, etc. land owner data and interview results were also included). This allowed the project staff to make landscape designs that fulfilled the conditions of all project aspects.

The model was thus used for data management, design, but also project implementation (during execution, the model was available on tablets), and model exports were used for reporting, monitoring and evaluation by the commissioner Rijkwaterstaat (Dutch water authorities, RWS).

The Stroomlijn Ijssel project itself did not involve hydrological data. However, the project was commissioned by RWS based on hydrological data.

As part of RECONECT, additional innovative hydrological measurements are taking place. The results are now being discussed with Dutch Water Board Rijkswaterstaat, coordinator of The Room for the River Program which involves large scale measures (for example parallel waterways, shortcuts, and by-passes) to increase the discharge of river water during periods of high water levels.

5.6.2 Baseline monitoring data (available before RECONECT start)

Details regarding monitoring and evaluation aspects, available Information/Data/Tools, are presented here in table format.

Table 5-2 Ijssel NBS available baseline (monitoring) data before RECONECT

	INDICATORS	PARAMETER / VARIABLE (Baseline data available) (Check"Indicator Selection Tool")	Please mention data source (measured/monitored by you, or taken from other source)	What kind of sensors have been used	Please provide the period of measurements	Please provide time interval of measurements	Please mention the format of data files	Any other important information relevant to monitoring /evaluation aspects
	Surface Run-off Reduction	Precipitation (mm)	Data taken from official reports of KNMI	Automatic Weather Stations	Data available over 100 years, depending on KNMI station	Measured on daily/hourly basis depending on station	Stored in XLS files	Statistics available for Extreme value/Return periods, applicable to flood hazard simulation/forecast
	Slowing and Storing Run-off	Precipitation (mm)	Data taken from official reports of KNMI	Automatic Weather Stations	Data available over 100 years, depending on KNMI station	Measured on daily/hourly basis depending on station	Stored in XLS files	Statistics available for Extreme value/Return periods, applicable to flood hazard simulation/forecast
WATER	Flood Hazard (such as The Rhine and Ijssel delta experiences annual flooding. In 1993 and 1995, floods threatened to devastate surrounding regions of the delta.)	Digital elevation model	Data provided by the State in GIS format	n/a	2011	n/a	GIS (raster)	
		Flow speed during a normative flood	Data provided by the State in GIS format	n/a	2014	n/a	GIS (point)	
		'Stroombaan' – river flow path	Data provided by the State in GIS format	n/a	2014	n/a	GIS (polygon)	The 'Stroombaan' river flow path was a area within the project area where water would flow faster than 1m/s during a normative flood. Vegetation within this area was focused on.
		River discharge (m3/s)	Data taken from reports of RWS hydrology station, located close to NBS site	Not known	Data available for a couple of years	Measured on daily basis	XLS and DAT (ASCII)	Numerical models (river hydrodynamic) available to serve as evaluation tool
		Flood depth (m)	Regular monitoring is performed by Rijkswaterstaat and partners (such as Deltares) and data is shared on platformed	Not known	Data available for a couple of years	Measured on daily basis	From website	https://waterinfo.rws.nl/#!/nav/bulkdownload/huidige-selectie.

		Vegetation growth	Data taken from reports and vegetation monitoring website of RWS	Satellite data	From a couple years back	Updates sync with satellite image data (>3 days)	From website	https://www.openearth.nl/vegetatiemonitor/
	Flood Peak Reduction	Digital elevation model	Data provided by the State in GIS format	n/a	2011	n/a	GIS (raster)	
		Flow speed during a normative flood	Data provided by the State in GIS format	n/a	2014	n/a	GIS (point)	
		'Stroombaan' – river flow path	Data provided by the State in GIS format	n/a	2014	n/a	GIS (polygon)	The 'Stroombaan' river flow path was a area within the project area where water would flow faster than 1m/s during a normative flood. Vegetation within this area was focused on.
		Precipitation (mm)	Data taken from official reports of KNMI	Automatic Weather Stations	Data available over 100 years, depending on KNMI station	Measured on daily/hourly basis depending on station	Stored in XLS files	Statistics available for Extreme value/Return periods, applicable to flood hazard simulation/forecast
		River discharge (m3/s)	Data taken from reports of RWS hydrology station, located close to NBS site	Not known	Data available for a couple of years	Measured on daily basis	XLS and DAT (ASCII)	Numerical models (river hydrodynamic) available to serve as evaluation tool
		Flood depth (m)	Regular monitoring is performed by Rijkswaterstaat and partners (such as Deltares) and data is shared on platformed	Not known	Data available for a couple of years	Measured on daily basis	From website	https://waterinfo.rws.nl/#!/nav/bulkdownload/huidige-selectie.
		Vegetation growth	Data taken from reports and vegetation monitoring website of RWS	Satellite data	From a couple years back	Updates sync with satellite image data (>3 days)	From website	https://www.openearth.nl/vegetatiemonitor/
NATURE	Changes in riparian habitat	Location of protected species	NDFF (national database flora and fauna)	n/a	All data available until 2018	n/a	GIS (point)	
	Changes in aquatic habitat							
	Change in wetland habitat							

	Changes in terrestrial habitat							
	Conservation status of habitats							
	Restricted-range species							
	Number and type of protected species							
	Change in location of habitat boundaries	1) Vegetation cover (vegetation types divided in 4 classes) 2) Vegetation growth	1) Data provided by the State in GIS format 2) Data taken from reports and vegetation monitoring website of RWS	1) n/a 2)Satellite data	1) 2011 2) From a couple years back	1) n/a 2) Updates sync with satellite image data (>3 days)	1) GIS (polygon) 2) From website	2) https://www.openearth.nl/vegetatiemonitor/
	Change in vegetation along watercourses							
	Shoreline characteristics and erosion protection							
	Change in land cover							
	Change in land use							
PEOPLE	Loss of cultural heritage due to hydro-metrological events/ due to land take	Monumental trees	Data provided by the State in GIS format	n/a	-2018	n/a	GIS (point)	
		Monumental trees	Data provided by the State in GIS format	Periodic updates by the provider	n/a	n/a	GIS (polygon)	
	The number of people communicate with neighbourhood in the NBS area	Ownership Kadaster data	Data provided by the State in GIS format	Periodic updates by the provider	n/a	n/a	GIS (polygon)	

5.6.3 Geographical information, GIS data

Since the client was the Dutch state, the project had access to almost all data available in the Netherlands. Because of the reliance of GIS in the project, all data made available was also in GIS format (raster or vector) The base data consisted of:

- Aerial photographs (2011-2018)
- Historic maps (1850-2018)
- Land use
- Land cover
- Digital elevation model (AHN2)
- Boundaries (province, waterboard, etc.)
- Protected zones (ecology, other projects, permitted areas, etc.)

5.6.4 Preparatory actions for monitoring

Information on the (planned) monitoring / evaluation activities, refering to selected indicators and variables is presented in the following table:

Table 5-3 Ijssel NBS variables that will be monitored during RECONECT, and used to evaluate NBS performance

	INDICATORS	VARIABLE to be monitored/evaluated	Do you posses baseline data on this variable ? (Yes/No, acc., to table 1.1)	Will it be monitored by you, or taken from other source	If already known, please provide details. Either on your external data source, or on your monitoring program (sensor type, time-interval of measurements, data formats, etc).				Please mention any innovative tools/methods that will be used (satellite data, drones, remote sensing)	Are you going to share this data within RECONECT ICT platform	Any other substantial information relevant to monitoring /evaluation aspects
					Data/monitoring Approach, Technique, sensor type, equipment,	Time interval	Data format	When (pre-construction, construction, post-construction)			
WATER	Surface Run-off	Precipitation (mm)	Yes	Data will be taken from official reports of National Center of Meteorology & Hydrology, UK	Equipment of the National Center	daily	.XLSX	Construction and post construction phase	n/a	Yes	no
	Slowing and Storing Run-off	Precipitation (mm)	Yes	Data will be taken from official reports of National Center of Meteorology & Hydrology, UK	Equipment of the National Center	daily	.XLSX	Construction and post construction phase	n/a	Yes	no
		To be decided (Roughness coefficient, Storage capacity)									
	Flood Hazard	Flood depth (m)	No	Will be monitored by project developer, (Name)	Not yet available			Only pre-construction and post-construction	Satellite data will be used during flood period only	Yes	Delft 3D will be used as a Hind-cast model to provide baseline data. All data will be shared in RECONECT ICT platform;
		River discharge (m^3/s)	Yes	Will be monitored by Rijkwaterstaat on frequent basis In detail monitoring by Reconect. Two times (2 days)	ADCP "River Surveyor"/Son Tek will be installed at NBS location	hourly	.MAT	Only during construction	*The discharge and wet perimeter will be measured using an ADCP (Acoustic Doppler Current Profiler) attached to a Jet-ski* Innovative software interface will be used to exchange between field survey - numerical model data formats	Yes	MIKE'21 FM/HD numerical model will be used to quantify discharge in neighboring areas of interest

		Indication flow velocity and *cross sections*	Yes	Monitoring by us. Two times (2 days)	Aerial drone with Global Navigation Satellite System (GNSS) GPS device	Try out 2 days	.XLSX	Post construction	*The measurements will be made by an aerial drone to map the dry flood plains next to the river. A DSM (digital surface model) can be made by processing the pictures with photogrammetry software. We will also experiment with using an aerial drone to try to estimate the surface flow velocity The width of three cross sections will be measured with a total station as well as a high-end Global Navigation Satellite System (GNSS) GPS device. This will also allow us to measure the water surface slope over a section of 300 meters*	Yes	
	Flood Peak Reduction	Flood depth (m)	Yes	Will be monitored by project developer, (Name)	Not yet available			Only pre-construction and post-construction	Satellite data will be used during flood period only	Yes	Delft 3D will be used as a Hind-cast model to provide baseline data. All data will be shared in RECONECT ICT platform;
		River discharge (m^3/s)	Yes	Will be monitored by Rijkwaterstaat on frequent basis In detail monitoring by Reconect. Two times (2 days)	ADCP "River Surveyor"/Son Tek will be installed at NBS location	hourly	.MAT	Only during construction	*The discharge and wet perimeter will be measured using an ADCP (Acoustic Doppler Current Profiler) attached to a Jet-ski* Innovative software interface will be used to exchange between field survey - numerical model data formats	Yes	MIKE'21 FM/HD numerical model will be used to quantify discharge in neighboring areas of interest
		Indication flow velocity and *cross sections*	Yes	Monitoring by us. Two times (2 days)	Aerial drone with Global Navigation Satellite System (GNSS) GPS device	Try out 2 days	.XLSX	Post construction	*The measurements will be made by an aerial drone to map the dry flood plains next to the river. A DSM (digital surface model) can be made by processing the pictures with photogrammetry software. We will also experiment with using an aerial drone to try to*	Yes	

									estimate the surface flow velocity The width of three cross sections will be measured with a total station as well as a high-end Global Navigation Satellite System (GNSS) GPS device. This will also allow us to measure the water surface slope over a section of 300 meters		
	Change in location of habitat boundaries	Vegetation cover (vegetation types divided in 4 classes)	Yes	Monitored by project	check with aerial photographs check by talking with owners check by field research	Continuous	GIS	Pre-construction, construction, post-construction	A pilot was done for the use of drones. This was successful, but no funds were available for implementation.	No	
	Change in vegetation along watercourses										
	Shoreline characteristics and erosion protection										
	Change in land cover										
	Change in land use										
	Changes in riparian habitat	Protected species and their habitat/feeding area Water quality and underwater ecoscan	Yes	1) Monitored by project External input by connected databases 2) Monitoring by us. Two times (2 days)	1) Monitored in the field by ecologists. Yearly input of new data with a database connection with NDFF 2) Monitored in the field by ecologists. Yearly input of new data with a database connection with	1) Continuous 2) Try out 2 days	1) GIS 2) XLSX	1) Pre-construction, construction, post-construction 2) Post construction	*2) we used an underwater drone equipped with water quality sensors to map the quality parameters of a section of the river.*	2) yes	2) www.indymo.nl
	Changes in aquatic habitat										
	Change in wetland habitat										
	Changes in terrestrial habitat										
	Conservation status of habitats										

	Restricted-range species Number and type of protected species				NDFF						
	Number, area, location, of invasive non-native animal and planted species that are threatening to ecosystem, habitats or species	Locations of invasive species									Evaluated through field check by ecologist
PEOPLE	Loss of cultural heritage due to hydro-metrological events/ due to land take	List and locations of culturally valuable hedgerows and trees									Through field check, talks with landowners and historical analyses by historical geographer
	Reduced need for management and maintenance	Land use in m2 design principles, focused on lower maintenance									Through field check with landowners
		Wishes and permissions of landowners	no	monitored	Talks with land owners	4 times during the project. Interval differs per owner	GIS	Pre-construction, construction, post-construction	Talk with owners were connected to their land in GIS. Team members were able to see the data of owners by clicking on their land in GIS.	No	
	Change in land and/or property values	list of areas were subsidies were received by land owners									Through talks with owners

5.6.5 Preparation of monitoring / evaluation

"Stroomlijn" is a sub-project in the 'Room for the River' program and aims to remove vegetation (forest, shrubs) that forms a barrier to the discharge of river water. These vegetation types will be transformed into agricultural vegetation types. The program is split into 5 separate regional projects. Tauw is responsible for the River IJssel. The project includes 250 ha of vegetation in a stretch of approx. 100 km of river with 400 owners and 16 local authorities. For in detail analyses of remote sensing possibilities the next monitoring methods are prepared and will be evaluated. The high-quality equipment to be employed is listed below.

- The width of three cross sections will be measured with a total station as well as a high-end Global Navigation Satellite System (GNSS) GPS device. This will also allow us to measure the water surface slope over a section of 300 meters.
- The measurements will also be made by an aerial drone to map the dry flood plains next to the river. A DSM (digital surface model) can be made by processing the pictures with photogrammetry software. We will also experiment with using an aerial drone to try to estimate the surface flow velocity.
- The discharge and wet perimeter will be measured using an ADCP (Acoustic Doppler Current Profiler) attached to a Jet-ski.
- Finally we will use an underwater drone equipped with water quality sensors to map the quality parameters of a section of the river.

The results are now being discussed with Rijkswaterstaat. The Room for the River is a project coordinated by the Dutch Water Board (Rijkswaterstaat) which involves large scale measures (for example parallel waterways, shortcuts, by-passes) to increase the discharge of river water during periods of high water levels.

5.7 Links / Synergies to other NBS project and already established EU monitoring network/ facilities

5.7.1 Synergy with other projects on the NBS site

The project Stroomlijn had overlap with other (local, Dutch) projects, e.g. nature development projects. In some cases, other projects focused on the same goal (lower flood water levels), were prioritized, and excluded from Stroomlijn. In other cases, the other projects data was used in Stroomlijn (ecological data), or the plans were incorporated in the Stroomlijn project design.

The project overlapped with dozens of other landscape/nature/water projects. They were all dealt with differently, in alignment with the commissioner, the Dutch water authorities (RWS).

5.7.2 Links to other NBS projects

Stroomlijn Ijssel was part of the larger 'Room for the River' Ijssel program. Limited communication took place between subprojects of 'Room for the River'. Project members have contact with INTERREG Project WaterCoG where water quality improvement is achieved by improving governance.

5.7.3 Links / synergies to already established EU monitoring network/facilities

N/A

5.8 Connection to the RECONECT TeleControlNet data platform

Brief Information about the TeleControlNet data platform is presented in Section II Methodology of the report. INTER ACT will contact all Demonstrators to facilitate linking (monitoring) systems/data to the platform. The questions / discussions will be of a highly technical nature.

Name of the project team staff member (to be contacted by INTER ACT):

Floris Boogaard, Nils van der Vliet

6 Demonstrator DB-2 Inn River Basin, Austria

6.1 Status analysis

In the Geroldsbach catchment, a number of measures was implemented over the last 100+ years. Among numerous installations and improvements of technical measure, NBS measures are implemented. The most significant one dealt with in this project is the afforestation of parts of the catchment in the 1950ies. The construction of NBS was under the responsibility of the WLV (Wildbach und Lawinenverbauung; Torrent and Avalanche Control Unit of the Ministry).

In the following, a brief overview is given with regard to the history of implementations and plannings made.

The construction of control structures of Geroldsbach started in 1908:

- Construction of protection wall by state construction
- Construction of an 8m barrier at the valley exit
- Elaboration of a general project which suggested securing the large failure scars by a number of transverse works in connection with drainage and ground stabilisation works. In addition the existing barrier should be increased and an additional barrier should be constructed (estimated investment 157.000 crowns). The project was not realized due to the war.
- 1950 development of a new project consisting of a gravity damn and greening of failure scars (estimated investment 340.000 ATS)
- 1950-1955: Sloping of the ‘Großen Blaike’ (subbasin), 107 drainage creeks, 2 supporting structures, 8 walls, 3ha greened and fenced (to protect from animals), multiple river bed stabilization bands (investment 455.000 ATS)

An investigation of in 1959 showed, that the biological measures were successful, especially when combined with technical measures. It was decided that the project should continue:

- Rounding of fracture edges, sloping of failure scar surfaces
- Greening and goat willows
- 2 concrete barriers
- Reforestation with larches and fencing
- Increase of the debris retention barrier to 2.500 m³
- Construction of 7 concrete barriers at the ‘Bärenmaisblaike” (subbasin) in case of a deterioration

(Investments 2,3 Mio ATS)

The afforestation of the "Große Blaike" was planned along with a retention wall in the main channel in 1962. Still, in the construction approval from 1970 the foreseen afforestation and greening was mentioned as "not realized". Legal background was, that the works actually did not take place in frame of the WLV based project, but were started much earlier (around 1952) initiated by a WLV employee (Hassenteufel). The financing was realized in frame of the ERP (European Recovery Program) of the Marshall Plan Foundation until approx. 1960. Thus, NBS (afforestation and greening) and technical solutions were realized in parallel.

In April 2010 an investigation of the 'Großen Blaike' by Stern and Markart (2010) showed the bioengineering measures of the 60ies were partly successful but require continuous maintenance. The continuous combined operation of natural and technical measures was suggested.

The exact areal extends is planned to be evaluated within the project. Similar urban extends are evaluated for past situations. Both rely on series of areal photogrammetry being earliest available in the 1950ies.

Due to the long history of the NBS implementations, rare information on permits, problems during that implementation or commissioning procedures are available. In fact, most of the today legal act associated with the implementation of such did not exist at that time.

Thus, in the following description regarding permits and legal procedures, not only the past situation is described. In addition, the current legal situation is described as if the implementation procedure would take place today following today's legal requirement applying when WLV is realizing such projects.

Literature:

Stern R. and Markart, G. (2010), Exkursionsführer zur Lehrveranstaltung „Hangstabilisierung mit naturnahen Bauweisen", im Rahmen des ULG „Schutztechnik im Alpinen Raum"; Innsbruck 2010.

6.2 Non-technical preparatory actions & legislative aspects

6.2.1 Summary information

The measures are implemented by a public authority (https://www.bmnt.gv.at/forst/wildbach-lawinenverbauung/organisation-kontakt/SektionTirol.html), which works in frame of the given Austrian and EU legislation. Still, the NBS have a history of more than 100 years (see above) at which the legislative boundaries were adapted constantly. Detailed information about non-technical boundaries (the affected law's, legal implementation procedures.) are not available for past situation. In fact most of the today's given laws did not exist at that time. Therefore, the current situation is described additionally.

Table 6-1 Inn River Basin NBS summary information on procedures and/or permits

Topic:	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
Spatial								
Spatial planning / land use change approval	Afforestation *[no legal procedure required]*	private procedure, only permission of the owner is needed. A specific application is not needed; Still the applied tree species are required to meet certain standards/types stated in the *[forstliche Pflanzenliste-Datenbank zugelassener Saatguterntebestände]*	District Forest Authority (*Bezirksforstinspektion*) as part of the forest authority of the state of Tyrol.	The selected tree species have to agree with specification given in the standards/types set in the plant/tree list of the forest state authority of Tyrol *[forstliche Pflanzenliste]*	0-1	0-1	no legal application needed; Responsibility at the Community or the WLV (operating on behalf of Community)	
Land acquisition	Land acquisition as part of afforestation	Public and Private procedure	Land owner Usually, as in this NBS, the acquisition of land is not an issue. For afforestation, only the permission of the owner is required. Only in rare cases, the land is bought by the community from privates before the legal procedure is started.	none	1	1	Community	
Environment								
Environmental permit Applicability: Did not exist at NBS realization (1950) Today: Applicable; only required for technical measure additional measures	Tyrolean nature conservation law (TNG 1975 i.d.g.F., Tiroler Naturschutzgesetz 1975 i.d.g.F.)	public procedure	State of Tirol, District Administration (e.g Innsbruck Land, Innsbruck, Reutte,..)	Not required for the afforestation itself, but for other technical measures built along with the NBS ; technical specification of the required measures (e.g fascines, slope adaptation, stabilization)	3-6 months	3 months	Community, WLV (on behalf of Community)	

Environmental Impact Assessment Applicability: At NBS realization (1950): act not formulated yet Today: Applicable only for certain size	UVPG-2000 Usually not applicabale, applies at area larger than 10ha (in special situation >3ha)							
Social Impact Assessment								
permit under the Water Act WRG 1959 Applicability: At NBS realization (1950): Did not apply, specific paragraphs of the act not formulated yet Today: applicable for add on measures	Water Act (Wasserrechtsgesetz, WRG 1959 i.d.g.F.)	public	1. (1st instance) District (Bezirksbehörde) 2. Administrative court 3. Federal court	Not required for the afforestation itself, but for other technical measures design along with the NBS (e.g. fascines, slope adaptation, stabilization, Berms, Krainer wall slope grate)	3-6 months	3 months	Community, WLV (on behalf of Community)	
Building/construction permit At NBS realization (1950): Did not apply, act non existing at that time Today: not applicable	Is covered within the permits granted under (1) the Water Act WRG 1959 i.d.g.F. and/or (2) Tyrolean nature conservation law (TNG 1975 i.d.g.F., Tiroler Naturschutzgesetz 1975 i.d.g.F.)	public		none	3-6 months		Community, WLV (on behalf of Community)	
Excavation permit/disposal procedure At NBS realization (1950): Did not apply, act non existing at that time Today: Potentially applicable depending on geogenic backround.	Tyrolean Waste Management Act 2007 (Tiroler Abfallwirtschaftsgesetz 2007)	public	State of Tirol, District Administration (e.g Innsbruck Land, Innsbruck, Reutte,..)	Type and intensity of pollutant background in the excavated material	3-6 months			
Ecology/Nature								
Natura2000: protected area's	Does not apply							
Other protected ecological								

zones								
Protected species Did not exist at NBS realization (1950) Today: Potential conflicting interest when open area (vertical open soils) are greend. Blocking of sand bees, etc.	Tyrolean nature conservation law (TNG 1975 i.d.g.F., Tiroler Naturschutzgesetz 1975 i.d.g.F.	public	BH IBK Land	For the afforstation measure itself, no application is required; still, potential conflicts araise when interests of protected species are vialoated; Usually the interest of species violation is considered less important compared to the flood risk / nat hazard risk reduction. Still, requirements for compensation measures are the case.	2 months	3 months	Community, WLV (on behalf of Community)	no
Tree felling permit	Does not apply							
Infrastructure								
Public roads: no public roads in the area construction of temporary private roads for construction need a permit At NBS realization (1950): Did not apply, act non existing at that time Today: according to ForstG 1975.	Forestry Law 1975 (ForstG 1975 i.d.g.F Forstgesetz)	public	1. (1st instance) District (Bezirksbehörde) 2. Administrative court 3. Federal court	planning and design of roads	2 months	3 months	Community, WLV (on behalf of Community)	no
Monitoring (within Reconect, no monitoring during construction of NBS)								
Data acquisition permits (e.g. Metrological and Gauging Data Series)	Water Act (Wasserrechtsgesetz , WRG 1959 i.d.g.F.)	public	Owner of the data: (1) HZB - Hydrographic services of the Ministry (and its state offices) (2) ZAMG (Zentralanstalt für Meteorlogie und Geodynamic) Austrian Central Institute for Meteorology and Geodynamics	No permit procedure required. In the data request, the use and application is to be stated. No costs apply to the data itself whereas handing may be charged.	<1 month	<1 month	User of the data (can be RECONECT Partner, Community,...)	

			(3) Austro Control GmbH (Austrian Civil Aviation Control)					
Water data/monitoring permit	only Permit according to Water Act (Wasserrechtsgesetz, WRG 1959 i.d.g.F.) for gauge required if water course is disturbed by means of e.g. lateral constructions	public	1. (1st instance) District (Bezirksbehörde) 2. Administrative court 3. Federal court	extend of the measure, description of location, size, equipment,	1	1	owner of gauge	planned action within the project - depending on support of the Community of Götzens
Nature data/monitoring permit / no permit required for Monitoring within the Project e.g. Leaf Area index, Stem Area index, Stem number	None							
Nature data/monitoring permit no permit required for monitoring within the RECONECT project monitoring of Forest state and stability is required by law covering the permanent visual inspection of afforestation NBS	Tyrolian Forest Law 2005	public participation/procedure	Local community/Mayor is request to monitor the state of the forst located at the communities area	permanent regulation which requires				
Meteo data/monitoring permit	none							
Access to external data bases	no permits required, assess granted upon request							
Drone permit	Luftfahrtgesetz LFG, 1957 idgF. (Civil Aviation Act 1957)	public	Austro Control GmbH	Drone Class, Requested operational area (populated, unpopulated, details on the max speed of the drone, maximum altitude, operational safety under low pressure circumstances, Name and ID of pilots operating, Insurance number and documents,	3 months	2 months (permission duration (1 year)	Drone owner/operator	

6.2.2 Descriptive information

6.2.2.1 Spatial

Spatial planning / land use change approval

For the affrestation as NBS as such, no legal procedure is foreseen. It is private procedure, concerning the land owner who has to grant permission on planting and growing new plant on his land. With regard to legal boundaries, only the compliance with the list of allowed tree species *[forstliche Pflanzenliste]* is required. Although no required application is the case, it is beneficial to inform the District Forest Authority *[Bezirksforstinspektion]* as part of the forest authority of the state of Tyrol. No time constrains are expected neither for planning nor legal approval. The responsibility is with the Community, respectively the WLV (operating on behalf of the Community)

Still, involving the WLV is of interest due to the knowledge at WLV given (management of the project). Beyond that, the funding of measures within the Act for funding of hydraulic structures (Wasserbautenförderungsgesetzes 1985 (WBFG)). Measures funded are required to meet the state of the art of technical measures.

Land acquisition

Land acquisition is not generally required. In case of land being not already owned by the community itself, the allowance can be granted by the land owner. In case the benefits given (forest planting) are not sufficient for granting allowance other contracting can be realized (civil agreement). The acquisition (owing) of land is not required, but can be an alternative.

In case of this NBS, the required land was already in possession of the community.

6.2.2.2 Environment

Environmental legislation

In general, following laws of the Austrian legislation (with EU laws implemented) apply today when realizing structures, measures or similar at or in the close proximity to water courses.

- Austrian Water Act (Wasserrechtsgesetz , WRG 1959 i.d.g.F.)
- Forestry Law 1975 (Forstgesetz 1975)
- Torrent Control Act (Wildbachverbauungsgesetz) 1884
- Tyrolean nature conservation law (TNG 1975 i.d.g.F., Tiroler Naturschutzgesetz 1975 i.d.g.F.)
- Tyrolean Waste Management Act 2007 (Tiroler Abfallwirtschaftsgesetz 2007)

All acts in common is, that non of them (except the Torrent Control Act, 1884) existed at the time of implementation of the NBS in the Geroldsbach. Still, also today the afforestation itself does not require any permit what so ever. Any side measures required to e.g. to stabilize slopes (Krainer wall, fascines, slope adaptation, etc.) are subject to permitting.

Environmental Impact Assessment (EIA)

The Environmental Impact Assessment (EIA) procedure according to the UVP 2000 (Bundesgesetz über die Prüfung der Umweltverträglichkeit (Umweltverträglichkeits-prüfungsgesetz 2000 – UVP-G 2000)) summarizes the different acts associated in a single stop procedure including the public participation in the progress.

For the afforestation and greening as an NBS no general requirement exists for the application

of the Environmental Impact Assessment (EIA) procedure. The application of the UVP-G 2000 for afforestation is applicable for continuously connected project areas larger than 10 ha.

6.2.2.3 Construction

Building/construction permits:

Construction permits of hydraulic structure go along with environmental/water law related permits and are not handled separately. Building / construction permits are covered therein by the Austrian Water Act 1959 permitting procedure and do not require additional / parallel permitting.

Other than the usual order of instances, the mayor is not the first instance. In frame of the Austrian Water Act (and related law material) the first instance is the District (Bezirksbehörde) followed by the Administrative court and the Federal court.

At NBS realization (1950), the Austrian Water Act was not in force and did therefore not apply. Today, the law is potentially applicable for realizing parallel construction (e.g. slope adjustments, supporting technical measures,...).

Excavation permits

Excavation permits for construction of building/hydraulics structure are usually part of the before described permits. Beyond that the Tyrolean Wastemanagament law applies with regard to the handling and disposal of the excavated material.

At NBS realization (1950), the Tyrolean Wastemanagement act was not in force and did therefore not apply. Today, the law is potentially applicable depending on geogenic backround of the excavated material.

6.2.2.4 Ecology

Natura 2000

No Natura 2000 or other protected area is in the catchment area nor in the close proximity.

Protected Species

The protection of species is covered within the Tyrolean nature conservation act (TNG 1975 i.d.g.F., Tiroler Naturschutzgesetz 1975 i.d.g.F.). An adverse side effect of greening and afforestation can be, that open soil structure (vertical wall) are closed (greened in case of the NBS afforestation and greening). Species such as sand bees etc. may face adverse effects.

In generally, the Tyrolean nature conservation act requires comparing the importance of the different aspects linked to the public interest. Any ecologically adverse effects are to be compared to the benefit created by the flood risk reduction. In most cases, potential conflicts arising due to the violation of protected species are considered less important as long as compensation measure can be realized. These compensation measures are part of the permitting procedure and are usually mandatory.

6.2.2.5 Infrastructure

Public roads:

No public roads are included in the Geroldsbach/Götzens catchment which are interfering with

the NBS. Still, for realizing the NBS, local forest road networks need potentially to be realized.

Permitting of such roads (private roads) -is (today) done under the Forestry Law 1975 (ForstG 1975 i.d.g.F Forstgesetz). The forest roads may be designed either as temporal (for the time of construction) or permanent (for continuous access) infrastructure.

For the situation in 1950, this did not apply due to the Forestry Law 1975did not existing at that time. The permitting process today would require the description or the road network planned including operational (construction, drainage, ...) aspects. The permitting authority in the 1st instance would be the District (Bezirksbehörde). Second and third instances are the States administrative court and the Federal court. Planning and permitting time usually are in the order of 2 respectively 3 months.

6.2.2.6 Monitoring

External Data Source:

External data source such as Meteorological and Flow gauging data sets are mainly located at the two following public offices:

(1) HZB - Hydrographic services of the Ministry and the hydrographic service of tyrol (local office of HZB)

(2) ZAMG (Zentralanstalt für Meteorlogie und Geodynamic) Austrian Central Institute for Meteorology and Geodynamics

(3) Austro Control GmbH (Austrian Civil Aviation Control)

Measured hydrological datasets (available at (1) and (2)) , regardless from which public organization, are free of charge according to the Austrian Water Act 1959 idgF. Still, as in the case of ZAMG, cost may arise for the handling and provision of the measured data sets.

The Austrian Civil Aviation Control (Austro Control GmbH) is as well a state organization, but does not measure or provide classical hydrological/metrological measurements (precipitation of flow gauges). Hydro-/meteorological relevant data can be obtained from measurements of the nationwide operated C-Band (5600-5650 MHz) radar network. Costs arise for the raw datasets as well as the preprocessed data sets. There are no specific permits to obtain the datasets.

Lit:

Rudolf Kaltenboeck (2012): New generation of dual polarized weather radars in Austria. ERAD 2012 -The Seventh European Conference On Radar In Meteorology And Hydrology; Source: http://www.meteo.fr/cic/meetings/2012/ERAD/extended_abs/NET_166_ext_abs.pdf

Lidar /fly over permit

No air based lidar measurements are foreseen in the project.

Water data/monitoring permit

Following the design of the (a) gauging station and the (b) surface runoff test site following

Installation of temporal gauging station:

The installation of a temporal gauge at the Geroldsbach is currently planned as an external contribution to the project by the WLV. Still, the realization (no fixed so far) depends on the availability of personal and material at the WLV during the year. Any permits need in this course are so far unknown.

Test site for artificial rainfall tests

The installation of the test site includes equipment for generation of artificial rainfall on 4 plots (5x10m), the capturing of surface runoff and discharge measurement runoff. Next to flow

quantities, the natural rainfall, soil moisture at various locations and The do not require specific permits. Still, allowance was given by (a) the municipality and (b) the private land owner.

6.3 Planning of legislative prepatory actions

During the implementation in 1950ies, no legal framework comparable to the current existed. Legislations action were therefore not required.

Still, as well under today's conditions, afforestation as an NBS is not subject to legal permitting as such. Still, usual project, accompanying measures (technical type measures) are subject for permitting. The same applies e.g. in case of adverse effects on species requiring compensation measures.

6.4 RECONECT Knowledge exchange. Lessons learned.

The legal boundaries applying today considered various aspects in the permitting process going beyond afforestation. Usually, the WLV (Torrent and avalanche control section) organizes the planning and implementation on behalf of the local community.

Thus, for the community, the procedure becomes a one stop - shop procedure, including permitting of all (technical and nature base solutions) including the preparation of funding in frame of the Wasserbautenföderungsgesetz (Water Structure Funding Act) .

6.5 Information on copies of permits / approvals

No permits available.

6.6 Preparatory actions for monitoring

6.6.1 Overal Assesment

The monitoring includes rainfall runoff experiments in the catchments, including permanent installation. The installations are planned to continuously monitor meteorological parameters as well as resulting surface runoff throughout the year.
Runoff is planned to be as well measured at the main reach gauging the catchment outlet. At side tributaries temporal measurements are planned to identify the mean and low flows including potential source of flows. Similar measurements are the case in the urban part as a part of the integrated catchment.

First installations have started and will be continued after snowmelt in spring / summer 2019. So far nor problems occurred. None of the measurements to be installed required legal permit. Still, allowances from local land owners and the community of Götzens are required and are granted.

The foreseen measurement build the basis to approach the ungauged catchment of the Geroldsbach/Götzens by means of hydrological simulations. Using the modelling approach, allows to address aspects of implementation stages of the given NBS (afforestation since 1950) together with scenarios of urban/natural catchment interactions and Climate Change scenarios.

6.6.2 Baseline monitoring data (available before RECONECT start)

Information upon available data is given in Table 6-1.

Table 6-2 Inn River Basin NBS available baseline (monitoring) data, before RECONECT

	INDICATORS	PARAMETER / VARIABLE (Baseline data available)	Please mention data source (measured/monitored by you, or taken from other source)	What kind of sensors have been used	Please provide the period of measurements	Please provide time interval of measurements	Please mention the format of data files	Any other important information relevant to monitoring /evaluation aspects
	Surface Run-off Reduction	Precipitation, INCA reanalysis	Meteorological Service	C band radar, precipitation gauges	2003 - 2016	15 min , 1km	Asci grid	https://www.zamg.ac.at/incaanalyse/
		Temperature analysis	Meteorological Service	Temperature sensors	2003 - 2016	1 hour 1km	Ascii grid	https://www.zamg.ac.at/incaanalyse/
		Precipitation e.g. station 103309 Axams	Hydrological service https://ehyd.gv.at/	Rain gauges	Since 1984	daily	ASCII txt files	
		Design rainfall	Hydrological service https://ehyd.gv.at/	Interpolation between measurements of the hydrographic service (HZB)	generated 2009	6 km resolution	ASCII txt files	https://ehyd.gv.at/
		Land use, areal images	Government Tyrol Open Data Portal Austria https://www.data.gv.at/ INSPIRE Austria https://www.inspire.gv.at/	Aerial photography	Since 1945	Multiple years (varying)	jpg	
		Terrain data Tyrol: digital terrain model (DTM/DGM), digital surface model (DSM/DOM), slope, aspect; shaded relief of DTM and DSM; contour lines	Government Tyrol	Based on Airborne Laserscan from 2006	2006	Terrain data Tyrol: digital terrain model (DTM/DGM), digital surface model (DSM/DOM), slope, aspect (5m resolution); shaded relief of DTM and DSM (1m resolution); contour lines (20m interval)	GeoTiff	https://www.data.gv.at/katalog/dataset/land-tirol_tirolgelnde
		Land-use (forest layer)	Government Tyrol	Based on aerial images	2016		shp	https://www.data.gv.at/katalog/dataset/6a52e518-bfc1-4738-9645-8cfb5b9ae139
		Forest development plan	Government Tyrol	Description of forest functions	2016		shp	https://www.data.gv.at/katalog/dataset/c8bc08ab-c987-4be5-8d54-07f3a815684d

		Population and population projections until 2034	Government Tyrol	Austrian Conference on Spatial Planning	2002 – 2015 Projection from 2014	1 year	csv	https://www.data.gv.at/katalog/dataset/bb9d9683-bb9d-4493-847b-9a51373e06f8 https://www.data.gv.at/katalog/dataset/8628fac7-1e83-42c1-9500-d66e74975011
		Zoning plan	Government Tyrol	Regulations	Since 2013	When updated	Shp, json	https://www.data.gv.at/katalog/dataset/AE90DD7E-79C9-48AA-B685-732B357E9246
		Spatial planning Tyrol	Government Tyrol	regulations	Since 1998	When updated	Shp, json	https://www.data.gv.at/katalog/dataset/89674D7F-3427-48A2-9874-4A05C2E8B6FF https://www.data.gv.at/katalog/dataset/3051AF8F-D7F7-4FCB-AE6F-D18EF493F6FA
	Slowing and Storing Run-off	Precipitation, INCA reanalysis	Meteorological Service	C band radar, precipitation gauges	2003 - 2016	15 min , 1km	Asci grid	https://www.zamg.ac.at/incaanalyse/
		Temperature analysis	Meteorological Service	Temperature sensors	2003 - 2016	1 hour 1km	Ascii grid	https://www.zamg.ac.at/incaanalyse/
	Flood hazard	Terrain data Tyrol: digital terrain model (DTM/DGM), digital surface model (DSM/DOM), slope, aspect; shaded relief of DTM and DSM; contour lines	Government Tyrol	Based on Airborne Laserscan from 2006	2006	Terrain data Tyrol: digital terrain model (DTM/DGM), digital surface model (DSM/DOM), slope, aspect (5m resolution); shaded relief of DTM and DSM (1m resolution); contour lines (20m interval)	GeoTiff	https://www.data.gv.at/katalog/dataset/land-tirol_tirolgelnde
		Land-use (forest layer)	Government Tyrol	Based on aerial images	2016		shp	https://www.data.gv.at/katalog/dataset/6a52e518-bfc1-4738-9645-8cfb5b9ae139
		Forest development plan	Government Tyrol	Description of forest functions	2016		shp	https://www.data.gv.at/katalog/dataset/c8bc08ab-c987-4be5-8d54-07f3a815684d
		Population and population projections until 2034	Government Tyrol	Austrian Conference on Spatial Planning	2002 – 2015 Projection from 2014	1 year	csv	https://www.data.gv.at/katalog/dataset/bb9d9683-bb9d-4493-847b-9a51373e06f8 https://www.data.gv.at/katalog/dataset/8628fac7-1e83-42c1-9500-d66e74975011
		Zoning plan	Government Tyrol	Regulations	Since 2013	When updated	Shp, json	https://www.data.gv.at/katalog/dataset/AE90DD7E-79C9-48AA-B685-732B357E9246
		Spatial planning Tyrol	Government Tyrol	regulations	Since 1998	When updated	Shp, json	https://www.data.gv.at/katalog/dat

								aset/89674D7F-3427-48A2-9874-4A05C2E8B6FF https://www.data.gv.at/katalog/dataset/3051AF8F-D7F7-4FCB-AE6F-D18EF493F6FA
	Flood Peak Reduction	Precipitation, INCA reanalysis	Meteorological Service	C band radar, precipitation gauges	2003 - 2016	15 min , 1km	Asci grid	https://www.zamg.ac.at/incaanalyse/
		Temperature analysis	Meteorological Service	Temperature sensors	2003 - 2016	1 hour 1km	Ascii grid	https://www.zamg.ac.at/incaanalyse/
		Precipitation e.g. station 103309 Axams	Hydrological service https://ehyd.gv.at/	Rain gauges	Since 1984	daily	ASCII txt files	
	Flood Peak Reduction	Design rainfall	Hydrological service https://ehyd.gv.at/	Interpolation between measurements of the hydrographic service (HZB)	generated 2009	6 km resolution	ASCII txt files	https://ehyd.gv.at/
	Flood Peak Reduction	Land use , areal images	Government Tyrol Open Data Portal Austria https://www.data.gv.at/ INSPIRE Austria https://www.inspire.gv.at/	Areal photography	Since 1945	Multiple years (varying)	jpg	
		Terrain data Tyrol: digital terrain model (DTM/DGM), digital surface model (DSM/DOM), slope, aspect; shaded relief of DTM and DSM; contour lines	Government Tyrol	Based on Airborne Laserscan from 2006	2006	Terrain data Tyrol: digital terrain model (DTM/DGM), digital surface model (DSM/DOM), slope, aspect (5m resolution); shaded relief of DTM and DSM (1m resolution); contour lines (20m interval)	GeoTiff	https://www.data.gv.at/katalog/dataset/land-tirol_tirolgelnde
		Land-use (forest layer)	Government Tyrol	Based on aerial images	2016		shp	https://www.data.gv.at/katalog/dataset/6a52e518-bfc1-4738-9645-8cfb5b9ae139
		Forest development plan	Government Tyrol	Description of forest functions	2016		shp	https://www.data.gv.at/katalog/dataset/c8bc08ab-c987-4be5-8d54-07f3a815684d
	To be decided	Water information system (different types of water use)	Government Tyrol		Since 2012	weekly	shp	https://www.data.gv.at/katalog/dataset/0b5d6529-d88c-46c0-84f7-b37282e96ce8
	To be decided	Water course network	Government Tyrol	maps	current	When required	Shp, wfs	https://www.data.gv.at/katalog/dat

								aset/cb2f663a-678e-4253-be61-f5125c14d143
	Landslide vulnerability	Population and population projections until 2034	Government Tyrol	Austrian Conference on Spatial Planning	2002 – 2015 Projection from 2014	1 year	csv	https://www.data.gv.at/katalog/dataset/bb9d9683-bb9d-4493-847b-9a51373e06f8 https://www.data.gv.at/katalog/dataset/8628fac7-1e83-42c1-9500-d66e74975011
	Surface Run-off Reduction in urban parts	Zoning plan	Government Tyrol	Regulations	Since 2013	When updated	Shp, json	https://www.data.gv.at/katalog/dataset/AE90DD7E-79C9-48AA-B685-732B357E9246
	Surface Run-off Reduction in urban parts	Spatial planning Tyrol	Government Tyrol	regulations	Since 1998	When updated	Shp, json	https://www.data.gv.at/katalog/dataset/89674D7F-3427-48A2-9874-4A05C2E8B6FF https://www.data.gv.at/katalog/dataset/3051AF8F-D7F7-4FCB-AE6F-D18EF493F6FA
NATURE	Change in land use	Land-use (forest layer)	Government Tyrol	Based on aerial images	2016		shp	https://www.data.gv.at/katalog/dataset/6a52e518-bfc1-4738-9645-8cfb5b9ae139
		Forest development plan	Government Tyrol	Description of forest functions	2016		shp	https://www.data.gv.at/katalog/dataset/c8bc08ab-c987-4be5-8d54-07f3a815684d
		Land use, areal images	Government Tyrol Open Data Portal Austria https://www.data.gv.at/ INSPIRE Austria https://www.inspire.gv.at/	Aerial photography	Since 1945	Multiple years (varying)	jpg	
		Terrain data Tyrol: digital terrain model (DTM/DGM), digital surface model (DSM/DOM), slope, aspect; shaded relief of DTM and DSM; contour lines	Government Tyrol	Based on Airborne Laserscan from 2006	2006	Terrain data Tyrol: digital terrain model (DTM/DGM), digital surface model (DSM/DOM), slope, aspect (5m resolution); shaded relief of DTM and DSM (1m resolution); contour lines (20m interval)	GeoTiff	https://www.data.gv.at/katalog/dataset/land-tirol_tirolgelnde

6.6.3 Geographical information, GIS data

Areal Photos:

Current/ short history areal photos

https://portal.tirol.gv.at/LBAWeb/luftbilduebersicht.show

https://www.tirol.gv.at/sicherheit/geoinformation/geodaten/orthofotos/

https://www.data.gv.at/katalog/dataset/land-tirol_orthofototirol

Historical Maps:

https://maps.tirol.gv.at/HIK/

Land use data sets

LISA Land Information System Austria - includes Landcover and Landuse informations of Austria (https://www.landinformationsystem.at/#/lisa/overview)

"Seger Dataset" - Land information data set for spatial planning (https://www.corp.at/archive/CORP1999_seger.pdf)

Corine Land Cover 2012 -Copernicus Land cover Monitoring

https://land.copernicus.eu/pan-european/corine-land-cover/clc-2012

Digital elevation maps

The available digital elevation maps have a resolution of 1m and are provided by the state of tyrol. Within the University, the maps are free of charge for scientific or educational uses.

(https://www.tirol.gv.at/sicherheit/geoinformation/geodaten/laserscandaten/)

Soil maps

eBOD - digital soil maps for Austria

https://bfw.ac.at/rz/bfwcms2.web?dok=7066

https://bodenkarte.at/#/center/13.3458,47.7132

BORIS - Bodeninformationssystem (Soil information system Austria)

http://www.umweltbundesamt.at/boris

6.6.4 Preparatory actions for monitoring

Information on the (planned) monitoring / evaluation activities, refering to selected indicators and variables is presented on the following table:

Table 6-3 Inn River Basin NBS variables that will be monitored during RECONECT, and used to evaluate NBS performance

	INDICATORS	VARIABLE to be monitored/evaluated	Do you posses baseline data on this variable ? (Yes/No, acc., to table 1.1)	Will it be monitored by you, or taken from other source	If already known, please provide details. Either on your external data source, or on your monitoring program (sensor type, time-interval of measurements, data formats, etc).				Please mention any innovative tools/methods that will be used (satellite data, drones, remote sensing)	Are you going to share this data within RECONECT ICT platform	Any other substantial information relevant to monitoring /evaluation aspects
					Data/monitoring Approach, Technique, sensor type, equipment,	Time interval	Data format	When (pre-construction, construction, post-construction)			
WATER	Surface Run-off Reduction	Precipitation, at surface runoff test site	No	Monitored	Rain gauge	minutes	txt	post construction		Yes	
		Surface runoff	No	monitored	Own construction, weir	Minutes during measurement campaign	txt	post construction	Innovation: Artificial rainfall runoff tests including (a) permanent runoff monitoring and (b) artificial tests including upstream run-on	Yes	
		Soil moisture	No	monitored	1) TDR type sensors and 2) Cosmic ray Neutron sensors (CRNS) (used from external UIBK project)	Temporal resolution (minutes (TDR) and hours (CRNS). Spatial resolution is point (TDR) and 200-300m (CRNS)	txt	post construction	Innovation: Potential use of CRNS for (a) soil moisture and (b) snow cover monitoring at medium scales (200-300m radius)	Yes	
		Discharge, Measured	No	monitored	water level gauge at the catchment outlet;	Minutes	txt	post construction		Yes	
		Discharge, Simulated	No	simulated with hydrological model	Use hydrological model at event based approach (ZEMOKOST) and/or	Minutes	txt	post construction	The modeling approach is used to approach an ex-post analysis of the discharges under (a)	Yes	Unclear if this is possible

					Waterbalance approach (HQsim, WASIM) Urban parts simulated with SWMM.				the current situation and (b) situation with NBS not or partly realized. In addition, the NBS scenarios are coupled with different Climate change scenarios. Therefore the models are combined with different design rainfall (current and CC altered) and NBS afforestaion scenarios. In addition, the urban parts influencing the total runoff are included.		
	Slowing and Storing Run-off	Precipitation, at surface runoff test site	No	Monitored	Rain gauge	minutes	txt	post construction		Yes	
		Surface runoff	No	monitored	Own construction, weir	Minutes during measurement campaign	txt	post construction	Innovation: Artificial rainfall runoff tests including (a) permanent runoff monitoring and (b) artificial tests including upstream run-on	Yes	
		Soil moisture	No	monitored	1) TDR type sensors and 2) Cosmic ray Neutron sensors (CRNS) (used from external UIBK project)	Temporal resolution (minutes (TDR) and hours (CRNS). Spatial resolution is point (TDR) and 200-300m (CRNS)	txt	post construction	Innovation: Potential use of CRNS for (a) soil moisture and (b) snow cover monitoring at medium scales (200-300m radius)	Yes	
		Discharge, Measured	No	monitored	water level gauge at the catchment outlet;	Minutes	txt	post construction		Yes	

		Discharge, Simulated	No	simulated with hydrologic al model	Use hydrological model at event based approach (ZEMOKOST) and/or Waterbalance approach (HQsim, WASIM) Urban parts simulated with SWMM.	Minutes	txt	post construction	The modeling approach is used to approach an ex-post analysis of the discharges under (a) the current situation and (b) situation with NBS not or partly realized. In addition, the NBS scenarios are coupled with different Climate change scenarios. Therefore the models are combined with different design rainfall (current and CC altered) and NBS afforestaion scenarios. In addition, the urban parts influencing the total runoff are included.	Yes	Unclear if this is possible
	Flood Hazard	Precipitation, at surface runoff test site	No	Monitored	Rain gauge	minutes	txt	post construction		Yes	Model results combined with expert opinion (qualitative description)
	Delay time to peak	Precipitation, at surface runoff test site	No	Monitored	Rain gauge	minutes	txt	post construction		Yes	Hydrological model will be used to compute surface run-off
	Flood Peak Reduction	Precipitation, at surface runoff test site	No	Monitored	Rain gauge	minutes	txt	post construction		Yes	
		Surface runoff	No	monitored	Own construction, weir	Minutes during measurement campaign	txt	post construction	Innovation: Artificial rainfall runoff tests including (a) permanent runoff monitoring and (b) artificial tests including upstream run-on	Yes	

		Soil moisture	No	monitored	1) TDR type sensors and 2) Cosmic ray Neutron sensors (CRNS) (used from external UIBK project)	Temporal resolution (minutes (TDR) and hours (CRNS). Spatial resolution is point (TDR) and 200-300m (CRNS)	txt	post construction	Innovation: Potential use of CRNS for (a) soil moisture and (b) snow cover monitoring at medium scales (200-300m radius)	Yes	
		Discharge, Measured	No	monitored	water level gauge at the catchment outlet;	Minutes	txt	post construction		Yes	
		Discharge, Simulated	No	simulated with hydrological model	Use hydrological model at event based approach (ZEMOKOST) and/or Waterbalance approach (HQsim, WASIM) Urban parts simulated with SWMM.	Minutes	txt	post construction	The modeling approach is used to approach an ex-post analysis of the discharges under (a) the current situation and (b) situation with NBS not or partly realized. In addition, the NBS scenarios are coupled with different Climate change scenarios. Therefore the models are combined with different design rainfall (current and CC altered) and NBS afforestaion scenarios. In addition, the urban parts influencing the total runoff are included.	Yes	Unclear if this is possible
	Landslide hazard										Qualitative assessment by experts based on land-use

	Vulnerability										change (reforestation)
NATURE	Change in land use	Land use change (forest)	Yes, Aerial images	GIS based analysis	Evaluation of aerial photos and forest data sets	Annual - decadal	shp	post construction	Innovation: Cont. Dataset for afforstation of NBS in the test catchment	Yes	Land use for rainfall runoff modelling
NATURE	Change in land cover	To be decided: Land cover data									
PEOPLE	Reduced/avoided damage cost from hydro-meteorological risk reduction	To be decided									

6.6.5 Preparation of monitoring / evaluation

In frame of the case study, monitoring at different locations and scales is planned.

- Monitoring of surface runoff and associated variables (artificial events and continuous monitoring)
- Monitoring of surface runoff and infiltration behavior at selected urban locations (artificial events)
- Discharge gauging at a downstream location of the Geroldsbach torrent (Optional - depending on effective realization together with WLV)
- Software based assessment of hydrological reaction based on simulation

ad 1)

Monitoring of surface runoff and associated variables (artificial events and continuous monitoring):

Core of the field test is the artificial rainfall test site at Götzner Berg (location A).

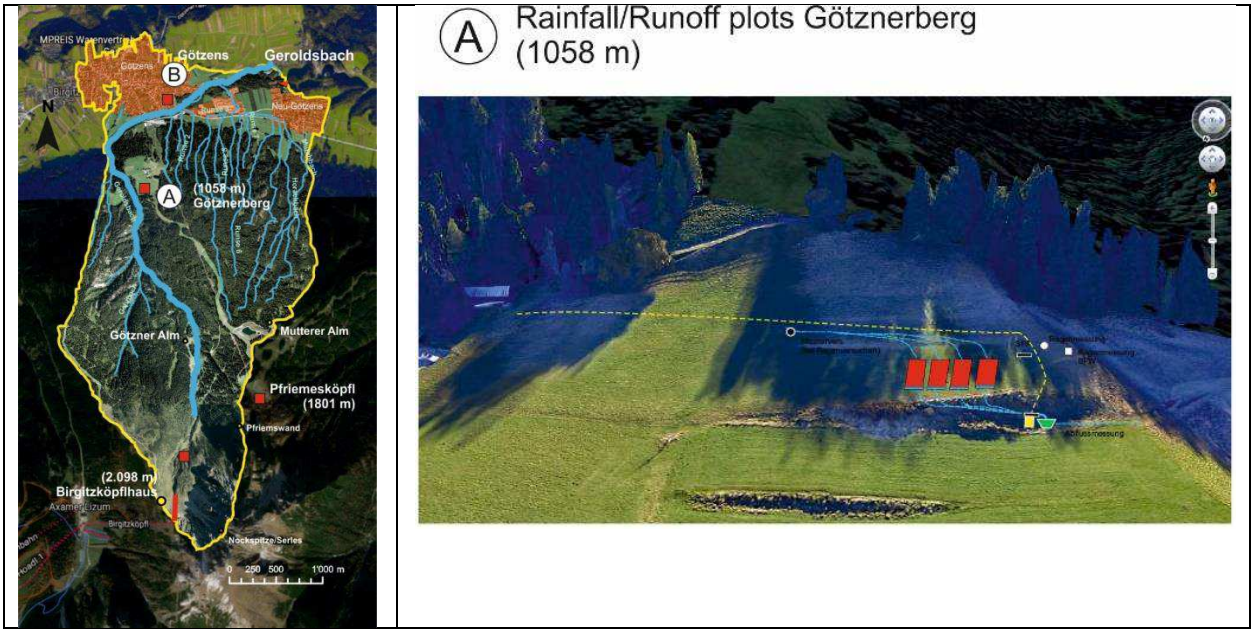
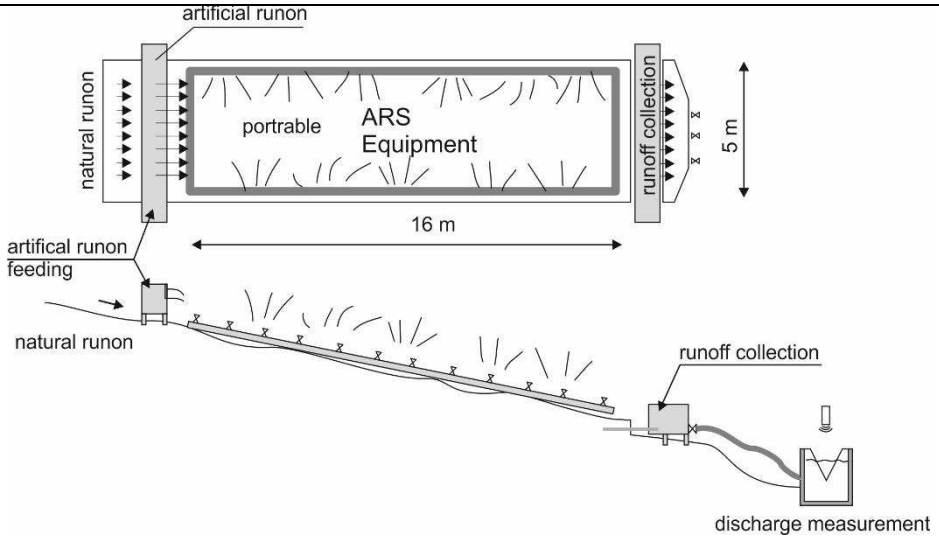


Figure 6-1: Illustration on Methodology to generate and monitor surface runoff; left: visualisation of catchment, right: planned surface runoff and artificial rainfall monitoring station

Here four parallel plots (5x10/16m) are realized to generate and monitor surface runoff. The gauging of runoff is planned to be realized on an events and on a continuous basis. The plots will be therefore equipped with an artificial rainfall simulator used to subject the plot to heavy artificial rainfall. An innovative approach at that site involves the application of run-on at plot scale. Thereby, upstream enter runoff is simulated, capturing the runoff dynamics under more complex - closer to reality - situations. Further, the event based artificial rainfall tests are examined for very high rainfall intensities. Where past test in the literature are limited to intensities of 50 to 100 mm per hour, rainfall tests with up to 200m per hour are envisaged in this project.



Water supply of the site is supported by the Muttereralm mountain ski-park, using the water from the automated artificial snowmaking systems located nearby. Water supply from the snow-making facilities only, allows multiple repeated artificial rainfall simulations with extreme intensities on the hillside scale. For all water demands going beyond the capacity of the fresh water supply, a circulation system including water basin and pumping system is planned.

Additionally, monitoring soil moisture by means of TDR type Soil Moisture Sensors at the ARS site and in the catchment is planned.

Discharge measurement of surface runoff is realized via runoff capturing (continuous) allowing a permanent measurement of natural and artificial runoff. In order assess the hydrological behavior of the site, the installation of a metrological station (rainfall, temperature, snow height) is foreseen.

Further the test site will be equipped with a CRNS (Cosmic Ray Neutron Sensor) on a temporal basis. This is linked to the project moosberre - a UIBK internal infrastructure project.

Legal permits:

No legal permits for operation and construction is needed

Private/public allowances:

The local community (Götzens) and the local mountain ski park "Muttereralmbahn" (partly owned by Götzens) assured their support. Still, detailed plans on when and how much water is supplied needs to be tested and defined during a first testing phase.

Financing:

Cost for Infrastructure are financed partly within the RECONECT Project. Cost beyond the foreseen infrastructure budget in RECONECT can be realized in frame of the project EECoMeR (UIBK internal funding specifically for infrastructure concerning the test catchment Götzens). Cosmic Ray Neutron Sensors are realized

ad 2)

Monitoring of surface runoff and infiltration behavior at selected urban locations (artificial events)

This measurement phase still needs to be defined in more details. This includes selection of measurement sites together with the municipality of Götzens. For the measurements itself the approval from the land-owner is required. Measurement equipment is already available or can be purchased within RECONECT, thus no additional financing is required.

ad 3)

The measurement itself consist of 2 parts (a) constructions in the river and (b) installations of measurement equipment (sensors). The construction needs negations with WLV and the municipality Götzens. In any case, the realization is not fully covered in current ongoing infrastructure projects and requires a financial contribution from either the municipality or the project RECONECT towards WLV.

Measurement equipment (sensors) can be purchased/co-financed from RECONECT. The whole installation including selection of the measurement site needs approval from WLV, which has not happened yet and is planned for summer 2019.

For sub-basins, single tracer measurements are foreseen throughout the year in order to access the source to discharges under different conditions.

Backup strategy:

In case that the realization of the fixed gauge at the catchment outlet face problems (financial, allowance from community), a potential backup could be the gauging with salt tracer similar to the sub-basin approach.

ad 4)

For the software based assessment (modeling) no permits are required, but the model calibration relies on collected measurement data from (1) to (3). Additionally the subcontractors BFW and BOKU are required for the following task:

- Development of climate change scenarios (subcontractor BOKU)
- Support in field measurement and setup of NBS (afforestation) scenarios (subcontractor BFW).
- The model building is planned to start in 2020

6.7 Links / Synergies to other NBS project and already established EU monitoring network/facitlities

6.7.1 Synergy with other projects on the NBS site

The financing of equipment beyond the material budget within RECONECT is supported by the following two UIBK internal infrastructure funds:

EECoMeR - Equipment of Event based and Continuous Measurement of Runoff at plot and catchment scale

moosbeere - Moisture observations based on an intermediate scale sensor network

EECoMeR support directly the realization of monitoring equipment in Götzens/Geroldsbach, focusing on the runoff behavior on the plot and catchment scale. In frame of moosbeere, the site Götzens is one out of more site being equipped with e.g. CRNS (Cosmic ray Neutron Sensors) enabling the detection of soil moisture and snow cover dynamic on an intermediate scale (200-300 m)

6.7.2 Links to other NBS projects

Links to project OPERANDUM exist (https://cordis.europa.eu/project/rcn/217473/factsheet/en, https://site.unibo.it/operandum/en) as subcontractor BFW is also partner in this project

A link to the COST Action CA17133 Implementing nature based solutions for creating a resourceful circular city (https://www.cost.eu/actions/CA17133/#tabs|Name:overview, circular-city.eu) has been established.

PHUSICOS (Solutions to reduce risk in mountain landscapes) links to the RECONECT project, since sub catchments of the Kaunertal Valley in North Tyrol are covered as case studies in the project. An exchange on the use and application of national data sets is expected.

(https://phusicos.eu/)

6.7.3 Links / synergies to already established EU monitoring network/facilities

INSPIRE Data

The check on INSPIRE Data sets and their usability in the modeling process is foreseen.

SWICCA - Service for Water Indicators in Climate Change Adaptation

(http://swicca.eu/)

The SWICCA project (and SWICCA portal for climate-impact data) was realized in frame of Copernicus C3S in which UIBK was involved as sub- contractor.

SHMI as the lead partner of SWICCA provides numerous data set concerning climate-impact data to speed up the workflow in climate-change adaptation on the portal. Among readily available impact data, mostly on pan-European scales, design rainfall under climate change are provided. Depending on the quality of data sets provided, they might be used in the catchment simulations next to the use of national data sets.

Other links not established to date.

6.8 Connection to the RECONECT TeleControlNet data platform

Brief Information about the TeleControlNet data platform is presented in Section II Methodology of the report. INTER ACT will contact all Demonstrators to facilitate linking (monitoring) systems/data to the platform. The questions / discussions will be of a highly technical nature.

Name of the project team staff member (to be contacted by INTER ACT)

Manfred Kleidorfer, Manfred.kleidorfer@uibk.ac.at
Stefan Achleitner, Stefan.achleitner@uibk.ac.at

7 Demonstrator DB-3 Egå Engsø and Lystrup, Denmark

7.1 Status analysis

The preparation of the project Egå Engsø took more than four years (2002-2006), including preparation, tender for consulting engineer, technical surveys, project design, permits, land consolidation/acquisition and tender for contractor. Especially the process of land consolidation took time due to lack of land to swap. The preparation phase needs to cope with changing project design during the phase and its consequences to eg. time to seek permits. Early archeological ratings/surveys can reduce the risk to stop the project in the implementation phase due to archeological finds.

The preparation of the project Lystrup took two years (2013-2014), including preparation, tender for consulting engineer, technical surveys, project design, permits, and tender for contractor.

Probably there is no further needs for permits for the expected future monitoring.

7.2 Non-technical preparatory actions & legislative aspects

Non-technical preparatory actions & legislative aspects are described here below in table format, providing information on relevant legislative aspects, procedures and/or permits.

7.2.1 Summary information

Table 7-1 Egå Engsø and Lystrup NBS preliminary overview of different legislative aspect

Topic	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
Spatial								
Land consolidation/acquisition	Land consolidation order	Public	Land distribution commission	Special agreements with all the landowners	36	4	Commissioner	No
Archeology / heritage	Museum Act	Private	Moesgaard Museum	Boundary of affected area. Kind of affection.	1	Depends on need for archeologically excavation.	Commissioner	No
Environment								
Environmental permit	Appendix to wastewater plan	Public	Municipality of aarhus	Purpose of the project	1	2	Commissioner	No
Environmental Impact Assessment	Screening for Environmental Impact Assessment	Public	Former County of Aarhus now Municipality of Aarhus	Standard application form with som 40 questions.	1 Besides the time designing the whole project	2	Commissioner	No
Watercourse permit	Watercourse Act	Public	Former County of Aarhus now Municipality of Aarhus	Purpose of the project, maps, overview of covered properties, technical description of change in watercourse and concequense on vaterlevel, expected cost and suggestion to costdistribution.	1 Besides the time designing the whole project	4 Including limit for complaint. If the project is appealed the time to treat the case will take at least 6 month	Commissioner	YES
Ecology/Nature								
Nature protection dispensation	Nature Protection Act	Public	Former County of Aarhus now Municipality of Aarhus	Purpose of the project, maps, overview of covered properties, technical description of change in watercourse and landuse and concequense on vaterlevel.	1 Besides the time designing the whole project	4 Including limit for complaint. If the project is appealed the time to treat the case will take at least 6 month	Commissioner	YES

7.2.2 Descriptive information

7.2.2.1 Spatial

The Egå Engsø area was appointed as a potential wetland area in the municipality plan, so the project was in accordance with the plan.

Acquisition of land was provided through a land consolidation process in combination with a nearby motorway project. The process is regulated by the Danish Land Consolidation Order.

The archaeologic Museum Moesgaard made archeological surveys in the area prior to the project. Important areas were excavated before the implementation of the project. As a consequence some areas was left unaffected.

In Lystrup it was necessary to make an appendix to the Wastewater Plan among other in order to get legal financial subsidy from the wastewater utility.

7.2.2.2 Environment

In Egå Engsø and Ellebæk (part af Lystrup) a screening for EIA was necessary. Both concludes that an EIA was not needed.

7.2.2.3 Construction

Not needed.

7.2.2.4 Ecology

There is no Natura2000 area nearby.

Part of the project area consisted of protected nature (Danish Nature Protection Act). Change demanded dispensation from the protection. Dispensation was given due to an overall improvement of the nature content because of the project.

The only protected species in the area was Otter. Otter is supposed to benefit of the project.

The creation of Egå Engsø have potential negative effects on the population of sea trout. It was rated that population not would be seriously affected. Still some avert actions was conducted.

No protected trees were cut down.

7.2.2.5 Infrastructure

In Lystrup a subproject needed accept from the municipal department of traffic and roads for permanent construction of bumps on a road to lead surface water in the wished direction.

Airborne electrical cables was removed from the Egå Engsø area prior to the project. The removal and establishment of a new supply was conducted in cooperation with the utility. No permits were required.

7.2.2.6 Monitoring

None needed.

7.2.2.7 Other

None.

7.3 Planning of legislative prepatory actions

Legislative aspect sets important framework/context for the design of the project.

Planning and design of project took most time besides the land consolidation (land acquisition). Consultants were used to deliver the main parts of the needed documents to obtain permits and dispensations.

7.4 RECONECT Knowledge exchange. Lessons learned.

Investigate witch permissions/dispensations that is necessary from legislation and landowners in order both to create a timetable for the applications (some permissions are necessary prior to others) and to set the legislative and landowner framework for the project design.

7.5 Information on copies of permits / approvals

Examples and copies of permits are available attached to this document in Section III Copies of permits: Permissions from Water Course Act including dispensations from Nature Protection Act Egå Engsø (in Danish)

7.6 Preparatory actions for monitoring

7.6.1 Overal Assesment

Status of preparing the monitoring program

AAKS is right now in the process of preparing the design of the monitoring program, and in the process of choosing appropriate indicator/variables. We foresee that our monitoring program will be fully designed during 2019. The monitoring program will mainly be based on the existing monitoring design of hydrology and nature. Concerning monitoring of people-indicators, we will have to design the monitoring from scratch.

Water: Measuring stations in the inlet (established 1975) and the outlet (established 2008) of Egå Engsø is already continuously measuring water levels in River Egå. The water discharge is automatically calculated based on Danish standard methods. Precipitation has been measured continuously, by the national Meteorological Institute (DMI).

Figure 7-1 Measuring station in the inlet of Egå Engsø

Figure 7-2 Measuring station in the outlet of Egå Engsø

Monitoring of hydrological aspects in Lystrup will mainly be based on precipitation. Furthermore, we need to choose a variable that can show the actual function of each sub-project as well as the entire NBS in Lystrup. A variable could be water level/discharge in retention basins an creeks.

Nature: Indicators and variables will be selected on the basis of existing registrations of birdlife, flora and fauna in and around Egå Engsø. In Lystrup the NBS's are 'new habitats' and indicators and variables will be chosen in a way, so the monitoring will show the development in the new habitats e.g. on the basis of replanted species. Focus will be on indicators/variables that show the added values of the NBS's in a local context with the purpose of upscaling.

People: Indicators and variables will be chosen with the purpose of showing local added values (especially Lystrup) and added values in a larger scale (especially Egå Engsø). It could be the number of visitors, the inhabitants perception of the NBS's, change in property values etc.

7.6.2 Baseline monitoring data (available before RECONECT start)

Details regarding monitoring and evaluation aspects, and available Information/Data/Tools, are presented here in table format.

Table 7-2 Ega Engso and Lystrup NBS available baseline (monitoring) data before RECONECT

	INDICATORS	PARAMETER / VARIABLE (Baseline data available) (Check"Indicator Selection Tool")	Please mention data source (measured/monitored by you, or taken from other source)	What kind of sensors have been used	Please provide the period of measurements	Please provide time interval of measurements	Please mention the format of data files	Any other important information relevant to monitoring /evaluation aspects
WATER	Surface Run-off Reduction	Precipitation (mm)	Data taken from official reports of Danish Meteorological Institute (DMI)	Automatic Weather Station				Data source will probably be changed to a more local station in connection with the imminent design of the monitoring program
	Slowing and Storing Run-off	Precipitation (mm)	Data taken from official reports of Danish Meteorological Institute (DMI)	Automatic Weather Station				Data source will probably be changed to a more local station in connection with the imminent design of the monitoring program
	Flood Peak Reduction	Precipitation (mm)	Data taken from official reports of Danish Meteorological Institute (DMI)	Automatic Weather Station				Data source will probably be changed to a more local station in connection with the imminent design of the monitoring program
		Flood depth (m) in river Egå	Is monitored by Orbicon on behalf of AAK	OTT Ecolog with pressure sensor, OTT Orpheus with pressure sensor and Campbell with pressure sensor	Data available for 1976- still in operation	Timestep 15 minutes. Online data updates every one or sixth hour	Can be agreed	Monitoring according to Danish technical guidelines
		River discharge (m^3/s) in river Egå	Is monitored by Orbicon on behalf of AAK	Water flow meter OTT c31	Data available for 1976- still in operation	10 measurements per year	Can be agreed	Monitoring according to Danish technical guidelines. Continuous discharge is calculated automatically (stage/discharge relationship)
	Flood Hazard	Flood depth (m) in river Egå	Is monitored by Orbicon on behalf of AAK	OTT Ecolog with pressure sensor, OTT Orpheus with pressure sensor and Campbell with pressure sensor	Data available for 1976- still in operation	Timestep 15 minutes. Online data updates every one or sixth hour	Can be agreed	Monitoring according to Danish technical guidelines
		River discharge (m^3/s) in river Egå	Is monitored by Orbicon on behalf of AAK	Water flow meter OTT c31	Data available for 1976- still in operation	10 measurements per year	Can be agreed	Monitoring according to Danish technical guidelines. Continuous discharge is calculated automatically (stage/discharge relationship)

7.6.3 Geographical information, GIS data

Examples of GIS-data available in Mapinfo-format, projection UTM Zone 32 Euref89:

Digital base maps with different themes (buildings, roads, sewer system etc.)

Historical maps and images

Protected areas (nature, ground water etc.)

Soil types, information from wells, nature registrations etc.

Socioeconomic data

Aerial Ortho Images (1954, 1999, 2001-2018 every year)

Digital Elevation Models based on laser scanning (2007, 2015)

7.6.4 Preparatory actions for monitoring

AAKS is right now in the process of preparing the design of the monitoring program, and in the process of choosing appropriate indicator/variables.

We foresee that our monitoring program will be fully designed during 2019.

Table 7-3 Ega Engso and Lystrup NBS variables that will be monitored during RECONECT, and used to evaluate NBS performance

	INDICATORS	VARIABLE to be monitored / evaluated	Do you posses baseline data on this variable ? (Yes/No, acc., to table 1.1)	Will it be monitored by you, or taken from other source	If already known, please provide details. Either on your external data source, or on your monitoring program (sensor type, time-interval of measurements, data formats, etc).				Please mention any innovative tools/methods that will be used (satellite data, drones, remote sensing)	Are you going to share this data within RECONECT ICT platform	Any other substantial information relevant to monitoring /evaluation aspects
					Data/monitoring Approach, Technique, sensor type, equipment,	Time interval	Data format	When (pre-construction, construction, post-construction)			
WATER	Surface Run-off Reduction	Precipitation (mm)	YES	Data will be taken from official reports of Danish Meteorological Institute (DMI)	Equipment of DMI					Will be decided in connection with the imminent design of the monitoring program	Data source will probably be changed to a more local station in connection with the imminent design of the monitoring program
	Flood Hazard	Flood depth (m)	YES, in Egå Engsø	Will be monitored by Orbicon on behalf of AAK	OTT Ecolog with pressure sensor, OTT Orpheus with pressure sensor and Campbell with pressure sensor	Timestep 15 minutes. Online data updates every one or sixth hour	Can be agreed	Both pre-construction and post-construction		Will be decided in connection with the imminent design of the monitoring program	Monitoring according to Danish technical guidelines
		River discharge (m^3/s)	YES, in Egå Engsø	Will be monitored by Orbicon on behalf of AAK	Water flow meter OTT c31	10 measurements per year.	Can be agreed	Both pre-construction and post-construction		Will be decided in connection with the imminent design of the monitoring program	Monitoring according to Danish technical guidelines. Continuous discharge is calculated automatically (stage/discharge relationship)
	Slowing and Storing Run-off	Precipitation (mm)	YES	Data will be taken from official reports of Danish Meteorological Institute (DMI)	Equipment of DMI					Will be decided in connection with the imminent design of the monitoring program	Data source will probably be changed to a more local station in connection with the imminent design of the monitoring program
	Flood Peak Reduction	Precipitation (mm)	YES	Data will be taken from official reports of Danish Meteorological Institute (DMI)	Equipment of DMI					Will be decided in connection with the imminent design of the monitoring program	Data source will probably be changed to a more local station in connection with the imminent design of the monitoring program

		Flood depth (m)	YES, in Egå Engsø	Will be monitored by Orbicon on behalf of AAK	OTT Ecolog with pressure sensor, OTT Orpheus with pressure sensor and Campbell with pressure sensor	Timestep 15 minutes. Online data updates every one or sixth hour	Can be agreed	Both pre-construction and post-construction		Will be decided in connection with the imminent design of the monitoring program	Monitoring according to Danish technical guidelines
		River discharge (m^3/s)	YES, in Egå Engsø	Will be monitored by Orbicon on behalf of AAK	Water flow meter OTT c31	10 measurements per year.	Can be agreed	Both pre-construction and post-construction		Will be decided in connection with the imminent design of the monitoring program	Monitoring according to Danish technical guidelines. Continuous discharge is calculated automatically (stage/discharge relationship)
	To be decided	Water level									Monitoring according to Danish technical guidelines
	To be decided	Retention time									Retention time will be evaluated based on water level/volume and discharge
NATURE	To be decided (presence of certain Species, changes in habitats)	Will be decided in connection with the imminent design of the monitoring program Expected: Birdlife, flora and sea trout									
PEOPLE	To be decided (recreational opportunities, physicals health, visits in the NBS's, change in land and property values, values of carbon Sequestration)	Will be decided in connection with the imminent design of the monitoring program Expected: number of visitors, erception of the NBS, change in property value divided into local and large scale added values									

7.6.5 Preparation of monitoring / evaluation

AAKS is right now in the process of preparing the design of the monitoring program, and in the process of choosing appropriate indicator/variables. We foresee that our monitoring program will be fully designed during 2019.

We don't expect further needs for permits.

7.7 Links / Synergies to other NBS project and already established EU monitoring network/facitlities

7.7.1 Synergy with other projects on the NBS site

DCE – Danish Centre For Environment and Energy monitored nitrogen turnover in Egå Engsø in 2017. Still to be reported.

DTU Aqua – National Institute of Aquatic Resources monitored smolt loss in Egå Engsø in 2005 and 2006 (before the lake was established) and in 2007, 2009-2011 (after the lake was established). Reported in 2014.

Orbicon registrated nature conditions in Egå Engsø in 2007. Reported in 2008.

Orbicon registrated breeding population of birds in Egpå Engsø 2007-2010. Reported in 2010.

Aarhus University evaluated the citizen participation in part of the Lystrup project. Reported in 2016.

7.7.2 Links to other NBS projects

No plans at the moment.

7.7.3 Links / synergies to already established EU monitoring network/facilities

None yet.

7.8 Connection to the RECONECT TeleControlNet data platform

Brief Information about the TeleControlNet data platform is presented in Section II Methodology of the report. INTER ACT will contact all Demonstrators to facilitate linking (monitoring) systems/data to the platform. The questions / discussions will be of a highly technical nature.

At the moment, the contact is:

Signe Iversen.

Technical contact person is yet not appointed.

8 Demonstrator DB-4 Thur River Basin, Switzerland

8.1 Status analysis

The preparation of the project was executed between 1995 and 2002 (about 6.5 years duration). This is necessary in Switzerland due to the involvement of the public. After project definition and planning there is a required public consultation.

Currently no additional action is planned for our NBS. However, more NBS within the Thur catchment are in the planning phase.

8.2 Non-technical preparatory actions & legislative aspects

Non-technical preparatory actions & legislative aspects are described here below in table format, providing information on relevant legislative aspects, procedures and/or permits.

8.2.1 Summary information

Table 8-1 Thur River Basin NBS summary information on procedures and/or permits

Topic	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
Spatial								
Spatial planning	Cantonal spatial planning law	Public participation	Cantonal authority (Agency for the Environment)	Goal of project	36	36	Cantonal Agency for the Environment	Upon request
Land acquisition	Cantonal spatial planning law	No	Cantonal authority (Agency for the Environment)	Goal of project	24	24	Cantonal Agency for the Environment	Upon request
Environment								
Environmental permit	Federal environment law	No	Federal authority (Federal Office for the Environment)	Goal of project	24	24	Cantonal Agency for the Environment	Upon request
Construction								
Building/construction permit	Cantonal spatial planning law	Public participation	Cantonal authority (Agency for the Environment)	Goal of project	36	36	Cantonal Agency for the Environment	Upon request
Ecology/Nature								
Protected riparian forest	Federal environment law	No	Federal authority (Federal Office for the	Goal of project	24	24	Cantonal Agency for the Environment	Upon request

			Environment)					
Protected species Little ringed plower	Federal environment law	No	Federal authority (Federal Office for the Environment)	Goal of project	24	24	Cantonal Agency for the Environment	Upon request
Protected species Beaver	Federal environment law	No	Federal authority (Federal Office for the Environment)	Goal of project	24	24	Cantonal Agency for the Environment	Upon request
Infrastructure								
New electrical cables	Cantonal spatial planning law	No	Cantonal authority (Agency for the Environment)	Goal of project	2	2	Cantonal Agency for the Environment	Upon request
Monitoring								
Federal and cantonal environmental monitoring program (NAQUA) of water quality	Federal environment law	No	Federal authority (Federal Office for the Environment)	None	Ongoing since 1975			

8.2.2 Descriptive information

8.2.2.1 Spatial

Canton acquired land from farmer to facilitate river restoration. This included a re-zonation of the land from intensive to extensive agriculture. After re-zonation, the land was rented to the farmer.

8.2.2.2 Environment

One goal of the project was to improve the ecological status of the area. No formal Environmental Impact Assessment (EIA) or Social Impact Assessment was required and performed.

8.2.2.3 Construction

A construction permit was required and granted by the Cantonal office.

8.2.2.4 Ecology

It was expected that two protected species would return to the site after restoration. The first is the Little ringed power that breads on gravel islands and that had disappeared after the engineering measures in the 1880s. The bird returned to the area after restoration took place in 2002. Secondly, it was expected that the beaver would return after restoration and also this has happened. No permissions were required for that.

Furthermore, the forest next to the channelized river was reconnected to become a riparian forest as it was before channelization. This was accomplished. To perform this work, different departments within the Cantonal Agency for the Environment worked together and granted the required permit in collaboration with the Federal Office for the Environment.

8.2.2.5 Infrastructure

Besides the removal of levees, no other infrastructure was affected by the restoration measures.

8.2.2.6 Monitoring

All cantonal and Eawag monitoring data are described in Table 1.1. of Deliverable D2.5A. No special permits were required. The monitoring of Eawag was discussed and approved be the Cantonal Agency for the Environment.

8.2.2.7 Other

There are no additional aspects to be described here.

8.3 Planning of legislative prepatory actions

There are no additional aspects to be described here.

8.4 RECONECT Knowledge exchange. Lessons learned.

The biggest lesson to be learned is to involve the public and especially the communities into the planning and execution process of the NBS. This was considered and everything went smoothly.

8.5 Information on copies of permits / approvals

To publish copies of permits, we would need to contact the Cantonal Agency for the Environment as well as the Federal Office for the Environment. However, all permits are only available in German.

8.6 Preparatory actions for monitoring

8.6.1 Overal Assesment

The case study baseline assessment at the Niederneunforn river restoration site within the Thur river catchment (Switzerland) is completed. There is ongoing monitoring and evaluation.

Overall, the Thur river catchment was a case study in the two EU-Projects REFORM (http://www.reformrivers.eu/home) and ADVOCATE (http://www.theadvocateproject.eu/). Over a period of 10 years, Eawag as well as water management partners have worked on the Thur catchment. This work was performed within the framework of two transdisciplinary projects: RECORD and RECORD Catchment (http://www.eawag.ch/en/department/wut/projects/record-catchment/). In addition, there was a large number of subsequent research projects at Eawag and its partners, which were funded by the Swiss National Science Foundation.

The existing data platform (a custom geodatabase and WebGIS platform) for water quantity will be further developed. It subdivides the Thur catchment into six sub-catchments and fully captures the hydraulic dynamics at the outlets of the sub-catchments. This information will help to characterize dominant runoff generation processes and to define Hydrological Response Units (HRUs) within these sub-catchments. The goal is to generically include the groundwater flow system into the semi-distributed model.

8.6.2 Baseline monitoring data (available before RECONECT start)

Details regarding monitoring and evaluation aspects, and available Information/Data/Tools are presented here in table format.

Table 8-2 Thur River Basin NBS available baseline (monitoring) data before RECONECT

	INDICATORS	PARAMETER / VARIABLE (Baseline data available) (Check"Indicator Selection Tool")	Please mention data source (measured/monitored by you, or taken from other source)	What kind of sensors have been used	Please provide the period of measurements	Please provide time interval of measurements	Please mention the format of data files	Any other important information relevant to monitoring /evaluation aspects
WATER	Flood Peak Reduction	Precipitation (mm)	Data taken from federal and cantonal weather stations (CH)	Automatic Weather Stations	Data available for the period from 1975 to today	Measured on daily basis	ASCII	
		River discharge (m^3/s)	Data taken from federal and cantonal surface water stations (CH)	Different pressure sensors	Data available for 1975 -today	Data recorded on hourly basis	ASCII	Numerical model (river hydrodynamic)
	Flood Hazard	River discharge (m^3/s)	Data taken from federal and cantonal surface water stations (CH)	Different pressure sensors	Data available for 1975 -today	Data recorded on hourly basis	ASCII	Numerical model (river hydrodynamic)
	Attenuation of pollution in groundwater	Electrical conductivity (mS/m)	Data taken from federal and cantonal groundwater wells and surface water stations	Sensors and stations	Data available for the period from 1999 to today	Measured on 15 min to daily basis	ASCII	
		Major ions (mg/L)	Data taken from federal and cantonal groundwater wells and surface water stations	Samples analyzed in the lab	Data available for 1975 -today	Data recorded four times a year	ASCII	
		Micropollutants	Data taken from federal and cantonal groundwater wells and surface water stations	Samples analyzed in the lab	Data available for 2015 -today	Data recorded four times a year	ASCII	
NATURE	Change in riparian habitat	Change habitat area	Research work Eawag	Areal evaluation	Several measurements	Three times between 2008 - 2015	ASCII	
	Change of habitats	Distribution of public green space	Research work Eawag	Areal evaluation	Several measurements	Three times between 2008 - 2015	ASCII	
	Change of biodiversity	Biodiversity	Research work of WSL (CH)	Individual evaluation	Several measurements	Three times between 2008 - 2015	ASCII	
PEOPLE	Increase of recreational opportunities of NBS area		Research work of ETH Zurich (CH)	Individual evaluation	One time evaluation	2011	Report	

8.6.3 Geographical information, GIS data

For the Thur river catchment, a rich data base is available. There exists a digital base map (Digital Elevation Models) from SWISS TOPO with a resolution of 25 m by 25 m. Higher resolution model can be made available upon request.

Maps on land use, soil and geology are available. Aerial images of certain areas are available upon request from the federal government and cantonal authorities.

8.6.4 Preparatory actions for monitoring

Information on the (planned) monitoring / evaluation activities, refering to selected indicators and variables is presented on the following table:

Table 8-3 Thur River Basin NBS variables that will be monitored during RECONECT, and used to evaluate NBS performance

	INDICATORS	VARIABLE to be monitored / evaluated	Do you posses baseline data on this variable ? (Yes/No, acc., to table 1.1)	Will it be monitored by you, or taken from other source	If already known, please provide details. Either on your external data source, or on your monitoring program (sensor type, time-interval of measurements, data formats, etc).				Please mention any innovative tools/methods that will be used (satellite data, drones, remote sensing)	Are you going to share this data within RECONECT ICT platform	Any other substantial information relevant to monitoring /evaluation aspects
					Data / monitoring Approach, Technique, sensor type, equipment	Time interval	Data format	When (pre-construction, construction, post-construction)			
WATER	Flood Peak Reduction	Precipitation (mm)	Yes	Automatic Weather Stations of Cantons	Weather stations	Measured on daily basis	ASCII	Ongoing		Yes	
		River discharge (m^3/s)	Yes	Federal and cantonal stations	Data available for 1975 -today	Data recorded on hourly basis	ASCII	Ongoing		Yes	
		To be decided: Water level time series									
	Change in Groundwater level/water table	Electrical conductivity (mS/m)	Yes	Federal and cantonal stations	Data available for the period from 1999 to today	Measured on 15 min to daily basis	ASCII	Ongoing		Yes	
		To be decided: groundwater level									
	Flood Hazard	River discharge (m^3/s)	Yes	Federal and cantonal stations	Data available for 1975 -today	Data recorded on hourly basis	ASCII	Ongoing		Yes	
	Attenuation of pollution in groundwater	Electrical conductivity (mS/m)	Yes	Federal and cantonal stations	Data available for the period from 1999 to today	Measured on 15 min to daily basis	ASCII	Ongoing		Yes	
		Major ions (mg/L)	Yes	Federal and cantonal sampling	Data available for 1975 -today	Data recorded four times a year	ASCII	Ongoing		Yes	
		Micropollutants	Yes	Federal and cantonal sampling	Data available for 2015 -today	Data recorded four times a year	ASCII	Ongoing		No	

NATURE	Shoreline characteristics and erosion protection	Change habitat area	Research work Eawag	Areal evaluation	One measurement	Once 2023	ASCII	2023	Drone flight	Yes	
	Number and type of protected species	Change habitat area	Research work Eawag	Areal evaluation	One measurement	Once 2023	ASCII	2023	Drone flight	Yes	
	Changes in riparian habitat	Change habitat area	Research work Eawag	Areal evaluation	One measurement	Once 2023	ASCII	2023	Drone flight	Yes	
PEOPLE	Increasing recreational opportunities of NBS area	To be decided, in frame of selected Indicators									
	Number and value of people visit or spend free time in NBS area	To be decided, in frame of selected Indicators									
	Provision of NBS sites for education and research	To be decided, in frame of selected Indicators									
	Change in land and/or property values	To be decided, in frame of selected Indicators									

8.6.5 Preparation of monitoring / evaluation

The program design is completed. All the necessary equipment is purchased. The obtained data will be made available to the RECONECT project. All required financing is in place. All permits and approvals are obtained.

8.7 Links / Synergies to other NBS project and already established EU monitoring network/ facilities

8.7.1 Synergy with other projects on the NBS site

The NBS was part of the RECORD and RECORD Catchment projects (http://www.eawag.ch/en/department/wut/projects/record-catchment/). In addition, there was a large number of subsequent research projects at Eawag and its partners, which were funded by the Swiss National Science Foundation (SNF). At the moment, the NBS is part of the larger-scale SNF-project Water Distribution.

8.7.2 Links to other NBS projects

At the moment, there is no intention to undertake additional activities beside RECONECT.

8.7.3 Links / synergies to already established EU monitoring network/facilities

Right now, there are no links or synergies established to other EU monitoring networks or facilities.

8.8 Connection to the RECONECT TeleControlNet data platform

Brief Information about the TeleControlNet data platform is presented in Section II Methodology of the report. INTER ACT will contact all Demonstrators to facilitate linking (monitoring) systems/data to the platform. The questions / discussions will be of a highly technical nature. Name of the project team staff member (to be contacted by INTER ACT): Mario Schirmer

9 Demonstrattor DB-5 The Var Éco-Vallée, France

9.1 Status analysis

The NBS area is in construction phase in general but the solutions we are interested in are already constructed. Balance between the structural measures in the Var river and reshape of flood plain and its transformation into new ecological city is in progress.

As mentioned, the Eco Vallee is a flagship project of France started in 2007. Preoperational steps that followed its beginning and preparation in recent years considered:

- February 21, 2007: Validation in inter-ministerial meeting of the principle of the creation of an operation of national interest on the plain of Var
- May 21, 2007: installation of a pre-figuration mission to prepare the creation of the EPA
- 07 March 2008: decree creating the operation of national interest
- July 30, 2008: decree establishing the EPA Plaine du Var
- January 23, 2009: first board of directors of EPA plain du Var
- November 4, 2009: the Nice Côte d'Azur dossier, which concerns the southern part of the ISO perimeter, is selected to participate in the EcoCité initiative

9.2 Non-technical preparatory actions & legislative aspects

As the NBS that will be demonstrated within RECONECT have been built over several years with the participation of many organizations, the information below is tentative; it is still under investigation and refinement.

9.2.1 Summary information

Table 9-1 The Var Eco Valley NBS summary information on procedures and/or permits

Topic	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
Spatial								
Spatial planning		Public participation	Public Urban Development Agency (EPA)					Subject of inquiry
Land acquisition		Public participation	Public Urban Development Agency (EPA)					Subject of inquiry
Environment								
Environmental declaration			Local Authority for the Environment					Subject of inquiry
EIA	EE *(Article R. 122-5, Environmental Code)*		Minister for the Environment, General Council for the Environment and Sustainable Development					Subject of inquiry
Construction								
Building/construction permit		Public participation	Commune or State					Subject of inquiry
Ecology/Nature								
Natura2000: protected area's	EE (Article R. 414-1-II, Environemntal Code[1]	No	Minister for the Environment, General Council for the Environment and Sustainable Development					Subject of inquiry
Infrastructure								
Public road network construction		Public participation	Commune or State					Subject of inquiry

[1] https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000037345533

9.2.2 Descriptive information

9.2.2.1 Spatial

The change in land use is significant in this NBS. The initial land use was mainly agriculture. Over the year the whole area was under development and slowly becoming less agricultural and more urbanized. With the EcoVallee project, the urban development focuses on living with nature concept and forcing fast urbanization taking into account character of this area and planning eco zones, green belts, new transportation networks and reconstruction of existing ones.

9.2.2.2 Environment

Regarding environment, the Éco-Vallée national interest project aims to develop eco-exemplarity and responsible urbanization by achieving the following objectives:

- Create and animate a territory of demonstration of the policies of the Grenelle of the Environment
- Establish a different relationship with nature, the river and water (valleys, canals ...)
- Towards an energy autonomy

Strategies and documents that are base of this project in a sense of legal framework are:

- The National Strategy for Sustainable Development for the period 2010-2013
- The National Strategy for Biodiversity for the period 2011-2020
- The National Strategy for Adaptation to Climate Change and the First National Plan for Adaptation to Climate Change, Anticipate and Act 2011-2015 (PNACC)
- The 2nd National Health Plan 2009-2013 (PNSE 2) and its regional variations (PRSE)

9.2.2.3 Construction

No data at this moment.

9.2.2.4 Ecology

Established The NATURA 2000 network and other regulatory protections of natural areas. The perimeter of the area mainly covers two Natura 2000 sites which constitute assets for the territory but also issues to be taken into account from the beginning of the project:

• the special protection zone of the Lower Var Valley (FR9312025)[2]

This Natura 2000 site, classified as an Area of interest for the conservation of birds in 1992, was designated in 2001. Covering 642 ha, it consists of the lower bed of the Var river, in its downstream part, up to the mouth of the sea. It is the largest coastal wetland on the Côte d'Azur. The General Council of the Alpes-Maritimes, as operator of the site, is currently developing the objective document (DOCOB).

[2] https://inpn.mnhn.fr/site/natura2000/FR9312025

• The Natura 2000 site of the dark valleys of Nice and Saint Blaise (FR9301569)

The project development will have no negative influence on existing protected zones.

9.2.2.5 Infrastructure

Public road network is under construction in the NBS area. As mentioning, the pre preparation activities taken long before, considered both construction of new and reconstruction of existing transportation network. At this moment regarding permits I have no more data.

9.2.2.6 Monitoring

None needed.

9.2.2.7 Other

None.

9.3 Planning of legislative prepatory actions

None.

9.4 RECONECT Knowledge exchange. Lessons learned.

Taking into account the national importance of the project the lessons learned should be downscaled to fit the need to other NBS within RECONECT project.

9.5 Information on copies of permits / approvals

All subject of inquiry.

9.6 Preparatory actions for monitoring

9.6.1 Overal Assesment

Status of preparing the monitoring program

NBS B5 Var is right now in the process of preparing the design of the monitoring program, and in the process of choosing appropriate indicator/variables. The table with indicative indicators has been produced for deliverable 2.3.

The monitoring program will mainly be based on the existing monitoring design of hydrology and nature. Concerning monitoring of PEOPLE indicators, we will have to design the monitoring from

scratch combining several sources.

Water: Existing measuring stations for water levels exist for the Var river. There are 2 measuring stations which are used during the AquaVar project. The measurement of surface water levels is done from 2 stations and from 10 the measurements for ground water. We will use rainfall data from MeteoFrance.

Nature: Indicators and variables will be selected on the basis of existing registrations of birdlife, flora and fauna in and around NBS.

People: Indicators and variables will be chosen with the purpose of showing local added values (Eco Valley) and added values in a larger scale (city of Nice). It could be the number of visitors, the inhabitants perception of the NBS, change in property values etc.

9.6.2 Baseline monitoring data (available before RECONECT start)

Details regarding monitoring and evaluation aspects, and available Information/Data/Tools, are presented here in table format.

Table 9-2 The Var NBS Available baseline (monitoring) data before RECONECT

	INDICATORS	PARAMETER / VARIABLE (Baseline data available)	Please mention data source (measured/monitored by you, or taken from other source)	What kind of sensors have been used	Please provide the period of measurements	Please provide time interval of measurements	Please mention the format of data files	Any other important information relevant to monitoring /evaluation aspects
WATER	Flood hazard	Precipitation (mm)	Data taken from official reports Meteo France		2012		Can be agreed	
		Water level (m)	Existing station from AquaVar project		2012		Can be agreed	
	Vulnerability	Precipitation (mm)	Data taken from official reports Meteo France		2012		Can be agreed	
NATURE	Restricted-range species	The numbers of restricted-range species	Other source		2008		Can be agreed	
		The numbers of restricted-range the area						
	Number and type of protected species	Type of protected species	Other source		2008		Can be agreed	
		Number of protected species						
	Type, density of native species	Type of native species	Other source		2008		Can be agreed	
		Number of native species						
		Area that native species are located m^2						
PEOPLE	Increasing recreational opportunities of NBS area	Number of recreation activity in the area	Other source		2006		Can be agreed	
	Reduced/avoided damage cost from hydro-meteorological risk reduction	Flood depth	Other source		2006		Can be agreed	
		Flood velocity						

		Land use map						
		Infrastructure data						
		Damage data						
		Inundation map						
	Number of cultural events in NBS area	Number of cultural events	Other source		2006		Can be agreed	

9.6.3 Geographical information, GIS data

Examples of GIS-data available:

- Digital basemaps with different themes (buildings, roads, sewer system etc.)
- Protected areas (nature, ground water etc.)
- Socioeconomic data

9.6.4 Preparatory actions for monitoring

Information on the (planned) monitoring / evaluation activities, refering to selected indicators and variables is presented in the following table:

Table 9-3 The Var NBS variables that will be monitored during RECONECT, and used to evaluate NBS performance

	INDICATORS	VARIABLE to be monitored/evaluated (Check "Indicator Selection Tool")	Do you posses baseline data on this variable ? (Yes/No acc., to table 1.1)	Will it be monitored by you, or taken from other source	If already known, please provide details. Either on your external data source, or on your monitoring program (sensor type, time-interval of measurements, data formats, etc).				Please mention any innovative tools/methods that will be used (satellite data, drones, remote sensing)	Are you going to share this data within RECONECT ICT platform	Any other substantial information relevant to monitoring /evaluation aspects
					Data/monitoring Approach, Technique, sensor type, equipment,	Time interval	Data format	When (pre-construction, construction, post-construction)			
WATER	Flood hazard	Precipitation (mm)	yes	Meteo France	sensor		Table			Will be decided later	
				Other source							
		Land use map		combined	INSEE - Statistical Institute MNCA AquaVar project						
		Infrastructures data									
		Population data									
		Building/Housing									
	Vulnerability	Land use map	yes	combined	INSEE - Statistical Institute MNCA AquaVar project		Table			Will be decided later	
		Infrastructures data									
		Population data									
		Building/Housing									

NATURE	Restricted-range species	The numbers of restricted-range species The numbers of restricted-range the area	yes	Other source	The data will be followed from given link: https://inpn.mnhn.fr/site/natura2000/FR9312025 If during the project we find additional source for monitoring we will include it in the program.		Table				
NATURE	Number and type of protected species	Type of protected species Number of protected species	yes	Other source	The data will be followed from given link: https://inpn.mnhn.fr/site/natura2000/FR9312025 If during the project we find additional source for monitoring we will include it in the program.		Table				
NATURE	Type, density of native species	Type of native species Number of native species Area that native species are located (m^2)	yes	Other source	The data will be followed from given link: https://inpn.mnhn.fr/site/natura2000/FR9312025 If during the project we find additional source for monitoring we will include it in the program.		Table				
PEOPLE	Increasing recreational opportunities of NBS area	Number of recreation activity in the area	yes	Other source	Data on the city level MNCA (Metropole Nice cote dAzur)		Table				
PEOPLE	Reduced/avoided damage cost from hydro-meteorological risk reduction	Flood depth Flood velocity Land use map	yes	combined	INSEE - Statistical Institute MNCA AquaVar project		Table				

		Infrastructure data									
		Damage data									
		Inundation map									
	Number of cultural events in NBS area	Number of cultural events	yes	combined	INSEE - Statistical Institute MNCA		Table				

9.6.5 Preparation of monitoring / evaluation

We don't expect further needs for permits.

9.7 Links / Synergies to other NBS project and already established EU monitoring network/ facilities

9.7.1 Synergy with other projects on the NBS site

Connection with project AquaVar. The main objective of the project was to develop a simulation tool for surface and underground flows in the lower valley of the Var, capable of reliably represent both the impacts of development projects, extreme hydrological situations and the evolution of hydroclimatic conditions (climate change in particular), as transfers of pollution (accidental) to fields capturing used for the production of drinking water.

9.7.2 Links to other NBS projects

No plans at the moment.

9.7.3 Links / synergies to already established EU monitoring network/facilities

We plan to apply for the membership to ECRINS network in order to monitor the river data. This will provide us a chance to compare to the data we have now.

9.8 Connection to the RECONECT TeleControlNet data platform

Brief Information about the TeleControlNet data platform is presented in Section II Methodology of the report. INTER ACT will contact all Demonstrators to facilitate linking (monitoring) systems/data to the platform. The questions / discussions will be of a highly technical nature. Name of the project team staff member (to be contacted by INTER ACT) Contact for B5-Var River Basin - Jelena Batica jelenabatica@gmail.com

10 Demonstrator DB-6 Les Bouscheleurs, France

10.1 Status analysis

The NBS area become an interested after Xynthia event in 2010. The actions taken after this event present an example how the local community started to more aware of the flood risk.

Following the storm Xynthia in 2010, the commune of Châtelaillon-Plage set up, with the communes of Yves, Aix and Fouras (neighboring communities), a plan PAPI (Program of Actions of Prevention against Floods). The main purpose of the program under this document is to protect people, property and activities from the risk of marine submersion.

Under this program the four main actions are carried out:

- **Risk Prevention and Prediction** *: Improved Risk Awareness and Awareness, Monitoring, Flood and Flood Forecasting*
- **Alert and crisis management:** *communal organization for safeguarding populations*
- **Spatial planning**: *Taking into account risk in urban planning, actions to reduce the vulnerability of people and property.*
- **Protection works**: *the management of water flows (coming from the sea and marshes) , the creation of protection works (breakwater, recovery, enhancement and thickening of existing littoral structures ...).*

Planned work includes actions necessary to close the protection system of the village of Boucholeurs, this action was the subject of a very heavy procedure taking into account environmental issues. Studies and consultation started in 2012.

Work started with extracting the clays necessary for the construction of the dike. End of work planned for the end of 2020. The dyke is 4km long and it is located through the National Nature Reserve of Yves Marsh.

Amount of the operation: € 7.4 Million excluding taxes including land acquisitions and compensatory and accompanying measures.

10.2 Non-technical preparatory actions & legislative aspects

As the NBS that will be demonstrated within RECONECT have been built over several years with the participation of many organizations, the information below is tentative; it is still under investigation and refinement.

10.2.1 Summary information

Table 10-1 Les Boucholeurs NBS summary information on procedures and/or permits

Topic	Procedure name	Public participation or private procedure	Competent authority	Info required in the application	Estimated preparation time (months)	Formal procedure time (months)	Which party should apply	Copy available?
Spatial								
Risk Spatial planning	Procedure of closing protection system	Public participation	State				Local commune	Subject of inquiry
Environment								
Environmental declaration/ EE			Local Authority for the Environment				Local commune	Subject of inquiry
Construction								
Re-Building/construction of coastal protection structures		Public participation	Mayor				Local commune	Subject of inquiry
Ecology/Nature								
Impact study NATURA2000		yes	Local authority (for the Environment)				Local commune	Subject of inquiry

10.2.2 Descriptive information

10.2.2.1 Spatial

Site is not under construction apart from construction wall along the coast line. Actually, here we are speaking about reconstruction.

10.2.2.2 Environment

The "NATURA2000" was conducted as the marine operations envisaged for the Boucholeurs are located within a NATURA 2000 environmental protection perimeter. The content of the impact study is recorded in Article L.414-4 of the Environmental Code. The service provider therefore ensured that the impact study contains all the elements necessary to Impact study "NATURA 2000". Village Les Boucholeurs as a part of protected area NATURA 2000

10.2.2.3 Construction

No data at this moment.

10.2.2.4 Ecology

Ecosystem interest: one of the most representative examples of the large mid-Atlantic mid-shore swamps offering large areas of habitats - including meadowlands - remarkable for their originality (presence of salt in varying quantities) and their diversity (many related to water-logging). As a part of NATURA2000 (FR5410013)[3] this site is valuable from ecological point of view. These habitats are home to a large number of Appendix 1 DO species (46 species) in reproduction, migratory passage or wintering, as well as other migratory species (46 species as well). The site meets 10 quantitative ZICO selection criteria and houses more than 20,000 wintering birds. Among the inventoried bird species: 70 are protected, 58 are nationally endangered and 38 breeding species are threatened at the regional level. In addition. before the planned construction works for this area the Impact study NATURA2000 is conducted with the conclusion that disruption of flora and fauna in this area will not have a long-term effect.

10.2.2.5 Infrastructure

No new roads in this area.

[3] https://inpn.mnhn.fr/site/natura2000/FR5410013

10.2.2.6 Monitoring

None needed.

10.2.2.7 Other

None.

10.3 Planning of legislative prepatory actions

None.

10.4 RECONECT Knowledge exchange. Lessons learned.

Taking into account the national importance of the project the lessons learned should be presented and shared to fit the need to other NBS within RECONECT project.

10.5 Information on copies of permits / approvals

All subject of inquiry.

10.6 Preparatory actions for monitoring

10.6.1 Overal Assesment

Status of preparing the monitoring program NBS B6 Les Boucholeurs is right now in the process of preparing the design of the monitoring program, and in the process of choosing appropriate indicator/variables. The table with indicative indicators has been produced for deliverable 2.3. The monitoring program will mainly be based on the existing monitoring design shoreline and nature. Concerning monitoring of PEOPLE indicators, we will have to design the monitoring from scratch combining several sources. Water: We are focused on the morphological change of the shoreline in this NBS. For this monitoring indicator we will use satellite views and also we plan to become members of the monitoring network. Nature: Indicators and variables will be selected on the basis of existing registrations of birdlife, flora and fauna in and around NBS. People: Indicators and variables will be chosen with the purpose of showing local added values It could be the number of visitors, the inhabitants perception of the NBS, change in property values etc.

10.6.2 Baseline monitoring data (available before RECONECT start)

Details regarding monitoring and evaluation aspects, and available Information/Data/Tools are presented here in table format.

Table 10-2 Les Boucholeurs NBS available baseline (monitoring) data before RECONECT

	INDICATORS	PARAMETER / VARIABLE (Baseline data available)	Please mention data source (measured/monitored by you, or taken from other source)	What kind of sensors have been used	Please provide the period of measurements	Please provide time interval of measurements	Please mention the format of data files	Any other important information relevant to monitoring /evaluation aspects
WATER	Flood hazard	Precipitation (mm)	Data taken from official reports 1) Meteo France;		2012		Can be agreed	
		Water level	1) Meteo France		2012		Can be agreed	
	Vulnerability	Precipitation (mm)	Data taken from official reports 1) Meteo France;		2012		Can be agreed	
	Coastal vulnerability index (CVI)	Shoreline rate (m/yr)	EMODnet					
NATURE	Restricted-range species	The numbers of restricted-range species	Other source		2008		Can be agreed	
		The numbers of restricted-range the area						
	Number and type of protected species	Type of protected species	Other source		2008		Can be agreed	
		Number of protected species						
	Type, density of native species	Type of native species	Other source		2008		Can be agreed	
		Number of native species						
		Area that native species are located (m^2)						

PEOPLE	Increasing recreational opportunities of NBS area	Number of recreation activity in the area	Other source		2006		Can be agreed	
	Reduced/avoided damage cost from hydro-meteorological risk reduction	Flood depth	Other source		2006		Can be agreed	
		Flood velocity						
		Land use map						
		Infrastructure data						
		Damage data						
		Inundation map						
	Number of cultural events in NBS area	Number of cultural events	Other source		2006		Can be agreed	

10.6.3 Geographical information, GIS data

Examples of GIS-data available:

- Digital basemaps with different themes (buildings, roads, sewer system etc.)
- Protected areas (nature, ground water etc.)
- Socioeconomic data

10.6.4 Preparatory actions for monitoring

Information on the (planned) monitoring / evaluation activities, refering to selected indicators and variables is presented on the following table:

Table 10-3 Les Boucholeurs NBS variables that will be monitored during RECONECT, and used to evaluate NBS performance

	INDICATORS	VARIABLE to be monitored/evaluated (Check "Indicator Selection Tool")	Do you posses baseline data on this variable ? (Yes/No, acc., to table 1.1)	Will it be monitored by you, or taken from other source	If already known, please provide details. Either on your external data source, or on your monitoring program (sensor type, time-interval of measurements, data formats, etc).				Please mention any innovative tools/methods that will be used (satellite data, drones, remote sensing)	Are you going to share this data within RECONECT ICT platform	Any other substantial information relevant to monitoring /evaluation aspects
					Data/monitoring Approach, Technique, sensor type, equipment,	Time interval	Data format	When (pre-construction, construction, post-construction)			
WATER	Flood hazard	Precipitation (mm)	yes	Meteo France Other source	sensor		Table			Will be decided later	
		Land use map		combined	INSEE - Statistical Institute						
		Infrastructures data									
		Population data									
		Building/Housing									
		To be decided (Shoreline change (m) using the data from EU monitoring network, wind speed, wave height)									
	Vulnerability	Land use map	yes	combined	INSEE - Statistical Institute		Table			Will be decided later	
		Infrastructures data									
		Population data									

		Building/Housing									
	Coastal vulnerability index (CVI)	Shoreline rate (m/yr)	yes	other	EMODnet						
NATURE	Restricted-range species	The numbers of restricted-range species The numbers of restricted-range the area	yes	Other source	The data will be followed from given link: https://inpn.mnhn.fr/site/natura2000/FR5410013 If during the project we find additional source for monitoring we will include it in the program.		Table				
	Number and type of protected species	Type of protected species Number of protected species	yes	Other source	The data will be followed from given link: https://inpn.mnhn.fr/site/natura2000/FR5410013 If during the project we find additional source for monitoring we will include it in the program.		Table				
	Type, density of native species	Type of native species Number of native species Area that native species are located (m^2)	yes	Other source	The data will be followed from given link: https://inpn.mnhn.fr/site/natura2000/FR5410013 If during the project we find additional source for monitoring we will include it in the program.		Table				
	Changes in riparian habitat										Evaluated through GPS and Aerial images
	Change in wetland habitat										
	Increase green area										
	Distribution of public green space										

PEOPLE	Reduced need for management and maintenance	Maintenance and management cost of grey infrastructures (if implemented)									
		Maintenance and management cost of NBS									
	Change in land and/or property values	Price of land and/or properties (euro)									
		Willingness to pay									
	Reduced / avoided damage cost from hydro-meteorological risk reduction	Flood depth	yes	combined	INSEE - Statistical Institute		Table				
		Flood velocity									
		Land use map									
		Infrastructure data									
		Damage data									
		Inundation map									
	Increasing recreational opportunities of NBS area	Number of recreation activity in the area	yes	Other source	Data on the city level		Table				
	Number of cultural events in NBS area	Number of cultural events	yes	combined	INSEE - Statistical Institute		Table				

10.6.5 Preparation of monitoring / evaluation

We don't expect further needs for permits.

10.7 Links / Synergies to other NBS project and already established EU monitoring network/ facilities

10.7.1 Synergy with other projects on the NBS site

As mentioned in deliverable 2.3, Les Boucholeurs project was a case study in two previous related projects: **CRISMA** - FP7project (2012-2015) and **PEARL** - FP7 project (2014-2017). The results obtained in these two projects will be used in RECONECT. Focusing on modeling crisis management for improved action, preparedness and developing adaptive socio technical risk management and strategies the use of lessons learned will be valuable.

10.7.2 Links to other NBS projects

No plans at the moment.

10.7.3 Links / synergies to already established EU monitoring network/facilities

We plan to apply for the membership to EMODNet network in order to monitor marine data. This will provide us a chance to compare the data we have now.

10.8 Connection to the RECONECT TeleControlNet data platform

Brief Information about the TeleControlNet data platform is presented in Section II Methodology of the report. INTER ACT will contact all Demonstrators to facilitate linking (monitoring) systems/data to the platform. The questions / discussions will be of a highly technical nature. Name of the project team staff member (to be contacted by INTER ACT) Contact for B6 – Les Boucholeurs - Jelena Batica jelenabatica@gmail.com

III. EXAMPLE COPIES OF BUILDING PERMITS / PERMISSIONS OF USES / COMMISSIONING WORKS

In the following section example copies of available permits (selected pages for illustration only) are presented as provided by Demonstrators Type B (in the language of the country to which they refer to).

Besides those, some references to publicly available online procedures and documents are listed (where applicable) in the text of Annex A above.

For some of the Demonstrators the publication of permits / permission of use / commissioning works is subject to authorisation.

1) Municipal permit - Application letter (DB-1, IJssel River NL)
2) Tranche 3 project-plan Waterwet for Stroomlijn IJssel river basin (DB-1, IJssel River NL)
3) Natura 2000 permit DB-1, IJssel River NL
4) Land Use Agreement (DB-1, IJssel River NL)
5) Permit application for working near a dyke (DB-1, IJssel River NL)
6) Approval of establishment of wetland in Egådalen, Municipality of Aarhus (DB-3 Aaarhus: Egå Engsø and Lystrup, DK)

Attachment to Annex A,
Report D2.5

EXAMPLE OF BUILDING PERMITS / PERMISSIONS OF USES / COMMISSIONING WORKS

In the following section copies of available permits are presented as provided by Demonstrators Type B (in the language of the country to which they refer to). Besides those, some references to publicly available online procedures and documents are listed (where applicable) in the text of Annex B. For some of the Demonstrators the publication of permits / permission of use / commissioning works is subject to authorization.

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Ons kenmerk 31091368-OMGM-BRIF-00700-20160229-BEA-Vergunningaanvraag Tranche 3 Stroomlijn Rheden
Datum 29 februari 2016

Geachte heer Beukema,

Rijkswaterstaat heeft Courant opdracht gegeven voor het project Stroomlijn IJssel. In het kader van dit project ontvangt u deze vergunningaanvraag voor het onderdeel Tranche 3. Een onderbouwing van de aanvraag is opgenomen in deze brief.

Toelichting op het project en noodzaak te treffen maatregelen
Door grote weersveranderingen neemt de hoeveelheid water in de Nederlandse rivieren toe. Bij hoogwater, als het water ook door de uiterwaarden stroomt, kan begroeiing de doorstroming van het water belemmeren. Goed beheer en onderhoud van de begroeiing in de uiterwaarden is daarom erg belangrijk.

In het programma Ruimte voor de Rivier en het project Maaswerken worden rivierverruimende maatregelen uitgevoerd om de afvoercapaciteit van de grote rivieren te vergroten. Deze projecten zorgen er voor dat de waterstanden bij hoge rivierafvoeren het Maatgevend Hoogwater (MHW) niet overschrijden.

De vegetatie in het rivierbed heeft zich de laatste jaren sterk ontwikkeld. Op veel plaatsen is agrarisch grasland overgegaan in natuurlijk grasland. Op andere plaatsen hebben zich bomen, struwelen en ooibossen ontwikkeld. Het is ongewenst dat de waterstanddaling die wordt bereikt met de rivierverruimende projecten deels teniet wordt gedaan door de waterstandverhogende effecten die vegetatieontwikkeling in het rivierbed heeft. Met een inhaalslag, als onderdeel van het programma Stroomlijn, wordt de vegetatie in het rivierbed eenmalig aangepakt, waardoor het waterafvoerend vermogen van de grote rivieren (Rijntakken en Maas) wordt vergroot.

Waterhuishoudkundige situatie
Rijkswaterstaat heeft onderzocht hoe het water bij hoogwater door de uiterwaarden stroomt. Op basis van de hiervoor opgestelde modelberekeningen heeft Rijkswaterstaat voor elke uiterwaard bepaald welke ingreep in de begroeiing het grootste effect heeft op de waterstand. In overleg met eigenaren en beheerders van de uiterwaarden worden verschillende soorten ingrepen uitgevoerd, op plekken waar het water bij hoogwater het hardste stroomt (de zogenoemde stroombaan).

Dit betreft onder andere:

1. Het verwijderen van bomen, struiken en riet
2. Het uitvoeren van maatwerk, zoals het verwijderen van enkel wilgen uit dichtbegroeide rietlanden, het weghalen van de onderste begroeiing uit een bos of het opkronen van bomen
3. Het treffen van duurzame beheersmaatregelen, te denken valt aan het opvullen van stroomgeultjes, herstellen van oevers, et cetera

Deze maatregelen zorgen voor een betere doorstroming en waar mogelijk wordt op deze manier het beheer voor de toekomst beperkt. Op ontwerptekeningen zijn de te treffen maatregelen verder uitgewerkt. Tevens is hierop de 'stroomluwte' aangegeven. Dit zijn gebieden niet zijnde de 'stroombaan' van de IJssel.

Stroombaan glad, tenzij – principe

Binnen het programma Stroomlijn worden ontwerpen opgesteld met als principe: een zo glad mogelijke stroombaan. Het meeste effect van verwijderen van vegetatie treedt namelijk op dáár, waar het water het hardst door de uiterwaarden stroomt, in de zogenaamde stroombaan. Maar ook binnen die stroombaan wordt niet rücksichtslos alle vegetatie weggehaald. Uiteraard moeten de werkzaamheden passen binnen de wettelijke kaders, zoals de natuurwetgeving. We houden rekening met beschermde dier- en plantensoorten, zoals de bever, kwartelkoning en stroomdalgrasland. Tevens worden waardevolle heggen en monumentale bomen behouden. Daarnaast treden wij niet in bestaande rechten, zoals vergunningen en privaatrechtelijke overeenkomsten. Het is dus niet zo dat alle vegetatie uit de uiterwaarden zal worden verwijderd, maar binnen de stroombaan wel zo veel mogelijk.

Beschrijving en fasering werkzaamheden

De werkzaamheden aan de uiterwaarden voeren wij gefaseerd uit in verschillende fasen. Deze fasering is onder andere afhankelijk van de beschikbaarheid van flora- en faunaonderzoek en de toestemming van en de afstemming met de verschillende grondeigenaren in het gebied.
De werkzaamheden waarvoor in deze fase in uw gemeente een vergunning wordt aangevraagd, zijn opgenomen in de tabel *'Stroomlijn: overzicht clusters en werkzaamheden, d.d. 29 februari 2016'* die als bijlage bij de vergunningaanvraag is bijgevoegd. In de bijgevoegde ontwerpdocumenten zijn deze maatregelen nader uitgewerkt.

Vergunningaanvraag

Met deze brief verzoeken wij u ons een omgevingsvergunning te verlenen voor de 'werkzaamheden' betreffende 'kappen' en/of 'werk of werkzaamheden uitvoeren', zoals deze zijn weergegeven in bovengenoemde tabel. Hierin is per cluster informatie opgenomen over de te verrichten werkzaamheden in relatie tot de geldende wet- en regelgeving.

In de onderstaande paragrafen hebben wij aangegeven waarvoor wij een vergunning aanvragen en hoe zich dit verhoudt tot de geldende gemeentelijke wet- en regelgeving.

Toelichting Boswet

Een melding in het kader van de Boswet heeft Rijkswaterstaat reeds gedaan voor de werkzaamheden in de Stroombaan van de IJssel. Ook heeft Rijkswaterstaat ontheffing gekregen van de compensatie van het te verwijderen areaal dat onder de Boswet valt. Een afschrift van deze ontheffing is (exclusief bijlagen) als bijlage bij deze aanvraag bijgevoegd.

Op grond van de Boswet (art. 15) zijn gemeenten niet bevoegd om regelen te stellen voor percelen die onder de Boswet vallen. In de tabel ‘Stroomlijn: overzicht clusters en werkzaamheden, d.d. 29 februari 2016’ is aangegeven welk areaal binnen de Boswet valt en waar geen kapvergunning op grond van de APV en/of andere gemeentelijke verordening voor verleend hoeft te worden.

Toelichting kapverordening
Er is geen kapvergunning nodig voor het kappen van houtopstanden die meldingplichtig zijn in het kader van de Boswet.

In de bijgevoegde tabel ‘Stroomlijn: overzicht clusters en werkzaamheden, d.d. 29 februari 2016’ is aangegeven voor welke te kappen houtopstanden op grond van de gemeentelijke verordening een vergunning noodzakelijk is voor het kappen van houtopstanden. Wij verzoeken u om voor deze te kappen houtopstanden een omgevingsvergunning te verlenen voor het onderdeel ‘kappen’.

Toelichting bestemmingsplan
De bestemmingsplannen die gelden in het gebied waar de werkzaamheden plaatsvinden zijn opgenomen in de bijgevoegde tabel. Hierin is per cluster aangegeven welke bestemmingen van toepassing zijn en of er op basis van deze bestemmingen een vergunning nodig is voor het uitvoeren van de werkzaamheden.

Op basis van het bestemmingsplan kan een vergunning nodig zijn voor meerdere activiteiten. In de tabel is onderscheid gemaakt tussen een vergunning noodzaak voor het ‘rooien’ van groen en voor het uitvoeren van ‘grondwerken’. Wij merken hierbij op dat de werkzaamheden in de bodem, het frezen van boomstobben, struweel en riet, niet dieper gaan dan 30 cm -mv. De ‘grondwerken’ komen voort uit de te treffen maatregelen in het kader van duurzaam beheer. De te treffen maatregelen zijn opgenomen in de bijgevoegde tabel alsmede weergegeven in bijgevoegde ontwerpdocumenten.

Zoals aangegeven in de tabel ‘Stroomlijn: overzicht clusters en werkzaamheden, d.d. 29 februari 2016’ verzoeken wij u om voor de te verrichten werkzaamheden een omgevingsvergunning te verlenen voor het onderdeel ‘werk of werkzaamheden’, voor zover dit noodzakelijk is.

Wanneer er verplichtingen voortvloeien richting vergunningen vanuit archeologische waarden, dan is dit opgenomen in de tabel.

Algemene toelichting archeologisch bureauonderzoek Stroomlijn
In bijlage 10 van de vergunningaanvraag vindt u de herziene, tweede versie van de archeologische rapportage van de bureaustudie voor het gehele projectgebied. Opmerkingen van de gemeentelijke en regionale archeologen zijn hierin meegenomen. Voor een aantal locaties dient vervolgonderzoek (in het veld) te worden gedaan indien wordt overgegaan tot ingrepen in de bodem. In hoofdstuk 11 van het rapport staan de conclusies opgenomen. De uitwerking per locatie vindt u in de tabellen in bijlage 3.

Overige wetgeving
Om onze werkzaamheden uit te kunnen voeren conform de geldende wet- en regelgeving houden wij rekening met de wetgeving zoals beschreven in onderstaande paragrafen.

Natuurwetgeving
De bescherming van Natura 2000-gebieden is geregeld in de Natuurbeschermingswet 1998. Er is onderzocht of het project een negatief effect heeft op de instandhoudingsdoelstellingen van het Natura 2000-gebied. Als negatieve effecten mogelijk zijn dan is een vergunning van de

Natuurbeschermingswet nodig. De bescherming van planten- en diersoorten is geregeld in de Flora- en faunawet. Vooraf dient onderzocht te worden of het project negatieve effecten heeft op beschermde soorten. Zo ja dan is meestal een ontheffing van de Flora- en faunawet nodig. Deze wordt pas verleend als maatregelen worden genomen om negatieve effecten te voorkomen of te verminderen.

Er is een passende beoordeling conform art. 19f Natuurbeschermingswet opgesteld, omdat significant negatieve gevolgen voor het Natura 2000-gebied op voorhand niet zijn uitgesloten. In deze passende beoordeling is onderzocht of sprake is van aantasting van de instandhoudingsdoelstellingen van het Natura 2000-gebied. Tevens zijn maatregelen opgesteld om negatieve effecten te voorkomen. Voor de Flora- en faunawet zijn recente verspreidingsgegevens van beschermde soorten verzameld. Daarnaast zijn aanvullende veldonderzoeken uitgevoerd. Het project is getoetst op negatieve effecten op de aanwezige soorten. Indien nodig zijn maatregelen vastgesteld om negatieve effecten te voorkomen.

Het natuuronderzoek zorgt er voor dat het project Stroomlijn binnen de kaders van de natuurwetgeving past. Uit de natuuronderzoeken blijkt welke vegetatie kan worden verwijderd en welke vegetatie dient te worden behouden (volgens het ‘Stroombaan glad, tenzij’ principe). Uit natuuronderzoeken blijkt eveneens onder welke voorwaarden het project wordt uitgevoerd. Dankzij deze voorwaarden worden negatieve effecten op natuurwaarden voorkomen en zijn de maatregelen vergunbaar. De aanvraag voor de vergunning in het kader van de Natuurbeschermingswet is ook bij deze aanvraag bijgevoegd, evenals de aanvraag in het kader van de flora- en faunawet.

Waterwet (projectplan met m.e.r.-beoordelingsnotitie / watervergunning)
In het kader van de waterwet worden de werkzaamheden ‘door of vanwege de beheerder’ Rijkswaterstaat uitgevoerd en is een Projectplan Waterwet met m.e.r.-beoordelingsnotitie opgesteld. Uit de m.e.r.-boordelingsnotitie blijkt dat er geen gevolgen zijn, die het opstellen van een milieueffectrapportage nodig maken. Voor de werkzaamheden die binnen de keurzone van het waterschap worden uitgevoerd en daarom vergunningplichtig zijn, is een watervergunning aangevraagd.

Ontgrondingenwet
In het kader van de ontgrondingenwet is voor het uitvoeren van graafwerkzaamheden een melding nodig. Deze melding wordt niet meegenomen met de gecoördineerde procedures en zal indien nodig minimaal vier weken voor de start van de werkzaamheden gedaan worden.

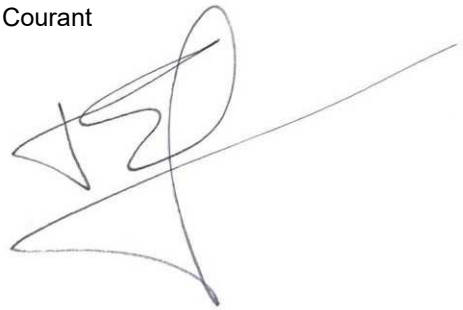
Afstemming met eigenaren en belanghebbenden
Met alle grondeigenaren van de percelen, waarop in deze fase werkzaamheden plaatsvinden, heeft afstemming plaatsgevonden. Zij zijn akkoord met het aanvragen van de vergunningen voor Stroomlijn.

Procedure Rijkscoördinatieregeling
De vergunningen zullen verleend worden met toepassing van de Rijkscoördinatieregeling, hetgeen inhoudt dat alle vergunningen voor het realiseren van de beoogde eindsituatie tegelijkertijd eenzelfde procedure doorlopen, waarbij de besluiten eerst in ontwerp ter inzage worden gelegd, voordat de definitieve besluiten worden genomen en gepubliceerd. De coördinatie wordt verzorgd door Rijkswaterstaat. Meer informatie is te vinden op de site www.coordinatiestroomlijn.nl.

Tot slot
De werkzaamheden zullen worden uitgevoerd in 2016 en 2017. Wij verzoeken u om, indien mogelijk, geen houdbaarheidsdatum aan de vergunning te koppelen. Mocht dit wel nodig zijn, dan verzoeken wij u om de vergunning te laten doen gelden tot 1 mei 2018.

Wij vertrouwen erop u met deze brief voldoende geïnformeerd te hebben om de omgevingsvergunning te kunnen verlenen. Mocht u nog vragen of opmerkingen hebben, dan kunt u contact opnemen met Alette Beerling (+31 61 17 59 04 7) van Courant. Voor algemene informatie over het Programma Stroomlijn kunt u ook de internetsite van Rijkswaterstaat raadplegen www.rijkswaterstaat.nl/stroomlijn.

Met vriendelijke groet,
Rob Korfage, vergunningenmanager
Courant



Bijlagen bij de aanvraag:
☐ 01 - voorliggende brief
- 02 - tabel ‘Stroomlijn: overzicht clusters en werkzaamheden, d.d. 29 februari 2016’

☐ 03A - ontwerpdocument 211
☐ 03B - ontwerpdocument 214
☐ 03C - ontwerpdocument 215
☐ 03D - ontwerpdocument 333
- 03E – ontwerpdocument 336
- 03F – ontwerpdocument 352

☐ 04 - ontheffing Boswet herplant Rijkswaterstaat
☐ 05 - document Principe ontwerpen Duurzaam Beheer Maatregelen
☐ 06 - overzichtstekeningen gemeente Rheden
☐ 07 - aanvraag vergunning Natuurbeschermingswet
☐ 08 - aanvraag ontheffing Flora- en faunawet
☐ 09 - ondertekening eigenaren
- 10 – archeologisch rapport

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Ons kenmerk 31091368-OMGM-BRIF-00706-20160229-BEA-Vergunningaanvraag Tranche 3 Stroomlijn Waterschap Vallei en Veluwe
Datum 29 februari 2016

Geachte heer Brummelman,

Rijkswaterstaat heeft Courant opdracht gegeven voor het project Stroomlijn IJssel. In het kader van dit project ontvangt u deze vergunningaanvraag.

Toelichting op het project en noodzaak te treffen maatregelen
Door grote weersveranderingen neemt de hoeveelheid water in de Nederlandse rivieren toe. Bij hoogwater, als het water ook door de uiterwaarden stroomt, kan begroeiing de doorstroming van het water belemmeren. Goed beheer en onderhoud van de begroeiing in de uiterwaarden is daarom erg belangrijk.

In het programma Ruimte voor de Rivier en het project Maaswerken worden rivierverruimende maatregelen uitgevoerd om de afvoercapaciteit van de grote rivieren te vergroten. Deze projecten zorgen er voor dat de waterstanden bij hoge rivierafvoeren het Maatgevend Hoogwater (MHW) niet overschrijden.

De vegetatie in het rivierbed heeft zich de laatste jaren sterk ontwikkeld. Op veel plaatsen is agrarisch grasland overgegaan in natuurlijk grasland. Op andere plaatsen hebben zich bomen, struwelen en ooibossen ontwikkeld. Het is ongewenst dat de waterstanddaling die wordt bereikt met de rivierverruimende projecten deels teniet wordt gedaan door de waterstandverhogende effecten die vegetatieontwikkeling in het rivierbed heeft. Met een inhaalslag, als onderdeel van het programma Stroomlijn, wordt de vegetatie in het rivierbed eenmalig aangepakt, waardoor het waterafvoerend vermogen van de grote rivieren (Rijntakken en Maas) wordt vergroot.

Rijkswaterstaat heeft onderzocht hoe het water bij hoogwater door de uiterwaarden stroomt. Op basis van de hiervoor opgestelde modelberekeningen heeft Rijkswaterstaat voor elke uiterwaard bepaald welke ingreep in de begroeiing het grootste effect heeft op de waterstand. In overleg met eigenaren en beheerders van de uiterwaarden worden verschillende soorten ingrepen uitgevoerd, op plekken waar het water bij hoogwater het hardste stroomt (de zogenoemde stroombaan).

Dit betreft onder andere:

1. Het verwijderen van bomen, struiken en riet
2. Het treffen van duurzame beheersmaatregelen, te denken valt aan het opvullen van stroomgeultjes, herstellen van oevers, et cetera

Deze maatregelen zorgen voor een betere doorstroming en waar mogelijk wordt op deze manier het beheer voor de toekomst beperkt.

Binnen de opgave Stroomlijn IJssel worden maatregelen getroffen in de gehele IJssel van Arnhem tot Kampen. Deze maatregelen voeren wij uit in een aantal fasen. Op bijgevoegde overzichtskaarten is aangegeven welke locaties binnen onze totale opgave vallen en welke clusters in deze fase (Tranche 3) raakvlakken hebben met waterkeringen en/of watergangen.

Beschrijving en fasering werkzaamheden

De werkzaamheden aan de uiterwaarden voeren wij uit in verschillende fasen. Deze fasering is onder andere afhankelijk van de beschikbaarheid van flora- en faunaonderzoek en de toestemming van en de afstemming met de verschillende grondeigenaren in het gebied.

De eerste uitvoeringsfase staat gepland omstreeks september 2015, na het doorlopen van de eerste gecoördineerde vergunningenprocedure voor het mogen uitvoeren van de werkzaamheden. De werkzaamheden dienen door ons als volgt opgeleverd te worden:

1. Uiterlijk eind 2016: Het verwijderen van bomen, struiken en riet
2. Uiterlijk eind 2017: Het treffen van duurzame beheersmaatregelen

Vergunningaanvraag

Onze werkzaamheden vinden plaats nabij primaire en secundaire waterkeringen, en watergangen. Deze waterstaatkundige werken kennen in veel gevallen kern- en beschermingszones waar regels gelden voor het uitvoeren van werkzaamheden en waar mogelijk een vergunning of melding voor het uitvoeren van de werkzaamheden nodig is. Op de bijgevoegde overzichtskaarten van bijlage 6 is de ligging van de clusters in relatie tot de waterstaatkundige werken en de bijbehorende beschermingszones weergegeven. In de tabel uit bijlage 2 zijn de betreffende clusters waar werkzaamheden plaats vinden ook opgenomen. In alle gevallen wordt bij de clusters riet/ruigte, struweel of bos verwijderd en in enkele gevallen worden er ook duurzame beheermaatregelen getroffen. Een overzicht en een toelichting van deze mogelijk te treffen maatregelen is opgenomen als bijlage 2. In de bijgevoegde ontwerpen is meer specifiek aangegeven welke maatregelen er per cluster genomen worden. Als voor de ingrepen een vergunning nodig is op grond van de Keur van het waterschap, dan is dat aangegeven in de overzichtstabel in bijlage 2 bij deze aanvraag. Deze overzichtstabel is gebaseerd op de regels in de keur van het Waterschap Vallei en Veluwe zoals deze samengevat weergegeven zijn in bijlage 4, overzichtstabel vergunningeisen bij keringen-WVV, zoals deze eerder ter goedkeuring aan u voorgelegd is.

Met deze aanvraag verzoeken wij u om ons een waterwetvergunning te verlenen voor de uitvoering van de werkzaamheden zoals deze zijn omschreven in de bijgevoegde ontwerpen. Een overzicht van de vergunningplichtige werkzaamheden is door ons opgenomen in de tabel in bijlage 2. Wij verzoeken u dat mocht u in de tabel constateren dat er voor de door ons te treffen werkzaamheden vergunningplicht geldt, maar dit niet is opgenomen in de tabel, deze mee te nemen in de te verlenen vergunning. Mochten onderdelen meldingplichtig zijn, dan verzoeken wij u om ook deze werkzaamheden te beschouwen als door ons gemeld, middels het indienen van de voorliggende aanvraag.

Voor de afhandeling van de voorliggende aanvraag wijzen wij u nog op de coördinatieregeling waarin deze aanvraag voor het verrichten van definitieve werkzaamheden in meegenomen dient te worden (zie paragraaf '**Procedure Rijkscoördinatieregeling'**.

Overige wetgeving
Om onze werkzaamheden uit te kunnen voeren conform de geldende wet- en regelgeving houden wij rekening met de wetgeving zoals beschreven in onderstaande paragrafen.

Wet algemene bepalingen omgevingsrecht / gemeentelijke verordeningen / Boswet
Op grond van de geldende bestemmingsplannen en de gemeentelijke verordeningen worden bij de gemeenten omgevingsvergunningen aangevraagd om de werkzaamheden uit te kunnen voeren. Voor zover nodig wordt hiervoor ook archeologisch onderzoek verricht. Een melding in het kader van de Boswet heeft Rijkswaterstaat reeds gedaan voor de werkzaamheden in de Stroombaan van de IJssel. Ook heeft Rijkswaterstaat ontheffing gekregen van de compensatie van het te verwijderen areaal dat onder de Boswet valt.

Natuurwetgeving
De bescherming van Natura 2000-gebieden is geregeld in de Natuurbeschermingswet 1998. Er is onderzocht of het project een negatief effect heeft op de instandhoudingsdoelstellingen van het Natura 2000-gebied. Als negatieve effecten mogelijk zijn dan is een vergunning van de Natuurbeschermingswet nodig. De bescherming van planten- en diersoorten is geregeld in de Flora- en faunawet. Vooraf dient onderzocht te worden of het project negatieve effecten heeft op beschermde soorten. Zo ja dan is meestal een ontheffing van de Flora- en faunawet nodig. Deze wordt pas verleend als maatregelen worden genomen om negatieve effecten te voorkomen of te verminderen.

Er is een passende beoordeling conform art. 19f Natuurbeschermingswet opgesteld, omdat significant negatieve gevolgen voor het Natura 2000-gebied op voorhand niet zijn uitgesloten. In deze passende beoordeling is onderzocht of sprake is van aantasting van de instandhoudingsdoelstellingen van het Natura 2000-gebied. Tevens zijn maatregelen opgesteld om negatieve effecten te voorkomen. Voor de Flora- en faunawet zijn recente verspreidingsgegevens van beschermde soorten verzameld. Daarnaast zijn aanvullende veldonderzoeken uitgevoerd. Het project is getoetst op negatieve effecten op de aanwezige soorten. Indien nodig zijn maatregelen vastgesteld om negatieve effecten te voorkomen.

Het natuuronderzoek zorgt er voor dat het project Stroomlijn binnen de kaders van de natuurwetgeving past. Uit de natuuronderzoeken blijkt namelijk welke vegetatie kan worden verwijderd en welke vegetatie behouden blijft (volgens het 'Stroombaan glad, tenzij' principe). Uit natuuronderzoeken blijkt eveneens onder welke voorwaarden het project wordt uitgevoerd. Dankzij deze voorwaarden worden negatieve effecten op natuurwaarden voorkomen en zijn de maatregelen vergunbaar. Waar nodig worden voor de betreffende clusters een vergunning aangevraagd in het kader van de Natuurbeschermingswet alsmede een ontheffing van de Flora- en faunawet.

Waterwet (projectplan met m.e.r.-beoordelingsnotitie / waterwetvergunning)
In het kader van de waterwet worden de werkzaamheden 'door of vanwege de beheerder' Rijkswaterstaat uitgevoerd en is een Projectplan Waterwet met m.e.r.-beoordelingsnotitie opgesteld. Uit de m.e.r.-boordelingsnotitie blijkt dat er geen gevolgen zijn, die het opstellen van een milieueffectrapportage nodig maken. Voor de werkzaamheden die binnen de keurzone van het waterschap worden uitgevoerd en daarom vergunningplichtig zijn, is een waterwetvergunning aangevraagd.

Ontgrondingenwet
In het kader van de ontgrondingenwet kan voor het uitvoeren van graafwerkzaamheden een melding of vergunning nodig zijn. Indien nodig wordt deze aangevraagd of verricht bij de provincie.

Meldingen Blbi / Bbk
Alle werkzaamheden vinden plaats in de uiterwaarden van de IJssel. Voor de uitvoering van de (grond)werkzaamheden worden voor zover nodig meldingen verricht in het kader van het Besluit bodemkwaliteit en het Besluit lozen buiten inrichtingen bij het betreffende bevoegde gezag (Rijkswaterstaat).

Afstemming met eigenaren en belanghebbenden
Met alle grondeigenaren van de percelen waarop de werkzaamheden plaatsvinden heeft afstemming plaats gevonden. Zij zijn akkoord met het aanvragen van de vergunningen voor Stroomlijn. In bijlage 1: *Logboek per rechthebbende* en bijlage 3: *Uitvoeringsovereenkomst per rechthebbende* van de ontwerpnotitie, bijlage 3 bij deze vergunningaanvraag, is de toestemming per eigenaar opgenomen voor de desbetreffende werkzaamheden op zijn of haar eigendom.

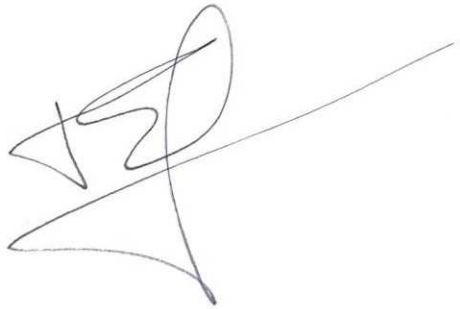
Procedure Rijkscoördinatieregeling
De vergunningen zullen verleend worden met toepassing van de Rijkscoördinatieregeling, hetgeen inhoudt dat alle vergunningen voor het realiseren van de beoogde eindsituatie tegelijkertijd eenzelfde procedure doorlopen, waarbij de besluiten eerst in ontwerp ter inzage worden gelegd, voordat de definitieve besluiten worden genomen en gepubliceerd. De coördinatie wordt verzorgd door Rijkswaterstaat. Voor zover u nog niet bekend bent met deze procedure, verzoeken wij u om dit af te stemmen met de Rijkscoördinator van Rijkswaterstaat: dhr. Jan Ponsioen. Tevens verwijzen wij u naar de verslagen van de AWBG overleggen, waar verder op deze procedures ingegaan is. Wij verzoeken u dringend om deze aanvraag bij binnenkomst niet te publiceren, maar om hierover eerst met dhr. Ponsioen of met ondergetekende contact op te nemen, mocht u nog niet bekend zijn met de procedure voor de coördinatieregeling voor het project Stroomlijn-IJssel.

Tot slot
De werkzaamheden zullen worden uitgevoerd in 2015, 2016 en 2017. Wij verzoeken u om, indien mogelijk, geen houdbaarheidsdatum aan de vergunning te koppelen. Mocht dit wel nodig zijn, dan verzoeken wij u om de vergunning te laten doen gelden tot 1 mei 2018.

Wij vertrouwen erop u met deze brief voldoende geïnformeerd te hebben om de waterwetvergunning te kunnen verlenen. Mocht u nog vragen of opmerkingen hebben, kunt u contact opnemen met Alette Beerling (06-11759047) van Courant. Voor algemene informatie over het Programma Stroomlijn kunt u ook de internetsite van Rijkswaterstaat raadplegen www.rijkswaterstaat.nl/stroomlijn.

Met vriendelijke groet,

Rob Korfage
Vergunningenmanager
Courant



Bijlagen bij de aanvraag:

- 01 - voorliggende brief
- 02 - overzichtstabel Waterschap Vallei en Veluwe Tranche 3 d.d. 29-02-2016
- 03A - ontwerp 276
- 03B - ontwerp 280
- 03C - ontwerp 388
- 04 - overzichtstabel vergunning eisen bij keringen-WVV
- 05 - document Principe ontwerpen Duurzame Beheer Maatregelen
- 06 - overzichtstekeningen WVV
- 07 - ondertekening eigenaren

Dato	Journalnr.	Sagsbehandler	Tlf. nr.
12. april 2005	8-70-51-3-751-11-04 Bedes oplyst ved henvendelse	Bodil Deen Petersen	8944 6661

Godkendelse af etablering af vadomrade i Egadalen, Arhus Kommune

Hermed meddeles der godkendelse i henhold til § 75 i lovbekendtg0relse nr. 882 af 18. august 2004 aflov om vand10b samt dispensation i henhold til § 65, stk. 3, i lov nr. 884 af 18. august 2004 om naturbeskyttelse, til

Etablering af et vadomrade i Egadalen mellem Lystrup og Vejlby i Egadalen

Godkendelse og dispensation er meddelt pa grundlag af de oplysninger og betingelser, som fremgar af de f01gende afsnit 1 til 12.

Med venlig hilsen

Mogens Bj0m Nielsen
Kontorchef

Jonna Mosgaard
Afdelingsleder

Godkendelsen offentliggores i Arhus Onsdag den: 13. april 2005

Klage skal vrere modtaget i Arhus Amt senest den: 11. maj 2005

Sogsmalsfristen udlober den: 13. oktober 2005

Etablering af vadomrade i Egadalen

1. Baggrund for projektet

1.1 Kort resume

Formalet med etablering afvadomradet er dels at mindske kvrelstoftilfurslen til Arhus Bugt og dels at forbedre naturforholdene i og omkring Egadalen i form af forbedrede levevilkar for dyre- og plantelivet. Desuden vil vadomradet give basis for en bedre rekreativ udnyttelse af omradet. Projektet er et Vandmilj0plan 11-projekt, og deter beregnet, at det planlagte vadomrade arligt vil tilbageholde ca. 37 t kvrelstof og *Yi* t fosfor, der derfor ikke vil blive udvasket i Arhus Bugt.

Projektet er oprindeligt startet i forbindelse med godkendelse af VVM-redeg0relsen for den kommende S0:ften-Sk0dstrup Motorvej, hvor det blev papeget, at der med fordel kan foretages naturgenopretning af Ega Enge som erstatning for vejanlreggets naturforringelser. Bl.a. er der en forpligtigelse i henhold til EF-fuglebeskyttelsesdirektivet til at foretage naturgenopretning til beskyttelse af Engsnarren, og det papeges, at Ega Enge vil vrere en oplagt mulighed i denne forbindelse.

Etablering afvadomradet sker i den vestlige del afVejlby-Ega Enges Landvindingslag (pumpelag). Digeme langs Ega fjemes sammen med Pumpestation Vest, og vandet i Ega holdes tilbage med et trerskelstryg ved Lystrupvej og oversv0mmer de lavtliggende arealer. Der etableres afvrergeforanstaltninger langs Lystrupvej, og enkelte regnvandsledninger omlregges. Ellebrekken, der er et ti110b til Egaen fra nord, forlregges i et slynget l0b, og der skabes faunapassage ved Petersmindevej og ved den kommende S0:ften-Sk0dstrup Motorvej. Interesseomradet er i alt 160 ha, hvoraf ca. 100 ha forventes at blive en lavvandet s0, og ca. 60 ha forventes at blive mere eller mindre vade engarealer.

1.2 Baggrundsmateriale

I forbindelse med udarbejdelse af projekt for etablering af engs0en i Egadalen er der udarbejdet fulgende rapporter, der beskriver projektet, den fremtidige tilstand og konsekvenseme:

- Ny vej S0:ften-Sk0dstrup, VVM. Arhus Amt i samarbejde med Ramb011, Anders Nyvig NS og M011er & Grnnborg, juni 2000.
- Registrering af naturforholdene i Egadalen og en vurdering af de naturmressige konsekvenser ved etableringen af en lavvandet s0 i omradet. Arhus Kommunes Naturforvaltning, august2002.
- Naturprojekt i Egadalen, forunders0gelse. COWi NS, 3. juli 2003.
- Arkreologisk forunders0gelse af9. december 2004 ved Moesgard Museum.
- Notat om vurdering afprojektet i forhold til smoltudtrrekket af 7. februar 2005. Danmarks Fiskeriunders0gelser, Afdelingen for Ferskvandsfiskeri.

2. Nuvaerende forhold

2.1 Lokaliteten

Vejlby-Ega Enge ligger i den nordlige del af Arhus mellem forstadsbebyggelseme Vejlby og Lystrup og tret pa Ega og Risskov (bilag 1). Projektomradet er mod 0st afgrrenset af Lystrupvej, mod nord af det h0jere liggende terrren med Lystrup By, mod vest af Grenabanen og mod syd af en markvej, der for10ber parallelt med Viengevej godt 100 m nord for denne.

Omradet har tilbage i stenalderen vreret en del af en smal fjord, der strakte sig fra Arhus Bugt ind til foden af Lisbjerg Bakke. Fjorden blev med tiden en fersk s0, der e:fterhanden forsumpede og blev til enge og moser. Omradet langs den tidligere fjords bredder rummer mange levn fra stenalder og jemalder, og der er foretaget omfattende arkreobgiske udgravninger i f.m. forunders0gelseme til motorvejen. Omradet er siden jemalderen blevet udnyttet til h0slet, grresning og t0rveskrering. Det blev endeligt afvandet i midten af 1950'eme med etablering af et landvindingslag, der inddigede a.en, gravede afvandingsgr0:fter og etablerede tre pumpestationer samt en sluse ved Egas ud10b i Arhus Bugt.

Projektomradet er i dag en del afVejlby-Ega Enges Landvindingslag og afvandes igennem drrenledninger og gr0:fter til dels via Pumpestation Vest til Ega. Omradet er i intensiv landbrugsmressig drift med 76 % af arealeme i omdrift, 18 % i grres (herafnoget i omdrift), 4 % brak og 2 % vand10b. Store dele af omradet har sat sig betydeligt siden afvandingen - mere end halvdelen af projektomradet liggernu mere end m og nogle omrader mere end 1 m under det terrrenniveau, der var for afvandingen

Efter gennemfortjordfordeling vil Arhus Kommune vrere ejer afhele projektomradet. Jordfordelingen er startet i forbindelse med projektering af S0ften-Sk0dstrup Motonejen, og den er efterfolgende blevet udvidet til ogsa at omfatte det kommende s0omrade.

2.2 Vejlby-Ega Enges Landvindingslag

Vejlby Ega Enges Landvindingslag er godkendt ved kendelse af 25. juni 1957 af afvandingskommissionen for Arhus amtsradskreds med efterfolgende vedtregtsrendringer godkendt 8. december 1960 og 19. oktober 1977. Interesseomradet for Landvindingslaget er i alt 453 ha, hvoraf projektomradet udg0r de vestligste 160 ha. Landvindingslagets interesseomrade er vist pa bilag 2.

Egaen og Viengekanalen med tilh0rende diger er srerskilt matrikulerede. Landvindingslaget ejer Egaen fra Grenabanen til ud10bet i Arhus Bugt (5.682 m), Viengekanalen fra Lystrupwj til ud10bet i Arhus Bugt, breddeme og digeme langs de to vand10b, pumpestatioren ved Akrogen (ved ud10bet i Arhus Bugt), 0stre og Vestre Pumpeanlreg i engene samt afvandingskanaler, gr0:fter og drrenledninger i interesseomradet. Fiskeretten i Ega ud for Landvindingslagets arealer tilh0rer Landvindingslaget. Fiskeretten er ikke udlejet.

2.3 Vandlsbs-, natur- og planforhold

Omradet er med regionplantillreg vedtaget 11. marts 2004 af Arhus Amtsrad udpeget som lavbundsareal, hvor der kan etableres Vandmilj0plan 11-vadomrader. Deter i Regionplan 2001 udpeget som omrade af srerlig landskabelig interesse, muligt naturomrade (med 2. prioritet) samt omrade med begrrensede drikkevandsinteresser. Arealeme langs Ega og Ellebrekken er udpeget som spredningskorridor. Omradet er udpeget som okkerpotentielt lavbundsomrade og som SFl..romrade, hvor der kan drives milj0Venlig lanlbrugsdrift (MVJ). Der er ikke indgaet MVJ-a:ftaler i omradet.

Ega og till0bet Ellebrekken er udpeget som beskyttede efter naturbeskyttelseslovens § 3, men ellers findes der ikke § 3 omrader (heder, overdrev, moser, enge eller s0er) inden

for projektomradet. Der er ikke omrader, der er fredet ved kendelse eller udpeget som intemationale naturbeskyttelsesomrader i eller ved projektomradet.

I den syoostlige del afprojektomradet forl0ber et jorddige pa 385 m, der ifolge Arhus Amts registrering er beskyttet efter museumslovens § 29a. I offentlighedsperioden er det blevet afklaret, at diget er af nyere oprindelse, da det er en overdrekning af et af10b fra et regnvandsbassin ved Grenabanen. Diget er derfor ikke beskyttet, og fjemelse /oversv0mmelse af det krrever ikke dispensation efter museumsloven.

Ega er amtsvand10b fra jembanebroen i Jelenge til ud10bet i Arhus Bugt, mens Ellebrekken er kommunevand10b. Arhus Kommune har den 6. december 2004 anmodet Arhus Amt om at behandle sagen for Ellebrekken i henhold til vand10bsloven.

Ega er malsat som B3-vand10b (karpefiskevand) frajembanebroen i Jelenge til ud10bet i Arhus Bugt, hvilket indebrerer, at forureningsgraden h0jst ma vrere 11-111. Ved det sereste tilsyn i 2000 blev forureningstilstanden beoomt til 11-111 vedjembanebroen og til III ved Lystrupvej. Malsretningen for Ega er derfor ikke opfyldt i den nedre del afprojektomradet. Ega er omgivet af diger pa begge sider inden for projektomradet, den har forholdsvis ringe fald og ret ensartede fysiske forhold. Umiddelbart 0st for passagen af Grenabaren er der et dobbelt betonstyrt, der er vanskeligt passabelt for nogle fisk og smadyr.

Ellebrekken er malsat som Bl-vandl0b (gyde- og yngelopvrekstomrade for laksefisk), hvilket indebrerer, at forureningsgraden h0jst ma vrere II (ret svagt forurenet). Den har et godt fald og meget varierede fysiske forhold pa den 0Verste strrekning, mens de fysiske forhold er darlige pa den nederste strrekning. Ved det seneste tilsyn i 2000 blev forureningstilstanden beoomt til II pa den omhandlede strrekning. Malsretningen er dermed opfyldt i Ellebrekken Der er i dag ikke fiskepassage, hvor Ellebrekken krydser Petersmindevej og Lystrupvej.

En mindre strrekning af GI. Ega i projektomradet er C-malsat som vand10b, der kun skal bruges til afledning afvand. De 0vrige vand10b i omradet (gr0:fter ogpumpekanaler) er ikke malsat eller omfattet afnaturbeskyttelseslovens § 3. Vandl0bene i projektomradet fremgar afbilag 3.

Ega har sit ud10b i Arhus Bugt. Bugten er udlagt med skrerpet malsretning. Ca. 400 m for Egas ud10b i Arhus Bugt ved Akrogen er der en sluse med to h0jvandsklapper samt to pumpehuse.

Umiddelbart nord for projektomradet har Arhus Amt planlagt at anlregge en ny motorvej S0ften-Sk0dstrup, og der er udlagt trace hertil i regionplanen

3. Anlaeg afvadomradet

I forbindelse med etableringen afvadomradet i Egadalen skal der foretages en rrekke anlregsarbejder, der i hovedtrrek bestar af folgende:

- Etablering af lavvandet s0 i engene mellem jembanen og Lystrupvej samt forbedring af faunapassagen i Egaen(bilag 4)
- Omlregning af Ellebrekken (bilag 5)
- Etablering afnyt regnvandsbassin ved Lystrup

De konkrete anlregsarbejder er nrermere beskrevet i rapporter mv. der er oplistet i afsnit 1.2.

3.1 Anlregsarbejder

Anlregsarbejdet omfatter i hovedtrrek f01gende:

- Etablering af et faunapassabelt stenstryg med dobbeltprofil og stenbanketter ved ud10bet fra ny s0 umiddelbart vest for Lystrupvej
- Nedlreggelse afdiger pa begge sider langs ca. 1.400 m af Ega og delvis tilfyldning af ca. 1.400 m eksisterende vand10b med jord fra diger
- Etablering af tre til fire fugleholme i den nye s0 med overskudsjord
- Etablering af ca. 1.300 m lavt dige/forstrerkning langs Lystrupwj med jorden fra digeme langs Ega
- Nedlreggelse af Pumpestation Vest
- Nedlreggelse af styrt i Ega umiddelbart 0st for Grenabanen
- Afbrydelse af drren og frilregning af en regnvandsledning
- Etablering af 475 m gravitationsledning for vejafvanding fra LystrupvejNiengevej til Gl. Ega Pmnpekanal
- Etablering af regnvandsbassin pa ca. 1.970 nf
- Etablering af ca. 820 m nyt vand10b for Ellebrekken*
- Etablering af en faunapassage under Petersmindevej for Ellebrekken*
- Etablering af sti rundt om s0en med bro over Ega og Ellebrekken

* Ellebrekkens for10b flyttes pa strrekningen fra Petersmindevej til ud10bet i Ega. I dag 10ber Ellebrekken under Lystrupvej mod 0st ud i Viengekanal, der munder ud i Ega. Ellebrekken planlregges fra Petersmindevej forlagt mod syd i et snoet for10b med sten- og grusbund og med ud10b i den nye s0. Derved bliver der skabt passage for fisk og smadyr i Ellebrekken, og den nederste delafvand10bet f'ar gode fysiske forhold. Fald og dimensioner for Ellebrekken er angivet i bilag 6 og 7. Faunapassagen ved Ellebrekkem krydsning med Petersmindevej fremgar afbilag 8.

Faunapassagen ved Ellebrekkens krydsning med motorvejen S0ften-Sk0dstrup myndighedsbehandles i f.m. de 0Vrige motorvejskrydsninger i en srerskilt sag.

3.2 Tidsplan og afledte konsekvenser

Anlregsarbejdet planlregges for hovedparten gennemf0rt i perioden september til december 2005. Enkelte opf01gende arbejder kan gennemf0res i 2006. For at g0re arbejdet praktisk gennemf0rligt i den meget vade og b10de jord i projektomradet, planlregges det om n0dvendigt at lukke sluseportene ved Egaens ud10b i Arhus Bugt og samtidig pumpe vandet fra Ega ud ved Akrogen med de eksisterende pumper, sa vandstanden konstant er sa lav som mulig i projektomradet i anlregsperioden

I en del af denne periode (fra ca. begyndelsen afnovember til midt i december) vii hav-0rredeme vandre fra havet op igennem Ega for at gyde i till0bene. Det er vurderet, at gydebestanden i Ega med till0b udg0r ca. 150 fisk. For at kompensere for, at sluseportene eventuelt er lukkede i denne periode, vii der blive foretaget regelmressig elbefiskning, sa hav0rredeme bliver :fisket op og sat ud igen i Ega inden for sluseportene.

Omlregningen af Ellebrekken skal koordineres med anlreg af S0ften-Sk0dstrup motonejen, idet Ellebrekken vii blive omlagt, sa den f'ar direkte udl0b i den kommende s0 med en faunapassage under motorvejen.

4. Fremtidig tilstand og konsekvenser

4.1 Afvandingsmressige konsekvenser

Det fremtidige vadomrade er vist pa bilag 4. S0ens vandspejl vii ligge i kote 0,5 med lidt varierende vandspejl. S0en f'ar en dybde pa max. 1 *Yi* m og en udstrrekning pa 90 til 110 ha. S0en bliver lavvandet med en gennemsnitlig dybde pa ca. 70 cm. Hertil kommer en brremme rundt om s0en pa ca. 50 ha, der vii blive til mere eller mindre vad eng. Den h0jeste vandstand i s0en vii vrere kote 0,8, og det er beregnet, at denne hrendelse vii indtrrede ca. hvert 10. ar. Den dybeste del af s0en vii vrere Egas l0b, idet den bevares i ca. halvdelen af den eksisterende dybde. Her vii vandstanden vrere op til *2 Yi* m.

Projektet vii ikke pavirke gnmdvandsstanden uden for projektomradet, og det vii ikke pavirke va:rrlstanden opstr0ms i Ega. Det vii sandsynligvis pavirke vand:furingen i Ega nedstr0ms projektomradet, idet s0en og engene vii virke som udligningsbassin og dermed drempe udsvingene i a.ens vandfuring. De omrader, der ligger inden for landvindingslagets interesseomrade 0st for Lystrupvej vii ikke blive pavirket afprojektet, da de furtsat vii blive afvandet med Pumpestation 0st og pumpeme ved Akrogen, der bibeholdes.

Der ligger en rrekke tekniske anlreg i og ved projektomradet, som bernres af den kommende s0, hvorfor der gennemfures en rrekke afvrergeforanstaltninger til sikring af anlreggene som beskrevet i afsnit 3.1.

4.2 Natur- og milj0mressige konsekvenser

Projektomradet er i dag i intensiv landbrugsmressig drift med ra og beskedne naturvrerdier. Deter fladt og ensformigt med ganske ra levende hegn og smabevoksninger afkrat og trreer. Som nrevnt er der ikke beskyttede naturomrader (§ 3 omrader) inden for projektomradet, bortset fra vandl0bene Ega og Ellebrekken.

Ved Arhus Kommunes optrelling af ynglefugle i 2002 blev der fundet i alt 6 forskellige arter af ynglefugle *(agerhene, vibe, sangkerke, gul vipstjert, klersanger og tomsanger)* med en trethed pa 63 par pr. km2. Dette svarer nogenlunde til antal arter pa lignende landbrugsarealer, men ynglefugletretheden er ret lav. Der blev konstateret en overraskende stor bestand af ynglende *gul vipstjert* i omradet, der i l0bet af den sidste snes ar nresten er forsvundet som ynglefugl i 0stjylland.

Ud fra omradets topografi ma det antages, at den 0Vrige fauna er relativt fatallig og artsfattig, dog er der ved Egas krydsning med Lystrupvej konstateret *odder* i 2004. *Odderen* er opfort pa habitatdirektivets bilag IV over arter, der krrever streng beskyttelse

Floraen iomradet er artsfattig og reprresentativ for et dyrket landbrugsomrade. F0r af:. vandingen rummede omradet bade h0jmose og overgangsrigkrer med flere plantearter, der er i tilbagegang i Danmark (Botaniske Lokaliteter i Arhus Amt: Peter Wind 1990). Etablering af en lavvandet s0 med omgivende rnrsump og vade enge pa i alt 160 ha vil 0ge omradets naturvrerdi og naturindhold betragteligt. Arhus Kommunes Naturforvaltning anforer i sin vurdering (fra 2002), at der i omradet vil udvikle sig et ynglefuglesamfund med flere arter (2-3 gange sa mange som nu) og h0jere ynglefugletrethed (2-4 gange sa stor som nu), og at der vil udvikle sig helt nye typer af plantesamfund med vandplanter, sumpplanter og lavtvoksende mose- og engplanter.

Desuden vil der blive skabt betydeligt bedre levevilkar for dyrelivet generelt. Der vil blive levesteder for insekter, padder, krybdyr og mange arter af pattedyr, bl.a. vil odderen fa gode levevilkar i omradet. Desuden er basis for, at omradet kan blive et vigtigt fouragerings- og rastested for fugle pa trrek eller overvintring.

4.3 Konsekvenser for fiskebestanden

Ega er i projektomradet malsat som karpefiskevand. Opstr0ms projektomradet er Ega ligesom ti110bene Ellebrekken, Lisbjerg Brek og Koldkrer Brek malsat som gyde- og yngelopvrekstomrade for laksefisk. Det vurderes ud fra Arhus Amts tidligere unders0gelser, at der ikke findes en oprindelig bestand af hav0rreder i Egaens vandl0bssystem, men at den nuvrerende bestand udelukkende bygger pa udsretninger foretaget siden 1988.

4.3.1 Vurdering fra DFU

Danmarks Fiskeriunders0gelser (DFU), Afdelingen for Ferskvandsfiskeri, er kommet med folgende vurdering af projektet i relation til smohudtrrekket:

"Pa baggrund af udsretningsplanen er smoltudtrrekket for Ega anslaet til ca. 960 smolt (yngeludsretningerne giver 150 stk. smolt, udsretninger af 1-ars fisk giver 225 stk. smolt, i alt 375 stk. smolt. Vildfiskeproduktionen giver 582 stk. smolt).

Det anslaede smoltudtrrek pa baggrund af udsretningsplaneme ligger ofte i underkanten af, hvad der observeres ved direkte smoltunders0gelser. Med baggrund i er:furinger fra andre vand10b forventes smoltudtrrekket fra Ega at ligge i omegnen 1500 - 2000 smolt.

Engs0en i Egadalen vil med sin lave dybde komme til at minde om den vestlige del af Arslev Engs0, hvor Arhus A10ber til. Ved en unders0gelse af smoltd0deligheden i Arslev Engs0 i 2004 blev den 0jeblikkelige d0delighed for smolt, der kommer fra .Arhus A, malt til 0,0771km (Rasmussen & Koed 2005, Smoltd0deligheder i Arslev Engs0, en nydannet Vandmilj0plan II-s0, og Brabrand S0 i foraret 2004). Dette svarer til en 0jeblikkelig d0delighed pa 0,108 for 1,4 km eller ca. 10 %. Pa den baggrund vurderes en smoltd0delighed i st0rrelsen 5 - 15 % i den nye s0 i Egadalen at vrere et realistisk sk0Il.

En cwdelighed pa dette niveau vurderes ikk:e i sig selv at vrere kritisk for Egaens hav0r-redbestand. Dog vii det givetvis resultere i, at hav0rredbestanden reduceres i forhold til den nuvrerende situation. Der kan evt. kompenseres for dette ved at skabe habitatforbed-ringer i a.en, der f0rer til 0get smoltproduktion.

DFU har planlagt at lave en unders0gelse af smoltcwdeligheden i Ega for og efter pro-jektets gennemf0relse, hvilket forventes at give en mere n0jagtig vurdering af engs0ens effekt pa smoltudtrrekket."

4.3.2. Arhus Am.ts vurdering

Det indgar i projektet, at Egaens 10b bevares igennem s0en i ca. halv dybde og fuld bredde, sa det kan fungere som vandringsvej for optrrekkende 0rreder og nedtrrekkende smolt (0rredyngel). Der skabes desuden habitatforbedringer i a.en og till0bene, idet der etableres fri passage og forbedrede fysiske forhold :for fisk og smadyr i Ellebrekken. Ligeledes skabes der passage til Egaen opstr0ms projektomrade, idet det eksisterende dobbelte betonstyrt 0st for Grenabanen fjernes. Projektet forventes derfor samlet set ikk:e at medf0re forringede betingelser for bestanden af vandrefisk i Ega-systemet.

Den nye s0 vii desuden skabe levesteder for andre fiskearter, der trives i s0er, sasom karpefisk, al og gedde. Disse fisk er i forvejen i vandl0bene i omradet.

4.3 Rekreative forhold

Projektomradet ligger meget bynrert i den nordlige del af Arhus med et stort befok-ningsgrundlag i kort afstand. Det grrenser mod nord op til Lystrup og mod syd til Vejl-by, og det ligger tret pa bebyggelseme i Risskov, Elev, Lisbjerg-Terp og Ega. Der er ret fa naturomrader og rekreative arealer i dette omrade (strrekninger langs kysten, Molle-mp Skov, golfbane).

Etablering af vadomradet vii give basis for helt andre og bedre muligheder for rekreativ udnyttelse, end der er mulighed for i dag. For det furste vii vadomradet 0ge omradets landskabelige vrerdi betragteligt, for det andet vii der indfinde sig et meget rigere og mere varieret plante- og dyreliv, der giver muligheder for oplevelser, og for det tredje vii der blive etableret stier, fugletarn og omrade med formidlingsaktiviteter, der giver mulighed for at komme ud i omradet.

Deter planlagt at bruge de eksisterende markveje (syd for s0en) og stier (0st for omra-det) som basis for en gang- og cykelsti hele vejen rundt om s0en med tilslutning fra w-jene ved Lystrup og Vejlby. Stisystemet udbygges saledes med nye stier vest og nord for s0en, og markvejen syd for s0en forbedres. Det er desuden planlagt at etablere en platform for formidling ved s0ens norcwstlige hj0me op mod Lystrupvej. Ved s0ens sydvestlige hj0me planlregges opf0rt et fugletam. Omfanget af etablering af de planlag-te rekreative anlreg afhrenger af, i hvor stor udstrrekning det lykkes at skaffe finanse-nng.

5. Sagens behandling

5.1 lnddragelse af lodsejere

I forbindelse med forarbejdet til anlreg af motorvejen S0ften-Slrndstrup er der gennemfort en jordfordeling, som er udvidet til ogsa at omfatte det kommende vadomrade. Det er hensigten, at Arhus Kommune overtager al jorden i projektomradet.

5.2 lnddragelse af ovrige myndigheder

Arhus Kommune deltager aktivt i en styregruppe om projektet. Arhus Kommune vii blive fremtidige ejere af omradet og vii derfor sta for driften af det.

Moesgard Museum har gennemfort prnveudgravninger i de omrader, der vii blive ber0rt af anlreg;arbejdet til supplering af de omfattende udgravninger og unders0gelser, der er foretaget som forberedelse til anlreg afmotorvejen S0ften-Slrndstrup. Der mangler at blive gennemf0rt prnvegravninger pa et par mindre lokaliteter. Disse unders0gelser forventes gennemf0rt i sommeren 2005, inden anlregsarbejdet gar i gang.

Moesgard Museum har bedt om at blive underrettet, nar der graves pa bestemte lokaliteter i omradet, ligesom de vii blive underrettet, hvis der under anlregsarbejdet bliver gjort fund af oldtidssager. Moesgard Museum deltager i en arbejdsgruppe, der planlregger de rekreative tiltag og formidlingen i omradet.

Danmarks Fiskeriunders0gelser, Afdelingen for Ferskvandsfiskeri, har givet udtalelse i sagen med hensyn til vilkarene for vandrefisk og deres overlevelse i det kommende vadomrade. DFU vii gennemfore en unders0gelse af smoltd0deligheden i Ega f0r og efter projektets gennemf0relse.

5.3 Orientering afinteresseorganisationer

De interesseorganisationer, der er nrevnt i afsnit 10, har iaet tilsendt udkast til afg0relsen i 4 uger med indsigelsesfrist til 23. marts 2005.

5.4 Annoncering

Meddelelse om udkast til godkendelse har vreret annonceret onsdag den 23. februar 2005 i Arhus Onsdag til offentlig fremlreggelse i 4 uger i henhold til vand10bsloven samt til bemrerkninger i 0Vrigt efter anden lovgivning.

5.5 Modtagne bemrerkninger

Arhus Amt har modtaget 4 bemrerkninger/indsigelser til forslaget til godkendelse:

1) Arhus Kommune, Magistratens 2. afdeling

Naturforvaltningen st0tter forslaget og vurderer, at engs0en vii forbedre de naturmressige og landskabelige forhold i Egadalen og skabe nye rekreative muligheder for borgerne. Engs0en forventes at ia lige sa stor rekreativ betydning for nordbyen som Brabrandstien har i dag for vestbyen. Nattrforvaltningen g0r opmrerksom pa, at den skitserede sti ikke udelukkende anlregges pa eksisterende stier og veje. Desuden papeges vigtigheden af at sikre gode stiforbindelser til de mange byomrader, der i dag og fremover vii omkranse s0en.

2) Danmarks Sportsfiskerforbund, Worsaesgade 1, 7100 Vejle
DS opfordrer til, at projektet tager vandrefiskenes tarv alvorligt og mener, at der i projektet i h0jere grad end nu b0r indga initiativer, der kan kompensere for den 0gede d0delighed af smolt. DS pointerer, at den anslaede smoltd0delighed pa 5-15 % sandsynligvis vil vrere meget st0ITe (op mod 80 %).

DS mener, at en rrekke forhold b0r inddrages i det frerdige projekt. Forholdene omhanller Egaens for10b igennem s0en, Ellebrekkens udmunding, s0ens af10b, miljmilstand og passageforhold i Egaen opstrnms og nedstrnms s0en samt ved slusen ved udmundingen samt fremtidig monitering af de vandrende fiskebestande.

DS nrevner desuden, at det ikke er muligt at elbefiske de optrrekkende hav0ITeder og flytte dem forbi sluseportene, da elfiskeri ikke er mulig i havvand.

3) Brabrand Lystfiskerforening, v/ nrestformand Henrik Aagaard Andreasen, Tingstedet 72, 8220 Brabrand
De arhusianske lystfiskerforeninger har i mere end 30 ar fredet Ega for fiskeri, da a.en har begrrensede muligheder for reproduktion og opvrekst af 0ITeder. Massive udsretninger siden 1988 har ikke givet de forventede resultater. I 1999 begyndte BL imidlertid at udsrette 0rreder af Ega's oprindelige stamme, hvilket siden har givet en betydelig fremgang for bestanden. Understeger at 0rreden er EU-rndlistet og krrever beskyttelse mod udryddelse. Erfaringer fra lignende vand10b med kunstige eller naturlige s0er viser, at 50- 80 % af de udstrrekkende smolt d0f under udtrrek om foraret, og at det samme vil ske i Egadalen.

G0r opmrerksom pa, at hav0rreder trrekker op i perioden fra august til februar, hovedvandringen er fra november til midt i januar. Hav0ITeder og smolt trrekker ud til havet fra februar til sidst i april. Devil vrere forhindret i dette, da Ega'ens vand trenkes pumpet ud ved Akrogen. En hel generation af smolt vil derfor ga til ved anlreg af s0en og en argang af hav0ITeder vil blive forhindret i at gyde, hvilket vil vrere genetisk uforsvarligt.

Det b0r unders0ges, hvilke fuglearter, der vil bebo de foreslaede holme i s0en. Hvis det bliver terner, vil det fa konsekvenser for smolten.

BL anf0rer, at en vresentlig del afkonklusionen fra DFU's rapport om Arslev Engs0 ikke er medtaget i forslaget. Heraf fremgar det, at geddebestanden i Arslev Engs0 pa unders0gelsestidspunktet endnu ikke var udvokset, hvorfor det ma antages, at smoltd0deligeheden i Arslev Engs0 vil blive h0jere end nu. En sadan d0delighed (som i Brabrand S0) vil vrere kritisk for den ret lille bestand af 0rreder i Ega. BL forslar derfor, at afstanden mellem ind10b og ud10b i s0en minimeres, at vandets opholdstid i s0en minimeres, samt at der skabes et veldefineret ud10b fra s0en. Intet af dette er tilgodeset i forslaget.

BL foreslar desuden, at man e:fterligner Vejle Amts projekt med etablering af en engs0 i Vejle A. Her er selve a.en furt uden om engs0en med et snrevert ind - og ud10b i s0en. Vedlregger skitse over, hvordan et sadan a med dobbeltprofil kan forl0be nord om det

aktuelle projektomrade ved Ega. Dette vil give en iltfattig s0, hvor nitratafgasningen er mest effektiv.

Konkluderer, at foreningen ikke kan godkende forslaget, idet der ikke er taget tilstrrekkeligt hensyn til den oprindelige og naturlige hav0rredbestands overlevelse, hverken under eller efter etablering af vadomradet.

4) 0stjydsk 0rredsammenslutning, v/ Mogens Enevoldsen, Edelhofvej 15, 8462 Harlev
Foreningens formal er at ophjrelpe bestanden af hav0rreder i Arhus Bugt, hvorfor man anser sig om berettiget til at give indsigelse.

00's indsigelse er den samme som indsigelsen fra Brabrand Lystfiskerforening bortset fra folgende tilfojelser og udeladelser:

00 pointerer, at man ikke er imod vadomrader som <let planlagte, da de er med til at forbedre milj0et i Arhusbugten, men vadomradet skal laves pa en sadan made, at det ikke mindsker hav0rredens mulighed for at reproducere sig.

00 anser <let for umuligt at opfiske hav0rreder uden for slusen ved Ega's udl0b, da der skal fiskes i et stort omrade pa dybt vand. Desuden skal hav0rredeme sv0mme igennem et stort lavvandet omrade med omfattende entrepren0rarbejde, hvilket vamkeligg0r eller umuligg0r 0rredens vandring.

00 nrevner ikke Brabrand Lystfiskerforenings forslag om, at vadomradet laves efter modellen fra Vejle A.

6. Arhus Amts kommentar til de modtagne bemcerkninger

1) Til Arhus Kommune, Magistratens 2. afdeling
Teksten i afsnit 4.3 om rekreative forhold er rendret, sa <let nu er prreciseret, at <let kun er en del af stifor10bet rundt om s0en, der etableres pa eksisterende markveje og stier. Resten vil vrere nye stier.

2) Til Danmarks Sportsfiskerforbund, Worsaesgade 1, 7100 Vejle
Med hensyn til vurderingen af smoltd0deligheden ma Arhus Amt henholde sig til <let notat, som Danmarks Fiskeriunders0glser har udarbejdet i sagen, hvor DFU anslar en smoltd0delighed pa 5-15 % som realistisk i en kommende s0.

Af de forhold, som DS nrevner b0r indga i <let kommende projekt, har Arhus Amt ved projekteringen sikret, at Ellebrekken udmunder sa tret som muligt pa s0ens afl0b, ligesom afl0bet fra s0en vil blive udformet sa optimalt som muligt med henblik pa, at smolten kan finde ud af s0en. Amtet er ikke indstillet pa at faskinere Ega'ens 10b igennem s0en, da vi finder, at dette kan vrere til mere skade end gavn, idet faskineme bl.a. kan fungere som siddeplads for fiskehejrer langs aens l0b.

Arhus Amt vil som foreslaet udarbejde en plan for milj0forbedringer i hele Egaens system med henblik pa at give optimal passage og forbedrede levevilkar for fisk og smadyr. Det skal nrevnes, at der ved projektet allerede bliver skabt passage for fisk i <let

vigtige tilwb Ellebrekken, hvilket der ikke har vreret indtil nu. Desuden indebrerer det foreliggende projekt andre fysiske forbedringer i Ellebrekken til gavn for bl.a. *havnrreder.* I planen vii amtet foretage en vurdering af og om oodvendigt gennemfore forbedringer afpassagemulighedeme ved slusen ved Akrogen. Arhus Amt vii gennemfore vurderingen og opfolgningen pa den inden udgangen af 2006.

Arhus Amt har ikke planlagt at lave videre unders0gelser, da Danmarks Fiskeriunders0gelser har planlagt at gennemfore en unders0gelse af smoltd0deligheden i Ega for og efter projektets gennemf0relse.

Det skal nrevnes, at Arhus Amt i november 2004 gennemforte et fors0g med elfiskeri uden for sluseportene i Egaen. Slusen i Ega er placeret 420 m inden a.ens udmunding i Arhusbugten, hvilket giver en afgrrenset og veldefineret astrrekning med ferskvand, hvor fiskene star og afventer. ForS0get viste, at det i praksis var muligt at elfiske med succes pa strrekningen mellem sluseportene og a.ens ulwb, i hvert fald ved faldende vandstand i havet(ebbe).

3) Til Brabrand Lystfiskerforening
Arhus Amt fastholder sin vurdering af, at bestanden af *havnrred* i Egaen ikke er af en oprindelige stamme, da der ifolge udsretningsplanen for Ega m.v. ikke var mreder i systemet i 1988. Ved amtets gennemfiskning afEga-systemet i 1984 blev det ligeledes konstateret, at der ikke var *havnrreder* i systemet. Udsretningeme siden 1988 har medfort en vis tilbagevendenaf *havnrred* til Ega'en, og deter sandsynligvis de fisk, der avles videre pa fra sidst i 1990'eme og ulsrettes i Ega.

Med hensyn til vurdering af smoltd0deligheden ma Arhus Amt igen henholde sig til det notat, som Danmarks Fiskeriunders0gelser har udarbejdet i sagen, og hvor DFU vurderer smoltd0deligheden til 5 - 15 %. Danmarks Fiskeriunders0gelser anforer, at dette er et realistisk sk0n, og at dette ikke i sig selv er kritisk for Ega'ens havmredbestand. DFU foreslar, at der kompenseres for den 0gede d0delighed ved at skabe habitatforbedringer i a.en.

Det er korrekt, at *havnrrederne* trrekker op i aeme fra august til februar, heraf hovedparten fra mvember til midt i januar. Anlregsperioden starter f0rst i september og forventes afsluttet ved udgangen af december, hvorfor det vii vrere i perioden november - december, Arhus Amt forventer at "hjrelpe" de optrrekkende hav0rreder over slusen ved elektrofiskeri. Dette vii ske, hvis det i perioder viser sig oodvendigt at lukke slusen af hensyn til gennemf0relse af anlregsarbejdet.

Smolten og *havnrrederne* trrekker som anf0rt ud i havet fra februar til sidst i april. Tidsplanen for projektet tager h0jde rerfor. I perioden for nedgang af smolt er anlregsarbejdet frerdigt, og sluse mv. vii fungere som normalt. Det er derfor ikke korrekt, at en hel generation af smolt vii ga tabt, og en hel generation af havmreder vii blive forhindret i at gyde, fordi de vii blive ga til i pumpeme.

Sp0rgsmalet om, hvilke fuglearter, der vii yngle pa holmene i s0en, er afklaret. Det vii primrert blive *hcettemager* og maske enkelte *gracender, blishnns* og *knopsvaner.* Det

bliver ikke temer, da de krrever mere uforstyrrede omgivelser i st0ffe, sammenhrengende naturomrader.
I projektet er der taget de anf0rte hensyn til, at afstanden mellem ind - og udk,b i s0en, bade for Ega og for Ellebrekken er de mindst mulige under hensyn til projektet formal med at fjeme kvrelstof. Deter planlagt, at Ega'ens 10b bliver staende tilbage i s0en i halv dybde (dvs. en dybde pa godt 1 m under s0bunden), sa den kan fungere som ledevej for de optrrekkende hav0ffeder og nedtrrekkende smolt og hav0rreder. Arhus Amt vil vurdere, om det vil vrere en god ide at trrekke de planlagte fugleholme vrek fra a:b-bet, sa de ikke kan fungere som stasteder for fiskehejrer under fiskeri af smolt. Ved projektering vil Arhus Amt som nrevnt udforme af10bet fra s0en, sa det bliver sa optimalt som muligt for de nedtrrekkende smolt og mv0ffeder. Opholdstiden for vandet i s0en er beregnet til at blive 0,15 ar (55 dage), hvilket er en forholdsvis kort opholdstid for en s0.

Forslaget om at udforme s0en, saledes at Egaen bliver ledt i et 10b nord om s0en, mens det kun er en mindre del af vandf0ringen, der bliver ledet ind igennem s0en, er ikke mulig af flere grunde:

- Kvrelstoffjemelsen vil blive alt for lav i forhold til det planlagte og milj0mressigt optimale (for Arhusbugten).
- Det er korrekt, at kvrelstoffjemelsen alt andet lige vil vrere st0ffe ved iltfrie forhold, som vil opsta om sommeren, hvis der stort set ikke kommer nyt vand til s0en. Det er imidlertid en forudsretning for kvrelstoffjemelsen, at der sker et vist flow igennem s0en. Det er dog meget tvivlsomt, om s0en bliver iltfri, selv om vandtilf0rslen mindskes. Hvis den skulle blive det, vil det imidlertid vrere direkte skadeligt for plantelivet og det 0Vrige dyreliv i s0en samt yderst generende for de omkringboende.
- Langs den nordlige del af den kommende s0 er der meget store arkreologiske interesser, da omradet er fyldt med fortidsfund. Det er derfor ikke muligt at grave i dette omrade. Det samme vil grelde for et evt. forslag om at lave et om10b syd om s0en.

Arhus Amt mener samlet, at der er taget forsvarlige hensyn til hav0ffedbestanlens overlevelse, bade under og efter gennemf0relse af projektet. Arhus Amt har foretaget en samlet afvejning af alle de natur- og milj0mressige interesser, der er i omradet og uiformet s0en derefter.

4) Til 0stjydsk 0rredsammenslutning
Arhus Amts bemrerkninger er de samme som til Brabrand Lystfiskerforening.

Hvad angar mulighedeme for at opfiske hav0ffeder uden for sluseportene ved Ega'ens udmunding, er dette kommenteret i bemrerkningeme til Danmarks Sportsfiskerforbund. Arhus Amt vurderer, at det er muligt for hav0ffedeme at sv0mme igennem a.en, mens anlregsarbejdet foregar. Hav0ffedeme vandrer hovedsageligt om natten, hvor arbejdet vil ligge stille.

7. Godkendelse

7.1 Vandlebsloven

Med baggrund i foranstaende meddeles der hermed godkendelse til etablering af en engs0 i Egadalen og omlregning af Ellebrekken og Viengekanel. Desuden meddeles der tilladelse til etablering af to gang- og cykelbroer over henholdsvis Ega og Ellebrekken.

Tilladelsen meddeles i medfur af § 17 og § 44 i lovbekendtg0relse nr. 882 af 18. august 2004 af lov om vand10b samt efter regleme i den tilknyttede bekendtg0relse nr. 424 af 7. september 1983 om vand10bsregulering mv.

Det er en forudsretning for godkendelsen, at alle forhold om 0konomi, arealerhvervelser, radighedsindskrrenkninger samt tinglysninger varetages efter bestemmelseme for gennemfurelse af vadomr adeprojekter efter Vandmilj0plan II.

7.2 Naturbeskyttelseslov og habitatdirektiv

I medfer af lovbekendtgerelse nr. 884 af 18. august 2004 af lov om naturbeskyttelse § 65, stk. 3, meddeles der dispensation fra bestemmelseme i lovens § 3 til etablering af vadomradet. Ega og Ellebrekken er omfattet aflovens § 3.

Det skal bemrerkes, at det kommende vadomrade vil blive omfattet af naturbeskyttelseslovens § 3.

Inden for projektomradet er der registreret tilstedevrerelse af *odder,* der er opfort pa habitatdirektivets bilag IV over arter, der krrever streng beskyttelse. Det vurderes, at gennemforelse af projektet vil forbedre forholdene for *odder* i omradet.

7.3 Landbrugsloven

Gennemferelse af projektet krrever ikke tilladelse efter landbrugsloven. Det fremgar af § 7 i lov nr. 434 af 9. juni 2004 om drift af landbrugsjorder, at "bestemmelseme er heller ikke til hinder for varig rendring af arealanvendelse til andre former for natur end angivet i § 4, nar det er i overensstemmelse med anden lovgivning og med amtsradets vedtagne og offentliggjorte planer i henhold til anden lovgivning".

7.4 Planloven

Ifolge vejledning om landzoneadministration krrever atbrydelse af pumpning i et inddremmet omrade ikke tilladelse efter planloven

7.5 Okkerloven

Projektomradet er okkerpotentielt, men da projektet indebrerer, at vandstanden i omradet breves, krrever det ikke tilladelse e:fter okkerloven.

8. Vilkar for godkendelsen

Anlregsarbejdet udferes med Arhus Amt som bygherre og under tilsyn af Arhus Amt.

Anlregsarbejdet udfores som beskrevet i afsnit 3.

I omradet er der gjort mange arkreologiske fund, hvorfor bygherren / entrepren0ren straks skal underrette Moesgard Museum, hvis der geres fund i omradet Desuden vil der vrere arealer i projektomradet, der er srerligt rige pa fund, og hvor der derfor krreves tilstedevrerelse af en person fra Moesgard Museum under anlregsarbejdet.

Bygherren kan, hvis det skmmes forrnalstjenligt, lade udf0re mindre tekniske rendringer under arbejdets udf0relse.

Efter frerdigg0relse af projektet overdrages dette til Arhus Kommune, der pa det tidspunkt vii vrere ejer af jorden i projektomradet. Den fremtidige drift og vedligeholde1se af omradet vii pahvile Arhus Kommune.

Godkendelsen bortfalder, hvis etableringen af vadomradet ikke er pabegyndt senest 3 ar fra godkendelsens dato.

9. 0konomi og tidsplan

Omkostningeme til gennemforelse af projektet atholdes af Arhus Amt og Arhus Kommune. Skov- og Naturstyrelsen har givet tilsagn om 0kommisk st0tte som Vandmilj0plan II projekt. De samlede omkostninger til projektet er anslaet til 16,7 mio. kr. Heraf drekkes godt 5 mio. kr. af statslige midler i henhold til Vandmilj0plan II, mens resten finansieres af Arhus Kommune og Arhus Amt i henhold til aftale af marts 2004.

Arbejdet paregnes udf0rt i efteraret 2005 med enkelte opf0lgende arbejder i 2006.

10. Underretning om afgerelsen

F0lgende har raet tilsendt udkast til afg0relse til bemrerkninger samt underretning om afg0relsen:

Offentlige myndig der:

- Arhus Amt, Natur og Milj0, Lyseng Alie 1, 8270 H0jbjerg.
- Arhus Amt, Veje og Trafik, Vejplanafdelingen, Lyseng Alie 1, 8270 H0jbjerg.
- Arhus Amt, Veje og Tra:fik, Anlregsafdelingen, Lyseng Alie 1, 8270 H0jbjerg.
- Arhus Kommune, Milj0kontoret, Grnndalsvej 1, Postboks 4077, 8260 Viby J.
- Arhus Kommune, Naturforvaltningen, Gr0ndalsvej 1, Postboks 4077, 8260 Viby J.
- Arhus Kommune, Ejendomsforvaltningen, Radhuset, 8000 Arhus C.
- Moesgard Museum, Moesgard, 8270 H0jbjerg.
- Danmarks Fiskeriunders0gelser, Afdelingen for Ferskvandsfiskeri, Vejls0Vej 39, 8600 Silkeborg.
- Skov- og Naturstyrelsen, Haraldsgade 53, 2100 K0benhavn 0
- Silkeborg Statsskovdistrikt, Vejlbo, Vejls0Vej 12, 8600 Silkeborg
- Kulturarvsstyrelsen, Slotsholmsgade 1, 1216 K0benhavn K

lnteresseorganisationer:

- Danmarks Sportsfiskerforbund, Worsaasgade 1, 7100 Vejle.
- DSF Vandplejeudvalget, Kim Keblovszk Bavnebakken 22, Kolt, 8361 Hasselager.
- Ferskvandsfiskeriforeningen for Danmark, Vejls0Vej 51, Bygning F, 8600 Silkeborg.
- Dansk Omitologisk Forening, Vesterbrogade 140, 1620 K0benhavn V.
- Dansk Omitologisk Forening Arhus, Peter Lange, Tujavej 16, Stjrer, 8464 Galten
- Danmarks Naturfredningsforening, Masned0gade 20, 2100 K0benhavn 0.
- Danmarks Naturfredningsforening, lokalkomite for Arhus, S0ren H0jager, Mej:10-vrenget 4, 8381 Tilst

- Friluftsradet Arhus, J0rgen Metzdorff, Risdalsvej 13, 8260 Viby J.
- Dansk Botanisk Forening, Erik Hammer, Bragesvej 23, 8230 Abyh0j.
- Arhus-Hadsten Landboforening, Sams0vej 33, 8382 Hinnerup.
- Kulturmilj0radet i Arhus Amt, Silkeborg Museum, Hovedgardsvej 7, 8600 Silkeborg, att. Keld Dalsgaard Larsen

0vrige:
Vejlby-Ega Enges Landvindingslag, v/ Jergen Mahler, Bj0rnholm, Arhusvej 91, 8570 Trustrup

Godkendelse afprojektet annonceres endvidere onsdag 13. april 2005 i Arhus Onsdag.

11. Klagevejledning

Afg0relsen efter Vandl0bslovens kan paklages til Skov- og Naturstyrelsen. Afg0relsen efter Naturbeskyttelsesloven kan paklages til Naturklagenrevnet. Afg0relsen kan paklages af:

- den som afg0relsen er rettet til eller som ejer jorden,
- enhver der ma antages at have en individuel, vresentlig interesse i sagens udfald,
- lokale foreninger og organisationer, der har en vresentlig interesse i afg0relsen,
- landsdrekkende foreninger og organisationer, hvis hovedformal er beskyttelse af natur og milj0 og
- landsdrekkende foreninger og organisationer, som efter deres formal varetager v.esentlige rekreative interesser, nar afg0relsen bemrer sadanne interesser.

Eventuel klage skal vrere skriftlig og sendes til Arhus Amt, Natur og Milj0, som videresender klagen til Skov- og Naturstyrelsen eller til Naturklagenrevnet

Afg0relsen vil blive offentliggjort onsdag 13. april 2005, og klage skal vrere modtaget senest onsdag 11. maj 2005 kl. 15.

Deter en betingelse for Naturklagenrevnets behandling afDeres klage efter naturbeskyttelsesloven, at De indbetaler et gebyr pa 500 kr. til Naturklagenrevnet. Nrevnet vil sende Dem en opkrrevning pa gebyret, nar nrevnet har modtaget klagen fra amtet. Naturkla - nrevnet vil ikke pabegynde behandlingen afklagen, for gebyret er modtaget. Vejledning om gebyrordningen kan fmdes pa Naturklagenrevnets hjemmeside www.nkn.dk.

Ved klage over tilladelsen efter vandl0bsloven, vil Skov- og Naturstyrelsen opkrreve et gebyr pa 7.760 kr., for klagen kan realitetsbehandles.

Gebyret tilbagebetales, hvis De f°ar helt eller delvis medhold i Deres klage.

Tilladelsen ma ikke udnyttes, f0r klagefristen er ud10bet. Rettidig klage har opsrettende virkning, medmindre klagemyndigheden bestemmer noget andet.

Hvis De vil indbringe sagen for domstolene, skal det ske inden 6 maneder fra den dato, hvor afg0relsen er meddelt. S0gsmalsfristen er anfort pa forsiden.

12. Bilag

1. Oversigtskort
2. Landvindingslagets interesseomrade
3. Vandl0bene i omradet
4. Projekt for det kommende vadomrade
5. Projekt for omlregning afEllebrekken
6. Lrengdeprofil for det nye forl0b af Ellebrekken
7. Tvrerprofiler for det nye for10b af Ellebrekken
8. Ellebrekkens krydsning med Petersmindevej