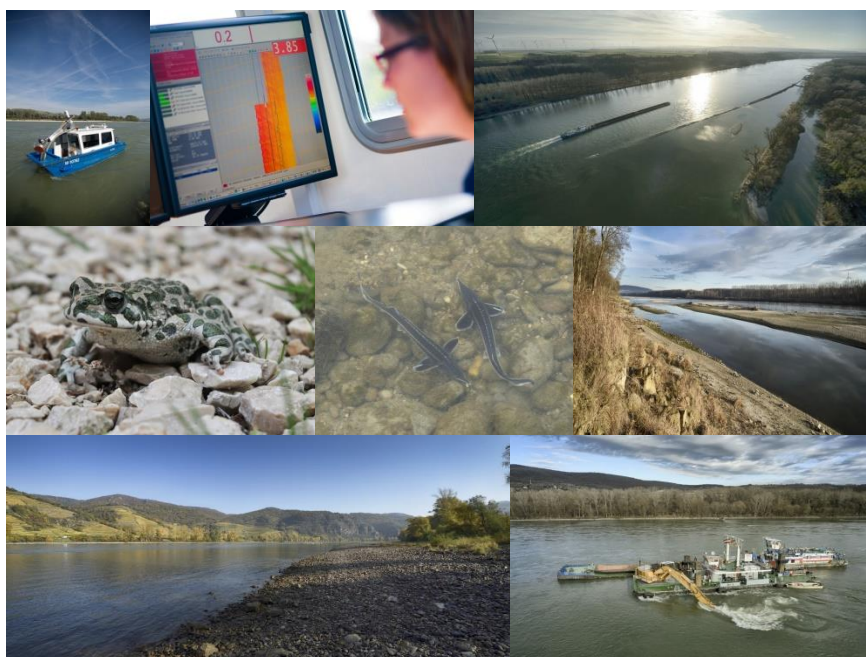


ENVIRONMENTALLY SOUND WATERWAY MANAGEMENT IN THE DANUBE RIVER BASIN

PRACTICAL MANUAL



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LIST OF ABBREVIATIONS

ABBREVIATION	ABBREVIATION EXPLAINED
AGN	Agreement on Main Inland Waterways of International Importance
ECMT	European Conference of Ministers of Transport
EUSDR	European Union Strategy for the Danube Region
FCS	Favourable Conservation Status (Habitats Directive)
FRMMP	Fairway Rehabilitation and Maintenance Master Plan
GES	Good Ecological Status (Water Framework Directive)
GNS	Good Navigation Status (TEN-T Regulation)
IWT	Inland Waterway Transport
LNWL	Low Navigable Water Level
PA1a	Priority Area 1a Mobility / Inland waterways (EUSDR)
SDF	Standard Data Form (Habitats Directive)
RBMP	River Basin Management Plan (Water Framework Directive)
TEN-T	Trans-European Transport Networks
WFD	Water Framework Directive

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1 PURPOSE OF THIS REPORT

1.1. The Danube river: ecological and economic life line

The Danube river runs through 10 different riparian states and is therefore called the most international river in the world. The Danube region is furthermore characterised by large cultural, social and economic diversity. Moreover the Danube river basin has unique natural resources and a high level of biodiversity. No less than 45% of its total length is covered by NATURA 2000 sites [European Commission, 2012] and nearly 1,500 protected areas have been designated in its territory [EUSDR PA4, 2017]. About 70% of the 2,415 km long, navigable Danube are free-flowing sections, most of them on the Middle and Lower Danube. Due to its high gradient, the Upper Danube shows the characteristics of a mountain river with outstandingly high volumes of sediment transport, while after the change of gradient at Gönyú in northern Hungary, the river becomes a lowland river [PLATINA-2, 2016].

The Danube river and its tributaries are however not only natural waters with manifold functions, but also important transport routes. As INEA [2018] states in the latest report on the topic, the Rhine-Danube Core Network Corridor is also a major transport backbone linking Central and South-Eastern Europe. About 40 million tons of goods are transported by Danube navigation on an annual basis.

The different functions of the Danube are also the root cause of the problems and issues that are encountered on the interface between natural resources management and waterway management: The most valuable and sensitive natural and free-flowing sections of the Danube are often also the river sections that cause the biggest problems in terms of navigability. The biggest navigational problems along the Danube waterway are related to limited admissible draughts or widths at critical bottlenecks, which are almost exclusively located in environmentally sensitive and valuable areas. In many cases, fluctuating fairway conditions are unavoidable due to natural circumstances (lack of precipitation), but may be aggravated due to lack of regular maintenance [European Commission, 2018].

As the European Court of Auditors concluded in their report: “Inland waterway transport projects faced many difficulties due to the need to ensure an adequate level of environmental protection on the one hand, and the need to ensure an adequate development of this transport mode on the other”. As one of their main conclusions, the ECA found that EU strategies did not give sufficient consideration to environmental aspects and waterway maintenance to be carried out by Member States [European Court of Auditors, 2015]. The fulfilment of transport-related objectives - as defined through the TEN-T Regulation among others - must therefore always be accompanied by water-related and nature-protection considerations, which are primarily laid down in the EU Water Framework Directive (WFD) and the EU Habitats and Birds Directives.

1.1.1. Definitions

Waterway management is an important part of integrated river basin management which might be defined as “the process of coordinating conservation, management and development of water, land and related resources across sectors within a given river basin, in order to maximise the economic and social benefits derived from water resources in an equitable manner while preserving and, where necessary, restoring freshwater ecosystems” [PLATINA-2, 2016]. Natural resources management on the other hand is a process of managing natural resources in a systematic way, thereby focusing on sustainability, stakeholder involvement, participatory planning, adaptive management, etc.

PIANC [2006] defines maintenance of waterway infrastructure as all “actions necessary for retaining an asset as near to its original condition, but excluding rehabilitation or renewal.” In the Good Practice Manual on Inland Waterway Maintenance [PLATINA-2, 2016] **waterway maintenance** measures are defined as “recurring, short-term measures with the aim to provide harmonised infrastructure parameters along the transport corridors, specifically a certain width and depth of the fairway on a specific waterway section which falls short the targeted fairway parameters.” **Waterway rehabilitation** is thereby used as a generic term for works to repair or renovate assets [PIANC, 2006], whereas **waterway upgrade** is the renewal, refurbishment or replacement of existing facilities in order to improve their performance.

Within the context of natural resources management, the above three waterway management concepts are mirrored by **nature protection/conservation**, **nature restoration** and **nature development** respectively (see Figure 1):

- **Waterway upgrade/nature development:** The process of enhancing and extending the current state through major modifications. Waterway upgrade and nature development is about *creating and achieving a better condition than in the current state*.
- **Rehabilitation/restoration:** The process of re-establishing a defined previous or ‘original’ state. Waterway rehabilitation and nature restoration is about *returning to a good condition*.
- **Maintenance/conservation:** The process of retaining the current state or overall performance and preventing (further) deterioration of the current state. Waterway maintenance and nature conservation is about *retaining a good condition*.

The transition between waterway maintenance/rehabilitation/upgrade is fluent in practice, as is the transition from nature protection/conservation, via restoration to nature development. The fluent borders between these concepts are sometimes caused by the fact that an “original state” is not objectively defined in practice. This could lead to different views, whether a certain activity is aimed at returning to a defined previous state or if the activity is seen as merely keeping the current condition. A continued lack of daily waterway maintenance could also lead to the deterioration of the existing navigability conditions and the formation of new bottlenecks, which ultimately could require major modifications or an upgrade of the waterway involved.

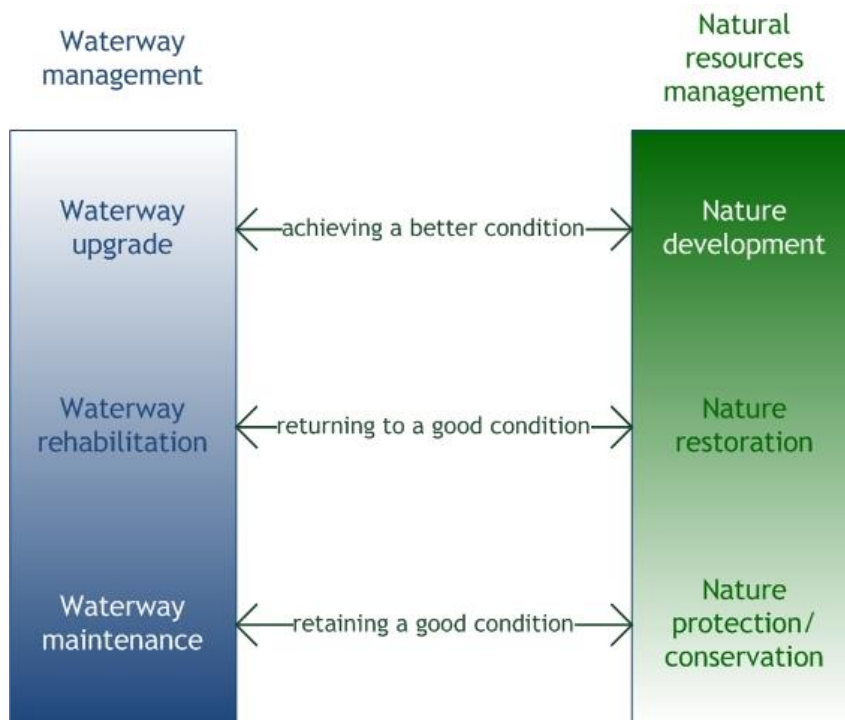


Figure 1: Definitions of waterway management and natural resources management

1.1.2. Thematic scope of this report

Whereas previous manuals have focused mainly on integrated planning processes for waterway upgrade projects (see next chapter), this manual focuses on the interface between waterway maintenance/rehabilitation activities on the one hand and nature conservation, restoration and development on the other (See Figure 2). Activities which are solely aimed at the natural resources management, with no interrelations to waterway management, or vice versa, are not within the scope of this manual. Since the interface between waterway maintenance/rehabilitation and natural resources management is the most critical in sensitive and dynamic river sections, this manual also largely focuses on free-flowing river sections. This is in line with the focus of the TEN-T Regulation, which calls for "paying particular attention to free-flowing rivers which are close to their natural state and which can therefore be the subject of specific measures" (Article 16).

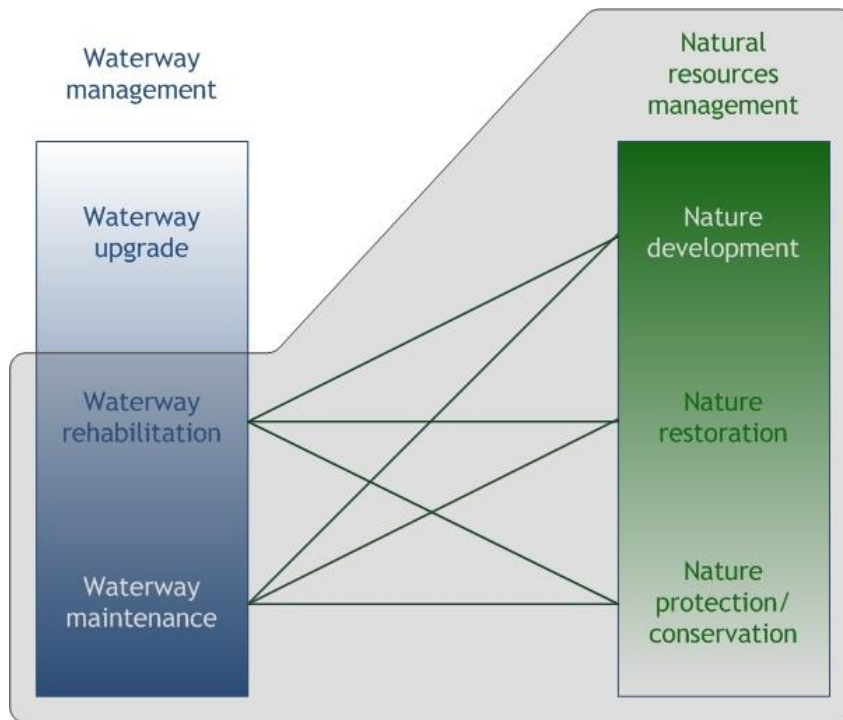


Figure 2: Thematic scope of this manual

This manual is therefore concentrated on balancing interests of both waterway and natural resources management, with the ultimate aim to achieve good navigation status (GNS), good ecological status (GES) and favourable conservation status (FCS) at the same time, as defined by the TEN-T Regulation, the Water Framework Directive and the Habitats Directive respectively. As will be demonstrated in the course of this manual, integrated planning approaches hereby form the key answer to the issues that arise in this context. This manual intends to illustrate how integrated projects should consider ecological objectives along with navigation objectives right from the beginning of the planning process.

1.1.3. Target groups for this report

This guidance and good practice manual is primarily aimed at waterway managers in the Danube region. The aim is to summarise the different requirements stemming from EU legislation (notably TEN-T Regulation, Water Framework Directive, Habitats and Birds Directives) as well as from important agreements and conventions (notably Joint Statement on Inland Navigation and Environmental Sustainability in the Danube River Basin, European Agreement on Main Inland Waterways of International Importance (AGN)). Based on existing sectoral guidance documents and existing waterway and nature protection management practices, an integrated process for waterway maintenance is proposed, which should support waterway managers in achieving the manifold objectives in the most efficient and effective way. Good practices are presented to illustrate how this integrated process can be applied in practice.

1.1.4. How this manual was developed

This manual was developed within the Danube STREAM project, as project which unites the Danube waterway administrations. This manual is primarily based on the longstanding intersectoral cooperation with the Protected Areas along the Danube, as united through the DANUBEparksCONNECTED network. The information contained in this manual is based on:

- An extensive literature analysis
- A series of national-level meetings between waterway and protected area administrations (held in Autumn 2017)
- Two intersectoral conferences (as organised by DANUBEparksCONNECTED and Danube STREAM in April 2017 and May 2018 respectively)
- A study trip to The Netherlands (organised by Danube STREAM in April 2018)
- One intersectoral seminar (organised by Danube STREAM in September 2018), involving a broad range of multidisciplinary experts and stakeholders
- A a cross-sectoral Board of Directors meeting in May 2019.

1.2. Objectives of the report

1.2.1. Provide practical guidance to waterway managers

In the context of the relevant EU legislation, some parallel concepts are defined:

- TEN-T Regulation (1315/2013) aims at achieving **Good Navigation Status (GNS)**
- Water Framework Directive (2000/60/EC) aims at **Good Ecological Status/Potential (GES/GEP)**
- Habitats Directive (92/43/EEC) aims at achieving **Favourable Conservation Status (FCS)**

These three European regulations or directives form the legal background of this manual. The ultimate aim is - broadly speaking - to create integrated projects that ideally allow the achievement of good navigation status (GNS), good ecological status (GES) and favourable conservation status (FCS) at the same time.

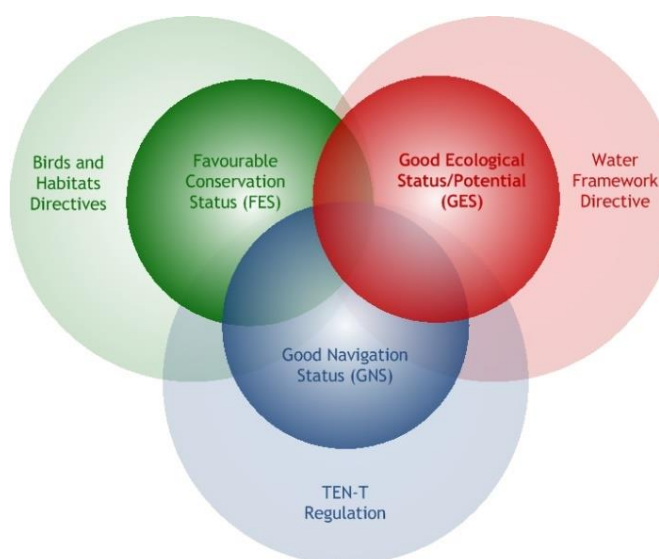


Figure 3: Interactions between FCS-GES-GNS

Through the integration of waterway maintenance objectives with the Water Framework Directive, waterway management has already changed significantly in the Danube region in the last decade: the prime focus of waterway managers on navigation issues has been replaced by an integrated approach in which transport and natural resources management are being pursued at the same time. Some waterway managers in the region have built up in-house experts and multidisciplinary teams, to plan and carry out integrated projects. The application of the integrated approach, as proposed by the Joint Statement on Guiding Principles for the Development of Inland Navigation and Environmental Protection in 2008, is however varying to a large extent. One of the main objectives of this manual is therefore to share know-how and experiences with regard to the setup of integrated waterway maintenance in practice.

In addition, the Convention on Wetlands (Ramsar, 1971) is of high relevance, as it applies to a high number of protected sites along the Danube. More information on these stipulations can be found on <https://www.ramsar.org/>.

1.2.1.1. *Compile integrated model process to achieve GNS / GES / FCS*

The know-how and experiences on the actual implementation of integrated project is dispersed over a large variety of legislative sources and guidance documents. This manual intends to compile one integrated and systematic model process to achieve GNS/GES/FCS, based on these different sources.

1.2.1.2. *Illustrate with Good Practices*

In order to be of practical value, this manual is rounded off by a series of national good practices for integrated waterway management. These good practices should serve as an illustration of how the integrated approach towards waterway management can be put into practice by other waterway managers in comparable situations.

1.3. Structure of this report

Chapter 2 of this report contains a summary of main legal provisions as well as of existing guidance documents, both in the area of waterway management and in the sphere of natural resources management. Furthermore, strategic guidelines for waterway maintenance in conjunction with natural resources management, including a model process for integrative waterway maintenance is proposed in Chapter 3.

Chapter 4 contains an overview of good practices observed in the Danube river basin, giving an illustration of how integrated waterway maintenance is applied in the various Danube riparian states. These good practices have been identified and developed in an ongoing dialogue between waterway managers (represented by the Danube STREAM consortium) and national park authorities (represented by the DANUBEparkCONNECTED consortium) in autumn 2017.

2 SUMMARY OF STATUS QUO

2.1. Existing legal provisions and policies

The general objective of waterway management is the provision of adequate fairway conditions for inland navigation, especially in low-water periods, based on an effective use of available resources. In the field of inland waterway transport, waterway management authorities are operating under several international agreements and recommendations, which specify targeted fairway parameters (width, depth and vertical clearance under bridges and overhead cables). Among the most important legally binding are the TEN-T Regulation (1315/2013/EU), the Agreement on Main Inland Waterways of International Importance (AGN), the Recommendations of the European Conference of Ministers of Transport (ECMT), the Mannheim Convention (Rhine) and the Belgrade Convention (Danube). Some waterway administrations take additional targets into account which derive from national/regional regulations and/or recommendations [PLATINA-2, 2016].

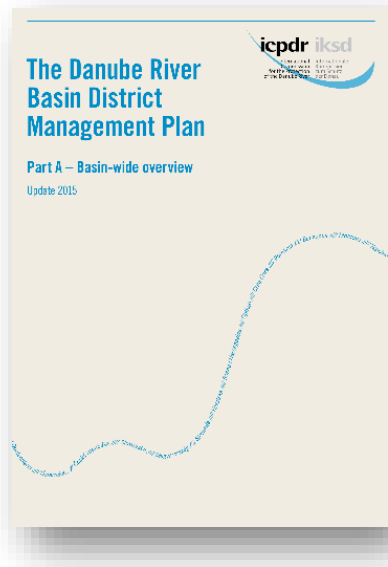
In order to foster improvements and to counteract possible negative impacts of human activities on the natural environment - such as waterway management - the European Union implemented a range of legislative instruments. The most important EU legislative instruments are the Water Framework Directive (2000/60/EC) and the Habitats Directive (92/43/EEC) in connection with the Birds Directive (2009/147/EC). Other Directives that have to be mentioned are the Council Directive 78/659/EEC of 18 July 1978 on the quality of fresh waters needing protection or improvement in order to support fish life, the Strategic Environmental Assessment Directive (2001/42/EC) and the Public Participation Directive (2003/35/EC). These Directives cover the aspects of managing natural resources, protected species and protected sites in or close to project areas whereas public participation and strategic environmental assessment additionally integrate the aspect of public consultation [PLATINA-2, 2016].

The purpose of this chapter is two-fold: first, the most important legal provisions dealing with nature conservation/protection on the one hand and waterway management on the other are briefly presented and summarised. Second, this chapter refers to existing guidance documents on these legal provisions that have been published in the last decade. The key lessons learned from these existing guidance documents are then processed into a model process for integrated waterway and natural resources management, which is presented in Chapter 3.

2.1.1. Nature conservation/protection

2.1.1.1. *Water Framework Directive (WFD)*

The main objective of the Water Framework Directive (2000/60/EC) is to achieve a **Good Ecological Status (GES)** for natural surface water bodies or a good ecological potential for heavily modified waters and to avoid a deterioration of this status. In the case of surface waters the quality of the water is judged on the sum of both its ecological and chemical status. The good ecological status of a river under the WFD is thereby determined by biological (e.g. the composition and abundance of aquatic flora or fish fauna), hydromorphological (e.g. quantity and dynamics of river flows, river continuity, river depth and width variation), as well as chemical elements (e.g. temperature, oxygenation conditions, nutrient conditions, pollutant level). By 2015 natural surface water bodies should have achieved good ecological and chemical status according to these criteria.



The WFD had to be transposed into national law by Member States by the end of 2003 and by 2009 first River Basin Management Plans (RBMP) had to be set up including a broad assessment of the actual situation of the river basin regarding several criteria (updated every 6 years). These RBMPs plans are developed by the responsible ministries in accordance with the waterway authorities and contain a programme of measures as well as an outlook on ongoing and planned projects affecting the river and their influence on achieving the target of good surface water status. Furthermore, the RBMP for the Danube contains annexes that describe the characteristics of each of the water bodies in the Danube river basin, a summary of significant pressures and impacts of human activity, as well as maps showing the status of the different water bodies.

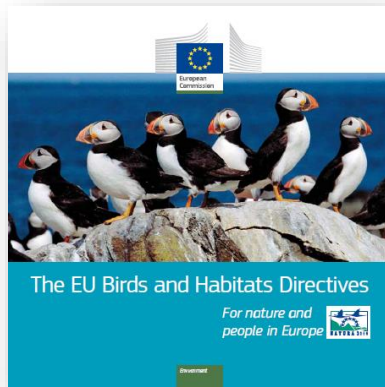
According to the current Danube River Basin Management Plan 2015-2021, about 20% of the Danube river basin surface waters have a good status or beyond, about 4% show a good or above potential. About 49% of the river water bodies are at risk or possibly at risk to achieve good ecological status by 2021 [FAIRway Danube, 2018].

When inland waterway projects are expected to lead to deterioration of the ecological or chemical status or endanger the realisation of the environmental objectives, they may only be authorised if all the conditions under Article 4(7) are met [Common Implementation Strategy, 2018]. Article 4(7) pertains to (1) the new modifications to the physical characteristics of water bodies, which may be liable to cause deterioration on the ecological status (...) and (2) failure to prevent deterioration from high status to good status of a body of surface water due to new sustainable human development activities” [Common Implementation Strategy, 2018].

2.1.1.2. Habitats and Birds Directives

The EU Birds Directive and the EU Habitats Directive are said to form the central element of the European Union's environmental policy: the Natura 2000 Network. About 45% of the entire length of the Danube is covered by so called Natura 2000 sites [European Commission, 2012]. Natural and dynamic rivers are, by nature, exceptionally rich ecosystems with usually large positive spill-over effects to the surrounding countryside (e.g. through irregular flooding) and interconnected ecological corridors, as rivers as such facilitate the spatial distribution and migration of species. All of these core processes generally lead to a large degree of diversity of species and habitats in and along natural rivers. A designation as Natura 2000 site does not mean that waterway infrastructure development is generally excluded in that area. It rather means that any intervention must be thoroughly assessed in order to safeguard the existing genetics, species and habitats diversity.

The Birds and Habitats Directives contain a comparable non-deterioration principle as laid down in the Water Framework Directive, as they aim to ensure the survival of Europe's most endangered and vulnerable species and ecosystems. Based on the provisions of the Birds and Habitats Directives Member States must however do more than just the prevention of further deterioration of listed species and habitat types: positive management measures to ensure that populations and habitats are maintained and restored to a **favourable conservation status (FCS)** must be undertaken [European Commission, 2012]. This FCS is always site-specific and is measured by characteristics such as range, area, population size and

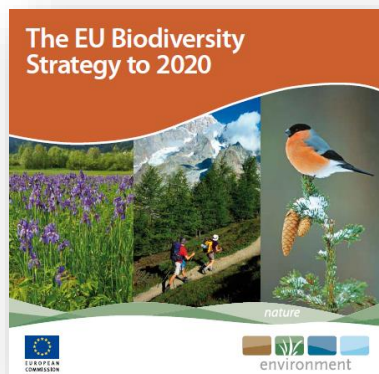


structure and functions of the habitats or species for which the Natura 2000 site is designated - not the aquatic community in general.

A favourable conservation status under the Habitats Directive is for instance achieved when the specific structure and functions of targeted ecosystems, which are necessary for its long-term survival, exist and are likely to continue to exist for the foreseeable future.

2.1.1.3. *EU Biodiversity Strategy to 2020*

The Birds and Habitats Directives are seen as the cornerstones of the EU's biodiversity policy. The EU Biodiversity Strategy to 2020 (as adopted by the Commission in 2011) formulates six main targets and 20 actions, which focus on the full implementation of EU nature legislation to protect biodiversity, better protection for ecosystems, more sustainable agriculture and forestry, better management of EU fish stocks and more sustainable fisheries, tighter controls on invasive alien species, and lastly, a greater EU contribution to averting global biodiversity loss [European Commission, 2012].



In order to come closer to the achievement of the goal of halting biodiversity loss and degradation of ecosystem services, as defined in the EU Biodiversity Strategy 2020, DG Environment carried out a fitness test of the Nature directives in relation to TEN-T projects. Given the positive outcome of this fitness test, the Commission adopted an "EU Action Plan for nature, people and the economy" (COM(2017)198 final) in 2017. The Action Plan contains a work programme with 15 actions and over 100 individual measures, all of which should be started by the year 2019.

2.1.2. **Waterway management**

2.1.2.1. *TEN-T Regulation*

The minimum inland waterway infrastructure requirements for core network inland waterways are described in Articles 15 and 39 of the TEN-T Regulation (EU) No 1315/2013 on Union Guidelines for the Development of the Trans-European Transport Network. Generally, the TEN-T Regulation requires Member States to maintain rivers, canals and lakes so as to preserve **Good Navigation Status (GNS)** while respecting the applicable environmental law. Inland waterways in the core network have to comply with the minimum requirements for class IV waterways (ECMT classification). Only in exceptional cases the European Commission shall grant an exemption from the minimum requirements on draught (less than 2.50 m) and on minimum height under bridges (less than 5.25 m). Member States have to comply with these requirements by 31 December 2030.

The concept of the "good navigation status" (Article 15.3 (b)) is not detailed in the TEN-T Regulation itself. However, a study initiated by the European Commission in 2016 further specified this concept with a view to possible revision of the TEN-T Regulation. Like in the application of the Natura 2000 network, Good Navigation Status is always defined for specific waterway stretches and does not list generally applicable minimum fairway parameters. The study also resulted in the definition of a model process towards the achievement of GNS and furthermore defines key principles of a GNS process. Some of the key principles are that every waterway maintenance or management activity should be performed within the framework of strategically defined targets and levels of service.

Furthermore, due to the multi-disciplinary character of waterways, participatory management is advisable in order to understand and respect the other uses of waterways. The GNS process should create transparency for all involved parties, that is, (non)compliance with target values should be easily monitored by means of selected performance indicators. The GNS process should ultimately result in a well-functioning European waterway system in line with the provisions of Regulation (EU) No 1315/2013, which is verifiable by monitoring the GNS Key Performance Indicators on the TEN-T network and through feedback from transport users.

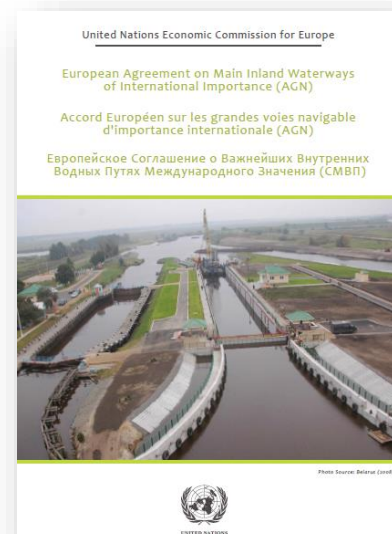


2.1.2.2. AGN

In 1996, the Inland Transport Committee of the United Nations Economic Commission for Europe (UNECE) adopted the European Agreement on Main Inland Waterways of International Importance (AGN). The Agreement came into force in 1999. It constitutes an international legal framework for the planning of the development and maintenance of the European inland waterway network and ports of international importance. It is based on technical characteristics and operational criteria for inland waterways (specified for different waterway stretches in Annex III of the Agreement).

In 1998, the UNECE Inland Transport Committee published an "Inventory of Main Standards and Parameters of the E Waterway Network", the so-called "Blue Book", as a supplement to the AGN. The document contains a list of the current and planned standards and parameters of the E waterway network (including ports and locks) as well as an overview of the existing infrastructural bottlenecks and missing links in the network. This publication enables monitoring of the current state of implementation of the Agreement on an international basis. To date, the AGN Agreement has been ratified or put into force by all Danube riparian countries except for Germany.

The AGN refers to ECMT Resolution No. 92/2 on new classification of inland waterways [ECMT/CM(92)6/FINAL]. The ECMT classification of waterways is however based only on the horizontal



dimensions for vessels (the length and width of the vessel), the vertical ones (draught and height under bridges) are not applied to decide if a waterway section shall be categorised as for example class IV, V or VI. The UN-ECE therefore provided additional guidance to the ECMT table, for instance that the draught value for a particular inland waterway is to be designated according to the local conditions or that - on the waterways with fluctuating water levels - the value of the recommended draught should correspond to the draught reached or exceeded for 240 days on average per year (for upstream sections of natural rivers characterized by frequently fluctuating water levels due to strong direct dependence of weather conditions, it is recommended to refer to a period of at least 300 days on average per year).

2.1.2.3. *NAIADES-2 European Action for the promotion of inland waterway transport*

In September 2013 the European Commission adopted the second NAIANES-2 action programme, which is called "Towards quality inland waterway transport". It contains a vision and the main policy initiatives for the period 2014-2020 in order to raise the share and significance of inland waterway transport within the European transport system. The main fields of policy action proposed in the NAIANES-2 programme include

- Quality infrastructure
- Quality through innovation
- Smooth functioning of the market
- Environmental quality through low emissions
- Skilled workforce and quality jobs
- Integration of inland navigation into the multimodal logistics chain



The NAIANES-2 package includes a Communication of the European Commission (setting out the main policy directions), a Staff Working Document on "Greening the fleet" (reducing pollutant emissions in inland waterway transport), a proposal for a Directive on technical requirements for inland waterway vessels and proposal for a Regulation amending Council Regulation (EC) No 718/1999 on a

Community-fleet capacity policy to promote inland waterway transport. In relation to River Information Services, an implementing Regulation for the introduction of an harmonised electronic chart display information system (ECDIS) was adopted by the Commission.

2.1.2.4. *Recommendations of the Danube Commission*

In the Danube Corridor, the "Convention Regarding the Regime of Navigation on the Danube" ("Belgrade Convention") was signed by all Danube riparian states in 1948 with the main goals



to safeguard the freedom of navigation on the Danube for all states and to oblige the Danube states to maintain their sections of the Danube waterway in a navigable condition. The implementation of the Convention is monitored by the Danube Commission [PLATINA-2, 2016]. The waterway infrastructure related targets pursued in the Danube Corridor are based on ECMT/UNECE waterway classes.

In addition, the Danube Commission issued the "Recommendations on Minimum Requirements for Standard Fairway Parameters, Hydrotechnical and Other Improvements

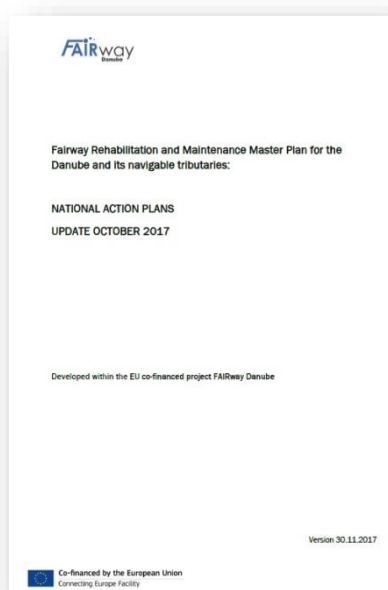
on the Danube" in 1988 and 2013, respectively. In the first, a minimum fairway depth of 2.5 m below low navigation and regulation level (LNRL) is required. In the latter document the Danube Commission set a minimum of 2.5 m draught of loaded vessels below LNRL. LNRL refers to the water level established for the navigable part of the Danube from Kelheim to Sulina and determined with duration of 94%, based on the discharges observed during a period of 30 years, excluding ice periods. Additionally, in its 2013 Recommendations the DC set a minimum fairway width of 50-180 m, depending on the site-specific characteristics of the river section.

2.1.2.5. Fairway Rehabilitation and Maintenance Masterplan (FRMMP)

In 2012, a majority of the Transport Ministers of the Danube Region signed a declaration expressing their commitment towards the implementation of effective waterway maintenance measures ("Luxemburg Declaration", 2012). This initiative from Priority Area 1a in the EU Strategy for the Danube Region resulted in a Fairway Rehabilitation Maintenance Master Plan (FRMMP) for the Danube and its navigable tributaries, which was endorsed in the year 2014. It highlights national needs and short-term measures in order to ensure the efficient and effective realisation of harmonised waterway infrastructure parameters within the existing legal framework (especially the AGN and Belgrade Convention).

The recommended target of the FRMMP is to provide a fairway depth exceeding 2.5 m at least on as many days per year as actual water levels equal to or exceed the statistical Low Navigable Water Level (LNWL). The recommended fairway widths for the minimum depth comprise a range of values for different bend radii for a reference (i.e. the most common) vessel or convoy going downstream in one-way traffic. The targeted minimum widths of the fairway are:

- 40 to 80 m in Austria and on the German-Austrian and Austrian-Slovakian border sections
- 60 to 100 m in Slovakia and on the Slovakian-Hungarian border section
- 80 to 120 m in Hungary, Croatia, Serbia, Romania and Bulgaria (including common border sections and excluding the maritime Danube)



Once a fairway depth of 2.5m at LNWL for this minimum fairway width has been established by dredging or realigning the course of the fairway, the recommended fairway widths shall be maintained in their entirety according to the 2013 Danube Commission Recommendations (Section 7.2.2. of the "Recommendations on Minimum Requirements for Standard Fairway Parameters, Hydraulotechnical and Other Improvements on the Danube").

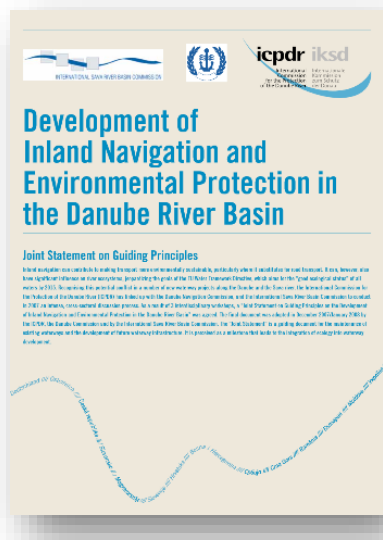
The overall aim is to implement the recommended Levels of Service on the fairway with reduced physical and/structural interventions, which cause lower costs as well as reduced environmental impacts. The rehabilitation and maintenance measures and activities monitored within the context of the Master Plan (surveying, fairway relocation, dredging and better information) have the character of reversible interventions, as recommended by the Joint Statement.

Effects of measures are monitored and - if relevant - adapted in the context of the national permitting processes [FAIRway Danube, 2018]. The key precondition to achieve this aim is to establish an improved information basis on the actual status of the critical waterway locations. In order to be able to monitor the development of the fairway channel at critical locations and to decide on the optimum measures under the given circumstances, monitoring of fairway depths at critical locations has to take place at high frequency (at least once a month).

2.1.3. Cross-sectoral management principles

2.1.3.1. Joint Statement

In order to bring together the sometimes conflicting interests of navigation and the environment in the Danube region, the International Commission for the Protection of the Danube River (ICPDR), the Danube Commission (navigation), and the International Sava River Basin Commission (ISRBC) joined forces and endorsed a “Joint Statement on Guiding Principles for the Development of Inland Navigation and Environmental Protection” in 2008.



The Joint Statement is in essence aimed at finding the balance between GES, FCS and GNS (as required by the WFD, the Birds and Habitats Directives and the TEN-T Regulation respectively). The statement provides integrative guiding principles and criteria for the planning and implementation of waterway projects with a strong focus on future river engineering projects on the Danube and its navigable tributaries. It opts for an interdisciplinary planning approach and the establishment of a “common language” across all disciplines involved in the process. Recommendations included in the document pertain to an integrated planning approach for the Danube river basin, integrated planning principles, and criteria for river engineering [PLATINA-2, 2016].

The recommendations of the Joint Statement are also applicable to waterway maintenance activities. However, as maintenance measures usually have significantly lower impacts than large infrastructure development projects, applying the fully-fledged “Joint Statement” process would not be proportionate. Like any measure affecting waterways, maintenance measures have to be carried out in line with the existing environmental legislation. This entails that qualified experts need to assess the planned measures regarding their environmental impacts and, if needed, specify conditions and requirements to be taken into account during implementation. This procedure is regulated by the applicable legal framework, which is in essence derived from the WFD and Natura 2000 legislation [FAIRway Danube, 2018]. Some of the most important principles included in the Joint Statement refer to the early involvement of key stakeholders and the creation of a transparent and integrated planning process based on comprehensive data.

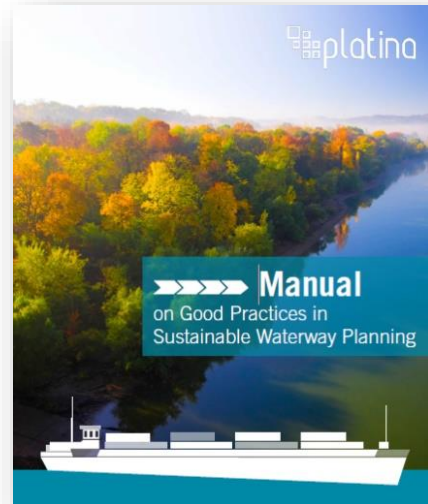
2.2. Existing guidance documents and manuals

2.2.1. PLATINA Manual on Good Practices in Sustainable Waterway Planning

In order to provide further guidance on how to apply integrated planning principles of the Joint Statement, a "Manual on Good Practices in Sustainable Waterway Planning" was prepared under the EU PLATINA project [ICPDR, 2010]. Published in 2010, the manual provides a practical guide for inland waterway planners across Europe on how to organise and implement a balanced and integrated planning process for inland waterway transport projects.

The manual identifies four essential features of an integrated planning process:

- defining integrated project objectives combining IWT aims, environmental needs and the objectives of other uses of the river reach such as nature protection, flood management and fisheries;
- integrating relevant stakeholders right from the initial phase of the project;
- carrying out an integrated planning process to translate the IWT and environmental objectives into concrete project measures, securing win-win results wherever possible;
- conducting comprehensive environmental monitoring before, during and after the project works to enable an adaptive implementation approach if necessary.

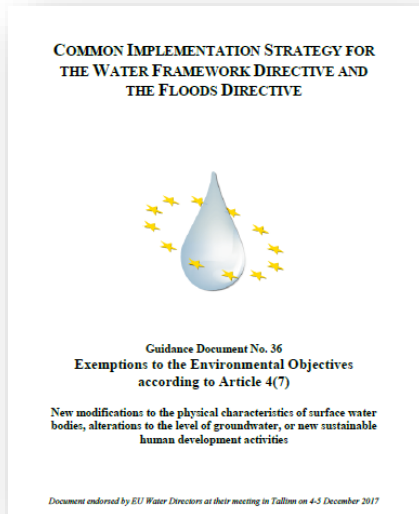


The PLATINA Manual furthermore proposes four general stages for the preparation and implementation of an integrated planning process in the context of structural waterway development projects:

- Define joint planning objectives and principles;
- Detailed planning of measures: technical and ecological options, plan alternatives; assess variants of chosen alternatives, local examination and/or testing of measures, as well as priority ranking;
- Communicate and adopt results of the integrated planning process;
- Execute the Environmental Impact Assessment and apply for environmental permits.

The manual closes with a series of good practice examples on how these requirements and stages can be applied in practice.

2.2.2. Common Implementation Strategy for the WFD and Floods Directive



The Common Implementation Strategy [2018] describes several model processes and decision-trees for the appropriate implementation of the WFD and Floods Directive in the context of waterway infrastructure projects. It describes the "Applicability Assessment" in relation to Article 4(7) which needs to be carried out in advance of any authorisation process. This assessment procedure determines whether a proposed new modification to the physical characteristics of a body of surface water could lead to deterioration or the non-achievement of good ecological status.

If, based on this Applicability Assessment, it is expected that the proposed project does not cause deterioration nor compromises the achievement of good status/potential, for instance by means of mitigation measures that are inherent elements of the project, then no further Article 4(7) Test is required and the project can be authorised under the WFD.

2.2.3. Guidance Document on Inland waterway transport and Natura 2000

In 2012, the European Commission's Directorate-General for Environment issued a Guidance Document on Inland Waterway Transport and Natura 2000 which stresses the importance of integrated planning in respect to environmental engineering and river restoration. The guidance document especially concentrates on the implications of the Birds and Habitats Directives (Natura 2000) of projects to promote inland waterway transport in Europe.



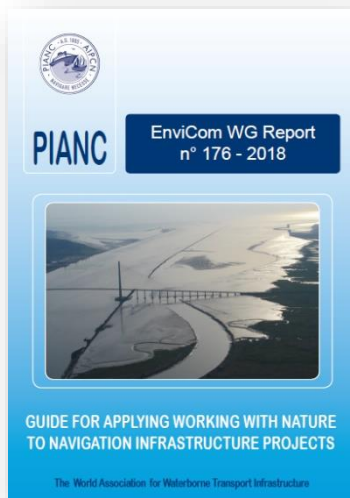
The document thereby first and foremost concentrates on the construction, maintenance and upgrading of infrastructure projects related to inland waterway transport, as well as on the conservation of rivers from the perspective of protecting Europe's rare species and habitats under the EU Birds and Habitats Directives and in the wider context of the Water Framework Directive [European Commission, 2012]. Early consideration of ecological processes in waterway planning is one of the core principles of the guidance document, in order to search for win-win solutions for both inland waterway transport and biodiversity wherever possible.

The guidance document gives practical recommendations for appropriate assessments in the so called Article 6 of the Habitats Directive, as experience has apparently shown that delays in the approval process are often caused by poorly prepared assessments [European Commission, 2012]. Competent authorities can consequently not make a clear judgement on

whether or not to authorise the proposed plan or project, which might require more in-depth analyses and checks.

2.2.4. Guide for applying Working with Nature to Navigation Infrastructure Projects

The concept of “Working with Nature” is an integrated approach or philosophy that was developed by the environmental committee of PIANC. Working with Nature strives for win-win solutions for navigation infrastructure projects and the environment. This is put into practice by carefully considering “natural processes, ecosystem impacts, stakeholder engagement and strategies to maximise opportunities for navigation and nature” [PIANC, 2018].

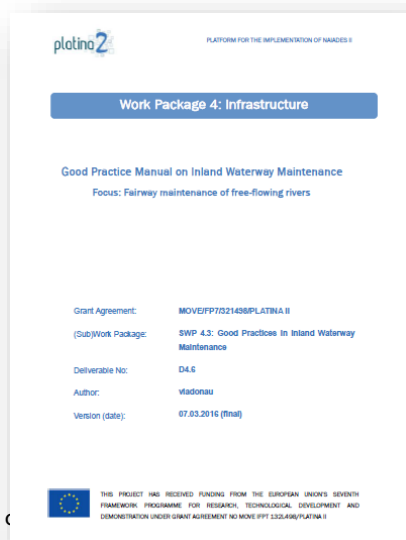


The main objective of the Working with Nature approach is to help project proponents and environmental stakeholders achieve long-term infrastructure and environmental goals. The guide is intended to raise awareness among waterway planners and illustrates the approach to improve habitat quality along with waterway projects by means of practical case studies. The PIANC guide is not exclusively concentrated on inland waterway development projects, but also includes maritime and river-sea projects.

2.2.5. Good Practice Manual on Inland Waterway Maintenance (PLATINA-2)

The PLATINA-2 Good Practice Manual on Inland Waterway Maintenance [PLATINA-2, 2016] provides general guidance for waterway administrations in Europe improve their fairway maintenance processes. The focus of the manual was set on free-flowing river sections, as these have been identified as one of the most challenging waterway sections for obvious reasons.

The manual illustrates an improved fairway maintenance cycle that takes the processes beyond the actual implementation of a measure into account. These processes relate to monitoring the status of the fairway, planning the most suitable measures based on high-quality data, evaluating the impacts of measures and deriving possible improvements. Furthermore, informing of/communicating with the various actors involved in the appropriate manner is seen as a key element of such a cycle. The cycle is designed in a recurrent manner and conceived as a continuous improvement process.



The manual also describes the related proactive fairway maintenance strategy, which aims at minimizing deterioration of navigation conditions as well as negative effects of interventions as much

as possible through actions taken on beforehand to potential critical situations. Furthermore, this integrative strategy duly considers the multiple functions of a waterway and takes the requirement to act in compliance with the environmental regulatory framework into account.

Good practice examples from several European waterway corridors have been collected and analysed in the manual. Lessons learned from these examples and requirements for implementation in other corridors are illustrated. That way, knowledge exchange across corridors shall be fostered.

2.2.6. Guidance Document on Environmental Issues regarding Maintenance of Federal Waterways



The “Leitfaden Umweltbelange bei der Unterhaltung von Bundeswasserstraßen”, which was developed by the German Federal Ministry for Transport and Digital Infrastructure [bmvdi, 2015], is a comprehensive guide that deals with all common legal environmental considerations and requirements that apply to waterway maintenance projects in Germany. The first part of the guide contains directives for appropriate planning procedures and the assessment of maintenance measures. The applicable legal provisions are summarised in detail in the second part of the guide. The last part of the document contains concrete maintenance directives and recommendations as well as check lists for particular waterway sections and habitats.

3 MODEL PROCESS TO ACHIEVE GOOD NAVIGATION, GOOD ECOLOGICAL AND FAVOURABLE CONSERVATION STATUS

The European Court of Auditors [2015] already noted in their review that inland waterway projects were “often subject to political and environmental considerations and to disputes among the different stakeholders and with civil society that delayed or blocked their implementation. In addition, obtaining the relevant environmental permits often required time-consuming administrative procedures and implied costly environmental compensation measures.” This analysis reveals that the mentioned projects have not been set up properly. The lack of an integrated project design right from the beginning thereby leads to the delays or sometimes even a complete standstill - but in any case to additional costs - later in the process. The Joint Statement on Guiding Principles for the Development of Inland Navigation and Environmental Protection of 2008 has apparently not been applied in these cases.

<p>Use a case-by-case approach</p> <p>Use a case-by-case approach considering both the ecological requirements for river sections as well as the strategic requirements of inland waterway transport at the basin-wide scale when deciding on fairway depth and width.</p> <p>Work with nature whenever possible</p> <p>Work with nature wherever possible through implementation of measures according to given natural river-morphological processes following the principle of minimum or temporary engineering intervention.</p> <p>Integrate design of regulation structures</p> <p>Integrate design of regulation structures, regarding hydraulic, morphological and ecological criteria.</p>	<p>Implement measures in adaptive form</p> <p>Implementation measures in an adaptive form, depending on specific situation and reacting on dynamic changes.</p> <p>Make optimal use of potential for river restoration</p> <p>Make optimal use of potential for river restoration (such as river banks restoration) and side-arm reconnection.</p> <p>Ensure flood water levels are not exacerbated</p> <p>Ensure that flood water levels are not exacerbated and, ideally, are reduced.</p>
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Source: *Guiding Principles of the Joint Statement (ISRBC, DC & ICPDR, 2008)*

On the other hand, recently a large number of co-funded Actions under the current Connecting Europe Facility programme have started on three stretches of the Danube and the Sava rivers with the explicit aim to integrate the guiding principles of the Joint Statement into pilot actions, including all necessary environmental assessments needed for subsequent construction works [INEA, 2018]. Recently, the so called METEET pilot is also aimed at spreading the key messages and approaches of the Joint Statement in the Danube river basin. The Mixed Environment Transport External Expert Team (METEET) aims at assisting and coordinating regional inland waterway transport authorities, in order to develop and foster an integrated and environmentally friendly approach to infrastructural projects in the field of inland navigation.

The European Commission [2012] strongly recommends the use of the integrated approach for planning inland waterway projects, among others because integrated planning can provide inland waterway planners and authorities with greater planning certainty - though no guarantee- over the success of their application and because integrated planning would be more cost effective in the long run, as remedial actions in retrospect are often much

more expensive than incorporation of environmental improvements in the initial project design [European Commission, 2012].

In addition to ongoing activities, as mentioned above, application of an integrated planning approach to waterway management projects will require continued attention and refinement. The model process for integrated waterway management projects, as proposed in the remainder of this chapter, is intended as complementary practical guidance to waterway managers, in order to facilitate wider application of the Joint Statement principles.

The scope of the model process is however limited by definition: The “case-by-case approach” advocated by the Joint Statement also implies that every river and waterway stretch is unique in terms of environmental and waterway conditions and therefore always requires separate analyses and assessments. There is no single site along the Danube river that is an exact copy of any other site in terms of river morphology, flow velocity, ecological status, habitat types, occurrence of species, etcetera. Consequently, the contents of each project or waterway management measure should be site-specific. The following model process can therefore not provide generally applicable analyses and recommendations for actions. The model process should rather be regarded as a check list for integrated waterway management processes, so that all legally required conditions are met and that the joint objectives of reaching good navigation, good ecological and favourable conservation status can be achieved. References for further reading on specific topics are given throughout this document.

Based on the various good practice examples (as identified in the course of stakeholder consultations and based on desk research) the main steps of the model process have been formulated and structured in six process steps. Many of the proposed process steps are already part of the normal procedures in various countries. They therefore reflect usual practice in some countries and would be easily acceptable in most cases.



Figure 4: Model process to achieve GNS, GES and FCS

3.1. Step 1 | Analyse navigation, ecological and conservation status

Analyse navigation status

Topical data on the “hard” components, i.e. the physical status, of the waterway are collected in the first step. A river such as the Danube is a living system with continuous changes to the riverbed and its morphology. A typical “fairway maintenance cycle” should therefore be first and foremost based on continuous monitoring of the fairway. The current state of the fairway shall be monitored and analysed on the basis of hydrographic riverbed surveys. Based on the analyses of collected data the most critical waterway sections in the particular year shall be identified. The actual location of shallow sections, which do not meet the targeted standards, may vary from year to year and from week to week, especially in the free-flowing sections. For this reason, frequent river bed surveying activities shall be carried out, depending on the dynamic character of the particular stretches. Important inputs for these analyses are characteristic water levels as well as a catalogue of critical navigation locations, whereas the expected output is a condition analysis of critical fairway locations.

Waterway infrastructure asset management as defined by PIANC [2013] is nowadays supported by sophisticated surveying and monitoring methods and asset management systems. In its basic form these asset management systems are fed by surveying and monitoring information on the status of critical fairway sections. This followed by an assessment of the fairway condition under low water conditions, as well as an analysis of the required measures to resolve bottlenecks. Many of these phases have been digitalised over the last decade, so that data analysis and assessment of required measures (including communication to waterway users) takes only a fraction of the time needed only 10 years ago.

To obtain thorough baseline data, seasonal patterns with natural variations and long-term trends have to be included into the analyses. Without doing so it may be impossible to determine whether changes were caused by maintenance activities, or not. These analyses should be conducted by qualified scientific and technical personnel to eventually avoid possible user conflicts and discussions on obtained material later on in the process [PLATINA-2, 2016].

Analyse ecological status

The main sources for analysing the current ecological status of the envisaged project area are the responsible water authorities and the relevant river basin management plans. The later assessment of impacts of project activities is thereby measured by comparing the actual status against so-called type-specific reference conditions [European Commission, 2012].

Analyse conservation status

If the envisaged project area is located in or next to a Natura 2000 site, information from the respective Standard Data Form (SDF) and applicable Natura 2000 management plan should be retrieved. Such data forms accompany every Natura 2000 site. The SDF provides key data about the site and the species or habitat type it was designated for, including their current conservation condition (grades A to D). Based on this baseline information, it can be assessed later on if there has been any deterioration in the conservation condition of the designated habitat types and species within the site [European Commission, 2012].

The level of detail for all of the above analyses shall be proportionate to the envisaged scope of the project and the level of impacts expected from it in the different fields.

Step 1 Analyse navigation, ecological and conservation status
Analyse navigation status
<input type="checkbox"/> Analyse the current state of the fairway on the basis of hydrographic riverbed surveys, including river engineering structures for low-water regulation
<input type="checkbox"/> Use digitalised waterway infrastructure asset management systems
<input type="checkbox"/> Engage qualified personnel or experts for solid baseline measurements and analyses
Analyse ecological status
<input type="checkbox"/> Consult responsible water authority and valid River Basin Management Plan
<input type="checkbox"/> Compare the measured status against so-called type-specific reference conditions
Analyse conservation status
<input type="checkbox"/> If Nature sites are involved, consult Standard Data Form (SDF) which accompanies every Natura 2000 site and/or Natura 2000 management plan
<input type="checkbox"/> Determine conservation status of species or habitat type for which the Natura 2000 site was designated

3.2. Step 2 | Outline targets and scope of project

Waterway maintenance projects are usually triggered by the identification of transport needs compared to the current performance of infrastructural bottlenecks (e.g. status of fords and shallow sections). Waterway managers are by definition aimed at aligning the level of service of critical waterway sections with existing national and international targets for the development of the transport network and infrastructure. Before concrete solutions are being elaborated, however, the initial project concept shall be described and justified. At the same time, integrated project targets shall be developed. The next step shall therefore be the identification of environmental needs of the river stretch involved in the same fashion.

The integrated targets shall be derived from national law and ordinances, which are in line with European legislation (notably the TEN-T Regulation, WFD, EU Birds and Habitats Directive). In specific cases, when national parks or protected areas are involved, special laws or ordinances for these areas apply. In sum, environmental concerns shall be taken into account already during the initial project concept phase, when there is still flexibility in the overall project design.

The integrated targets pursued by the initial project concept should be outlined by the project team:

- **Targets to contribute to Good Navigation Status:** the functional requirements that pertain to fairway maintenance are usually derived from the relevant management and core processes of the authority as well as from the applicable navigation act. As regards the navigation targets for free-flowing river sections the target values shall be related to reference water levels in these sections [European Commission, 2018].

- **Targets to contribute to Good Ecological Status/Potential:** Waterway maintenance activities shall be aligned with the objectives of the relevant river basin management plans, as required by the Water Framework Directive. Targets shall reflect the WFD requirement that surface water bodies within a river basin district reach good ecological status (or potential) and good chemical status, as well as the non-deterioration principle. The status of each water body shall be judged by comparing its status against defined reference conditions [European Commission, 2012].
- **Targets to contribute to Favourable Conservation Status:** In the case of the Habitats Directive targets should be defined as to whether a protected species or habitat has reached a favourable conservation status or not. Special attention shall therefore be paid to the identification of ecological requirements of any EU protected species and habitat types that the concrete site has been designated for (cf. the Natura 2000 management plans) [European Commission, 2012].

In integrated projects these targets are in no hierarchical relationship towards each other. In this initial scoping phase - and in the remainder of this model process - navigation, ecological and conservation targets shall be treated on an equal footing.

Based on the initial project concept a screening of possibly applicable legal provisions shall take place. Waterway maintenance activities are almost always relevant with regard to the national water act, but a multidisciplinary team shall clarify and document whether the envisaged project could possibly have effects on water body status/potential expected (WFD) or on adjacent Natura 2000. In some cases adjacent national parks or otherwise protected areas could be affected.

The Common Implementation Strategy [2018] describes several model processes and decision-trees for the appropriate implementation of the WFD and Floods Directive in the context of waterway infrastructure projects. It describes the "Applicability Assessment" in relation to Article 4(7) which needs to be carried out in advance of any authorisation process. This assessment procedure determines whether a proposed new modification to the physical characteristics of a body of surface water could lead to deterioration or the non-achievement of good ecological status. If, based on this Applicability Assessment, it is expected that the proposed project does not cause deterioration nor compromises the achievement of good status/potential, for instance by means of mitigation measures that are inherent elements of the project, then no further Article 4(7) Test is required and the project can be authorised under the WFD.

Measures to maintain natural waterways shall use all available technical know-how and scientific insights, in order to result in good ecological status without impeding good navigation status and vice versa. Relevant experts and stakeholders shall therefore be invited to join briefing meetings with project promoters and responsible authorities to discuss the initial project scope. The level of involvement shall be proportionate to the project scope and potentials impacts.

Step 2 Outline targets and scope of project
Provide outline of initial project concept
<input type="checkbox"/> Provide outline/sketch of possible measures/actions
<input type="checkbox"/> Outline project targets (improve/retain navigation, ecological, conservation status) - provide broad justification for the need to take action, based on analysis of navigation, ecological and conservation status (step 1)
<input type="checkbox"/> Specify geographical scope/location (river-km)
<input type="checkbox"/> Identify potentially affected water bodies, species and habitats
Screening of possibly applicable legal provisions
<input type="checkbox"/> Relevance with regard to national water act?
<input type="checkbox"/> Are any direct or indirect effects on water body status/potential expected (WFD)?
<input type="checkbox"/> Could any adjacent Natura 2000 sites be possibly affected?
<input type="checkbox"/> Could any adjacent national park or otherwise protected area be possibly affected?
Based on answers to previous questions, inform and engage responsible authorities, experts and stakeholders accordingly in further planning process - proportionate to the envisaged project scope and impacts
<input type="checkbox"/> Organise briefing meeting with responsible authorities and engaged experts as well as stakeholders to discuss initial project scope
<input type="checkbox"/> Set up multidisciplinary planning team, proportionate to the envisaged project scope and impacts

3.3. Step 3 | Elaborate and assess integrated measures

After closure of the initial project scoping phase in step 2 - during which the integrated project targets have been agreed upon among the authorities, experts and stakeholders involved - detailed planning and elaboration of the integrated measures constitutes the main part of step 3. By the way, an iterative feedback loop between step 2 and 3 can be valuable in some cases, especially when the scoping phase is facing many uncertainties. Step 3 usually represents the most data-intensive phase of the model process, as many different options need to be assessed from different perspectives. A multidisciplinary planning team, including both navigation and ecological experts, should elaborate the detailed project planning. Again, the size and qualifications of the planning team should be dependent on the scope of the project. Regular maintenance works with limited environmental impacts and a host of empirical values from previous and comparable projects will not require a full-fledged multidisciplinary team.

As the European Commission [2012] notes in the guidance document on Natura 2000, the detailed consideration and proper documentation of “technical alternatives and possible variants within the chosen alternatives at the outset not only improves the overall quality of the planning results but is also very useful for the relevant environmental impact assessment

that may be required later on". The proper execution of this step might therefore be seen as an investment for later stages in the project's lifetime.

Identify technically feasible options

Whereas achieving Good Navigation Status usually requires a reduction of water level fluctuations in free flowing stretches, the achievement of Good Ecological Status and Favourable Conservation Status generally require a higher degree of variation and dynamism. In this phase a whole range of different options should be identified and assessed by the multidisciplinary planning team. This team should build on previous experiences and use the available tools which enable the co-existence of both stable and dynamic water conditions in critical navigation and sensitive natural areas. Examples of these infrastructural solutions, that should be considered along with mere navigation interventions, are for instance side-arm restoration, adapted groyne designs, lateral dams, etcetera.

Achieving a balance between the navigation needs and adequate environmental protection can be a challenge. But in many cases measures to achieve the needed depth, width, and clearance of the fairway can be designed in such a way as to minimise the impacts on important waterway functions or to even restore ecological functions [PLATINA-2, 2016].

Maintenance measures to combat river bed erosion are usually typical examples for integrated measures, as they usually also have positive impacts on river ecology. The same goes for the re-use of dredging material or alluvial deposits for the creation of gravel islands or diversified river bed structures, the removal of hard river banks, the reconnection of side arms or the lowering of groyne roots. These measures usually do not impair navigation interests (in some cases even improve navigation conditions), while they have clear positive impacts on natural resources.

The German Guidance Document on Environmental Issues regarding Maintenance of Federal Waterways [bmvdi, 2015] and the Guide on IWT and Natura 2000 [European Commission, 2012] contain a large range of technical options for such integrated water and environmental protection activities in specific areas:

- **Fairways and use of sediment management techniques:** in areas with high sedimentation, alternatives to dredging shall be investigated. These include adaptation or erection of training walls or the relocation of the fairway after intensive surveying. These alternatives can have significantly lower environmental impacts. Uncontaminated dredging material shall be redeposited and shall remain in the river system as a general rule. Experiences in Austria show that the upstream deposition of gravel (up to 30 km upstream) show positive environmental impacts, while causing relatively low additional costs. Stable dredging materials can be used to create or extend river banks, islands or shallow water zones. As the extraction of sediments (for commercial or other reasons) contributes significantly to bed load deficit and consequently endangers a "good ecological status" or a "good ecological potential" of surface water bodies according to the EU's Water Framework Directive. It is therefore recommended that the excavation of sediments be prevented and that material dredged for fairway maintenance be inserted back into the river. The exact placement site needs to be evaluated case by case as well as whether the sediment can/should be immobilized or not.
- **Reconnection of side arms:** side arms or tributaries that are not used for navigation purposes are generally left to themselves and only continuity is to be secured. Therefore, dredging could become necessary because of water and/or nature reasons only.
- **Groynes and lateral training walls:** these low water regulation structures can host different biospheres and Natura 2000 habitat types. Even groynes with low

vegetation can for instance be host of endangered reptiles. Maintenance works shall be performed in such a way that backwaters are not negatively affected or breeding/spawning seasons are respected. Creation of bypasses or use of alternative groyne types can result in higher dynamics along the river bank.

- **Groyne fields/shallow water zones:** groyne fields are often important habitats for aquatic organisms because of the lower flow velocity in these areas. Because of this important habitat function, measures that affect waterway engineering structures (e.g. relocation, repairs, adaptations) in shallow water zones should be planned and coordinated carefully with water and nature protection authorities. Optimisation of regulating structures in order to ensure navigability also during low water periods reduce operating costs of waterway infrastructure in the short term. In areas of riverbed erosion, regulating measures can be moderately reduced to widen the channel to relieve pressure on the riverbed.
- **Islands and banks:** as long as banks or island do not endanger navigation conditions and safety, they should be left to themselves. Active monitoring and surveying of the stability of the islands and banks should be ensured in the interest of safe navigation. Re-creation of typical riverine habitats such as floodplain islands or the creation of soft side channels increases the range of natural habitats available for local wildlife.
- **River bank restoration:** restoration or removal of hard reinforcement structures along riverbank and the use of more natural embankment techniques can lead to much more dynamic river habitats in specific cases, whilst not affecting navigability conditions. These measures could also contribute to reduce riverbed degradation and lower flood water levels.

Assess impacts on navigation status (TEN-T Regulation)

An assessment shall be undertaken for each significant waterway maintenance measure, in order to determine which planning alternatives are available that result in the targeted navigation status with the least or no environmental impact.

Based on surveying results and analyses, the remedial and/or preventative actions and measures need to be defined, planned and presented in waterway management plans prepared by Member States. Measures may include the following:

- **Traffic management measures** (Improving the navigation channel marking based on the traffic intensities and available dimensions of the fairway),
- **Infrastructure maintenance measures** incl. navigation channel dredging (e.g. remove sediments from the fairway deep channel), and
- **Infrastructure rehabilitation measures** (adaptation of hydraulic structures, e.g. groynes or training walls) [European Commission, 2018].

The impacts of these measures on navigation status in the particular critical stretches should basically be assessed by means of empirical evidence and waterway asset management systems.

Assess impacts on conservation status (Natura 2000)

Natura 2000 sites are not generally excluded from further infrastructural development. However, planned projects need to be assessed regarding their impact on existing genetics, species and ecosystem diversity and, if necessary, rejected or accepted with conditions.

For regular waterway maintenance works, the waterway operator should seek agreement and consensus with the regional water authority as well as with the regional nature conservation authority. When national parks or specifically protected areas are involved, specific authorisation procedures in conjunction with the national park authority shall be

required. Protected areas, such as national parks, biosphere reserves or nature conservation areas are normally defined and protected through dedicated national legislation or legal ordinances. There are no generally applicable provisions and requirements for these types of protected areas. The specific requirements or bans applicable in the national parks are to be respected. Close coordination between waterway managers and national park authorities is in any case imperative.

Regular waterway maintenance works usually do not require a full impact assessment in the framework of the Birds and Habitats Directives, as long as a degradation of natural habitats or the disturbance of defined species is avoided. If maintenance dredging works are aimed towards maintaining a certain state of infrastructure, they usually do not qualify as a project in the sense of Article 6(3) of the Habitats Directive [European Commission, 2012]. This however changes as basic maintenance techniques change, or if conditions or regularity under which they are carried out change significantly.

Three basic assessment steps are proposed to be carried out by waterway managers, when any plan or project could have a significant negative effect on one or more Natura 2000 sites [bmvdi, 2015]:

- Determine whether waterway maintenance measures could possibly affect a Nature 2000 area (based on official experts' judgement);
- If yes, assess whether proposed measures could lead to deterioration or disturbances of defined habitats and species. Information on habitat types and species in the specific Natura 2000 should be publicly available through the Natura 2000 data sources;
- If deterioration of one of the protection objectives cannot be ruled out, specific expertise should be arranged. Such deterioration could e.g. consist of habitat loss, degradation and fragmentation, species disturbance and displacement or barriers to migration and dispersal. Together with experts, alternative ways to avoid or to minimize damage should be investigated and documented.

The Guidance document on Inland Waterway Transport and Natura 2000 [European Commission, 2012] explains how the procedure laid out in Articles 6(3) and 6(4) must be carried out in sequential order. Every step determines whether a further step in the process is required. The prescribed approach for a so-called appropriate assessment (AA) is recapitulated below. More detailed information and guidance can be found in the mentioned document.

- *Step one: screening* - this initial step is to determine whether a plan or project has to undergo an appropriate assessment or not. If it is likely to have significant negative effects on a Natura 2000 site, then an appropriate assessment is required.
- *Step two: appropriate assessment* - once it has been decided that an appropriate assessment is required under Article 6(3), a detailed analysis must be undertaken of the effects of the plan or project, alone or in combination with other plans or projects, on the integrity of Natura 2000 site(s) in view of its conservation objectives. If the appropriate assessment concludes that there is an adverse effect on integrity of the site (despite the introduction of mitigation measures) then the competent authorities must refuse the plan or project or apply the derogation procedure under Article 6(4).
- *Step three: exceptional cases* - Article 6(4) provides for derogations to Article 6(3). Thus if it is concluded that the plan or project will have an adverse effect on a Natura 2000 site, it can still be approved in exceptional circumstances provided the conditions of Article 6(4) are met.

Source: Guidance document on Inland Waterway Transport and Natura 2000 [European Commission, 2012]

Based on the provisions of the Birds and Habitats Directives and/or national species protection regulations, waterway construction or dredging works are for instance usually prohibited during spawning or breeding seasons. Alternatively, works could be phased in time and space, avoiding that certain species are encircled. These requirements are typically reflected by official instructions or conditions that accompany the authorisation documents. There are no European standards for these types of nature protection instructions, so that close coordination between nature protection and waterway management authorities is strongly recommended.

Assessment of impacts on ecological status/potential (WFD)

Regular waterway maintenance measures usually do not impair the ecological status in the sense of the WFD [bmvdi, 2015]. If possible conflicts with the WFD objectives appear during the planning phase, an exemption procedure could be started. DG Environment elaborated a method for such exemption procedures in 2018, as laid down in the Common Implementation Strategy [2018]. The prescribed approach for a so-called Article 4(7) Applicability Assessment is recapitulated below. More detailed information and guidance can be found in the mentioned document.

Step 1: Screening for potential effects

The purpose of this step is to "screen out" projects that will clearly not affect water body status/potential and to identify quality elements which require in a second step (scoping) further attention for more detailed investigations.

Relevant data needs for the screening step:

- Information on project design in sufficient detail incl. applied mitigation measures
- Identification of potentially affected water bodies, as well as adjacent water bodies
- Size of each water body
- Existing pressures, current status of relevant surface and groundwater water bodies
- WFD objective for the water body/measures under the Program of Measures of the RBMP;
- Other projects which may cause cumulative effects;
- Other legislation which might be concerned (e.g. EIA, Habitats Directive or MSFD)."

The result of Step 1 is a conclusion whether the proposed project may affect the status/potential of concerned water bodies. If no, then evidence supporting this conclusion should be documented in the frame of the authorisation procedure and no further assessments are required;

If yes or uncertain, then continue to Step 2.

Step 2: Scoping of further investigations

Step 2 is a scoping step to identify further data needs and to define the necessary assessments which are required for determining the significance of the effects on quality elements.

Step 3: Data collection and assessment

A judgment can require investigations performed by experts and/or modelling in order to determine the effects on quality elements.

If the result of Step 3 is that the proposed project is not expected to cause deterioration of the water body at quality element level or compromise improvement, or if the effects are expected to be only temporary short-term, the evidence supporting this conclusion needs to be documented in the frame of the permitting procedure, no Article 4(7) Test is required and authorisation may be granted according to the WFD;

If the project is expected to cause deterioration of the water body at quality element level or compromise improvement, proceed to Step 4.

Step 4: Article 4(7) Test

If the project is expected to cause deterioration / compromising the achievement of good status/potential, then evidence should be documented and the Article 4(7) Test needs to be launched. The project can only be authorised if the conditions as outlined under Article 4(7) a) to d) are fulfilled.

Source: Common Implementation Strategy for the Water Framework Directive and the Floods Directive, Guidance Document No. 36 (2018)

Step 3 Plan and assess integrated measures
Identify technically feasible options
<input type="checkbox"/> List range of technically feasible options for integrated water and environmental protection activities
Assess impacts on navigation status (TEN-T Regulation)
<input type="checkbox"/> Assess and measure possible impacts of traffic management measures, infrastructure maintenance measures or infrastructure rehabilitation measures
<input type="checkbox"/> Apply waterway asset management systems where possible to determine impacts
Assess impacts on conservation status (Natura 2000)
<input type="checkbox"/> Could proposed measures affect a Nature 2000 area?
<input type="checkbox"/> If yes, assess whether proposed measures could lead to deterioration or disturbances of defined habitats and species. Information on habitat types and species in the specific Natura 2000 should be publicly available through the Natura 2000 data sources.
<input type="checkbox"/> If deterioration of one of the protection objectives cannot be ruled out, specific expertise should be arranged. Together with experts, alternative ways to avoid or to minimize damage should be investigated and documented.
Assess impacts on ecological status/potential (WFD)
<input type="checkbox"/> Is the project likely to have effects on water body status/potential?
<input type="checkbox"/> Is the project expected to cause a deterioration / non-achievement of good status / potential (based on official experts)?
<input type="checkbox"/> Is an Article 4(7) Test required during the authorisation phase?

3.4. Step 4 | Agree on and attain authorisation for integrated measures

The phase of attaining official authorisation (water act, nature protection, national park, etc.) for integrated measures is the last step of a - usually - iterative and interactive process with the respective authorities.

In principle, permits (in line with national water act, environmental law, navigation act, etc.) have to be requested from the authorities for every single physical intervention measure in the waterway, but long- or medium-term permits are generally preferred. An effectual notification always includes certain regulatory requirements as to how the maintenance works in question have to be performed (e.g. defining specific months in which no dredging is allowed because of disturbance of fauna and flora, specific water levels above/below which dredging is forbidden, or restrictions on the amount of dredged material to be dumped in the river at once). In some cases, long- or medium-term notifications are issued by the authorities, which may cover physical interventions over the period of several years, based on specific regulatory requirements for the approved maintenance works. In this case, permits for single measures do not have to be obtained.

The duration of legal deadlines and the need for coordination depend on the required processing efforts of the different authorities and the sensitivity of the natural resources involved. Regular and repetitive maintenance measures will not take as lengthy procedures as newly erected regulation works, as the impacts on natural resources or water quality are known. A differentiated approach is proposed regarding the “weight” of the coordination procedures followed [bmvdi, 2015]:

- **Simple maintenance works without regular coordination:** this procedure can for instance be applied for cutting bushes to allow visibility of traffic signs. Environmental impacts of these types of works shall be assessed with longer time intervals or when the working method is significantly changed.
- **Maintenance works with standard coordination process:** a regular coordination meeting between waterway authorities, water and nature conservation authorities is proposed, during which planned waterway maintenance measures for the forthcoming period are introduced and during which results of works in the previous are jointly evaluated. This meeting is also another opportunity to consider integration of measures in the framework of water or natural resources management (check whether water management or natural resource management measures are planned in the same area). For the waterway manager, these meetings are an opportunity to receive information on presence of endangered species, planned WFD measures (river basin management plan, Natura 2000 management plan). Under normal conditions, agreement on proposed waterway maintenance measures can already be obtained - mostly with explicit and official instructions to optimise or mitigate impacts on water bodies and the natural environment - directly after the meeting or hearing.
- **Complex maintenance works or works in sensitive areas with enhanced coordination needs:** these circumstances require a detailed and local assessment of potential ecological impacts caused by the proposed waterway maintenance measures.

The coordination processes between water and nature conservation authorities on the one side and waterway managers on the other shall be characterised by transparency. Transparency is created by solid documentation. Before approval is given, regional authorities shall receive the required supporting documents, which describe the proposed measures (e.g. verbal specification, maps, engineering drawings, expert reports) including a justification for the waterway maintenance needs. The level of detail and size of the documentation is dependent on the complexity of the measures and the ecological

sensitivity of the areas involved. In order to obtain mutual legal and planning security, it is imperative to document the outcome of any coordination meeting as well as the execution of the actual measures in writing in a standardised way if possible.

In the course of attaining legal authorisation for maintenance measures, the various competent authorities consider user interests and usage aspects. The authorities usually involve official legal experts in judging the different effects of maintenance activities on other uses of waterways (e.g. fishery, ecology, recreation, nature reserve, drinking water, etc.). Thereto related and site-specific restrictions are usually imposed by the competent authorities regarding the performance of maintenance works. The competent authority, upon the advice of its ecological experts or the relevant nature authorities, may make the approval of the project conditional upon the introduction of mitigation measures [European Commission, 2012]. Dredging activities should for instance be harmonized with ecological needs, particularly concerning discharge and seasons or aspects like spawning periods of certain fish species. These types of aspects need to be evaluated carefully and specifically for each project and are to be specified in the conditions of the respective legal permits.

As with NATURA 2000, the national (and sometimes regional) authorities act in the framework of the national water laws, which are in turn the national implementation mechanisms of the WFD when it comes to environmental permits for fairway rehabilitation and maintenance activities. EU Directives are subject to the principle of subsidiarity and therefore Member States ultimately can determine the procedural requirements arising from the mentioned directives [European Commission, 2012].

Step 4 Agree on and attain authorisation for integrated measures	
Establish maximum transparency	
<input type="checkbox"/>	Hold regular coordination meetings between waterway authorities, water and nature conservation authorities to identify conditions at an early stage and to identify opportunities for synergies between previously separated activities in the same area
<input type="checkbox"/>	Involve in-house and external experts to provide a solid decision basis
<input type="checkbox"/>	Adjust the level of detail and size of the documentation to the complexity of the measures and the ecological sensitivity of the areas involved

3.5. Step 5 | Carry out and monitor integrated measures

Elaborate monitoring needs

Based on the final conditions and requirements as formulated by the different authorisation bodies, relevant parameters and indicators for monitoring purposes shall be defined. The European Commission [2012] recommends - in the case of inland waterway projects that could possibly affect Natura 2000 sites - that the monitoring programme should ideally include regular surveys of the status of the habitats and species for which the site is designated. Monitoring of effects of measures on navigation conditions usually include hydrographic surveys before and after maintenance measures. A key metric and performance indicator is the minimum fairway draught and width to be realised on critical stretches by the chosen maintenance works.

Monitoring efforts shall thereby be proportionate to the expected impacts and as required by the authorisation bodies. Monitoring exercises shall thereby enable an a posteriori evaluation whether taken measures have had an impact on the overall project objectives.

Carry out works

The actual execution of works is usually preceded by checking if a framework contract for the respective works is available. In some cases, a tender procedure will have to be initiated in order to retrieve external services. If there is no framework contract available, a tendering procedure has to be conducted for external services (e.g. dredging measures). For this legal notifications and tender documentation need to be prepared and turned into a contract with the contractor. Sufficient time (taking into account applicable national legal provisions) should be reserved for this preparation phase. If external services can be called off from a framework contract, then the call-off of the measure has to be prepared as well.

Waterway maintenance measures such as adaptation of hydraulic structures and dredging are usually faced with quite narrow time windows:

- They are normally forbidden during spawning and breeding seasons
- They can normally only be carried out under middle/low water circumstances in free-flowing sections
- They should be completed shortly before the statistically expected low-water season, which differs per corridor and section, in order to be effective (the principle of proactive fairway maintenance). An example for the Danube is that the optimum time frame for the start of priority maintenance works is prior to the beginning of the low-water period in early autumn. This is based on the annual hydrological regime of the river.

In order to remain flexible within such tight time windows, lead times for all other process steps, which are not dependent on external circumstances, shall be kept as short as possible or shall be prepared well in advance. The prior preparation of framework contracts is an adequate way of compressing lead time for regular maintenance works.

After the contracting phase, a briefing meeting before the beginning of the works shall be scheduled. During this meeting, in which the contractor and usually the navigation authority takes part, all details for the planned maintenance measures should be cleared. These details include the exact area of intervention (e.g. dredging sites, sites for relocation of dredged materials), target depth for dredging site, date of beginning and end of works, daily working hours, equipment deployed, responsibility to display navigational signs, relevant water gauge with reference water level etcetera. Previous surveying results and contracting details are also fed into this briefing meeting. Arrangements shall also be made with regard to communication with waterway users, including in-time notification of maintenance

measures to the navigation authority (to be later published as Notices to Skippers), fishermen and operators of berths.

All additional agreements made during the briefing meeting shall be documented in a signed protocol of the meeting.

Carry out impact monitoring

Prior to the execution of a fairway maintenance measure, the critical location to be maintained will have to be thoroughly surveyed. The same goes for ecological monitoring data, if applicable and required. During the maintenance works, work safety supervision as well as ecological and local/technical site supervision should be carried out. This is to safeguard adherence to safety regulations and to monitor the proper execution of works, according to the contract terms and agreements. If any legal or ecological issues occur during the fairway maintenance works, they have to be clarified in cooperation with involved legal experts and ecologists.

During the implementation phase physical changes as a result of dredging activities will undoubtedly arise. This is caused by the presence of dredging equipment and excavation activities, sediment removal, altered morphology and re-suspension of sediment. As stated in the Common Implementation Strategy [2018], “temporary effects due to the establishment of the modification during the building phase are not required to be addressed as long as there is no long term adverse consequence and no deterioration in the status or potential of the element could be expected thereafter in the water body”. In the same report it is also noted that nature might require time to recover or measures might need time to reach full ecological effectiveness following the intervention to the ecosystem. These cases could be subject to exemptions according to Article 4(4) based on 'natural conditions'.

At the least, actual works are being closed by a hydrographic survey during or after completion of the maintenance measure, for the purpose of quality assurance and settlement of accounts. The contractor therefore has to notify the navigation authority in due time about the estimated end of the measure. For dredging measures with a longer duration, an additional hydrographic survey can also be performed during the measure.

Step 5 Carry out and monitor integrated measures
Elaborate monitoring needs
<input type="checkbox"/> Define relevant parameters and indicators for monitoring purposes based on the final conditions and requirements as formulated by the different authorisation bodies
<input type="checkbox"/> Determine monitoring efforts as proportionate to the expected impacts and as required by the authorisation bodies
<input type="checkbox"/> Determine baseline situation to enable an a posteriori evaluation whether taken measures have had the desired impact on the overall project objectives
Carry out works
<input type="checkbox"/> Checking if a framework contract for the respective works is available
<input type="checkbox"/> Compress lead times for regular maintenance works by prior preparation of framework contracts wherever possible
<input type="checkbox"/> Hold briefing meeting before the beginning of the works to go through all details with the contractor and the involved authorities
<input type="checkbox"/> Prepare arrangements with regard to communication with waterway users on planned maintenance measures
<input type="checkbox"/> Document all additional agreements made during the briefing meeting
Carry out impact monitoring
<input type="checkbox"/> Carry out work safety supervision as well as ecological and local/technical site supervision
<input type="checkbox"/> Close actual works by means of hydrographic survey and required (ecological) monitoring reports

3.6. Step 6 | Report and evaluate outcomes

Document project results

The outcomes of integrated waterway management measures have to be properly documented and reported. The reports drafted by the (ecological and local) site supervision as well as the final hydrography survey of both the dredging and the dumping sites are to be analysed for this reason [European Commission, 2018]. In addition, information necessary for inhouse performance indicators are collected. The inputs for these analyses include the service contract, daily reports of site supervision, surveying results prior, during and after measure, as well ecological monitoring reports, if required. The outputs of this phase are approved reports of site supervision and, if applicable, a list of deficiencies and requirements for their remedy.

Have the contractor or the in-house units not achieved the agreed quality of the measure, finishing work has to be performed on the basis of a structured list of deficiencies. Only after their adequate remedy, the final financial settlement and invoicing process can start. The achievement of objectives and actual values of the performance indicators after the

maintenance works shall be documented, for later communication with and verification by the authorisation bodies. Performance indicators are calculated on the basis of final input data, as defined in the previous step.

Evaluate outcomes

With the entry into force of the Water Framework Directive and the TEN-T Regulation, Member States are obliged to report on the steps to be taken to reach and to preserve good status of the waters (through river basin management plans) and good navigation status (in future through the TENtec system). In addition, the status of fairway conditions in the various Danubian states is systematically monitored after the implementation of measures through the FAIRway National Actions Plans and in the framework of the EUSDR Steering Group on PA1A (Inland Waterway Transport). These reports describe in detail the navigability status, the maintenance needs, the actual maintenance efforts and possible gaps as regards critical bottlenecks in the corridor. When it comes to evaluation of width/depth dimensions, it is based on monitoring the hydro-morphological changes in the riverbed and the monitoring of ecological effects of measures (e.g. changes in biomass indices, number of rejuvenated river banks).

Apart from the measurement of physical performance indicators on both the ecological and navigational side, regular user satisfaction studies should be carried out. This is important in order to identify the extent to which physical outcomes are actually perceived by the different user and stakeholder groups. These user satisfaction surveys often reveal important lessons learned for upcoming waterway management cycles. In order to increase customer satisfaction and in order to gear works and measures towards actual user needs, waterway administrations shall make use of such consultative instruments. Anonymous user surveys also help to evaluate their performance in connection with regular maintenance activities, or the provision of information etcetera.

Step 6 Report and evaluate outcomes
Document project results
<input type="checkbox"/> Analyse the reports drafted by the (ecological and local) site supervision as well as the final hydrography survey
<input type="checkbox"/> Generate approved reports of site supervision and, if applicable, a list of deficiencies and requirements for their remedy
<input type="checkbox"/> Calculate defined performance indicators on the basis of final input data
Evaluate outcomes
<input type="checkbox"/> Report on the steps taken to reach and to preserve good status of the waters (through river basin management plans) and good navigation status (FAIRway National Action Plans)
<input type="checkbox"/> Carry out regular user satisfaction studies to reveal user perception on performance and outcomes
<input type="checkbox"/> Define lessons learned for upcoming waterway management cycle

4 GOOD PRACTICES ON ENVIRONMENTALLY SOUND WATERWAY MANAGEMENT

Chapter 4 contains an overview of good practices observed in the Danube river basin, giving an illustration of how integrated waterway maintenance is applied in the various Danube riparian states. These good practices have been identified and developed in an ongoing dialogue between waterway managers (represented by the Danube STREAM consortium) and national park authorities (represented by the DANUBEparkCONNECTED consortium) in autumn 2017.

4.1. Austria - Integrative Bedload Management

4.1.1. Background information/context

The approximately 48 km long and free-flowing stretch of the Danube between the Freudenu power plant in Vienna (river km 1921.0) and the end of the Austrian-Slovakian border (river km 1872.7) is a particular challenge. Here, where the river can still flow freely (without any barrages) the consequences of the upstream dams of the Danube power plants are visible: the natural flow of gravel along the riverbed is interrupted as the Danube digs deeper and deeper into its riverbed causing both surface and groundwater levels to drop.

During the course of the large-scale project to regulate the river in the 19th century, both riverbanks were reinforced with stone blocks, thus cutting off all the secondary tributaries of the river from the main stream. This led to a decoupling between the river and the riparian forest, reinforced by falling water levels. In addition, fine sediment deposited during flood events also contributes to an increase of the surrounding areas from the river. Due to these slow but steady changes many typical riverine habitats have already been lost. Without countermeasures these negative developments will continue.

According to legal requirements viadonau is responsible for regulation, maintenance and development of the Danube waterway. The agreed minimum fairway depth for inland waterway transport in Austria is 25 dm at regulated low water level. In Austria the Danube east of Vienna has the most critical sections for navigation and nautical bottlenecks. viadonau is responsible to clear those nautical bottlenecks in an environmentally friendly way.

Additionally, a "good ecological status" has to be achieved with "good ecological potential" for all waters according to the EU-Water Framework Directive (2000/60/EG), whereby the challenges for Austria can be identified especially in the areas of hydro-morphology and fish ecology.

Thus, viadonau's objectives regarding waterway management processes are that those processes contribute to both, a good navigation status and a good ecological status.

4.1.2. Addressed problems and objectives of the initiative

In the free-flowing stretches of the Austrian Danube, the current of the river digs continually deeper into the riverbed. Within the past 50 years this has caused degradation to the riverbed of about one meter on the Danube east of Vienna. This erosion of the riverbed also causes surface and groundwater levels to decline, thereby threatening the delicate ecosystem of the Danube wetlands. The primary reason for this erosion of the riverbed is the

disruption of natural gravel transportation along the river by hydropower plants. The channelling of the river into a single riverbed also increases erosional forces.

Thus, the addressed problems were (1) the deepening tendencies of the Danube east of Vienna and thus a decrease in the water table (which in turn intensifies the decoupling between the river and the riparian forest) and (2) the aggradation tendencies at shallow sections east of Vienna which lead to obstructions for navigation.

The objectives of the initiative were mainly to reduce the deepening tendencies of the river by an integrative bedload management: Gravel dredged during the course of maintenance of the fairway channel is not removed from the river anymore, but transported upstream and then deposited in the river again. Furthermore, bed load traps help gathering gravel for further bed load management. This approach leads not only to an improvement of the navigation status via the dredging activities but to an improvement of the ecological status as well as the material stays in the system and thus counteracts the deepening tendencies of the river which leads, amongst others, to a drop in the water table.

4.1.3. Stakeholders involved

The integrative bedload management is implemented by viadonau in cooperation with the with the Donau-Auen National Park.

4.1.4. Key success factors and innovative aspects

viadonau has adopted a proactive approach in its efforts to ensure the provision of internationally specified fairway parameters on the Austrian section of the Danube. The objective is to ensure that the shallowest sections of the river are maintained and in good condition prior to the onset of the annual low water period in autumn. For both ecological and bedload management reasons (degradation of the riverbed), all dredged material is returned to the river, being either dumped in the river, used for structuring the riverbanks or for landfill on islands.



Figure 3: Dredging in the fairway.

4.1.5. Implementation status and transferability

Bedload management was tested in 2015 with some 68,500 cubic meters of gravel, which were transported more than 18 kilometres upstream. The focus of the investigations was on the effects this management approach had on the riverbed, along with economic aspects, considering cost of implementation, equipment used, weekly performance, etc.

In 2016, 273,000 cubic meters of gravel were dredged and transported an average of over ten kilometres upstream before being returned to the river. As a result, on the one hand minimum fairway parameters for navigation were by and large achieved. On the other hand, the gravel remains substantially longer in the section of the Danube. This represents a major contribution to the stabilisation of water levels. Since summer 2017 the operation of a bed load trap was started in the area of ford Treuschütt in order to gather gravel for bed load management and to further improve the fairway conditions in this section. In this context 80,000 cubic metres of Danube gravel were dredged in 2017 and transported around 20 km upstream, where they were deposited in two critical areas of riverbed erosion. This measure also contributes actively to the dynamic stabilization of the Danube's river bed as well as its water levels.

The project can be used as a good practice example for the improvement of the good ecological status while measures regarding the fairway maintenance take place anyway. The approach of the project could be transferable to other countries and/or settings with comparable situations but should be adapted to the specific conditions, respectively.

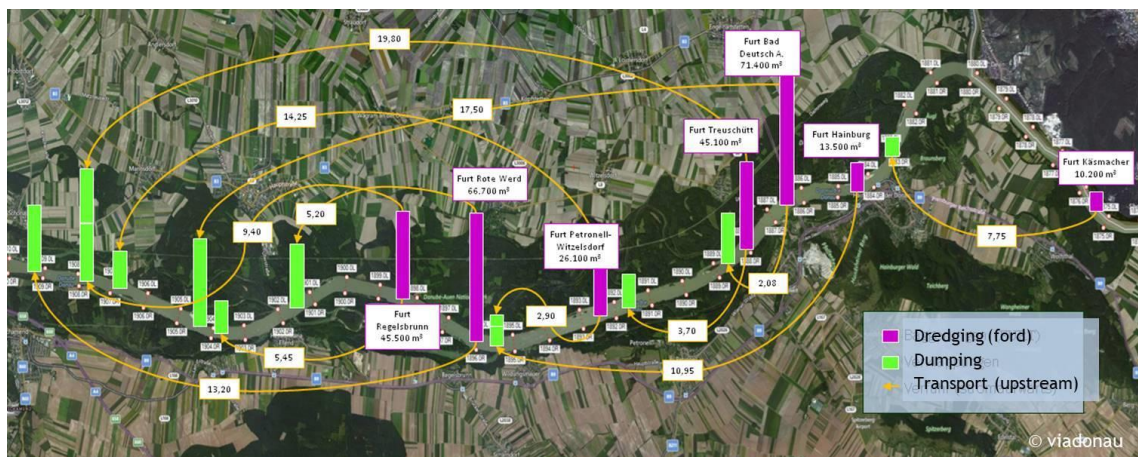


Figure 4 Bedload management via recirculation at the Austrian Danube east of Vienna in 2016

4.1.6. Main lessons learned

Despite hydropower plants and regulation structures the Danube east of Vienna is still very dynamic and bed load is transported faster and for longer distances than originally expected. As a consequence, gravel which is dredged in the course of maintenance measures of the shipping channel or from bedload traps, is now transported as far upstream as possible, where it is dumped in deep areas of the riverbed (bedload redistribution). The additional deposit of coarse grit can be a further element of bedload management. It is of primary importance that this natural abrasion (grinding of the stones) is compensated for.

viadonau's maintenance measures, along with the efforts of Verbund AG, ensure stable water levels over the entire section of the river and are fundamental to maintain safe underwater conditions for the Freudenu power plant on the first kilometres of the Danube east of Vienna.

4.1.7. Contact data for more detailed information

via donau - Austrian Waterway Company

Donau-City-Straße 1, 1220 Vienna, Austria

Web: www.viaddonau.org

4.2. Slovakia - Fish and other species migration and habitats quality improvement in the Slovak rivers

4.2.1. Background information/context

The “Guidance to determine the most suitable fish passes to assure fish migration according to the typology of rivers” (Ministry of the Environment of the Slovak Republic, 2015) was compiled by the Slovakian Water Research Institute in cooperation with the Slovak Water Management Enterprise, the State Nature Conservancy of the Slovak Republic, the Slovak Angling Association and independent national experts. The aim was to prevent the deterioration of ecological status and to improve the ecological status of the water bodies regarding fish fauna and other water dependent fauna as response to the implementation of the EU's Water Framework Directive and EU's Habitats Directive. Based on the publication of the Guidance the common meetings started. Moreover, observations of particular hydromorphological alterations (longitudinal and lateral continuity interruptions, etc.), common designs of solutions and activities in the whole territory of the Slovak Republic are still ongoing.

The implementation of the ecological measures focused on the revitalization and reopening of the arms connected with the Danube River as well as the creation of “steep river banks” on the Danube banks (removal of the bank stones and restoring the natural character, better places for the nesting of the birds, etc.).

4.2.2. Addressed problems and objectives of the initiative

According to the EU Water Framework Directive, new hydromorphological alterations/pressures shall not cause a deterioration of the ecological status of the waters. Some of the existing hydromorphological alterations/pressures can be improved to preserve the existing ecological status of the waters and thus the objectives of the EU Habitats Directive can be achieved.

The objective of the initiative was to improve the ecological status of water bodies and to prevent the deterioration of ecological status in the most ecological way by reducing hydromorphological alterations/pressures in cooperation with water management authorities and nature conservancy authorities.

4.2.3. Stakeholders involved

- Water management authorities: Slovak Water Management Enterprise, state enterprise;
- Nature conservancy authorities: State Nature Conservancy of the Slovak Republic, NGOs (SOSBirdLife, BROZ, etc.);
- Others: Slovak Angling Association, independent national experts, local municipalities or NGO's, private companies (e.g. energy producers), etc.

4.2.4. Key success factors and innovative aspects

For each particular hydromorphological alteration/pressure all possible solutions to assure fish migration or to improve habitats quality whilst retaining the necessary existing water uses were evaluated. Here are two examples:

- Water structures WS Kráľová and WS Selice: According to the Guidance the WS Selice is a fishmigration barrier. Both are located at the Váh river, which is a planned waterway. Separately the WS Selice should be rebuilt. But in connection with WS Kráľová, if the waterway will be built, the impoundment of WS Kráľová will assure the fish migration of the WS Selice too. The negative impact of an impoundment on other species or habitats on the Váh River is less negative than that of interrupted fish migration.
- Water structures WS Kráľová and WS Sĺňava: Water reservoirs of these water structures are habitats of water-dependent birds and are particular protected SPAs. As the State Nature Conservancy of the Slovak Republic would like to improve the ecological value of these two habitats, they have proposed to build a new bird islands there. The common solution is consulted and under preparation with the aim to enhance the value of the bird habitat and to retain the planned waterway uses at WS Kráľová too.

4.2.5. Implementation status and transferability

Concrete common measures will be financed from the Operational programme budget and further maintained by the responsible authority, either the water management or nature conservancy authority. Improved environmental quality will lead also to improvement of recreational potential of localities.



Figure 5 Restoration of steep river banks as nesting bird habitats in Slovakia

The concrete measure is strongly dependent on the particular conditions of the localities (rivers, water structures, reservoirs, etc.). But good cooperation of different authorities is a motivation for other countries too. After monitoring the effectiveness of the fish passes built according to the Guidance, they could be applied across the EU.

4.2.6. Main lessons learned

- The knowledge gap of each of the authorities is still evident;
- A lot of time is necessary to communicate and to explain scopes and objectives of both authorities;
- The support on policy level (e.g. financing, objectives) is crucial;

- A cooperation of the waterway administration and protected areas is necessary for the sake of the implementation of the ecological activities like reopening of the arms or removal of the bank stones for restoring the river banks;
- creation and appearance of the bank abrasion and formation of sediments and their transport into the river, more sediments lead to higher maintenance needs in order to maintain navigation conditions.

4.2.7. Contact data for more detailed information

1. **BROZ - Bratislavské regionálne ochrannárske združenie**
Na Riviére 7/a, 841 04 Bratislava, Slovakia
Web: www.broz.sk
2. **SVP - Slovenský vodohospodársky podnik, štátny podnik**
Radničné námestie 8, 969 55 Banská Štiavnica, Slovakia
Web: www.svp.sk

4.3. Hungary - Restoration of the Szabadság Island and its sidearm

4.3.1. Background information/context

The following Good Practice is an environmentally sound process which affects the management of the waterway. It includes the integration of all relevant stakeholders - especially those linked to protected areas - into the planning process from the beginning. Within an environmentally sound waterway management the main goal is to identify the major common threads between a sustainable good navigation status and a sustainable good ecological status.

Due to the river regulations in the past the river is not able to form new islands and branches, and the existing ones are disappearing due to natural processes. The idea behind the revitalisation of the island and its side-arm came up, to save the existing side-arms, before it would finally disappear.

The project was implemented in the framework of the LIFE+ Nature Project, with the financial support of the Municipality of Mohács and Coca-Cola Hungary.

4.3.2. Addressed problems and objectives of the initiative

The aim of the project was the revitalisation of the Liberty Island on the river Danube, and its side-arm near Mohács. The side-arm was blocked by a rockfill-dam, which accelerated the degradation process.

One goal was to restore the living side-arm by opening the cross-dam and dredging the riverbed, and thus enabling the water to flow through the arm, refreshing the stored water. Another objective was the replacement of non-native tree plantations with native, alluvial soft-wood forest.

4.3.3. Stakeholders involved

- WWF Hungary was the coordinating beneficiary in the project. Its responsibility was the overall project implementation, the communication activities and the preparation of project reports;
- Danube-Drava National Park Directorate supervised the technical implementation of the project from nature conservation perspective, and it is now the manager of the island;
- Lower-Danube Water Management Directorate supervised the technical aspects of the project, it created the design of the dredging and the opening of the rockfill dam;
- Transdanubian Regional Waterworks Corporation performed the technical supervision of the designing of the waterpipe relocation;
- Municipality of Mohács City was one of the main promoters of the project. Beyond the financial contribution, it provided place for meeting in the City Hall, and local inhabitants continuously provided assistance on volunteer days;
- Coca-Cola Hungary provided essential financial contribution and communication assistance. Its volunteers participated in the nursery of the young forest several times.

4.3.4. Implementation status and transferability

The five year project concluded by the end of 2013. Now Liberty Island is a strictly protected area owned by the Hungarian State, and its side-branch is now restored to its natural shape again. New, protected species appeared in the area, and the side-arm is flowing again with almost two meters deep water throughout the year. The young forest need nursery for a few years, but after that, it can be left on its own. The sedimentation and the quality of the drinking water extracted from the wells by the river arm need to be monitored.



Figure 6 Dredging activities for side-arm reconnection in Hungary

Most of the Danube's islands have the same problems, as Liberty Island did have. They are connected to the mainland and therefore the side-arm is blocked which is why it is a stagnant water body, suffering from intensive sedimentation. To prevent the extinction of the side-arms and to reach the aim of the preservation of islands, great efforts as well as effective national and international cooperation are necessary.

4.3.5. Main lessons learned

This project has proven that governments, NGOs and corporate partners can cooperate and mobilize professional work and financial resources resulting in great achievements.

4.3.6. Contact data for more detailed information

OVF - General Directorate of Water Management

Márvány Street 1/D, 1012 Budapest, Hungary

Web: www.ovf.hu

Project Website: www.szabadsagsziget.hu

4.4. Croatia - Arrangement of Drava River Waterway

4.4.1. Background information/context

The planned variant solutions are realized in the environmentally sensitive area of the Nature Park Kopački rit. Therefore, it was important to consider the needs of this precious ecosystem in the project. Interdisciplinary planning and stakeholder involvement are key issues for the successful implementation.

The first meeting of the Danube Forum for the stakeholders of the project "Arrangement of the Drava River waterway from the mouth (rkm 0) to the Port Osijek (rkm 12) was held in the premises of the Agency for Inland Waterways in Vukovar on 28th November 2013. The agency for inland waterways founded the Danube Forum in 2012 in order to establish better communication between the administrations in charge of inland waterway projects on the Danube and its tributaries in accordance with the guidelines of the Platina manual on Good Practices in Sustainable Waterway Planning (the NAIADES Action Programme of European Commission) and the Joint Statement on Guiding Principles for the Development of Inland Navigation and Environmental Protection in the Danube River Basin. In the Forum the active involvement of stakeholders will be achieved with full participation throughout the entire process of project planning, which will consequently lead to their direct contribution to the final outcome and plans.

4.4.2. Addressed problems and objectives of the initiative

The main problems have been the implementation of the Joint Statement planning and Implementation of the manual on good practices in sustainable waterway planning. The overall aim is to integrate environmental objectives of new legislation into the operational guidelines for integrated waterway maintenance on national level.

The main objectives of the initiative were as follows:

- To achieve both transport-related and environmentally motivated goals through integrative maintenance measures;
- To utilize expertise in the field of waterway engineering, navigation, hydrology, ecology, and environmental protection to create a coordinated program of measures;
- To use a case-by-case approach which considers both the ecological requirements and the strategic requirements of IWT 'working with nature' wherever possible through implementation of measures according to given natural river-morphological processes following the principle of minimum or temporary engineering intervention;
- Integrated design of regulation structures, equally regarding hydraulic, morphological and ecological criteria;
- Implementation of measures in an adaptive form (e.g. river bed stabilisation by granulometric bed improvement, low water regulation by groynes);

- Optimal use of the potential for river restoration (e.g. river banks restoration) and side channel reconnection;
- To ensure that flood water levels are not exacerbated and, ideally, are reduced.

4.4.3. Stakeholders involved

- Planning, prioritization and implementation of measures related to inland waterways lies within the responsibility of the Agencija za vodne putove;
- Environmental stakeholders (contributed intensively to the development of the framework concept);
- Relevant ministries and governmental bodies;
- Experts in river engineering, navigation and ecology;
- NGOs and relevant private sector representatives;
- The document takes the needs of waterway users (transport sector) and recreational users into account;
- Active involvement of stakeholders and their full participation throughout the entire process of project planning, and thus their direct contribution to the final outcome and plans.

4.4.4. Key success factors and innovative aspects

- It addresses the interface between transport and environmental objectives in regards to maintenance activities and presents integrative guidelines for measures and gives examples of combined measures as well;
- Legal obligations and limitations are illustrated in detail and from a practical point of view;
- Key environmental stakeholders were integrated in the development process of the framework concept;
- The framework concept was developed specifically for waterway maintenance measures.

4.4.5. Implementation status and transferability

There is a constant process of updating and improving the navigation conditions on the Drava river from Port Osijek (rkm 12) to the Danube mouth (rkm 0).

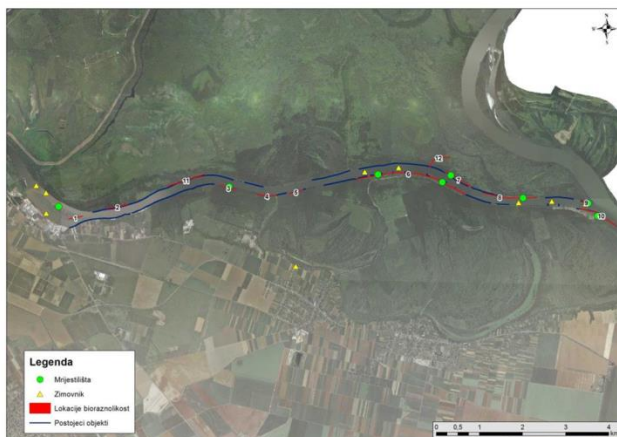


Figure 7 Satellite picture of project area in Croatia

The project can be applied to the local conditions of Croatian waterways. The requirements are based on obligations due to European legislation. Thus - as an example of good practice - the document may be relevant to other European waterway administrations, too.

4.4.6. Main lessons learned

- An interdisciplinary approach creates synergies and enables that manifold goals are met with comparably little effort;
- In order to successfully implement the goals of the WFD it is crucial that waterway administrations closely cooperate with water and conservation authorities.

4.4.7. Contact data for more detailed information

AVP - Agency for Inland waterways

Parobrodarska 5, 32000 Vukovar, Croatia

Web: www.vodniputovi.hr

4.5. Serbia - Stakeholders' Forum

4.5.1. Background information/context

The project “Preparation of necessary Documentation for River Training and Dredging Works on selected locations along the Danube River” was set out to create conditions to ensure a minimum navigable depth and width of the Danube fairway during periods of low water levels, taking into account environmental concerns. The adopted guidelines for the development of the documentation within this project include: preserving connectivity conditions of the water bodies, preferable application of detached structures, preserving sediment equilibrium and ensuring mitigation measures.

The Stakeholders' Forum was established within this project as a multidisciplinary body in which different interests are represented: navigation, environmental and nature protection, industry and archaeology.

The Directorate for Inland Waterways, together with the Ministry of Transport, was the beneficiary of the project “Preparation of Documentation for River Training and Dredging Works on Critical Sectors of the Danube River in Serbia”. The Stakeholders' Forum of the project was established in line with the long-term orientation of the Directorate for Inland Waterways Plovput towards application of the modern concept of inland waterway management, as well as with identified good practice in implementation of similar projects on the Danube River.

4.5.2. Addressed problems and objectives of the initiative

The Stakeholders' Forum performed the following tasks:

- Ensure transparency during the Project phase;
- Exchange of information about the Project;
- Providing independent and professional inputs and guidance for the Project;
- Discussion and provision of recommendations related to the Project.

The main objective was integrated inland waterway management, oriented towards harmonising the interests of various stakeholders, and respecting national and international

legal frameworks, including, among others, the Joint Statement on Guiding Principles on Inland Navigation and Environmental Protection in the Danube River Basin.

The purpose of the organization of the Forum is the establishment of a body for improvement of the quality of the project, as well as exchange of information of importance to the project. The Forum is being established with the goal to enable wide input and involvement of civil society organizations which have an interest in the project.

4.5.3. Stakeholders involved

During the project preparation phase the advisory group was made up of the ICPDR, the Institute for Nature Protection of Vojvodina, WWF, the Ship Masters' Association of Serbia, the Serbian Chamber of Commerce, the National Alliance for Local Economic Development, Aqua et Archaeologia, the Centre for Ecology and Sustainable Development, and Local Agenda 21 for Kostolac.

A number of observers (all of which are welcome) have taken part at forum meetings, including the Delegation of the European Union to the Republic of Serbia, relevant Serbian ministries and other governmental institutions interested in the project, international river commissions, waterway administrations from other Danube countries, as well as NGOs which are not members of the forum.

A representative of Plovput is the forum chairperson, and makes sure that all forum members have equal treatment. The chairperson is also the link between the forum members and consultants (Witteveen Bos, Danish Hydraulic Institute and Energoprojekt), making sure that information is properly exchanged between forum members and consultants.

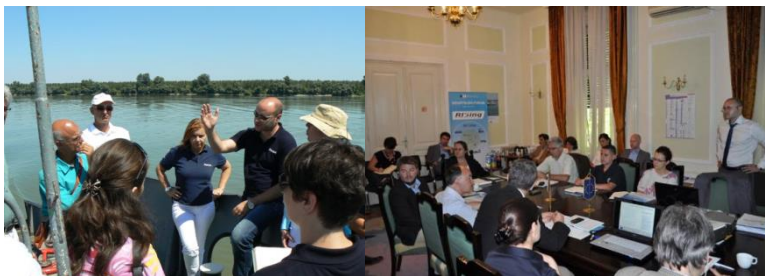


Figure 8 Stakeholder engagement in Serbia

The meetings of the Forum could be attended by the representatives of:

- Delegation of the European Union to the Republic of Serbia (as the donor of funds for the Project).
- Serbian European Integration Office.
- Serbian ministries responsible for inland waterway transport, environment, spatial planning, water management, and archaeology.
- Danube Commission.
- International Sava River Basin Commission.
- Consortium contracted for the Project (Witteveen Bos, DHI and Energoprojekt).

Meetings of the Forum, as observers, can be attended also by representatives of civil society organizations which are not members of the Forum, as well as representatives of relevant governmental organizations interested in the project.

4.5.4. Key success factors and innovative aspects

The basic principles of the forum included: voluntary membership that was free of charge, mutual acknowledgment of and respect for the various standpoints of the forum members and transparency of the work. Those basic principles are part of the general rules on organisation and work of the forum.

Recommendations of the Forum have advisory character.

Organizations which are accepting membership in the Forum delegate one person who is becoming the regular member of the Forum and one person who is becoming the deputy member of the Forum.

The innovative approach assumed ensuring minimum depth and width of the fairway during the low water periods, while respecting environmental requirements:

- Preserving connectivity conditions.
- Preferring detached structures.
- Ensuring mitigation measures.
- Preserving sediment equilibrium.

4.5.5. Implementation status and transferability

The kick-off meeting of the Stakeholders' Forum was held on 26 June 2012 in Belgrade and the second on 17 July 2012 in Belgrade. At the fourth meeting of the forum held on 14 September 2012 in Belgrade, the first big milestone of the forum was reached by a common agreement on preferred options for six critical sectors on the Danube River in Serbia, which are to be further investigated in the next phase of the project. By May 2013, 9 Forum meetings were held.

Cross-sectorial cooperation is the basis for creation of long-term sustainable solutions. Those are solutions which define clear relation between identified benefits and costs, with presumptions and parameters on which all stakeholders agree. Work of this Forum and generated solutions which are acceptable for all stakeholders are possibly a guideline of possible work in the future.

The Stakeholders' Forum is continued as a practice during the Project implementation phase as well, gathering a wider scope of stakeholders and it is supposed to be finished by the Project conclusion. As a basic implementation activity within the project second phase "River Training and Dredging Works on critical sectors on the Danube River in Serbia", the Forum now allows the continuous monitoring of project development and the comparison of current project efforts and stakeholders' involvement with the outcomes of the project preparation phase.

Nevertheless, this activity can be continued within the other projects in progress in Serbia, but also it is applicable to all similar activities in other countries. Public participation and environmental protection are now one of the key objectives of the EU legislation and strategies, meaning all means of its providing are welcomed - making Stakeholders' Forum an exemplary exercise.

Present projects (including these relevant for navigational purposes) imply different types of stakeholder workshops, public researches etc. where a Stakeholder Forum established as presented in Serbia may take part in the actual projects as well.

4.5.6. Main lessons learned

- Successful implementation of water management strategies requires close cooperation between experts and organisations involved or interested in river basin management planning - in short among all stakeholders;
- Considering the wider importance of the work being done, all forum documents are prepared and distributed in both Serbian and English. Likewise, all documents from forum meetings (both from the project preparation and implementation phases) are available to the general public at Plovput's web-site (<http://www.plovput.gov.rs/forum-zainteresovanih-strana>), ensuring direct insight for all stakeholders of the project and guaranteeing the transparency of the planning process;
- Forum members have the right to raise questions as well as to make recommendations for further investigations or a more detailed analysis regarding different options for critical sectors;
- The Directorate for Inland Waterways was respecting the existing mechanisms of cooperation with organizations of the civil society in the Republic of Serbia, for those fields of importance for the Project, which are available within the existing mechanisms;
- The work of the Forum is transparent.

4.5.7. Contact data for more detailed information

Plovput - Directorate for Inland Waterways

Ministry of Construction, Transport and Infrastructure (MCTI)

Francuska 9, 11000 Belgrade, Serbia

Web: <http://www.plovput.rs/>

4.6. Romania - Technical Assistance for the Review and Completion of the Feasibility Study on Improvement of the Navigation Conditions on the Romanian-Bulgarian Danube Joint Sector and Complementary Studies

4.6.1. Background information/context

The project "Technical Assistance for the Review and Completion of the Feasibility Study on Improvement of the Navigation Conditions on the Romanian-Bulgarian Danube Joint Sector and Complementary Studies", referring to the Danube Joint Sector for Romania and Bulgaria, ranging from km 845.5 at km 375, which is an important sector of the Rhine Danube Corridor. There were identified 12 critical points in the sector between the Iron Gates II-Silistra, where the recommendations of the Danube Commission to maintain the minimum depths during the low-level period are not met. These were grouped into 5 critical areas as follows:

1. *Critical zone 1* (km 850 to km 818) contains critical points Garla Mare (km 839 to km 837) and Salcia (km 824 to km 820).
2. *Critical zone 2* (km 786 to km 755) contains the critical points Bogdan-Secian (km 786 to km 782) and Dobrina (km 762 to km 756)
3. *Critical zone 3* km (678 to km 625) contains critical Bechet (km 678 to km 673) and Corabia (km 632 to km 626)
4. *Critical zone 4* (km 577to km 520) contains critical points Belene (km 577 to km 560), Vardim (km 542 to km 539), Iantra (km 537 to km 534) and Batin (km 530 to km 520)

5. *Critical zone 5* (km 428 to km 401) contains the critical points: Kosui (km 428 to km 423) and Popina (km 408 to km 401).

The project was approved for funding under the CEF Transport 2014 Call for Multiannual Projects, Financing Objective 4 - Specific Call for Cohesion Funds, Priority 1 - Pre-identified projects on the core network corridors - inland waterways and ports. The project benefits from 85% EU funding and 15% funding from state budget. The project has partners of the two waterway administrations in Romania and Bulgaria, namely AFDJ Galati and IAPPD Ruse.

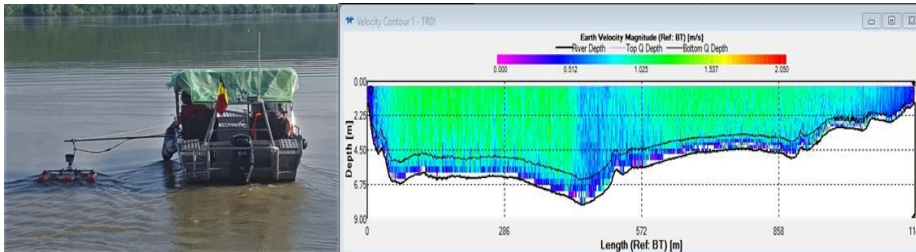


Figure 9 Hydrodynamics survey at the Lower Danube (Romania)

Project actions:

- Investigation and development of technical solutions to be included in the feasibility study in order to ensure stable navigation conditions throughout the year, on the Romanian - Bulgarian joint Danube sector;
- Preliminary identification and design of works to remove existing difficult points;
- Carrying out the Environmental Impact Study and Appropriate Assessment for the elaboration of documentation to obtain the Environmental Agreement;
- Completion of technical specifications for works to be carried out on this Danube sector;
- The Action Coordinator, AFDJ Galati, will be responsible for project management.

4.6.2. Addressed problems and objectives of the initiative

The main objective of the project is to identify the technical solutions which will be implemented to ensure navigation conditions on the Romanian-Bulgarian Danube Joint Sector and to conduct safe Danube transport throughout the year in accordance with the Danube Commission's recommendations.

According to the Water Framework Directive (WFD), maintenance works should not lead to deterioration or put at risk the achievement of WFD objectives. One objective is to achieve both transport-related and environmentally motivated goals through integrative maintenance measures. A second goal is to utilize expertise in the field of waterway engineering, navigation, hydrology, ecology, and environmental protection to create a coordinated programme of measures.

4.6.3. Stakeholders involved

The service contract under the Project was concluded with HALCROW ROMANIA SRL.



Figure 10 Stakeholder engagement in the project

Within this project, the participation of the Custodians for Protected Area consisted in the analysis of documentation submitted by AFDJ in the procedure of obtaining the environmental agreement. The representatives of the protected areas are consulted in the Technical Analysis Boards that are organized at the headquarters of Environmental Protection Agencies during the process of obtaining the environmental agreement.

4.6.4. Key success factors and innovative aspects

A Consultative Council consisting of all relevant stakeholders, acting as an advisory body, for reviewing technical solutions prior to the approval of the Steering Committee has been established within the project.

The Steering Committee has been established as the main decision-making platform. The Steering Committee consists of representatives of relevant ministries and representatives of the port and waterway administrations of Romania and Bulgaria.

In order to improve the dissemination of the information acquired during the studies and for a better transparency within the project, working groups were established on activities in which the documents resulting from the studies will be discussed.

4.6.5. Implementation status and transferability

The following studies will be included in the environmental impact assessment work:

- A study to assess the impact on Natura 2000 sites in line with the requirements of existing national and European environmental legislation in order to limit environmental effects and propose, where necessary, compensatory measures;
- A study on the impact of proposed works on water bodies, carried out in accordance with the provisions of the Water Framework Directive.
- The risk assessment and vulnerability to climate change of the project will need to provide consistent information on the impact of the project on climate change and the impact of climate change on the project and will take into account the Guidance on Integration Climate Change biodiversity into EIA;
- The Environmental Impact Monitoring Program to be drawn up in the framework of the environmental agreement procedure and shall contain at least the following:
 - The activities to be monitored;
 - The frequency and specific monitoring period broken down by type of activity;
 - The methodology for conducting monitoring with the types of specific analyses;
 - The standards to be respected specific to each methodology.

After the completion of the environmental studies and the feasibility study, the tender documentation for the procurement of the design and execution works will be prepared, based on the FIDIC Yellow Book and the legal provisions in force in Romania and Bulgaria.

The project may be relevant to other European waterway administrations. Member States can learn from the methodological approach how the monitoring of the waterway works. There are practical examples of integrative surveillance measures.

4.6.6. Main lessons learned

- An interdisciplinary approach creates synergies and enables that manifold goals are met with comparably little effort.
- In order to successfully implement the goals of the monitoring programme it is crucial that waterway administrations cooperate closely with nature conservation and water authorities.
- When carrying out a project, it is important that information meetings be held with all authorities involved in the implementation of the project pending the handover of the official documents to the environmental authorities.

4.6.7. Contact data for more detailed information

AFDJ - River Administration of the Lower Danube, Galati

32 Portului Street, Galati, Romania

Web: www.afdj.ro

4.7. Romania - Automatic water quality monitoring system

4.7.1. Background information/context

The project was implemented between 2012 and 2014 and supposed the installation of 12 automatic monitoring stations for water quality parameters along the navigable canals and the transmission of collected data to the dispatch from ACN central premises.

According with the execution of the project, the navigable canals acts like a complex hydro-technical schema. One of its main functions is that the water from the canal is a source for drinking water for riparian cities along the canals. Thus, the quality of the waters should be maintained between certain parameters.

The project entailed the following:

- Installation of 12 automatic monitoring stations for water quality parameters along the navigable canals in critical points or in section with high risk of flooding accidental water
- Development of the software application(SMAPCA) within the project collects and stores the data received from the 12 automatic measurement stations and enables to generate on-line reports and alerts when the monitored parameter values exceed the admissible values. The facilities of the application are: real-time monitoring of physico-chemical water indicators, parameter values measurement, alert monitoring, administration-audit, reporting and archiving.
- Implementation of a software application (GFMS) for monitoring security system with the following role: Perimeter Detection, Burglar Warning and Alarm to the fire; Access control; Surveillance through TVCI and sound for stations with high risk of vandalism

- Implementation of a software application (SMART VIEW) for collection data on meteorological parameters in the measuring station area allows alarming the central dispatcher when overtaking temperature and humidity parameters inside container; viewing reports and reading weather parameters from the location of each measuring station;
- Acquisition of a mobile measuring station equipped with the necessary equipment sampling and physico-chemical analysis for operative interventions at any point along the waterways in the event of accidental pollution and for measuring the parameters that cannot be determined in an automatic mode.

4.7.2. Addressed problems and objectives of the initiative

The overall objectives included:

- Reducing the environmental impact due to operation of ships in transit in accordance with the conditions imposed by European regulations;
- Monitoring the qualitative parameters of water;
- Increasing water quality;
- Quick intervention when accidental water pollution occurs.

Deficiencies of the old water quality monitoring system:

- Visual inspection does not allow the detection of most pollutants in the water of navigable canals;
- There is no permanent and instantaneous surveillance of pollution source;
- Operational deployment of accidental pollution was delayed;
- In the case of litigation, no conclusive evidence could be provided.

The overall goal is to reduce the environmental impact due to the exploitation of ships in transit on inland waterways in accordance with the conditions imposed by European regulations on discharge conditions in the aquatic environment of sewage. The main conditions for achieving this goal originate from following documents:

- WFD Water Framework Directive 2000/60/EC through which monitoring represents one of the ways to protect and prevent the deterioration of water resources, focusing both on the quality of the biological, chemical, hydro-morphological and also the physical and chemical parameters of the surface and underground waters;
- The provisions of Government Decision 100/2002 regarding the special quality conditions imposed on the surface water used for potable watering, given that the water from the waterways is the source of drinking water;
- Conditions imposed by the European regulations on the discharge conditions in the aquatic environment of waste water from the operation of ships in transit on inland waterways.

4.7.3. Stakeholders involved

- System supplier: the Company that designed and executed the entire system.
- The National Administration Romanian Waters, who is the main beneficiary of the data collected by the system;
- The Agency for Environmental Protection Constanta - which is also the beneficiary of the data collected by the system;
- The water consumers from this source, by increasing their confidence.

4.7.4. Key success factors and innovative aspects

It is a unique system in the region through the multitude of monitored parameters simultaneously and their automatic collection and transmission in one place (12 monitoring stations).

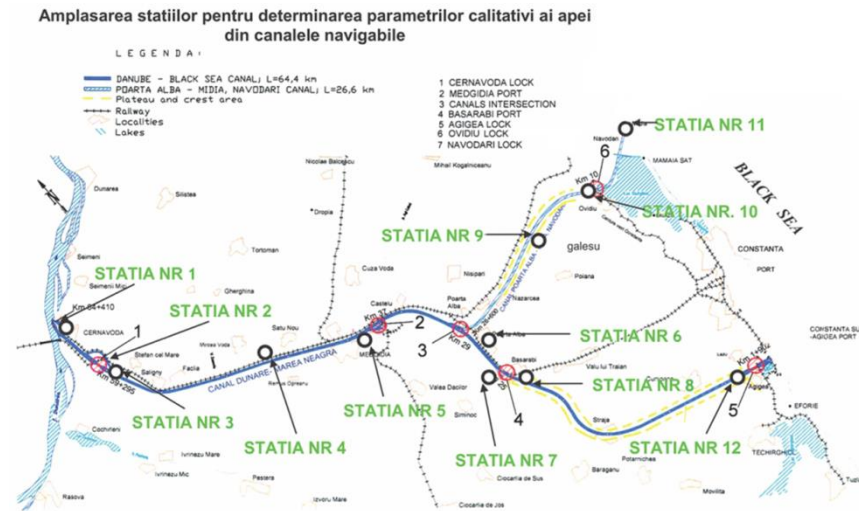


Figure 11 Overview of monitoring stations at the Danube-Black Sea Canal

4.7.5. Implementation status

The project was finalized and put in operation in 2014 (financed by Sectoral Operational Programme - Transport 2012/2014).



Figure 12 Water quality monitoring system

4.7.6. Main lessons learned

- The maintenance costs are high, as an authorized service for the equipment is required (replacement of sensors).
- We take into consideration to train and certify our employees to do this kind of activities.
- Reagents and consumable costs are high.

4.7.7. Contact data for more detailed information

ACN - Administration of the Navigable Canals, Romania

Str. Ecluzei nr.1 Agigea, Cod postal 907015, Constanta, Romania

Web: www.acn.ro

4.8. Bulgaria - Cooperation Agreement between EAEMDR and Nature Parks Persina and Rusenski Lom Administrations

4.8.1. Background information/context

The global development of inland waterway infrastructure definitely has a significant impact on ecosystems. The lower Danube is a free-flowing shallow river that does not have large structures of construction, so the environment can be considered relatively unaffected by the development of transport infrastructure. In this sense, the future rehabilitation and modernization of the waterway infrastructure should have an integrated approach so that cooperation with the environmental sector is compulsory.

The cooperation between EAEMDR and the authorities of Danube nature parks started firstly on international level under the EU projects NEWADA duo and DANUBEPARKS STEP 2.0. Now it continues on the national level and will be further strengthened within Danube STREAM and DANUBEparksConnected.

Development and adaptation of a **Common cooperation agreement between EAEMDR and Nature Parks Persina and Rusenski Lom administrations.**

4.8.2. Addressed problems and objectives of the initiative

The main objective is to strengthen and develop reciprocal efforts towards a good navigation status of the Danube, taking into account environmentally friendly approaches. Cooperation between waterway and national park administrations shall be enhanced. Possible aspects of cooperation include:

- Regular exchange of information and data
- Exchange of experience and knowledge to promote common projects, integrated infrastructure projects
- Expert exchange in the field of waterway management and ecology
- Education and training activities for joint initiatives
- Joint volunteer initiatives
- Implementation of common projects
- Fish monitoring using navigational infrastructure

4.8.3. Stakeholders involved

- EAEMDR - Executive Agency for Exploration and Maintenance of the Danube River
- Persina and Rusenski Lom Nature Parks Administrations

4.8.4. Key success factors and innovative aspects

- Support of the initiative on management level.

4.8.5. Implementation status and transferability

So far, the cooperation between the waterway administration and the nature conservation authorities of the Danube is in its initial phase. Joint activities in preparation mainly concern data exchange, logistical support and so on. During a meeting in December 2017 EAEMDR

together with the National Park Directorate „Persina“, Friends Club of National Park „Rusenski Lom“ and National Park Directorate „Rusenski Lom“ targeted several future common activities. One of them is to sign a cooperation agreement, which will define the responsibilities of the parties involved. The representatives of nature parks shared that in many of their activities volunteers are needed and cooperation in this field would be useful for them and on the other side they are willing to participate in common initiatives with EAEMDR. Another example for future cooperation is the monitoring of sturgeons by means of buoys. The equipment for the monitoring might be attached to the buoys in the river. The participants discussed that the possibilities for implementation of this should be further assessed. In order to continue and strengthen the cooperation the next joint meeting was scheduled for the end of March/ beginning of April 2018.



Figure 13 First meeting between waterway and national park administrations in Dec 2017

Basically, signing a general cooperation agreement between a waterway administration and a nature park administration could be applied in each other country depending on the points of common actions to be included and the support and will on management level.

4.8.6. Contact data for more detailed information

EAEMDR - Executive Agency for Exploration and Maintenance of the Danube River

6 Slavyanska str., p.c. 7000 Ruse, Bulgaria

Web: www.appd-bg.org

5 LITERATURE

Bundesministerium für Verkehr und digitale Infrastruktur [2015], Leitfaden Umweltbelange bei der Unterhaltung von Bundeswasserstraßen, Bonn, März 2015.

Common Implementation Strategy [2018], Common Implementation Strategy for the Water Framework Directive and the Floods Directive, Guidance Document No. 36, Exemptions to the Environmental Objectives according to Article 4(7).

DG Environment [2017], An Action Plan for nature, people and the economy: The EU Habitats and Birds Directive, Brussel.

European Court of Auditors [2015], Inland Waterway Transport in Europe: No significant improvements in modal share and navigability conditions since 2001, Luxembourg.

European Commission [2012], Guidance document on inland waterway transport and Natura 2000, Brussels.

European Commission [2018], Good Navigation Status: Guidelines towards achieving a Good Navigation Status, Directorate-General for Mobility and Transport, Directorate D Waterborne, Brussels, January 2018.

EUSDR PA1a [2014], Fairway Rehabilitation and Maintenance Master Plan - Danube and its navigable tributaries, EU Strategy for the Danube Region, Priority Area 1a, 13 November 2014.

EUSDR PA4 [2017], Restoring and maintaining the quality of waters, Interreg Danube Transnational Programme.

FAIRway Danube [2018], Fairway Rehabilitation and Maintenance Master Plan for the Danube and its navigable tributaries: National Action Plans - Update May 2018.

ICPDR [2010], PLATINA Manual on Good Practices in Sustainable Waterway Planning [2010], Vienna.

ISRBC, DC & ICPDR [2008], Development of Inland Navigation and Environmental Protection in the Danube River Basin: Joint Statement on Guiding Principles, Vienna.

INEA [2018], CEF Support to Rhine-Danube Corridor, European Commission, Innovation and Networks Executive Agency, February 2018.

PIANC [2006], Maintenance and Renovation of Navigation Infrastructure, International Navigation Association, InCom, Report of WG 25 - April 2006.

PIANC [2013], Report No. 129-2013: Waterway infrastructure asset maintenance management, Inland Navigation Commission, Brussels.

PIANC [2018], Guide for applying Working with Nature to Navigation Infrastructure Projects, EnviCom WG Report no. 176 - 2018

PLATINA-2 [2016], Good Practice Manual on Inland Waterway Maintenance, viadonau.

Rijkswaterstaat [2015], Tailor made collaboration: A clever combination of process and content, in collaboration with UNESCO-IHE Institute for Water Education.