
Interim Overview: Significant Water Management Issues in the Danube River Basin District



International Commission
for the Protection
of the Danube River
Internationale Kommission
zum Schutz der Donau

Interim overview on the Significant Water Management Issues to meet the requirements of WFD (Directive 2000/60/EC) Article 14 regarding public information and consultation in preparation of developing the 3rd Danube River Basin Management Plan for the implementation cycle 2021 to 2027.

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List of acronyms

AKIS	Agricultural Knowledge and Innovation System
BA	Bosnia and Herzegovina
BAT	Best Available Techniques
CAP	EU Common Agricultural Policy
CIS	Common Implementation Strategy
DFRM Plan	Danube Flood Risk Management Plan
DMCSEE	Drought Management Centre for South-Eastern Europe
DPSIR	Drivers, Pressures, States, Impacts and Responses
DRB	Danube River Basin
DRBD	Danube River Basin District
DRBM Plan	Danube River Basin District Management Plan
DRPC	Danube River Protection Convention
DSTF	Danube Sturgeon Task Force
EBRD	European Bank for Reconstruction and Development
EG	Expert Group
EIA	Environmental Impact Assessment
EIB	European Investment Bank
ENVSEC	Environment and Security Initiative
EQS	Environment Quality Standards
EU MS	European Union Member States
EUSDR	EU Strategy for the Danube Region
FD	EU Floods Directive 2007/60/EC
FRMP	Flood Risk Management Plan
GEF	Global Environmental Facility
GEP	Good Ecological Potential
GES	Good Ecological Status
GWP CEE	Global Water Partnership Central and Eastern Europe
HR	Croatia
HU	Hungary
HYMO TG	Hydromorphology Task Group
IAD	International Association for Danube Research
IAS	Invasive Alien Species
IAWD	International Association of Water Supply Companies in the Danube River Catchment Area
ICPDR	International Commission for the Protection of the Danube River
IFI	International Financial Institutions
IDMP CEE	Integrated Drought Management Programme in Central and Eastern Europe
IPPC	Integrated Pollution Prevention and Control Directive 2008/1/EC
JDS	Joint Danube Survey
JPM	Joint Programme of Measures
MSFD	EU Marine Strategy Framework Directive 2008/56/EC

PE	Population equivalent
RBM	River Basin Management
RO	Romania
RS	Serbia
SEA	Strategic Environmental Assessment
SI	Slovenia
SK	Slovakia
SWMI	Significant Water Management Issue
TNMN	TransNational Monitoring Network
TN	Total nitrogen
TP	Total phosphorus
UA	Ukraine
UWWTD	EU Urban Wastewater Treatment Directive 91/271/EC
UWWTP	Urban Wastewater Treatment Plant
WFD	EU Water Framework Directive 2000/60/EC
WMO	World Meteorological Organization
WWF	World Wide Fund for Nature

1 Introduction

The sustainable development of the Danube River Basin (DRB) requires the cooperation between the countries jointly sharing this most international river basin in the world. The Danube River Protection Convention (DRPC) and the Danube Declaration 2016 represent the legal, as well as political framework for cooperation and transboundary water management. The **International Commission for the Protection of the Danube River** (ICPDR), established under the DRPC, is the coordinating platform to compile multilateral and basin-wide issues at the “roof level” (basin-wide level) for the DRB.

The **EU Water Framework Directive 2000/60/EC** (WFD) further specifies the required steps for the prevention of deterioration and enhancement of water status by promoting sustainable water use.¹ The Danube and its tributaries, transitional waters, lakes, coastal waters and groundwaters form the Danube River Basin District (DRBD). When the WFD was adopted in October 2000, all countries cooperating under the DRPC - in particular the Non EU Member States (Non EU MS) - decided to make all efforts to implement the WFD throughout the basin.

Since 2000 the following major milestones were achieved in the DRBD in implementing the WFD:

- 2004 – Accomplishment of the first Danube Basin Analysis Report, compiling relevant information inter alia on the main pressures and impacts on water
- 2006 – Summary report on the monitoring programmes in the DRBD
- 2007 – Interim overview on the Significant Water Management Issues (SWMI) in the DRBD which are the main pressures on water requiring to be addressed on the Danube basin-wide level
- 2009 – Adoption of the 1st Danube River Basin District Management Plan (DRBM Plan)
- 2012 – Interim report on the progress in the implementation of the Joint Programme of Measures (JPM)
- 2013 – Interim overview on the Significant Water Management Issues in the DRBD
- 2015 – Adoption of the 2nd DRBM Plan, providing an updated analysis on the main pressures water status information stemming from the monitoring programmes, and including the JPM towards the improvement of water status in the basin until 2021
- 2018 – Interim report on the progress in the implementation of the JPM

As a first step in the preparation of the third WFD management cycle, covering the 6 years timeframe from 2021 until 2027, a timetable, work program and statement on consultation measures for the development of the 3rd DRBM Plan² were adopted by the ICPDR in December 2018 and published for public consultation.

This updated **Interim Overview on the Significant Water Management Issues in the DRBD** was elaborated by the end of 2019 as a step towards the development of the 3rd DRBM Plan by December 2021. The document is made available to the public, **allowing for six months to comment in writing** in order to ensure active involvement and consultation.

2 Scope and aim of the document

The interim overview on the Significant Water Management Issues (SWMI) from 2007 and 2013 as well as the 1st DRBM Plan from 2009 and the 2nd DRBM Plan from 2015 outline the following SWMIs

¹ Several guidance documents to support the implementation of the WFD were published in the frame of the Common Implementation Strategy (CIS) and can be accessed via http://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm.

² <http://www.icpdr.org/main/public-participation-schedule-wfd-efd>.

identified in the frame of the ICPDR for the DRBD that affect directly or indirectly the status of surface water and transboundary groundwater:

- Pollution by organic substances
- Pollution by nutrients
- Pollution by hazardous substances
- Hydromorphological alterations³

These SWMIs were derived on the basis of the requirements of the WFD and mainly relate to quality aspects.

Though the Danube Basin Analysis 2004⁴ also identified alterations regarding quantity and quality of transboundary groundwater bodies as Significant Water Management Issues these aspects of groundwater management are not specifically addressed as SWMIs. This reflects the fact that most groundwater-related issues are dealt with at the national scale, whilst the DRBM Plan only deals with a small number of transboundary groundwater bodies of Danube basin-wide importance.

The scope of this document is to provide an updated interim overview on the Significant Water Management Issues and other cross-cutting issues in the DRBD, which need to be addressed in the 3rd DRBM Plan. Important changes with respect to the two previous DRBM Plans are the addition of “Effects of climate change (drought, water scarcity, extreme hydrological phenomena and other impacts)” as a Significant Water Management Issue and the definition of a new sub-item “alteration of the sediment balance” under the existing Significant Water Management Issue “Hydromorphological alterations”.

This updated SWMI Paper focuses on the progress and changes since the elaboration of the first and second SWMI Papers in 2007 and 2013 and the implementation of the 1st and 2nd DRBM Plans taking also into account the findings of the 2012 and 2018 Interim Report on the Implementation of the JPM, and aims to **aid the development of a target-oriented 3rd DRBM Plan and updated Joint Programme of Measures by 2021**. The update is helping to identify the actions needed to address the main pressures on the Danube water environment.

Furthermore, **integration with other sector policies** is an important issue in order to create synergies and avoid potential conflicts. Work is ongoing to intensify the exchange with different sectors such as inland navigation, hydropower and agriculture, alongside efforts towards the coordination of water management with the sustainable management of floods – **EU Floods Directive 2007/60/EC (FD)** – as well as the marine environment and the Black Sea – **EU Marine Strategy Framework Directive 2008/56/EC (MSFD)**.

The document also **reflects on the steps taken and progress achieved** on different other topics relevant for water management on the Danube basin-wide scale. These topics include sediment quality management making use of results from the SIMONA project⁵, updated information as regards invasive alien species, and the issue of Danube sturgeons and related ongoing activities.

Where necessary, national and regional strategies and management plans will address additional Significant Water Management Issues and/or cross-cutting issues at the appropriate level in accordance with the principle of subsidiarity.

³ Hydromorphological alterations are human pressures to the natural structure of surface waters such as modification of bank/bed/floodplain structures, sediment balance, hydrological regime, and slope. The consequence of these pressures can impact the aquatic flora and fauna and therefore the water status.

⁴ <https://www.icpdr.org/main/activities-projects/danube-basin-analysis-report-2004>.

⁵ <http://www.interreg-danube.eu/approved-projects/simona>.

3 General Issues

The following chapter outlines general issues which are relevant for the management of the DRB on the basin-wide scale. It provides information on the different levels of management and their interrelation, describes the basin-wide approach and the definition of visions and management objectives. Furthermore, a description of the nature of the Joint Programme of Measures is provided.

3.1 Interrelation between the basin-wide, national/sub-basin and sub-unit level

The DRBM Plan and Programmes of Measures are based on three levels of coordination:

- ⇒ **Part A:** the international, basin-wide level – the Roof level;
- ⇒ **Part B:** the national level (managed through competent authorities) and/or the international coordinated sub-basin level for some larger sub-basins (Tisza, Sava, Prut, and Danube Delta);
- ⇒ **Part C:** the sub-unit level, defined as management units within the national territory.

The information increases in detail from Part A to Parts B and C (see Figure 1).

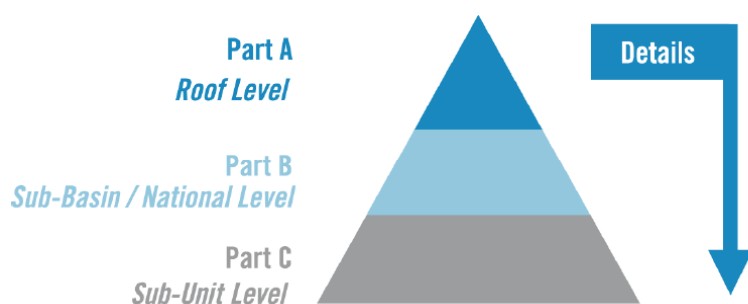


Figure 1: Overall hierarchy of the DRBM planning documents, showing the increase of the level of detail from Part A to C.

The investigations, analysis and findings of the DRBM Plan for the basin-wide scale (Part A) focus on:

- rivers with catchment areas $>4,000 \text{ km}^2$;⁶
- lakes $>100 \text{ km}^2$;
- transitional and coastal waters;
- transboundary groundwater bodies of basin-wide importance⁷.

Waters with smaller catchment and surface areas are part of the national RBM Plans, which provide a description of measures to be undertaken in these areas.

The content of the DRBM Plan at the Roof level is strongly based on findings and actions at the national/sub-basin level. So far, the Danube countries have developed sub-basin management plans for the Sava in the frame of the International Sava River Basin Commission (BA, HR, RS, SI) and the Tisza (HU, RO, RS, SK, UA). These plans were elaborated in a higher resolution and level of detail compared to the basin-wide level and addressed additional issues. In addition, RBM activities are currently under way for the Danube Delta and the Prut⁸.

⁶ The scale for measures related to point source pollution is smaller and therefore more detailed.

⁷ Transboundary groundwater bodies of basin-wide importance were defined as follows: (i) important due to the size of the groundwater body i.e. an area $> 4,000 \text{ km}^2$ or (ii) important due to various criteria e.g. socio-economic importance, uses, impacts or pressures interaction with aquatic eco-system.

⁸ Romania supports the EUWI+ project in its effort to improve the Prut River Basin Management Plan. The EUWI+ project (European Union Water Initiative Plus for the Eastern Partnership Countries) supports Armenia, Azerbaijan, Belarus, Georgia, Moldova, and Ukraine to bring their legislation closer to EU policy in the field of water management, with a main

Furthermore, bilateral/multilateral agreements between individual countries are in place, enabling transboundary cooperation below the Roof level. At the Roof level, the ICPDR serves as the facilitating and coordinating platform between the different DRPC Contracting Parties. Where the boundaries of the DRBD extend beyond the national borders of the countries cooperating under the DRPC (e.g. into Italy or Poland) it is the responsibility of the respective DRPC Contracting Parties to find an appropriate form of coordination with the relevant neighbours.

3.2 Long-term visions and management objectives

The approach on the basin-wide level must be complementary to national level planning and implementation – and vice versa. To enable this approach in practice, **visions and management objectives** on the international scale were defined and included in the 1st and 2nd DRBM Plan in order to support the Danube countries as they move towards a commonly agreed goal.

Visions and management objectives have been developed for each SWMI as well as for the transboundary groundwater bodies of Danube basin-wide importance (henceforth referred to as “groundwater”). The visions are based on shared values and describe the principle objectives for the DRBD with a long-term perspective. The respective management objectives describe the steps towards the environmental objectives in the DRBD in a more explicit way.

EU Member States are obliged to implement the WFD, which requires more detailed river basin planning on a water body level. All other Contracting Parties to the DRPC have signed up to follow the WFD as well. The visions and management objectives reflect this joint approach among all Danube countries and support the achievement of the WFD objectives in this very large, unique and heterogeneous European river basin.

The visions as agreed in the frame of the 1st and 2nd DRBM Plan remain highly relevant, as indicated in chapter 4 of this document. **No major updates of the existing visions are expected** to be required for the preparation of the 3rd DRBM Plan by 2021, though some amendments may prove necessary in the course of the planning process.

The **management objectives for the DRBM Plan** follow the ones of the DRB Plan 2015. Possible **updates to the management objectives will be considered for the 3rd DRBM Plan** based on progress regarding the implementation of the planned measures and the achievement of the environmental objectives.

3.3 Basin-wide approach

The DRBM Plan follows the principle of the basin-wide approach. The added value for an international RBM Plan can be summarised in the following ways:

- Water management issues which require basin-wide cooperation to be resolved can be addressed not only by individual countries but jointly by all of them (e.g. nutrient pollution of the Black Sea with special reference to the coastal waters as part of the DRBD);
- Coordination of actions can increase effectiveness and efficiency for an integrated and sustainable water management policy;
- Exchange of experiences and information serve to strengthen capacities in the Danube countries;
- Sharing of national approaches help to improve assessments and to increase their consistency (e.g. sampling and assessment methods such as approaches for the definition of “Good Ecological Status” (GES) and ‘Good Ecological Potential’ (GEP));
- Communication and information flow is improved (of particular relevance for early warning in case of floods and accidents);

focus on the management of trans-boundary river basins, developing and implementing pilot river basin management plans, building improved policy framework and ensuring a strong participation of local stakeholders.

- The joint assessment of the nature and extent of transboundary problems in relation to water is enhanced; and
- Solidarity between the countries sharing the same river basin is fostered.

At the same time, the basin-wide approach has to take the different conditions (e.g. natural conditions, socio-economic aspects, EU MS status) into account in order to properly reflect the diversity within the basin.

3.4 Joint Programme of Measures

An updated JPM will be part of the 3rd DRBM Plan and build upon the agreements of the 2nd DRBM Plan of 2015, the results of the 2018 Interim Report on the Implementation of the JPM, as well as on updated information on water status assessment. The JPM will, for each SWMI, include measures of basin-wide importance oriented towards the agreed visions and management objectives for 2027, which will also be included in the 3rd DRBM Plan.

As in the past, the JPM will be firmly based on and coordinated with the national programmes of measures. However, where appropriate individual measures can also be agreed on at the ICPDR level to ensure that they are carried out to the extent necessary to address basin-wide concerns (e.g. a feasibility study for the migration of sturgeons and other migratory fish species at Iron Gate I & II or nutrient input to the Black Sea).

The JPM should represent more than a collection of measures from the national level. Appropriate exchange from the international level to national and sub-basin planning processes, and vice versa, will ensure the design of the JPM in the most efficient way for the achievement of the objectives jointly agreed for the basin-wide scale.

3.5 Financing issues

Financing tools and mechanisms are essential for the implementation of the DRBM Plan and the JPM. Discussions on the actions needed for securing the long-term matching of needs and funds for the identified measures already during the planning process is essential for ensuring implementation following the adoption of the 3rd DRBM Plan.

It is an overall objective that the ICPDR promotes information exchange on existing international and EU financing instruments as well as on existing International Financial Institutions (IFI) to exploit them to the best possible extent. Important financing mechanisms and institutions include:

- National funds and financing commitments of the countries;
- EU funding instruments, e.g. the Common Agricultural Policy (CAP/mainly Pillar II – European Agricultural Fund for Rural Development/EAFRD), Cohesion Funds, Structural Funds, the LIFE and Interreg Programme;
- Water pricing policies, i.e. the application of the polluter pays principle;
- Loans from different international financial institutions (e.g. European Investment Bank (EIB), European Bank for Reconstruction and Development (EBRD), World Bank);
- Other sources of funding and initiatives, e.g. Global Environmental Facility (GEF), Environment and Security Initiative (ENVSEC).

The EU Neighbourhood Policy will also have to be taken into account as an important funding source. In order to facilitate and secure that funding needs for actions to improve water status are met, the ICPDR initiated a dialogue with representatives of financial institutions and programmes. In December 2017, a TAIEX Multi-beneficiary Workshop on Funding Opportunities for the Water Sector took place in Brussels with the aim to increase the knowledge of the water authorities in the Enlargement and Eastern Neighbourhood regions about the existing EU funding opportunities for the water sector. This dialogue is proposed to be continued towards facilitating the allocation of necessary funding for the measures of the 3rd DRBM Plan and the JPM.

Also, the EU Strategy for the Danube Region (EUSDR) provides a framework for the discussion and promotion of project proposals. The ICPDR is actively involved in ongoing EUSDR activities and joint actions are already and should further be undertaken, i.e. in cooperation with the Priority Areas 1a (Inland Navigation), 2 (Energy), 4 (Water Quality), 5 (Environmental Risks) and 6 (Biodiversity).

Finally, a key issue is the continued access to funding in particular for research projects relevant at the basin-wide scale in order to respond to uncertainties and fill existing knowledge gaps regarding various management issues highlighted in the DRBM Plan (i.e. sediment management, invasive alien species).

4 Significant Water Management Issues

This chapter provides an updated **interim overview on the Significant Water Management Issues in the DRBD**. The visions for each SWMI and groundwater are outlined, followed by a preliminary summary of the actions and coordination requirements for the basin-wide level.

More detailed information about measures for each SWMI and groundwater will be provided in the 3rd DRBM Plan, based on progress achieved in the implementation of the measures as included in the 2nd DRBM Plan, 2018 Interim report on JPM implementation and the latest data and information, e.g. on water status. The JPM of the 3rd DRBM Plan will comprise measures to be implemented by 2027.

4.1 Surface waters

Surface water pollution has been identified as one of the major problems hindering the achievement of the WFD objectives. To reflect the different types of the pollutant discharged into water bodies, three pollution-related SWMIs have been considered to be of basin-wide importance: organic, nutrient and hazardous substances pollution. All of them can trigger serious consequences on water status by adversely affecting aquatic ecosystems and human health at various spatial scales from the local to the regional.

Although the management of these issues requires targeted strategies addressing several emission sources and pathways by implementing different measures, clear inter-linkages exist between measures addressing the pollution-related SWMIs. For example, implementation of measures in order to reduce the emissions of organic pollution (e.g. by the development of urban wastewater treatment facilities) also has clear benefits for the reduction of pollution with nutrients and hazardous substances by also partly eliminating these substances.

Hydromorphological alterations are another major problem hindering the achievement of the WFD objectives. They play an important role resulting in failing good ecological status/potential for many water bodies in the Danube basin.

These central considerations related to surface waters were already described in the 1st and 2nd DRBM Plan and will remain key issues in the elaboration of the 3rd DRBM Plan.

4.1.1 Organic pollution

The issue:

Organic pollution refers to emissions of non-toxic organic substances that can be biologically decomposed by bacteria to a high extent. The key emitters of organic pollution are point sources like untreated or not sufficiently treated municipal wastewater from households, industries and major agricultural farms. The primary impact of organic pollution on the aquatic environment is dissolved oxygen depletion due to biochemical decomposition of organic matter. In the most severe cases this can lead to anaerobic conditions, which only some specific organism can tolerate. The pollution with organic substances can therefore cause changes in the natural composition of the aquatic flora and fauna. It can also be associated with health hazards due to possible microbiological contamination of waters.

Vision

The ICPDR's basin-wide vision for organic pollution is zero emission of untreated wastewaters into the waters of the Danube River Basin District.

Preliminary identification of actions and coordination requirements for the basin-wide level

- ⇒ In the last twelve years, Danube countries have invested more than €22 billion in wastewater infrastructure in line with the requirements of the Urban Wastewater Treatment Directive⁹ (UWWTD) and the WFD. Since 2006, almost 5,000 municipalities and almost 40 million Population Equivalent (PE) have had collecting and treatment facilities constructed or upgraded, with over 2,200 more planned or currently in progress to improve the services for 25 million people. In addition, nearly 400 industrial facilities have been certified with updated technology standards according to the provisions of the Industrial Emission Directive¹⁰ (IED). During the same time period, the percentage of municipalities and industrial facilities (bigger than 2,000 PE) connected to a sewer system and wastewater treatment plant also increased substantially (to nearly 75% at the DRB level), demonstrating a significant improvement of wastewater services in the DRB. Construction of urban wastewater treatment plants (UWWTP) with at least biological treatment and application of enhanced industrial technologies have contributed to a significant decrease of organic pollution. Thanks to the substantial development of the wastewater infrastructure in the last decade, organic matter emissions via wastewater discharges have been reduced by almost 50%.
- ⇒ Danube countries have developed and regularly update a comprehensive emission inventory for UWWTPs and industrial facilities for the DRB that provides valuable information at agglomeration and facility level on pollutant discharges, level of wastewater treatment, connected PE and the type of industrial activities.
- ⇒ Despite the huge investments already made in the wastewater infrastructure, further measures should be taken in the future that are listed in the 2nd DRBM Plan. As of 2018, some 90 million PE of the DRB generate more than 10 million m³ of wastewater each day. About 25% of the basin-wide total PE still need basic infrastructural development aiming to achieve connection to public sewer systems and at least biological treatment. There are about 250 large industrial facilities in the DRB, which release significant pollutant emissions into surface waters and which must ensure that the industrial technologies are applied and maintained in line with the Best Available Techniques (BAT) requirements.
- ⇒ Further efforts should be made to maintain and update the emission inventory of UWWTPs and industrial facilities and to further increase data consistency and comparability.
- ⇒ Further efforts should be made to foster the development of the wastewater sector. In new and non EU MS, the most important issues are financing infrastructure projects, strengthening management and technical capacity, tariff setting and ensuring affordability, establishing proper legal framework, and reforming or restructuring the utility sector. For other EU MS, investment needs will be shifted towards the proper maintenance and rehabilitation of the existing infrastructure. In particular, in order to achieve sustainable wastewater management in the DRB, capacity should be strengthened at the national and local administration levels as well as at the utility level to improve financing, operational, and technological aspects of the wastewater infrastructure and services.
- ⇒ The ICPDR will further guide and support Danube countries in achieving sustainable wastewater management by developing and implementing capacity building programs in wastewater management and by facilitating proper dialogue among the international financing institutes, national and local administration bodies and utilities.

4.1.2 Nutrient pollution

The issue:

⁹ Council Directive 91/271/EEC of 21 May 1991 concerning urban waste water treatment.

¹⁰ Directive 2010/75/EU of the European Parliament and the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control).

Nutrient pollution is caused by releases of nitrogen and phosphorus into the aquatic environment. Nutrient emissions can originate from both point and diffuse sources. Point sources of nutrient pollution are similar to those of the organic pollution. Diffuse pathways such as overland flow, urban runoff, soil erosion, tile drainage flow and groundwater flow can contribute significantly to the emissions into surface waters transporting nutrients from agricultural lands, urban areas, atmosphere and even from naturally covered areas. Impacts on water status caused by nutrient pollution can be recognized through substantial changes in water ecosystems. In case of nutrient enrichment, water bodies can “tip” into a eutrophic state, where the growth of algae and/or macrophytes is substantially accelerated. Eutrophication severely affects water quality and damages ecosystems (e.g. oxygen depletion, toxicity, excessive biomass production) and can potentially even limit or hinder human water uses (e.g. recreation, fisheries, drinking water supply).

Vision

The ICPDR’s basin-wide vision for nutrient pollution is the management of nutrient emissions via point and diffuse sources in the whole Danube River Basin District ensuring that neither the waters of the DRBD nor the Black Sea are threatened or impacted by eutrophication.

Preliminary identification of actions and coordination requirements for the basin-wide level

- ⇒ Since 2006, over 1,000 municipalities and more than 25 million PE have had treatment plants with nutrient removal technology either constructed or extended in compliance with the UWWTD and WFD requirements. More than €10 billion have been invested for these projects. Besides this, almost 600 more are planned or in progress by the end of 2018 to serve an additional 12 million PE. During the same time period, the percentage of people connected to nutrient removal in mid-sized and big settlements has increased by a significant 25% and reached 75%.
- ⇒ Nitrates Action Programmes according to the obligations of the Nitrates Directive¹¹ with strict rules on manure and fertilizer application are being implemented for more than 60% of the DRB. For agricultural areas in EU MS across the DRB, 70% are determined for direct support linked to cross-compliance and 22% receive additional subsidies for implementing environmentally-friendly measures. These financial mechanisms are linked to the EU Common Agricultural Policy (CAP)^{12,13}. In the last decade, more than €70 billion has been spent in the DRB territory to support farmers and finance best management practices. The percentage of these areas has increased substantially since 2006.
- ⇒ Danube countries have developed and regularly update a sub-catchment scale nutrient emission calculation tool based on the MONERIS model¹⁴ for the DRB along with a supporting database. The model offers the unique opportunity to assess basin-wide nutrient fluxes and to link terrestrial emissions released within the DRB to nutrient loads discharged to the Black Sea.
- ⇒ Upgrading wastewater treatment plants with nutrient removal technology at agglomerations above 10,000 PE, application of phosphate-free detergents (in compliance with the Detergents Regulation¹⁵) and enhancement of best management practices in agriculture are current measures which have been implemented to reduce nutrient pollution. In the last decade, total nitrogen emissions decreased by 12% and total phosphorus emissions were reduced by 34%.

¹¹ Council Directive 91/676/ EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources.

¹² Regulation (EU) No 1307/2013 of the European Parliament and of the Council of 17 December 2013 establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy.

¹³ Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD).

¹⁴ <http://www.moneris.igb-berlin.de/index.php/homepage.html>.

¹⁵ Regulation (EU) No 259/2012 of the European Parliament and of the Council of 14 March 2012 amending Regulation (EC) No 648/2004 as regards the use of phosphates and other phosphorus compounds in consumer laundry detergents and consumer automatic dishwasher detergents.

- ⇒ The measures under implementation have been substantially contributing to the reduction of nutrient inputs into surface waters and groundwater in the DRB but further efforts are still needed. Continuation of measures implementation in urban wastewater, industrial, market production and agricultural sectors as indicated in the 2nd DRBM Plan is necessary. Settlements above 10,000 PE (representing about 70 million PE in total) are mainly equipped with nutrient removal technologies (75%), but there is still room for improvement. Diffuse pathways have a dominant share in the total nutrient emissions, therefore implementation of measures addressing land management has high importance. About 50% of the DRB (about 45 million ha) is under agricultural cultivation, where agri-environmental measures to reduce nutrient inputs of waters related to farming and land management need to be more effectively implemented. The recently transported fluxes to the Black Sea are still higher than those of the early 1960ies when the Black Sea had favourable environmental conditions, which indicates a further load reduction potential that could be at least partly exploited for the benefit of the Black Sea (total nitrogen: 40%, total phosphorus: 20%, both related to the Black Sea loads around the early 60ies, see the 2nd DRBM Plan). This would require further reduction of both the point source and diffuse emissions generated in the Danube basin.
- ⇒ Activities on nutrient emission modelling and nutrient balancing should be further enhanced regarding the necessary input database for emission modelling, to improve the knowledge on nutrient fluxes in the basin, to identify major regional emission hot-spots, to determine primary emission sources and pathways and to assess measure efficiency and impacts of potential future development scenarios at the basin-wide scale.
- ⇒ Efforts are needed in all Danube countries to appropriately promote best management practices and to finance agricultural measures. Besides regulatory actions to comply with basic standards, persuading farmers with economic incentives can further ensure higher nutrient use efficiency and better implementation of measures.
- ⇒ Soil-friendly farming systems and practices to preserve and improve soil structure, organic matter content, nutrient/water retention capacity and fertility should be promoted.
- ⇒ Advisory services and the Agricultural Knowledge and Innovation Systems (AKIS) providing technical support and appropriate information on modern technologies and innovative tools for farmers should be enhanced to improve and modernise agricultural practices. Knowledge gaps on cost-efficiency of supplementary measures at local and catchment scale need to be closed.
- ⇒ Significant efforts are needed to better align the goals of the water and agricultural sectors. Joint strategies and targeted actions should be developed and promoted in order to decouple nutrient pollution from agricultural development. The ICPDR strongly supports the efforts to be made for achieving sustainable agriculture thus ensuring the profitability of agriculture and the vitality of rural areas, safeguarding water resources and achieving and maintaining good status of ground- and surface water resources. The ICPDR will support the national agri-environmental policy making of the Danube countries by developing a guidance document on sustainable agriculture. The guidance will highlight the potential of effective funding mechanisms and instruments for improving nutrient management practices and will make relevant knowledge and best practice examples available to the Danube countries. It will offer additional support for the preparation and implementation of suitable national agro-environmental policies, CAP Strategic Plans (as envisaged under the new CAP proposal¹⁶) and relevant strategies of the River Basin Management Plans.

4.1.3 Hazardous substances pollution

The issue:

¹⁶ Proposal for a Regulation of the European Parliament and of the Council establishing rules on support for strategic plans to be drawn up by Member States under the Common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulation (EU) No 1305/2013 of the European Parliament and of the Council and Regulation (EU) No 1307/2013 of the European Parliament and of the Council.

Hazardous substances pollution involves contamination with priority substances and other specific pollutants with toxic effects on aquatic organisms and humans. Hazardous substances can be emitted from both point and diffuse sources. The most important sources of hazardous substances pollution are households and public buildings via municipal wastewater (use of pharmaceuticals and personal care products), industrial facilities, urban areas (via deposited air pollutants, littering, combined sewer overflows, use of pesticides on urban green areas, building protection with biocides), agriculture (through the application of pesticides and contaminated sludge as well as atmospheric deposition), old contaminated and mining sites. Hazardous substances can pose a serious threat to the aquatic environment. Depending on their concentration and the actual environmental conditions, they can cause acute (immediate) or chronic (latent) toxicity. Some of the hazardous substances are persistent, slowly degradable and can accumulate in the ecosystem.

Vision

The ICPDR's basin-wide vision for hazardous substances pollution is no risk or threat to human health and the aquatic ecosystem of the waters in the Danube River Basin District and Black Sea waters impacted by the Danube River discharge.

Preliminary identification of actions and coordination requirements for the basin-wide level

- ⇒ Improving wastewater treatment and industrial technologies, regulating market products, controlling the release and application of chemicals and sewage sludge in agriculture and minimising the risk of accidental pollution through safety measures and reports, accident emergency plans and early warning systems are the most important recent activities to address hazardous substances pollution. In the EU MS these activities are in line with the provisions of the WFD, the UWWTD, the IED, the E-PRTR Regulation¹⁷, the Environmental Quality Standards Directive¹⁸, the REACH Regulation¹⁹, Biocidal Products Regulation²⁰, the Plant Protection Products Regulation²¹, the CAP, the Sustainable Use of Pesticides Directive²², the Sewage Sludge Directive²³, the SEVESO Directive²⁴ and the Mining Waste Directive²⁵. Since 2006, about 20 UWWTPs have added specific technologies such as UV-treatment or activated carbon filters to remove hazardous pollutants from wastewater. On top of these, Danube countries have taken important steps to close knowledge gaps on hazardous substances by compiling emission

¹⁷ Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC.

¹⁸ Directive 2013/39/EU of the European Parliament and of the Council of 12 August 2013 amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy.

¹⁹ Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

²⁰ Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products.

²¹ Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC.

²² Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides.

²³ Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture.

²⁴ Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC.

²⁵ Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC.

inventories, conducting targeted campaigns on UWWTP effluent analysis, organising specific sampling campaigns (JDS) and supporting scientific projects on modelling and monitoring (e.g. SOLUTIONS project²⁶).

- ⇒ Danube countries have developed and are operating and maintaining the Danube Accident Emergency Warning System (AEWS), which sends out international warning messages to downstream countries whenever there is a risk of transboundary water pollution, or threshold danger levels of hazardous substances are exceeded. Efforts are on-going to develop an updated database on Accident Hazard Sites that store, process or produce hazardous substances in considerable amount, and thus represent an accident hazard.
- ⇒ Despite the substantial progress achieved in many aspects of managing hazardous substances pollution, the state of the art knowledge needs to be improved and the implementation of measures should further progress in the future to appropriately manage the problem. Also, despite the fact that many measures have been taken for reduction of priority substances discharges and for phasing-out hazardous ones (including banning at EU level), these pollutants are still found in the aquatic environment having ubiquitous persistent, bioaccumulative and toxic features and leading to failing good chemical status of surface water bodies. The sources of hazardous substances pollution are still not fully understood; only very scarce information is available on point source emissions from industrial inventories and the understanding on diffuse emissions from agricultural and urban areas is very limited. Several hundreds of industrial facilities with significant potential to cause accidental pollution are located in the DRB where appropriate safety measures accompanied with regular checking and maintenance should be in place.
- ⇒ Further efforts are needed to close knowledge gaps on the monitoring of hazardous substances in surface waters and to identify which priority substances and other emerging chemicals are of basin-wide relevance. The list of river basin specific pollutants should be updated and joint research programs are needed in order to establish EQS for these pollutants.
- ⇒ The compilation of the basin-wide inventory on discharges, emissions and losses has to be continued. In particular, determining sources and pathways of hazardous substances emissions and quantifying water emissions and loads should be addressed using regionalized pathway modelling to get a better understanding of inputs and fluxes of hazardous substances in the Danube basin. The ICPDR is committed to supporting a targeted project on managing hazardous substances pollution. The project would be focused on monitoring, modelling and management of selected hazardous substances in the DRB. It would also contribute to capacity strengthening to be provided for the national water administrations by organising training events and elaborating management guidelines. The outcomes of the European Union Strategic Approach to Pharmaceuticals in the Environment (COM(2019) 128 final as of 11.03.2019) should be considered for the future management of pharmaceuticals in the Danube basin. Furthermore, integrated basin-wide actions are needed to achieve the objectives of the Sustainable Use of Pesticides Directive, especially in terms of identification and controlling of hazardous chemicals not regulated under the EQS Directive.
- ⇒ Regular update of a basin-wide catalogue of hazardous industrial, abandoned and mining sites should be pursued further. Besides identifying the most important potential accident hot-spots, information exchange and know-how need to be further provided for the countries to facilitate risk management in the identified key priority industrial fields and to recommend particular preventive measures to be implemented. In addition, capacity building is needed to improve safety management at industrial facilities storing large amounts of dangerous chemicals, particularly in the mineral processing, energy, and chemical industries. The ICPDR has recently begun a project²⁷ on capacity building to improve the knowledge on and to raise awareness of safety conditions of

²⁶ <https://www.solutions-project.eu/>.

²⁷ “Capacity development to improve safety conditions of tailings management facilities in the Danube River Basin – Phase I: North-Eastern Danube countries”, funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

the tailings management facilities, i.e. mining waste storages. Project activities include organising demonstration training events for facility operators and authority inspectors on how to assess the safety conditions and how to implement safety measures. The project will also provide recommendations for developing and implementing further national/sub-regional training programs in order to pass on and preserve the knowledge on safe operation of the tailings management facilities in the DRB.

4.1.4 Hydromorphological alterations

A significant number of surface waters in the DRBD are failing to achieve the WFD objectives due to hydromorphological alterations. Interruption of river continuity, morphological alteration, disturbed or severely altered sediment balance, disconnection of adjacent wetland/floodplains, hydrological alterations and future infrastructure may impact water status and are therefore addressed. Hydromorphological alterations can also have an effect on quantitative and chemical status of groundwater bodies.

Many of those pressures are caused by flood protection measures, agriculture, hydropower projects, water supply and navigation. For this reason, efforts towards integration with the respective sector policies, as described in chapter 5.1, is of major importance and therefore directly inter-linked with the SWMI “Hydromorphological alterations”.

4.1.4.1 Hydrological alterations

The issue:

Hydrological alterations may impact the status of water bodies inter alia due to alterations (increase or reductions) of flow velocities and the flow regime or alterations in quantity and flow dynamics of rivers. Impoundments²⁸, water abstraction and artificial rapid water level fluctuations e.g. by hydropeaking²⁹ are key pressures that can require measures on the basin-wide scale. Hydrological alterations are also important in relation to climate change and water scarcity and droughts which are mostly affecting water demand.

Vision

The ICPDR’s basin-wide vision for hydrological alterations is that they are managed in such a way, that the aquatic ecosystem is not negatively influenced in its natural development and distribution.

Preliminary identification of actions and coordination requirements for the basin-wide level

- ⇒ More than 50 restoration and mitigation measures addressing hydrological alterations have been implemented between 2009 and 2015.
- ⇒ In the 2nd DRBM Plan, information on the hydrological alterations in the DRBD was updated and measures agreed to be implemented by 2021 in order to address this pressure type.
- ⇒ Research projects were performed in the 1st and 2nd River basin management cycle to identify ecological effective measures to mitigate hydropeaking (artificial rapid water level fluctuations due to hydropower generation on demand). In the frame of the SuREmMa project the impacts of those mitigation measures on the flexibility of electricity generation as well as on business economics and macroeconomic aspects were assessed. Feasibility studies were initiated by Austrian hydropower companies to identify appropriate mitigation measures to achieve good ecological potential in those water bodies impacted by hydropeaking.
- ⇒ For the 3rd DRBM Plan efforts will be continued and further measures will be identified to improve the hydrological situation and to ensure the provision of appropriate ecological flows as well as to reduce impacts of impoundments.

²⁸ Impoundments are river sections with reduced natural flow velocities caused by ponding of a river by artificial transversal structures.

²⁹ Hydropeaking is the artificial water level fluctuation from storage hydropower plants.

4.1.4.2 Interruption of river continuity

4.1.4.2.1 Interruption of river continuity for fish migration

The issue:

Transversal structures (such as dams and weirs) in rivers for flood protection, hydropower generation, agriculture, water supply, navigation and other infrastructure projects act as barriers for the migration of fish species and their access to relevant habitats and spawning grounds (and for other biota). Dams and weirs can be made passable for fish e.g. by functional fish migration facilities. Structural changes are causing the loss of morphodynamic structures and habitats resulting in impacts on the composition of aquatic species/populations and thus on the water status of surface water bodies.

Vision

The ICPDR's basin-wide vision for hydromorphological alterations is the balanced management of past, ongoing and future structural changes of the riverine environment so that the aquatic ecosystem in the whole DRB can function in a holistic way and is represented with all type-specific native species.

This means in particular that anthropogenic barriers and habitat deficits do not hinder fish migration and spawning anymore – sturgeon species and specified other migratory species are able to access the Danube River and relevant tributaries. Sturgeon species and specified other migratory species are represented with self-sustaining populations in the DRBD according to their historical distribution.

Preliminary identification of actions and coordination requirements for the basin-wide level

- ⇒ More than 120 fish migration aids have been constructed between 2009 and 2015; delays in the implementation of some measures identified in the 1st DRBM Plan were due to the lack of financial resources, difficulties in solving issues related to ownership questions and the need for further assessments.
- ⇒ In support for implementing fish migration measures, the ICPDR organised a workshop on river and habitat continuity in 2012. The workshop allowed for exchange between fish migration experts and for the elaboration of the ICPDR Technical Paper “Measures for ensuring fish migration at transversal structures”, summarising the latest knowledge on fish migration aids.
- ⇒ In the 2nd DRBM Plan, the data on barriers preventing fish from migration was updated for the DRBD. As part of the implementation of the JPM, a significant number of fish migration aids, both for upstream and downstream migration, and other measures to achieve/improve river continuity and to ensure reproduction and self-sustaining of sturgeon species and other migratory species, are implemented.
- ⇒ For the 3rd DRBM Plan, efforts will be continued to achieve/improve river continuity and habitats in the Danube River and in respective tributaries to ensure reproduction and self-sustaining of sturgeon species and other migratory species. A particular focus will be on design, functionality and maintenance of fish migration aids to be monitored and assessed. An exchange of experiences will also be useful towards reaching more cost-effective programs of measures in the future.
- ⇒ The ecological prioritisation approach for continuity restoration in the DRB was carried out for the first time in the frame of the 1st DRBM Plan, subsequently further developed with additional criteria for the 2nd DRBM Plan and will be further updated for the 3rd DRBM Plan. The results of the proposed prioritisation are recommended to be taken into account on national level to ensure the implementation of ecological efficient measures.
- ⇒ First activities identified in the Terms of Reference for the Feasibility Study analysing options for fish migration at Iron Gate I & II at the Romanian-Serbian border, which were adopted by the ICPDR in December 2016, started in the year 2018 with the support of an EU funded project. The gathering of required hydrological, hydraulic, topographical and morphological data as well as the monitoring of fish behaviour are performed by Romanian and Serbian partners. If the results of

these investigations will be positive, the necessary financial resources should be raised and the respective measures to open the migration route at Iron Gate I & II should be implemented and a similar feasibility study will be performed step by step for the Gabčíkovo Dam and in case of positive results also for the Upper Danube.

- ⇒ The EU funded MEASURES project (2018-2021) aims to create ecological corridors for migratory fish species by identifying key habitats and initiating protection measures along the Danube and its main tributaries. Main activities include the mapping and identifying of key habitats by developing and testing a methodology for migratory fish habitat mapping and the development of a harmonized strategy for restoring blue and green corridors.

4.1.4.2.2 Sediment balance alteration

The aspect of sediment quantity in the Danube River Basin was already mentioned in the 1st DRBM Plan 2009 and considered as potential Significant Water Management Issue in 2013. Based on key findings of the DanubeSediment project (Danube Sediment Management - Restoration of the Sediment Balance in the Danube River) the alteration of the sediment balance is now identified as new sub-item of the Significant Water Management Issue “Hydromorphological alterations”. First results of the project are used for the description of the issue and the preliminary identification of actions and coordination requirements for the basin-wide level. The results of the project will be further discussed under the umbrella of the ICPDR with the aim to fully integrate them into the development of the 3rd DRBM Plan.

The issue:

The sediment balance is disturbed in particular by interruption of sediment transport caused by transversal structures (such as weirs or dams due to e.g. hydropower use, water supply or flood protection). The sediment balance is furthermore impacted by river regulation works for flood protection and navigation (river strengthening and building dykes often leading to cut-off meanders and shortening of the river length), as well as commercial dredging, land use on the entire catchment and other infrastructure projects. These measures reduce the river width, increase the riverbed slope whereas bank protection measures prohibit side erosion. This leads to a sediment deficit and increased sediment transport capacity in the free flowing sections as well as to coastal erosion. In impounded sections, floodplains and groin fields a surplus of sediments is dominating. Disturbed morphodynamics cause a deterioration of type-specific habitats and may cause a lowering of groundwater levels. In general this may lead to severe impacts on the type-specific aquatic communities and groundwater dependent terrestrial ecosystems and thus on the water status.³⁰

Vision

The ICPDR’s basin-wide vision is a balanced sediment regime and an undisturbed sediment continuity. Type-specific natural bed forms and bed material as well as a dynamic equilibrium between sedimentation and erosion are provided. The balanced sediment regime enables the long-term provision of appropriate habitats for the type-specific aquatic communities and groundwater dependent terrestrial ecosystems.

Preliminary identification of actions and coordination requirements for the basin-wide level

- ⇒ The objective of the EU funded DanubeSediment project (2017-2019) is to improve water and sediment management as well as the morphology of the Danube River. Following the DPSIR (Drivers, Pressures, States, Impacts and Responses) approach the key drivers and pressures in the Danube River Basin that act on the sediment regime were identified and their impacts were described.

³⁰ Article 1a Water Framework Directive.

- ⇒ The DanubeSediment project identified a sediment imbalance for the Danube River, revealing areas with erosion and sedimentation being a risk for achieving the environmental objectives of the WFD.
- ⇒ To gain deeper understanding of sediment quantity related problems, the establishment of a harmonized sediment quantity monitoring network will be discussed in the frame of the TransNational Monitoring Network (TNMN)³¹ and under the supervision of the Hydromorphology Task Group (HYMO TG), Monitoring and Assessment Expert Group and Flood Protection Expert Group.
- ⇒ The Danube Sediment Management Guidance will provide recommendations towards the 3rd DRBM Plan for an improved sediment balance.
- ⇒ The Manual for Stakeholders will offer assistance for sediment related actions in the Danube River Basin and future programmes of measures.
- ⇒ A catalogue of measures in order to mitigate the impacts is available to support targeting measures to improve the sediment balance and continuity; the catalogue will need to be updated in the future.

4.1.4.3 Morphological alterations

4.1.4.3.1 River morphology alteration

Morphological alterations may impact the status of water bodies due to altered river depth and width variation, altered structure and substrate of the river bed as well as altered structure of the riparian zone. River straightening and re-profiling, bank reinforcement, riverbed stabilisation and intensive use of the riparian zone are key pressures that can require measures on the basin-wide scale. Morphological alterations may lead to changes in hydromorphological structures (e.g. rapids, riffles, pools, bars) that are representing crucial habitats for aquatic species/populations.

Vision

The ICPDR's basin-wide vision for morphological alterations is that rivers will be revitalized/restored and maintained in a way, that aquatic species/populations are not negatively impacted, moreover, in a way that river restorations will support improvement of connection to groundwater bodies.

Preliminary identification of actions and coordination requirements for the basin-wide level

- ⇒ In the 2nd DRBM Plan, information on the morphological alterations in the DRBD was updated and measures for 77 water bodies were agreed to be implemented until the year 2021.
- ⇒ The ICPDR prepared a GEF project proposal “Danube River Basin Hydromorphology and River Restoration (DYNA)” with the aim to improve the morphological conditions, strengthening HYMO method development, application and capacity building in the Danube River Basin, with a particular focus on the beneficiary countries Bosnia-Herzegovina, Moldova, Montenegro, Serbia and Ukraine. The project is planned to start at end 2019/beginning of 2020, will undertake a blend of regional and national actions that support the work of the countries and policies of the ICPDR, and will be augmented by national and transboundary pilots demonstrating the potential of different approaches in addressing hydromorphological pressures.
- ⇒ For the 3rd DRBM Plan efforts will be continued and further measures will be identified to improve the morphological conditions and to ensure improvement of aquatic ecosystems.

4.1.4.3.2 Disconnection of adjacent floodplains / wetlands

The issue:

Among many ecosystem services, wetlands/floodplains and their connection to adjacent river water bodies play an important role in the functioning of aquatic ecosystems by providing important habitats

³¹ <https://www.icpdr.org/main/activities-projects/tnmn-transnational-monitoring-network>.

for fish as well as other fauna and have a positive effect on status of surface and groundwaters. Connected wetlands/floodplains also play a significant role when it comes to retention areas during flood events and may also have positive effects on the reduction of nutrients and siltation of riverbeds. Pressures on wetlands are to be considered as significant and need to be addressed by measures where they are impacting negatively the water status of adjacent water bodies.

Vision

The ICPDR's basin-wide vision is that floodplains/wetlands all over the DRBD are re-connected and restored. The integrated function of these riverine systems contribute to the development of self-sustaining aquatic populations, flood protection, climate change adaptation and reduction of pollution in the DRBD.

Preliminary identification of actions and coordination requirements for the basin-wide level

- ⇒ As 80% of the former wetlands in the DRBD are considered to be disconnected, ongoing restoration efforts and measures are needed in order to further improve the reconnection of wetlands/floodplains in the entire DRBD. Activities on the implementation of the Floods Directive and the elaboration of the FRMP are significantly contributing to the compilation of inventories of connected and disconnected wetlands/floodplains and therefore increase the knowledge on reconnection potential.
- ⇒ More than 50,000 ha of wetlands/floodplains have been partly or totally reconnected and/or their hydrological regime has been improved between 2009 and 2015.
- ⇒ In the 2nd DRBM Plan, the number and area of wetlands/floodplains with the potential to be re-connected to the Danube River and its tributaries, were updated and measures for the re-connection were agreed.
- ⇒ For the 3rd DRBM Plan, efforts will be continued and further measures will be identified for the protection and conservation of existing and the restoration of wetlands/floodplains with reconnection potential to ensure biodiversity, the good status in the connected river, flood protection and pollution reduction. Beneficial effects are expected to be manifold, including improvements like the provision of fish habitats for spawning, nursery and feeding.
- ⇒ The EU funded Danube Floodplain project (2018-2020) aims to improve transnational water management and flood risk prevention while maximizing benefits for biodiversity conservation. The expected outcome is improved knowledge among the countries located within the DRBP related to integrative water management through restoration of floodplains, combination of classical and blue/green infrastructure, natural retention measures and the involvement of all related stakeholders. The Project will develop a Danube basin-wide manual for floodplain restoration and preservation mainly addressed to practitioners, a Strategic Guidance on sustainable floodplain management summarizing the key findings of the manual targeting a wider audience as well as a Roadmap comprising agreed next steps towards realizing floodplain projects. To determine the implementation steps for restoration and reconnection of lost floodplains and wetlands along the Danube River and its tributaries, an evaluation and clustering is currently being developed based on hydrological, hydraulic, ecological and socio-economic criteria (such as flood retention, nutrient reduction, biodiversity conservation objectives and wetland/floodplain re-connection potentials).

4.1.4.4 Future infrastructure projects

The issue:

Future infrastructure projects may, next to already existing hydromorphological alterations, have additional negative impacts on water status which are in need to be addressed accordingly.

Vision

The ICPDR's basin-wide vision for future infrastructure projects is that they are conducted in a transparent way using best environmental practices and best available techniques in the entire DRBD

– impacts on deterioration of the good ecological status/ecological potential and negative transboundary effects are fully prevented, mitigated or compensated.

Preliminary identification of actions and coordination requirements for the basin-wide level

- ⇒ For new infrastructure projects it is of particular importance that environmental requirements are considered as an integral part of the planning and implementation. Deterioration of the water ecological status/ecological potential should only be allowed as set by the WFD (considering Art 4.7 WFD requirements). All practicable measures to minimise negative effects will be implemented.
- ⇒ A Catalogue of mitigation/restoration measures was developed in the frame of ICPDR (2019) and can be used also for selection of mitigation/restoration measures for reducing the negative impacts of new infrastructure projects.
- ⇒ A first list of future infrastructure projects has been compiled for the 1st DRBM Plan and was updated for future infrastructure projects requiring a Strategic Environmental Assessment/Environmental Impact Assessment (SEA/EIA) and/or having a transboundary effect in the 2nd DRBM Plan. 40 Future Infrastructure Projects have been reported for the Danube and main tributaries in the 2nd DRBM Plan; in total, 20 are related to navigation, 15 to flood protection, 4 to hydropower generation and one to water supply.
- ⇒ For the 3rd DRBM Plan, the list of future infrastructure projects requiring an SEA/EIA and/or having a transboundary effect will be updated.
- ⇒ In the framework of the ICPDR guidance for targeted inter-sectoral cooperation, activities have been launched during the past years, such as for the navigation sector (Joint Statement process), hydropower (Guiding Principles) and a coordinated implementation of the WFD and FD. Efforts towards integration between different sectors, i.e. water management, navigation, hydropower and flood protection, will be continued.

4.2 Groundwater

4.2.1 Alterations of groundwater quality

The issue:

Groundwater is the major source of drinking water in the Danube River Basin and is often connected with the adjacent terrestrial ecosystems, therefore the demand on its quality is high. The types of pressures on groundwater bodies of basin-wide importance have not changed since the 1st DRBM Plan. Pollution by nitrogen compounds (especially nitrates) from diffuse sources is the key factor affecting the chemical status of groundwater bodies in the Danube River Basin. The major sources of this diffuse pollution are the agricultural activities, non-sewered population and urban land use.

Vision

The ICPDR's basin-wide vision is that the emissions of polluting substances do not cause any deterioration of groundwater quality in the Danube River Basin District. Where groundwater is already polluted, restoration to good quality will be the ambition.

Preliminary identification of actions and coordination requirements for the basin-wide level

- ⇒ For the groundwater bodies of basin-wide importance in poor chemical status a number of UWWTD and Nitrates Directive related measures were implemented such as increasing the rate of connection to sewer systems or the construction of new sewer systems and nitrates action programmes.
- ⇒ The progress in implementation of measures addressing pollution by organic substances, nutrients and hazardous substances for surface water bodies as mentioned above, has a positive effect on the improvement of the quality of ground waters.

- ⇒ The reduction of pollution by nitrates has to be further accomplished by improved wastewater management (e.g. construction/upgrade/reconstruction of UWWTPs and sewer systems etc.), implementation of nitrate action programmes and the IED-related measures.
- ⇒ An appropriate national regulatory framework ensuring prohibition of direct discharge of pollutants into groundwater proved to be an effective tool for protecting groundwater quality. Efforts will have to be taken in making sure that such a framework will be effectively implemented in all ICPDR countries.
- ⇒ Nevertheless, it should be taken into account that due to the dynamics of groundwater and the time needed for measures to be effective (longer residence time of groundwater) the impact on water quality due to changes in anthropogenic pressures will not be apparent instantly but after several years or even decades.
- ⇒ Further actions are needed to prevent significant losses of pollutants from technical installations and to reduce the impact of accidental pollution incidents by applying appropriate safety measures.

4.2.2 Alterations of groundwater quantity

The issue:

Next to the provision of drinking water, groundwater is subject to other uses such as industry, agriculture, spa and geothermal energy. Groundwater quantity in the Danube River Basin is affected by groundwater abstraction for these uses. Furthermore, groundwater dependent terrestrial and associated aquatic ecosystems not only depend on groundwater quality but also on groundwater quantity. Therefore, groundwater use has to be appropriately balanced and should not exceed the available groundwater resource.

Vision

The ICPDR's basin-wide vision is that the water use is appropriately balanced and does not exceed the available groundwater resource in the Danube River Basin District, considering future impacts of climate change.

Preliminary identification of actions and coordination requirements for the basin-wide level

- ⇒ To ensure balanced groundwater use, registers of groundwater abstractions are in use in those countries which share the aggregated transboundary groundwater bodies of basin-wide importance. The measures addressing poor quantitative status include among others licensing of wells, construction and rehabilitation projects, demand management measures, promotion of adapted water saving agricultural production and the optimisation of the utilisation of the groundwater resources.
- ⇒ For the groundwater bodies of basin-wide importance in poor quantitative status
 - Hungary revised the relevant legislation concerning the licensing of wells, construction and rehabilitation projects, demand management measures and inter alia, promotion of adapted water saving agricultural production;
 - Serbia focused its measures on research, development and demonstration projects and construction designs for new groundwater sources.
- ⇒ In future RBM planning periods, the use of appropriate controls over the abstraction of fresh surface water and groundwater and controls over the impoundment of surface waters (including the use of registers of water abstractions) must be put in place in all ICPDR countries.
- ⇒ For proper planning of the balanced groundwater use a better understanding of the transboundary groundwater systems is needed. This requires the development of harmonized conceptual models for particular groundwater bodies.
- ⇒ The expected development of future water demand and of the impacts of climate change have to be taken into account when identifying water exploitation and protection strategies.

4.3 Effects of climate change (drought, water scarcity, extreme hydrological phenomena and other impacts)

With the publication of the 5th IPCC Assessment Report³², human influence on the climate system and impacts on human and natural systems due to recent climate changes has been scientifically confirmed. Anthropogenic emissions and atmospheric concentrations of CO₂ and other greenhouse gases as drivers of climate change have increased since the pre-industrial era, driven largely by economic and population growth. As a result, atmospheric and ocean temperatures have increased, the global mean sea level has risen and ice and snow cover have receded, not only in polar regions, but also, for example, in the mountain ranges of continental Europe. These changes have been accompanied by a slow shift in mean temperature and precipitation. At the same time, many regions are facing higher uncertainty due to more frequent and pronounced extreme weather phenomena, such as hot temperature extremes and heavy precipitation events.

Based on the ICPDR Strategy on Adaptation to Climate Change, the 3rd DRBM Plan will give a comprehensive overview of these effects, corresponding measures and management options. Important climate change impacts related to the Danube River Basin are shifts in precipitation patterns and snow cover and an increase in the frequency of flooding/flash flooding and droughts. Simulations show both a future increase in the intensity and frequency of dry periods, hot days and heat waves and local and regional increases in heavy rainfall. Higher temperatures are also expected to lead to an increase in evapotranspiration rates, affecting vegetation, rivers and lakes and ultimately the water balance of the whole region. Consequently, climate change will have a wide range of effects in the Danube River Basin. For example, two highly significant phenomena that will be exacerbated by climate change in the future are drought and water scarcity. Both pose significant risks to the stability of water dependent aquatic and terrestrial ecosystems and may influence the achievement of the good status of all waters. Furthermore, both have severe economic consequences for the society and for most economic sectors, particularly drinking water supply, agriculture, energy and transport, and crucially both also pose significant risks to the stability of water dependent aquatic and terrestrial ecosystems. In addition, the region will face other known impacts of climate change, e.g. rising water temperatures or an increase in extreme precipitation events.

The issue:

To reduce and manage the risks posed by climate change, both adaptation and mitigation measures are urgently needed. While adaptation is the process of adjustment to the actual or expected climate and its effects, mitigation is the process of reducing emissions to limit future climate change. Effective implementation of such measures depends on coherent policies and cooperation on all scales – international, regional and national – and requires integrated responses that link mitigation and adaptation with other societal objectives. The mitigation of and resilience to the extreme hydrological phenomena that can be intensified by climate change will be ensured via coordinated implementation of the Water Framework Directive and Floods Directive. Water dependent terrestrial ecosystems can suffer long-term damage, whilst increased water temperatures, higher pollutant concentrations and reduced oxygen levels can pose a serious threat to sensitive aquatic species, especially if there is no natural access to alternative habitats. Drought and water scarcity can have widespread impacts on water-dependent sectors, such as agriculture, water supply (drinking water), energy (hydropower), industry (cooling water), transport and navigation, and recreation.

Vision

The ICPDR's basin-wide vision to deal with adaptation to and mitigation of water related effects of climate change (drought, water scarcity, extreme hydrological phenomena and other impacts) is to make full use of our wealth of knowledge on River Basin Management to meet the challenges posed by climate change, to achieve resilience and ultimately sustain the inherent ecological and cultural value of the aquatic environment for the Danube River Basin. Preventive measures will be taken to

³² 5th IPCC Assessment Report to be downloaded from <http://www.ipcc.ch/report/ar5/syr/>.

mitigate impacts of climate change, to adapt to it and to minimise the related damages, thus reducing the vulnerability of aquatic ecosystems and water related ecosystems to climate change.

Preliminary identification of actions and coordination requirements for the basin-wide level

- ⇒ The EU 2019 WFD Implementation Report states that compliance with EU water law is already helping to manage the effects of a changing climate.
- ⇒ As a frontrunner and pioneer among transboundary river basin commissions, the ICPDR adopted the first ICPDR Strategy on Adaptation to Climate Change in 2012. Based on this strategy, the ICPDR was able to integrate climate adaptation issues into the updated DRBM Plan and the first DFRM Plan in 2015.
- ⇒ The 2018 update of the Climate Change Adaptation Strategy³³ takes further steps to promote action in a multilateral and transboundary context. It serves as a reference document for national strategies and activities in general and, more specifically, gives guiding principles and outlines suitable adaptation measures for the national and international RBMPs and FRMPs and provides an overview of relevant background and boundary conditions.
- ⇒ Addressing the effects of climate change, such as droughts and water scarcity, is essential for the achievement of WFD objectives³⁴, as illustrated by the need to ensure the quantitative status of groundwater bodies and to achieve good ecological status in surface waters (including in terms of supporting river flows) as specified by the WFD. Climate adaptation measures are often closely linked to other SWMIs for the Danube River Basin. For example, measures to mitigate hydromorphological alterations have to take the increased likelihood of water scarcity or other extreme hydrological phenomena into account. Those measures and natural and urban water retention measures are instrumental in increasing the resilience of ecosystems to these climate change impacts.
- ⇒ The ICPDR carried out a scoping study on the hydrological modelling of the water balance for the Danube River Basin. The results of it will feed into the further design of the planned ICPDR Danube Hydrological Information System with the scope to provide Danube basin-wide level basic hydrological and meteorological near real time data in a standard format, and, if possible, a validated long-term data series, for flood risk management, for an improved water balance for the Danube River Basin or for any water related scientific activities in the Danube River Basin and its sub-basins.
- ⇒ The ICPDR is aiming to help Danube countries to better align water and agricultural policies by elaborating a guidance document on sustainable agriculture. One of the main elements of the guidance is related to drought and water scarcity including management strategies and concrete measures to be implemented. In this respect, smart irrigation techniques should be promoted that are modern, efficient, water saving and adjusted to the specific conditions (e.g. soil moisture deficit, crop production). Agricultural producers would also benefit from in-situ monitoring support including detailed data on land, water, soil and meteorology as well as from modelled data and drought forecast.
- ⇒ Significant progress has also been made in the scientific domain, in raising awareness and support to governments. Several projects have contributed to a wide knowledge base in different research areas and regions, providing monitoring tools and management guidelines for policy-makers and water managers, e.g. with regard to droughts: DROUGHT-R&SPI, DEWFORA, PESETA and regional cooperation programmes such as EUROCLIMA. Multi-

³³ At the Danube Ministerial Meeting in February 2016 Ministers asked “*the ICPDR to foresee an update of its strategy, in particular with regard to its knowledge base, in 2018 in order to prepare the updated strategy in time for the next planning cycle of the EU Water Framework Directive and EU Floods Directive*”. For more information please see: <https://www.icpdr.org/main/activities-projects/climate-change-adaptation>.

³⁴ See also Communication from the Commission to the European Parliament and the Council: Addressing the challenge of water scarcity and droughts in the European Union COM(2007) 414 final.

- beneficial measures are also investigated (e.g. in the ongoing Danube Floodplain project) and can ensure that relevant aspects (e.g. floods, hydromorphology and biodiversity) are addressed.
- ⇒ In addition, WMO and GWP CEE have been running a joint Integrated Drought Management Programme in Central and Eastern Europe (IDMP CEE)³⁵ since 2015 that supports governments with the development of drought management policies and plans. In this context, there is also ongoing work in the frame of the Drought Management Centre for South-Eastern Europe (DMCSEE)³⁶ to support activities in the region. A major contribution was the implementation of the DriDanube project³⁷ and the preparation of the Danube Drought Strategy³⁸.
 - ⇒ For the 3rd DRBM Plan it is intended to summarise the available knowledge base on effects of climate change in the Danube River Basin, to highlight its cross-cutting character vis-à-vis the other SWMIs, to identify the potential measures for the water management and to focus on the most relevant ones for the basin-wide level.

5 Cross-cutting Issues

This chapter provides an overview of cross-cutting emerging issues, which are not formally defined as Significant Water Management Issues for the Danube basin-wide scale, but addressed within the frame of the ICPDR. Since the adoption of the 1st DRBM Plan and 2nd DRBM Plan, work has continued and additional topics have been investigated, in order to identify their relevance and significance on the basin-wide scale. This chapter provides an overview on these topics and an analysis of the state of play with regard to the

- Potential to be formally defined as a SWMI;
- Aspects of integration into existing SWMIs;
- Identification of knowledge gaps and further research requirements.

Hence, although the following issues are not formally defined as SWMIs, actions are ongoing or planned for appropriately addressing these aspects on the basin-wide level.

5.1 Integration with other sector policies

The process of integrating water management with other sector policies is highly relevant, a fact recognised by the Danube Declaration 2016 but also the EU Blueprint to Safeguard Europe's Water Resources³⁹.

On **inland navigation**, following the adoption of the “Joint Statement on Inland Navigation and Environmental Sustainability in the Danube River Basin” in 2007, significant progress has been made towards setting up integrated planning approaches throughout the basin for more sustainable navigation projects along the Danube and the Sava River. In the frame of yearly meetings, exchange on the experiences with the application of the “Joint Statement” is shared amongst administrations, stakeholders and environmental groups. The focus of discussions during the “Joint Statement meetings” is on environmental monitoring activities (also taking into account Article 4.7 WFD implementation) and sustainable technological solutions. Furthermore, a Mixed Environment and Transport External Expert Team (METEET) was established by the European Commission. METEET provides advice to competent authorities in developing sustainable strategies, plans and projects in the field of inland

³⁵ <https://gfcs.wmo.int//idmp>.

³⁶ http://www.dmcsee.org/en/drought_monitor/.

³⁷ <http://www.interreg-danube.eu/approved-projects/dridanube>.

³⁸ <http://www.interreg-danube.eu/approved-projects/dridanube/outputs>.

³⁹ COM(2012) 673 final.

navigation in the Danube, taking into account European environmental legislation from the beginning of the drafting process in order to analyse impacts, constraints and possible mitigation and compensation measures at a very early stage.

A similar integrative process on **hydropower** was launched in 2011 with the elaboration of the “Assessment Report on Hydropower Generation in the Danube Basin” and the “Guiding Principles on Sustainable Hydropower Development in the Danube Basin”⁴⁰. The Guiding Principles outline inter alia important elements on how to deal with existing hydropower facilities, strategic planning approaches for new hydropower projects development and mitigation measures. As a follow-up to the ICPDR Hydropower Workshop 2017, the ICPDR is working on an improved knowledge base on key social and economic drivers for sustainable hydropower development in view of future renewable energy strategies in those Danube countries, which have a high potential for hydropower development. Results of this study will be made available before the next ICPDR Hydropower Workshop in 2020. Furthermore, efforts were made by Danube countries to translate the Guiding Principles, which are now available in Bosnian, Croatian, Czech, English, German, Slovakian, Slovene and Ukraine language.

Regarding **agriculture**, the ICPDR has launched a dialogue with the agricultural sector that aims at developing a guidance document on sustainable agriculture by early 2020. The guidance will offer Danube countries additional support for the preparation and implementation of the national agro-environmental policies, Common Agricultural Policy Strategic Plans and relevant strategies of the RBM Plans. It will provide a consistent policy framework with a set of recommended instruments and tools to facilitate national water and agricultural decision making and to identify common goals, set up tailor-made policies and implement joint actions and cost-effective measures.

The **EU Floods Directive 2007/60/EC** (FD) and the ICPDR Flood Risk Management Plan 2015 set the frame for flood management in the DRBD. Measures taken for flood protection can impact surface water status (e.g. dams and polders) but can also bring synergies towards the achievement of the objectives of both the FD and the WFD (e.g. the re-connection of adjacent wetlands and floodplains). These inter-linkages were already indicated in the 1st and 2nd DRBM Plan and will, along with the implementation of the FD, have to be appropriately continued to be addressed for a **coordinated elaboration of the 3rd DRBM Plan and 2nd Danube Flood Risk Management Plan** (DFRM Plan) by 2021 in order to ensure best possible solutions.

Beyond the scope of the DRBD, the **EU Marine Strategy Framework Directive 2008/56/EC** (MSFD) aims to protect more effectively the marine environment across Europe with the objective of achieving good environmental status of the EU's marine waters by 2020. For instance, actions taken within the DRBD will reduce marine pollution from land-based sources and will protect ecosystems in coastal and transitional waters of the Black Sea Region. Therefore, the **WFD and the MSFD are closely inter-linked**, requiring a coordination of the related tasks.

With its integrated approach and aim to achieve inter alia a healthy aquatic ecosystem and ‘good status’ for all waters, the WFD is closely related to **nature protection legislation and policies**. This is in particular the case for the EU Habitats Directive 92/43/EEC and EU Birds Directive 79/409/EEC, but also the EU Green Infrastructure Strategy⁴¹ and the EU 2020 Biodiversity Strategy⁴², beside national nature protection legislation. By acknowledging these connections and elements of nature conservation, biodiversity and green infrastructure, synergies can be developed that help saving resources and reaching multiple goals since a significant number of protected areas is located along the Danube and its tributaries.

⁴⁰ Available on the ICPDR website: <http://www.icpdr.org/main/activities-projects/guiding-principles-sustainable-hydropower>.

⁴¹ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Green Infrastructure (GI) — Enhancing Europe’s Natural Capital – SWD(2013) 155 final.

⁴² Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Our life insurance, our natural capital: an EU biodiversity strategy to 2020 – SEC(2011) 540 final / SEC(2011) 541 final.

The **sector policies mentioned above can be relevant to one or several SWMIs**. Infrastructure projects (i.e. navigation, hydropower and flood protection measures) are of specific relevance for the SWMI “Hydromorphological alterations”, whilst agricultural production and the pollution of the Black Sea are a specific issue for the SWMIs “Organic pollution”, “Nutrient pollution” and “Hazardous substances pollution” and are addressed accordingly.

5.2 Quality aspect of sediment management

While the aspect of sediment quantity is being tackled under the Significant Water Management Issue “Hydromorphological alterations” (see chapter 4.1.4.2), further investigations as regards the quality aspect of sediment management are currently being undertaken in the Danube River Basin by the DTP-project “SIMONA” on Sediment-quality Information, Monitoring and Assessment System to support transnational cooperation for joint Danube Basin water management (2018-2021). Within the SIMONA project an inventory of the current status was made as regards river sediment quality monitoring, which describes existing good practices and available knowledge. Information about legislative frameworks, experiences, practices, technical procedures, existing sampling, laboratory and evaluation methods, existing waterbody monitoring and sampling points, existing methodologies of surface water chemical status assessment and limit values was collected. This information sets the basis and directions for all SIMONA protocols which will be developed in the frame of the project. Based on the review of the current status, in general, most of the countries in the Danube River Basin carry out sampling of sediment quality monitoring in accordance with the WFD, but specific protocols for sampling and laboratory analysis are not yet developed.

The availability of sufficient and reliable data on sediment quality is a prerequisite for any future decisions on a related sediment quality management in the Danube River Basin. So far, the characterisation of the sediment quality in the Danube is primarily based on the results of the Joint Danube Surveys. The monitoring activities showed that while concentrations of certain substances (organochlorinated compounds) in the solid phase were at low levels, heavy metals and polycyclic aromatic hydrocarbons occasionally occur at elevated concentrations requiring further research. The SIMONA project aims to respond to the current demand for effective and comparable measurements and assessments of sediment quality in surface waters in the Danube River Basin.

5.3 Invasive Alien Species

The 1st DRBM Plan, as well as its update from 2015, highlighted that the Danube River Basin is very vulnerable to invasive species given its direct linkages with other large water bodies (Southern Invasive Corridor connecting Black Sea through the Danube - Danube/Main/Rhine Canal - Rhine with the North Sea). The Danube is exposed to an intensive colonisation of invasive species and further spreading in both north-west and south-east directions throughout the Basin.

To achieve a common consensus on how to assess the presence of IAS in the Danube and to decide whether they significantly impact the ecological status of the Danube and its tributaries, the ICPDR is developing guidance for the whole River Basin. The experts aim to establish a common platform for a long-term approach to this issue. The ICPDR has already adopted a joint position that IAS should not be considered en-bloc as having a negative impact on the ecological status unless a detailed integrative evaluation provides conclusive evidence that this is the case.

All IAS-related activities coordinated by the ICPDR are in line with activities on EU level, specifically recently adopted Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species and Commission Implementing Regulation (EU) 2016/1141 of 13 July 2016 adopting a list of invasive alien species of Union concern pursuant to Regulation (EU) No 1143/2014 of the European Parliament and of the Council.

The ICPDR is collecting data on the distribution of non-indigenous species with the intention to carry out the assessment of the level of invasiveness for the aquatic non-indigenous species (Risk Assessment) and to evaluate the level of influence of biological invasions to aquatic ecosystems. To ensure the comparability of results and avoid bias due to different methods used for investigations, only the data

from routine national monitoring and Danube surveys (JDS1 in 2001, AquaTerra in 2004, JDS2 in 2007 and JDS3 in 2013) are taken into consideration. Due to the data availability, in previous period, the activities were focused on the Danube River.

Based on the developed risk assessment scheme, a “Black List” of Danube IAS has been developed by the ICPDR.

The results of Joint Danube Surveys show that the Danube River is significantly exposed to non-native species.

The level of so-called bio contamination of the Danube River was estimated as moderate to high, with higher levels for the Upper Danube (high to severe bio contamination) and Middle Danube (moderate to high bio contamination), in comparison to the Lower Danube (low bio contamination).

A comparison with the results of previous Danube Surveys clearly showed a constant impact of invasive alien species on native flora and fauna and a considerable increase of the number of non-native species. One specific example is the allochthonous *Neogobius* fish species, which was found in high or even dominating abundance along upper and middle course of the Danube.

JDS experts have reconfirmed that further work has to be done to collect basic information on the distribution of invasive alien species, their influence on native ecosystems, and appropriate mitigation measures.

Further work will be focused on:

- Extending these activities to the major tributaries and aquatic ecosystems assessed as the most exposed to biological invasions;
- Developing criteria for the selection of target water bodies of basin wide importance regarding biological invasions;
- Continuous update of the list of aquatic neozoa of the DRB and consequently of the “Danube Black List”;
- Periodical evaluation of ecological impacts of neozoa species on the Danube River, its main tributaries and other selected habitats;
- Further development of mechanisms of monitoring of the IAS within the DRB;
- Improving of the methodology of the assessment of the impact of the biological invasions on selected water bodies.

Difficulties in management of IAS are evident and are still an open issue, thus the ICPDR will continue to provide the platform for collaboration between the Danube countries in their endeavour to find more effective mitigation measures.

5.4 Sturgeon issue

Sturgeons are considered as flagship species for the DRBD and are valuable indicators for water status and the health of the ecosystem. However, today sturgeons are on the brink of extinction inter alia due to overexploitation, illegal marketing, disruption of migration routes and loss of habitats and spawning grounds caused by hydromorphological alterations. Hence, urgent measures are needed to stop the decline and prevent disappearance of these endangered fish species.

The issue was already addressed inter alia in the frame of the Bern Convention with the adoption of the Danube Sturgeon Action Plan in 2005; since the 1st DRBM Plan from 2009 several measures regarding sturgeon conservation were specified (i.e. addressing water quality and the improvement of hydromorphological conditions). In addition, further measures were taken on the national level to prevent sturgeons from extinction (eg. fishing bans in Austria, Bulgaria, Romania and Serbia). The “Danube Sturgeon Task Force” (DSTF)⁴³ was created in January 2012 in the frame of EUSDR Priority Area 6 (Biodiversity), where different organisations from the Danube basin (e.g. World Wide Fund for Nature (WWF), International Association for Danube Research (IAD), ICPDR, representatives from national research institutions, Ministries and the World Sturgeon Conservation Society) joined to work

⁴³ <http://www.dstf.eu/>.

towards the sustainable solutions. The DSTF aims to coordinate and foster conservation efforts in the DRBD and the Black Sea by promoting actions which are outlined in the DSTF Programme “Sturgeon 2020”. In 2019, a relaunch of DSTF was implemented on the basis of rules and procedures, an Executive Committee was elected and the work plan was revised. The ICPDR has a guest status in the relaunched DSTF.

In order to outline key competences of the ICPDR in sturgeon conservation, such as the restoration of lost and altered habitats, the prevention of further habitat degradation, the enabling of fish migration as well as the improvement of water quality, the ICPDR Sturgeon Strategy was adopted in the year 2017. For other activities, such as an effective control of poaching and fishing as well as trade in sturgeon products such as caviar, combating overexploitation or establishment of living gene banks and conservation stocking, which are outside the mandate of the ICPDR, cooperation with other partners who are competent in these matters is required.

In November 2018, an EU Grant to support for the Implementation of the Feasibility Study analysing options for fish migration at Iron Gate I & II (DG REGIO) was signed with the ICPDR as coordinator and the Danube Delta National Institute for Research and Development (Romania) and the Institute for Water Resources Development Jaroslav Černi (Serbia) as co-applicants. With this Grant ICPDR will be able to kick-off the most urgent activities outlined in the Terms of Reference of the Feasibility Study to reduce the obstacles caused by the Iron Gates and would trigger funding sources for related follow-up measures on hydromorphological alterations.

Furthermore, Austria has made a commitment to finance an ex-situ feasibility study for the upstream Danube including the identification of potential locations for the “ex-situ-facility⁴⁴” in Austria/Slovakia/Hungary, clarification of land availability and necessary permits, the exact description of technical details for the facility, cost estimation for development, installation, equipment and maintenance of the facility, exploring potential financial sources on European and national levels and the preparation of a project proposal.

The project “MEASURES: Managing and rEstoring Aquatic bio-corridors for migratory fiSh species in the danUbe RivEr baSin⁴⁵” (2018-2021) addresses migratory fish habitat mapping, ex-situ conservation and strengthening the Danube sturgeon network.

In November 2018, the Bern Convention adopted the Pan-European Action Plan for sturgeons, which was used as a basis for the adoption of a Species Action Plan under the EU Fauna Flora Habitats Directive 92/43/EEC.

6 Outlook

This **Interim Overview on the Significant Water Management Issues in the DRBD** was published in December 2019 and therefore two years before the deadline for the finalisation of the 3rd DRBM Plan in 2021.

The document is made available to the public, allowing for **six months to comment in writing until June 2020** in order to allow for active involvement and consultation. Subsequently, the document will be revised based on the feedback received and endorsed by the ICPDR in December 2020.

This process aids the development of the 3rd DRBM Plan by 2021 based on the issues outlined in this document and the comments received.

⁴⁴ An “ex-situ-facility” means an “off-site conservation” of protecting endangered species outside its natural habitat.

⁴⁵ <http://www.interreg-danube.eu/approved-projects/measures>.