

# Lessons from the Danube

A WORLD LEADER IN TRANSBOUNDARY RIVER BASIN MANAGEMENT

**ICPDR IKSD**

International Commission  
for the Protection  
of the Danube River

Internationale Kommission  
zum Schutz der Donau



Österreich // Česká republika // Slovensko // Magyarország // Slovenija // Hrvatska // Bosna i Hercegovina // Srbija // Crna Gora // România // България // Moldova // Україна // Deu



# Contents

- 04** | Foreword
- 06** | The Role of the ICPDR
- 10** | A World Leader
- 12** | Joint Danube Surveys
- 16** | Integrated River Basin Management
- 20** | From Source to Sea
- 22** | Adapting to Climate Change
- 24** | Managing Risks
- 26** | Public Participation

# Foreword

This publication is designed to highlight the key lessons from 20 years of transboundary water management by the International Commission for the Protection of the Danube River (ICPDR).

In just 20 years the ICPDR has become a global role model for the transboundary management of shared river basins around the world.

Since it was established in 1998 by the Danube River Protection Convention, the ICPDR has served its member countries as a highly successful platform for the integrated management of water resources across the Danube River Basin. It has enabled countries to work together to assess the health of the river and develop basin-wide plans to address priority issues such as pollution, climate change, flooding, impact of hydropower generation, and navigation.

Today the ICPDR continues to help national decision-makers to balance the competing needs and uses of the Danube River. In its work to implement the European Union's Water Framework Directive (WFD) and the Flood Directive (FD) the ICPDR and its partners have developed basin-wide management plans that are helping countries to improve the ecological status of the river basin and reduce impacts from risks such as flooding.

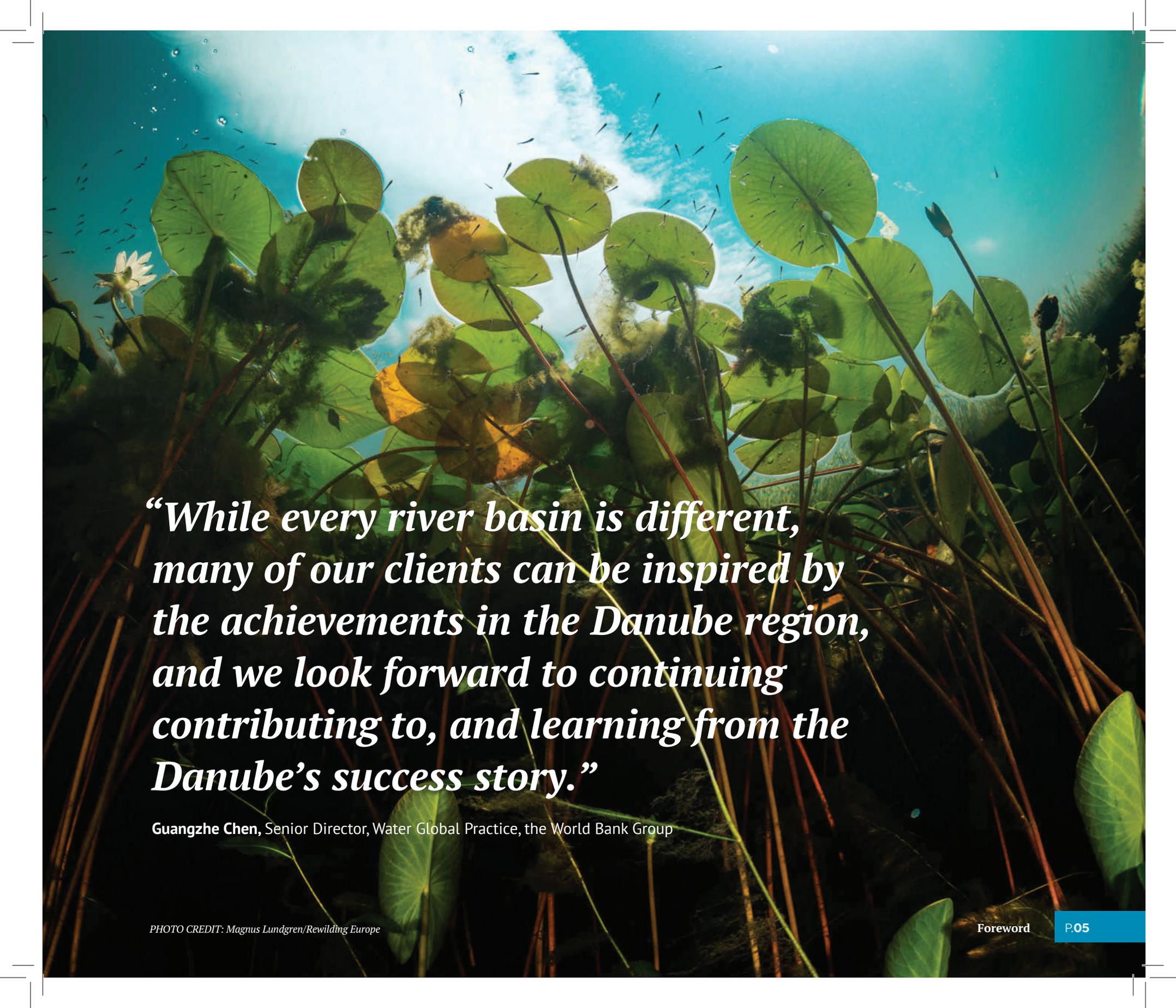
National delegates, ministers, technical experts, civil society, the scientific community and the wider public all now cooperate with the ICPDR to ensure the sustainable and equitable use of water resources in the Danube River Basin. The ICPDR has improved data collection and analysis, championed river basin management planning, generated cross-sector dialogue, facilitated investments, promoted public participation and created greater awareness of the need to protect, conserve and manage the Danube River Basin in a sustainable way.

In the field of water management, the work of the ICPDR has also supported the accession of Danube countries to the European Union. The cooperation and technical support provided by the ICPDR has helped to strengthen the environment, economy and security of the entire Danube River Basin.

The ICPDR continues to serve as a vital learning hub and platform for the exchange of experiences and innovation between countries facing vastly different economic and environmental challenges. It also continues to pioneer inter-sectoral cooperation and structured dialogue across the different users of the Danube's water resources from navigation and water supply to hydropower and sanitation.

While this publication celebrates the many achievements and successes of the ICPDR, it also clearly outlines the many challenges that remain to be addressed in efforts to manage the shared Danube River Basin. In the coming years these challenges will undoubtedly require even greater cooperation, innovation and determination from all the countries, organizations and individuals that continue to make the ICPDR a world leader in river basin management.

**Ivan Zavadsky**  
Executive Secretary  
International Commission for the Protection of the Danube River (ICPDR)



*“While every river basin is different, many of our clients can be inspired by the achievements in the Danube region, and we look forward to continuing contributing to, and learning from the Danube’s success story.”*

Guangzhe Chen, Senior Director, Water Global Practice, the World Bank Group

# The Role of the ICPDR

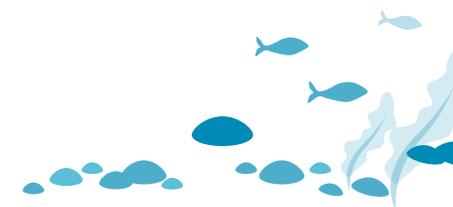
The ICPDR is a transboundary river basin organization - established by the Danube River Protection Convention (DRPC) - that works to ensure the sustainable and equitable use of freshwater resources in the Danube River Basin for the benefit of over 80 million people.

The ICPDR pursues this mission by making recommendations for the improvement of water quality, developing mechanisms for flood and accident pollution control, agreeing standards for emissions and by assuring that these are reflected in the national legislations and policies of their contracting parties.

Since the ICPDR was established in 1998 it has provided a platform for countries to assess the health of the river and develop basin-wide plans to address priority issues such as pollution, hydropower, navigation and adaptation to climate change. By bringing together representatives from the highest ministerial levels, technical experts, members of civil society and the scientific community, the ICPDR has contributed significantly towards improvements in the state of water resources in the Danube River Basin.

The ICPDR is now the most international river basin organization in the world and the primary mission of this body of river basin management experts is to promote and coordinate sustainable water management for the benefit of all people across the Danube River Basin. Nineteen countries share the Danube River Basin but, because of a requirement for at least 2,000-km<sup>2</sup> of national territory to be located within the Danube River Basin, only fourteen of these countries – and the European Union - are full contracting parties to the ICPDR.

The Danube River is the second longest river in Europe (2857 km) and its basin covers 817,000 square kilometers. The Danube passes through numerous large cities – including four national capitals: Vienna; Bratislava; Budapest and; Belgrade. The river is also critical for the generation of hydropower, navigation, agriculture, recreation, water supply and the natural environment. But, while some 20 million people rely on the Danube for drinking water, currently just 24.7% of the Danube's water bodies are considered to have good ecological status.



## THE DANUBE RIVER PROTECTION CONVENTION

The Convention was signed on 29 June, 1994, and signatories to the Convention have agreed to cooperate on fundamental water management issues, including: the conservation, improvement and rational use of surface and groundwater; preventive measures to control hazards originating from accidents, floods, ice or hazardous substances; and measures to reduce the pollution loads entering the Black Sea from sources in the Danube River Basin.

The Danube River Protection Convention is based on the principles of the 1992 United Nations Economic Commission for Europe (UNECE) Convention on the Protection and Use of Transboundary Watercourses and International Lakes. The aim of the UNECE Water Convention is to strengthen transboundary water cooperation in order to protect and ensure the quantity, quality and sustainable use of transboundary water resources – both surface and groundwater. The Convention – now a global instrument – takes a holistic approach, based on the understanding that water resources play an integral part in ecosystems as well as in human societies and economies.

The ongoing goal of the ICPDR is to implement the Danube River Protection Convention and make it a living tool to coordinate sustainable and equitable water management, including conservation, improvement and rational use of water resources for the benefit of the Danube River Basin countries and their people.

The 2016 Danube Ministerial Declaration outlines the ICPDR's three key goals for a cleaner, healthier and safer Danube River by 2021:

1. “Cleaner” water;
2. A “Healthier” home for aquatic animals and plants and;
3. A “Safer” environment for people to live without the fear of floods.

## SUPPORTING BASIN-WIDE COORDINATION

The ICPDR assesses and synthesizes information on the state of surface and groundwater in the basin and acts as a forum for countries to identify, coordinate and implement projects with external organizations, such as the Black Sea Commission.

### Danube River Basin Management Plan (DRBMP)

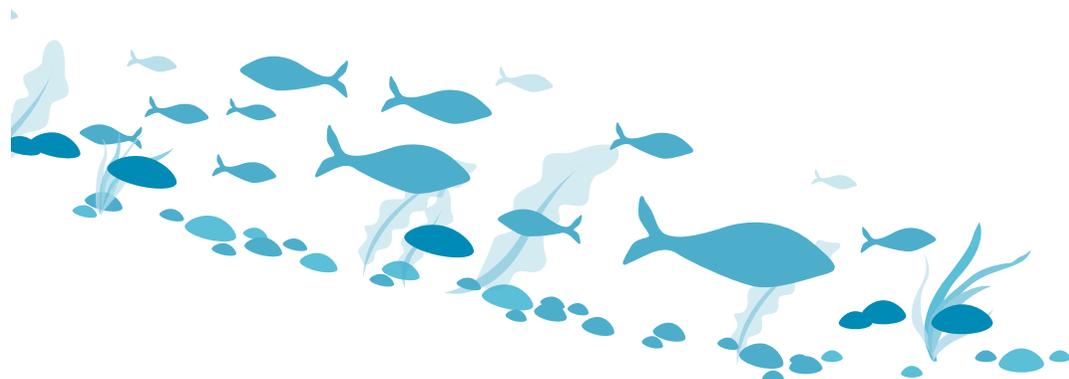
The ICPDR, in conjunction with its contracting parties, has developed the Danube River Basin Management Plan. This plan helps to coordinate the national river management plans, which have been developed by individual countries across the basin. While only the EU Member States in the ICPDR are legally bound by the EU Water Framework Directive to fulfill the DRBMP and achieve “good ecological status” by 2027 at the latest, all of the countries in the ICPDR have agreed to fully commit themselves to implement the Plan and the Directive. The first DRBMP was developed in 2009 and it is updated every six years. The current plan is for 2015-2020.

### Danube Flood Risk Management Plan (DFRMP)

In 2015 the ICPDR developed the first Danube Flood Risk Management Plan (DFRMP), which is based on the EU Floods Directive. The DFRMP focuses on the strategic management of flood risks across the entire river basin and it promotes the ‘Solidarity Principle’ which is designed to prevent countries from simply exporting their flood problems to downstream neighbours. The application of this principle is essential, because structural flood protection, such as dykes and demountable barriers, may simply transfer more water downstream during extreme flood events.

### Key Issue Areas

In the Danube River Basin, four main pressures that affect water status: organic substance pollution; nutrient pollution; hazardous substance pollution and; hydromorphological alterations have been identified as Significant Water Management Issues (SWMIs). The groundwater quantity and quality are also under constant pressure.



## CONT.

### Organic Substance Pollution

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 such as untreated or insufficiently treated municipal wastewater from households, industries and major agricultural farms.

### Nutrient Pollution

Recent studies report basin-wide nutrient emissions entering surface water bodies are 605,000 tons of nitrogen and 28,500 tons of phosphorus per year total. Impacts on water status caused by nutrient pollution can be recognized through substantial changes in aquatic ecosystems.

### Hazardous Substance Pollution

The most important sources of hazardous substances pollution are households and public buildings via municipal wastewater, industrial facilities, urban run-off (deposited air pollutants, litter, combined sewer overflows), agriculture (pesticide and contaminated sludge application), contaminated sites and mining sites. While there are considerable knowledge gaps in the field of hazardous materials, the ICPDR has identified thirty-three hazardous compounds released by major industrial facilities and wastewater treatment plants. Amongst these compounds are eight organic pollutants, three pesticides, and eight heavy metals.

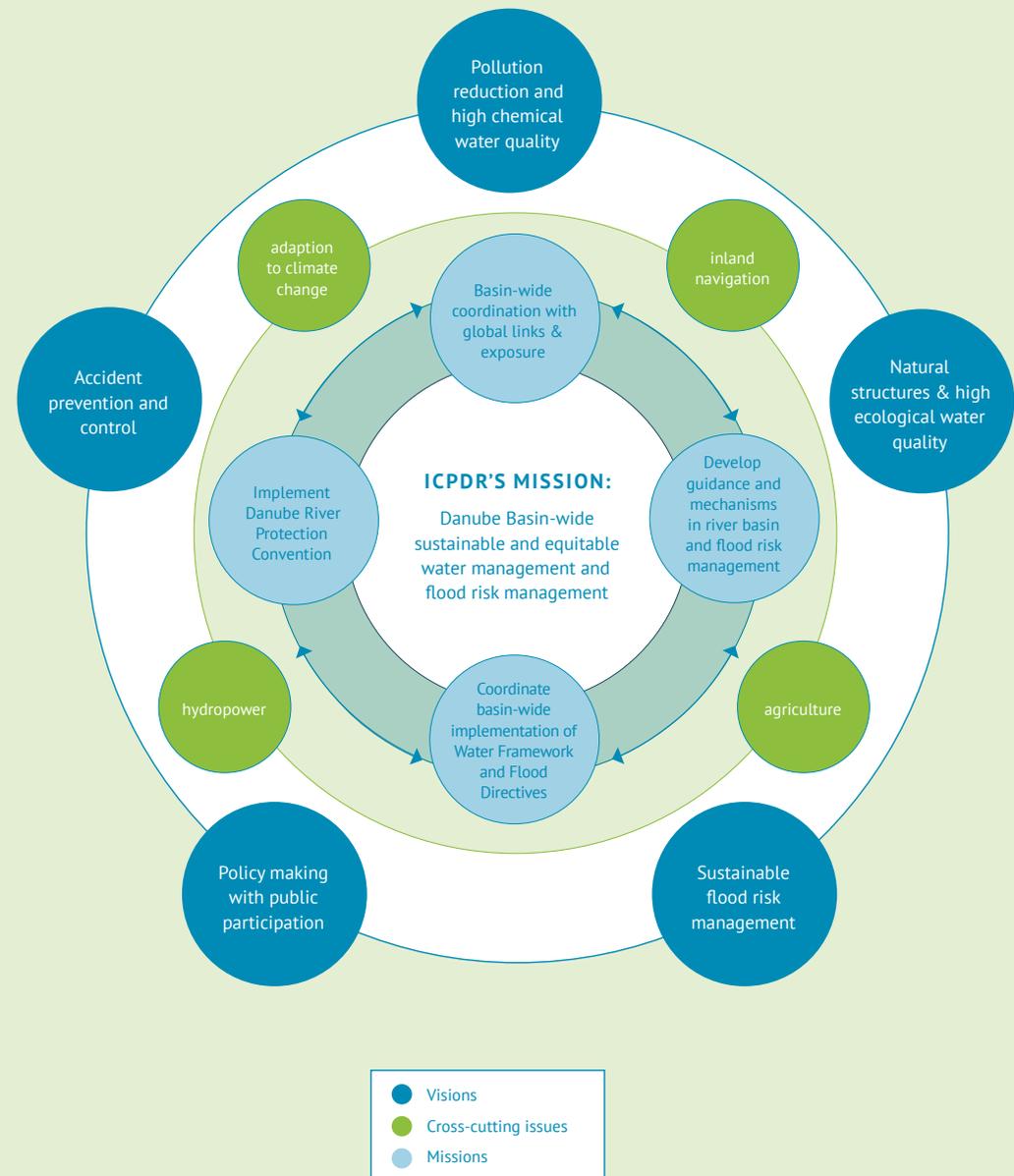
### Hydromorphological Alterations

It is estimated that approximately 17% of Danube River water bodies are still near their natural state, with another 10% considered to be "slightly altered". The remaining 73% water bodies are considered to be heavily modified. While efforts have been made to restore connectivity and floodplains, studies have identified 667 of 1030 barriers remain impassible to fish, sturgeons, and other crucial species in the Danube Basin; approximately 100,000 ha of wetlands that have a reconnection potential; and 403 impoundments still cause hydrological alterations.

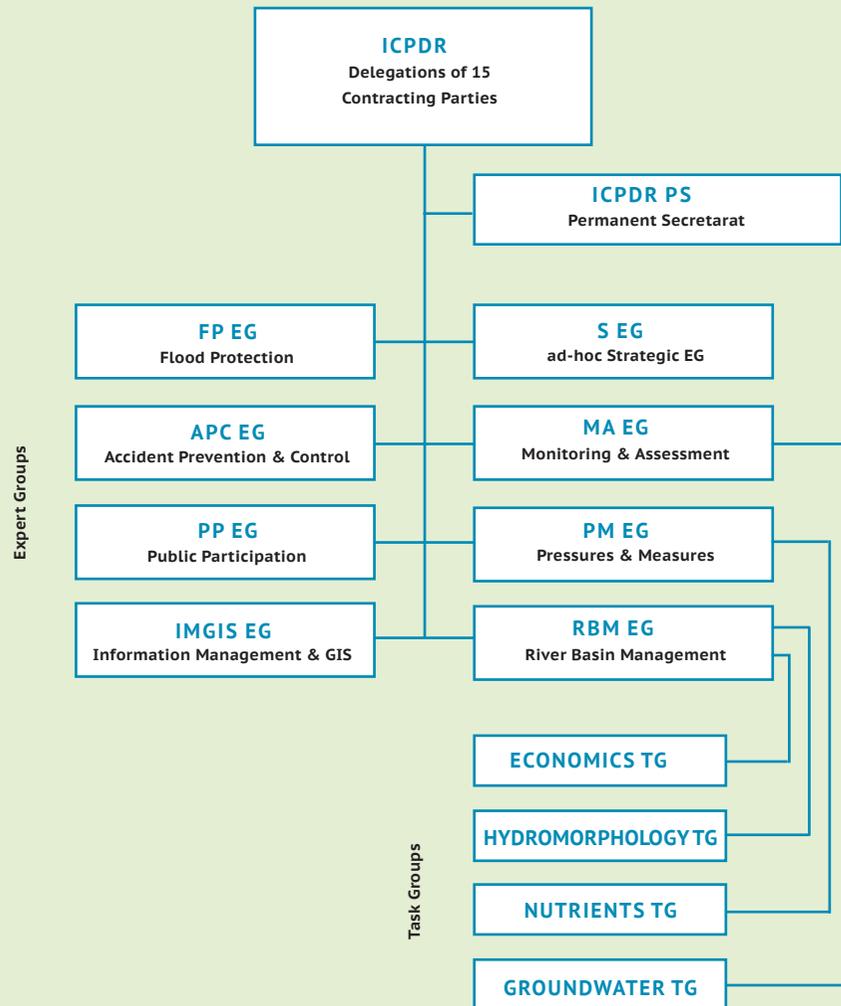
### Groundwater Quality and Quantity

The ICPDR has identified eleven transboundary groundwater bodies of basin-wide importance due to either the size or the ecological/socio-economic significance. While eight out of the eleven bodies were deemed to be of "good chemical status", nitrate pollution has continued to be a very serious threat to groundwater quality.

## ICPDR VISION & MISSION



## ICPDR – EXPERT AND TASK GROUPS



## THE ICPDR – FACTS & FIGURES

<b>MEMBERS</b>	Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Moldova, Montenegro, Romania, Slovakia, Slovenia, Serbia, Ukraine, and the European Union.
<b>ANNUAL BUDGET</b>	€1.2m
<b>FUNCTION</b>	The ICPDR assesses and synthesizes information on the state of surface and groundwater in the Danube basin and acts as a forum for countries to coordinate and implement basin related EU Directives and individual projects.
<b>HOW DOES IT WORK?</b>	The ICPDR consists of delegations from contracting parties. Delegates make decisions by consensus, twice yearly, in the Heads of Delegation (Standing Working Group) and the Commission's plenary meetings (Ordinary Meeting). These meetings are chaired by the ICPDR President. The ICPDR working structure further includes Expert Groups and Task Groups. Twenty-three observer organisations are involved in the work of the ICPDR.
<b>EXPERT GROUPS</b>	<p>The ICPDR Secretariat coordinates the following Expert Groups (EG) and Task Groups. Expert groups are panels of specialists and external observers, and contain at least one national expert for each contracting party:</p> <ul style="list-style-type: none"> <li>• Flood Protection Expert Group</li> <li>• Accident Prevention and Control Expert Group</li> <li>• Monitoring and Assessment Expert Group</li> <li>• Pressures and Measures Expert Group</li> <li>• River Basin Management Expert Group (the Hydromorphology and Economics Task Groups report directly to the River Basin Management Expert Group)</li> <li>• Information Management and GIS Expert Group</li> <li>• Public Participation Expert Group</li> <li>• Strategic (ad-hoc) Expert Group</li> </ul>
<b>TASK GROUPS</b>	<ul style="list-style-type: none"> <li>• Groundwater Task Group</li> <li>• Nutrients Task Group</li> <li>• Economics Task Group</li> <li>• Hydromorphology Task Group</li> </ul>
<b>SECRETARIAT</b>	The Commission is supported by a permanent secretariat of nine staff based in the Vienna International Centre (VIC).

# A World Leader

The ICPDR addresses the entire Danube River basin, including more than 300 tributaries and connected ground water resources. It is one of the most mature and active international river basin management commissions in the world.

Around the world the ICPDR is seen as a world leader in river basin management, providing valuable lessons for the managers of other transboundary water systems from the Orange River to the Amazon. The ICPDR is also actively cooperating with global organisations such as the Global Environment Facility (GEF), the World Bank, UNDP, UNECE, UN Environment and OECD, to ensure that other programmes can learn from the experiences of managing the Danube River Basin.

Since 1991 one of the main drivers of regional efforts to strengthen the environmental management of the Danube River Basin has been the expansion of the European Union.

One of the key initial drivers for transboundary cooperation on the Danube was the significant decline of the Black Sea ecosystem following the collapse of the former Soviet Union. Growing levels of nutrient and organic pollution reached a peak in 1990 when about 40,000 km<sup>2</sup> of the Black Sea was considered “dead”.

The work of the ICPDR and key partners, such as the GEF, helped Danube countries to generate USD 3.5 billion worth of investments to improve agricultural practices, municipal wastewater treatment and the management of important wetland areas. Today the Black Sea has recovered, nitrogen emissions have fallen by 20%, phosphorus by 50%, and the number of species has almost doubled from 1980 levels.

With the support provided by this technically and institutionally strong river basin commission, the Danube countries are now backed by the solid environmental regulation and investments needed to meet their own environmental needs.

The work of the ICPDR and its Expert Groups and Task Groups has also significantly strengthened the capacity of the Danube countries to continuously meet the EU's accession and Acquis Communautaire challenges. Moreover, political and economic incentives for environmental compliance resulting from the EU accession process has facilitated a speedier implementation of the Danube River Protection Convention's objectives. As more Danube countries move closer to the EU the Danube becomes safer, cleaner and healthier because the countries' expertise is growing and more lessons are being learned.

Given the complexity of the Danube River Basin, including many countries with widely differing economic and environmental management needs, one overall framework was required to sustainably manage the basin. In 2000, the ICPDR contracting parties nominated the ICPDR as the platform for the implementation of all transboundary aspects of the EU Water Framework Directive (WFD). The WFD is a holistic legal and policy framework, based on transboundary cooperation in basins, seen by many as the strongest water protection legislation in the world. The ICPDR received a similar mandate in 2009 to support the coordination of the implementation of the EU Floods Directive.

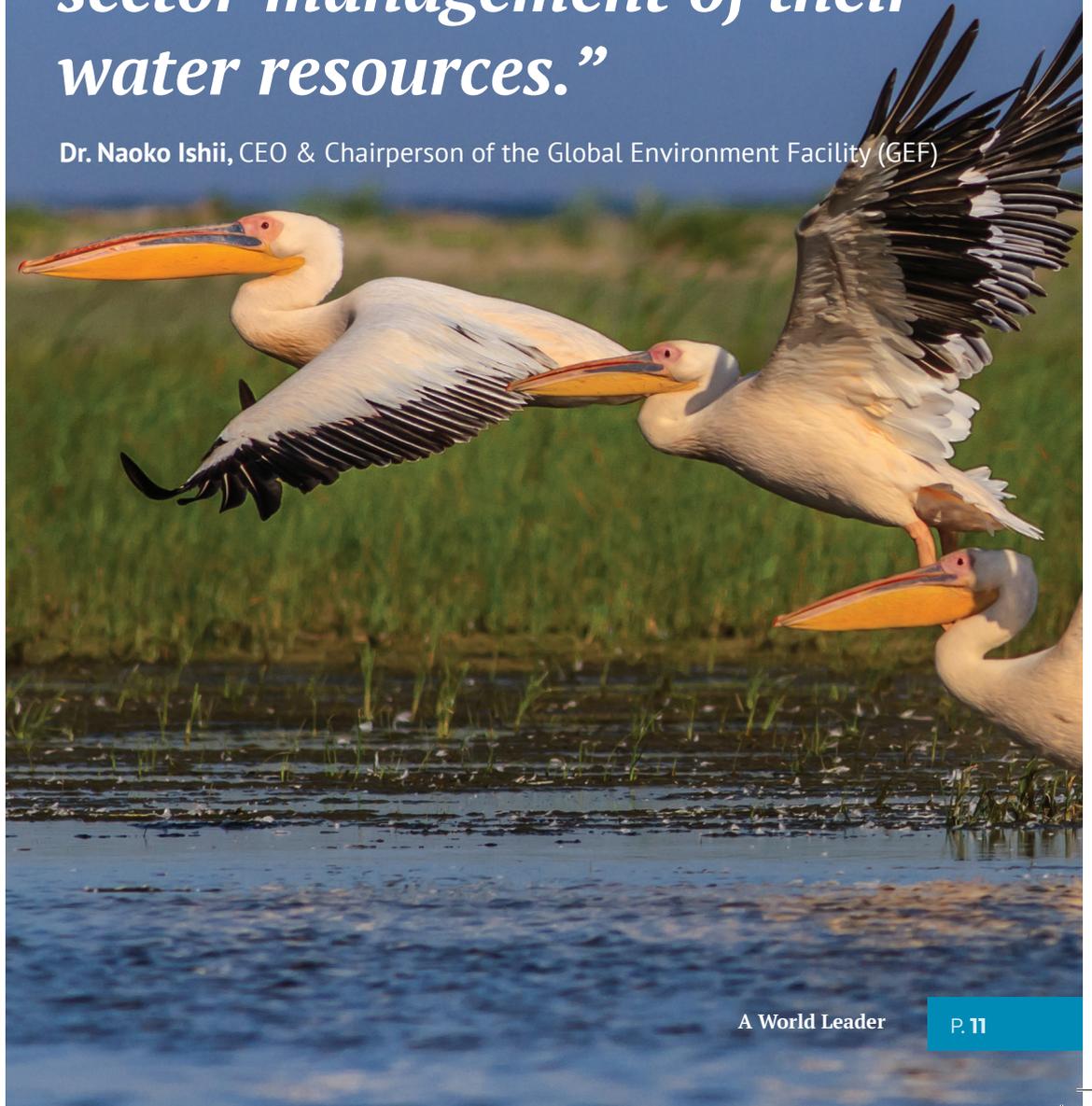
In its work to implement the EU's Water Framework Directive (WFD), the ICPDR and its partners have developed a truly integrated approach to the management of the river basin and its resources. Naoko Ishii, CEO & Chairperson of the GEF, says the long-term GEF engagement along the entire continuum from the source in the Danube countries to the Black Sea region is a good example of how countries, often, have to look beyond their own political borders to be able to truly implement Integrated River Basin Management. This has, in turn, been helping to reinforce the political stability of the entire Danube region.

Ms. Ishii says the ICPDR has improved data collection and analysis, generated cross-sector dialogue, increased investments, promoted public participation and created greater awareness of the need to protect, conserve and manage the Danube River Basin.

"The work of the GEF and the ICPDR has supported the accession of Danube countries to the European Union. The investments, cooperation and technical support provided by the GEF and the ICPDR has helped to strengthen the environment, economy and security of the entire Danube River Basin," she says.

***“All Danube countries now benefit from a strong ICPDR, solid environmental regulation and growing levels of national investment into the cross-sector management of their water resources.”***

**Dr. Naoko Ishii**, CEO & Chairperson of the Global Environment Facility (GEF)



# Joint Danube Surveys

<b>APPROACH</b>	The ICPDR has established a regional investigative monitoring exercise providing homogeneous data for sound decision-making in river basin management of the Danube River Basin.
<b>ACHIEVEMENTS</b>	Three international surveys along the Danube River (Joint Danube Surveys) have been carried out which has provided critical information on Danube biology, chemistry and hydromorphology.
<b>LESSONS</b>	The results of these surveys are included in each cycle of the Danube River Basin Management Plan and this helps the Danube countries to select the right measures to solve the problems in the basin.

## JOINT DANUBE SURVEY 3

**Every six years the ICPDR coordinates the Joint Danube Surveys as a core component of the monitoring strategy for the Danube River Basin. The 2013 Joint Danube Survey 3 (JDS3) was the world's biggest river research expedition of its kind and provided a unique opportunity to assess the water quality across the entire Danube.**

This expedition provided the largest volume of knowledge about the Danube River Basin ever collected through a single scientific exercise. The JDS3 results showed that the health of the Danube is progressively improving and new species were also discovered, such as the floating fern *Azolla*.

These joint, cooperative surveys are critical in helping decision-makers in selecting the right measures for the Danube River Basin Management Plan updates. They are critical for measuring progress and identifying problems and the specific measures that are needed to address them.

For six weeks in August and September 2013, the survey ships travelled 2,375 km downstream the Danube River, through 10 countries, to the Danube Delta. A core team of 20 scientists was responsible for all survey activities including sample processing and on-board analyses. The expedition vessels included Serbia's *Argus*, the *Istros* from Romania and two Austrian vessels, the *Wien* and *Meßschiff IV*.

The survey found that nutrient (i.e. nitrogen and phosphorus) concentrations have declined and this may indicate that recent improvements to municipal wastewater treatment are having a positive impact on water quality in the Danube. While most hazardous chemicals were found to be below levels of concern, concentrations of perfluorooctanesulfonic acid (PFOS) in water and fish were generally higher and the concentration of mercury in all fish samples significantly exceeded desired levels.

While JDS3 reconfirmed the Danube's high degree of biodiversity, pressures from fishing, invasive species and hydropower means that up to 90% of the sites did not meet the ecological requirements of the WFD for fish. The hydromorphological assessment found no "natural" stretches of the river with about 60% of the entire Danube having now been modified in some way.

The remaining 40% is classified as extensively or severely modified and about 75% of the Upper Danube is considered to be intensively altered. The Lower Danube is generally good and includes the river's longest free-flowing stretch of 860 km.

Dense urbanization and hydropower plants, such as Gabčíkovo and Iron Gates dams, mean that long stretches of the Danube are engineered. Very few stretches provide good conditions for floodplains and much of the 30-35% of remaining natural floodplains are impacted by disconnection from the main river.

The JDS3 report identified the need for further measures to restore floodplains, manage the sediment balance and to reinforce bank revetments. There is also a need to develop and upgrade wastewater treatment plants, especially in the middle and lower Danube areas. Work is already underway to investigate the occurrence of mercury in fish, implement policies to reduce the emission of hazardous substances, and to protect bank-filtered water wells used for drinking water.

#### **JOINT DANUBE SURVEY 4**

The results from the planned Joint Danube Survey 4 in 2019 will be used for the 2021 update of the Danube River Basin Management Plan. The JDS4 will also test new analytical methods which are also likely to prove highly useful for other river basins. The next survey will focus on the use of new approaches to screen pollutants and it will also explore the potential for using environmental DNA to assess changes in biological quality. JDS4 will also help to provide a detailed analysis of microplastics in the Danube.



*“Our work with ICPDR has now inspired countries to collaborate on similar freshwater surveys in shared river basins across the globe.”*

Vladimir Šucha, Director-General of the Joint Research Centre for the European Commission

## CONT.

In past surveys a core team of leading experts carried out all off the sampling and analysis activities. In JDS4 most tasks will be undertaken directly by national experts while the core team will play more of a coordination and advisory role. It is hoped that this shift in responsibility will encourage greater country autonomy and ownership of the results, while also supporting a higher level of technical cooperation and harmonization across the region.

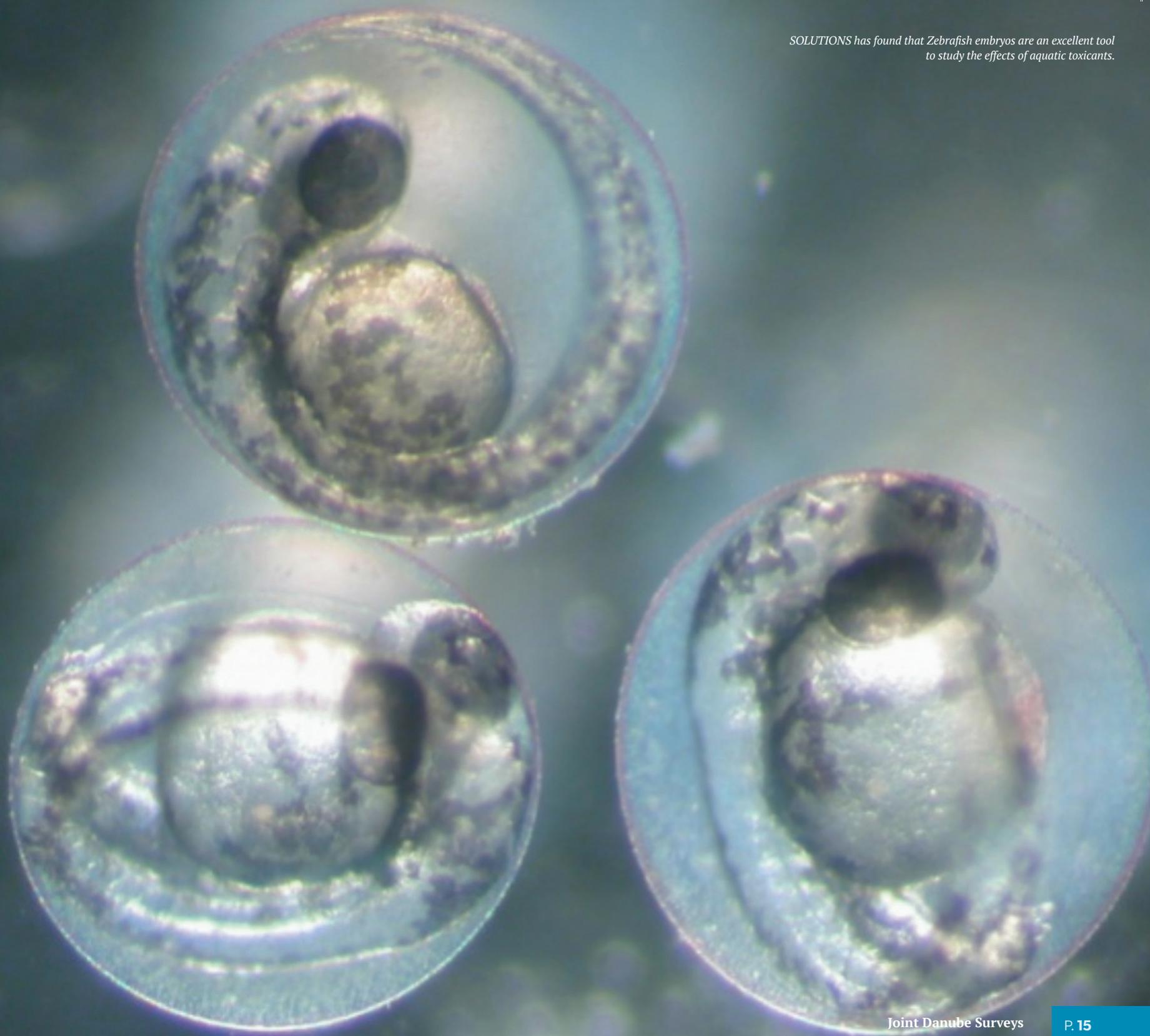
### SOLUTIONS FOR EMERGING POLLUTANTS

A major objective of the EU FP7 SOLUTIONS project is to develop the evidence-base for water policies and consistent guidance for the early detection, identification and abatement of chemicals in the water cycle. The ICPDR is a project partner of SOLUTIONS. The project provided a substantial contribution to JDS3 by analyzing samples for a wide range of hazardous substances and this analysis was used to identify Danube River Basin specific pollutants that were included in the 2015 update of the Danube River Basin Management Plan. In August 2017 a total of twelve wastewater treatment plants were also sampled in nine Danube countries for further analysis of emerging chemicals and heavy metals. The SOLUTIONS modelling results and the final list of the Danube River Specific Substances produced by JDS3 will be available in 2018.



*Some SOLUTIONS studies use Zebrafish embryos as a tool to study the effects of aquatic toxicants.*

*SOLUTIONS has found that Zebrafish embryos are an excellent tool to study the effects of aquatic toxicants.*



# Integrated River Basin Management

One of the main benefits provided by the ICPDR is the ability to help national decision-makers balance the competing needs and uses of the Danube River, such as hydropower, agriculture and the management of climate risks. The ICPDR serves its member countries as a fully-functioning platform for consultation, coordination and the integrated management of the Danube River Basin.

<b>APPROACH</b>	It was clear from the establishment of the ICPDR that one overall framework was required to balance the use of water resources in the Danube River Basin. Today the ICPDR continues to use <i>Integrated River Basin Management (IRBM)</i> as the main mechanism for understanding how to balance different water uses, such as hydropower and navigation.
<b>ACHIEVEMENTS</b>	<ul style="list-style-type: none"><li>• Reconnected 50,000 hectares of wetlands and floodplains.</li><li>• Some 900 Urban Waste Water Treatment Plants have been constructed or upgraded.</li><li>• Reductions of 50% of organic emissions, 30% of phosphorus emissions and 10% of nitrogen emissions.</li></ul>
<b>LESSONS</b>	<ul style="list-style-type: none"><li>• The best way to manage shared water resources at the transboundary level is through the use of IRBM, based on sound data and jointly agreed measures to address joint challenges.</li><li>• Cross-sectoral dialogue is crucial for the development and implementation of of RBM plans.</li></ul>

## SUSTAINABLE HYDROPOWER

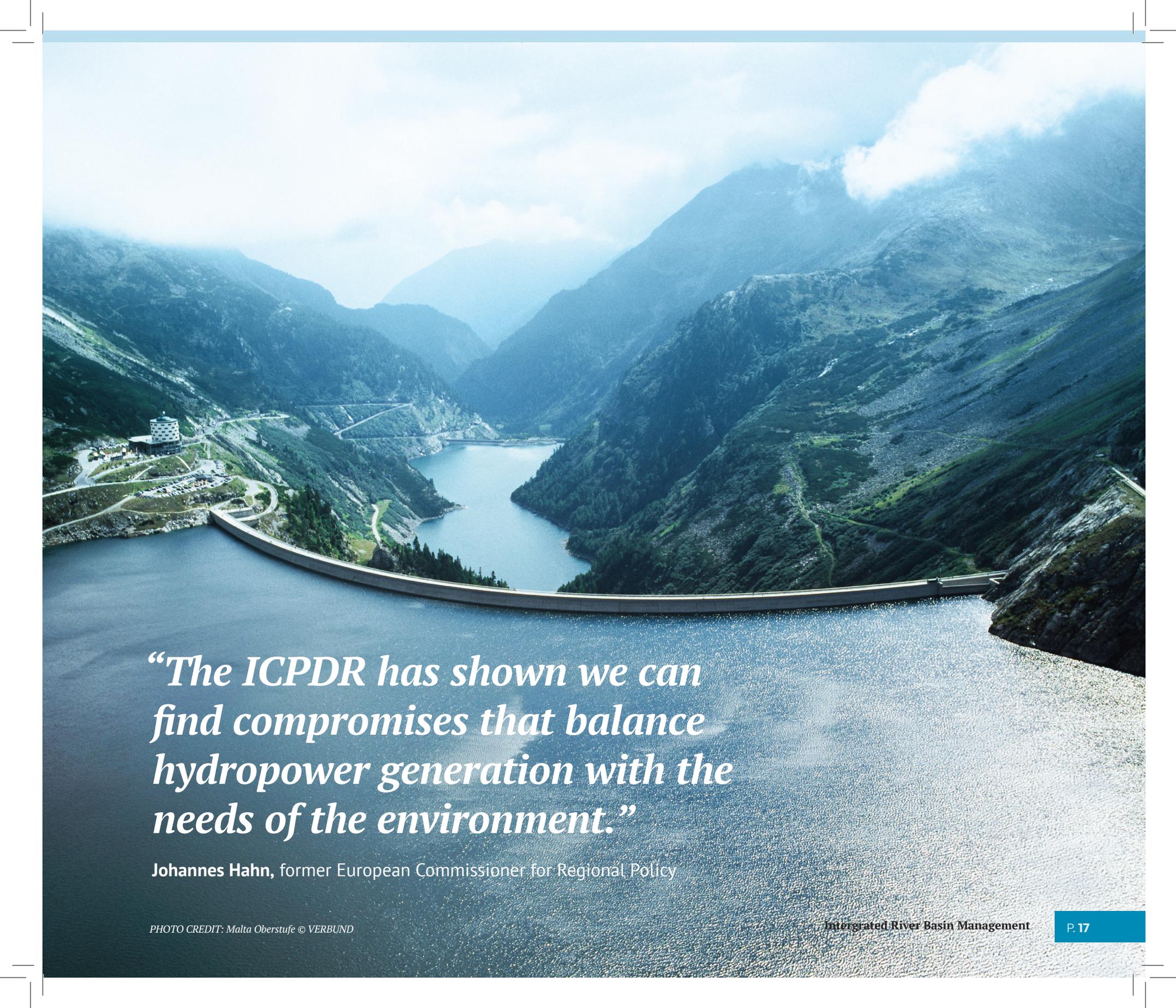
**The ICPDR is helping Danube countries to ensure that the growing demand for hydropower is balanced with the need to protect the environment and endangered fish species.**

Hydropower is an important renewable and clean source of energy for Danube countries such as Austria, Romania, Croatia, Slovenia, and Serbia. While hydropower helps to reduce greenhouse gases, the interruption of river continuity places significant pressure on river ecology and now threatens the survival of key fish species such as sturgeons.

A third of the Danube and a number of its tributaries are already impounded by 8557 hydropower stations, many of

which are located in the upper catchment. A number of new hydropower projects are now at different stages of planning and development throughout the Danube River Basin.

Over 100 species of fish are found in the Danube, including many migratory species such as Danube salmon and nase. Both large and small hydropower facilities can prevent these migratory fish species from reaching their spawning grounds.

A wide-angle photograph of a large concrete dam in a mountain valley. The dam is curved and spans across a river. To the left of the dam, there is a building and a parking area. The valley is surrounded by steep, rocky mountains with some green vegetation. The sky is blue with some clouds.

*“The ICPDR has shown we can find compromises that balance hydropower generation with the needs of the environment.”*

**Johannes Hahn**, former European Commissioner for Regional Policy

## CONT.

The Iron Gate I and II hydropower plants, which are jointly operated by Romania and Serbia, represent the largest hydropower dam and reservoir system along the entire Danube. Installing fish passes here would open up an additional 800 kilometres all the way upstream to the Gabčíkovo Dam in Slovakia and the Szigetköz region in Hungary. With the support of the ICPDR, the Governments of Serbia and Romania are now working closely to develop effective solutions to overcome the significant engineering challenge posed by a drop in the river level of 20-28m.

## CONSULTATION LEADS TO IMPROVED DECISION-MAKING

In 2010 Ministers from the Danube countries mandated ICPDR to trigger a broad discussion process with the hydropower sector and all relevant stakeholders with the aim of integrating environmental considerations into the management of new and existing hydropower plants.

In 2011 Austria, Romania and Slovenia volunteered to steer an innovative and participative process to develop *Guiding Principles on Sustainable Hydropower Development in the Danube Basin*. These Guiding Principles were shaped in fierce discussions between the hydropower sector and stakeholders such as environmental NGOs, ministries and the scientific community. They were adopted by the ICPDR in 2013.

Since 2013 the Guiding Principles have helped to create a common vision and practical recommendations for countries to improve the efficiency and environmental management of all existing and planned hydropower plants. The principles have also enabled all Danube countries to develop a more predictable and transparent decision-making process, thereby reducing potential conflicts between the goals of energy production and environmental protection.

The process of developing the Guiding Principles has also helped to share a range of best practices across the region, such as the integration of fish migration aids into the upgrades of existing facilities. They are also helping to ensure that any new sites for hydropower plants are selected to minimize environmental impacts on ecology, sediment flows and groundwater quality.

The Guiding Principles are also supported by a number of inspiring case studies from countries such as Austria, Slovenia and Germany that show where the quality of water and the wider natural environment does not have to be substantially degraded as a result of hydropower generation.

## AUSTRIA TARGETS 2027

Austria generates the highest share of electricity from hydropower in the EU and it has become a world leader in making hydropower more environmentally friendly. The ICPDR is working to ensure that best practices in the generation of sustainable hydropower are shared among all its member countries.

Verbund AG, Austria's largest electricity provider, meets about 40% of Austria's electricity demands and generates 90% of this energy from hydropower. The company also says its goal is to make the entire 352 kilometre length of the Austrian Danube passable for fish by 2027.

Since 2011 Verbund AG has been supporting 'LIFE+ Network Danube', a €25 million programme designed to implement an extensive network of measures on the Austrian part of the Danube. Developed with the support of the federal Ministry of Environment and the Fishing Associations of Upper and Lower Austria, the 'LIFE + Network Danube' includes Europe's longest fish pass at the Ottensheim power plant. This 14.2 kilometre bypass through the Innbach-Aschach channel was completed in autumn 2016 at a total cost of around €8 million.

One of the main goals of the 'LIFE+ Network Danube' project is the connection of existing ecologically sound areas and renaturation projects. The project aims to build on the efforts of previous LIFE projects along the Danube which have already succeeded in making 20 kilometres of the rivers Melk, Pielach and Ybbs passable for migrating fish species.

The Traisen is one of the largest rivers in Lower Austria and, in 1976, the Altenwörth power station went into operation as the most powerful electricity generator on the Danube. In the course of the construction work the Traisen estuary was relocated and the migration of fish was severely obstructed. In 2016, 40 years after construction, Verbund AG has now supported the LIFE+ project to completely rebuild a new river to restore fish migration and provide diverse habitats linked back to the wetlands.

## ICPDR'S STURGEON STRATEGY

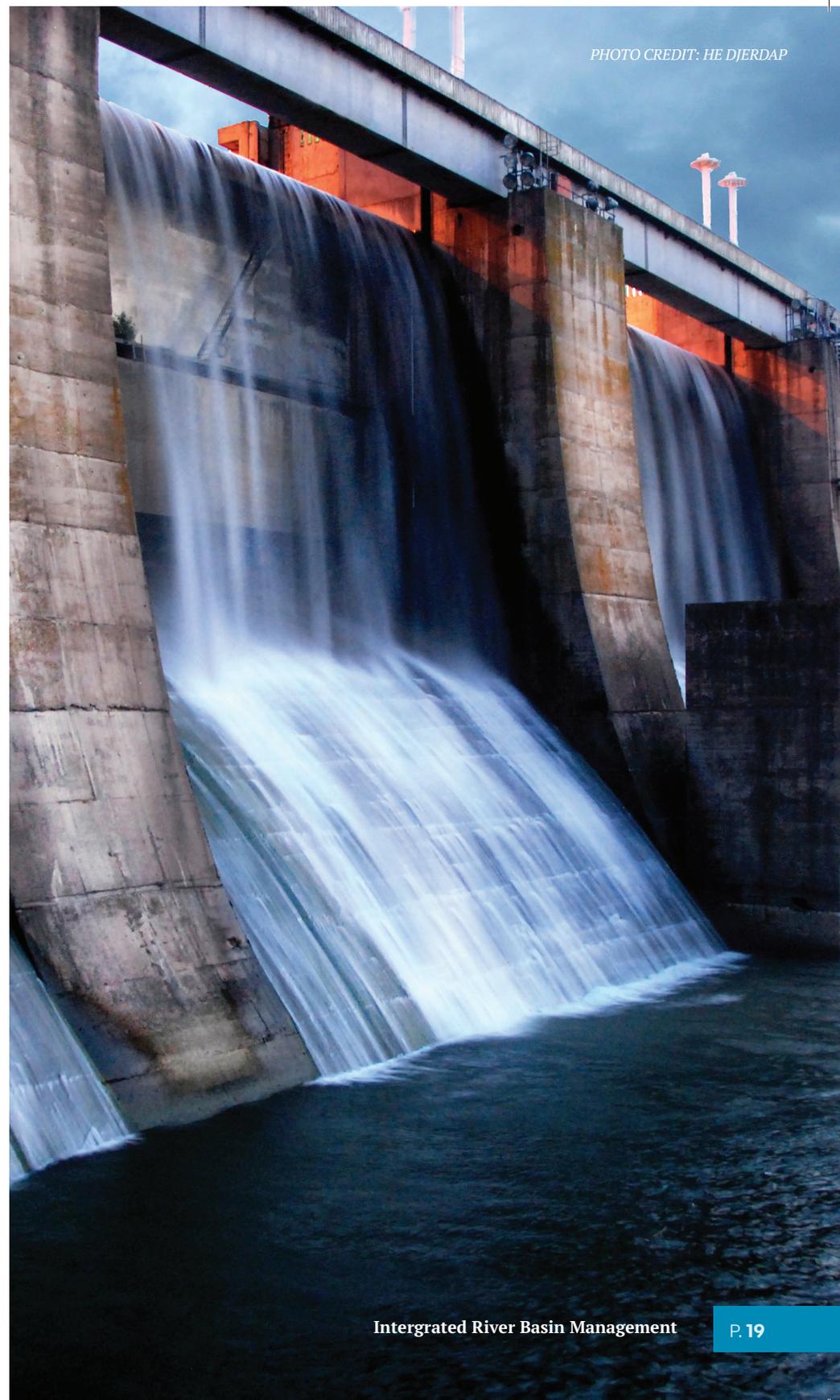
The ICPDR formally adopted its Sturgeon Strategy at the ICPDR Ordinary Meeting in December, 2017 as part of its efforts to ensure the survival and recovery of this ancient species in the Danube River Basin. The new strategy provides a comprehensive overview of actions and measures considered necessary for securing the survival of sturgeons by fostering cooperation between all national and international players dedicated to sturgeon conservation activities.

The ICPDR's Sturgeon Strategy will help to catalyze much needed cross-sectoral actions to secure the survival of Danube sturgeons. This includes an array of actions such as removing barriers blocking their migration, stopping the loss and deterioration of habitats and halting or mitigating other negative impacts such as pollution, overexploitation and trafficking. Making the Iron Gates and Gabčíkovo dams passable for sturgeons as is envisaged by the ICPDR Strategy will reopen precious sturgeon habitat upstream.

Sturgeons are an integral part of the natural heritage of the Danube River Basin. For over 200 million years sturgeons have outlasted the dinosaurs. However, according to the International Union for Conservation of Nature, they are now the most endangered species group on the planet.

This ancient migratory fish can grow up to seven meters in length and can live to be a hundred years old. Once present in large, viable populations in many rivers and adjacent coastal areas of the European Union sturgeons have now either completely disappeared or declined very dramatically over the past century. The largest stock of the sturgeon population in the European Union still living in the wild can be found in the lower Danube Catchment. All surviving stocks share the status of critically endangered species and their survival depends on imminent action.

PHOTO CREDIT: HE DJERDAP



# From Source to Sea

Cooperation between the countries of the Danube and the Black Sea is a global success story that witnessed the recovery of their shared ecosystem.

One of the key initial drivers for transboundary cooperation between the Danube and Black Sea countries was the significant decline of the Black Sea ecosystem following the collapse of the former Soviet Union. Growing levels of nutrient and organic pollution reached a peak in 1990 when about 40,000 km<sup>2</sup> of the Black Sea was considered “dead”.

Today the Black Sea has recovered. Nitrogen emissions have fallen by 20%, phosphorus by 50%, and the number of species has almost doubled from 1980 levels.

In 2001 the ICPDR and the Black Sea Commission implemented a Memorandum of Understanding (MoU) on common strategic goals. This MoU has set the strategic goals on long and mid-term reduction of pollution entering the Black Sea and it has also established a Joint Technical Working Group as the technical mechanism to achieve these objectives.

By bringing together representatives from the highest ministerial levels, technical experts, members of civil society and the scientific community, the ICPDR has contributed significantly towards improvements in the state of water bodies in the North Western Shelf of the Black Sea.

The 2001 MoU between the International Commission for the Protection of the Black Sea (ICPBS) and the ICPDR provided the framework that was needed for the implementation of common strategic goals.

The long term goal was to reduce the loads of nutrients and hazardous substances to permit Black Sea ecosystems to recover to conditions similar to those observed in the 1960s. The more intermediate goal was to take urgent measures in the wider Black Sea Basin to avoid that the loads of nutrients and hazardous substances that existed in the mid-1990s.

Since 1996 the Trans-National Monitoring Network (TNMN) in the Danube River Basin has provided an overview of the overall status and long-term changes of surface water and, where necessary, groundwater status in a basin-wide context (with particular attention paid to the transboundary pollution load).

From 2001-2007, the GEF Strategic Partnership on the Black Sea/Danube Basin consisted of capital investments, economic instruments, the development and enforcement of environmental law and policy, the strengthening of public participation, and the monitoring of trends and compliance.

Aided by cooperation and funding from the European Union, the GEF, the UNDP and the World Bank, a series of projects were launched in the early 2000s to reduce land-based nutrient inputs into the Black Sea from agriculture, municipal sewage and industrial discharges, as well as by trapping nutrients in restored flood plains and wetlands. About USD 500 million was invested in these projects and the expected nutrient input reduction to the Black Sea, mainly from the Danube Basin, was about 16,000 tonnes of nitrogen/year (20% reduction) and 5000 tonnes of phosphorus/year (50% reduction).

---

*“ Like other water sources, the Danube is under threat from pollution, human action, and climate change. The International Commission for the Protection of the Danube River plays a vital role in bringing together and inspiring countries to act for a cleaner and healthier river for all.”*

**Eric Solheim**, Executive Director, UN Environment

---

By 2007, the “dead zone” on the North Western Black Sea Shelf was virtually eliminated and oxygen levels are now at, or near, saturation in most areas of the Black Sea. The Danube and Black Sea ecosystems have seen improved water quality, less oxygen depletion, and improved biodiversity and conditions for local fisheries. Chlorophyll concentrations in the Black Sea have been reduced and the number of benthic species is increasing. The downstream impact of this has marked a decrease in the frequency of algal blooms, and the return of many species that had become locally extinct.

The ICPDR is strongly committed to further efforts to reduce nutrient pollution, especially from the agricultural sector but the Danube-Black Sea partnership still lacks the comprehensive assessment of the impact of the Danube pollution on the Black Sea that was originally envisaged in the MoU between the Black Sea Commission and ICPDR.

Today this partnership has forged closer cooperation between the implementation and monitoring of the two related Sustainable Development Goals on freshwater (SDG6) and on oceans (SDG14). The ICPDR also announced a voluntary commitment on SDG 14 at the UN Ocean Conference on 5-9 June 2017 in New York.

Because the ICPDR's Guidance Document on Sustainable Agriculture will provide the Danube countries with a new policy framework to support policies and measures to reduce nutrient loads, the implementation of this work will further contribute to the reduction of nutrient pollution and to the protection of coastal and marine ecosystems of the Danube River Basin and the Black Sea.

## ANGEL'S RETURN TO DANUBE DELTA AFTER 60 YEARS

In October, 2016, the Bivalve mollusc *Barnea candida* were observed in the Ukrainian part of Danube Delta for the first time in 60 years. During a marine coastal survey in the Danube Biosphere Reserve (Ukraine) a number of Angel molluscs were found and this observation confirms the reduction of eutrophication and the restoration of biodiversity in the Danube. The valves of the mollusc are white and when opened, look like angel's wings. *B. candida* occurs from Norway south to the Mediterranean and West Africa. It belongs to molluscs-borers. At crossings of radial and concentric edges in the upper part of its valves, sharp teeth (cloves) are located, allowing the mollusc to enter deeply into limestone, clay and wood.



Fig. 1. External view of mollusc “Angel’s wings”, *Barnea candida* (Linnaeus, 1758).

## MODELLING NUTRIENT EMISSIONS IN RIVER SYSTEMS

The MONERIS (Modelling Nutrient Emissions in River Systems) model developed by IGB Berlin is a critical tool in efforts to mitigate nutrient pollution. It calculates the nitrogen and phosphorus emissions from point and diffuse sources into surface waters and their transport to the sea. As a regionalized model MONERIS allows for identification of nutrient emission hot-spots and the development and assessment of effective measures at sub-catchment scale to reduce the nitrogen and phosphorus content within the water bodies. One of the key findings of MONERIS is that about half of the nitrogen discharged into the rivers is from agricultural sources such as chemical fertilisers and manure from intensive farming operations. Other sources include industrial and municipal wastewater and runoff from urban areas.

# Adapting to Climate Change

<b>APPROACH</b>	The ICPDR has developed a basin-wide climate change strategy to help Danube countries develop more effective water management approaches in the face of increasing extreme floods and droughts.
<b>ACHIEVEMENTS</b>	<ul style="list-style-type: none"><li>• Increased understanding of the impacts of climate change on water resources across the basin.</li><li>• Development of set of 'win-win, no-regret' and 'low-regret' adaptation measures, which are flexible enough for various conditions.</li></ul>
<b>LESSONS</b>	The combination of utilizing scientific knowledge and supporting consultation with a broad set of stakeholders has enabled the integration of climate change adaptation into the elaboration of the next Danube Regional Management Plan (DRBM) Plan and Danube Flood Risk Management Plan (DFRM).

**In 2012 the ICPDR was the first river basin commission in the world to develop a Climate Adaptation Strategy. At the 2010 Danube Ministerial Conference, Ministers asked the ICPDR to develop a Climate Adaptation Strategy for the Danube River Basin and Germany was nominated as Lead Country for this activity.**

As a part of this work Germany supported a study to develop greater understanding of the impacts of climate change on water resources across the basin, as the basis for an adaptation strategy.

In some parts of the Danube River Basin the drought risk is expected to increase drastically, leading to possible economic loss, potential for water conflicts and water use restrictions. Water quality is also expected to be impacted by a decreasing oxygen concentration in rivers, aquifers and lakes, while higher water temperatures may lead to increased algal blooms.

ICPDR's climate adaptation strategy says that drought, low flow events and water scarcity situations are likely to become more intense, longer and more frequent. The Carpathian Area, particularly the southern parts of Hungary and Romania, as well as the Republic of Serbia, Bulgaria and the region of the Danube Delta, are likely to face severe droughts and water stress resulting in water shortages.

An intensification of extreme events, such as droughts, leads to high impacts for sectors such as agriculture and industry. The ICPDR's basin-wide approach to climate change is now helping to provide water management information at the catchment scale so that countries can determine the most likely impacts and cooperate on suitable adaptation measures. The Climate Adaptation Strategy stresses that any potential conflicts need to be addressed at the earliest possible stage in the planning process together with the involvement of all key stakeholders and interest groups.

In 2015 significant parts of the Danube River Basin were affected by drought. In July 2015, absolute maximum temperatures were well above 40°C in several areas of Germany, Austria, Hungary and the Czech Republic, which all recorded their highest maximum daily temperatures since 1975. For those Danube countries which experienced a significant drought phenomena during 2015, agriculture was by far the most impacted sector.

---

*“The Danube River Protection Convention and the ICPDR are a clear demonstration that fruitful cooperation can be established in very complex settings, bringing benefits to all riparians. Sharing the experience of this cooperation in the Danube basin through the international platform of the UNECE Water Convention can also inspire other countries and basins around the world to work together on the sustainable management of shared water resources.”*

**Olga Algayerova**, Executive Secretary of the UNECE.

---

The most significant impact was on corn production but some countries also observed lower yields with later harvested plants like soya, sugar beet and rape seed.

Agriculture will also have to adapt to more frequent, longer and more intensive periods of drought in summer and many Danube countries are already adapting to the impact of droughts. However, many countries acknowledged the need for better monitoring data especially concerning the withdrawal of water for farming. In order to avoid or reduce the damage caused by droughts the ICPDR is working to support greater preparedness concerning the effective use of water across the entire agricultural sector.

Climate change impacts upstream can have implications downstream and vice versa. This is why international cooperation on the issue of climate change and water management will be one of the key issues regarding the implementation of the EU Water Framework Directive and its River Basin Management Plans, as well as the EU Floods Directive and its Flood Risk Management Plans.

The ICPDR adaptation strategy, and the study it is based on, are currently being updated to incorporate new developments in recent years. A new study and strategy will be available in 2018.

At a basin-wide level Danube countries are continuing to support development of green infrastructure, such as the extension of natural areas and the re-connection of wetlands and floodplains, which helps to support the protection and maintenance of a natural ecosystem. Further positive adaptation measures can also include the improved linkage between surface and groundwater, which also leads to increased robustness of water resources during potential periods of water scarcity and droughts.

*During the 2015 drought one of the most significant impacts was on the corn production*



# Managing Risks

<b>APPROACH</b>	The ICPDR is working to increase the safety of Danube communities by enabling countries to work together to reduce a range of risks from flooding, pollution and industrial hazards.
<b>ACHIEVEMENTS</b>	<ul style="list-style-type: none"><li>• The first Danube Flood Risk Management Plan has been prepared reviewing the strategic level measures across the entire river basin.</li><li>• The inventories of Accident Risk Spots and of Contaminated Sites in the Danube River Basin have been elaborated.</li><li>• The Danube Accident Emergency Warning System is in 24/7 operation.</li></ul>
<b>LESSONS</b>	<ul style="list-style-type: none"><li>• Implementation of the Danube Flood Risk Management Plan reduces the flood risks across the whole basin and provides for effective flood protection, prevention and mitigation.</li><li>• Development of accidental risk inventories is a prerequisite for establishing and implementing a sound and coherent accident prevention policy in the Danube River Basin.</li><li>• The Danube Accident Emergency Warning System effectively enables the timely activation of measures that would prevent extensive damage to people and ecosystems caused by pollution accidents.</li></ul>

## THE DANUBE'S FIRST FLOOD RISK MANAGEMENT PLAN

**The increasing frequency of major flood events in the Danube River Basin has raised serious concerns about the role of climate change on increasing flood risks. In this new millennium major flood events have already occurred in 2002, 2005, 2006, 2009, 2010 and 2013. The floods in June, 2013, alone resulted in economic costs of €2.4 billion.**

The ICPDR's 2015 *Danube Flood Risk Management Plan*, which is based on the EU Floods Directive, focuses on the strategic management of flood risks across the entire river basin. This regional plan complements the national flood risk management plans, which provide more detailed information on measures such as flood maps.

A core foundation of the *Danube Flood Risk Management Plan* is the practical application of the Solidarity Principle which is designed to prevent countries from simply exporting their flood problems to downstream neighbours. The application of this principle is essential because structural flood protection, such as dykes and demountable barriers, may also lead to transferring more water downstream during extreme flood events.

The *Danube Flood Risk Management Plan* supports every effort to retain rainfall and store excess water locally, before releasing it downstream. Natural water retention measures include wetlands, restoration of flood plains and land-use changes such as the increased planting of grasses and forest areas.

Changes in land use in rural and urban areas can also worsen flood effects. The key lessons from the 2010 floods have shown that the risk of flood damage could be dramatically reduced by creating dry polders, revitalizing floodplains and providing regular maintenance of river channels to ensure unhindered flow during extreme flooding events.

## ACCIDENT PREVENTION

The Danube Accident Emergency Warning System (AEWS) is activated whenever there is a risk of transboundary water pollution, or threshold danger levels of hazardous substances are exceeded. The AEWS sends out international warning messages to countries downstream based on a predefined routing scheme. Details about each incident, such as time, place, involved substances, causes, observed effects, and counter measures taken, are collected in predefined forms and then automatically translated into the recipient's language. This helps the authorities to put environmental protection and public safety measures into action.

The system underwent a major test in 2000, during the Baia Mare and Baia Borsa spill accidents on the Tisza River. The system effectively enabled the timely activation of measures that prevented more extensive damage to people and ecosystems downstream along the Tisza River.

The AEWS operates on a network of Principal International Alert Centres (PIACs) in each of the participating countries. These centres are made up of three basic units:

- Communication Unit (operating 24 hours a day), which sends and receives warning messages;
- Expert Unit, which evaluates the possible transboundary impact of any accident using the database of dangerous substances;
- Decision Unit, which decides when international warnings are to be sent.

The ICPDR Secretariat operates and maintains the Danube AEWS server. To ensure good performance and 24/7 preparedness of the Danube AEWS regular tests of the system are taking place twice a year. The ICPDR is also using the test results to continuously improve and fine-tune the system.



*“The case for countries to work together is particularly compelling when water related risks extend across borders. But cooperation amongst governments also raises the question of what to do, who takes action, at which level and how?”*

**Mari Kiviniemi**, Deputy Secretary-General, OECD & former Prime Minister of Finland

# Public Participation

<b>APPROACH</b>	Public participation in environmental decision-making is critical to the successful management of the water resources of the Danube River Basin. The ICPDR supports the active involvement of stakeholders and civil society on all levels of its work.
<b>ACHIEVEMENTS</b>	<ul style="list-style-type: none"> <li>• Danube Day has been celebrated every year since 2004.</li> <li>• 2015 Public Consultation process for the two plans (the Danube River Basin Management Plan and The Flood Risk Management Plan) was open to all stakeholders basin-wide.</li> <li>• The 2017 Danube Day festivities mobilized 33,000 people in 230 events across 14 countries.</li> </ul>
<b>LESSONS</b>	<ul style="list-style-type: none"> <li>• Increased involvement of stakeholders brings more ownership to ICPDR countries.</li> <li>• Establishing and implementing a sound and coherent communication and public participation process in the Danube River Basin has enhanced the effectiveness of the ICPDR.</li> </ul>

**Every year on 29 June, Danube Day commemorates the anniversary of the signing of the Danube River Protection Convention in Sofia, Bulgaria, in 1994. Danube Day has become the largest river festival in the world, with huge festivals on the riverbanks and public meetings as well as educational events.**

Mr. Vasyl Gubal is mayor of Kvasovo, a small Ukrainian village of 900 inhabitants, located in the Tisza Basin, not far from the Hungarian border. Since 2009 Kvasovo has been actively participating in Danube Day and Mr. Gubal believes that it is really the local communities that are the key to protecting the Danube.

“Local communities are actually the ones who put actions into practice. For example, we conduct river clean ups twice a month on Saturdays, we also collect and separate plastic and glass and are pushing hard for a centralized wastewater system,” he says.

Mr. Gubal says the entire community has been motivated by direct observation of environmental changes that have impacted the Borzhava River, a tributary of the Tisza River, which feeds into the Danube.

“We are observing more strange weather patterns, with extreme heat or extreme cold and rain,” he says. He adds that in 2001 the village suffered greatly from the catastrophic floods and was then selected as a pilot site for the introduction soft mitigation measures.

Danube Day is a basin-wide celebration reflecting the diversity of the region. The celebration pays tribute to the vital role that the Danube and its tributaries play in people’s lives, providing water, food, power, recreation and livelihoods.

Maria M. Galambos, Chief Adviser Department of International Relations at Hungary’s Ministry of Agriculture, believes that Danube Day allows all Danube countries to celebrate the diversity of its communities and to share their appreciation for the river and its biodiversity.

“Danube Day provides a great opportunity to organize joint events between countries that directly demonstrate the need for international cooperation to protect our shared river,” she says.

In 2017 the ICPDR asked everyone in the basin to get active for a “Cleaner Danube”. The 2018 motto is “Get active for a healthier Danube” inspired by the 2016 Danube Declaration which has made it a priority for all Danube Basin countries to make the Danube River Basin cleaner, healthier and safer for everyone to enjoy.

## ENCOURAGING PUBLIC PARTICIPATION

The ICPDR supports the active involvement of the public and civil society at all levels of its work, such as the development of the Danube River Basin Management Plan and the Flood Risk Management Plan. The ICPDR's public participation approach allows all of the Danube Basin's residents to make their voices heard and get involved to help restore the water resources of the basin and safeguard them for future generations.

In its commitment to directly involve stakeholders, the ICPDR goes far beyond its legal requirements. In order to ensure that civil society and the wider public can be more meaningfully involved in its work, the ICPDR places a strong emphasis on public information, education and outreach activities. This is because of a firmly held belief that active public participation supports greater understanding, facilitates broader support for policies and leads to greater efficiency in the implementation of management measures.

The ICPDR actively engages in public participation through the direct involvement of twenty-three observer organisations such as the Danube Environmental Forum (DEF), the Danube Tourist Commission (DIE DONAU) and the World Wide Fund for Nature – Danube-Carpathian Programme (WWF-DCP). It also supports a number of activities that ensure a high level of public consultation in the development of the ICPDR management plans such as stakeholder workshops, online surveys and public calls for the submission of comments on draft documents.

In recent years one of the best illustrations of stakeholder involvement was the stakeholder consultation workshop Voice of the Danube on the draft DRBMP Update 2015 and the DFRMP, which was held in Zagreb, on 2-3 July 2015. The workshop targeted specialists with expertise in water management, and was implemented by the ICPDR together with the Global Water Partnership. In total, over 80 participants represented a broad range of backgrounds, from academia, to the national and international public sector, to non-government organisations and corporate entities.



*“If we want to achieve significant results in river conservation we need to unite decision-makers and local communities.”*

Mr. Vasyl Gubal, Mayor of Kvasovo village

**Contributing authors (ICPDR Secretariat):**

Adam Kovacs

Igor Liska

Helene Masliah-Gilkarov

Ivan Zavadsky

**Production team:**

**Lead Editor:** Steve Menzies

**Design:** Susan Tiumalu

**Production Date:** April 2018

**Production:** Flinchmarketing.com

[www.icpdr.org](http://www.icpdr.org)

**ICPDR Secretariat**

Vienna International Centre, Room D0412  
Wagramer Strasse 5, A-1220 Vienna, Austria

**E-Mail:** [secretariat@icpdr.org](mailto:secretariat@icpdr.org)

**Telephone:** +431 260 60 5738

**Fax:** +431 260 60 5895



Intergovernmental  
Oceanographic  
Commission



This publication was produced with the financial support of the "GEF International Waters: Learning Exchange and Resource Network"

**COVER PHOTO BY DANIEL GHEORGHITA**  
[WWW.BYDANIEL.ME](http://WWW.BYDANIEL.ME)