



Convention of the Protection and Use of Transboundary Watercourses and International Lakes
Seventh meeting of the Global network of basins working on climate change adaptation
25-26th May 2023

Progress report of the Global network of basins working on climate change adaptation as of April 2023

The global network of basins working on climate change adaptation was created by the secretariat of the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention), serviced by the United Nations Economic Commission for Europe (UNECE), in cooperation with the International Network of Basin Organizations (INBO) in 2013. It aims to promote cooperation on adaptation in transboundary basins, to compare different methodologies and approaches for adapting to climate change and to promote a shared vision between the participating basins.

The network includes on the one hand several pilot basins where UNECE, INBO and their partners implement activities and, on the other hand, additional basins which primarily work on their adaptation activities themselves in accordance with the agreed decisions of their governing bodies or with the terms of reference of international projects. The network allows for the exchange of experience, learning from each other, establishing contacts between basins and their experts, discussing challenges and lessons learnt etc. The network activities include regular meetings of all basins, larger workshops, trainings and development of guidance.

The following basins are included into the Global network:

1. The Amazon river basin shared by Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela, activities are implemented by the Amazon Cooperation Treaty Organization (ACTO).
2. The Chu Talas river basin, shared by Kazakhstan and Kyrgyzstan¹, activities implemented by the Chu Talas Water Management Commission, United Nations Development Programme (UNDP) and UNECE.
3. The Congo river basin, shared by Angola, Cameroon, Central African Republic, Gabon, Democratic Republic of the Congo and Republic of the Congo, activities implemented by the International Commission of the Congo-Oubangui-Sangha Basin (CICOS).
4. The Danube river basin, shared by Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Republic of Moldova, Montenegro, Romania, Serbia, Slovenia, Slovak Republic and Ukraine, activities implemented by the International Commission for the Protection of the Danube River (ICPDR).
5. The Rivers and Wetlands of Dauria Steppes (Upper Amur, Ulz-Torey, Selenge-Baikal basins), shared by China, Mongolia and the Russian Federation, with the activities implemented by WWF Russian Federation, Daursky Biosphere Reserve and Rivers without Boundaries International Coalition.
6. The Dniester river basin, shared by the Republic of Moldova and Ukraine, activities implemented by the Commission on Sustainable Use and Protection of the Dniester River Basin, UNDP/GEF, Organization for Security and Cooperation in Europe (OSCE) and UNECE.

¹ The listed countries include only the members of the river basin organisations in all basins where they are established.

7. The Drin river basin, shared by Albania, the Republic of North Macedonia, Kosovo² and Montenegro and Greece, activities implemented by the Global Water Partnership Mediterranean, on behalf of the Drin Core Group.
8. Lake Victoria basin, shared by Burundi, Kenya, Rwanda, Tanzania, and Uganda, activities implemented by the Lake Victoria Basin Commission.
9. The Lower Mekong River Basin, shared by Cambodia, Laos, Thailand and Vietnam, activities implemented by the Mekong River Commission.
10. The Meuse river basin, shared by Belgium, France, Germany, Luxembourg and the Netherlands, activities implemented by the International Meuse Commission.
11. The Neman river basin, shared by Belarus, Lithuania and the Russian Federation, activities implemented by UNDP, United Nations Educational, Scientific and Cultural Organization (UNESCO) and UNECE.
12. The Niger river basin, shared by Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Guinea, Mali, Niger and Nigeria, activities implemented by the Niger Basin Authority.
13. The North Western Sahara Aquifer System (NWSAS)⁵, shared by Algeria, Libya, Tunisia, activities implemented by the Sahara and Sahel Observatory (OSS).
14. The Rhine basin, shared by France, Germany, Luxemburg, the Netherlands and Switzerland, activities implemented by the International Commission for the Protection of the Rhine (ICPR).
15. The Sava river basin, shared by Bosnia and Herzegovina, Croatia, Montenegro, Serbia and Slovenia, activities implemented by the Sava River Basin Commission.
16. The Senegal river basin, shared by Guinea, Mali, Mauritania and Senegal, activities implemented by the Senegal River Basin Development Authority.
17. The Sixaola river basin, shared by Costa Rica and Panama, activities implemented by the Binational Commission of the Sixaola River Basin.
18. The Volta river basin, shared by Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali and Togo, activities implemented by the Volta Basin Authority.

More information about the activities and progress of the pilots and basins 1-18 is provided below³.

² United Nations administered territory under Security Council Resolution 1244 (1999).

³ Updates provided by the basins; the UNECE secretariat is not responsible for the correctness of the information.

1. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE AMAZON BASIN

1. Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

The Amazon ecosystem is highly vulnerable to climate change. The increase in temperature and the alteration of the water cycle are significantly affecting natural systems with the respective impacts on the socioeconomic systems, including significant impacts on the most vulnerable populations whose livelihood is strongly associated with the integrity of the ecosystem.

According to the *Amazon Assessment Report 2021* published by the Science Panel for the Amazon, nowadays the Amazon is about 1.2°C warmer. Higher incidence of extreme hydroclimatic events, with more severe floods and droughts, is impacting Amazonian ecosystems and their functioning. Forests are more susceptible to drought and fires, while floodplain systems are vulnerable to changes in flood regimes. At the same time, the decrease in precipitation in the dry months affects aquatic ecosystems, negatively impacting their natural habitats and fish reproduction regimes. Likewise, the increase in water temperature can affect temperature-dependent species, and the reduction of dissolved oxygen in the water, which can lead to favouring exotic invasive species.

Moreover, the Amazon is also suffering the gradual loss of its tropical glaciers with significant impacts on water balance in some sub-basins impacting community/urban water supply and environmental functions. In addition, the sea level rise is a factor in coastal erosion affecting important coastal mangroves.

2. What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

In 2022, ACTO advanced in the expansion of the scope of the **Amazon Regional Observatory - ORA**. The Observatory is a comprehensive Information Reference Center on the Amazon Region, where information is produced and shared between institutions, government authorities, scientific institutions, academia, and civil society from ACTO Member Countries (Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela). The ORA can be accessed at: www.oraotca.org. During 2022, the Organization advanced in developing a new module of the Observatory specifically dedicated to Climate Change and Adaptation issues in the Amazon.

ACTO also advanced in further defining the operation and related products of the Regional **Water Situation Room**, which is receiving data from the Amazon Hydrological Network (AHN) and ACTO Regional Water Quality Monitoring Network (RWQMN) and systematically tracking various aspects related to water resources and extreme weather events in the Amazon Region. Both networks are being supported with official information from Member Countries and became fully operational in 2022, providing relevant data to the ORA.

ACTO also advanced in the implementation of climate change **adaptation activities** under the implementation of the Amazon Basin Strategic Action Program, specifically on issues related to adaptation to the impacts of glaciers loss in the Andes mountains (in Bolivia and Peru) and transboundary aquifers (Brazil and Colombia). Moreover, climate change scenarios have been integrated in the development of the Regional Hydrological Platform and the Water-Energy-Food Nexus Simulation Model for the Amazon Basin.

3. Name and short description of the flagship adaptation activity your organization wishes to highlight

ACTO started activities to build a Climate Change Module and strengthen other modules such as Biodiversity and Forest within the Amazon Regional Observatory, including benchmarking of existing GHG emissions baselines with countries' NDCs and climate resilience and adaptation actions, and also oriented to developing a financial facility and strategic guidelines for climate finance to strengthen and promote resilient economy in the Amazon.

4. Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?

The 8 Basin countries assessed the main challenges in climate change adaptation in the Amazon from a transboundary perspective, including the following issues: lack of regional data and information related to variables relevant to climate change adaptation in order to facilitate decision-making at the basin scale; lack

of a regional information platform consolidating official multi-thematic data on the Amazon; lack of hydroclimatic vulnerability mapping of the basin; insufficient knowledge of socio-economic gaps in the region, insufficient tools to respond efficiently to extreme hydroclimatic events; and insufficient availability of financial resources for regional initiatives.

To overcome these challenges, ACTO has advanced in the regional cooperation to establish a regional hydrological and water quality monitoring networks covering the whole basin, adopting a multi-step approach. At the same time, the Organization has advanced in the building of the different modules of the Amazon Regional Observatory, including the thematic Module on Water Resources, the Amazon Monitoring Networks Module, and the Module on Climate Change, among others. In addition, the Organization is implementing the Strategic Action Program (SAP) which includes agreed strategic actions to address climate change impacts and improve socioeconomic and ecosystems resilience in the basin.

Regarding financial resources, this challenge still remains to be fully overcome. So far, the Organization has partnered with other organizations and institutions such as UNEP, IDB, KfW, EU, GIZ, CAF, among others, and have promoted South-South cooperation with resources from the Brazilian Cooperation Agency (ABC) and the National Water and Basic Sanitation Agency (ANA) of Brazil.

5. Which lessons learned would you like to share with other basins?

- a. Incorporating climate change adaptation in all institutional strategies (Water Resources Management, Biodiversity, Forest, etc.) promotes regional cooperation and actively supports adaptation to critical climate change impacts at the basin and national levels.
- b. A Regional Organization plays a critical role in providing space for sharing experiences, innovative tools and lessons learned in improving climate resilience, facilitating regional actions and mobilizing and channeling financial resources for adaptation to climate change.
- c. Availability and analysis of data and information at the basin level support both regional and national decision making for improving approaches and tools for adaptation decision-making and action.
- d. Transboundary cooperation in border areas is crucial for strengthening both monitoring and early warning systems to quickly and effectively respond to climate change-related extreme events avoiding major losses and damage.
- e. Institutional strengthening and coordination, decrease in asymmetries among basin countries and public participation are necessary conditions for effective adaptation to climate change.

6. What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

In the Amazon basin, adaptation to climate change and variability has been included as one of the three Strategic Response Lines of the Strategic Action Program (SAP) for Integrated Water Resources Management adopted by the eight ACTO Member Countries in 2017. Under the SAP, the riparian countries agreed to implement strategic actions oriented to establishing and operating prevention, early warning and risk management systems, and a network of hydrometeorological stations to improve the ability of local governments and people to cope with droughts and floods, while minimizing human and socioeconomic losses. In addition, national actions are addressing issues such as coastal erosion and mangrove loss due to sea level rise; impacts on urban and community water supply in the context of glacier melting; and the use of groundwater alternatives in view of poor superficial water quality due to increased flooding, among others. The SAP is currently under implementation through several regional initiatives such as the Amazon Basin SAP Implementation Project, the Amazonas Project: Regional Action in the Area of Water Resources, the Nexus Model, etc. carried out in partnership with the 8 countries and UNEP/GEF, ANA-ABC (Brazil), IDB and others.

7. How do you finance your climate change activities? How do you plan to finance the implementation of measures?

Climate change activities at the basin level are mainly financed by regional cooperation initiatives led by ACTO in partnerships with UNEP/GEF, KfW, IDB, ANA/ABC-Brazil, etc. and national counterpart resources. In the framework of the Amazon SAP Implementation Project, ACTO is promoting the development and/or strengthening of the countries' capacities for conservation financing considering climate change adaptation and innovative financing mechanisms as well as sharing of good practices among the countries.

Finally, ACTO has partnered with the CAF to advance in the development of a climate finance facility and Strategic Guide, as an accessible tool or instrument for climate finance, for Amazon projects, plans and programs. Pipeline tool for initiatives and project prioritization mechanisms based on climate criteria will also be established.

8. How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

Climate change adaptation activities in the Amazon are carried out in parallel at the transboundary, national and local levels according to the agreed priority issues. Thus, the Amazon Hydrological Network and the Regional Water Quality Network provide regional data and information through the Amazon Regional Observatory, while based on both national and regional monitoring data. Likewise, the regional Situation Room will soon be connected to 8 national situation rooms, and national institutional coordination will provide the respective responses to the alerts issued. In addition, specific national interventions support the implementation of the adaptation priorities in the Amazon.

Thus, the Strategic Action Program will be implemented also through National Action Plans, including adaptation strategies and activities at the national level.

Also, ACTO is currently advancing in the development of Benchmarking Report document, with existing GHG emissions baselines, identifying country NDCs for the Amazon and climate resilience and adaptation actions, in collaborating with CAF.

9. Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

The ACTO Strategic Action Program includes actions on wetland monitoring and protection leading to a development of a Regional integrated management plan for the headwaters, páramos and wetlands of the Amazon basin. At the same time, the issue of drought management is included in the actions oriented to creating systems to forecast and warn about extreme hydroclimatic events, focusing on droughts and floods. ACTO is currently supporting the implementation of actions to consolidate a database for monitoring environmental status and health of upper catchment regions, moorlands and wetlands as input to regional protection plans; implementing mangroves' protection actions in the Suriname coastal area; and supporting the establishment of early warning systems for floods and droughts in vulnerable transboundary areas.

10. Future planned activities

The Organization will advance in the implementation of the Strategic Action Program and the Amazon Regional Observatory (ORA) with focus on the Climate Change Adaptation strategic actions agreed by the 8 ACTO Member Countries and the further development of the Climate Adaptation Module and the Amazon Regional Platform of Indigenous Peoples. Further, ACTO will be promoting the development of a regional strategic planning for climate-resilient economy and water services in the Amazon.

In addition, ACTO will advance the implementation of monitoring, forecasting and early warning systems in the Amazon, and will support the updating of the Hydroclimatic Vulnerability Atlas of the Amazon Region.

11. Contact details

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2. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE CHU TALAS BASIN

1. Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

According to a study by experts from the Chu-Talas Water commission (the Commission), glaciers in the upper mountain portion of the Chu-Talas River basins are melting.

Over the last 30 years, rising temperatures have been observed, leading to an overall increase in aridity and decreased availability of water resources, and deteriorating water availability in the lower Chu-Talas basin, especially in the Kazakh part of the basins.

Declining river flow in recent decades has had a negative impact on wetlands and biodiversity in the lower river basins in Kazakh territory.

2. What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

As part of the Commission Secretariat's Environmental Working Group (EWG), the amount of water resources necessary to conserve wetlands of international importance in the Chu River basin was assessed.

- In 2021, the Kazakh subgroup of the EWG concluded that the lower Chu River basin fully complies with Ramsar criteria. The following issues were identified: "Over the last 30 years, water flow into the Chu River delta has sharply decreased, due to growing water consumption, intensified economic activity, the construction of new reservoirs, storage reservoirs, etc., which upset the water balance. Generally speaking, desertification, the drying up of unique landscapes, a practical decline in fisheries in bodies of water, the disappearance of some fish species, a drop in the number of nesting aquatic birds, problems with the development of hunting activity and a sudden drop in the population of valley settlements have all been observed.

- In 2022, the Kyrgyz subgroup of the EWG identified the following problems in the areas belonging to the Chu basin, which were nominated to the Ramsar list, namely the Orto-Tokoi Reservoir and the Left Bank of the Chu River (between the Alamedin and Ak-Suu Rivers): "As a result of human activity, some species of flora and fauna have entirely disappeared, while others are endangered".

Preserving these ecosystems will facilitate adaptation to climate change (SDGs 6 and 13).

3. Name and short description of the flagship adaptation activity your organization wishes to highlight

Due to the climate changes observed in the Chu and Talas River basins, preventive measures to reduce the risks to human life, the economy and environment are necessary.

Priority measures include:

- introducing modern water-saving irrigation methods, adapting, and cultivating less water-intensive crops, etc.
- improving the quality of observations, hydrological monitoring, and forecasting.
- informing the population of the risks of climate change and opportunities for adaptation, as well as the importance of introducing water-saving technology.

4. Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?

As a result of international projects supported by the Commission, Secretariat and expert working groups between 2005 and 2019:

- Insufficient water accounting and major water losses were revealed and found to be due to a lack of modern measuring tools and monitoring systems. As a result, the Commission began creating products for data exchange, such as automated SCADA systems at water management facilities for transboundary and domestic use, and the Interactive Operational Hydrological Bulletin for use by national parties. Unfortunately, however, real time data exchange between countries currently remains a challenge.

- In order to ensure transparency in transboundary water allocation, separate automated software programmes were created for joint water distribution and water accounting for the Chu and Talas basins. Currently, those programmes are not yet fully operational, and further improvements are needed.

Currently, there are still unresolved issues with a negative impact on the development of cooperation, including the lack of an agreement between the countries on the construction and reconstruction of hydraulic facilities in the upper Chu-Talas basin. This is in violation of procedures adopted earlier for the distribution of water resources from these rivers and may lead to irreversible environmental consequences. The Commission is working to address these matters.

5. Which lessons learned would you like to share with other basins?

Each river basin needs a water balance.

Members of the public as well as a wide range of experts are necessary.

6. What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

The strategy has already been developed and approved, and a joint statement on launching a new project to promote the IPA and seek investment for implementing activities will be signed at the upcoming Commission meeting.

7. How do you finance your climate change activities? How do you plan to finance the implementation of measures?

In 2022, in order to ensure Kazakhstan's equal participation, repair and reconstruction projects were carried out at the Kirov reservoir dam. In particular, cone gate 6 was replaced with a new model, financed with **196.26 million tenge or approximately 423,000 US dollars** from the national budget.

In 2022, experts from the Commission Secretariat's working group on dam safety conducted an inspection of the cone gates at the Orto-Tokoi reservoir dam and submitted relevant proposals and recommendations in order to improve the cone gates' operations.

Financial support from international institutions is necessary to resolve issues related to adaptation to climate change, as most of these problems are regional or transboundary in nature.

Currently, pursuant to the protocol decision, the Chu-Talas Commission and its Secretariat are seeking funding for adaptation activities, such as continuing the project on assessing wetlands, flora and fauna for the conservation of wetlands and biodiversity in the Chu River basin in the Parties' border territories, as well as the creation of an Atlas of Ecological Areas of the Chu River Basin, including plant and animal habitats.

8. How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

Adaptation measures outlined in the joint CPD are reflected in the Plan of Action of the Kyrgyz Republic and the National Plan of Action of the Republic of Kazakhstan.

9. Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

Measure to ensure the conservation of wetlands in the lower Chu and Talas Rivers are laid out in the National Action Programme of the Republic of Kazakhstan.

Pursuant to paragraphs 2 and 7 of this report, at its last meetings, the EWG reviewed and discussed the assessment of wetlands, flora and fauna, as well as biodiversity for conservation of the territories in our countries nominated for the Ramsar list. The EWG's decisions have been submitted for consideration by the Commission.

10. Future planned activities

Strict implementation of the short, medium and long-term objectives of the joint IPA, National Plan of Action of the Republic of Kazakhstan and Plan of Action of the Republic of Kyrgyzstan.

In the future, the process of implementing integrated water resources management in the transboundary Chu and Talas River basins will include the creation of an International Basin Council to support the Commission's activities (currently, both countries have approved basin councils, which may become part of the future international body).

To jointly address transboundary cooperation issues related to water and climate with the International Network of Basin Organizations, along with training to bring the system closer to global standards.

11. Contact details

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3. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE IN THE CONGO BASIN

1. Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

- Recurring floods;
- Draughts;
- Rising temperatures, etc.

2. What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

- Strengthening stakeholders' capacities in monitoring water resources using satellite technology (satellite altimetry);
- Drafting monitoring reports of the water balance, brushfires;
- Mapping soil use and the dynamic in flooded zones under the Central Basin forests;
- Mapping the evolution of the biodiversity habitat;
- Launching a project to improve the Water Information System, etc.

3. Name and short description of the flagship adaptation activity your organization wishes to highlight

- Establishing Climate Observation Units in member states
- Drafting Alerts:
 1. On flooding and draughts;
 2. On forest degradation on smartphone apps;
- Evaluating water resources vulnerabilities in the Congo basin in a context of climate change.

4. Which major challenges did you face with regards to transboundary cooperation and climate change adaptation?

- Building synergy with the CICOS and various ministerial entities of Member States involved with addressing climate change;
- Sharing data among neighbouring countries;
- Densifying the hydrometric network in the Congo Basin;
- Feeding the Hydrological Information System with data.

How did you overcome them?

- Implementing the National and Regional Concertation Platform;
- Establishing water user networks;
- Supporting the densification of national hydrometric networks through hydrological measures equipment and others (PCD, satellite reception stations, etc.)

5. Which lessons learned would you like to share with other basins?

6. What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

Not yet drafted

7. How do you finance your climate change activities? How do you plan to finance the implementation of measures?

Currently, financing for activities related to climate change is achieved with support from development partners and our own fund.

We plan to access the climate fund.

8. How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

No.

9. Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

- The Modelling and Water Resources Allocation Tool in the Congo basin, which considers various climate change scenarios in hydraulic development projects in the Congo basin;
- The SDAGE and its measures programme;
- The Strategic Plan of Action for promoting navigation in domestic waterways;
- Producing information on the water balance of the Congo basin subbasin;
- Strengthening operational capacities in national bodies responsible for monitoring water in CICOS Member States.

10. Future planned activities

- Conducting a study assessing the vulnerability of water resources in the Congo basin in the face of climate change;
- Mapping risks (flooding, draughts, pollution, etc.);
- Drafting the climate change adaptation strategy for the Congo basin;
- Drafting reports on trends in biophysical parameters (temperature, precipitation, evapotranspiration, etc.) in the Congo basin subbasin through a geo services platform called “Managing Water and Natural Resources in Central Africa” (GERNAC).

11. Contact details

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4. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE DANUBE BASIN

1. Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

Findings of the ICPDR Strategy on Adaptation to Climate Change Update 2018 and the Danube River Basin Management Plan Update 2021 show that water availability is likely to decrease in the southern and eastern parts of the Danube River Basin due to the expected changes in climatic conditions, whereas it will remain unchanged or even increase in the northern and western part. Changes in water availability can highly differ locally and regionally. Nevertheless, a north-westward shift of regions affected by water stress is expected until the end of the 21st century. Runoff is projected to significantly decrease until the end of the 21st century, whereas only little change is projected in the next decades. According to precipitation, changes in runoff seasonality are expected. The assessment of future extreme hydrological events like floods and droughts includes high uncertainty. However, there is consensus that extreme hydrological events will occur more often and be more intense. Following the future increase in air temperature, water temperature will most likely increase in the Danube River Basin.

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 can have severe economic consequences for 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 analysis of the Danube water temperature data showed that the water temperature has risen significantly since the mid-1970s. The gradient is between 0.035 ° C/Year (Kienstock/DE) and 0.054 ° C/Year (Bezdan/RS). Due to changes to all temperature-dependent chemical and biological processes, as well as increasing flood and drought events, the pressure on water quality in rivers and lakes will increase. An intensification of extreme events, such as floods and droughts, leads to high impacts for agriculture, forestry and industry, as well as built-up areas and infrastructure. As a consequence of decreasing water availability, a shortage in water supply is expected in some areas. There will not be enough water to meet the requirements for irrigation in agriculture and the vegetation period will shorten in large areas in the south of the Danube River Basin. In contrast, in the northern parts there will be enough water for productive farming. A shift in species distribution and an increasing risk of invasive species is expected due to changing climatic conditions. An increase in air and water temperature, combined with changes in precipitation, water availability, water quality and increasing extreme events, such as floods, low flows and droughts, may lead to changes in ecosystems, life cycles, and biodiversity in the Danube River Basin in the long-term.

2. What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

The ICPDR Strategy on Adaptation to Climate Change finalized in 2018 describes the approach of the ICPDR to integrate the issue of climate change adaptation into its activities, in particular in the Danube River Basin Management Plan and the Flood Risk Management Plan. The relevance of the Danube basin wide Climate Change Adaptation Strategy for Danube countries – in addition to national and regional strategies – is specifically seen in the context of promoting action in a multilateral and transboundary context as outlined as

one of the key priorities of the EU Strategy on Adaptation to Climate Change. The ICPDR Climate Change Adaptation Strategy serves as a reference document influencing national strategies and activities in general and more specifically providing input for national RBMPs and FRMPs on possible adaptation measures of relevance for the Danube River Basin.

Additionally, end of 2019, the ICPDR adopted the “Effects of climate change (drought, water scarcity, extreme hydrological phenomena and other impacts)” as additional Significant Water Management Issue (SWMI) in the Danube River Basin. In the preparation of the Danube River Basin Management Plan Update (DRBMP) 2021, a related vision and operational management objectives have been agreed in 2020 to guide the Danube countries in the next 6 years WFD implementation cycle (2021-2027). The vision is outlined as follows: *“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 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.”*

Prioritising water management issues for the Danube River Basin until 2027, the ICPDR has adopted the Danube River Basin Management Plan (DRBMP) Update 2021 together with the Danube Flood Risk Management Plan (DFRMP) Update 2021 at the 24th ICPDR Ordinary Meeting in December 2021. The DRBMP Update 2021 sets out further aims to protect and enhance the status of all waters in the basin, and to prevent their deterioration while ensuring sustainable, long-term use of water resources. The plan also includes latest assessments on significant pressures, water status and a programme of measures jointly agreed by the Danube countries for the next six years. It establishes and strengthens several integrated principles for river basin management and connections to other sectors’ policies like energy, transport and adaptation to climate change. The DFRMP Update 2021 represents a key step forward in the ICPDR’s work towards sustainable flood risk management. It strengthens various aspects of flood risk management focusing on prevention, protection and preparedness, including measures for achieving the established objectives and calls for solidarity among all ICPDR Contracting Parties. Throughout 2021, both management plans have been elaborated and reviewed with the involvement of stakeholders and the public alike, throughout the Danube River Basin during the ICPDR’s Public Consultation Process. For the next six years, the work of the ICPDR will be streamlined with the implementation of the plans and the measures contained therein.

During the 4th ICPDR Ministerial Meeting on 8 February 2022, Ministers and Minister Representatives responsible for water management from the Danube River Basin countries Austria, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Germany, Hungary, Montenegro, Moldova, Romania, Serbia, Slovakia, Slovenia and Ukraine and the European Union endorsed the two Management Plans and adopted the ministerial “Danube Declaration”. As for adaptation to Climate Change, the Ministers, the Member of the European Commission, and the High Officials as those responsible for the implementation of the Danube River Protection Convention

(6) welcome the objectives and key messages of the updated ICPDR Climate Adaptation Strategy (2018).

(7) reaffirm the “Effects of Climate Change (drought, water scarcity, extreme hydrological phenomena and other impacts)” as a new significant water management issue for the Danube River Basin.

We call for actions to be undertaken in the years 2022 to 2027:

(8) developing sustainable adaptation measures to urgently enhance resilience of aquatic ecosystems to climate change impacts, supporting water balance activities and enhancing cooperation and exchange of good practices on adaptation measures to climate change impacts.

Significant progress has also been made with regard to drought and its tackling: several projects have contributed to widening the knowledge base in different research areas and regions, providing monitoring tools and management guidelines for policy-makers and water managers, e.g.: DROUGHT-R&SPI, DEWFORA, PESETA and regional cooperation programmes such as EUROCLIMA. In addition, WMO and GWP CEE have been running a joint Integrated Drought Management Programme in Central and Eastern Europe (IDMP CEE) 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) to support activities in the region. A major contribution was the implementation of the DriDanube Project and the preparation of the Danube Drought Strategy. The project aimed at increasing the society's resilience to the occurrence of drought in the Danube region by developing a regional drought monitoring tool and a strategic document on improved national response to drought.

As regards wetland reconnection, the Danube River Basin Management Plan Update 2021 shows that from the 144,659 ha of wetlands/floodplains areas, which were identified with potential for reconnection, 3,590 ha were already reconnected in 2021 also as a result of measures implementation from the DRBMP Update 2015. An area of 23,399 ha is planned to be reconnected by 2027.

The EU-funded Danube Floodplain project (2018-2021) aimed to improve transnational water management and flood risk prevention while maximizing benefits for water status and biodiversity conservation. It improved the knowledge about integrative water management using floodplain restoration combined with classical and blue/green infrastructure, natural retention measures and the involvement of all related stakeholders.

The main activities within the Danube Floodplain project were:

- a. to identify and evaluate active and potential floodplain areas with the Floodplain Evaluation Matrix (FEM) along the Danube River and selected tributaries,
- b. to assess the efficiency of floodplain restoration projects in the Danube District by using the pre-selected pilot areas and,
- c. to develop tools for increasing the knowledge and cooperation of experts, practitioners, decision makers and stakeholders on floodplain preservation and restoration.

The main outputs of the project (DRB Floodplain Management Strategic Guidance, Manual aiming at cross sectoral cooperation and a Roadmap for action), finally agreed in cooperation with ICPDR will contribute to the development of better policies for the region.

In order to address the coordination between the WFD and the FD in the ICPDR, a discussion paper "Coordinating the WFD and the FD: Focusing on opportunities for improving efficiency, information exchange and for achieving common synergies and benefits" was developed. It is a living document, which can be continuously updated and completed with good practice examples. The document outlines objectives and measures of the WFD and FD and describes potential conflicts. It highlights synergies between WFD and FD objectives and measures with a particular focus on win-win solutions. The measures focussing on floodplain restoration have central position in the WFD-FD paper.

3. Name and short description of the flagship adaptation activity your organization wishes to highlight

Next to the new SWMI on "Effects of climate change (drought, water scarcity, extreme hydrological phenomena and other impacts)" and its integration in the DRBMP Update 2021 (see answer to question 2), further ICPDR activities such the ICPDR Transnational Monitoring Network (TNMN) and the planned Danube Hydrological Information System (HIS), expanded knowledge and exchange of information on water scarcity and droughts as well as other ICPDR activities such as the planned updated water balance for the Danube River Basin can be mentioned.

A project proposal has been submitted to develop a Danube basin-wide water balance. A common Danube wide water balance would assist achieving objectives of the EU Water Framework Directive i.e., good chemical, ecological and quantitative status of EU and will be able to contribute to:

- d. Better understanding of main components of water balance on basin and sub-basin levels,
- e. Provision of a framework for evaluation of management policies leading to good quantitative status of water bodies,
- f. Development of a commonly accepted tool to be used for the DRBMP and national RBMPs,
- g. Assessment of the climate change impacts on elements of water balance.

Knowledge about water balances can support the development of RBMPs by providing a coherent framework to cross-evaluate the information on water quantity (including the coherence between water abstraction and water recharge, water flows between water bodies/catchments, storage changes over time, etc.) and provide a sound basis to the quantitative management of water resources. Moreover, it could support water quality assessments by providing essential hydrological information. Water balances are usually linked to models for simulating different components of the balance and different water management scenarios in order to assess

(ex-ante) their potential impact on water use, demand and availability, or to learn (ex-post) from the effectiveness of past efforts and applied measures to respond to drought and water.

Following seven project preparatory meetings between September and November 2022, the project concept (EoI) “Development of a harmonized water balance modelling system for the Danube River Basin” involving institutions from all 14 ICPDR contracting parties (20 project partners and 13 associated strategic partners) was finalised and submitted to the Interreg DRP 1st Call on 21 November 2022. The project aims at the development of an a) improved data management for the water balance calculations (a data repository with a toolbox and a new data management strategy), b) the state-of-the-art, open-source water balance model for the Danube River Basin, c) and elaborated water balance scenarios for the Danube River Basin and 4 selected shared sub-basins.

4. Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?

Climate change is a cross-cutting issue, causing impacts to different sectors on a transboundary scale. The quality of water and its availability are very much at the heart of the expected changes and therefore require coordinated action in an integrative way. Due to the transboundary character of water and its relevance for various issues and water-related sectors such as its role for biodiversity and the ecosystem, energy, transport, agriculture, floods and droughts, integrated river basin management can support the ICPDR’s approach to climate change adaptation. Building on this basic rationale, work on climate change adaptation is anchored in existing ICPDR structures and planning instruments as well as the corresponding national institutions and structures.

The drought of summer 2022 impacted the DRB and the Danube River in a significant way as never before. The JRC in its Analytical Report on Droughts in August 2022 stated that Hungary and Romania were already affected by drought in Spring 2022 and that the drought hazard has been increasing in both countries as well as northern Serbia, Ukraine and Moldova towards August 2022. Soil moisture and vegetation stress were both severely affected. Alert and warning conditions for drought were dominant across Europe and in the DRB in August 2022. As for the entire DRB and Europe, an increase of drought impacts – and probably also the severity of the impacts – can be expected for riparian countries, their economies, their people and their ecosystems.

The ICPDR addresses drought in the Climate Change Adaptation Strategy (2018) and developed a document on the 2015 droughts in the DRB stating that ‘drought is expected to become one of the major topics for water management in the near future’. In 2019, Effects of Climate Change (Drought, Water Scarcity, Extreme Hydrological Phenomena and other Impacts) was adopted as a new Significant Water Management Issue to be tackled as part of the Danube RBM Plan with the aim to achieve resilience and sustain the ecological and cultural value of the aquatic environment for the DRB.

As a consequence to the 2022 drought event, the ICPDR discussed the topic at its 25th Ordinary Meeting in December 2023 concluding that the topics of drought and low water are important for further action within the ICPDR framework. Discussion and identification of transboundary needs regarding the topic will be tackled with follow-up actions.

5. Which lessons learned would you like to share with other basins?

The ICPDR approach for integrating climate change adaptation in ICPDR activities includes a joint understanding of scenarios, impacts and adaptation measures and does not include a separate programme of measures, but relevant action is incorporated in the Danube River Basin Management Plan and Flood Risk Management Plan.

The ICPDR Climate Change Adaptation Strategy focuses on issues relevant at the Danube basin-wide level (level A) and needs to be complemented with further detailed planning for adaptation at sub-basin, national and/or sub-unit levels. Consultation on competing uses and priorities to prevent potential conflicts is needed to take into account potential target conflicts and competition between different water-related users and sectors such as agriculture, navigation, water supply, energy, industry, tourism, environment and nature protection. The communication, coordination and stakeholder involvement on climate change adaptation issues between different levels of management in the Danube River Basin is ensured at the national level through the ICPDR and also through different projects. Building resilience against climate change impacts on

water resources through capacity building, transboundary cooperation and benefit-sharing is a key priority to address climate change in the Danube River Basin.

6. What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

The ICPDR Strategy on Adaptation to Climate Change finalized in 2018 describes the approach of the ICPDR to integrate the issue of climate change adaptation into its activities, in particular in the Danube River Basin Management Plan and the Flood Risk Management Plan.

The Danube River Basin Management Plan and Flood Risk Management Plan Updates 2021 were adopted by ICPDR Head of Delegations in December 2021 and endorsed by Danube Ministers in February 2022.

7. How do you finance your climate change activities? How do you plan to finance the implementation of measures?

The ICPDR approach for integrating climate change adaptation in ICPDR activities does not include a separate programme of measures, but relevant action is incorporated in the Danube River Basin Management Plan and Flood Risk Management Plan. Financing of implementation of measures is within the discretion of ICPDR contracting parties.

8. How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

The ICPDR Climate Change Adaptation Strategy focuses on issues relevant at the Danube basin-wide level (level A) and needs to be complemented with further detailed planning for adaptation at sub-basin, national and/or sub-unit levels.

ICPDR does not contribute to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for its riparian countries.

9. Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

Climate change may affect all types of land use. As a consequence of decreasing water availability, a shortage in water supply is expected. An increased risk of conflicts over water use can occur in the event that no adequate adaptation measures are taken. Possible consequences are difficulties in water supply with an increased risk of water shortages and an over-exploitation of aquifers in the future. An assumed general increase in water demand for households, industry and agriculture, together with pronounced water scarcity during summer in the Lower and Middle Danube Basin and in some areas of the UDRB, is likely to lead to high water stress. Due to a warmer climate, increased water demand by, and water withdrawal for, agriculture, industry, energy and human consumption is probable, especially in the southeast DRB and in the hot season. This includes increased water use, for example, for garden watering and field irrigation, household showers and cooling water for industrial plants.

The wetland management, conservation and restoration as well as drought management are thoroughly addressed in the ICPDR Climate change adaptation strategy as well as in the Danube River Basin Management Plan Update 2021 as stated above. The primary role of the ICPDR is to support transboundary cooperation related to river basin management and flood risk management that includes management of wetlands and droughts.

10. Future planned activities

Awareness of ongoing adaptation processes is created and an exchange takes place between experts working on adaptation at different levels, such as national, sub-basin or international levels. This will be guaranteed through the involvement of national experts in the international working groups of the ICPDR, respectively via existing coordination approaches between the basin-wide and the sub-basin level within the Danube River Basin (Sava, Tisza, Danube Delta, Prut). The ICPDR Strategy on Adaptation to Climate Change is fully taken into account during the next steps of the implementation of the Water Framework Directive and Floods Directive in the Danube River Basin. Closing of knowledge gaps and identification of further research requirements will be constantly aimed for.

The Danube River Basin Management Plan (DRBMP) Update 2021 together with the Danube Flood Risk Management Plan (DFRMP) Update 2021 are prioritising water management issues for the Danube River Basin until 2027. The DRBMP Update 2021 sets out further aims to protect and enhance the status of all waters in the basin, and to prevent their deterioration while ensuring sustainable, long-term use of water resources. The plan also includes latest assessments on significant pressures, water status and a programme of measures jointly agreed by the Danube countries for the next six years. It establishes and strengthens several integrated principles for river basin management and connections to other sectors' policies like energy, transport and adaptation to climate change. The DFRMP Update 2021 represents a key step forward in the ICPDR's work towards sustainable flood risk management. It strengthens various aspects of flood risk management focusing on prevention, protection and preparedness, including measures for achieving the established objectives and calls for solidarity among all ICPDR Contracting Parties. For the next few years until 2027, the work of the ICPDR will be streamlined with the implementation of the plans and the measures contained therein.

As adopted at its 25th Ordinary Meeting in December 2023, the ICPDR considers the topics of drought and low water as important for further action by the ICPDR and asked – as a first step - the Secretariat with the support of interested Contracting Parties to organise a moderated workshop to better understand the needs of the ICPDR countries regarding drought/low water to be tackled on the transboundary level as well as to define possible actions and next steps needed on the basin-wide level. This workshop will be held on 16 June 2023. Based on the findings of the workshop and the contributions by the ICPDR Contracting Parties the ICPDR will develop an initial basin-wide overview on droughts.

The project concept “Development of a harmonized water balance modelling system for the Danube River Basin” was finalised and submitted to the Interreg DRP 1st Call on 21 November 2022. The project aims at the development of an a) improved data management for the water balance calculations (a data repository with a toolbox and a new data management strategy), b) the state-of-the-art, open-source water balance model for the Danube River Basin, c) and elaborated water balance scenarios for the Danube River Basin and 4 selected shared sub-basins.

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5. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE DAURIA STEPPES RIVERS AND WETLANDS OF UPPER AMUR, ULZ-TOREY AND SELENGE-BAIKAL BASINS

1. Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

In the Uldza River basin, the Torey Lakes began to fill steadily beginning in 2019, indicating that the wet phase of the multiyear humidification cycle has begun. In 2022, only the Barun-Torey Lake filled, while the Zun-Torey Lake remained dry. The final water bodies in the river basin were filled by the flow from the Uldza River, which approached average annual levels, as well as the renewed flow of the Imalka River, the second transboundary river flowing into the Torey Lakes, after a 20-year break.

We expect that the high-water phase will last about 10-12 years, and in a context of continuous warming/increased evaporation, maximum water availability in the Uldza River will be lower than the previous maximum in 1999. This will likely manifest as lower water levels and volumes in the Torey Lakes by the beginning of the next dry phase (Publication illustrating the role of climate cycles in Daurian ecosystems here: <https://www.thethirdpole.net/en/nature/landscapes-of-dauria-wetland-russia-mongolia-border/>)

2. What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

The climate adaptation plan for the Russian part of the basin has not been developed, and without appropriate planning for the Mongolian part, it will not be effective. The only measure that helps with water conservation is increased fire control, which significantly reduces burnout on the floodplain in a context of increased risk of fires due to the climate.

3. Name and short description of the flagship adaptation activity your organization wishes to highlight

Adopting a checklist and introducing water-saving measures in the Mongolian part of the basin. As a first step, we must fence off swamp areas of the floodplain from livestock, and partially transfer livestock to stables in order to reduce the number of floodplain fires. This is also an effective measure for retaining carbon in floodplain peat and vegetation. Reducing the number of fires is also necessary in the upper tributaries, where frequent fires burn out trees and shrubs. Greater regulation is needed for gold mining in the tributaries and other water-intensive operations. (More details on issues related to transboundary basin management are available here: <https://www.researchgate.net/publication/365205218>)

4. Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?

There are still misunderstandings. The Mongolian side began (and then suspended) construction of a reservoir on the main riverbed as an adaptation measure, while the Russian side, based on scientific analysis, considers this measure to be excessively water-intensive (additional evaporation, violating the natural hydrological status), and that it will cause an ecological disaster for the Torey Lakes and threaten the population of many bird species in the area. This dam construction project on the Mongolian side of the basin is not only a threat to the river, but also the Landscapes of Dauria World Heritage Site.

5. Which lessons learned would you like to share with other basins?

We believe that many climate adaptation measures supported by international funds and programmes- this plan was also developed for the Mongolian part of the basin with funding from the Adaptation Fund- were developed with socioeconomic needs or in line with resource business interests, but instead bring us closer to a global environmental disaster. We need a critical reassessment of climate adaptation measures previously proposed for transboundary river basins, given the importance of conserving freshwater ecosystems and wetlands, as well as human dependence on local ecosystem services and ecosystem functions in the biosphere. Against this backdrop, the Government of Mongolia's "Blue Horse" ("Huh Mor") water management "adaptation" programme, which, in addition to building a dam on the Uldza River, involves the construction of 32 dams on 11 other rivers in Mongolia, including the transboundary Kerulen, Selenga, and Onon Rivers (Article about the risks of the Blue Horse programme here: <https://www.thethirdpole.net/en/energy/analysis-blue-horse-mongolia-water-infrastructure/>

Presentation on threats to transboundary rivers and lakes in Dauria here:
<https://www.researchgate.net/publication/358796359>

6. What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

There are none for the transboundary basin.

7. How do you finance your climate change activities? How do you plan to finance the implementation of measures?

There are no plans or financing.

8. How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

In Russia, the first phase of the national plan 2020-2022 involved the development of federal, sectoral and regional criteria, along with institutional and methodological frameworks, and did not address the grassroots level or specific natural sites.

9. Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

These issues are included in cooperation at the transboundary Russian-Mongolian-Chinese Dauria Nature Reserve, for which management bodies are responsible for the conservation of wetlands in the transboundary Uldza River basin that fall within protected areas. However, recommendations from the grassroots level are not considered by local governments or higher levels of government, especially in Mongolia. There is some benefit to addressing the issue at the level of the Russian-Mongolian intergovernmental commission.

10. Future planned activities

The Russian-Mongolian-Chinese Dauria Nature Reserve conducts both remote and ground-based monitoring of key elements of biodiversity and threats in the transboundary basin, both annually and in the mid-term. It conducts specialized research and disseminates results, and also carries out specialized programmes to educate key population groups and decision-makers.

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6. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE DNIESTER BASIN

1. Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

One of the critical effects of climate change (floods, low water) in the Dniester river basin is a likely change in the volume and seasonal distribution of runoff. Potential deterioration of water quality is also attributable to the anticipated changes in the runoff.

Moldova

According to studies performed for the entire country, over the last 133 years, average temperature has increased by 1.2°C, while the increase in precipitations constituted only around 51.3 mm. It is predicted that by the middle of the century, the air temperature in the country will be by 1.7-2.0°C higher than in the period 1961-1990, and by the end of the century it will increase by 4-5°C, if the level of emissions of greenhouse gases will not be significantly reduced globally. Regarding precipitation, a 13% decrease in total annual amount is forecast, while annual flows are forecast to become more unstable with increased flood frequency. In the last decade, 6 of the highest average annual air temperatures were recorded from the entire period of meteorological observations. The 2019-2020 winter season was extremely warm. Average air temperature exceeded the norm by 4-5°C. Extremely hot weather was also recorded in the 2020 autumn season, when an average air temperature was higher by 3-4°C higher than norm. Annual rainfall was 355-615 mm, or 70-105% of normal.

Droughts, water scarcity

7 out of 10 of the warmest years recorded in the Republic of Moldova occurred in the last two decades. In 2007 the country suffered the worst drought in its recent history, which affected 80% of the territory and about 135,000 people, causing losses of about 1 billion USD. The 2020 drought caused an over 26% reduction in agricultural production and had a significant socio-economic impact, with around 20% of jobs lost in the agricultural sector, thus reducing household income and consumption, contributing to the overall recession and involving additional burdens for the budget

Floods

Floods frequently affect the Republic of Moldova including the Dniester river basin. In the last 70 years, 10 major floods occurred in the country, including those from 2008 and 2010. The total damage caused by the 2008 floods formed in the Dniester in Prut floodplains amounted to \$120 mil. More than 40 settlements and approximately 6525 ha of agricultural land were affected. Also, over 1100 of houses and public buildings were flooded. Severe floods in 2010 affected more than 13 thousand people in 60 villages, causing losses and damages of more than \$75 mil.

Population and economy

In the future, higher frequency of natural disasters will increase number of disabilities, displaced persons and refugees, who are disproportionately affected by the effects of disasters. Likewise, it will increase the vulnerability of assets to the impacts of natural hazards, implying significant challenges to the country's ability to prepare for and respond to natural disasters.

2. What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

Moldova

- The "Lower Dniester" National Park was created (Law no. 71 of 31.03.2022)
- NAP was developed and provided for public consultations
- National Forest Extension and Rehabilitation Program for the period 2023-2032, as well as the Action Plan for its implementation for the period 2023-2027 was developed
- "Joint Actions for Afforestation of Moldova" campaign launched
- Establishing the Emerald Network (Law no. 225 of 13.10.2022)

Ukraine

In Ukraine, Ordinance No. 895-r of the Cabinet of Ministers of 8 October 2022 approved the Flood Risk Management Plan in the Dniester River Basin. This Plan contains the main steps and measures for the

prevention, protection and preparedness, in particular construction, restoration and repair of protective infrastructure (bank fortifications, dams, other hydraulic and protective structures), ensuring public safety and protection of agricultural land in risk zones, reducing the number of casualties, victims, damage caused by flooding to the surrounding natural environment, infrastructure and cultural heritage sites, improving the functional subsystem for anti-flood measures of the unified state system of civil protection, improving the flood preparedness, forecasting and early warning system, as well as restoration measures in the event of flooding.

3. Name and short description of the flagship adaptation activity your organization wishes to highlight

Moldova

1. During implementation of the Dniester river Basin District Management plan, many springs were rehabilitated, river buffer strips along Dniester river tributaries were planted, the Dniester was populated by fish
2. Many education activities were performed in order to increase people understanding of climate change
3. Many reports and researches were developed for assessment of risk and vulnerabilities of different sectors to climate change
4. The National Forest Extension and Rehabilitation Program for the period 2023-2032, as well as the Action Plan for its implementation for the period 2023-2027 were approved
5. Rehabilitation of river segment „Old Dniester” with elements of flow regulation (Important sectors of the Old Dniester - oxbow – were cleaned and rehabilitated, waterlocks were installed in order to improve the hydrological connection between the old riverbed and the current bed of the Dniester. A number of seminars to raise awareness among the local population about the importance of environmental protection were conducted)

Ukraine

1. Development of the Dniester River Basin Management Plan

The Dniester Basin Department of Water Resources (Dniester BDWR) develops the Dniester River Basin Management Plan (Dniester RBMP) in accordance with Resolution No. 336 of the Cabinet of Ministers of Ukraine dated 18 May 2017 and pursuant to a schedule plan of drafting the Dniester River Basin Management Plan, approved by Order No. 313 of the Ministry of Environmental Protection and Natural Resources of 27 November 2020. The first implementation cycle is to take place in 2025-2030.

2. State Water Monitoring

Pursuant to the requirements and principles of the EU Water Framework Directive, a Western Region Water Monitoring Laboratory (the “Laboratory”) was set up in the Dniester BDWR, which operates in pursuance of the State Water Monitoring Programme according to Order No. 27 of the Ministry of Environmental Protection and Natural Resources “On Approval of the State Water Monitoring Programme” dated 17 January 2023 and Order No. 18 of the State Water Resources Agency “On the Implementation of the State Water Monitoring Procedure” dated 25 January 2023. The laboratory was accredited by the National Accreditation Agency of Ukraine for compliance with DSTU ISO 17025:2019 (accreditation certificate No. 202265 dated 24 September 2021) and, according to the scope of accreditation, conducts surveys of surface, underground, return water (wastewater), and soils.

According to the scope of accreditation, the Laboratory analyzes surface water samples to determine:

- 35 priority pollutants (pesticides, polycyclic aromatic hydrocarbons that are used in the synthesis of dyes and medicinal substances and can be generated during the combustion of hydrocarbon liquid or gaseous fuel, volatile organic compounds, heavy metals - mercury, cadmium, lead, nickel);
- 11 pollutants specific to the Dniester River basin, namely pesticides, metals and pharmaceuticals identified by screening; and
- 23 chemical and physico-chemical indicators of the state of surface water bodies.

3. Dniester Basin Council

In 2018, the Dniester Basin Council was established, which includes 72 representatives of seven regions of Ukraine: Lviv, Ivano-Frankivsk, Ternopil, Chernivtsi, Khmelnytskyi, Vinnytsia, and Odesa.

One of the key objectives of the Basin Council is to develop proposals and ensure coordination of interests of enterprises, institutions and organizations in the field of water use and protection and reproduction of water resources within the Dniester river basin area.

4. Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?

Hydrometeorological data exchange

Hydrometeorological data exchange is an important factor in understanding the state of climate and water resources in the entire river basin. Improving of collaboration in the field of common Moldova - Ukraine measurements, hazard warning and data trust should be taken. The common platform with actual data on climate and hydrology from the Dniester river stopped functioning in 2022, probably due to war in the region.

Release of environmental flows from the Dniester Hydropower Complex

The Interdepartmental Commission for Coordination of Dniester Reservoirs' Operating Modes operates at the State Water Resources Agency of Ukraine to coordinate practical aspects of water flow regulation in the reservoirs of the Dniester Hydropower Complex.

In 2022 Ukraine adopted updated regulation of the Dniester hydropower complex exploitation, which enabled to balance interests and settle key issues for the efficient use of water resources. Not all recommendations given by Moldovan part were taken in consideration, thus an important issue is to continue improvement of this document especially in the field of protection of downstream part from more frequent extreme droughts and floods. Lower part of the basin is more sensitive to climate change, especially ecosystems from the Ramsar zones Unguri-Holosnita and Lower Dniester situated in the Dniester floodplain which contain the largest network of the biodiversity of the country.

Strategic Action Programme

The following two strategic documents were prepared as part of the GEF/UNDP/OSCE/UNECE project "Enabling Transboundary Cooperation and Integrated Water Resources Management in the Dniester River Basin": the Transboundary Diagnostic Analysis for the Dniester River Basin and the Strategic Action Programme, which will underlie the future Dniester River basin management plans in both countries. Both documents were developed based on the methodologies of the Water Framework Directive of the European Parliament (2000/60/EC) and are key documents for the Dniester Commission. The Strategic Action Programme is intended for 2021 to 2035 and is aimed at restoring the river ecosystem and ensuring the sustainable development of its natural resources. It describes measures such as reducing water pollution, preventing accidental pollution, managing tailing storage facilities, mitigating the effects of climate change and natural disasters, improving the regulatory framework, and strengthening Moldovan-Ukrainian cooperation. In 2021 the Strategic Action Programme was endorsed by the countries, and its implementation requires financial support.

5. Which lessons learned would you like to share with other basins?

Climate change has a serious impact on population, economy and ecosystems. Increasing frequency of natural hazards, such as floods and droughts in the Dniester river basin, causes big financial losses and damages national budget. Rapid measures should be implemented in order to adapt to climate change and mitigate their consequences.

Coordinated and joint work of both countries' representatives in the working groups of the Commission on Sustainable Use and Protection of the Dniester River Basin is extremely important for achieving the goals of the Dniester Treaty. This Commission has become one of the most important environmental cooperation mechanisms in the Dniester River basin, including in the context of climate change.

International project support in the field of adaptation to climate change in transboundary basins is also crucial. For example, as part of the Dniester Project, GEF updated climate change scenarios in the Dniester basin and, in particular, prepared a study on "Future Water Demand and Climate Change Scenarios Modeled in the Dniester River Basin."

6. What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

The Strategic Framework for Climate Change Adaptation and its implementation plan were endorsed by the countries in 2015 and 2017 accordingly. During recent years climate change adaptation measures were integrated into national river basin management plans for the Dniester.

Moldova

In the Dniester river Basin District Management plan, first cycle, developed for 2017 – 2022, some measures are included with regard to climate change. These refer to development of studies in order to analyze the climate change in the basin and its impact on water resources vulnerability. The measures were realized by development of a series of studies at country level, some of these were reported to the United Nations Framework Convention on Climate Change.

At present next cycle of the Dniester river Basin District Management plan is under development, it will contain a larger set of measures linked to climate change. These measures will be also included in the National Plan for adaption to climate changes till 2030.

Ukraine

A total of 80 percent of the core sections of the Dniester River Basin Management Plan have already been developed to date. Section 8 of the Dniester RBMP “**Complete List of Programmes (Plans) for River Basin Area or Sub-Basin, Their Content and Issues to Be Addressed**” is currently being developed.

The Action Programme is aimed at addressing the main water and environmental issues (MWEI):

- nutrient, organic and hazardous substances pollution;
- hydromorphological alterations;
- effects of military operations;
- pollution with household waste;
- invasive species;
- **climate change.**

RBMPs in Ukraine must be approved by the Cabinet of Ministers of Ukraine by the end of 2024.

7. How do you finance your climate change activities? How do you plan to finance the implementation of measures?

Moldova

Financial support for measures implementation come from two sources: state budget and international donors. Certain measures for agriculture sector adaption and mitigation to climate change is performed from state budget.

Ukraine

1. Pilot Project for the Restoration of the Iahorlyk River.

A pilot project “Ecological Restoration of the Iahorlyk River Section between Dovzhanka and Rozhivka” was implemented in 2019-2021 with the support of the GEF/UNDP/OSCE/UNECE project “Enabling Transboundary Cooperation and Integrated Water Resources Management in the Dniester River Basin”. This project was designed to address the disappearance of small rivers due to unscrupulous agricultural practices, climate change and regulation.

2. Dniester River Basin Management Plan

The measures provided for in the Dniester River Basin Management Plan will be **funded** out of **state and local budgets, as well as other sources** not prohibited by law. The said measures are funded from the state budget within the spending limits provided for by the State Budget of Ukraine for the relevant year. On top of this, the Dniester RBMP will be tied to the **Reconstruction Plan for Ukraine**.

The measures proposed in the Dniester River Basin Action Programme will also be sent to potential donors to attract investments for the restoration of water resources.

8. How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

One of the cross-cutting issues identified in the Dniester river basin Transboundary Diagnostic analysis is climate change. As a result, in the developed and approved Strategic Action Programme for the entire Dniester River basin for 2021-2035, a special strategic direction was developed: “*Mitigation of climate change and natural disasters*” focuses on adaptation to climate change and disaster risk reduction. A set of measures

will contribute to addressing issues related to: climate change; floods and inundations; droughts and water scarcity. Strategic Action Programme is taken in consideration in the process of development on the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) as well as into national river basin management plans.

9. Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

Ukraine and the Republic of Moldova cooperate within the framework of the Treaty between the Government of the Republic of Moldova and the Cabinet of Ministers of Ukraine on Cooperation in the Field of Protection and Sustainable Development of the Dniester River Basin, signed on 29 November 2012. The Treaty includes the issues of ecosystem conservation, emergency risk mitigation and water distribution.

In order to achieve the objectives of the Treaty, the Contracting Parties have established the Commission on Sustainable Use and Protection of the Dniester River basin. The Commission is represented by the following working groups, also dealing with the issues of ecosystems and droughts:

- Strategic Working Group (core group);
- Working Group on Ecosystems and Biodiversity;
- Working Group on Monitoring and Information Exchange;
- Working Group on River Basin Planning and Management; and
- Working Group on Emergencies.

On 28-29 October 2021, the third meeting of the Commission on Sustainable Use and Protection of the Dniester River Basin was held in Chisinau (Republic of Moldova). Following the meeting, a protocol was signed, approving the work plans of the working groups. Meetings of the working groups are held once a year.

Strategic Action Programme for the entire Dniester River basin for 2021-2035 include measures for biodiversity protection, through which can be found measures for expansion of protected areas, wetlands, and ecological networks, improvement of protected area management and aquatic biodiversity. Also, Strategic Action Programme include measures: Development and implementation of flood and drought risk management plans, Improvement of stormwater runoff and irrigation management systems. However, implementation of common measures needs important financial support as well as common agreements and activities from Moldova and Ukraine.

10. Future planned activities

Moldova

At present the second cycle of the Dniester river Basin District Management Plan is under development. It will include measures for adaption and mitigation to consequences of climate change.

Also, Moldova is in the process of promoting the National climate change adaptation program until 2030 and the action plan for its implementation.

Ukraine

Upcoming events:

- 19 May 2023 – meeting of the Dniester Basin Council
- 16 June 2023 – meeting of the Working Group on River Basin Planning and Management as part of the Dniester Commission.
- 2023 – meeting of the Dniester Commission.

11. Contact details

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7. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE DRIN BASIN

1. Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

The Drin River Basin (DRB) is a transboundary river basin, which extends across Albania, Kosovo, North Macedonia, Montenegro and Greece. All Drin riparian countries rely on the extended Drin River Basin waters and use of its resources for agriculture, energy, water supply and sanitation, mining and industry, environment, fisheries, and tourism.

According to the National Communications to UNFCCC from Albania, Montenegro and North Macedonia, as well as to the report 'The state of water in Kosovo', Climate change and climate variability have been increasing the frequency, intensity and impact of flooding in the basin.

According to future projections, climate change will have serious negative impacts in Drin River Basin including **increased frequency and intensity of floods and droughts, increased water scarcity, intensified erosion and sedimentation, increased intensity of snowmelt, sea level rise, and damage to water quality and ecosystems.**

Moreover, climate change impacts on water resources will have cascading effects on human health and many parts of the economy and society, as various sectors directly depend on water such as agriculture, energy and hydropower, navigation, health, tourism – as does the environment.

In North Macedonia, Black Drim (Crni Drim) River Basin is identified as one of the flood-prone region.

There are number of different sources of flooding in the Drin Basin, including:

- Fluvial flooding from major rivers when run-off from the surrounding area exceeds the flow capacity of the rivers, streams or the artificial drainage system (Drin, Sateska River)
- Torrential foods: combination of high water discharge and mass movement through the channels of the streams, leading to the transport of large volumes of sediment and debris.
- Coastal Flooding, in coastal areas of the towns Ohrid and Struga, which is happening during extreme weather events and high tides that are causing a rise in lake levels and coastal flooding.
- Groundwater floods especially in the region of Struga (Struga is built on a former wetland/marshland and has high level of underground waters)
- Flooding in urban areas (due to intensive rainfalls)

2. What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

- Flood hazard and risk management tools of the Integrated climate-resilient transboundary flood risk management in the Drin River Basin in the Western Balkans (GIZ and AF/UNDP Drin project);
- Established Hydrodynamic models, flood hazard and risk maps of the pilot Areas of Potential Significant Flood Risk (APSEFRs) in the Drin River Basin;
- Strengthening of the institutional capacities for flood risk management;
- Improved national legislation for flood risk management;
- Modernization of the hydro-meteorological network
- Works for Sateska river diversion

3. Name and short description of the flagship adaptation activity your organization wishes to highlight

Adaptation fund / UNDP project "Integrated climate-resilient transboundary flood risk management in the Drin River basin in the Western Balkans"

The objective of the project is to assist the riparian countries in the implementation of an integrated climate-resilient river basin flood risk management approach in order to improve their existing capacity to manage flood risk **at regional, national and local levels** and to enhance resilience of vulnerable communities in the DRB to climate-induced floods.

The project will contribute to the strengthening of the current flood forecasting and early warning system by increasing the density of the hydrometric network, and by digitizing historical data for stations not currently in the existing forecasting model.

The project will develop and implement transboundary integrated FRM strategies providing the national authorities with robust and innovative solutions for FRM, DRR and climate adaptation, including ecosystem-based gender sensitive participatory approaches. In addition, the project will develop the underlying capacity of national and regional institutions to ensure sustainability and to scale up the results.

It will support stakeholders by providing guidance, sharing climate information, knowledge and best practices. The project will also invest in the priority structural and community-based non-structural measures.

4. Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?

There are a number of barriers to effective basin-level flood risk management which need to be addressed to ensure effective integrated flood risk management for the basin.

- a) Lack of financial, technical and human capacities within the national Hydro-meteorological Services, insufficient technologies, equipment, data and tools for flood hazard, risk and vulnerability assessments;
- b) Limited capacities and insufficient policy framework for basin-level coordination, cooperation and joint basin-level strategic action on flood risk management
- c) Flood risk reduction, including flood protection measures, do not adequately integrate climate risk information, ecosystem-based and non-structural approaches to climate resilience

5. Which lessons learned would you like to share with other basins?

Pilot project: “The diversion of Sateska River” (AF/UNDP project)

Sateska River is located in the south-west of the North Macedonia. Currently a tributary of Lake Ohrid, it originally flowed directly into the River Crn Drim but was re-routed in 1961/2.

The 1961/2 Sateska river redirection from its natural flow in the River Crn Drim to the Lake Ohrid, is between the towns of Struga and Ohrid and was motivated by three main reasons:

- To decrease the sediment load on the artificial reservoir Globocica and the hydropower plant Globocica;
- To ensure the hydro potential of the hydropower plants on the River Crn Drim;
- To drain the Struga wetland/marshland.

The diversion of Sateska River caused a huge sediment load of approx. 120, 000m³ annually to Lake Ohrid which is negatively affecting the habitats and the entire ecosystem in the littoral part of the Ohrid Lake.

Moreover, Sateska River brings 39% of phosphorus load to the Lake Ohrid which on a long run will increase the eutrophication of the Lake.

The sediment that Sateska is bringing is significantly increasing the river bed level and decreasing the storage and conveyance capacity of the river especially during extreme weather events and/or intensive rainfalls.

This pilot project is in final stage of realization.

6. What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

Drin River Basin Integrated CCA and FRM Strategy and Plan will be developed under the AF UNDP Project, jointly by GWP-MED and UNDP team and experts.

Adaptation component was covered by the National Communications on Climate Change and other sectoral strategies (in health, agriculture and other sectors).

The Forth National Communication on Climate Change was adopted by the Government in February 2023.

The two National Communications proposed the following priority measures for adaptation to climate change in the water resources sector and flood risk management:

- a) modernization of the hydro-meteorological network; (GIZ project, AF UNDP Project...)
- b) improvement of data availability and the establishment of data monitoring and processing; rehabilitation and reconstruction of existing hydropower and water management structures and systems;
- c) development and implementation of effective water management plan;
- d) implementation of priority measures related to water supply and irrigation systems, flood and drought control, as well as protection strategies for controlling erosion and sedimentation;
- e) restriction of urban development in flood-risk zones;

- f) measures aimed at maintaining dam safety, afforestation and other structural and non-structural measures to avoid mudflows;
- g) construction of dikes;
- h) adjusting operation of reservoirs and lakes (e.g. multiple use of reservoirs to include flood alleviation);
- i) land use management;
- j) implementation of retention areas;
- k) improve drainage;
- l) structural measures such as temporary dams, building resilient housing and modifying transport infrastructure;
- m) migration of people away from high-risk areas.

7. How do you finance your climate change activities? How do you plan to finance the implementation of measures?

Through:

- National budget;
- Active projects; AF -UNDP
- Planned (approved) project supported by the GEF,
- EU IPA funds and other donators

8. How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

Up to now, four National Communications (2003, 2008, 2014, 2023) and three Biennial Update Reports (2015, 2018 and 2021) have been delivered to the UNFCCC.

Project proposal on preparation of a National Adaptation Plan was submitted to the Green Climate Fund for its development.

9. Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

The Third National Communication highlights the need for the country to continue accumulating experience to cope with droughts and floods and make best use of existing technologies in water supply and irrigation used in the country. It also emphasizes the need for transboundary cooperation to increase the resilience of water resources shared with other countries.

Such cooperation will further create opportunities for sharing knowledge and experience and will allow for the exploration of more cost-effective measures.

Drought management plan for Black Drin basin, will be developed in frame of the new GEF project “Implementing the Strategic Action Programme of the Drin Basin to strengthen transboundary cooperation and enable integrated natural resources management”.

10. Future planned activities

- a) Realization of the planned activities under the Adaptation fund / UNDP project “Integrated climate-resilient transboundary flood risk management in the Drin River basin in the Western Balkans” with focus on:
 - 1) exchange of flood risk knowledge and climate information;
 - 2) basin level climate change adaptation and flood risk management strategy and plans;
 - 3) combination of structural and non-structural flood risk reduction interventions;
 - 4) institutional capacity.
- b) Implementation of the Strategic Action Plan developed in frame of The GEF supported project “Enabling Transboundary Cooperation and Integrated Water Resources Management in the Extended Drin River Basin” (GEF Drin Project) through the new GEF project “Implementing the Strategic Action Programme of the Drin Basin to strengthen transboundary cooperation and enable integrated natural resources management” (planned to start by end of 2023).

11. Contact details

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8. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE LAKE VICTORIA BASIN

1) Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

Lake Victoria Basin (LVB) has been experiencing inter-annual and inter-seasonal variability in rainfall and temperature that continue to negatively affecting economic growth, ecosystem functioning and services, livelihoods as well as overall human development in the region. For instance, climate change impacts have negatively affected productivity of agriculture, wetlands and the abundance of fish in Lake Victoria basin. Similarly, climate change is causing inter-seasonal variability in rainfall thus leading to water level fluctuations and a significant aberration in hydrological patterns in Lake Victoria and river systems in LVB. For instance, the heavy rains experienced in East Africa region in 2019 and 2020 caused the Lake Victoria's water levels to surge to their highest levels of 13.4 metres, a mark last recorded in 1964. This resulted to floods that destroyed property, lives and livelihoods as well as displacement of local communities thereby causing an influx of environmental refugees into the basin. For instance the rising water levels in 2019. On the other hand, studies show that frequent drought episodes that are now happening in LVB have already pushed more than 10 percent of the population toward chronic food insecurity as well as caused suffering due to water scarcity. Climate change is also having significant impacts health such as increased prevalence of waterborne diseases. Malaria infections are also rising in areas that previously were free of malaria, especially in the highlands due to rising temperatures that make these areas conducive for breeding of mosquitoes.

2) What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

Under the Adapting to Climate Change in Lake Victoria Basin (ACC-LVB) Project, one regional level and national training workshops were carried out across all the partner states (Kenya, Uganda, Rwanda, Burundi and Tanzania) where a total of 140 (55% male and 45% female) representatives of national institutions responsible for transboundary water catchment management and climate change adaptation in LVB were trained. In collaboration with ICPAC, reports showing scenarios of past and future climate projections including projected climate extremes have been developed. These reports are helping to ensure that adaptation technologies and practices in ACC-LVB project sites are aligned to forecasted climate change and variability.

Additionally, all partner states implemented concrete adaptation technologies and practices in their respective jurisdiction. Financial support was also provided to communities across the partner states to implement 59 small-scale community-based projects. These adaptation technologies and practices are contributing towards enhancing the resilience of human and natural systems in the project sites across LVB.

With respect to Knowledge management, significant progress has been achieved where more than 30 media bulletins highlighting ACC-LVB project events/interventions across the partner states have been produced. Similarly, formation of a Regional Media Network will henceforth be utilized in coverage of Climate Change issues within the Lake Victoria Basin.

3) Name and short description of the flagship adaptation activity your organization wishes to highlight

Adapting to Climate Change in Lake Victoria Basin is a flagship project in LVB that was developed by the East African Community (EAC)/Lake Victoria Basin Commission (LVBC) in collaboration with Partner States sharing LVB and UNEP. The project which is financed by Adaptation Fund (AF) aims to "reduce vulnerability to the negative effects of climate change in the Lake Victoria Basin (Burundi, Kenya, Rwanda, Tanzania and Uganda), by building climate resilience". To achieve this, ACC-LVB project supports implementation of adaptation technologies and community-based adaptation interventions in order to reduce the vulnerability and impacts of climate change on local communities and water dependent economic sectors within the LVB. The project implementation period is June 2018 to June 2023.

4) Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?

In the Lake Victoria Basin, there are several major challenges associated with transboundary cooperation and climate change adaptation. These challenges arise due to the shared nature of the basin, with five (5) countries involved, as well as the complex and interconnected impacts of climate change. However, efforts have been

made to overcome these challenges through various approaches. Here are some of the major challenges faced and how they have been addressed:

- Limited coordination and cooperation among the countries sharing the LVB. This involves aligning policies, strategies, and actions to address common climate change impacts. Overcoming this challenge, the East African Community (EAC) established LVBC, which serves as a platform for collaboration, dialogue, and joint decision-making among the riparian countries. Through LVBC regional harmonization and implementation of policies and strategies has made possible to promote transboundary water catchment management and climate change adaptation in LVB across all the partner states.
- Limited financial and technical resources are hinderance in the implementation of transboundary climate change adaptation projects. To address this challenge, LVBC write proposals to access international funding. For example, LVB through UNEP accessed Adaptation Fund to implement a project "Adapting to Climate Change – LVB) promoting climate change resilience and transboundary cooperation in the LVB. Additionally, collaboration with development partners, such as international organizations and donor agencies, helped LVBC leverage resources and expertise.
- Access to reliable and up-to-date data and information is crucial for effective climate change adaptation planning and decision-making. However, challenges exist in sharing data among the riparian countries, including issues related to data availability, data quality, and data sharing protocols. LVBC developed police for data-sharing, developed strategy for Integrated Water Management (IWRM) and establishing Water Information System (WIS), and promoting knowledge exchange in the LVB.
- The LVB faces significant ecosystem degradation and pollution, including water pollution, deforestation, and habitat loss. These challenges exacerbate the impacts of climate change and hinder the effectiveness of adaptation measures. To address this, integrated approaches that combine climate change adaptation with ecosystem restoration and sustainable resource management are being implemented through projects and programmes. This includes promoting sustainable land use practices, afforestation and reforestation initiatives, and pollution control measures through Lakewide Inclusive Sanitation (LVB-LWIS) strategy.
- Social economic linkages of national, subnational and local communities' economies and livelihoods to the utilization of natural resources in the LVB poses a challenge towards promotion of sustainable management in absence of providing alternative livelihood sources.

5) Which lessons learned would you like to share with other basins?

- During implementation of adaptation initiatives in transboundary resources, it is important to pay attention to both vertical and horizontal levels of collaboration when responding to the multiple risks posed by climate change. This will promote scalability and replication of the desired impact of increased climate resilience especially at regional scale.
- Applying a basin/landscape perspective is critical when addressing environmental and climate related issues affecting trans-boundary resources e.g. Lake Victoria.
- Capacity building and knowledge sharing on adaptation technologies and practices are critical for improving adaptive capacity of local communities. Additionally, well-customized training programmes to augment local capacity on adaptation technologies are crucial to ensure the continuity and sustainability of climate change interventions in a coherent, relevant and proper way. 'Learning-by-doing' capacity building approaches also result in greater ownership of project results and impact.
- Adaptation technologies that allow for, and promote diversity are more likely to provide a strategy which strengthens adaptation of human and natural systems in the face of uncertain future climate change scenarios.
- Long term sustainability and success of adaptation initiatives in LVB will require a long term commitment of public funds and willingness of people living in the basin to change behaviors. Attainment of both requires relentless and sophisticated investment in education targeting local communities, well as decision- and policymakers and other stakeholders.

6) What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

Currently, the Lake Victoria Basin Climate Change Adaptation Strategy and Action Plan (2018 – 2023) that is being implemented. The goal of the strategy is to address climate uncertainties, variability, and extreme events in order to improve and sustain livelihoods and adaptive capacities of vulnerable communities. The strategy is the guiding principle for implementation of the “Adapting to Climate Change (ACC-LVB) project, a USD 5 million project financed by Adaptation Fund through UNEP. The project is implemented in the 5 Countries in the LVB, will end in June 2023. LVBC is in the process to mobilize resources to promote successful technologies piloted in the climate change adaptation.

7) How do you finance your climate change activities? How do you plan to finance the implementation of measures?

Financing of climate change activities in EAC is through development of projects/programmes proposals that are used to mobilize resources from various sources/ e.g. bilateral, multilateral, foundations, private sector institutions as well as national budgets of partner states.

8) How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

Development of projects/programmes on transboundary climate change adaptation in LVB is consistent with national or sub-national sustainable development strategies, including, where appropriate, national or sub-national development plans, poverty reduction strategies, Country Strategy Papers, National Adaptation Programs of Action (NAPA), National Adaptation Plans (NAPs), Intended Nationally Determined Contributions (INDC) or other relevant instruments of partner states, where they exist. Similarly, projects/programmes in LVB are aligned to international and EAC region policy frameworks on transboundary climate change adaptation.

9) Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

Yes. Wetland management, conservation and restoration as well as drought management is a key thematic area of focus into EAC/LVB transboundary climate change adaptation strategies and plans. Design of programmes/projects integrate principles, strategies and initiatives that promote sustainable management and utilization of wetland resources as well as addressing impacts related to droughts episodes occurring in the region.

10) Future planned activities

LVBC in collaboration with EAC partner states is currently working closely with various donor institutions e.g. Adaptation Fund, World Bank, UNEP, AfDB, and USAID to develop programmes/projects that will upscale adaptation interventions in the LVB.

11) Contact details

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9. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE LOWER MEKONG BASIN

1) Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

From some of the MRC studies, the existence of climate change across the Lower Mekong Basin attributes to changes in water and water-related resources, and river ecosystem. Together, climate change and operation of the hydropower projects and other water infrastructure upstream and throughout the basin attribute to changing pattern of hydrology of the Mekong River.

While there is evidence that the climate of the region is changing, on average becoming hotter and wetter, a wide range of potential future changes is projected to occur over the next 15 to 45 years⁴. Projected changes are potentially very significant and many people and communities are vulnerable to potentially wide-ranging impacts:

- Agricultural yields are likely to be affected with the negative impacts outweighing the positive. Potential declines in rice yields are of particular concern. Planned increases in irrigation, changes in agricultural practice and technological improvements are likely to be required to offset these impacts.
- Yields from fisheries and aquaculture are also vulnerable but impacts could be either positive or negative. While aquaculture is often considered more vulnerable due to rising sea-levels, salinity intrusion and the impacts of increased temperatures, floods, and droughts on smaller ponds and reservoirs, basin-wide impacts on capture fisheries in flooded habitats are projected to be the more significant.
- Hydropower production in both the mainstream and tributaries is at risk due to increased drought frequency although changes could be positive or negative depending on the scenario.
- Roads and water supply infrastructure are at risk from more intense rainfall, increased flooding and landslides, while significant expenditure may be required to protect coastal infrastructure from rising sea levels and storm surges.
- Overall, food security has improved significantly in recent decades, the health of the population is better, poverty levels have fallen dramatically, the population is more urbanized and fertility rates have fallen. However, many households and communities along the Mekong corridor remain vulnerable to shocks, particularly droughts and floods which can have a material impact on their livelihoods. Future climate change is likely to exacerbate the losses from extreme events with greater numbers of people likely to be affected by larger flooding events in future.

Annual flood flow peaks are lower in recent years at upstream monitoring stations, but are more variable at downstream stations, with potential for more areas of increased flooding in the Tonle Sap and Mekong Delta. Climate change impacts on drought conditions are affected not only by precipitation but also local temperature and humidity changes, amongst others. The impacts of drought in the Mekong River Basin can be severe, especially on food production and livelihoods that depend on agriculture and other natural resources. Low river flows can affect fish populations and result in larger areas of high salinity in the delta.

2) What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

The MRC has been mainstreaming regional climate change adaptation at a national level in accordance with Strategic Priority 1 of the Mekong Adaptation Strategy and Action Plan (MASAP: Mekong Climate Change Adaptation Strategy and Action Plan (MASAP) (mrcmekong.org)) since 2018. The mainstreaming activities involved identifying and implementing short-term projects, actions or activities to introduce a regional perspective into national climate change adaptation efforts.

In 2022, the MRC focused on selecting a single national policy, strategy, programme or plan in each Member Country and identifying potential changes to that policy, strategy, programme or plan to ensure a regional perspective was introduced either in the document itself or in its implementation. This represents a more

⁴ MRC. (2017). Summary of the basin-wide assessments of climate change impacts on water and water-related resources in the Lower Mekong Basin

targeted approach, with the focus of the most recent effort on mainstreaming regional climate change approaches into national drought management activities.

Additionally, the MRC has drafted a concept note for a joint project on Transboundary Climate Adaptation in the Mekong Delta through Nature Based Solutions. The project aims to establish Nature Based Approaches to flood and drought management in the transboundary area of the Mekong delta to ensure water security in the Mekong Delta under climate change and sea level rise conditions. The concept note were already put into consultation with all member countries.

Most importantly, the MRC, in collaboration with GIZ, has also developed a concept note on Integrating Flood and Drought Management and Early Warning for Climate Change Adaptation in the Lower Mekong Basin using nature-based solutions. The project aims to strengthen climate observing infrastructure and increase capacity to utilize climate and environmental information for responding to climate hazards, such as floods and droughts, and planning adaptation to climate change in the LMB region. Such decision making, risk reduction and management activities will benefit agriculture and water management sectors in their planning process. This will be achieved through establishing a functional system in the country that generates knowledge of the risks (vulnerability and hazard), has the capacity to monitor, analyze and forecast hazards, and provides communication and dissemination of alerts and warnings.

MRC also working with Member Countries to proceed for its accreditation to the Green Climate Fund (GCF). This will enable the MRC to provide support to the member countries by channeling the financial resources from the GCF needed to implement regional transboundary projects and the MASAP in the frame of MRC Strategic Plan 2021-2025 and Basin Development Strategy 2021-2030.

3) Name and short description of the flagship adaptation activity your organization wishes to highlight

As identified in the Basin Development Strategy (BDS) 2021-2030, drought and flood management is an important issue for the MRC Member Countries, and this is reflected in their Nationally Determined Contributions (NDCs) to the United Nations Framework Convention on Climate Change (UNFCCC). Regional climate change adaptation mainstreaming into national drought and flood management is necessary due to the basin-wide nature of the impacts and the need for transboundary cooperation between countries to mitigate and manage potentially more frequent and severe droughts and flood as a result of changing in climate. Below are flagship adaptation activities that the MRC has worked with regard to the climate change.

- a) Mainstreaming regional climate change approaches into national flood and drought management activities: This was focused more on selecting a single national policy, strategy, programme or plan in each Member Country and identifying potential changes to that policy, strategy, programme or plan to ensure a regional perspective is introduced either in the document itself or in its implementation.
- b) Implementing the Flood and Drought Master Plan for the 9C-9T Sub-basin between Cambodia and Thailand, which is a dynamic framework for resource mobilization, and activities implemented will strengthen resilience to flood and drought within their shared basin. This Master Plan is addressing issues such as pressures from population growth, uncoordinated hard infrastructure development, altering hydrological function, and climate change exacerbating watershed degradation. It also includes green (nature-based) and grey (infrastructure) solutions to cope with flood and drought mitigation and adaptation.
- c) Developing proposal on Integrating Flood and Drought Management and Early Warning for Climate Change Adaptation in the Lower Mekong Basin using nature-based solutions.
- d) Developing proposal on Joint Project on Transboundary Climate Adaptation in the Mekong Delta through Nature Based Solutions and Integrated Planning.

4) Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?

Rising sea levels and declining freshwater challenge the possibility to control salinity intrusion which may reach key intake points rendering them unusable for drinking or agricultural use. These challenges need significant efforts and investments to ensure basin-wide resilience. Member Countries are already taking important actions to tackle these challenges but mainly at national levels. This is why one MASAP strategic priority is aiming at enabling implementation of transboundary and gender sensitive adaptation projects while other focuses on supporting access to adaptation finance. The MRC has been working with development partners

and other international and regional organizations (including GIZ, ASEAN, WB, etc.) to improve and enhance the transboundary cooperation to address and respond to the climate change in the LMB.

In response to more disasters (including floods and droughts) and salinity intrusion due to climate change and unexpected impacts of water infrastructure projects, national development plans are implemented. Some of these key projects include those gears toward increasing dry season flows to support agriculture during drought and to mitigate salinity intrusion during low flows – which respond to sea level rise. Transboundary cooperation projects on climate change adaptation facilitate the identification of these significant joint and national projects by building trust and enhancing joint planning and problem-solving. It is also expected that the use of infrastructure for flood and drought mitigation is coordinated, including through transboundary cooperation, and that floodwater management is coordinated to enable storage and conveyance of floodwaters in an efficient and cost-effective way. Measures to adapt to flood and drought are mainstreamed in national sector strategies, plans and projects.

Importantly, huge financial investment is needed to concretely carry out the above-mentioned and other climate-change national and transboundary projects and activities. The MRC is currently working on becoming an Accredited Entity to the Green Climate Fund and Adaptation Fund, which will enable the MRC Secretariat to provide support to all member countries by channeling the financial resources needed to implement regional projects and the MASAP, in the framework of MRC Strategic Plan 2021-2025 and Basin Development Strategy 2021-2030.

5) Which lessons learned would you like to share with other basins?

It is useful to have regional cooperation and institutional framework like the MRC to support member countries in addressing climate change. The MRC has a strong legal basis (given by the 1995 Mekong Agreement signed by Cambodia, Lao PDR, Thailand, and Viet Nam) and is an important regional organization for enabling climate change adaptation at the river basin level. Moreover, various existing MRC Procedures and Guidelines will guide regional cooperation on climate change adaptation. The MRC's current efforts, stated in its Strategic Plan 2016-2020, on strengthening the implementation of these Procedures and Guidelines are readily supportive for implementation of transboundary adaptation to climate change.

A regional initiative is crucial to support climate change adaptation in addition to national planning and projects. The MASAP can be seen as an interpretation and implementation of the Mekong Agreement. The MASAP focuses on and priorities and activities addressing the threats to livelihoods posed by climate change and preparing for climate change adaptation measures to minimize poverty and food insecurity among vulnerable communities.

To supplement budget available at the MRC, it is recommended in the agreed MASAP that global climate finance should be explored to support climate change activities. Therefore, the MRC is currently working on becoming the GCF accredited entity, and also is working with a number of partners to formulate climate project proposals to be submitted for funding support from global climate financing such as GCF, GEF, AF etc.

6) What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

In 2009, the MRC established the Climate Change Adaptation Initiative (CCAI) aimed at understanding and reducing the impacts of climate change in the LMB. A central theme of the CCAI was to assess climate change impacts and vulnerabilities, and review existing monitoring systems and indicators to improve understanding on the status and impacts of climate change. In addition, the CCAI explored ways to protect communities and biodiversity in the Mekong region from a changing climate. It also supported implementation of pilot adaptation projects and actions in communities in each of the lower Mekong countries. EU provided financial support for implementing the Climate Change Adaptation Initiative.

The Mekong Climate Change Adaptation Strategy and Action Plan (MASAP) was approved by the MRC Council in 2017. The MASAP is a statement of the Lower Mekong Basin (LMB), setting out the MRC's strategic priorities and actions at basin level to address climate change risks and strengthen basin-wide resilience. The MASAP has contributed to ensuring sustainable development of the Mekong River Basin, in line with the 1995 Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin (the 1995 Mekong Agreement). It identified seven strategic priorities to mitigate negative impacts of current and future climate change in the Mekong Basin as follows:

- 1) Mainstream climate change into regional and national policies, programmes and plans;
- 2) Enhance regional and international cooperation and partnership on adaptation;
- 3) Prepare transboundary and gender-sensitive adaptation options;
- 4) Support access to adaptation finance;
- 5) Enhance monitoring, data collection and sharing;
- 6) Strengthen capacity on development of climate change adaptation strategies and plans; and
- 7) Improve outreach of MRC products on climate change and adaptation.

All seven strategic priorities have been implementing since its inception. For instance, selection of national flood and drought policies, strategies or programmes for mainstreaming regional climate change responses; operationalization of the MRC monitoring and reporting system on climate change and adaptation; application for accessing to adaptation finance (Green Climate Fund, Adaptation Fund, Global Environmental Facility, etc.). Additionally, a national budget of the member countries' contribution has been used to implement the activities spelled out under the MASAP.

7) How do you finance your climate change activities? How do you plan to finance the implementation of measures?

The MRC has presently made its efforts to access to international funding agencies by becoming an accredited organization to the GCF and AF. The MRC also collaborate with GIZ to develop proposals on (i) Integrating Flood and Drought Management and Early Warning for Climate Change Adaptation in the Lower Mekong Basin using nature-based solutions; and (ii) Joint Project on Transboundary Climate Adaptation in the Mekong Delta through Nature Based Solutions and Integrated Planning.

Additionally, the MRC is seeking financial support from Development Partners (including Mekong-Australia Partnership, European Union, Federal Ministry for Economic Affairs and Climate Action – Germany, Netherlands, Norway, Sweden, etc.). The EU provided significant financial support for CCAI (including the development of the MASAP and its implementation). Australia (DFAT) also has long experience with MRC by supporting the previous transboundary project for the Mekong Delta. GIZ/BMZ has provided significant support to the MRC climate work including supporting a Cambodia-Thailand joint projects for transboundary cooperation of the 9C-9T sub-basin.

8) How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

As mentioned in answers to Q.2 and 6 above, each member countries carried out activities under the MASAP at their national levels, for instance, selection of national flood and drought policies, strategies or programmes for mainstreaming regional climate change responses. The implementation of the MASAP's activities has contributed to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) of the member countries. For instance, enhancement of monitoring, data collection and sharing, which is one of the seven strategic priorities has linked to and aligned with the member countries' NDCs since they all have expressed a strong will to adapt to climate change, especially by setting up monitoring and warning systems to limit human, economic, and environmental losses linked to natural disasters and the impacts of climate change.

9) Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

The LMB wetland activities have been undertaken by the Environment Programme of the MRC Secretariat since the establishment of the 1995 Mekong Agreement . During the first phase of Inventory and Management of Wetlands - Lower Mekong Basin (IMW-LMB), between 1990 and 1998, the wetland classification system was proposed and has been used in different degree in the member countries. Between 1997 and 2000 a wetland inventory and management project was implemented in Cambodia. During the second phase between 1999 and 2001, the field surveys at two wetland sites including Chiang Saen of Thailand and Tram Chim of Viet Nam were conducted. In 2003, the National Reports (of the four MCs) on Classification and Inventory of Wetland/Aquatic Ecosystems in the LMB were developed.

Started in 2010, the MRC-supported initiative of developing a wetland inventory methodology framework for the Mekong River Basin aimed at applying for the inventory of wetlands in the LMB countries, especially Cambodia and Lao PDR. In early 2011, MRC commissioned a study entitled “Basin-wide Climate Change Impact and Vulnerability Assessment for the Wetlands of the LMB for Adaptation Planning”. The development of a methodology and adaptation guidance for planners to ‘up-scale’ the climate change assessments and adaptation response in specific cases to other wetlands of the same type was the major output. The study focused on climate change impact on natural systems of wetlands and their functions rather than on the ecosystem services and human use values. Continued work on developing methodologies for wetland ecosystem functions assessment is a necessary step towards enhancing LMB countries’ capacity in wetland assessment for sustainable management.

Enhancing early forecasting and warning on drought extreme events is one of the major activities of the strategic priority #5 under the MRC MASAP. Selection of national drought policies, strategies or programmes for mainstreaming regional climate change responses under the MASAP was carried out by the member countries in 2022; and this activity is planned to be continued in 2023.

Under the proactive regional planning, the MRC will conduct a strategic study to explore management activities to conserve wetland by exploring hydrological requirement which need to be preserved for the maintenance of the wetland assets in the lower Mekong basin.

10) Future planned activities

The future planned activities in relation to the climate change under the MRC include as following:

- a) Support mainstreaming of climate change adaptation to increased climate risks, floods and droughts into regional and national strategies, plans and projects;
- b) Coordinate enhanced access to international climate finance through climate fund accreditation for the MRC; and
- c) Further identify and facilitate implementation of transboundary projects on climate change adaptation and water resources management.

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10. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE MEUSE BASIN

1. Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

Two main phenomena have been observed in the Meuse basin:

- a) Rising temperatures in the waters of the Meuse: the International Meuse Commission (CIM) conducted a study on evolution in the temperature of the Meuse for the 1999-2019 period, which highlighted significant increases over the last 20 years;
- b) Multiplication of extreme phenomena: following years of exceptional draught between 2018 and 2020, a catastrophic flood of unprecedented scope devastated the area downstream from the Meuse in July 2021, which was followed by an exceptionally low water level during the summer of 2022. The IPCC's forecasts highlight that these types of severe climate events will multiply and intensify in the years to come. The CIM published a plan for exceptionally low water levels in December 2020, and since 2021, has been preparing a feedback session on the July 2021 flooding through two exchange seminars for flooding forecast services in September 2021 and 2022, along with training on the European Flood Awareness System (EFAS) in April 2023. Additionally, a feedback session on the 2022 low water levels is also being prepared.

2. What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

In 2022, the CIM published a report on the evolution of the temperature of the Meuse for the period 1000-2019. It highlights rising temperatures in later years of this period, which corresponds to episodes of exceptionally low water levels in the Meuse basin, with a notably faster rise in spring temperatures, and higher maximum temperatures being reached earlier in the year.

The CIM has also finalized the first part of the experience exchange session on the exceptional flooding in July 2021, which has made it possible to understand the rainfall and hydrological events that led to these record floods. The second part on forecasting this flooding will be completed in 2023.

3. Name and short description of the flagship adaptation activity your organization wishes to highlight

The CIM's flagship climate change adaptation activity in 2022 is the publication of a report on the evolution of the temperature of the Meuse.

4. Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?

The major challenges in the Meuse basin include multiplying extreme climate and hydrological events over a very short time period. Despite strong reactivity in transboundary cooperation, the succession of extreme events does not permit taking a step back and working strategically. The plan for exceptionally low water levels was published in December 2020, following a succession of low water levels between 2017 and 2020. The CIM then organized a feedback session seminar for flooding forecast services in September 2021, two months after the catastrophic events of July of the same year, followed by a second seminar in September 2022 and training in April 2023, which will conclude with the publication of an experience report in December 2023.

However, at the same time, an exceptionally low water level occurred once again during the summer of 2022, for which an experience exchange is being planned.

This leaves the impression of constantly trying to catch up to events related to climate change.

The other challenge that impacts transboundary cooperation is that these extreme climate events mobilize vast amounts of financial and human resources in the states and regions, which leaves few resources for international cooperation. Thus, the CIM's plans or reports are often limited to the minimum time and staff that the delegations can dedicate to this matter...

5. Which lessons learned would you like to share with other basins?

Extreme events are multiplying and intensifying due to climate change. Transboundary cooperation is indispensable to address this and react at the catchment level. International river commissions play a key role in this endeavour.

In order to better address low water levels, the CIM expanded its low water level monitoring network in 2022 and 2023 in order to share data on more tributaries. It also organized visits to sites with a considerable influence on the Meuse's flow (nuclear power plant, dams), so that each delegation comprehends the challenges inherent to these facilities and how to manage them.

With regard to flooding, the CIM has updated components to the prevention data exchange convention, which was signed in 2017. This convention allows real-time exchange of data measured at 160 stations distributed over the Meuse DHI and forecasts for 60 stations. This data feeds the flooding forecast models for the States and Regions of the Meuse, and was extremely valuable during the events of July 2021, as it allowed states located downstream to be warned about the water volume and levels to expect, and therefore organize to protect both persons and property.

6. What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

No climate change adaptation plans are planned at the international basin level, insofar as each state has drafted its own strategy and CIM delegations have decided to not invest time or money in this matter at the international scale.

7. How do you finance your climate change activities? How do you plan to finance the implementation of measures?

All of the CIM's activities are financed by contributions made by the delegations, as defined according to the distribution key contained in the Gand Agreement.

8. How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

All CIM documents are drafted based on contributions from the delegations, which often stem from national plans.

9. Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

The delegations have not yet given the CIM a mandate to work on wetlands, and the CIM has no climate change adaptation plan or strategy.

10. Future planned activities

- a) Experience exchange session on the flooding of July 2021 – publication expected in December 2023
- b) Experience exchange session on the low water levels of 2022 – publication expected during phase 2 of the exceptionally low water levels plan, in December 2024
- c) EFAS training in April 2023, technical visit to the Eau d'Heure dams in June 2023, flooding forecast service seminar in September 2023

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11. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE NEMAN BASIN

1. Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

In recent years, forecasting has taken place under the framework of the UNECE pilot project “Managing Water Resources in the Neman River Basin With Regard to Adaptation to Climate Change” (herein, the “pilot project”). These forecasts have mainly included lower river flows in the Neman River basin (especially in the spring and summer months) within Belarusian territory.

In 2015, 2016 and 2020, the decrease in water flow was particularly significant. In some parts of the Neman and its tributaries, fish freezes were observed. In terms of water, 2022 was close to an average year.

2. What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

The Neman River basin pilot project was implemented with support from the UNECE. Its results drove development of the national strategy for water resource management in the context of climate change for the period up to 2030. This strategy was approved on 22 February 2022 by Decree 91 of the Council of Ministers of the Republic of Belarus.

3. Name and short description of the flagship adaptation activity your organization wishes to highlight

In 2022, the national project to assess the risk of freezing events for an early warning system in the Neman River basin was complete.

This project proposes a set of measures for the prevention of freezing events in the Neman River basin for 2023-2030.

4. Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?

Implementing the full-scale project “Strengthening international cooperation on joint surface water and groundwater management of the transboundary Bug and Neman River basins and related aquifers, financed by the Global Environment Fund (Belarus – Ukraine with participation by Poland and Lithuania) did not begin in 2022. This is a significant limitation on transboundary cooperation.

5. Which lessons learned would you like to share with other basins?

Experience in predicting flow and assessing the Neman River basin’s vulnerability to climate change.

6. What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

The Neman River Basin Management Plan began in 2022. In 2023, we plan on completing the development of this plan, to include measures to improve the ecology of water bodies, considering the Strategic Framework for Adaptation of the Neman River Basin to Climate Change, which was developed under the UNECE pilot project. The plan is expected to be financed and implemented in 2024.

In 2022, measures were taken to improve the availability of centralized and local wastewater disposal systems in small settlements and rural areas in the Neman River basin, through treatment facilities, reconstruction of filtration fields, reduced discharge of insufficiently treated wastewater into water bodies and reconstruction of municipal wastewater treatment plants. These activities were financed and implemented under the framework of the government programme entitled “Comfortable housing and a favourable environment” for 2021-2025.

7. How do you finance your climate change activities? How do you plan to finance the implementation of measures?

Climate change adaptation activities are financed by the budget for government programmes.

8. How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

Following approval of the Neman River basin management plan, we expect to implement its measures, which will address both transboundary and local issues.

9. Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

The Republic of Belarus has been a party to the Ramsar Convention since 1999 and supports transboundary cooperation related to wetlands and draughts. The Republic of Belarus has hitherto taken on obligations to preserve 26 wetlands of international importance, two of which in the Neman River basin are transboundary with Lithuania.

10. Future planned activities

The Neman River Basin Management Plan is expected to be finalized in 2023 and submitted for approval in 2024.

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12. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE NIGER BASIN

<p>1. Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?</p> <p>Floods, droughts, water & air pollution, water scarcity, wetlands & biodiversity degradation, conflicts among users, displacement, food shortages, electricity shortages and economic degradation.</p>
<p>2. What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?</p> <ul style="list-style-type: none"> * Setting up of FRAAC to aid the funding of Climate Change Adaptation Programme in NBA * Council of Ministers approval of WEFE NEXUS guidelines * Studies on the restoration of Fouta D’jallon Highlands (River Niger source) and protection of Inner Delta wetlands *Review of phase 1 of the Sand dunes fixation & gully erosion
<p>3. Name and short description of the flagship adaptation activity your organization wishes to highlight</p> <p>Fixation of sand dunes in some parts of the Basin: Sand dunes formation and transportation is one of the major impacts of CC in the Basin. Fixing the sand dunes entails plants cultivation, nurturing, construction of river channels and control of gully erosion in the Upper, Inner, Middle and Lower parts of the Basin. Also, the protection/ restoration of wetlands of the Inner Delta and the maritime delta of the Basin.</p> <p>For example: Through some of the above activities; flooding as a result of sand dune siltation and gully erosion in the river Niger catchments were reduced; water quality issues due to gully erosion and anthropogenic activities were ameliorated, covering the sand dunes areas with vegetation reduces land degradation and air pollution, quality life restored to wetlands and biodiversity. It is an on-going activity which covers a large expanse of lands, more than 5000km². It is expected to create over 100,000 indirect jobs in the Basin.</p>
<p>4. Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?</p> <ol style="list-style-type: none"> a. Funding b. Synergies/ cooperation among stakeholders: regional and national agencies etc c. Lack of data/ documented information about climate change indices d. Shortage of manpower/expertise <p>NBA haven’t overcome all the challenges but there are strategies to overcome them. Example is the Development of Climate Change Adaptation Investment Plan for Niger Basin; Support to funding scheme called FRAAC; Adoption of Water- Energy -Food and Environment (WEFE) NEXUS Guidelines.</p>
<p>5. Which lessons learned would you like to share with other basins?</p> <p>Setting up of support funding scheme for the implementation of Climate Change Adaptation Programme in NBA called FRACC</p>
<p>6. What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?</p> <p>Yes, NBA have developed its own Climate Change Adaptation Plan called Investment Plan for the Strengthening of Resilience to Climate Change in the Niger Basin, 2015 – 2024, 3.11 billion USD. Some of the activities are been financed by World Bank, AfDB, CIWA etc Implementation is very slow due to paucity of funds.</p>
<p>7. How do you finance your climate change activities? How do you plan to finance the implementation of measures?</p> <p>Financing is from partners and members countries; but there is a need for more financial support!</p>
<p>8. How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?</p> <p>Yes, they are link together and they are in consistence with NDCs and NAPs</p>

Most of the projects are being implemented at National portion of Niger Basin members countries, so they are contributing to the development and implementation of NDCs and NAPs in each country of NBA.

9. Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

Yes, wetland management, conservation and restoration are included in NBA climate change adaptation strategies and plan.

Yes, we are supporting transboundary cooperation through our Shared Vision Policy: Water Charter and its Annexes, the implementation of Sustainable Development Action Plans and Adoption of WEFE NEXUS Guidelines.

10. Future planned activities

Regional workshop on Funds mobilization (FRACC) to support NBA-Climate Change Investment Plan implementation, July., 2023.

Regional Steering Committee of NBA, Sept., 2023

NBA Council of Minister's Meeting, Nov., 2023

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13. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE NORTHERN WESTERN SAHARA AQUIFER SYSTEM

1. What climate change impacts have you experienced or do you anticipate in your basin (impacts on wetlands and biodiversity, draught, water shortages, flooding, etc.)?

Climate change has a major impact on the NSAS basin, which effects biodiversity, wetlands, drought and water shortages.

- Droughts: Climate change has contributed to the increased frequency and intensity of draughts in the NSAS basin.
- Water shortages: climate change also has consequences on the availability of water in the NSAS basin.
- Rising average annual temperatures have led to increased evaporation, which has reduced the surface area of wetlands, and therefore, the habitat of migrating birds (Chott el Djérid...).
- Decreased precipitation and heightened demand for water for agriculture and other uses have led to increased pressure on groundwater resources.

2. What concrete results were achieved in 2022 with regard to adaptation to climate change in your basin? Are they related to the issues related to wetlands and draughts, and if so, how?

Farmers have been trained in water-saving agricultural techniques in order to improve irrigation water management and boost productivity.

With regard to wetlands, restoration measures have been undertaken to improve capacities. For example, forestation programmes were carried out in order to create forest strips and improve the quality of habitats for animal and plant species.

To summarize, there has been progress in adaptation to climate change in the NSAS basin, with initiatives focused on agriculture, water and energy, as well as restoration and conservation in wetlands.

3. Name and briefly describe the most illustrative adaptation activity that your organization would like to highlight.

Climate change adaptation is a process aimed at reducing the vulnerability of human and natural systems in the face of climate change impacts. It aims at strengthening societies' capacity to adapt to and resist the negative impacts of climate change, while maximizing potential advantages. The key climate change adaptation activities that we would like to implement in future projects may include:

- Climate change risk management: reducing risks associated with extreme climate phenomena, such as draught and heat waves.
- Smart irrigation in the face of climate: the adoption of sustainable farming practices adapted to the climate in order to improve food security and rural farmers' means of subsistence.
- Water management: efficient, sustainable management of unconventional water, including the use of collection, storage and reuse techniques.

Climate change adaptation is an ongoing process that requires collaboration between governments, companies, communities and civil society organizations in order to ensure that actions are coordinated and effective.

4. What major challenges have you faced with regard to transboundary cooperation and adaptation to climate change? How have you overcome them?

- Different regulatory and legal frameworks in countries sharing the NSAS may complicate the implementation of policy coordination.
- Political instability in one country is an obstacle to cooperation and the implementation of joint projects.

5. What lessons would you like to share with other basins?

The NSAS (Northern Sahara Aquifer System) aquifer is a vast aquifer system located under the Sahara, extending through eight North African countries: Algeria, Libya, Tunisia, Egypt, Chad, Mali, Niger and Sudan. The main lesson regarding the NSAS aquifer is its vulnerability due to growing pressure from human activity, as well as climate change, which has led to lower precipitation and increased demand for water. Human

activities such as intensive agriculture, industrialization and mining, as well as demographic growth, all increase pressure on the aquifer's groundwater reserves.

Studies have shown that the NSAS aquifer's water resources are being used at a rate greater than the discharge rate (1 billion m³), causing a drop in both the quality and quantity of groundwater. Overexploitation of the aquifer also impacts ecosystems and biodiversity, with a negative effect on wetlands, oases and desert ecosystems that depend on groundwater.

Another important lesson is the need to strengthen transboundary cooperation for effective and sustainable aquifer management. The NSAS countries share resources, but aquifer management has hitherto been fragmented, with little coordination and cooperation among countries. Therefore, implementing a mechanism for more effective coordination and collaboration for sustainable aquifer management that considers the needs of all countries concerned is essential.

Finally, it is important to promote sustainable water management practices, such as smart irrigation in the face of climate, effective water management, ecosystems restoration and water loss reduction in infrastructure. These practices can contribute to mitigating pressure on the aquifer and ensuring sustainable use of water resources for future generations.

6. What is the state of the climate change adaptation plan and strategy in your basin? Have they already been drafted, financed, and implemented?

Climate change adaptation strategies and plans have been defined with donors providing funds and the financial resources necessary for implementing these strategies. This strategy still must be approved by all concerned countries.

7. How do you finance your activities related to climate change? How do you plan to finance implementing these measures?

We must recognize that implementing effective strategies to fight global warming requires substantial and sustainable financing, as well as international cooperation in order to obtain the necessary resources.

Through international funds such as the Green Climate Fund and the Adaptation Fund, international financial institutions, such as the African Development Bank (ADB). The private sector can also play an important role in financing activities related to climate change, notably by investing in renewable energy and energy efficiency projects.

8. How have you linked transboundary adaptation to climate change with adaptation activities at other levels, for example, at the national scale? Does this contribute to the development and implementation of the Nationally Determined Contributions (NDC) and National Adaptation Plans (NAP) in your riparian states?

Transboundary adaptation activities can be linked to national adaptation activities, by developing national policies and adaptation plans that consider transboundary challenges and regional cooperation activities. The Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAP) are important tools for helping countries draft national adaptation strategies. Regional bodies can play an important role in this process by facilitating coordination between different countries, identifying shared needs in the area of adaptation and contributing to drafting and implementing national adaptation plans.

This regional body may contribute to implementing a monitoring and evaluation system to measure progress achieved in implementing national and transboundary adaptation plans. This can help improve transparency and responsibility while promoting collaboration among countries to achieve shared goals in climate change adaptation.

9. Do your transboundary climate change adaptation plans and strategy include management, conservation and restoration of wetlands as well as draught management? Does it support transboundary cooperation related to wetlands and draughts, and how?

Management, conservation and restoration activities in wetlands, as well as draught management activities in the transboundary plan include:

- Assessing needs: wetlands and zones impacted by draught, in order to identify specific needs for management, conservation and restoration.

- Defining clear objectives for management, conservation and restoration in wetlands, as well as draught management.
- Identifying specific adaptation measures to be implemented in order to achieve the objectives defined.
- Regular and efficient assessment of adaptation measures implemented and adjusting the plans as necessary.

10. Future planned activities

- Creating an environment that promotes reversing degradation trends;
- Testing solutions on the ground;
- Promoting adoption by countries concerned.

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14. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE RHINE BASIN

1. Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

Detailed impacts were given in previous meetings/workshop reports/templates.

To sum-up:

According to studies, by the middle of the 21st century, up to 20 % higher discharges are to be expected during winters in the Rhine catchment and up to 10 % lower discharges are expected during summers, while regional variations may occur. Thus, effects of climate change modify the discharge pattern of the Rhine and its tributaries. Presumably, periods with floods or low flow will become more frequent and more distinct. A rise in air temperatures leads to higher water temperatures which again – together with low flow – might result in an ecological and chemical modification of water bodies.

In July 2021 a heavy rainfall event caused severe flooding on tributaries of the Rhine and in part of the Meuse basin. More than 220 people lost *their* life and the damage is estimated at 21 billion euros (17 billion for Germany). Due to CC and global/regional warming, it is expected that the likelihood and intensity of such events will increase. This is generally explained by warmer air leading to higher evaporation and air containing more humidity. Thus, this disaster was a wake-up call for the Rhine regions to be better prepared for such local/regional events. A lot of reconstruction and flood risk management improvement measures/actions are being taken by the affected States which can be seen as CC mitigation/adaptation win-win measures.

In summer 2022 (see corresponding [press release](#)) and for the third time since 2003 and 2018, the Rhine and many water bodies in its catchment area were affected by a pronounced low water level. The low flow event was comparable to the low water of 2018. At the gauges in Duisburg-Ruhrort (Germany) and Lobith (Netherlands), the water levels even fell below those of 2018. If low water takes on extreme proportions and lasts for a long time, it can negatively affect the ecology (especially together with warm water temperatures), significantly disrupt navigation, lead to restricted water availability for agriculture and industry, and affect the drinking water supply in the Rhine delta. Climate change increases the likelihood of more frequent and more severe low-water events in the future. As [recent study results](#) of the Commission for the Hydrology of the Rhine (CHR) shows it is also to be feared that the share of meltwater from snow and glaciers, which stabilises the discharge of the Rhine during low water, will decrease. This makes it even more important to restore near-natural water structures on the Rhine and in its catchment area, and to adapt to climate change.

The ICPR is following closely, through its Expert group Low water (EG LW) the situation in 2023 which began with a heavy winter drought and could and could represent another summer of drought and low water. The EG LW will also report until next year on the summer drought and low water of 2022.

2. What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

2022 was rather a “preparation year” for the ICPR for further working steps linked to updating the CC adaptation strategy by end of 2025.

A [press release](#) of the ICPR was published on the occasion of the low water event of summer 2022 which was followed carefully by the ICPR own expert group on Low water and its [low flow monitoring system](#). The low flow event of 2022 was also used to test in real the monitoring system and decide on technical improvements. The 16th Rhine Ministerial Conference took place on the 13th of February 2020 in Amsterdam. At this occasion, the [Programme Rhine 2040](#) entitled “The Rhine and its Catchment: Sustainably Managed and Climate-resilient” was launched. The ICPR working plan for the period 2022-2027 translates the objectives of the programme Rhine 2040 into concrete actions for the first period of implementation of Rhine 2040. In 2022 two brochures on the programme Rhine 2040 were published: [a short version for the great public](#) and a [long and complete version](#).

Also interesting in the context of the UN work is the specific document from the ICPR linking the SDGs to the objectives of the Rhine 2040 programme:

https://www.iksr.org/fileadmin/user_upload/DKDM/Dokumente/Broschueren/EN/bro_En_SDGs.pdf

General/Past improvements and products can be also mentioned here:

The integration of climate change and its adaptation have been reinforced in the 2nd International Flood Risk Management Plan (IFRMP) published end of 2021. See <https://www.iksr.org/en/eu-directives/floods-directive/flood-risk-management-plan>. The same is true for the 3rd International River Basin Management Plan of the Rhine river basin (IRBMP) published beginning of 2022. See <https://www.iksr.org/en/eu-directives/european-water-framework-directive/river-basin-management-plan-2021-1>.

The ICPR is the coordinating platform for the implementation of those two plans. A lot of measures in these two plans are win-win and no-regret measures regarding climate change/evolution and mitigation of negative effects.

3. Name and short description of the flagship adaptation activity your organization wishes to highlight

Beginning the implementation of the new Programme Rhine 2040 with the objective of having the Rhine river basin climate resilient by 2040. In this frame, the ICPR expert group HCLIM has the task to update discharge projections for the Rhine and its major tributaries by the end of 2023. Also in connection with the new strategy, the ICPR has started work on the topic - new to the ICPR - of water demand/use and availability during hydrological droughts and low water events as well as in the future.

4. Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?

Our main challenge was to develop a common, interdisciplinary and transboundary adaptation strategy and to strengthen its integration into the IRBMP and IFRMP as well as the working plan 2016-2021 of the ICPR. Then to incorporate this topic in a strong way in the new Rhine 2040 programme which was published beginning of 2020. A major challenge for the future is the implementation of Rhine 2040 and its elements related to climate change mitigation and adaptation. Important upcoming work will be to update the CC adaptation strategy by 2025 with the first step being the updating of the discharge projections for the Rhine and its major tributaries by the end of 2023.

But while the topics and work on floods are more familiar to the ICPR, new topics concerning water demand/use and water availability in the future are real challenges for the ICPR in terms of knowledge, methodology and available data.

We overcome these challenges mainly by making use of the strong experience of cooperation between states in the Rhine basin, which dates to 1950. In addition to cooperation between states, we can also count on the enriching contribution of observers (NGOs, other international river commissions, etc.) and other important players such as the Commission for the Hydrology of the Rhine (CHR), the Central Commission for the Navigation of the Rhine (CCNR) and the UN-ECE.

5. Which lessons learned would you like to share with other basins?

There are and will always be some uncertainties about climate change impacts, but the Rhine countries believe the trends to be robust enough to act and to implement an international adaptation strategy.

So far, we have learned that a mix of top-down and bottom-up measures (from the transboundary/international level to the national and regional level and vice-versa) is the best option when developing an adaptation strategy. It is also very important not to reinvent the wheel: try to use available, realized or planned measures, e.g. the ones linked to the WFD and FD implementation or originating from former programmes. Additionally, working on common issues like drought and low flow events (e.g. 2022 on the Rhine) plays a key role to strengthen exchange, cooperation and mutual understanding between riparian states. And, at least, the topic of CC can be a very good common topic for transboundary cooperation as shown by the decisions taken by the Ministers of the Rhine concerning the launch of the new Rhine 2040 program. Now the objectives and tasks of Rhine 2040 have been transposed into a concrete working plan for 2022-2027.

6. What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

The 16th Rhine Ministerial Conference took place on the 13th of February 2020 in Amsterdam. At this occasion, the [Programme Rhine 2040](#) entitled "The Rhine and its Catchment: Sustainably Managed and Climate-resilient" was launched. The ICPR working plan for the period 2022-2027 translates the objectives of the programme into concrete actions for the first period of implementation of Rhine 2040.

The CC adaptation strategy of the ICPR was published in 2015, mainstreamed into the work of the ICPR, in particular through river basin and flood risk management plans as well as through the work of the ICPR regarding the effects of CC on water quality, environment/ecology, low water and uses. The program Rhine 2040 foresees the updating of the strategy by 2025. First steps for this update have begun with the update of the discharge scenarios by end of 2023. This creates a new scientific basis for other ICPR groups to work on effects of CC and changed discharges on water temperature, negative impacts on water quality and ecology as well as future water availability.

7. How do you finance your climate change activities? How do you plan to finance the implementation of measures?

The different states within the ICPR are financing the implementation of CC measures on their respective territories. The budget of the ICPR is used only for the organization/coordination of the ICPR activities which is carried out by the ICPR secretariat in Koblenz and the various working groups with national representatives and observers. Furthermore, national and municipal activities related to CC are being implemented and financed directly at a national level but benefit the implementation of the actual and upcoming updated ICPR Climate Change Adaptation Strategy.

8. How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

The Climate Change Adaptation Strategy for the Rhine Basin was, amongst others, based on aspects included in the national adaptation strategies of the individual states. On the other hand, the Rhine basin states can inspire themselves from the ICPR Climate Change Adaptation Strategy. Updates and progress reports are being drafted by the ICPR identifying new national developments or knowledge about CC impacts and mitigation measures/actions. Furthermore, climate change adaptation aspects are being implemented by the countries within their implementation of the river basin and flood risk management plans. For the upcoming update of the CC strategy, the current revision of the discharge projections/scenarios is not based on new ICPR modelling but consists of a common integration and visualisation of national and international (CHR) available modelling results. Thus, there is a direct link between national and cross-border work.

9. Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

Restoring and protecting the aquatic ecosystems – including revitalizing/restoring floodplains, reconnecting sidearms and creeks and river banks but also restoring the continuity of the river (for fish migration) - are long standing tasks and objectives of the ICPR. All achievement so far in river protection or restoration can be found in the [assessment of the previous ICPR programme Rhine 2020](#). The improvement of the aquatic environment, both for humans and nature, are part of the ICPR's CC adaptation strategy and the new Rhine 2040 program but also more concretely in the 3rd IRBMP published beginning of 2022. These aspects will be strengthened in the update of the adaptation strategy by 2025.

When it comes to drought and low water management, these are quite new topics which we are now dealing with and actively working on in the frame of our program Rhine 2040 (and respective objectives).

10. Future planned activities

- a. In particular, an update of the ICPR's CC adaptation strategy is planned by 2025. This involves a whole range of preparatory activities as updating the discharge scenarios/projections and identifying new effects on the uses, environment of the Rhine as well as mitigation measures.
- b. The expert group HCLIM has the task to update discharge projections for the Rhine and its major tributaries by the end of 2023. A dedicated report with new outcomes will be published by mid-2024. After this and/or in parallel to this the other working and expert groups of the ICPR will work on the (update of) consequences of CC on floods and low water, water use and availability, water temperature, water quality and the ecology/aquatic environment.
- c. For the issue of (projection of) water demand/use and water availability, the ICPR is working closely together with the CHR and also a new EU project called [Stars4Water](#). The ICPR also has connections

with the European Drought Observatory (EDO) and their drought maps are being displayed in the ICPR low water monitoring system. In 2023 the ICPR will also improve technically this system and assess the summer low flood event of 2022 as well as the potential one of summer 2023.

- d. End of 2023 the ICPR will organise a specific workshop on the topic of heavy rainfall and flash flood events. Beginning of 2024 the ICPR will also organised an interdisciplinary workshop on the topic of sediment. In those two workshops links with CC impacts will be made.
- e. An ICPR workshop to prepare the revised strategy will be held in 2024.
- f. In 2023 the ICPR will also improve its low water monitoring system.

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15. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE SAVA BASIN

1. Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

For the assessment of future climate parameters, various global and regional climate models and scenarios have been used. Although uncertainties exist, some common trends have been identified and projected as follows:

- a. for the future, a further increase in air temperature is expected within the Sava basin by around +1°C in the next 30 years,
- b. the precipitation change is complex and expected changes are very variable. In general, an increase during the winter and a decrease for the summer months is expected. Summer precipitation deficit is more pronounced in 2041-2070 period,
- c. Frequent and more intense extreme weather events will take place more often. Longer periods of droughts and shorter and locally distributed periods of intense precipitation in the future are predicted in all countries in the Sava River Basin with an increasing risk of flooding

2. What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

Climate change adaptation chapter providing guiding principles and recommendation for the future steps has been included in the draft 2nd Sava River Basin Management Plan which was accepted by the Parties to the FASRB (Slovenia, Croatia, Bosnia and Herzegovina and Serbia) on 9th of December 2022.

Delegation of the Republic of Slovenia at the UN 2023 Water Conference promoted the ISRBC as a good practice of collaboration and cooperation in the international river basin and as a contribution in the field of water and peace. The ISRBC's commitment for the Water Action Agenda played an important support to the delegation's interventions and work at the conference, is focused on the integrated water resources management and transboundary cooperation on flood and drought monitoring and mitigation, thereby making the countries more resilient to climate shocks.

3. Name and short description of the flagship adaptation activity your organization wishes to highlight

During the development of the Outline on CCA Strategy the following future steps have been recommended to be implemented:

- a. Vulnerability assessment
- b. Analysis of cost and benefits of climate change adaptation
- c. Raise awareness and the scale of adaptation by assessment of climate change at the SRB level.
- d. Identification of principles of measures implementation
- e. Monitoring and evaluation of adaptation measures

4. Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?

The following major gaps have been recognized

- a. a number of sectors have not been addressed in the climate change context in the below mentioned studies and plans (e.g., forestry, fishery, aquaculture, spatial and urban planning, infrastructure development, tourism, health)
- b. for the sectors that have been considered so far (i.e., water management, flood protection, navigation, hydropower use, agriculture), potential adaptation measures have been identified and recommended, however these measures have to be elaborated into more details, so as to allow for prioritization and implementation of basin relevance measures.

5. Which lessons learned would you like to share with other basins?

It has already been proven that the Framework Agreement on the Sava River Basin, signed and ratified by Slovenia, Croatia, Bosnia and Herzegovina and Serbia, along with ISRBC as its implementing body, is a good example of transboundary cooperation on the river basin level.

6. What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

At the Sava RB level, the following projects have addressed the climate change adaptation:

- a. Building the link between Flood Risk management planning and climate change assessment in the Sava River Basin, UNECE, 2013
- b. Water – Food – Energy – Ecosystems Nexus Assessment in the Sava River Basin (finalized in 2015) ;
- c. Danube Water Nexus Project – Sava Case Study, implemented by the EC Joint Research Centre (finalized in 2016);
- d. Water and Climate Adaptation Plan for the Sava River Basin (WATCAP) (finalized in 2015)
- e. Outline of the Climate Adaptation Strategy and basin-wide priority measures for the Sava River Basin (finalized in 2018)

7. How do you finance your climate change activities? How do you plan to finance the implementation of measures?

At the ISRBC most of the activities have been financed by external funding sources (World Bank, Ministry of Ecological and Inclusive Transition (Republic of France), International Office for Water and UNECE).

The future activities will be supported by the World Bank/GEF through approved Sava and Drina River Corridors Integrated Development Program (SDIP).

8. How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

The climate change adaptation has been included in the 1st Flood Risk Management Plan and in the 1st and 2nd Sava River Basin Management Plan. In development of those plans the experts from the Sava countries have been involved through direct contact on workshops and through the permanent expert groups, particular for River Basin Management, for Flood Protection and for Hydrological and Meteorological Issues, established by the ISRBC.

9. Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and droughts and how?

In the Outline on the Climate Change Adaptation Strategy the following measures have been foreseen:

- a. Preparation measures for adaptation aiming to support planning process,
- b. Ecosystem -based measures which are based the use of biodiversity and ecosystem services to help people adapt to the adverse effects of climate change
- c. Behavior-change measures aiming to raise awareness about possible future conditions, to modify behaviors and practices and to support sustainable management with a focus on the efficient use of water and conservation of good water quality.
- d. Policy measures aiming to support the national, international, and basin-wide coordination of activities.
- e. Technological measures focusing is on infrastructure which has to be built or improved.
- f. Disaster Risk reduction measures to reduce the risk of disasters and the adverse impacts of natural hazards.

The Parties to the FASRB oversee implementing adaptation measures to climate change and apply the principles of subsidiarity and solidarity. To respect these provisions, they have agreed to effectively coordinate measures with transboundary effects. The International Sava River Basin Commission has a coordination role in the process of FASRB implementation.

10. Future planned activities

The development of the CCA Strategy for the Sava River Basin is foreseen to be implemented in scope of the Sava and Drina River Corridors Integrated Development Program (SDIP), financed by the World Bank/GEF. The SDIP implementation became effective in November 2022. The development of the Strategy is foreseen to start in 2024.

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16. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE SENEGAL BASIN

1. What climate change impacts have you experienced or do you anticipate in your basin (impacts on wetlands and biodiversity, draught, water shortages, flooding, etc.)?

Flooding has been observed almost everywhere throughout the Senegal River basin. In fact, the return of rainfall water cycles noted in recent years, as well as the recurrence of extreme phenomena have highlighted the complexity of flooding in the Senegal River basin. Precipitation recorded since the early 2000s has led to major run-off and repetitive flooding in some parts of the catchment, including some “dormant” wadis where very high flows have been observed.

In southern Mauritania and northern Senegal, many rainfall events greater than 100 mm or even 150 to 200 mm in 24 hours have been observed. In the upper basin, even if it is favourable, abundant rainfall has taken place, filling the Manantali dam, followed by flooding of the spillway.

2. What concrete results were achieved in 2022 with regard to adaptation to climate change in your basin? Are they related to the issues related to wetlands and draughts, and if so, how?

The roadmap for the 2050 Development and Management of the Senegal River Basin Waters (SDAGE) has been updated and the Climate Investment Plan has been drafted and approved by stakeholders in December 2022.

To summarize: The SDAGE Senegal River Basin vision is that **by 2050, water management of the Senegal River Basin is optimized and consolidated to improve populations’ living conditions, respect for equity among countries and ecosystem preservation**. The SDAGE plan of action is divided into five fundamental guidelines; 19 provisions and 119 measures, with a total cost of 10,539,000,000 euros. The fundamental guidelines are defined as follows:

- a. Strengthen governance to ensure comprehensive management of water resources in the Senegal River Basin: with 5 provisions and 31 associated measures;
- b. Preserve water resources in the Senegal River Basin: with 4 provisions and 27 associated measures;
- c. Manage risks related to Senegal River Basin water resources: comprised of 3 provisions and 16 associated measures;
- d. Control water resources: 4 provisions and 24 associated measures
- e. Value water resources: 3 provisions and 26 associated measures.

This SDAGE is aimed at building coherence in the development of various uses with available water resources by 2050, and stems from a Climate Investment Plan (CIP). The CIP consists of a series of measures from the 2050 SDAGE, which contribute to building resilience to climate change among populations of the Senegal River Basin. It includes two strategic intervention axes, 100 measures for 2033 and has an overall cost of 6 billion euros, or 56.9 per cent of the SDAGE. The intervention axes include improving knowledge of climate change and its impact and implementing multisectoral activities to fight and build resilience to climate change.

Disseminating a flooding alert plan drafted in 2021 by the four member states’ basin committee

3. Name and briefly describe the most illustrative adaptation activity that your organization would like to highlight.

Flooding prevention and management in the Senegal River Basin, by 1. operating a flooding alert plan; 2. supporting member states in disaster management; 3. sharing hydrometeorological information.

4. What major challenges have you faced with regard to transboundary cooperation and adaptation to climate change? How have you overcome them?

- a. Gaps/low capacity in managing investments for adaptation at the local level, which impacts their sustainability and requires ongoing support, which decentralized technical services are not able to provide.
- b. Limitations on the mobilization of financing with a view toward scaling/disseminating adaptation pilot projects.

5. What lessons would you like to share with other basins?

- a. Implementing a monitoring and evaluation system and finding mechanisms that make it possible to sustain achievements are imperative;
- b. It is vital that river basin groundwater resource management be strengthened and less vulnerable to climate change. Today, they represent an alternative in terms of water control for socioeconomic activities;
- c. Pursue and intensify capacity building in order to shift toward deep-seated changes in the behaviour of populations living in the basin when it comes to challenges related to environmental preservation, water resource management and investment management.

6. What is the state of the climate change adaptation plan and strategy in your basin? Have they already been drafted, financed, and implemented?

The CIP has been drafted and approved. The next step is disseminating it and seeking financing for implementing the activities.

7. How do you finance your activities related to climate change? How do you plan to finance implementing these measures?

Through contributions from the states, loans, donations and bilateral cooperation.

8. How have you linked transboundary adaptation to climate change with adaptation activities at other levels, for example, at the national scale? Does this contribute to the development and implementation of the Nationally Determined Contributions (NDC) and National Adaptation Plans (NAP) in your riparian states?

SDAGE plans of action, the CIP and all adaptation projects have been aligned with the states' strategic documents regarding climate change. The organization's planning and investment documents consider member states' concerns in the section on the Senegal River Basin. More broadly speaking, we are contributing to reducing greenhouse gas emissions in the region. The OMVS's hydroelectric infrastructure currently totals 400 MW, for an average annual production of 1761 GWhs. Electricity produced is delivered by an interconnected network (transport) intermediary from the Manantali dam (RIMA) along a route measuring nearly 2,000 kilometres long. These projects have made it possible to avoid the emission of 14,119,237 tons of CO₂ over the last two decades, substantially reducing OMVS member states' energy bills over the same period. From 2002 to 2022, savings compared to thermal production using fossil fuels total 845 billion FCFA, or an average of about 42 billion FCFA per year.

9. Do your transboundary climate change adaptation plans and strategy include management, conservation and restoration of wetlands as well as draught management? Does it support transboundary cooperation related to wetlands and draughts, and how?

As it is aligned with member states' concerns, these issues are a major part of the organization's planning and activities. We have reforested 70 ha of mangrove in the Diawling Park. In 2022, over 5,200 ha of sensitive zones were protected and/or restored in the upper basin of the Senegal River (Guinea and Mali), through conservation activities, reforestation and mechanical activities from the Défense Restauration des Sols, Conservation des Eaux et des Sols [Soil Defense and Restoration, Water and Soil Conservation] (DRS-CES).

10. Future planned activities

Disseminating the SDAGE and CIP, seeking financing
 Seek to implement the flooding alert plan
 Pursue improvements in water resource knowledge

11. Contact information

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17. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE SIXAOLA BASIN

1. What climate change impacts have you experienced or do you anticipate in your basin (impacts on wetlands and biodiversity, draught, water shortages, flooding, etc.)?

In the face of global challenges emerging due to the climate crisis in our location, we have seen alterations and changes that are a direct consequence of global warming and changes to climate patterns. Among the impacts we have seen, we can mention changes to the water flow, which is progressively decreasing in volume and low water current levels in the basins. At the same time, tributary networks that in prior years fed the basins have dried up entirely.

Draughts and a prolonged summer season have also become a reality in the province compared to prior years. There is greater rainfall in marked seasons; currently, precipitation has decreased which impacts soil conditions and the development of plants that had adapted to certain climate conditions.

It is also important to note the impact of climate change on agriculture and soil production, which are affected by changes to the water cycles allowing the exchange of material and energy in the soil change. Strong and intense precipitation lead to erosion of productive soil, which deteriorates its quality.

Among other impacts, we can cite flooding in areas close to water sources- both rivers and streams, which leads to heightened vulnerability in those zones, as in recent years, as flooding has become both intense and recurrent, while simultaneously, coastal areas have seen rising sea levels, which have submerged some previously exposed beach ecosystems.

Rising sea levels, since approximately the year 2000, in both countries, particularly from Cahuita to Bahía del Almirante, which have both socioeconomic and environmental consequences, species migration, changes to the coastal landscape, changes to the coastal ecosystem dynamic, reduced areas of state-owned natural reserves and the loss of reefs; **Biological and ecological changes to aquatic and land ecosystems caused by invasive species**, in the middle and lower basin of the Sixaola River and the San San Pond Sak Wetland of International Importance for the past decade. This problem is worsening based on studies conducted in the area; we have lost materials and agricultural and fishery production in the lower and medium zones of the Sixaola River basin. Banana farms in the lower basin have wells built over decades for the banana fruit packing process, which have been impacted because the aquifers have disappeared in some areas; extreme phenomena have become more frequent and summer temperatures have risen, while precipitation has become more intense, and draughts have become more frequent and longer. **Difficulty accessing drinking water**. The problem of accessing quality water was noted, due to the high amounts of some minerals such as iron and manganese, which are naturally occurring in the zone. There is also a lack of infrastructure investment and there are no mechanisms to provide sustainability for aqueducts in indigenous territories. This problem has become more acute with population growth.

2. What concrete results were achieved in 2022 with regard to adaptation to climate change in your basin? Are they related to the issues related to wetlands and draughts, and if so, how?

Climate change adaptation measures are mainly based on forest management, community-based management and conservation in ecosystems which have been repopulated with strong pressure due to human activity as a measure to restore and reconvert degraded soil and preserve forests with important ecological functions. This has been achieved through programmes like “Alianzas por el Millón” [Partnerships for a Million] and Plan Colmena, which build local capacities in adaptation to a new rural reality, as well as through programmes financed to promote participative community resilience, incorporating governance and the implementation of ancestral knowledge as adaptation strategies based on indigenous communities’ traditional knowledge.

Basins and plant nurseries in vulnerable zones have been reforested.

Living conditions have improved in vulnerable communities.

Local adaptation capacities have been generated with a gender-based approach.

Adaptation measures in coastal marine areas.

3. Name and briefly describe the most illustrative adaptation activity that your organization would like to highlight.

Restoring basins and reforestation in critical areas for conservation, while incorporating cross-cutting axes, such as a gender-based approach and governance, implemented by the Alianzas por el Millón programme and community-based organizations.

This programme allows participative activities and empowers women to build capacities and promote a conservation culture through activities and innovations aimed at adapting to climate conditions, driving resilient means of subsistence, with a focus on more sustainable agroecology and the promotion of solidarity-based economies to improve the quality of life in rural and indigenous communities.

4. What major challenges have you faced with regard to transboundary cooperation and adaptation to climate change? How have you overcome them?

The cohesion of government policies with community-level needs and interests, which lead to gaps in inequality, low levels of inclusion, and low capacities in facilities aimed at efficiently strengthening activities, along with little implementation of intercultural approaches that might enrich joint strategies and activities, low levels of governance and weak institutions, which are partners and allies in addressing climate change.

5. What lessons would you like to share with other basins?

Effectively implementing interventions to address climate challenges and major threats to ecosystems requires a sociocultural approach, participative governance and the development of local capacities. Applying ancestral knowledge as a means of adaptation is now a tool for integration and inclusion. The contribution of youth and women as agents of change and transformation for greater development is also valuable. In this sense, it is worth highlighting that there are several indigenous groups living along the binational Sixaola River who have preserved their traditions and customs.

6. What is the state of the climate change adaptation plan and strategy in your basin? Have they already been drafted, financed, and implemented?

- a. Donations
- b. Subsidies
- c. Partnerships with local organizations
- d. External financing

7. How do you finance your activities related to climate change? How do you plan to finance implementing these measures?

Activities linked to strengthening adaptation capacities have been achieved through partnerships, strategies with institutions, companies and civil society, which have joined efforts with resources or input through donor partners who plan subsidies or through international cooperation agencies and international organization bodies that promote sustainable development agendas and the vision of a more resilient society by 2030.

8. How have you linked transboundary adaptation to climate change with adaptation activities at other levels, for example, at the national scale? Does this contribute to the development and implementation of the Nationally Determined Contributions (NDC) and National Adaptation Plans (NAP) in your riparian states?

These activities have been executed through interinstitutional management and follow-up to programme commitments and government policies linked to international strategies to consolidate the country's development targets.

9. Do your transboundary climate change adaptation plans and strategy include management, conservation and restoration of wetlands as well as draught management? Does it support transboundary cooperation related to wetlands and draughts, and how?

Not applicable.

10. Future planned activities

Of lessons learned and experience exchanges, dialogue, developing plans by reviewing and analysing the results of viable programmes and projects that have received a positive response.

11. Contact information

18. ACTIVITIES ON TRANSBOUNDARY WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE VOLTA BASIN

1. Which climate change impacts are you already experiencing or expecting in your basin (impacts on wetlands and biodiversity, droughts, water scarcity, floods, etc.)?

The ABV commissioned a situational assessment of climate change and its impacts in the Volta basin. Essentially, we have noted that:

The Volta basin has a semi-arid to semi-humid climate. The semi-arid climate is located above the 9°N latitude, while the subhumid climate is located below the 9°N latitude. Average annual rainfall is presenting significant north-south spatial variability. Average annual precipitation varies from less than 300 mm in the north to over 1500 mm in the south. The time and distribution of precipitation are largely influenced by the West African monsoon (WAM) and divided into a dry season (November-March) and a rainy season (April-October). Average potential annual evapotranspiration is below 1500 mm in the south but greater than 2500 mm in the north of the basin. Average annual temperatures in the ***northern part varies from 27°C to 36°C*** and from 24°C to 30°C in the southern part of the basin. Several studies have shown that climate change will become more accentuated in all regions in the coming decades. In the case of a global warming of 1.5°C, heat waves will become more frequent, hot seasons longer and cool seasons shorter. With a temperature increase of 2°C, extreme heat will reach the critical tolerance threshold for agriculture and public health more frequently. Spatial climate variability in the Volta basin, along with climate change, will increase the unpredictability and decrease the viability of rainfall for agriculture, which will seriously endanger inhabitants' means of subsistence.

The drop in precipitation varies from 2 per cent to 10 per cent, while surface runoff will increase by 16 per cent to 76 per cent in some locations of catchments. At the basin level, this increase is approximately from 9 per cent to 14 per cent. This can have a negative impact on agriculture and also intensify flooding in these subbasins.

One potential adaptation strategy is water storage through small reservoirs capable of retaining water with small dams built upstream from the watershed and ephemeral rivers. Water stored during the rainy season is used for agriculture during the dry season. Thus, they are storing water not only for irrigating crops during the dry season, but also reducing the flooding points.

This study, based on bibliographical review, highlights that key priorities for the future include the development of a meaningful database for adaptation based on effective monitoring and assessment and strengthening capacities at all levels. Having reviewed the results of this study, we confirm the findings of the 6th IPCC Report, including:

1.1 Extreme heat is rising in West Africa.

In the Volta basin, the impact of extreme heat is observed as strong evaporative demand, causing early drying in humid zones and small water retentions, as well as disruptions to the reproductive cycle of many aquatic and land species (for example, unproductive eggs).

1.2 Extreme precipitation is still poorly understood in West Africa, due to the limited **data and/or scientific publications**. In the Volta basin, heavy rain is becoming increasingly frequent. Pockets of draught lasting from 10 days to two weeks lead to very weak production yields.

1.3 Agricultural and ecological draughts are rising in West Africa: For example, in the Plandi 2 catchment in Burkina Faso, plant formations have dropped from 90.6 per cent in 1972 to 77 per cent in 2018, and farms have dropped from 97 per cent to 78.61 per cent of the total basin area. Uncontrolled occupation of the riverbanks and an expansion of farmland have eroded biodiversity, and are a climate change adaptation strategy developed by populations to address poor harvests and a need to improve their income. Analysis of these climate simulations for the Volta basin shows that:

All the climate models agree that temperatures will rise. According to the models considered, annual temperatures could rise by 1.7 to 2.5°C for high temperatures (daily maxima) and between 2 and 3°C for low temperatures (daily minima).

As far as precipitation is concerned, the results of the models are highly contradictory, and it is not possible to draw any conclusions.

- Some models predict an increase in annual rainfall totals, while others predict a decrease.
- On a seasonal scale, the models are also highly contradictory (see figures below).

2. What are the concrete results achieved in 2022 with regards to climate change adaptation in your basin? Are they connected to the topics of wetlands and droughts and, if yes, how?

2.1) The ABV took part in preparing and participating in the PTF roundtable to mobilize resources with a view toward sustainable management of wetlands.

2.2) The VFDM Project (*Integrating Flood and Draught Management and Early Warnings for Climate Change Adaptation in the Volta Basin*) / Cost: 7.92 million USD is financed by the Adaptation Fund: (i) development of a flooding and draught forecast and early warning system (**VoltAlarm**), (ii) drafting a regional community and ecosystem resilience strengthening programme based on "**Nature-Based Solutions**", (iii) mapping zones vulnerable to flooding and draughts, etc., for more information, please see: <https://www.floodmanagement.info/volta-basin/deliverables/>

3. Name and short description of the flagship adaptation activity your organization wishes to highlight

The REWarD-Volta River Project, financed by the GEF – cost 7.122 million USD / 5 years: (i) an IT tool for evaluating samples and forecasting short, medium and long-term water needs coupled with the SIG, (ii) a strategy and communication supports for the ABV's Strategic Action Programme, (iii) usage mapping, etc.;

The BAD-ABV Programme, financed by (ADA & FAT) – cost 4.4 million euros / 2 years: "*Knowledge development programme to fight regional fragility and strengthen resilience in the Volta basin*", (i) a hydraulic allocation and water resources management model in the basin; (ii) an economic analysis model with a view toward facilitating the drafting of a Master Plan for Development and Management of the Volta Basin in coming years; (iii) updating construction projects for the multipurpose Nounbiel dam, etc.;

The DYNObA Project "*Revitalization of African Transboundary Basin Organizations for improved water resources management in a context of climate change*", financed by AFT & ADA / OiEau

a. SO1. Improve transboundary basin organization governance and support new financing mechanisms

1. Support for the Volta basin **Water Charter** ratification process;
2. Support dissemination of the Volta basin **GENDER Charter**;
3. Support the organization of meetings of the Stakeholders' Forum, with a special focus on **GENDER** and youth participation.

b. SO2. Strengthen information systems and disseminate their products

A support for **benefiting from advancements in spatial hydrology in the Volta basin**. This would facilitate hydrometeorological data collection for various hydraulics models to assist with decision-making.

c. SO3. Support strategic planning, as well as programming and infrastructure management.

4. Which major challenges did you face with regards to transboundary cooperation and climate change adaptation? How did you overcome them?

Challenge 4.1) Coordinated management of hydraulic development projects/infrastructure.

Challenge 4.2) Equitable sharing of available water resources to satisfy a variety of needs; challenges are related to forecasting environmental flows and basin strategic hubs.

In response, in May 2019, member states adopted the Water Charter, which is a legal and regulatory text establishing concerted water resources management in the Volta basin. This Charter will include 12 explanatory annexes, including: **1) methods for production, collection, exchange and use of data and information; 2) Attributes, composition, organization and operations of specific bodies created by the Water Charter (Independent Experts Panel, Interparliamentary Committee); 3) Notification prior to planned measures; (note: these first three annexes have already been drafted and adopted); 4) Environmental protocol; 5) Coordinated management of IH, 6) Shared projects and interests; 7) Flow objectives and water volume to be sampled; 8) Authorizations and declarations of sampling, non-removal uses and polluting waste; 9) Distribution of fees between ABV/states; 10) Navigation methods; 11) Harmonization of fishing and aquaculture; 12) Map of the Volta drainage basin.**

A detailed rain study will be conducted in 2023 on concerted management of hydraulic facilities and contribute to greater accuracy in order to request adherence by all.

Challenges 4.3) The hydrometric network is obsolete, which does not allow for available data for designing a viable model.

In response: a) **spatial hydrology** is planned for the DYNObA project, b) the use of satellite imagery data is one alternative, and the GMES & Africa Programme is conducting training to promote Google Earth Engin, c) The ABC is seeking the means to obtain a modern hydrometric network.

Challenges 4.4) Financing infrastructure for water mobilization (multipurpose/multiuse dams in the basin). In response, the BAD Project's component 2 will update technical studies and relaunch cooperation and dialogue between countries directly impacted, expanded to other countries of the basin.

Challenges 4.5) Implementation of independent and sustainable financing mechanisms in the ABV, based on the user pays principle.

New projects underway will contribute to mitigating these challenges.

5. Which lessons learned would you like to share with other basins?

5.1) The history of the Nounbiel dam project on a transboundary site between Burkina Faso and Ghana, not far from Côte d'Ivoire: inter-state negotiation meetings

5.2) Mapping zones vulnerable to flooding and draughts and implementing community Early Warning Systems (EWS).

5.3) Designing, organizing and implementing online trainings on five topics related to hydro-climactic disaster management for 700 young professionals in the sector.

6. What is the status of your basin climate change adaptation strategy and plan? Are they already developed, financed and implemented?

Several projects have been implemented based on the Strategic Programme of Action (SPA) 2014-2024
The climate change adaptation plan will be drafted as part of the Project "Revitalization of African Transboundary Basin Organizations for improved water resources management in a context of climate change", financed by the AFD/OIEau.

7. How do you finance your climate change activities? How do you plan to finance the implementation of measures?

With support from international, regional and subregional PTFs.

8. How did you link transboundary climate change adaptation to adaptation activities at other levels, such as the national level? Are you contributing to development and implementation of the National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for your riparian countries?

The ABV is involved in some cases, collaboration must be improved for some countries.

9. Do you include wetland management, conservation and restoration as well as drought management into your transboundary climate change adaptation strategies and plans? Are you supporting transboundary cooperation related to wetlands and draughts and how?

Yes, absolutely.

9.1) The ABV collaborates with: 1) Centre AGRHYMET, 2) WETLAND International, 3) GREEN CROSS, UICN under the framework of shared projects,

9.b) The ABV just drafted a regional programme for strengthening the resilience of ecosystems and communities based on "**Nature-based solutions**"

10. Future planned activities

10.1) Participating actively in calls for projects to mobilize sufficient financing

10.2) Implementing the three projects described above which are currently being launched

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