Policy and Technical Solutions for Water Data Diplomacy and Exchange
After Action Report
October 2024 | Cairo, Egypt | In-person and Online
Cairo Water Week | Africa Water Week | Africa Hydrological Conference

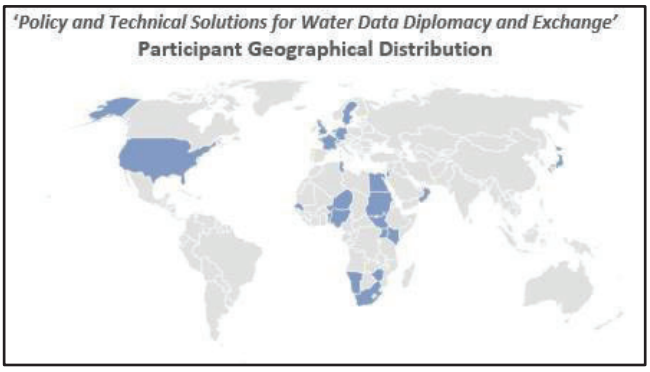
Executive Summary

During the 2024 concurrent Cairo Water Week/ Africa Water Week/ Africa Hydrological Conference, the Internet of Water team at the Center for Geospatial Solutions (CGS) within the Lincoln Institute of Land Policy, with support from the Women in Water Diplomacy Network and the Environmental Law Institute, **co-convened an official session on the subject of '*Policy and Technical Solutions for Water Data Diplomacy and Exchange*' in partnership with leading global water data focused institutes.**

Launched in 2016 by the Egyptian Ministry of Water Resources and Irrigation, the Cairo Water Week (CWW) has quickly become an important regional water event with a particular focus on the MENA region. With Egypt currently chairing the African Ministers Council on Water (AMCOW), which convenes the biannual Africa Water Week, 2024 served as an opportunity to bring Cairo Water Week together with Africa Water Week for the first time. In addition, the African Hydrological Conference was launched this year within the two major conferences, significantly elevating Africa on the CWW program and attracting broader participation from across the continent. Leveraging the unique opportunity of engaging in two of the most significant water policy events on the African continent, CGS's engagement served to identify, support, and disseminate research that will lead to better understanding, decisions, and actions; to foster and participate in communications and interactions with scholars, practitioners, public officials, policy advisers, and civic leaders; and to identify relevant audiences in CGS's topical areas and disseminate its work to them through the most effective means available, including courses, seminars, conferences, printed publications, web-based materials, electronic media, audio and video resources, and other methods of communication.

While CGS and partners engaged across the series of events organized as part of the first annual Africa Hydrological Conference (AHC), CGS's engagement was centered around the three-hour session on '*Policy and Technical Solutions for Water Data Diplomacy and Exchange.'* This session was co-convened with numerous partners, including the World Meteorological Organization, the Permanent Joint Technical Committee for Nile Waters, the International Centre for Water Resources and Global Change, the United Nations Economic Commission for Europe, the Women in Water Diplomacy Network and the Environmental Law Institute. Working collaboratively to co-create the innovative session enabled all partners to learn and share experience and knowledge, leverage complementary expertise, as well as provide an opportunity to identify shared interests and future collaborations beyond Cairo. **As part of the core group of AHC partners, CGS contributed to shaping this new policy dialogue space from its inception and elevating the critical importance of water data exchange and cross-cutting issues around gender equality and youth empowerment.**

Official Session Summary: Policy and Technical Solutions for Water Data Diplomacy and Exchange



In this two-part session convened during Africa Hydrological Dialogue within Cairo WaterWeek and Africa Water Week, the co-convening partners engaged expert decision-makers and session participants in an ***experience exchange dialogue on water data exchange and collectively explored the application of water diplomacy approaches*** to support dialogue, trust-building, and exchange within hydrological and meteorological services at local, national, and regional levels with focus on Africa. Part 1 of the session shared new research related to good practice in data-sharing and considered how water diplomacy can support data-sharing processes. Reflections were invited from a panel of experts elevating a variety of perspectives (context, scale, government, inter-government, global, civil society, etc.). Part 2 provided an update on the current state of water data exchange at various scales and invited session participants to engage in an interactive exercise to explore water data exchange in practice. This event was open to all participants of the African Hydrological Dialogue, Africa Water Week, and Cairo Water Week conference, and simultaneous interpretation was available in French, Arabic, and English. **The session was attended by more than 120 in-person participants from over 20 countries, including formal and informal water and policy decision-makers, researchers, and practitioners, among others, with an additional 50 persons participating online.**

Dr. Faith Sternlieb, Associate Director, Global Engagement, Internet of Water, Center for Geospatial Solutions, Lincoln Institute of Land Policy welcomed participants highlighting the urgency of challenge to improve water data sharing and the opportunities of integrating tools of water diplomacy to the discussion space. Dr. Faith's introduction was followed by an Ignite speech delivered by **Dr. Komlan Sangbana**, Legal Officer, United Nations Economic Commission for Europe, on good practices and lessons learned in data-sharing in transboundary basins. Komlan emphasized the critical role of data in fostering effective transboundary cooperation and agreements and introduced a new report, *Good Practices and Lessons Learned in Data-sharing in Transboundary Basins,* in which he highlighted the scarcity of comprehensive data-sharing agreements and the key factors that must be considered when forming them. Dr. Komlan described that effective and sustainable data-sharing requires both an enabling environment and a technical, basin-wide approach backed by political will. He concluded by describing the role of the UN Water Convention as an intergovernmental platform for discussion of data and information-sharing practices on a transboundary scale.

Ms. Jessica Troell, Senior Attorney and Director, International Water Program, Environmental Law Institute, then facilitated an experience exchange panel on "Integrating Data into Diplomacy and Diplomacy into Data" with **Dr. Tahani Sileet**, AMCOW Technical Advisory Committee Chairperson and Egypt's Minister Assistant for International Cooperation at Ministry of Water Resources and Irrigation, **Ms. Harriette Okal**, Research Fellow/Associate Scientist (Water Systems), Stockholm Environment Institute Africa, **Eng. Abdelrahman Saghayroon Elzein,** Director General for Nile Waters Affairs of Sudan's Ministry of Irrigation and Water Resources and the executive director of the Permanent Joint Technical Commission (PJTC) in Sudan, and **Ms. Nangira Betty**, National Meteorological Authority, Uganda. The

session provided local, national, and regional perspectives around the opportunities and challenges for improved water data exchange leveraging the tools of diplomacy, with a focus on Africa.

Eng. Abdelrahman discussed the role of enabling environments and demonstrated the consequences of not having data-sharing agreements in place. On a national level, Ms. Okal emphasized the value of a cloud-based integrative data platform that allows real-time data sharing across sectors. Noting that such platforms break down silos, reduce duplicative efforts, and enhance coordination between sectors like water, energy, food, and the environment, reinforcing the need for cross-sectoral collaboration. On the local level, Ms. Betty highlighted the importance of sharing data with stakeholders and ensuring feedback loops that inform management decisions at both the ground level and higher-level policymaking. She stressed the need for platforms that facilitate two-way communication, allowing stakeholders on the ground to contribute to and benefit from data-driven decision-making processes. At the multinational level, Dr. Sileet emphasized that the primary challenge is not the mode of data-sharing, but rather the absence of reliable data and the lack of trust to share it. Dr. Sileet pointed out that incompatibilities between data from different countries often stem from both a lack of data and insufficient trust in sharing what is available. A recurring theme from the panelists was the need for feedback channels between data producers and consumers, spanning all levels from local to multinational. As Dr. Sileet noted, trust-building must be a key component of data-sharing efforts, and inclusivity is essential to foster that trust. The session concluded with common threads and pressing questions about how to improve data collection, availability, and cooperation moving forward. Part 1 concluded with a networking break and a group photo.

To kick off part 2 of the session, **Dr. Dominique Bérod**, Head of Earth System Monitoring Division at the World Meteorological Organization, and **Mr. Philipp Saile,** Coordinator, GEMS/ Water Data Center, hosted by the International Centre for Water Resources and Global Change oriented participants to the current state of the World Meteorological Organization Hydrological Observation System and future in this space.

Dr. Faith Sternlieb, Associate Director, Internet of Water, Center for Geospatial Solutions Lincoln Institute of Land Policy and **Dr. Stephan Dietrich**, Deputy Director, International Centre for Water Resources and Global Change, then introduced the engagement exercise, wherein session participants were invited to collaboratively engage in small group discussions for 30-minutes as an opportunity to share their experiences and perspectives on water data diplomacy. Participants grouped themselves into groups of 5-7 people by preferred language and discussed the following three questions:

1. *Based on your experience, what are the information needs at different scales (country to catchment to global)? For different applications (observational data, aggregated or indicators based on observations)?*
2. *Which data sharing efforts respond to those needs?*
3. *What types of diplomatic processes and tools can be leveraged to support improved information sharing?*

For the first question, groups noted the importance of traditional hydro-meteorological data collected locally and consolidated at the national level. However, they observed that groundwater and water quality data were often missing and stressed the need for catchment-specific information and near real-time data to support Early Warning Systems.

Information Needs

Data Types

- Meteorological data (e.g., rainfall, temperature)
- Hydrological data (e.g., water levels, discharge, groundwater quality/quantity, soil moisture, population-driven water demand, hydrological flows) at local and regional scales
- Basin characteristics (e.g., land use, land cover, slope, soil, and basin-specific features)
- High-resolution data

Data Applications

- Data for early warning systems
- Observational data for monitoring and engagement
- Aggregated data and indicators for planning and decision-making

Challenges

- Lack of baseline/historical data
- Lack of enabling environment

In response to the second question, participants discussed data-sharing efforts that build trust, such as joint projects and exchange programs. They emphasized that investments in capacity building and both hard and soft data infrastructure are crucial to improving collaboration on water issues.

Data Sharing Efforts Addressing Needs

- Early Warning Systems
- Platforms for regional collaboration and partnerships to develop data harmonization and build data trust incrementally (i.e., river-basin organizations or joint commissions)
- Regional standards for data sharing
- Improved access to remote sensing for regional monitoring
- Basin planning, reporting, and strategic assessments

Challenges

- Data quality gaps
- Lack of enabling environment
- Differences in data quality and quantity in a basin
- Recognition/Integration of indigenous knowledge

Finally, in addressing the third question, participants highlighted informal water diplomacy ‘tracks’ as essential to enhance communication and access to information across borders. They noted the importance of setting minimum data-sharing requirements to foster trust and political will, and recommended data-sharing protocols and standards for harmonizing basin-level information as essential foundations for transboundary cooperation.

Diplomatic Tools and Processes for Information Sharing

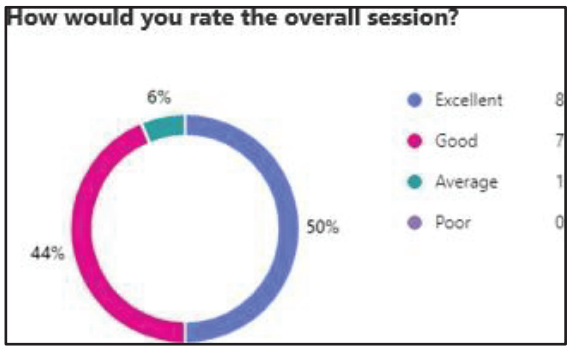
- Track 3 Diplomacy (i.e., engaging universities, research centers, CBOs, and NGOs) for trust-building, data access and collection, data harmonization, and development of data-sharing protocols
- Frameworks for transparent and standardized data sharing
- Frameworks for open access to data built upon minimum data-sharing requirements

Challenges

- Continuity of technical and negotiating staff
- Mindset shift
- Path dependencies in national systems
- Bridging gaps between national and regional decision-makers and ground-level data use

Please see Annex 4 for a summary list of all participant inputs collected through the mapping exercise captured via Google Form, written notes, and reporting back presentations.

Following the exercise, **Dr. Aref Gharib**, Chairman of Nile Water Sector-MoWRI (PJTC) and Egypt's hydrological advisor to the WMO delivered closing remarks, reflecting on lessons learned from the session and remarking on the timeliness and importance of these conversations.



At the conclusion of the official session, participants were given an opportunity to complete a short exit poll provided by QR code to the participants. While the session was attended by over 120 participants, the exit poll was completed by just 15% of the total participants. The exit poll was administered using an online Microsoft Office 'Form,' which the participants accessed using their personal phones. The Form was enabled to allow responses in Arabic, English and French. All respondents were made aware that aggregate response data, as well as individual statements, may be quoted *anonymously* in external communications and activity reports such as this After-Action Report. All respondents indicated that they were motivated to participate in the session because of the importance of sharing knowledge and experience around water data sharing. When asked to identify key benefits to their participation, most respondents identified the session's support for increasing professional knowledge. **94% of respondents gave the session an overall rating of 'excellent' or 'good.'**

Participants particularly highlighted the session's value in elevating the critical role of water data sharing:

- *'Data exchange is vital for shared basin management.'*
- *'The UN Water Convention plays a unique role as governmental platform to discuss and share openly about transboundary issues.'*
- *'Data sharing is critical.'*
- *'The meaning and importance of data diplomacy.'*
- *'Working together, political will and creating platforms for sharing data.'*

- *'Transboundary agreements provide the basis for data diplomacy! Data sharing enables cooperation!'*
- *'Importance of enhancing data availability and harmonization.'*
- *'The challenges in transboundary data sharing.'*
- *'The importance of political will.'*

Reflecting on areas of improvement, participants noted that there was insufficient time for questions and answers and that the room layout was not particularly conducive to the interactive format of the session.

Conclusion

The 2024 concurrent Africa Water Week, Cairo Water Week, and the African Hydrological Conference marked a significant milestone in elevating Africa's presence in global water policy dialogue. The event successfully brought together experts, policymakers, and practitioners to discuss and explore innovative solutions for water data diplomacy and exchange. The session lasted three hours and featured 10 speakers who presented research on best practices in data sharing and the role of water data diplomacy in facilitating this process. The diverse audience included at least 120 in-person attendees from over 20 countries, along with 50 participants who joined online. The session included an hour-long interactive exercise where participants engaged in 11 small break-out groups based on their preferred languages: Arabic, French, and English. This exercise enabled participants to explore practical aspects of water data exchange and share their experiences based on their regional perspectives. Building on the discussions from the event, we call upon all stakeholders, governments, international organizations, and NGOs to commit to strengthening water data-sharing frameworks, enhancing capacity building, promoting inclusive dialogue, leveraging technology, and fostering regional cooperation to manage shared water resources and reinforce early warning systems successfully.

To access the session recording, slide deck, and other resources related to this session, please visit: https://www.eli.org/events/policy-and-technical-solutions-water-data-diplomacy-and-exchange-cairo-water-weekafrica.

Annex 1: Policy and Technical Solutions for Water Data Diplomacy and Exchange Session Program

TIME	Session Program
9:30	**Part 1: A New Era for Water Data Diplomacy? Welcome and Introduction** **Dr. Faith Sternlieb**, Associate Director, Global Engagement, Internet of Water, Center for Geospatial Solutions, Lincoln Institute of Land Policy
9:40	**Ignite Speech: Good Practices and Lessons Learned in Data-sharing in Transboundary Basins** **Dr. Komlan Sangbana**, Legal Officer, United Nations Economic Commission for Europe
9:55	**Experience Exchange Panel: Integrating Data into Diplomacy and Diplomacy into Data.** *Panelists will share experiences from local, national, and regional perspectives around the opportunities and challenges for improved water data exchange leveraging the tools of diplomacy, with a focus on Africa.* Facilitated by **Ms. Jessica Troell**, Senior Attorney and Director, International Water Program, Environmental Law Institute **Expert Panelists:** • **Dr. Tahani Sileet**, AMCOW Technical Advisory Committee Chairperson and Minister Assistant for International Cooperation at the Ministry of Water Resources and Irrigation, Egypt • **Ms. Harriette Okal**, Research Fellow/Associate Scientist (Water Systems), Stockholm Environment Institute Africa • **Eng. Abdelrahman Saghayroon Elzein,** Director General for Nile Waters Affairs of Sudan's Ministry of Irrigation and Water Resources and the executive director of PJTC in Sudan • **Ms. Nangira Betty**, National Meteorological Authority, Uganda **Facilitated Discussion**: Session participants are invited to join the discussion *and share their experiences.*
11:00	**Networking Break**

11:30	**Part 2: Hydrological Data Management and Water Data Exchange.** *Current state of WMO Hydrologic Observation System and future plans, including the WMO Unified Data Policy, under development, as well as an introduction to Open-Source software for safe data exchange* **Dr. Dominique Bérod**, Head of the Earth System Monitoring Division at the World Meteorological Organization, and **Philipp Saile,** Coordinator of GEMS/ Water Data Center, hosted by the International Centre for Water Resources and Global Change.
11:45	**Exercise: Mapping Water Data Management and Exchange** *In this exercise, session participants will work in small groups and in plenary to discuss different approaches to water data exchange and provide input into the WMO Unified Data Policy's draft classification of core & recommended hydrological data.* **Exercise Introduction and facilitation by Dr. Stephan Dietrich**, the International Centre for Water Resources and Global Change, and **Dr. Faith Sternlieb**, Associate Director, Global Engagement, Internet of Water, Center for Geospatial Solutions, Lincoln Institute of Land Policy. **Key questions to be explored in this exercise include:** • *What are the data needs at different scales (country to catchment to global) and applications (observational data, aggregated or indicators based on observations)?* • *Which data exchange efforts respond to those needs?* • *Are scale-specific assessment of data needs undertaken periodically? On which scale (catchment to global)?* • *How can tools of diplomacy support data exchange, break down knowledge silos at different scales, and build trust?*
12:50	**Closing Reflection** **Dr. Aref Gharib**, Chairman, Nile Water Sector-MoWRI, Permanent Joint Technical Commission (PJTC) and Egypt's hydrological advisor to the WMO *All session participants are invited to complete a short exit survey at the close of the session.*

Annex 2: Policy and Technical Solutions for Water Data Diplomacy and Exchange Session

Collected Speaker Short Biographies

Alphabetical order by first name.

Eng. Abdelrahman Saghayroon Elzein is the Director General for Nile Waters Affairs of Sudan's Ministry of Irrigation and Water Resources and the executive director of PJTC in Sudan. Eng. Abdelrahaman (B.Sc. Civil Eng., M. Sc. WRE) is a senior hydrologist with 33 years of professional experience in Water Resources, specialized in Surface Hydrology, Hydrometry, River Flow Forecasting, Integrated Water Resources Management (IWRM) and Decision Support Systems (DSS). His professional experience includes joining Sudan's *Flood Early Warning System (FEWS) Unit*, implemented by DELFT Hydraulics-The Netherlands. Regionally, he participated in and contributed to the development of the Nile Decision Support Tool (FAO-Nile Basin Water Resources Project), Nile Decision Support System, and Nile Water Resources Atlas *(Nile Basin Initiative)*. He seconded to Dams Implementation Unit as *Chief Hydrologist*, representing clients in the hydrological studies of 14 dams undertaken by Layemer and SMEC Consultants in Main Nile and River Atbara, North Sudan (Dal, Kadjar, Merowe, Dagash, Mugrat, Shereq, Sabaloqa, Roseiris Heightening and Upper Atbara) and in Bahr El Jebel, South Sudan (Fola, Lakki, Shokoli, Bedden and Juba Barrage). In his role as *Manager of Water Harvesting Project-Phase I*, he supervised the execution of Water Harvesting Contracts implemented by the Dams Implementation Unit in 17 States. His experience also includes the establishment and management of the Hydrology and DSS Centre under the *Hydrological Information System Project*. The main features of the project included the design and implementation of the Hydrometric Network, Telemetry System, and DSS, as well as capacity development.

Dr. Aref Gharib is a highly experienced Water Resources and Irrigation Engineer with over 32 years of experience in integrated water resources planning and management. His expertise spans project management, supervision, and implementation of water resource policies, including surface and groundwater management, flood control, and rainwater harvesting. He holds a Ph.D. in Water Resources Management from Cairo University, a master's degree from Luneburg University in Germany, and a bachelor's degree in civil engineering from Cairo University. Dr. Gharib has held leadership roles, including Chairman of the Nile Water Sector (NWS) and the Permanent Joint Technical Commission for Nile Waters (PJTC), where he has coordinated transboundary water management efforts. Throughout his career, He has been actively involved in defining and coordinating water resources projects and liaising with international funding agencies and stakeholders. He has collaborated with various organizations, including the World Bank, United Nations, International Commission on Large Dams (ICOLD), Inter-Islamic Network on Water Resources Development and Management (INWRDAM), the Board of Governors of the Arab Water Council, and the World Water Council. His work on multiple projects has focused on the sustainable development of water resources across the Nile region. Dr. Gharib's career reflects a deep commitment to enhancing water resource management in the Nile Basin, contributing to Egypt's strategic interests in the region, and fostering sustainable development across international borders.

Dr. Dominique Bérod is the Head of the Earth System Monitoring Division at the World Meteorological Organization. Dr. Bérod is responsible for WMO activities on monitoring and information systems on water, cryosphere, and ocean. Before joining WMO in June 2016, he was in 2015 the senior expert for the Water, Cold Regions, and Disasters activities at the Intergovernmental Group on Earth Observations (GEO) Secretariat. From 2008 to 2014, he served as the Head of the Swiss National Hydrological Service, in charge of water monitoring, flow forecast, water information systems, and applied research. He was also the President of the Swiss Commission of Hydrology and was the Regional Hydrological Advisor of the World Meteorological Organization for Europe, the Middle East, and the Caucasus. Until 2008, he was the Head of the flood protection unit in the canton of Wallis, Switzerland. There, he was responsible for flood mitigation and river restoration projects, including flood forecast and warning as well as hazard mapping. Dr. Bérod holds a master's degree in environmental engineering from the Swiss Institute of Technology at Lausanne (EPFL, 1989) and a PhD in Hydrology from the same university, in collaboration with the Louisiana State University at Baton Rouge, USA (1994).

Dr. Faith Sternlieb is the Associate Director for Global Engagement for the Internet of Water Initiative at the Lincoln Institute of Land Policy's Center for Geospatial Solutions. She provides support to international and indigenous communities, including a NOAA initiative, Data Access for Urban Climate Resilience for Early Warning Systems in Africa. Dr. Sternlieb received a bachelor's degree in anthropology and Latin American languages from the University of Maryland. She earned both a master's degree in agriculture through the Peace Corps Masters International Program, and a Ph.D. in earth sciences with a watershed specialty from Colorado State University. Her post-doctoral work through the U.S. Department of State, Office of the Geographer, was on the Secondary Cities project, where she facilitated teams from under-served, rapidly growing cities across the globe to collect and curate geospatial data for participatory mapping to help them better prepare for uncertain futures. Dr. Sternlieb's tenure at the Lincoln Institute of Land Policy included work with the Babbitt Center for Land and Water Policy (where she led Growing Water Smart, a program that helps communities integrate their land and water planning) and with CGS, where she convened the Internet of Water Coalition and co-founded the North American branch of the Women in Water Diplomacy Network. In her role as Associate Director of Global Engagement for the Internet of Water, she continues to work with diverse communities on land and water equity, sustainability, and climate resilience. This work includes engaging in private-public partnerships within local and global geographies and facilitating water data policy and technical solutions through diplomacy.

Ms. Harriette Okal is a Research Fellow/Associate Scientist (Water Systems) at Stockholm Environment Institute, Africa. Ms. Okal has over 6 years of experience and is a dynamic water scientist with a strong dedication to advancing sustainable water resource management. She is pursuing a PhD in Hydrology at Rhodes University and has a diverse skill set, excelling in hydrological modeling, remote sensing, GIS, and climate change. She has contributed significantly to the field, as evidenced by her impactful publications on drought assessment, land degradation, and local capacity building in Sub-Saharan Africa. She also has a keen interest in nature-based solutions, green infrastructure, biodiversity conservation, and ecology. Ms. Okal's experience extends beyond academia to mentorship, highlighting her commitment to capacity building and community engagement. Active participation in global and local conferences underscores her thought leadership and advocacy for strategic investments in African water and climate expertise. Ms. Okal stands out as a versatile professional addressing diverse water challenges with a collaborative spirit.

Ms. Jessica Troell is a Senior Attorney and has directed the Environmental Law Institute's International Water Program since its founding in 2006. Under her leadership, the Program has developed and implemented projects to define and track the legal recognition and protections for Indigenous and community-based water tenure; create realistic mechanisms for involving diverse stakeholders in water-related decision-making; identify and implement innovative water governance mechanisms to strengthen resilience of communities and countries in the face of climate change; build the legal and institutional capacity to manage transboundary water challenges; strengthen livelihoods and food security through more effective water management; and ensure that water management is effectively leveraged in fragile and post-conflict states to promote peacebuilding. Ms. Troell works with NGOs, governments, the private sector, and universities to create, implement, and enforce sustainable water laws, policies, and management mechanisms. Ms. Troell has supported the development and implementation of the Women in Water Diplomacy Network on behalf of ELI's International Waters Programme since its inception in the Nile Basin in 2017.

Dr. Komlan Sangbana is a Legal Officer with the Secretariat of the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE). He leads the Convention's engagement and accession processes in West and Central Africa and acts as the Thematic Lead of the sub-program area on the Development of Agreements and Establishment of Joint Bodies. He has over 15 years of experience in the practice of International Water Law, having previously worked in academia and consulted on water governance in Africa and Europe. A member of the African Society for International Law and the Platform for International Water Law (University of Geneva Law School), Dr. Sangbana holds a postgraduate degree in Public Law from the University of Lome (Togo) and a Doctorate in International Law from the University of Geneva (Switzerland).

Ms. Nangira Betty is a meteorologist at the Uganda National Meteorological Authority and holds a bachelor's degree in Environment Management, a UN leadership certificate in Disaster Risk Reduction on adaptation, resilience, and mitigation measures on extreme weather and climate events and is currently pursuing a master's degree in climate science and disaster risk management. With 5 years of experience in data collection in the observation section and 10 years in meteorological weather forecasting, Ms. Betty has been responsible for public weather forecasting, issuing weather alerts, weather sensitization, delivering weather briefings to pilots, and engaging in community outreach. She has served as the Project Coordinator for the Daraja Project, focusing on community outreach, resilience, adaptation, and mitigation. She is the focal link person for the Hydrosos Project, which involves drought and flood prediction, anticipatory action, and preparedness.

Mr. Philipp Saile has been Head of the GEMS/Water Data Centre (GWDC) at the International Centre for Water Resources and Global Change (ICWRGC) since its inception in 2014. He focuses on the monitoring, analysis, and assessment of freshwater quality worldwide. This work includes supporting environmental agencies in UN Member States to strengthen their water quality monitoring, data management, and reporting capacities and contributing to the UNEP Global Environment Monitoring System for Freshwater (GEMS/Water), including the reporting on SDG Indicator 6.3.2 on ambient water quality. He has 15 years of experience in international water cooperation, contributing to

various UN-led water quality and water data exchange activities. He co-leads the Technical Advisory Committee of the World Water Quality Alliance (WWQA), which is working towards a global freshwater quality assessment. Mr. Saile co-chairs the UNESCO-IHP Flagship International Initiative on Water Quality (IIWQ) and is a member of the GEO's inland and coastal water quality initiative AquaWatch to promote the use of satellite-based water quality monitoring for national water quality management and international reporting. He also leads the WMO Task Team on WIS2 for Hydrology, which supports the development and implementation of the WMO Hydrological Observing System and promotes the interoperable exchange of hydrological observation and forecast data.

Dr. Stephan Dietrich is the Deputy Director at the International Centre for Water Resources and Global Change (ICWRGC), a UNESCO Centre hosted by the German Federal Institute of Hydrology (BfG). Here, he coordinates the international data activities. Dr. Dietrich is a geoscientist specializing in climate observations with a focus on water data and hydrological data services. His research focuses on hydrological data management and large-scale drivers of climate change, with an emphasis on impacts on the regional to global hydrological cycle. In his role as the Deputy Director, he is actively involved in intergovernmental water programs at the United Nations and other international scientific collaborations, including WMO and UNESCO-IHP. He is primarily engaged in international initiatives related to freshwater research, data sharing, research operationalization and policy advice. Dr. Dietrich coordinates the Global Terrestrial Network-Hydrology (GTN H, https://www.gtn-h.info) under the auspices of WMO and the Global Climate Observing System (GCOS) to promote collaboration between the different global water data centers. In this capacity, he is a member of the GCOS Terrestrial Observational Panel on Climate (TOPC). He co-chairs EURO-FRIEND-Water, one regional group of the UNESCO-IHP international flagship initiative FRIEND-Water (Flow Regimes from International Experimental and Network Data. Dr. Dietrich is also the coordinating author of "Closing the Water Cycle from Observations across Scales: Where Do We Stand?" Most recently, he has been researching and developing projects around global drought forecasting systems.

Dr. Tahani Sileet currently serves as the Chair of the African Minister Council On Water (AMCOW) Technical Advisory Committee and Minister Assistant for International Cooperation at the Ministry of Water Resources and Irrigation, Egypt. She formerly served as the Head of the Central Department for External Cooperation in the Nile Water Sector on behalf of the Egyptian Ministry of Water Resources and Irrigation. Dr. Sileet has represented the Ministry of Water Resources and Irrigation in many regional and international organizations, including the Technical and Scientific Committee Member in the League of Arab States (LAS), the Water Expert Group Member in the Union for the Mediterranean (UfM), the Director of Nile Basin Initiative National Office and the Project Management Unit Director and Regional Coordinator of "Establishment of a Navigational Line Between Lake Victoria and the Mediterranean Sea (VICMED) Project." She has also been appointed as the National Focal Point of Program Infrastructure Development in Africa (PIDA). She holds a PhD in Shared Water Resources Management and a master's degree of science in the "Impact of Climate Change and Sea Surface Temperature on the River Nile Flood Regime," an International Post Graduate Diploma in Shared Water Resources, and a Post Graduate Diploma in Irrigation and Drainage from Cairo University. She frequently publishes on many different topics related to Shared Water Resources Management with a focus on the Nile Basin. Dr. Sileet is a founding Member of the Women in Water Diplomacy Network and served on the Network's first Leadership Council.

Annex 3: Resources for ongoing learning provided by the Policy and Technical Solutions for Water Data Diplomacy and Exchange Session partners:

Updated Strategies for Monitoring and Assessment of Transboundary Rivers, Lakes and Groundwaters. January 2023. UNECE Water Convention. Available in English, French, Russian, and Arabic. **Available at**: https://unece.org/info/publications/pub/375468
The Water Convention hosted by the United Nations Economic Commission for Europe (UNECE) requires Parties to establish and implement joint programs for monitoring transboundary waters including to exchange data and information to enable sustainable management and protection of shared water resources. This report provides guidance on monitoring, assessment, and data sharing in a transboundary context, to assist policy and decision-makers, representatives of joint bodies for transboundary water cooperation, and water managers responsible for establishing and carrying out cooperation between riparian countries in operationalizing cooperation over transboundary waters.

Good Practices and Lessons Learned in Data-sharing in Transboundary Basins. October 2024. UNECE Water Convention. Available in English, additional languages forthcoming.
Available at: *Details forthcoming at* https://unece.org/publications/oes/welcome
The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (the Water Convention), hosted by the United Nations Economic Commission for Europe (UNECE), provides a legal framework for monitoring, assessment, and exchange of data and information in transboundary basins. It calls for all Parties to provide for the widest exchange of information, as early as possible, on issues covered by the provisions of the Convention. Furthermore, it requires Riparian Parties to establish and implement joint programs for monitoring the conditions of transboundary waters and to exchange reasonably available data within the framework of relevant agreements or other arrangements. Good Practices and Lessons Learned in Data-sharing in Transboundary Basins presents a global collection of case studies related to different aspects of data and information sharing, building on real-life experiences across all levels. The publication provides a wide array of examples showing how monitoring and data-sharing programs can be implemented and thus complements previously developed guidance materials on monitoring and assessment.

WMO Unified Data policy for the International Exchange of Earth System Data (the WMO Unified Data Policy). 2022. World Meteorological Organization (WHO).
Available at: https://library.wmo.int/records/item/58009-wmo-unified-data-policy
The WMO Unified Data Policy provides a comprehensive update of the international agreements guiding the exchange of weather, climate, and related Earth system data between the 193 Member States and Territories of WMO.

WMO Hydrological Observing System (WHOS)
Available at: https://community.wmo.int/en/activity-areas/wmo-hydrological-observing-system-whos
WHOS is a framework for hydrological interoperable data and metadata exchange and access linking heterogeneous data sources from multiple data providers. WHOS, a hydrological component of WIS2.0, is system of systems implemented using open standardization and brokering approaches for the benefiting of the National Meteorological and Hydrological Services, non NMHS data providers and users, and transboundary cooperation and providing visibility of data providers. WHOS does not impose any

specific tools but encourages use of open standards, web services, systems. The core of WHOS is the DAB (Discovery and Access Broker) that implements access, semantic and discover broker; and WHOS ontology that maps various concepts.

The World Meteorological Organization's WMO Information System 2.0 (WIS 2.0) is the framework for WMO data sharing for all WMO domains and disciplines. It supports the **WMO Unified Data policy**, and the **Global Basic Observing Network (GBON)** and makes international, regional, and national data sharing simple, effective, and inexpensive. The idea that no Member should be left behind and the objective of lowering the barrier to adoption has been at the core of WIS 2.0 development. These objectives inspire the principles underpinning the WIS 2.0 technical framework, such as adopting open standards and Web technologies to facilitate sharing of increasing variety and volume of real-time data.

The World Meteorological Organization's WMO Information System 2.0 in a box (wis2box)
Available at: https://docs.wis2box.wis.wmo.int/en/1.0b8/
Wis2box is a Free and Open Source (FOSS) Reference Implementation of a WMO WIS2 Node. The project provides a plug and play toolset to ingest, process, and publish weather/climate/water data using standards-based approaches in alignment with the WIS2 principles. wis2box also provides access to all data in the WIS2 network. wis2box is designed to have a low barrier to entry for data providers, providing enabling infrastructure and services for data discovery, acc ess, and visualization. wis2box enables World Meteorological Organization (WMO) members to publish and download data through the WIS2 network. Learn more from countries currently sharing data on the WIS2 network (marked on the pictured map) by visiting https://demo.wis2box.wis.wmo.int

The Global Environment Monitoring System for Freshwater (GEMS/Water) is a program that aims at collecting world-wide freshwater quality data to support scientific assessments and decision-making processes. In addition, GEMS/Water offers support and encouragement to developing countries wishing to establish monitoring programs and conduct assessments of water quality, by providing capacity development via training, advice, and assessment tools. GEMS/Water was established in 1978 as an interagency program under the auspices of the United Nations through the United Nations Environment Programme (UNEP), the World Health Organization (WHO), the World Meteorological Organization (WMO), and the United Nations Educational, Scientific and Cultural Organization (UNESCO). In June 2014, the first UN Environment Assembly (UNEA) in Nairobi (Kenya) endorsed GEMS/Water as one of the mechanisms to assist in achieving the SDGs. Special focus is on sub-target 6.3, aiming at improving water quality, and the corresponding indicator 6.3.2. Collected in the GEMStat database, the data of GEMS/Water is currently operated, hosted and maintained by the GEMS/Water Data Centre (GWDC) within the International Centre for Water Resources and Global Change (ICWRGC) in Koblenz, Germany. Learn more about GEMS/Water here: https://www.unep.org/explore-topics/water/monitoring-water-quality and visit the GEMStat Database here: https://gemstat.org/

The Global Runoff Data Centre (GRDC) is an international data center operating under the auspices of the World Meteorological Organization (WMO). Established in 1988 to support research on global and climate change and integrated water resources management, it holds the most substantive collection of quality assured river discharge data on global scale. For the execution of its tasks and international recognition, GRDC is mandated by the WMO in several resolutions. Through this multilateral and bilateral collaboration, the hydrological and meteorological services of WMO member states directly contribute to the successful operation of GRDC. **Available at**: https://grdc.bafg.de/

The International Soil Moisture Network (ISMN) is an international cooperation to establish and maintain a global in-situ soil moisture database. This database is an essential means for validating and improving global satellite products, and land surface, climate, and hydrological models. Soil moisture, which is the water stored in the upper soil layer, is a crucial variable in a wide variety of processes and applications, including numerical weather prediction, flood forecasting, agricultural drought assessment, water resources management, greenhouse gas accounting, civil protection, and epidemiological modeling of water-borne diseases. Therefore, the societal benefits of the International Soil Moisture Network are large. Currently the ISMN is being processed to work under the auspices of the WMO and FAO in the future to improve the international recognition. **Available at:** https://ismn.earth/en/

The Global Terrestrial Network – Hydrology (GTN-H) links existing networks and systems for integrated observations of the global water cycle. The network was established in 2001 as a "network of networks" to support a range of climate and water resource objectives, building on existing networks and data centres, and producing value-added products through enhanced communications and shared development. GTN-H works under the auspices of WMO and the Global Climate Observing System (GCOS) and is a gateway to a great number of global observing systems for hydrological data. You can find descriptions and links to all network partners of GTN-H and the hydrological data products developed under the cooperation of the network.
Available at: https://www.gtn-h.info/networks/

The Permanent Joint Technical Commission for Nile Waters (PJTC) is a joint body established by Egypt and Sudan according to 1959 agreement on the utilization of the Nile Waters. The PJTC is responsible for transboundary water cooperation between both countries as well as the cooperation between them and the rest of the Nile Basin countries in the field of shared water resources management & development. The (PJTC) plays a vital role in coordinating and overseeing various projects aimed at managing water resources effectively. The commission contributes significantly to collection and sharing of data and information to enable the commission to carry out its tasks, and to ensure the ongoing measurement and monitoring of the Nile and all its upper reaches.

Annex 4: Participant Responses from Mapping Water Data Management and Exchange Exercise

All inputs provided by participants during the Mapping Water Data Management and Exchange Exercise. Please note that duplicate responses reflect contributions from different participants. Inputs from the French and Arabic language exercise groups have been translated using Google Translate (please allow for errors).

Question 1: Based on your experience, what are the information needs:

- At different scales (country to catchment to global)?
- For different applications (observational data, aggregated or indicators based on observations)?

Participant inputs:

- Meteorological Data (Rainfall-Temperature-Evaporation), Hydrological Data (Water Levels, Discharge).
- Water Quality Data.
- Basin Characteristics (Land use, Land cover, Slope, Soil, etc.).
- Existing Water Facilities and their operation rules.
- Future projects information.
- Open Geo data.
- Observed data and indicators based on observations.
- We need accurate information to manage water resources in a good way like data about precipitation about temperature, humidity etc. We need to share data with our neighbors. Data about groundwater is very important to help us to develop our water supply. So, water quality and quantity are very important issues. All that is important help decisions makers and early warning systems.
- In South Sudan No data: experiencing flooding – new experience for country to be able to take position, need data – that requires policy and guidance for data collection and sharing in the region.
- Capacity building on data collection to level of management of data and feedback from community the feedback.
- South Sudan and Uganda flooding – Nile – countries don't like to share data in a blanket way but needs to be a specific management topic and working group can share information in joint meetings and then analyzing data together that builds trust – instead of all the data and uploading onto a platform.
- Basin planning, basin reporting, strategic assessments – countries share historical data if there's a purpose and a "safe space" for what the cooperation space is (not open source) and other domain of operational data sharing in terms of early warning/flooding – real time and people aren't ready for real time – but importance given the situation – seasonal at least – and scale informs timing.
- Capacity building and lack of regional cooperation – lack of acceptance of Indigenous knowledge and science and build into decision-making.
- Rhine experience – issues with too much information and different data sets – working on it but hard to harmonization and creation of baseline.
- Path dependencies for data systems at country levels.
- Openness of data in Nile – Rwanda has open hydrological data access others don't – remote sensing to cross check and call attention to secrecy- political issue.
- Meteorological data.
- Hydrological data and characteristics.

- Land use data.
- Water quality data (for water data it must be at a micro/macro scale).
- Daily observation data that resolves quality issues (validate).
- The transformation of data (height) into flow rates because of the quality of the ratingcurves.
- Staff capacity building.
- valorization of the profession of hydrologist (employee).
- Lack of hydrographic knowledge & surface and groundwater.
- The mesh resolution of (new spatial partition of stations and insufficient).
- Need to plan for present and future utilization of water resources. Look at information we need at a community of global users of water resources: looking at data and started with HydroMet correlated data: precipitation, temperature, soil moisture, etc.
- Need highest resolution data for precipitation and temperature for early warning.
- Need data at country-scale; water demand driven by population dynamics, land use, land cover Also need local water quality data. Provided example of Namibia and needing data from upstream stakeholder.
- Observation data to bring out gaps. Also need data on soil moisture and discharge.
- Also need hydrological data to optimize infrastructure.
- Data related to global aims needed to achieve national sustainable goals; quality and quantity of groundwater/water scarcity offering services related to infrastructure.

Question 2: Which data sharing efforts respond to those needs?

Participant inputs:

- Establishing Platform for Geospatial data (sharing climate data and basin characteristics information).
- Early Warning Systems (sharing timely data).
- Exchange programs (universities/ministries).
- There are efforts but there is also a certain blockage in terms of sharing data with the authorities.
- Making information from shared data available to all.
- We need to know about water demand and the goal we need to approach. We share information and usually update through many channels and platforms.
- Data gaps – partnership to fill gaps.
- From – iterative approach – what's the least amount of data you need to make decisions and then build trust and political will.
- Knowledge development and data quality management.
- Joint projects.
- Data protocols.
- Exchange programs.
- Scientific programs from researchers.
- Thinking about data and information that can be universally understood.
- Platforms for observational data: regional collaboration platforms/agreements within Niger Basin came up. These agreements enhance collaboration among transboundary countries, where members are active in voicing their concerns.
- Improved access to satellite data --regional collaboration and advocacy to improve access to satellites to support institutional data.

Question 3: What types of diplomatic processes and tools can be leveraged to support improved information sharing?

Participant inputs:

- Building Confidence: Participating in the same regional and international organizations, Joint bilateral studies/projects, Twining universities and research centers, Establishing bilateral committees.
- Data sharing protocol.
- Joint committee/commissions --> data sharing platform for geospatial solutions/early warning systems.
- exchanges between governments.
- There are NGOs in Tunisia which facilitate access to the geographical information essential for analyzing and evaluating water resources.
- Highlights on water quality and system to manage water resources - Ministry of Water and irrigation in Egypt noted efforts to collaborate with all countries in the Nile Basin and share projects through bilateral cooperation.
- The construction of common works.
- Ensuring harmonization across riparians – through regional bodies (like RBOs) and agreeing to standards for harmonization – build capacity needs funding for RBOs to play that role.
- Developing regional protocols for data sharing at basin level – SADC for example.
- Continuity of staff in both data/technical and negotiating to really build trust.
- High level data at larger spatial level – focus on how to support diplomacy by unlocking open-source data and linking to what's on the ground - tools and standards.
- The web applications.
- Regional training to transfer knowledge.
- Mindset shift for need of transparent data within countries -- incentive for sharing.
- Diplomatic tools can support improved information sharing but need rules.
- Paying attention to decision makers and how to assist them in making a framework for the country scale.