

International Centre for Water
Resources and Global Change (ICWRGC)

ICWRGC- STRATEGY 2030



“WATER IS LIFE’S MATTER AND MATRIX, MOTHER AND MEDIUM. THERE IS NO LIFE WITHOUT WATER.”

Albert Szent-Györgyi

1893 – 1986, Nobel Prize 1937

As climate and anthropogenic changes continue to severely impact the world’s finite freshwater resources, understanding how freshwater availability is changing globally, regionally and locally is increasingly important for responsible and sustainable water management. The urgency of how dramatically off-track the UN Sustainable Development Goal 6 (“Ensure availability and sustainable management of water and sanitation for all”) is has been confirmed and documented on the highest political and scientific level – with serious consequences for many other SDGs. Nine countermeasures – so-called gamechangers – have been identified and agreed upon at the UN 2023 Water Conference. Implementation of those gamechangers remains very challenging and requires an understanding and willingness to protect and share the very limited freshwater resources with a systemic, transboundary and transdisciplinary approach.

Within this context, the International Centre for Water Resources and Global Change (ICWRGC) reviewed its remit, mandates, and goals to make the best possible contribution to the UN 2030 Agenda with its limited resources. Located at the Federal Institute of Hydrology

(BfG), and originally established in 1974 as Germany’s national secretariat for UNESCO and WMO water programmes, the ICWRGC has long-standing international experience. However, now was the first time it had conducted a comprehensive strategic process. All staff participated, contributing their diverse expertise and creating a shared vision, mission, and strategic goals. Interim consultations with the supervising federal ministries, the scientific advisory board, and the international governing board further clarified the role and future focus of the ICWRGC.

The process lead to the understanding that ICWRGC’s possible and meaningful portfolio of operational targets and measures contributes to the challenges and needs of the Agenda 2030, SDG6 and Nexus goals, the UN Water programmes and gamechangers of the UN 2023 Water Conference. This needs to be prioritised in the future annual work plans. The strategy will guide us and all our partners to our best possible contribution for a better achievement of the overarching international goals for water.

Harald Köthe
Director ICWRGC

MOTIVATION AND VISION

Our motivation is to develop the ICWRGC and the associated global water data centres to best serve the challenges and needs of the 2030 Agenda, SDG6 and Nexus goals, the UN water programmes and gamechangers of the UN 2023 Water Conference. Therefore, we are encouraged to contribute to important open research questions and operational services. We are guided by the UN system-wide strategy on water and sanitation (July 2024), the Strategy of the ninth phase of the UNESCO Intergovernmental Programme (UNESCO IHP-IX, 2022 – 2029), the WMO Plan of Action for Hydrology 2022 – 2030 and the 3rd International Association of Hydrological Sciences (IAHS) Scientific Decade 2023 – 2032 HELPING (Hydrology Engaging Local People IN one Global world).

Important questions and tools identified by these strategies still require further development. Despite all the progress, we continue to struggle to gain a better understanding of hydrology in the society; prediction models have to be still further improved significantly; model parameterisation remains problematic; global overviews of water resources still have too many gaps in many parts of the globe; hydrological scenarios are rarely validated; and uncertainties are rarely fully assessed. Furthermore, dialogue with policy makers remains fragmented and lacks coherence. We are motivated to contribute to these unresolved questions, in partnership with the UN Water family and the global water science community, and to support initiatives dedicated to water solutions in the Anthropocene.



OVERALL VISION 2030

The ICWRGC promotes a sound scientific, systematic and observation-based understanding of the changing water cycle, extreme events, freshwater availability and quality, and anthropogenic impacts on freshwater resources that is integrated into decision-making and sustainable water management.

Our vision is that by 2030 the ICWRGC and the associated global water data centres will have ...



... sharpened and established their role and mode of action within the UN Water family, the national and international scientific network and for relevant decision-makers and stakeholders and is a known and valued partner



... contributed to the UN system-wide strategy on water and sanitation and to the defragmentation of the UN Water system through new science and service products, as well as water and climate data from Earth observation.



... supported the Open Science principles, with their data service, research and education activities.

FRESHWATER-RELATED PHENOMENA THAT GUIDE OUR ACTIONS

Climate change and anthropogenic change are the main drivers of shifts in the global water cycle, influencing regional and local water availability and quality.

Climate change is scientifically well observed and documented (e.g. by the IPCC), and we can observe that hydrological extremes are becoming more frequent and severe. At the same time, anthropogenic changes – including land use and freshwater system alterations – are complex and often insufficiently monitored, making it challenging to predict effects on water resources and support innovative, sustainable catchment management.

ICWRGC's role is to synthesise and apply established, internationally acknowledged knowledge on climate and anthropogenic changes, focusing on their consequences for freshwater availability and

quality. These two phenomena lie at the heart of the ICWRGC's mandate, alongside the global water data centres' work.

Since water cycles invariably cross political boundaries, it is vital that all efforts rest upon the Open Science principle, ensuring transparent, accessible, and long-term usability of data, methods, and outcomes. Unlike traditional science, which might restrict or monetise data, Open Science relies on collaborative networks and digital platforms, making research products freely available to all. The advantages are obvious, but in reality there is still a lot to do. UN Water and associated UN entities are strongly supporting Open Science principles with their water programmes. Their implementation is an essential part of the UNESCO IHP and requested by the WMO Unified Data Policy and the FAIR data principles.



VISIONS, MISSIONS AND STRATEGIC GOALS TO SPECIFIC FRESHWATER-RELATED PHENOMENA

Phenomena visions



Freshwater availability is changing:

Freshwater resources are managed sustainably, ensuring water security for human societies and natural ecosystems facing the challenges of global change.

Freshwater quality is changing:

Freshwater quality has improved to ensure safe water for all.

Climate and hydrological extremes are changing:

Suitable climate change adaptation and mitigation strategies and measures, including up to date forecasting and projection tools, from local to global scale, to support resilient and sustainable livelihood systems and help to reduce the detrimental impacts of hydrological extreme events.

Anthropogenic change of terrestrial and freshwater ecosystems:

Terrestrial and freshwater ecosystems as well as their ecosystem services are sustainably used and managed worldwide facing the challenges of global change.

Phenomena missions



Freshwater availability is changing:

We contribute to identify sustainable freshwater management and development pathways considering population growth, planetary boundaries and tipping points.

Freshwater quality is changing:

We support the monitoring and implementation of Sustainable Development Goal target 6.3 to improve water quality together with the United Nations entities and member states.

Climate and hydrological extremes are changing:

We assess and contribute to better understanding of the impacts of climate change and variability on the water cycle and freshwater resources, human societies and natural ecosystems at various temporal and spatial scales. We promote the understanding and the quantification of changes in hydrometeorological extreme events and their impact at local to global scales.

Anthropogenic change of terrestrial and freshwater ecosystems:

We research and communicate the impacts of anthropogenic changes in terrestrial and freshwater ecosystems on ecosystem services. We contribute to identify sustainable freshwater management and development pathways considering population growth, planetary boundaries and tipping points. We supply information and studies and promote tools, methods and scenarios enabling sustainable freshwater use and protection of ecosystem services.



Phenomena strategic goals



Freshwater quality is changing:

We support UN Member States in regularly monitoring and assessing the status of their inland water bodies by providing targeted training, guidance and tools together with scientific communities. We provide data and information products and services based on in-situ and remote sensing data and model results supporting a continuous status assessment of freshwater quality at regional and global scales and serving the interface between science and policy.

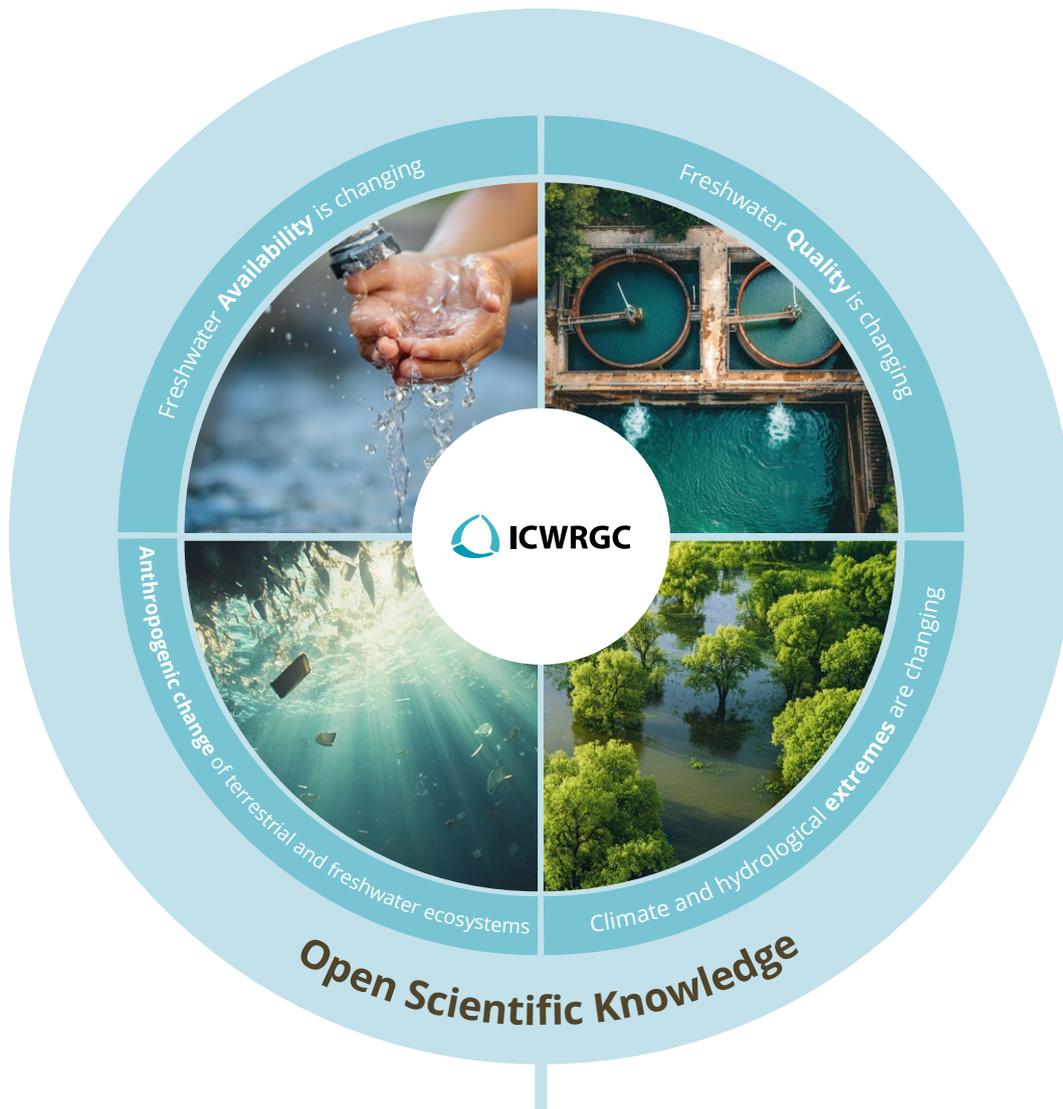
Climate and hydrological extremes are changing:

We support the availability, perception, and usability of standardised water-related data and products, according to Open Science Principles, thus providing a significant contribution to the goals of the relevant UN entities. We promote the integration of in-situ measurements and remote sensing data into models to assess extreme events and

their impact on changes in the water balance seamlessly in time and space through the BfG's and other partners' advanced digital infrastructure at the international level. We promote international capacity development, including education and training, in the understanding and application of data for climate impact research in the freshwater sector. We support scientific assessments of the impacts of climate change on the availability and quality of freshwater resources on local, regional and global scales

Anthropogenic change of terrestrial and fresh water ecosystems

We contribute to better understanding of the impacts of socio-economic changes in terrestrial and freshwater ecosystems. We assess anthropogenic impacts at various temporal and spatial scales. We promote methods to derive nature-based cross-sectoral solutions that sustain water-related ecosystems and their services.



Vision

Open Scientific Knowledge on water resources and its sustainable management is established to create a water secure world in a changing environment.



Mission

We support the generation of Open Scientific Knowledge, including open water data, open source hydrological software, open access to scientific publications and open educational resources to support open water science and sustainable water resource management worldwide.



Strategic goals

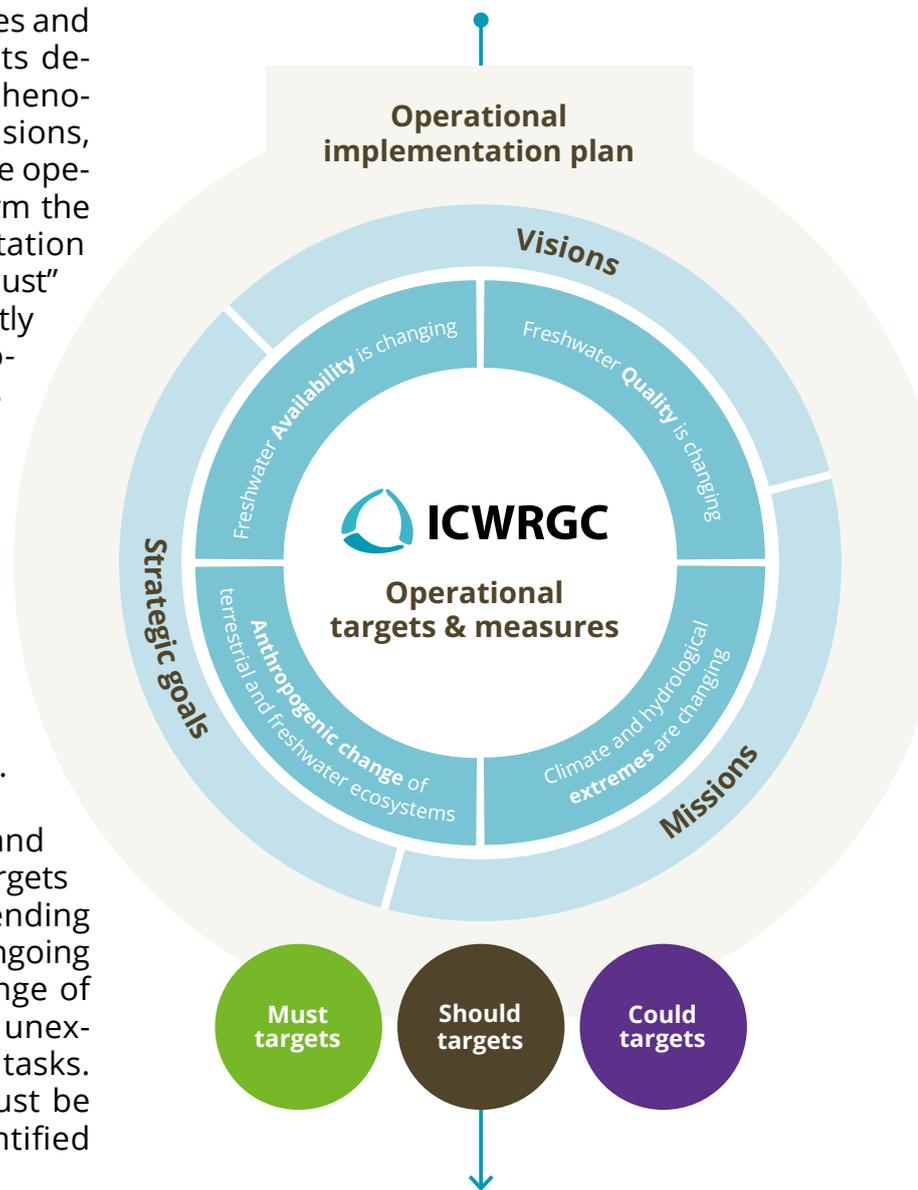
We improve the generation of Open Scientific Knowledge through enhancing findability, accessibility, interoperability and reusability of hydrometeorological data and software. We enable global data centres and UN member states to publish their data and products under harmonised and unified open data policies and via interoperable formats and services.



OUR IMPLEMENTATION PROCESS

All existing and planned activities have been defined as individual measures and grouped under operational targets derived from the four focal areas (phenomena) with their corresponding visions, missions, and strategic goals. These operational targets and measures form the core of the operational implementation plan, following SMART principles. “Must” targets and measures stem directly from existing mandates and projects. “Should” and “Could” targets reflect essential activities identified by the ICWRGC to help meet the primary objectives of the 2030 Agenda, the nexus goals, the UN Water programmes, and the priorities highlighted at the UN 2023 Water Conference. They also align with key partner strategies, such as UNESCO IHP-IX and the WMO Plan of Action for Hydrology 2022–2030.

When shaping annual work plans and day-to-day activities, operational targets and measures are prioritised depending on available resources. This is an ongoing process. It is a well-known challenge of project management to deal with unexpected incoming requests or new tasks. However, it is clear that these must be within the framework of the identified operational objectives.



MODE OF OPERATION AND ORGANISATION – ICWRGC

MISSION



We conduct and **contribute to current research** on regional and global water cycles, hydrological extremes, water quality and sustainable water management.



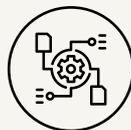
We develop and contribute to **education and training activities** to support sustainable development of fresh-water resources.



We support global and regional water programmes by **providing global data, scientific products and capacity-building activities** as a key contact and German Secretariat to selected UN water programmes.



We serve as a **catalyst for promoting the link between science and policy** through convening dialogues and exchanges between scientists, practitioners and policy makers through establishing knowledge platforms.



We operate and promote **global water data centres** and design customised data products.



We **foster international cooperation and exchange** between country governments, scientific and data networks in the development and long-term operation of modelling and analysis tools as well as capacity development of in-situ measurement and reporting of hydrological data.

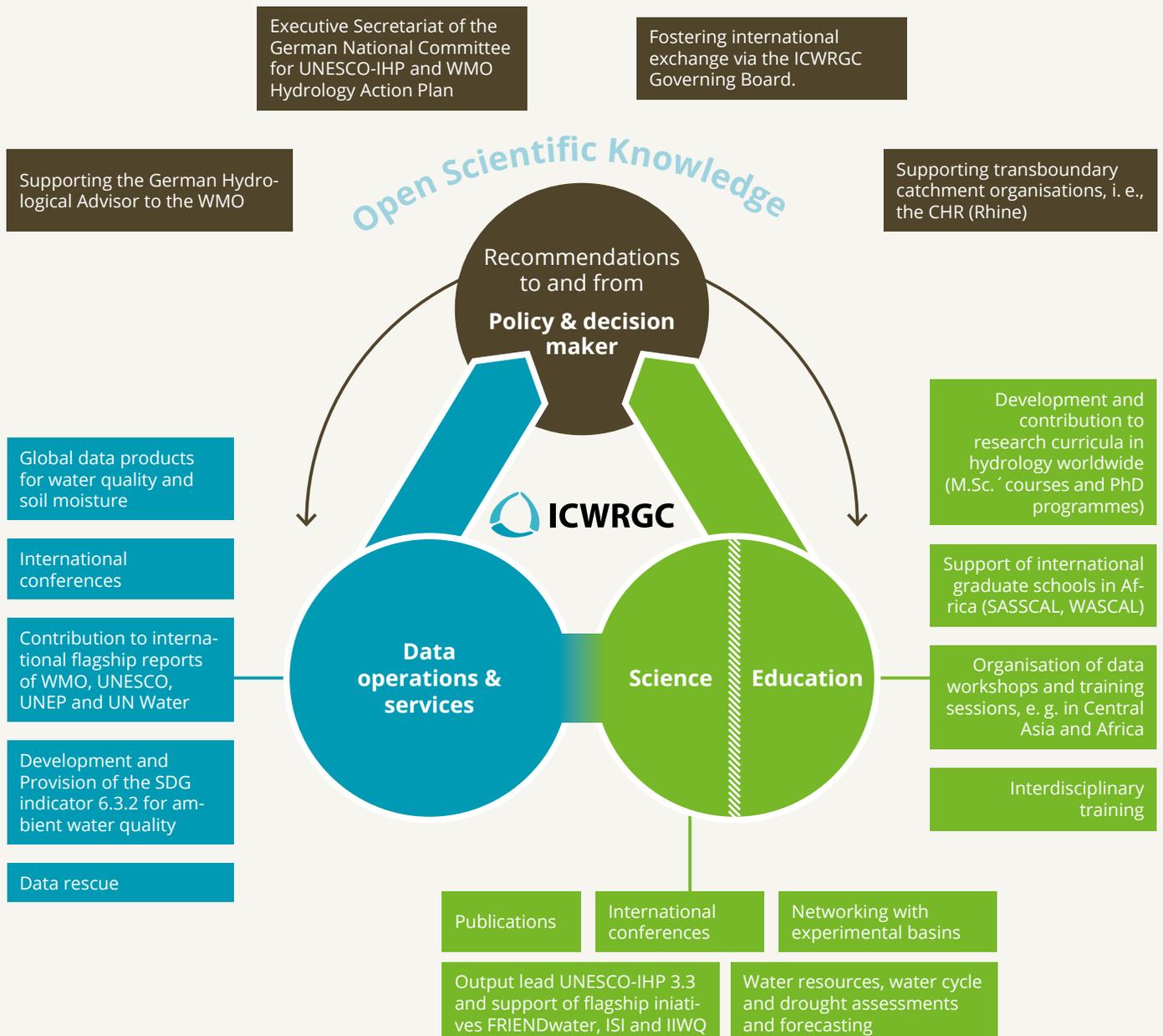


We accelerate efforts to **improve the exchange and use of water data** under the FAIR data principles.

OUR ROLE AND HOW WE WORK

All our activities fall within the three fields (Recommendations to and from Policy & decision maker, Science and Education, Data operations & services) and are interconnected. For example, science activities (research projects) can generate operational tools that should progress into permanent operational services, while global water data centre outputs feed into new research. In any case, products from scientific or operational services are intended to support decision-making wherever they are needed.

The ICWRGC acts as a hinge in a triangle between three fields:



WHO WE ARE

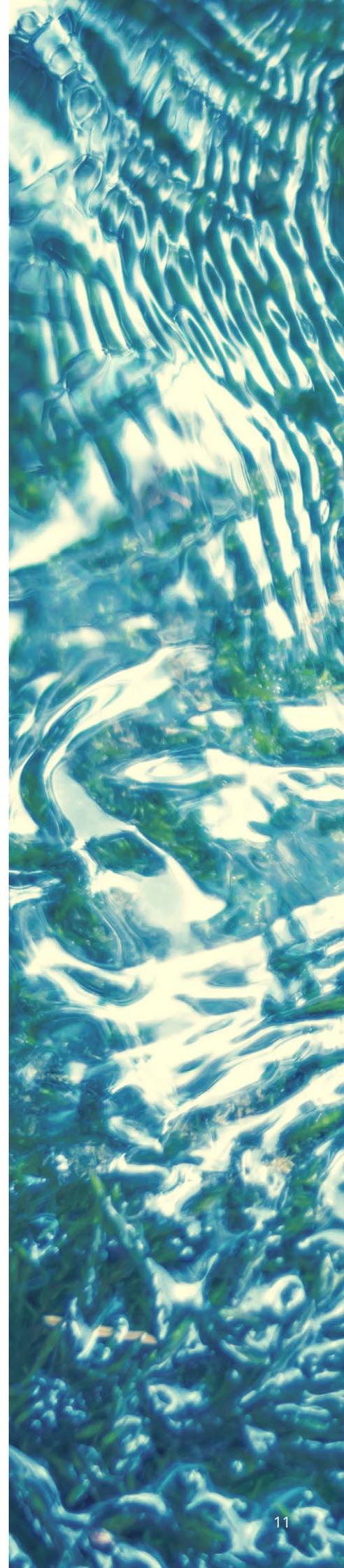
We are embedded in the international and intergovernmental water sector with mandates from UNESCO, WMO and UNEP. Fully and permanently funded by various German Federal Ministries, we have been recognised as a UNESCO Category 2 Centre since 2014. Together with BfG, we run the GEMS/Water Data Centre (GWDC) for Water Quality for UNEP and contribute to the International Monitoring Initiative for SDG indicator 6.3.2. Since 2022, we have been operating the International Soil Moisture Network (ISMN in cooperation with BfG). We also work closely with the Global Runoff Data Centre (GRDC) at BfG and the Global Precipitation Climatology Centre (GPCC) at the German Meteorological Service (DWD). Since 2017, we have been mandated by WMO to coordinate the Global Terrestrial Network–Hydrology (GTN-H), bringing together all 12 global water data centres relevant to the GCOS Implementation Plan and its role.

OUR MAIN PARTNERS

We contribute to the WMO Plan of Action for Hydrology 2022-2030 through a range of activities. We further actively contribute to the implementation of the UNESCO IHP (phase IX 2022-2029) and its flagships with leading functions (IHP-IX output 3.3, or IHP flagship initiatives FRIEND-Water, or the International Initiative for Water Quality IIWQ) and applied research and education projects. In addition, we actively participate in regional hydrological commissions, like the International Commission for the Hydrology of the Rhine basin (CHR) and the Regional Co-operation of the Danube countries in the frame of UNESCO IHP (IHP Danube) to assure long-term monographies of the discharge and flood and drought developments in the whole international river basin.

OUR QUALITY ASSURANCE

Together with our scientific advisory board, which is composed of German water scientists and experts from universities, research institutions and the water management from the Federal States, we connect German water knowledge with the UN water programmes and vice versa. Internationally, our scientific activities are also monitored by the Governing Board.





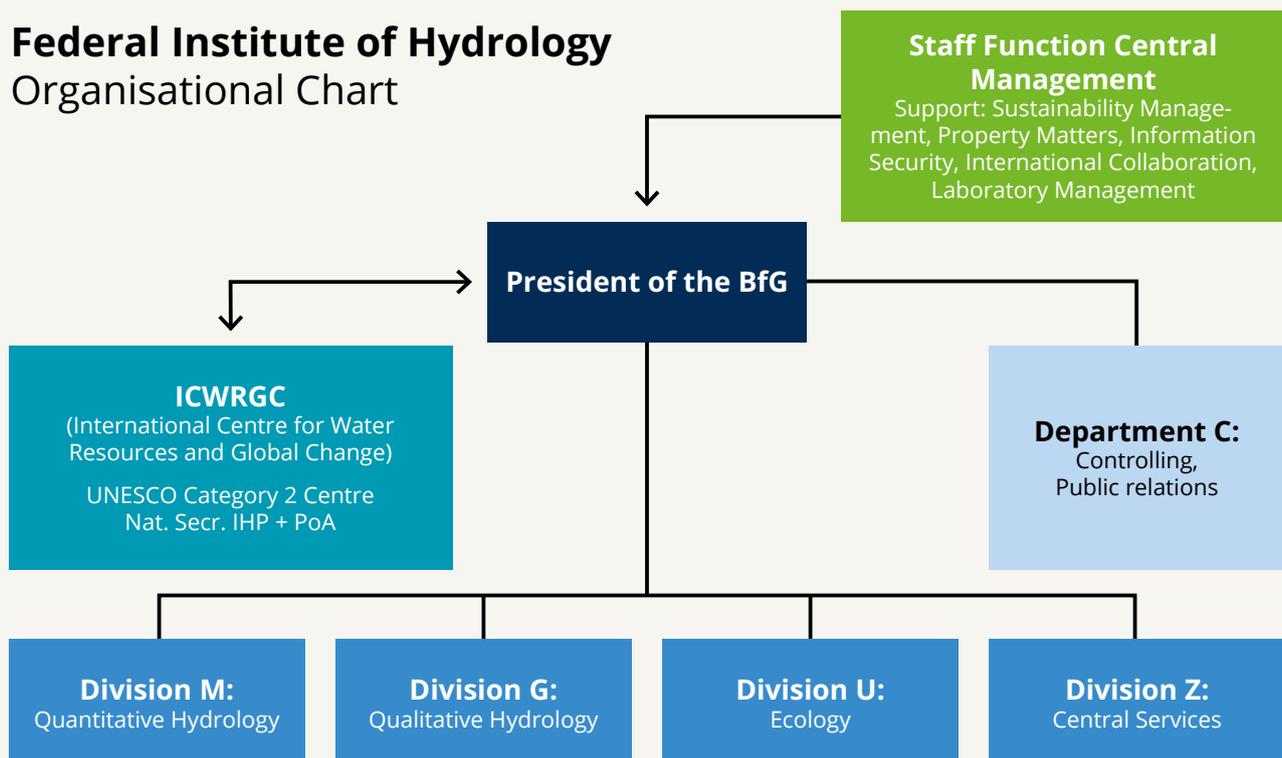
ORGANISATIONAL INFORMATION

Located in Koblenz, Germany, the ICWRGC operates with the Federal Institute of Hydrology (BfG), benefiting from shared facilities and administrative support, including IT infrastructure. This collaboration enhances scientific, technical, and administrative synergies. The ICWRGC, along with the global water data centres, are integral to BfG's international network. The ICWRGC director serves on the BfG board, while the president of the BfG oversees the official activities of both

the ICWRGC and the data centres. A consortium of Federal Ministries, led by the Foreign Office and providing permanent funding, supervises the technical and scientific operations of the ICWRGC.

In compliance with UNESCO rules for Category 2 centres, the ICWRGC is advised by an internationally composed Governing Board, guiding its contributions within the UNESCO water family.

Federal Institute of Hydrology Organisational Chart



IHP/HWRP NATIONAL COMMITTEE

Administrative Committee

- AA** Federal Foreign Office (Chair), Division 408 "Geopolitics of Climate Change, Climate and Security, Water Diplomacy", Berlin
- BMV** Federal Ministry for Digital and Transport
- BMUKN** Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety, Berlin
- BMFTR** Federal Ministry of Research, Technology and Space, Bonn
- BMLEH** Federal Ministry of Agriculture, Food and Community, Berlin
- BMZ** Federal Ministry for Economic Cooperation and Development, Bonn
- LAWA** German Working Group on water issues of the Federal States and the Federal Government, Senate Department for Urban Mobility, Transport, Climate Action and the Environment (SenUMVK), Berlin
- BfG** Federal Institute of Hydrology, Koblenz
- DWD** German Meteorological Service, Offenbach
- DUK** German Commission for UNESCO, Bonn



National Committee of the Federal Republic of Germany for the Intergovernmental Hydrological Programme (IHP) of UNESCO and for the Hydrology and Water Resources Programme (HWRP) of WMO



Scientific Advisory Board

Scientists nominated by the federation, by LAWA and by the German Research Foundation

Chair:

- University of Applied Sciences, Cologne

Representatives of universities and research institutes:

- Goethe-University, Frankfurt/Main
- Helmholtz-Centre for Environmental Research
- Leibniz University Hannover
- Technical University of Munich
- Department of Geography at the University of Bonn
- University of Münster
- RWTH Aachen
- Friedrich-Alexander-University Erlangen-Nürnberg (FAU)

Representatives of the federal research institutes:

- German Meteorological Service (DWD)
- Federal Institute of Hydrology (BfG)
- Federal Institute for Geosciences and Natural Resources (BGR)
- Johann Heinrich von Thuenen Institute
- Federal Ministry of Education and Research (BMBF)

Representatives of the federal states (LAWA):

- Berlin
- Brandenburg

Permanent guest:

- Ruhr-University Bochum



The management of the IHP/HWRP Secretariat has been incorporated into the ICWRGC

GOVERNING BOARD OF THE INTERNATIONAL CENTRE FOR WATER RESOURCES AND GLOBAL CHANGE (ICWRGC) UNDER THE AUSPICES OF UNESCO



UNESCO Cat. 2 Centres of other Member States	UNESCO	German National Committee for the IHP	Guests
<p>Sweden (ICWC) International Centre for Water Cooperation</p> <p>Poland (ERCE) European Regional Centre for Ecohydrology</p> <p>Japan (ICHARM) International Centre for Water Hazard and Risk Management</p> <p>Iran (RCUWM) Regional Centre on Urban Water Management</p> <p>USA (ICIWaRM) International Centre for Integrated Water Resources Management</p>	<p>Representative of the Director General, IHP-Secretariat</p>	<p>AA Federal Foreign Office (Chair), Division 408 "Geopolitics of Climate Change, Climate and Security, Water Diplomacy", Berlin</p> <p>BMV Federal Ministry for Digital and Transport</p> <p>BMUKN Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety, Berlin</p> <p>BfG Federal Institute of Hydrology, Koblenz</p> <p>SAB University of Applied Sciences, Cologne, Chair of Scientific Advisory Board (SAB)</p> <p>DUK German Commission for UNESCO, Bonn</p>	<p>IHE Delft The Netherlands</p> <p>Members of the Scientific Advisory Board</p> <p>WMO Representative</p>

LIST OF ABBREVIATIONS

AA	Auswärtiges Amt (Federal Foreign Office)	ICIWaRM	International Centre for Integrated Water Resources Management
BfG	Bundesanstalt für Gewässerkunde (Federal Institute of Hydrology)	ICWC	International Centre for Water Cooperation
BMFTR	Bundesministerium für Forschung, Technologie und Raumfahrt (Federal Ministry Research, Technology and Space)	ICWRGC	International Centre for Water Resources and Global Change
BMV	Bundesministerium für Digitales und Verkehr (Federal Ministry for Digital and Transport)	IHP	Intergovernmental Hydrology Programme
BMLEH	Bundesministerium für Landwirtschaft, Ernährung und Heimat (Federal Ministry Agriculture, Food and Community)	IIWQ	International Initiative on Water Quality
BMUKN	Bundesministerium für Umwelt, Klimaschutz, Naturschutz und nukleare Sicherheit (Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety)	IPCC	Intergovernmental Panel on Climate Change
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (Federal Ministry for Economic Cooperation and Development)	ISI	International Sediment Initiative
CHR	International Commission for the Hydrology of the Rhine basin	ISMN	International Soil Moisture Network
DUK	Deutsche UNESCO-Kommission (German Commission to UNESCO)	LAWA	Bund/Länder-Arbeitsgemeinschaft Wasser (German Working Group on water issues of the Federal States and the Federal Government)
DWD	Deutscher Wetterdienst (German Meteorological Service)	RCUWM	Regional Centre on Urban Water Management
ERCE	European Regional Centre for Ecohydrology	SAB	Scientific Advisory Board (University of Applied Sciences Cologne)
EURO - FRIEND	European Flow Regimes from International Experimental and Network Data	SASSCAL	Southern African Science Service Centre for Climate Change and Adaptive Land Management
FAIR principles	Findability, Accessibility, Interoperability, Reusability	SDG	Sustainable Development Goal
GCOS	Global Climate Observing System	SMART principles	Specific, Measurable, Achievable, Relevant, Time-based
GPCC	Global Precipitation Climatology Centre	UN	United Nations
GRDC	Global Runoff Data Centre	UNEP	United Nations Environment Programme
GTN-H	Global Terrestrial Network - Hydrology	UNESCO	United Nations Educational Scientific and Cultural Organization
GWDC	GEMS/Water Data Centre	UNESCO IHP-IX	UNESCO Intergovernmental Hydrological Programme
HELPING	Hydrology Engaging Local People IN one Global world	WASSCAL	West African Science Service Centre on Climate Change and Adapted Land Use
HAP	Hydrological Action Plan	WMO	World Meteorological Organization
IAHS	International Association of Hydrological Sciences		
ICHARM	International Centre for Water Hazard and Risk Management		

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