

WCRP and WMO Hydrology Linkages



Stefan Uhlenbrook and MANY other

WMO OMM

World Meteorological Organization

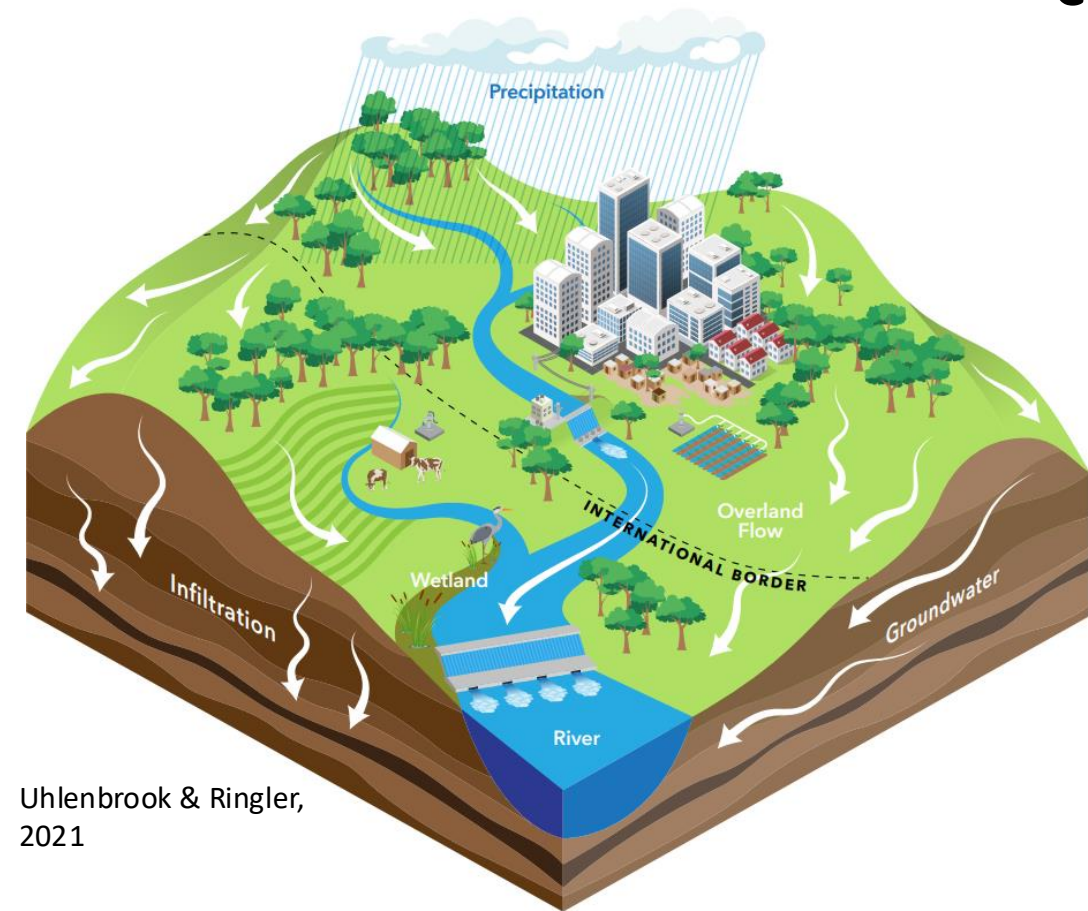
Organisation météorologique mondiale

How to improve hydrological information and services? (observations, data management, modelling and forecasting)

Challenges include:

- Climate change and change of hydro-meteorological parameters
- Apply a Earth systems approach
- Change of water availability and ever-increasing water demand of society
- Human interventions water cycle
- Lack of data and information, systems understanding
- Politics around sharing hydrological data
- Limited capacities at many WMO Members
- ...

➤ *Operational hydrology/water management needs to address these challenges*



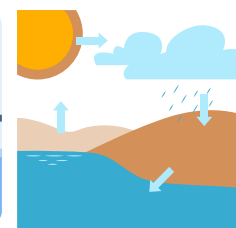
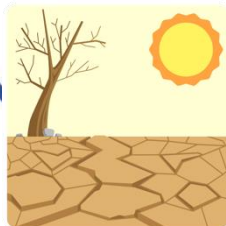
WMO Resolution 25 (CG-18) in 2019

Basis for WMO Plan of Action for Hydrology – eight Long-term Ambitions:

1. No one is surprised by a **flood**
2. Everyone is prepared for **drought**
3. Hydro-climate and meteorological data support the **food security** agenda
4. **High-quality** data supports science
5. **Science** provides a sound basis for operational hydrology
6. We have a thorough **knowledge of the water resources** of our world
7. **Sustainable development** is supported by hydrological information
8. **Water quality** is known



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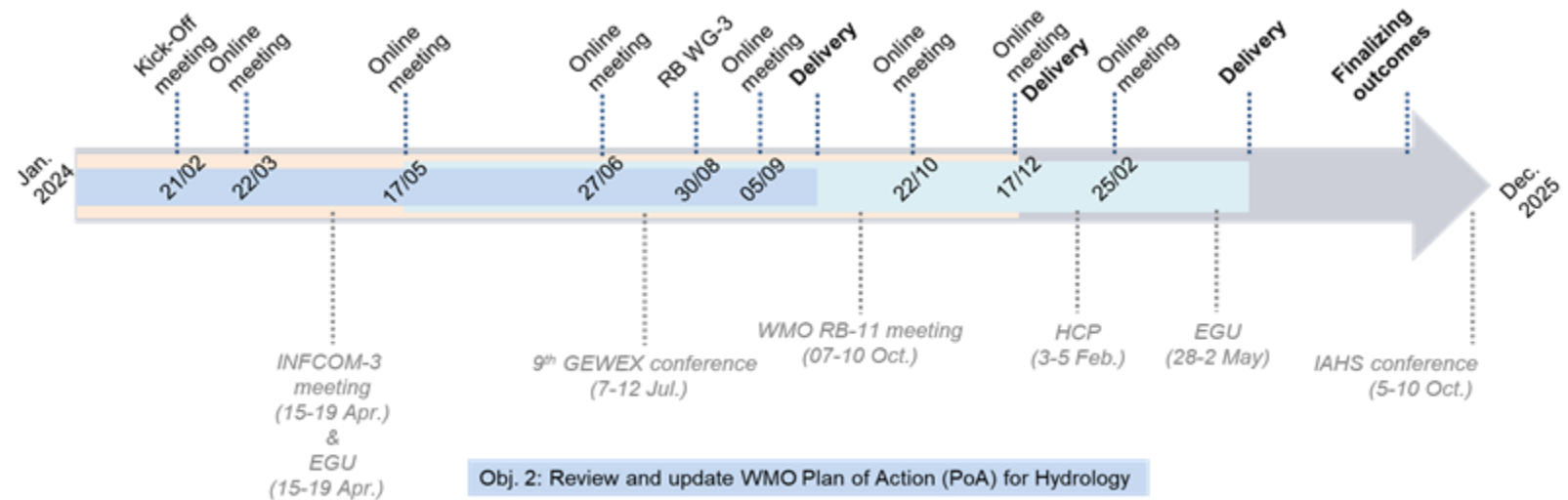


Task Team Hydrology Research of the RB

(TT-HydroResearch; led by Ilias Pechlivanidis, SMHI, Sweden)

Ongoing effort:

- **Obj1.** Review, update and oversee the implementation of [WMO Hydrology Research Strategy 2022-2030](#)
- ✓ **Obj2.** *Review, update and oversee the implementation of the actions related to the WMO RB in the [WMO Plan of Action for Hydrology](#)*
- **Obj3.** Recommend the establishment of a subsidiary body (e.g., Expert Team) or research program under the Research Board to lead the [Hydrology Research Agenda of WMO](#)
- ✓ **Obj4.** Identify research priorities for improving hydrological predictions across spatial scales and time horizons



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Obj. 2: Review and update WMO Plan of Action (PoA) for Hydrology

Obj. 1: Review and update WMO Hydrological Research Strategy 2022-2030

Obj. 4: Report on prioritisations for (co-) creating R2O hydrological forecast systems

Obj. 3: Connect with IAHS, AGU, EGU, UNESCO IHP, UN Water, HEPEX, SC-HYD, and HCP etc.
→ towards establishing the WMO Hydrology Research Agenda

WMO Hydrological Research Strategy 2022-2030

1. Improve **hydrological monitoring** to enhance understanding and assessments
 1. Data collection
 2. Design and evaluation of monitoring networks
2. Improve **hydrological forecasting**
 1. Hydro/cryosphere modelling and forecasting
 2. Precipitation estimation and forecasting
 3. Understanding and predicting hydrological extremes
 4. Human-water-ecosystem interactions
3. Methods, procedures for **collection/analysis/communication of data** to users
 1. Data processing and quality control
 2. Data storage, access and dissemination
 3. Communication



Table of Content

Chapter 1: Introduction

- 1.1. Global Challenges and the Need for Operational Hydrology Research
- 1.2. Vision, Goals and Strategic Objectives
- 1.3 Implementing the WMO's Research Strategy on Hydrology

Chapter 2: Data Collection, Quality and Management

- 2.1. Surface Water, Groundwater, and Cryosphere Data Collection
- 2.2. Advances in Remote Sensing and Earth Observation
- 2.3. Data Quality Control and Standardization
- 2.4. Data Storage, Access and Dissemination
- 2.5. Design and evaluation of hydrological monitoring networks

Chapter 3: Precipitation Analysis and Forecasting

- 3.1. Precipitation Measurement Techniques
- 3.2. Advanced Precipitation Forecasting Models
- 3.3. Integrating Remote Sensing, Ground-Based Data and AI for Enhanced Forecasting
- 3.4. Uncertainty Quantification in Precipitation Forecasting



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Chapter 4: Hydrological Analysis and Modelling

- 4.1. Hydrological Modelling Techniques
 - 4.1.1. Process-Based and Statistical Modelling Approaches
 - 4.1.2. Data Assimilation from Traditional and Non-traditional Sources
 - 4.1.3. Machine Learning and Hybrid Models in Hydrological Forecasting
- 4.2. Extreme Hydrological Events: Floods and Droughts
- 4.3. Assessing Human-Water-Ecosystem Interactions

Chapter 5: Hydrological Predictions and Projections

- 5.1. Advances in Nowcasting and Short-Term Time Horizons
- 5.2. Advances in Medium-Term Time Horizons
- 5.3. Advances in Sub-seasonal to Seasonal Time Horizons
- 5.4. Advances in Decadal to Centennial Time Horizons

Chapter 6: Digital Innovations in Operational Hydrology

- 6.1. Emerging Technologies: Digital Twins and Virtual Simulations
- 6.2. Real-Time Decision Support and Dissemination Systems

Chapter 7: Co-Creation of Hydrological Products and Services

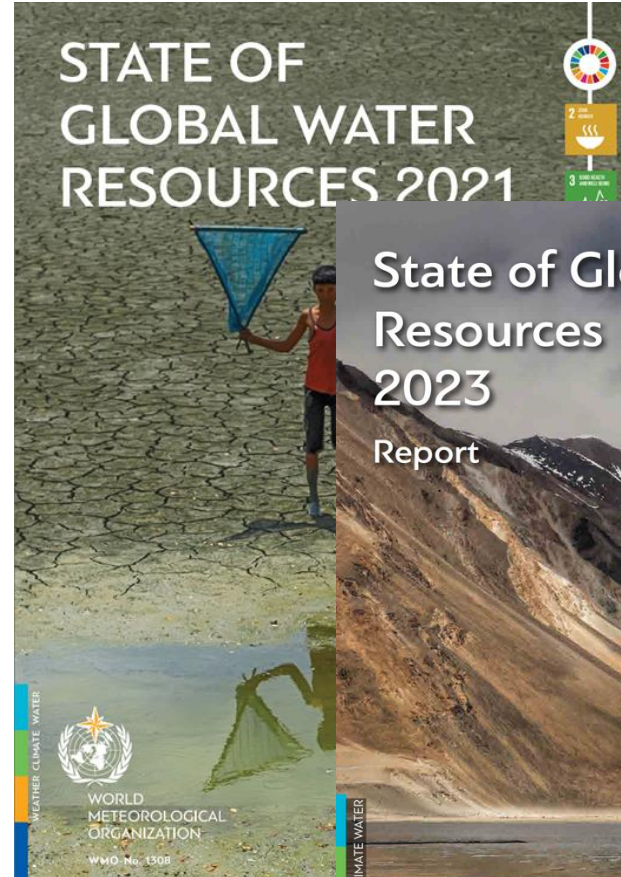
- 7.1. User-Centric Hydrological Service Generation
- 7.2. Decision Support for Integrated Human-Water-Ecosystem Management
- 7.3. Improving Communication of Hydrological Data and Information for Effective Decision-Making
- 7.4. Advanced Visualization and Dissemination for Policy and Practice

Improving Global Water Assessments

- Provide a **quantitative assessment** of global water resources in the last year
- Give an overview of status on **data availability and data sharing** at a global scale (hydrological data)
- **Innovative methodology** used to overcome the gaps in available observations
- The report was **well received** by Members, international organizations and media (>2500 articles, in one week)



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Other things to mention ...

- Involvement of SC-HYD experts in GPEX SSG, and WWRP/In-PRHA
- GEWEX \longleftrightarrow State of Global Water Resources report
- More formal involvement of WMO Hydrology in GEWEX Steering Committee?



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