

## 2.5 WATER

### Improving water-resource management through better understanding of the water cycle

Water-related issues addressed by GEOSS will include: precipitation; soil moisture; streamflow; lake and reservoir levels; snow cover; glaciers and ice; evaporation and transpiration; groundwater; and water quality and water use. GEOSS implementation will improve integrated water-resource management by bringing together observations, prediction, and decision-support systems and by creating better linkages to climate and other data. In situ networks and the automation of data collection will be consolidated, and the capacity to collect and use hydrological observations will be built where it is lacking.

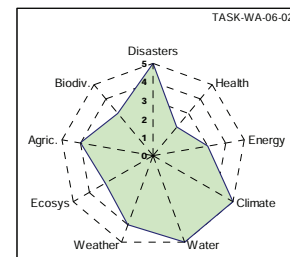
*GEOSS 10-Year Implementation Plan, Section 4.1.5*

#### WA-06-02: Droughts, Floods and Water Resource Management

Address decision-making challenges related to the management of hydro-meteorological extremes and the sustainable use of water.

##### a) Forecasting for Droughts and Floods

This sub-task is led by USA (NOAA, john.schaake@noaa.gov), and supported by the **Integrated Global** Water Cycle Community of Practice



Improve forecasting methods for extreme events (floods, droughts) used by hydrological services throughout the world to help bridge the gap between research and user communities. Expand upon initiatives such as (i) HEPEX (Hydrological Ensemble Prediction Experiment) (ii) the European Flood Alert System EFAS to produce twice-daily 10-day early flood warnings for Europe, and (iii) GMES projects related to land management (GEOLAND).

##### b) Impacts from Drought

This sub-task is led by Canada (University of Manitoba, lawford@umbc.edu), Canada/WCRP, EC (CEOP-AEGIS), USA (NOAA) and **WMO**, and supported by the **Integrated Global** Water Cycle Community of Practice

Track and analyze impacts from drought (including feedbacks such as soil drying) to provide a tangible and practical demonstration of the value of integrated water cycle observations. Develop a full and operational data cycle of environmental information from “producer-to-consumer”/“source to sink,” and explore the application of data products to Water and Agriculture.

##### c) Mountain Water Resources

This sub-task is led by EC (ACQWA, martin.beniston@unige.ch), and supported by the **Integrated Global** Water Cycle Community of Practice

Analyze the future of water resources in vulnerable mountain regions in the context of climate change and increasing extreme events. Build upon the European project ACQWA (Assessing Climatic change and impacts on the Quantity and quality of WAtER) to deliver among others, technical papers on downscaling techniques for hydrological modelling and water policy recommendations for decision-makers.

##### d) Prototype Regional Drought Early Warning Test Beds

This sub-task is led by USA (NIDIS, NOAA, chad.mcnutt@noaa.gov), and supported by the **Integrated Global** Water Cycle Community of Practice

Explore expanding the concept of the North American Drought Monitor and drought portal through prototype drought early warning test bed activities in specific international river basins, such as on the US-Canada border, basins in Central America and the Caribbean, the Mediterranean, and other drought-sensitive regions.

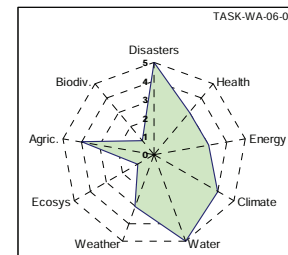
*Key related Tasks in other SBAs include: DI-06-09 (Use of Satellites for Risk Management), DI-09-02 (Multi-Risk Management and Regional Applications), CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), WA-06-07 (Capacity Building for Water Resource Management), WA-08-01 (Integrated Products for Water Resource Management and Research), WE-06-03 (TIGGE), WE-09-01 (Capacity Building for High-Impact Weather Prediction), AG-07-03 (Global Agricultural Monitoring)*

### **WA-06-07: Capacity Building for Water Resource Management**

Initiate capacity building programs in support of water management, to show the value of, and develop tools for, Earth observation data.

#### a) Latin America

This sub-task is led by Argentina (CONAE), Canada (University of Manitoba, lawford@umbc.edu) and USA (NASA), supported by the **Integrated Global** Water Cycle Community of Practice



Develop a proposal along the lines of the ESA/UNESCO TIGER programme focused on the use of Earth observation data for water resources management (surface waters, groundwater). This to help: (i) Identify data and general support from space agencies; (ii) Identify a coordinating agency to organize calls for proposals and securing reviews and monitoring of the proposals; (iii) Identify further funding sources; and (iv) Issue a call for proposals to the research and development community. The program will be initiated in Latin America and then be extended to Asia and Africa. Linkages with existing GEO efforts will be made.

#### b) Africa

This sub-task is led by USA (NASA) and CEOS (ESA; diego.fernandez@esa.int), and supported by the **Integrated Global** Water Cycle Community of Practice

In the scope of Phase 2 of the TIGER initiative (focusing on the use of space technology for water resource management in Africa), assist African countries to overcome problems faced in the collection, analysis and dissemination of water-related geo-information. Exploit the advantages of Earth Observation (EO) technology to build the basis for an independent African capacity and set up sustainable water observation systems. In addition, build and extend the Central American “SERVIR” (visualization and monitoring using Earth science data) for hydrologic applications (e.g. flood warning) to East Africa and possibly other parts of the world. Other important projects include the hydrologic data integration and assimilation systems of the ‘Land Information System’ (LIS).

#### c) Asia

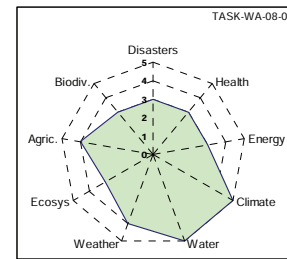
This sub-task is led by Japan (JAXA, University of Tokyo, tkoike@hydrat.u-tokyo.ac.jp), and supported by the **Integrated Global** Water Cycle Community of Practice

Build upon the Asian Water Cycle Initiative (AWCI) to develop competencies among water management practitioners, researchers, and administrators (AWCI addresses climate change monitoring in Asia through the integration of in-situ and satellite/remote sensing). In addition, build upon Sentinel Asia to develop disaster management-support systems in the Asia-Pacific region and building capacity for utilization of satellite images.

*Key related Tasks in other SBAs include: CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), WA-06-02 (Droughts, Floods and Water Resource Management), WA-08-01 (Integrated Products for Water Resource Management and Research)*

## **WA-08-01: Integrated Products for Water Resource Management and Research**

Improvements and expansion of in-situ networks, combined with new satellite missions (in addition to existing space-borne Earth observing systems) and emerging assimilation and prediction capabilities, are opening the door to a new era in global water-cycle management.



### a) Soil Moisture

This sub-task is led by ESA and WCRP (GEWEX, peter.vanoevelen@gewex.org), and supported by the Integrated Global Water Cycle Community of Practice

Establish a global soil moisture network suitable for the development of multi-purpose soil moisture products. Apply in-situ based products to the calibration and validation of remotely-sensed observations. Such a global network is still to be established and is as such a high priority. Make relevant synergies with Task US-09-03 (Cross-cutting Products and Services).

### b) Runoff

This sub-task is led by Japan (University of Tokyo) and WMO (wgrabs@wmo.int), and supported by the Integrated Global Water Cycle Community of Practice

Integrate, in a phased approach, dedicated river gauging networks of existing hydrological stations into a global runoff observation network. The main output of the HARON project (Hydrological Applications and Run-Off Network) will be strengthened in-situ and satellite monitoring networks of estuaries, rivers, lakes, reservoirs, and groundwater levels.

### c) Groundwater

This sub-task is led by Netherlands (IGRAC, sophie.vermooten@deltares.nl), and supported by the Integrated Global Water Cycle Community of Practice

Establish a Global Groundwater Monitoring Network (GGMN) for a periodic assessment of global groundwater resources, using information from existing national, regional and global networks – in order to represent changes in groundwater resources at scales relevant to regional and global resource assessment.

### d) Precipitation

This sub-task is led by CGMS (george.j.huffman@nasa.gov), and supported by the Integrated Global Water Cycle Community of Practice

Under the guidance of CGMS/International Precipitation Working Group (IPWG), promote and advance the development and validation of multi-sensor satellite-based precipitation estimates, including snowfall. Inputs from the Precipitation Virtual Constellation (AR-09-02a) will supplement these efforts.

### e) Water Cycle Data Integration

This sub-task is led by Canada (University of Manitoba), EC (CEOP-AEGIS), Japan (University of Tokyo), WCRP (GEWEX,) and WMO (WGrabs@wmo.int), and supported by the Integrated Global Water Cycle Community of Practice

Upcoming satellite launches and plans for new missions provide new global data sets that will supplement the in-situ networks for many water cycle variables. The Coordinated Energy and water cycle Observations Project (CEOP) under the WCRP Global Energy and Water-cycle Experiment (GEWEX) is tailoring and developing tools to access the various data collections and undertake data integration work over the Internet.

f) Pilot Projects for Improved Water Discovery and Quality Assessments

This sub-task is led by USA (EPA) and IEEE (lyonjohn@aol.com), and supported by the Integrated Global Water Cycle, and Coastal Zone, Communities of Practice.

Conduct pilot projects in cooperation with local, regional, and national groups, and other organizations to provide water quantity and quality assistance where it is needed, but not now available. These projects over twelve in number are focused on developing countries and realizable in the field within one year, and/or slightly more in time. They will be sustainable, reusable, repeatable, and scalable. Currently, the sub-task has submitted more than four of the Pilot Projects for potential funding by sponsor groups.

g) Global Water Quality Monitoring

This sub-task is led by Australia (CSIRO) and USA (EPA, State of Wisconsin, steven.greb@Wisconsin.gov), and supported by the Integrated Global Water Cycle, and Coastal Zone, Communities of Practice

Initiate projects to develop operational observation and monitoring systems of water quality, integrating in-situ water quality monitoring methods for terrestrial sources & the coastal ocean with remote-sensed operational systems of global-scale freshwater quality. Ensure that resulting information systems are compatible and interoperable as part of the system of systems. Make relevant synergies with HE-07-02 and develop models that relate water quality databases to exposure and health effects data; and identify mechanisms for alerting public health professionals on hazardous conditions identified by the monitoring of these parameters.

*Key related Tasks in other SBAs include: HE-09-02 (Monitoring and Prediction Systems for Health), CL-06-01 (A Climate Record for Assessing Variability and Change), CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), AR-09-03 (Sustained Observing Systems), WA-06-02 (Droughts, Floods and Water Resource Management), WA-06-07 (Capacity Building for Water Resource Management), WE-06-03 (TIGGE), EC-09-01 (Ecosystem Observation and Monitoring Network), AG-07-03 (Global Agricultural Monitoring)*