Data and Information for Climate Resilient Water Resources Management

Earth Observation and AI Solutions for climate resilient water resources management

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Water is essential







Water sustains the planet

Water is a vital factor of production

Water is the essence of life

But... Water is in crisis



... and pressures and extremes are increasing

and supply of water by 2030

10% of global population already living in countries with high or critical water stress

Climate change is amplifying water-related risks;



of natural disasters involve water

Section by 2030 and \$22.6 trillion by 2050

Achieving water security for all requires coordinated action and a massive increase in investment across the water sector.



Proportion of global land surface with irregular rainfall is increasing



Demand and endowment

Examples: Water Management Issues in Central Asia and South Africa



Image: World Economic Forum

Aral sea shrinkage

- Semi-Arid area with growing physical water scarcity
- Irrigation as the largest water user
- Increased competition for (transboundary) waters
- Climate change affects water availability and will significantly increase irrigation water demand



Cape Town in South Africa

- Theewaterskloof reservoir, one of the largest water supply systems near Cape Town
- Climate change increases risk of droughts and desertification
- Drop to 27% of its full capacity between 2014-2018



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What about Europe?



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'God, give us rain' - Romanian monastery prays for end to drought

By Octav Ganea and Luiza Ilie



Floods cause death and destruction across Europe

Alejandro López

Widespread flooding in Greece, Turkey, Bulgaria and Spain has left at least 25 people dead, dozens missing, many more injured and thousands displaced. The floods have destroyed whole bridges, washed away roads, burst dams and drifted cars into the sea.





Climate-related extreme events in Europe

- Between 1980 and 2022: Climate-related extremes amounted to an estimated EUR 650 billion in the European Union
- The most expensive hazards:
 - > 2002 flood in central Europe (EUR 34 billion)
 - > 2021 flooding in Germany and Belgium (EUR 44 billion)
 - > 2022 compound drought and heat events (EUR 40 billion)



Water is to Adaptation what Energy is to Mitigation

Climate impacts are channeled through the hydrological cycle

Adaptation to Climate Change requires a multi-sectorial approach





World Bank's new Global Challenge Program (GCPs)

World Bank response for **faster and more effective financing, partnerships and knowledge** to make progress on tackling global challenges

- **1. Fast-Track Water Security and Climate Adaptation**: to strengthen water security and increase access to safe water supply and sanitation and invest in the scale-up of sustainable water management and disaster risk reduction solutions
- **2. Energy Transition, Efficiency and Access:** to increase access to affordable, reliable, sustainable, and modern energy by scaling up clean energy and phasing down fossil fuel use

3. Enhanced Health Emergency Prevention, Preparedness and Response: to

enhance capacity to prevent, detect, and respond to health emergencies by strengthening health systems and supporting a One Health approach at country, regional, and global levels

- 4. Accelerating Digitalization: to build digital foundations that accelerate digitalization at scale
- 5. Food and Nutrition Security: to help break the cycle of food and nutrition insecurity
- 6. Forests for Development, Climate, and Biodiversity: to build a sustainable forest

economy in critical forest ecosystems that manages, restores, and conserves natural resources, creates jobs, and protects the interests of smallholder and forest-dwelling communities



Access points for action? The three 3 l's:





INSTITUTIONS



INVESTMENT

i INFORMATION The significance of water data and information

- 1. Environmental sustainability to ensure preservation and restoration of aquatic ecosystems
- 2. Public health by detecting contaminants that could pose risks
- 3. Industrial compliance to assess whether standards are met
- 4. Agricultural practices to optimize irrigation and ensure required water quality
- 5. Research to understand environmental changes and develop conservation strategies
- 6. Infrastructure planning and maintenance to ensure continuous supply of clean water
- 7. Disaster preparedness to support risk mitigation and ensure timely evacuation efforts



(i) INFORMATION: Challenges

Data coverage and quality

- Sometimes culture of "data-free analysis" and "analysis-free decisionmaking"
- Infrastructure deficit, poor office space, and equipment
- Limited technical and managerial capacity for modern water resources data and analytical knowledge tools
- Need for a vision for hydromet and analytical services (rather than just starting from equipment and models)









(i) INFORMATION: Opportunities from EO and AI

- Water Resource Monitoring: Use satellite data to track water levels, quality, and availability
- Disaster Management: Apply remote sensing for early flood and drought detection, improving response strategies
- Infrastructure Assessment: Use satellite imagery to monitor water infrastructure, enabling efficient maintenance
- Data for Decision Making: Provide high-quality data to support evidence-based water policy and investment planning

Meaningful use of modern information and analytical tools











See Data 🔿



SERVICES

Water supply, sanitation, and irrigation infrastructure and services See Data → BUILD RESILIENCE

Climate change, extreme events, and adaptation infrastructure See Data →



	https://wbwaterdata.org/		Datasets About
			Search datasets within Sustain Water Resources pillar Q 1,812 DATASETS FOUND Order by: Relevance V
WORLD BANK	NK OF THE STAFF	SUSTAIN WATER RESOURCES Sustaining Water Resources means improving resource management at the river bain, country, and transboundary levels. Here you can find data on quantity and quality of surface and groundwater, water satridiy, and	Groups: Sustain Water Resources # GLOBAL - NITRATE-NITRITE IN SUBFACE WATER Globally gridded dataset of nitrate-nitrite in surface water for the years 1993-2010, monthly observations. Data is available at the 0.5x0.5 degree gridcell level. Units are GV
/ 3 Pillars / Sustain Water Res	sources	Datasets 1.8k	BLUE TECR: INNOVATIVE TECRNOLOGIES FOR BLUE ECONOMY This innovative interactive e-book is to provide a quick introduction to how Technology and Innovation are being app in the Blue Economy. An interactive e-book is more than
	Datasets About	Y 3 FILLERS Build Resilience (1353) Deliver Services (1703) Sustain Water Resou(1812) *	BLOBAL RIVER SEDIMENTS (BLOBISE) This database is a set of 2828 suspended and bed sediment compositional measurements from 1683 locations aroun the globa. Is in amed Global River Sediments (GloRSe), and
	Search datasets within Sustain Water Resources pillar Q	▼ REGIONS East Asia and Pacific (170) Europe and Central (136)	THE WATER AND SANITATION OBSERVATORY FOR LATIN AMERICA AND THE CARIBBEAN (OLAS) The Water and Sanitation Observatory for Latin America and the Caribbean (OLAS) is a digital platform that collects relevant information on the water and sanitation sector in
	1,812 DATASETS FOUND Order by: Relevance V	Latin America and C (224) Middle East and Nor (107) North America (3)	GUBBAL DISTRIBUTION OF SALTMARSHES This dataset displays the extent of our knowledge regarding the distribution of saltmarshes globally, drawing from occurrence data (surveyed and/or remotely sensed). The dataset
STAIN WATER RESOURCES	GLOBAL - NITRATE-NITRITE IN SURFACE WATER	South Asia (124) Sub-Saharan Africa (719) T COUNTRIES	BLOBAL DISTRIBUTION OF CORAL REEFS This dataset shows the global distribution of coral reefs in tropical and subtropical regions. It is the most comprehe global dataset of warm-water coral reefs to date
taining Water Resources means roving resource management at the r basin, country, and transboundary els. Here you can find data on ntity and quality of surface and undwater, water scarcity, and isboundary issues. read more	Globally gridded dataset of nitrate-nitrite in surface water for the years 1992-2010, monthly observations. Data is available at the 0.5x0.5 degree gridcell level. Units are CSV Albania (24) Armenia (27) Benin (17)	Albania (24) Armenia (37) Benin (17)	FAO MAP CATALOG Hand-in-Hand has brought together over 20 FAO units across multiple domains, from Animal Health to Trade and Markets, integrating data from across FAO on Soli, Land, Water,
	BLUE TECH: INNOVATIVE TECHNOLOGIES FOR BLUE ECONOMY This innovative interactive e-book is to provide a quick introduction to how Technology and Innovation are being applied in the Blue Economy. An interactive e-book is more than HTML	Burkina Fazo (19) Bangladesh (31) Bulgaria (22) Bosnia and Herzegovina (19)	WATER OBSERVATIONS FROM SPACE It is continental-wide service Water Observations from Space (WO/S) allows anyone to better understand water availability anywhere in Africa. It translates years of satellite
		Bolivia, Flurinatio (17) Côte d'Ivoire (17) Congo, The Democrat (19)	SOUTH ASIA DROUGHT MONITORING SYSTEM [SADMS] IDSI Integrates multi-source remote sensing data from moderate resolution imaging spectroradiometer (MODIS) an tropical rainfail measuring mission (TRMM), ESA Soil Molsture
		Show More Countries TASS agriculture (11)	PAKISTAN FLOODS MONITOR PAKISTAN FLOODS MONITOR Information about response to Pakistan floods. The dataset contains types of UK aid funding by sector (eg nutrition water, health, UK aid by allocation to partners, and the

https://spatialagent.org/HydroInformatics/





https://spatialagent.org/HydroInformatics/





- Water is key for socio-economic development, environmental protection, risk mitigation and climate change adaptation
- "You can't manage what you don't measure" Data and information systems play crucial role for the sustainable management of water resources, delivery of water services, and mitigation of water-related risks
- Significant potential of Earth Observation and AI tools
- Meaningful use of modern information and analytical tools embedded in an overall strategy

For more information, please consult the World Bank website!



Thank you!

www.worldbank.org/water | www.blogs.worldbank.org/water | 😏@WorldBankWater

