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WMO calls for better monitoring of increasingly erratic water cycle

- *State of water resources report provides independent global assessment*
- *More investments and data sharing needed to strengthen water management*
- *Climate change intensifies extremes like floods and droughts*
- *Water resource management is at heart of climate action*
- *Hydrological information supports Early Warnings For All*

Geneva, 12 October 2023 (WMO) _ The hydrological cycle is spinning out of balance as a result of climate change and human activities, according to a new report from the World Meteorological Organization, which provides an extensive assessment of global water resources.

Droughts and extreme rainfall events are wreaking a heavy toll on lives and economies. Melting snow, ice and glaciers have increased hazards like floods and threaten long-term water security for many millions of people.

And yet, far too little is known about the true state of the world's freshwater resources. We cannot manage what we do not measure, says the WMO State of Global Water Resources 2022 report, calling for a fundamental policy shift.

There must be improved monitoring, data-sharing, cross-border collaboration and assessments of water resources – and an accompanying increase in investments to facilitate this. This is vital to help society cope with increasing water extremes of too much or too little, it says.

The WMO State of Global Water Resources Report 2022 builds on a pilot issued last year. It contains more expanded information on important hydrological variables like groundwater, evaporation, streamflow, terrestrial water storage, soil moisture, cryosphere (frozen water), inflows to reservoirs, and hydrological disasters. It integrates field observations, satellite-based remote sensing data and numerical modelling simulations to assess water resources at the global scale.

“This WMO report offers a comprehensive, and consistent overview of water resources worldwide, highlighting the influence of climate, environmental, and societal changes,” says WMO Secretary-General Prof. Petteri Taalas.

“Glaciers and ice cover are retreating before our eyes. Rising temperatures have accelerated – and also disrupted – the water cycle. A warmer atmosphere holds more moisture. We are seeing much heavier precipitation episodes and flooding. And at the opposite extreme, more evaporation, dry soils and more intense droughts,” he says.

“The overwhelming majority of disasters are water-related and so water management and monitoring lies at the heart of the global Early Warnings For All initiative. Many of the countries targeted for priority action in Early Warnings for All suffered from major floods or droughts in 2022. Not a single country had timely and accurate hydrological data available to support evidence-based decision making and early action,” says Prof Taalas.

“This report is a call to action for more data sharing to enable meaningful early warnings and for more coordinated and integrated water management policies that are an integral part of climate action,” he says.

The report combines input from dozens of experts and complements WMO’s flagship State of the Global Climate report in order to provide integrated and holistic information for policy makers.

Currently, 3.6 billion people face inadequate access to water at least a month per year and this is expected to increase to more than 5 billion by 2050, according to UN Water.

Key Findings

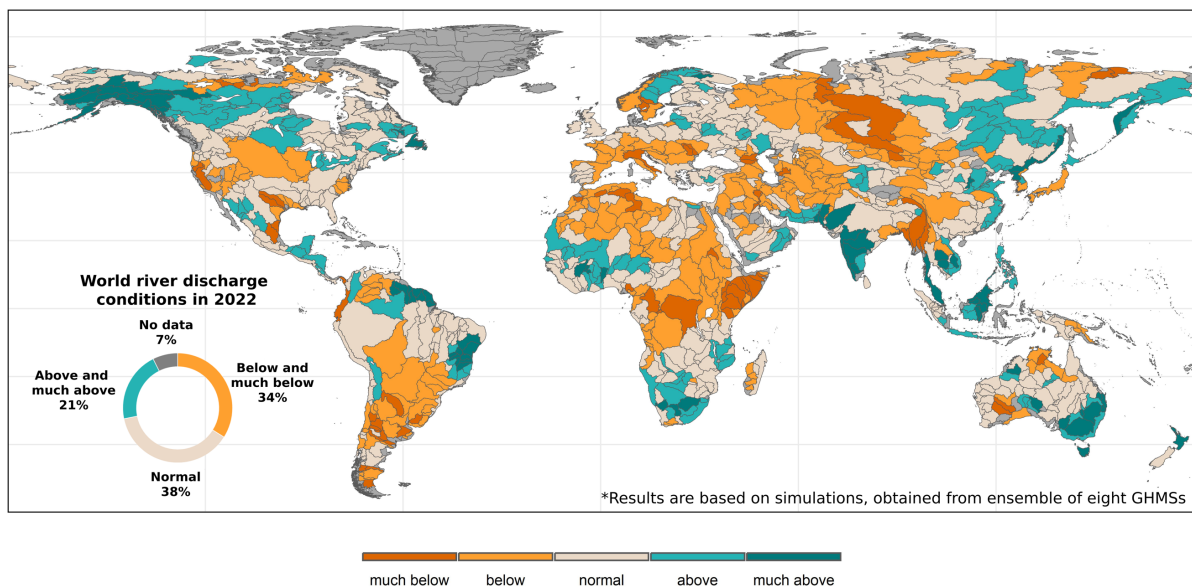


Figure showing average river discharge for the year 2022 compared to the historic average from period 1991–2020

Hydrological variables

The report provides an independent and consistent, global scale quantitative assessment of water resources in large river basins in comparison to the long-term average for various variables like river discharge, groundwater, evaporation, soil moisture, inflow to reservoirs etc.

In 2022, over 50% of the global catchment areas experienced deviations from normal river discharge conditions. Most of these areas were drier than normal, while a smaller percentage of basins displayed above or much above normal conditions. This was similar to 2021. More than 60% of major water reservoirs saw below or normal inflow, which provides a challenge for providing water to all users in an increasingly variable climate.

Throughout 2022, anomalies in soil moisture and evaporation echoed those in river discharge conditions. Thus, for instance, Europe saw increased evaporation and decreased soil moisture and river flows during the summer because of a major heatwave and drought. This led not only to challenges in agriculture but also to a shut of power plans due to the lack of cooling water.

The switch from La Niña in 2022 to El Niño conditions in 2023 will likely have a major impact on the hydrological cycle that will be analysed in the next year's report.

Cryosphere

The Third Pole, encompassing the Tibetan Plateau, the Himalayas, the Karakorum, the Hindu Kush, the Pamirs, and the Tien Shan Mountains, is vital for almost 2 billion people's water supply. From 2000 to 2018, total glacier mass balance decreased by more than 4 percent. There has been a notable decrease in snow cover, and a big increase in the volume of glacial lakes.

This has impacted river runoffs at the Indus, Amu Darya, Yangtze and Yellow River basins, indicating climate change's evolving influence on the region.

In 2022, the snow cover in the Alps, crucial for feeding major rivers like the Rhine, Danube, Rhone, and Po, remained much lower than average. The European Alps witnessed unprecedented levels of glacier mass loss.

The subtropical Andes experienced a consistent decline in winter snow accumulation since 2009, impacting water supplies for cities across Chile and the west of Argentina. Although 2022 saw slightly above-average snow in some areas, key watersheds still reported below-average conditions, especially on the Argentinean side, leading to sustained water restrictions in populous urban centres.

Water-related disasters

Severe droughts impacted many parts of Europe in the summer of 2022, posing transportation challenges in rivers like the Danube and Rhine and disrupting nuclear electricity production in France due the lack of cooling water.

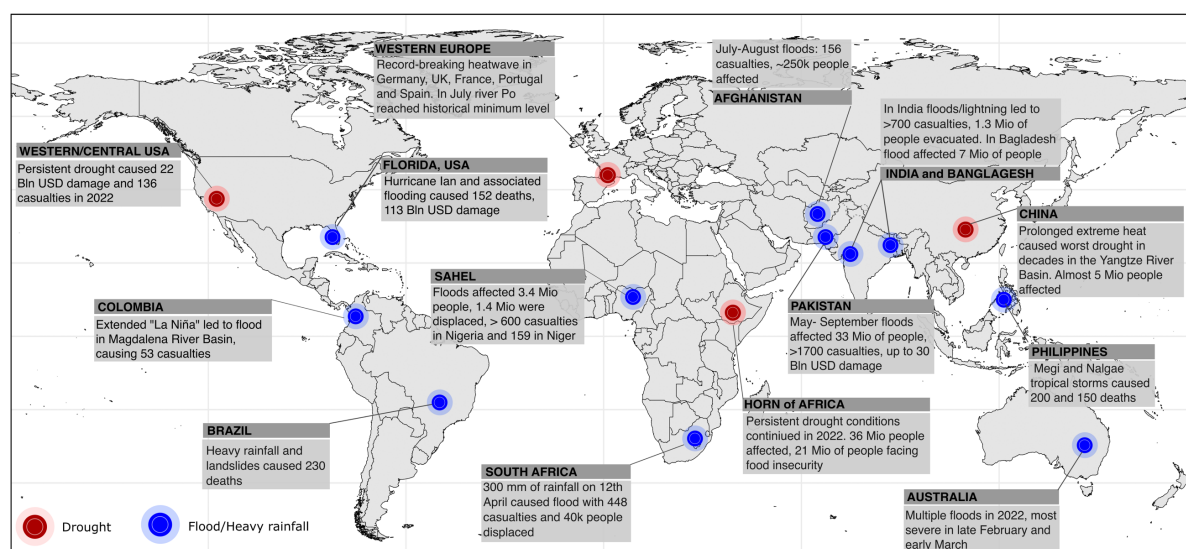
Navigation on the Mississippi River in the USA was affected by the extremely low water levels, as a result of a continuous drought in the USA.

In South America, the La Plata river basin has endured a continuation of drought conditions since 2020. This caused a significant drop in hydropower production in 2022, resulting from low river flows. There were several instances of no water supply in Paraguay during 2022.

Severe drought in the Yangtze River Basin in China led to much lower than average river discharge, inflow to reservoirs, and soil moisture.

Prolonged drought led to a major humanitarian crisis in the Horn of Africa. By contrast, the Niger Basin and much of South Africa recorded above-average river discharge, linked to major flood events in 2022.

A mega flood hit the Indus River Basin in Pakistan, killing at least 1 700, affecting 33 million and causing an estimated more than US\$ 30 billion in economic losses. A heatwave early in the year increased meltwater from glaciers, increasing river levels which were then swelled by severe monsoon rainfall which was more than twice the average in July and August.



Sources: WMO Global State of the Climate Report 2022, EM-DAT, 2023; World Bank; ReliefWeb and others

Figure showing selected notable high-impact hydrological events across the globe in 2022; circles indicate flood (blue) and drought (red) events

WMO Response

The report highlights the lack of accessible verified hydrological data. Africa, the Middle East and Asia, in particular, have too little available observational data. There is an urgent need for investments in monitoring and data sharing in accordance with the WMO Unified Data Policy.

The WMO Hydrological Status and Outlook System (HydroSOS), which is currently under development, seeks to meet this challenge.

Scope of the report

The 2022 edition of the Global State of the Water Resources Report has introduced several important advancements. It incorporates new chapters, with additional components of the hydrological cycle: groundwater, soil moisture, evapotranspiration, snow and ice, and reservoir inflows. Data for these additional components was received through the integration of observation, satellite-based remote sensing data, and outputs from numerical modeling simulations.

There has been a substantial increase in the number of observed discharge data compared to the previous year, which were received from more than 500 stations. After quality control, this was reduced to 273 stations as compared to the 38 stations utilized in the previous report. However, data sharing was limited to only 14 countries, leaving regions such as Africa, the Middle East, and Asia notably underrepresented in terms of available observational data.

The spatial resolution of global analysis has been refined, reaching a total of 986 river basins globally.

Partners

The State of Global Water Resources report contains input from a wide network of hydrological experts, including National Meteorological and Hydrological Services, Global Data Centres, global hydrological modelling community members and supporting organizations such as NASA and the German Research Centre for Geosciences (GFZ).

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