UN: Trapped Sediment Robbing World's Large Dams of Vital Water Storage Capacity; ~26% Loss by 2050 Foreseen

Dams' original storage capacity lost to sediment by 2050: 1.65 trillion m3, roughly the combined annual water use of India, China, Indonesia, France and Canada

HAMILTON, ONTARIO, CANADA, January 11, 2023 /EINPresswire.com/ -- Trapped sediment has robbed roughly 50,000 large dams worldwide of an estimated 13% to 19% of their combined original storage capacity, and total losses will reach 23% to 28% by 2050, UN research warns.

> Sedimentation is a serious issue that endangers the sustainability of future water supplies for many"
> *UNU-INWEH Director Vladimir Smakhtin*

The global loss from original dam capacity foreseen by mid-century – from ~6,300 billion to ~4,650 billion m3 in 2050, a difference of ~1,650 billion m3 – roughly equals the annual water use of India, China, Indonesia, France and Canada combined.

UN University's Canadian-based Institute for Water, Environment and Health applied previously-determined storage loss rates in various areas worldwide to large dams in 150 countries to forecast cumulative reservoir storage losses by country, region, and globally.

The United Kingdom, Panama, Ireland, Japan and Seychelles will experience the highest water storage losses by 2050 – between 35% and 50% of their original capacities – the study shows. By contrast, Bhutan, Cambodia, Ethiopia, Guinea, and Niger will be the five least affected countries, losing less than 15% by mid-century.

"The decrease in available storage by 2050 in all countries and regions will challenge many aspects of national economies, including irrigation, power generation, and water supply," says Dr. Duminda Perera, who co-authored the study with UNU-INWEH Director Vladimir Smakhtin and Spencer Williams of McGill University in Montreal. It is published by the journal Sustainability.

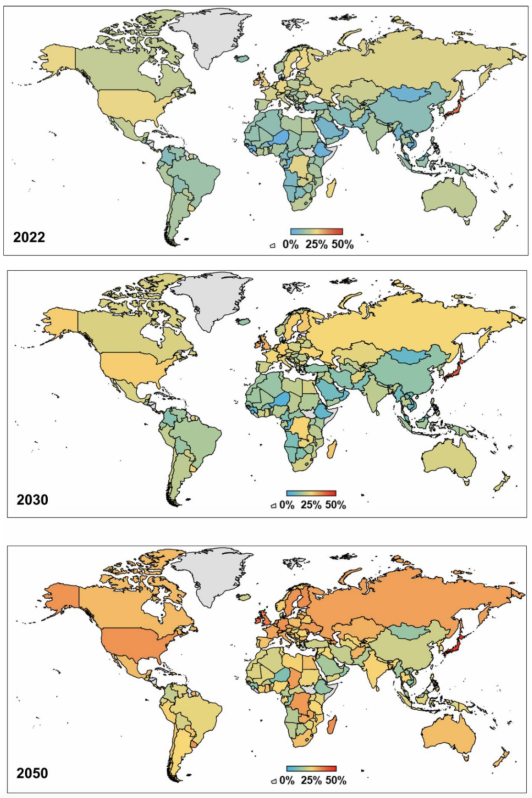
"The new dams under construction or planned will not offset storage losses to sedimentation.

This paper sounds an alarm on a creeping global water challenge with potentially significant development implications."

The researchers applied previously-established storage loss rates worldwide to a subset of nearly 60,000 dams in a database maintained by the International Commission on Large Dams (ICOLD). The subset comprises 47,403 large dams for which original storage capacity and year of construction are known: 28,045 in Asia-Pacific, 2,349 in Africa, 6,651 in Europe, and 10,358 in North, Central and South America.

Large dams and reservoirs – defined as higher than 15 m, or between 5 and 15 m high impounding over 3 million m3 – are essential in many places for hydroelectricity, flood control, irrigation, and drinking water.

River sediment accumulates behind a dam's barrier. The problem, often ignored, has now become a significant challenge to global water storage infrastructure that must be addressed with a long-term sediment management strategy.



River sediment accumulates behind a dam's barrier. The problem, often ignored, has now become a significant challenge to global water storage infrastructure that must be addressed with a long-term sediment management strategy.

"Sedimentation is a serious issue that endangers the sustainability of future water supplies for many," says Dr. Smakhtin.

"It stimulates downstream flooding causing erosion, impacting wildlife habitats and coastal populations. And abrasive sediments can damage hydroelectric turbines and other dam components and mechanisms, decreasing their efficiency and increasing maintenance costs."

Global average annual storage losses amount to approximately 0.36% of initial capacity, the UNU-INWEH study says, noting that figure may err on the conservative side. Previous attempts to estimate a global annual rate of loss from initial reservoir capacity generally agree on a range between 0.5% and 1%.

Many other studies suggest, however, that reservoir sedimentation rates and associated storage losses are site-specific and vary significantly between regions.

For example, other researchers have estimated the loss from 190 California reservoirs at more than 50% from their original capacities, with 120 reservoirs having lost over 75%. A similar study

predicted Japan's Sakuma reservoir will lose around 44% of its initial capacity by 2040.

* * * * *

The Americas

The Americas' 19 countries contain 10,358 large dams with an initial storage capacity of 2,810 billion m3 foreseen falling 28% to 2,014 billion m3 by 2050. And Panama's 21 dams appear to be facing the highest storage loss: 38%, from an initial 9.5 billion m3 to 5.9 billion m3 by 2050.

Brazil, second after the USA in the Americas in number of large dams, will lose an estimated 23% of its initial storage of 600 billion m3 by 2050.

* * * * *

Europe

Europe's 6,651 large dams across 42 countries had a total initial storage capacity of 895 billion m3. The region has already lost 19% of that volume, will lose up to 21% by 2030 and 28% by 2050, the study found.

Among the 42 countries, 33 (~78%) will likely lose over 25% of initial storage by 2050 in part because of the dams' age. Ireland can anticipate the greatest loss of storage by 2050 (39%), Denmark the least loss (20%). Turkey, Iceland, Hungary, and Cyprus appear to be Europe's other least-impacted countries.

* * * * *

Africa

Already, the 2,349 dams across Africa's 44 countries have lost about 702 billion m3 or 15% of their original storage capacity. By 2030 and 2050, cumulative storage losses are estimated at 17% and 24%, respectively.

The Seychelles' two dams have to date lost about 30% of their original 1 million m3 capacity and are projected to lose 50% by 2050 – the greatest loss of any country. Madagascar, DR Congo, Chad, and Zambia are projected to lose 30% by 2050, while another 11 countries will lose an estimated 25% to 30% by mid-century.

The lowest storage loss by 2050 is estimated for Niger (11%). Losses of less than 15% are foreseen for Sierra Leone, Congo, Ethiopia, and Guinea, mostly attributable to their relatively young dams.

A previous study noted that the Aswan Dam on the Nile River, with 99% of estimated trapping efficiency, has almost completely blocked sediment flow to the Nile River Delta.

The new UNU-INWEH study estimates Aswan dam storage losses at 18%, 21%, and 28% in 2022, 2030, and 2050 respectively.

* * * * *

Asia-Pacific

Combined with those in Australia, and New Zealand, Asia's 43 countries are home to 35,252 large dams, making it the world's most heavily dammed region. The region is home to 60% of the world's population and water storage is crucial for sustaining water and food security.

In 2022, the region is estimated to have lost 13% of its initial dam storage capacity. It will have lost nearly a quarter (23%) of initial storage capacity by mid-century.

* * * * *

UNU-INWEH (www.inweh.unu.edu) is hosted by the Government of Canada and McMaster University.

Terry Collins
UNU-INWEH
+1 416-878-8712
email us here