

**INTERNATIONAL COMMISSION ON LARGE DAMS  
COMMISSION INTERNATIONALE DES GRANDS BARRAGES**

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Dr. Michael Small, Chair  
International Advisory Committee  
United Nations University – Institute for Water, Environment and Health  
204-175 Longwood RD S  
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**Subject: Comments on recent United Nations University publication, *Ageing Water Storage Infrastructure: An Emerging Global Risk*.**

Dear Dr. Small,

Introducing myself as President of the International Commission on Large Dams (ICOLD), the world's preeminent professional organization for dams and dam safety. I have been an active practitioner of civil engineering for the design and construction of dams for more than 40 years. Please find hereafter, my comments on the recent publication *Ageing Water Storage Infrastructure: An Emerging Global Risk* attributed to the United Nations University Institute for Water, Environment and Health (UNU-INWEH), 2021.

I appreciate the efforts of the authors to contribute to the discussion of the importance of maintaining global infrastructure, especially the critical function of dams and hydropower in modern society. However, "aging" infrastructure, as characterized in this article and although a familiar soundbite, does a disservice to the real challenges and the benefits of dams in society, and thus the discussions our societies should be having on this important topic. As such, I am concerned that the article will not meet the desired intent to progress the discussion on the management of risks associated with dams.

I believe that the authors of this article attempt to directly link dam risk with decommissioning and removal, as evidenced by the lack of mention regarding the societal benefits of dams. Dams stand head-and-shoulders above all other renewable energy sources by providing society with more than just clean renewable hydropower energy. They can also provide reliable water supplies, flood control, recreation, and an adaptation to climate change like no other renewable with the ability to store water and energy; and not just while the sun shines and the wind blows.

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**From: Michael F. Rogers, President of ICOLD**  
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As a representative of our industry, ICOLD has been studying and documenting the state of the practice of dam engineering for more than 90 years. As President, I can relate to you that our industry would characterize the most significant challenges to dams as:

- A rapidly changing natural world that both threatens to make natural events such as floods and earthquakes more frequent and intense, while at the same time placing more demand on those key societal benefits that dams offer such as clean water and clean power.
- Infrastructure which was designed and constructed with the science and engineering of decades past that now require an infusion of investment to address the advancements in our profession for safety and reliability.
- A fundamental disconnect in society regarding the how land development behavior has privatized gains in and around dams, while socializing the losses and risks that invariably come with increasing populations.

So, I submit that the authors have missed the point and that the challenge is not really aging of dams. Engineering design and construction of dams must be appreciated for its robust nature intrinsic for generations in practice and regulation. Dams are designed, built, carefully supervised, and maintained as an ever indispensable, vital part of our society's critical infrastructure. Careful regulation and a strong professional state of the practice built on global cooperation through ICOLD have shown that dam structures can have a life expectancy of hundreds to thousands of years.

ICOLD exists to facilitate sharing of knowledge and experience so that dams are designed and built with a strong focus on meeting design intent with consideration for resiliency and sustainability for the future. One need only look at the Roman dam near Extremadura, Spain, Proserpina Dam which was commissioned back in the 1st century AD. It was built to provide water supply to the city of Emerita Augusta. This dam has lasted more than 2000 years serving as a key part of the regional infrastructure to provide clean water to the local residents. It shows that with proper engineering, good construction and regular maintenance, the dams that we design and build today can continue to serve people of our world for many, many generations.

It is inaccurate and a gross misunderstanding of the technology of dam design to describe the average life expectancy of a dam is to last 50-100 years as represented in the article. Modern high hazard dams have been designed for extreme events such as "probable maximum" flood and "maximum credible" earthquakes, events which have a probability of one in thousands of years. ICOLD has been a driving force for global cooperation and collaboration in dam safety through publications and regular technical seminars and training. More than just a repository of the World Registry of Dams (WRD) referenced in the UNU-INWEH article, the 104 countries of ICOLD – a United Nations of dam engineering – brings together knowledge and experience without regard to political or geographic boundaries. Through ICOLD's publications of experience and guidelines, the world's population is better served by those in the profession of dam engineering committed to excellence and safety.

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ICOLD's recent World Declaration on Dam Safety reaffirms our industry's commitment to the safe development of dams around the world. The World Declaration touches different areas, including ICOLD's long-term mission and commitment to dam safety considering the changing conditions of dam safety around the world. The declaration addresses the important aspects of dam safety, including structural integrity, surveillance and monitoring, instrumentation, and basic design, and discusses what it means to have a successful dam safety program.

A critical statement in the ICOLD World Declaration is that for the hundreds of thousands of dams of all sizes around the world, we must all do our part in managing risks: owners must take full responsibility for their projects with a regular and routine safety assessments; Governments must also do their part to protect those at risk with strong governance and oversight; and communities must plan and develop land around critical infrastructure in a responsible and sustainable manner.

The continued use of dams of all sizes must be weighed against their ability to continue to serve a useful purpose related to their design intent and risks for continued operations. Our industry considers decommissioning of dams in context as just one of many risk management strategies, but certainly not the sole means or even primary means of addressing risks as implied in the article. The cost of dam removal is influenced by many site-specific factors, including treatment of accumulated reservoir sediments, stream restoration, and loss of operational benefits (flood control, water supply, power, recreation, etc.). While there are certainly exceptions, in general the experience of our industry has been that regular refurbishment and good upkeep will be less expensive than dam removal, and more beneficial to society. When these critical risk management decisions are made on dams, multiple criteria are considered, not just economics. Chief among the decision objectives are public safety and the co-equal goals of the environment.

Instead of ageing of water storage infrastructure, the largest "emerging" risk factor should be the increase in unregulated downstream development without consideration of the corresponding risk escalation. Society has been quick to "privatize development gains and socialize development risks". That is, profits from flood plain development are kept by the developers, while damages from developing in known flood risk areas are left to insurances and government reimbursement of losses.

There are many strong advocates for increasing safety related investment in dams. For example, the World Bank in just the last few years has invested over a billion US\$ in the Dam Rehabilitation Improvement Program (DRIP) in India. More investment like this is needed around the world, especially in those countries like the United States where recognized lack of investment in critical infrastructure has been documented by the American Society of Civil Engineers (ASCE) and others for decades. Unfortunately, only when a bridge collapses; a power grid shuts down; or a dam spillway erodes does the proper (but short-lived) attention be brought to bear on the systemic problems.

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I applaud the UNU-INWEH for this publication – any publication – that brings a light to infrastructure challenges of our generation. We should be reminded that “We are made wise not by the recollection of our past, but by the responsibility for our future.” (George Bernard Shaw). We owe it to the next generations to take care of what has been given to us so that they may have similar opportunities for success. In a society focused on “green” sustainability, more recognition is needed of the benefits of carbon-clean and renewable hydropower as the world’s largest and most viable market for clean power and water for developed and developing countries and people on our planet. Water is a renewable resource in the hydrologic cycle powered by strong cosmic features – sun, wind, and gravity – that sustains our planet. A strong four-legged chair of water, sun, wind, and gravity can support a growing global population using the experience gained in a history of good and tragic lessons learned.

Nothing – not man nor grandest feat of man’s ingenuity – can escape the rigors of time. As stated in the UNU-INWEH article, it is agreeable that “value judgements will determine the fate of many of these large water storage structures.” These value judgements, however, must be informed by science and not passions to remove these silent protectors and servants of citizens in our modern society. Dams should not be damned for their age or environmental stigma. Science and technology demonstrate that water can work with solar, wind and gravity forces to create a sustainable and environmentally friendly service to meet the basic needs of humankind around the world for clean and reliable sources of water and power, along with the protections of flood control and many other benefits.

In summary, “Ageing” is not an emerging risk in the profession of dam engineers. Rather, it is a long-held, well-documented and understood element of risk that is considered in the design and construction of dams of all sizes. I invite your representatives to participate in broadening the conversation addressed in the subject article by attending and engaging our profession at our next Congress in Marseille, France in November to recognize the hard work and progress already made in solving these challenges. We are paying attention to this risk and would welcome your help and contributions. As a representative of the profession, ICOLD remains committed to this vision of Better Dams for a Better World.

Sincerely,



Michael F. Rogers

President, International Commission on Large Dams /  
Commission Internationale des Grands Barrages (ICOLD/CIGB)

Cc: Duminda Perera, Vladimir Smakhtin, Spencer Williams, Taylor North, Allen Curry (via [contact.inweh@unu.edu](mailto:contact.inweh@unu.edu))