

# Safety and Lifespan of Critical Infrastructure Projects with Large Damage Potential: Large Dams

**Martin Wieland**  
Dam and Earthquake Expert  
Poyry Energy Ltd.  
Hardturmstrasse 161  
Zurich, Switzerland  
*[martin.wieland@poyry.com](mailto:martin.wieland@poyry.com)*



Martin Wieland, born 1948, received his civil engineering and doctoral degrees from the Swiss Federal Institute of Technology in Zurich in 1971 and 1978 respectively. He is the Chairman of the Committee on Seismic Aspects of Dam Design of the International Commission on Large Dams (ICOLD).

## Abstract

For critical infrastructure projects like large dams and nuclear facilities an integral safety concept is used, which includes the following elements: (i) structural safety, (ii) safety monitoring, (iii) operational safety and maintenance, and (iv) emergency planning. This paper deals with the safety and lifespan of large storage dams as these elements are the prerequisites for any sustainable infrastructure projects.

## 1. Introduction

Modern water storage projects are evaluated on the basis of sustainability criteria. However, among the different parties and stakeholders involved in a large dam project there is often no general consensus on what exactly means „sustainable“. In general, a development is considered sustainable if it satisfies the needs of today's generation without jeopardizing the possibilities of future generations to satisfy their needs at their time. In the case of water storage projects this means that the project must be conceived in such a way that it satisfies the purposes it has been designed for, e.g. energy production, water supply, irrigation, flood control, navigation, aquaculture, recreation etc., but it must not later negatively affect future generations' benefits.

Sustainability of a storage project is closely related to dam safety and thus to the ageing and service life of the project structures. All parts of a storage scheme (civil, mechanical and electro-mechanical) are subject to ageing. To some extent ageing can be mitigated by maintenance activities or rehabilitation work. Dams with an age of over 100 years are now not uncommon. These dams and their appurtenances have been looked after systematically by the owner and inspected regularly for possible deficiencies by dam specialists, usually from a government organization. Records of their performance are available since their commissioning.

Ageing not only affects the durability of the storage structures but also their functionality which in turn determines the safety of the storage facility. Safety is a key factor in the sustainability of a storage scheme. If the safety of, for example the dam, is no longer guaranteed, the dam becomes a risk and remedial works have to be initiated. The benefits of such a dam will decrease or even vanish. The dam may have to be abandoned or de-commissioned.

This paper discusses the importance of dam safety in maintaining the sustainability of a storage scheme, looking at such factors as ageing, maintenance, rehabilitation and upgrading.

## 2. Sustainability of Dams

Many factors govern the sustainability of a storage facility, such as: the natural environment, including river characteristics, site conditions and natural hazards, the existing infrastructure and