Ageing Dams – An Emerging Threat

January 28, 2021

The ageing of large dams –an emerging global development issue as tens of thousands of existing large dams have reached or exceeded an "alert" age threshold of 50 years, and many others will soon approach 100 years. These aged structures incur rapidly rising maintenance needs and costs while simultaneously declining their effectiveness and posing potential threats to human safety and the environment.

In news: UN report cautions that ageing dams in India, US, other nations pose a growing threat
Placing it in syllabus: Disaster Management
Dimensions:

- Highlights of the UN report
- Ageing of dams in India
- Dam failures and dam decommissioned in India
- Disaster management and Dams
- Critical functions of Large Dams in India

Content:

Highlights of the UN report

- United Nations University's Canadian-based Institute for Water, Environment and Health released a report titled **'Ageing water infrastructure: An emerging global risk'**
- The report **aims to attract global attention** to the creeping issue of **ageing water storage infrastructure** and stimulate international efforts to deal with this emerging, rising water risk.
- Most of the **58,700 large dams worldwide were constructed between 1930 and 1970** with a design life of 50 to 100

years.

- A large concrete dam usually begins to show signs of ageing when reaching the age of 50 years.
- **Ageing signs** include increasing cases of dam failures, progressively increasing costs of dam repair and maintenance, increasing reservoir sedimentation, and loss of a dam's functionality and effectiveness
- Such **aging structures across the world pose a growing threat** because by the year 2050 **most people on Earth will live downstream of tens of thousands of dams** built in the 20th century.
- The report said that 32,716 large dams **(55 per cent of the world's total)** are found in just **four Asian countries: China, India, Japan, and South Korea** – a majority of which will reach the 50-year threshold relatively soon.

According to the report in India :

- There are over **1,115 large dams** that will be roughly **50 years old** in 2025
- more than **4,250 large dams** will be **over 50 years old in 2050**
- **64 large dams will be more than 150 years old in 2050**

Ageing of dams in India

The following is the list of major dams that are older than 50 years in India:

Major Dams in India	State	River	Year
Bhavani Sagar dam	Tamil Nadu	Bhavani	1955
Tungabhadra Dam	Karnataka	Tungabhadra	1953
Rihand Dam	Uttar Pradesh	Rihand	1962
Maithon Dam	Jharkhand	Barakar	1957
Koyna Dam	Maharashtra	Koyna	1964
Mettur Dam	Tamil Nadu	Kaveri	1934
Krishnarajasagar Dam	Karnataka	Kaveri	1911
Cheruthoni Dam	Kerala	Cheruthoni	1973
Nagarjuna Sagar Dam	Telangana	Krishna	1967
Hirakud dam	Odisha	Mahanadi	1957
Bhakra Nangal Dam	Punjab-Himachal Pradesh Border	Sutlej	1963
Maithon Dam	Jharkhand	Barakar River	1957

Dam failures and dam decommissioned in India

- India has a long history and many cases of dam failures.
- In 1958, the Kaddam dom in Andhra Pradesh broke down. In 1959, Kaila dam in Gujarat collapsed due to weak foundation. Kodanagar dam in Tamil Nadu failed because of an earthquake

Other notable Dam related tragedies are as below:

1961 Panshet Dam Tragedy:

- Panshet Dam, also called **Tanajisagar Dam**, is a dam on the **Mutha river** about 50 km southwest of the city of **Pune**.
- The dam was constructed in late 1950s for irrigation and water supply for Pune
- In its first year of storing water on **12 July 1961**, the dam wall burst.
- It was because of the total absence of reinforced cement concrete (RCC) strengthening in the conduit through the earthen dam
- This caused massive flooding in Pune. An estimated 1,000 people died from it.

1979 Machchhu dam failure:

- The **Machchu-2 dam** was situated on the **Machchhu river**.

- On 11 August 1979, the dam burst, sending a wall of water through the **town of Morbi in Gujarat, India**.
- Estimates of the number of people killed vary greatly ranging from 1800 to 25000 people.
- The failure was caused by **excessive rain and massive flooding** leading to the disintegration of the earthen walls

2019 Tiware dam failure:

- On 2 July 2019, the Tiware dam failed. During the time it was overflowing after incessant rains the previous days.
- The water **flooded at least seven villages situated downstream** including Bhendewadi, Daadar, Akle, Riktoli, Ovali, Kalkavne and Nandivase with about population of 3000.
- Several houses were washed away. At **least 19 people died** and four more went missing.

Case of Mullaperiyar Dam

- The Mullaperiyar Dam is a **gravity dam built across the Periyar River** in Kerala State.
- It was built in **1895 by the British government** to provide irrigation and eventually began to generate power in 1959.
- At the time of construction, the dam had an **intended lifespan of 50 years**. Now it is 125 years old.
- Still, in service over a century later, the dam **shows significant structural flaws** and may be at risk of failure.
- The dam is **located in a seismically active area.** A minor earthquake caused cracks in the dam in 1979, and in 2011, more cracks appeared in the dam due to seismic activity.
- Leaks and leaching are also concerning, as the methods and materials used during construction are considered

outdated compared to current building standards.

- In response to these structural issues, **dam decommissioning has been considered**.
- However, a **conflict between Kerala and Tamil Nadu** started to grow regarding the best way to manage this ageing infrastructure.
- Although the dam is located in Kerala, it is **operated by the upstream state of Tamil Nadu**.
- **Kerala residents are afraid of a dam collapse** and argue that the reservoir level must be lowered until the dam is fixed. Meanwhile, Tamil Nadu residents want to maintain the water levels at capacity.
- In 2009, Kerala requested a new dam to be built, but Tamil Nadu opposed the idea.

Currently, the decision of how to manage the ageing Mullaperiyar dam is **hotly debated and working through the court system**. A dam failure risk would be catastrophic: nearly **3.5 million people will be affected.**

Dams and Disaster management

- Dams, and large dams in particular, even if structurally sound, are **considered to be "high hazard" forms of infrastructure**.
- The **consequences of dam failure** would be forced displacement, the destruction of livelihoods and potential loss of human life
- **Dam failure mechanisms** include seismic activity, flooding, seepage/internal erosion, deterioration, and structural instability.
- Such **triggers of failures are more likely in older dams** because ageing increases the vulnerability of a dam to such triggers.
- Also, **climate change may accelerate a dam's ageing process**. Extreme weather events, especially floods, are expected to become more severe and frequent with the

changing climate.

- Consequently, these events increase the threat to aging large dams designed using historical hydrological data
- Thus, a c**omprehensive safety review and audit of old dams in India is necessary** as a precautionary and preventive measure.
- If a dam is found unsafe, suh dam should be considered for **Dam decommissioning**.
- Early warning systems and regular checks are also necessary for better preparedness during dam related disasters.

UN Report's view on Dam Decommissioning:

- The **chief reasons driving dam decommissioning** are public safety, escalating maintenance costs, reservoir sedimentation, and restoration of a natural river ecosystem.

Overall, **dam decommissioning should be seen as equally important as dam building** in the overall planning process on water storage infrastructure developments.

Critical functions of Large Dams in India

The dams and reservoirs world over have been playing a dual role of harnessing the river waters **for accelerating socio-economic growth and mitigating the miseries from the vagaries of floods and droughts**.

Dams and reservoirs in India contribute significantly in fulfilling the following basic human needs, in the following ways:

Water for Drinking and Industrial Use:

- Large dams are the source of water for nearby cities and towns.
- Many cities are dependent on dams for meeting their

drinking water and industrial water requirements.

Irrigation:

- Using these dams, surplus waters during wet periods are used for irrigating arid lands.
- Water flows can be regulated as per agricultural requirements of the various regions over the year.
- It is estimated that 80% of additional food production by the year 2025 would be available from the irrigation made possible by dams and reservoirs.

Flood Control:

- Dams and reservoirs are also being used to control floods by regulating river water flows downstream the dam.

Hydroelectric Power Generation:

- Large Dams are used for Hydro Power Generation which provides a cheap, clean and renewable source of energy.
- Hydro Power is the most advanced and economically viable resource of renewable energy.
- Reservoir based hydroelectric projects provide much needed peaking power to the grid.

Mould your thought: What are the emerging challenges of ageing large dams in India? What can be done to mitigate these risks?***Approach to the answer:***

- Introduction
- Write the Challenges of ageing dams
- List out the solutions for the challenges
- Conclusion