BACKGROUNDERS
Press Information Bureau
Government of India

Dam Rehabilitation: Strengthening Infrastructure through Policy and Technology

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*India stands 3rd in terms of Large Dams worldwide, with **6628 Specified dams.** Over 26% of dams are more than 50 years old, necessitating systematic rehabilitation and safety upgrades. The Dam Rehabilitation and Improvement Project (DRIP) is being implemented in phases to improve dam safety and operational performance. The Dam Safety Act, 2021, provides surveillance, inspection, operation, and maintenance of the specified dam for the prevention of dam failure-related disasters. It also provides an institutional mechanism to ensure their safe functioning and for matters connected therewith or incidental thereto. Digital platforms such as DHARMA, along with instrumentation and Early Warning Systems, are strengthening real-time monitoring and data-driven dam safety management.*

Introduction

India's dams play a critical role in irrigation, hydropower generation, flood moderation, drinking water supply and overall water security. Over the decades, dams have contributed significantly to agricultural growth, industrial development and socio-economic progress across the country.


The Tehri Dam in Uttarakhand, at 260.5 metres, is India's tallest dam.

As a large number of dams age and climatic variability increases, the issue of their rehabilitation, operational safety and long-term resilience becomes important. The

Government of India addresses this through a comprehensive approach combining structural rehabilitation, institutional reforms, digital monitoring systems and risk-based safety management.

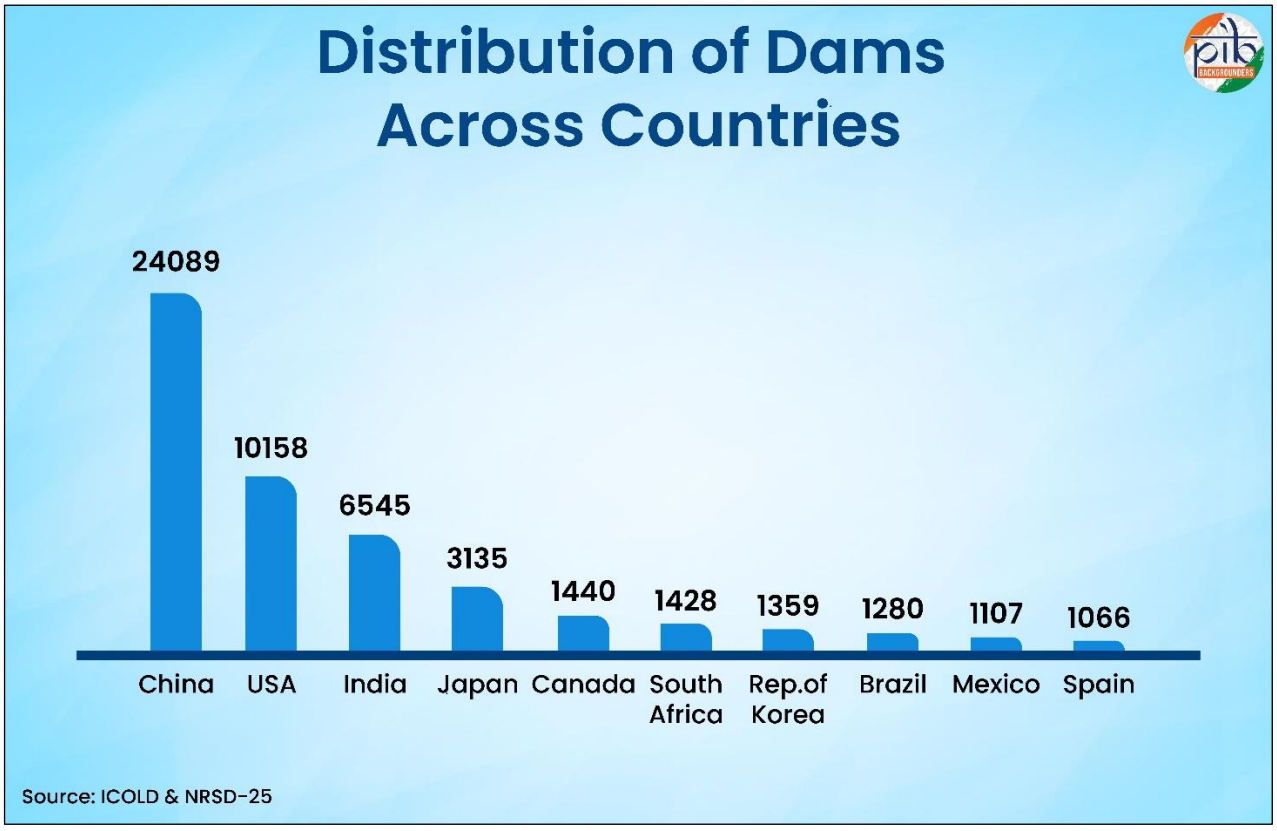
Status of Dams In India

India today manages one of the largest dam portfolios globally. It ranks third in the world, with 6628 specified dams, of which 6,545 are operational and 83 are under construction. The gross water storage capacity of these dams is about 330 billion cubic metres. They are critical for ensuring national food, energy, and water security.

About **26%** (1,681 dams) of these dams are **more than 50 years old.** This includes 291 **that are more than 100 years old.** About 42**% fall within the 25–50 years age** bracket. **India's oldest, the Kallanai (Grand Anicut) in Tamil Nadu,** has functioned for nearly 2,000 years—showcasing enduring engineering and maintenance.

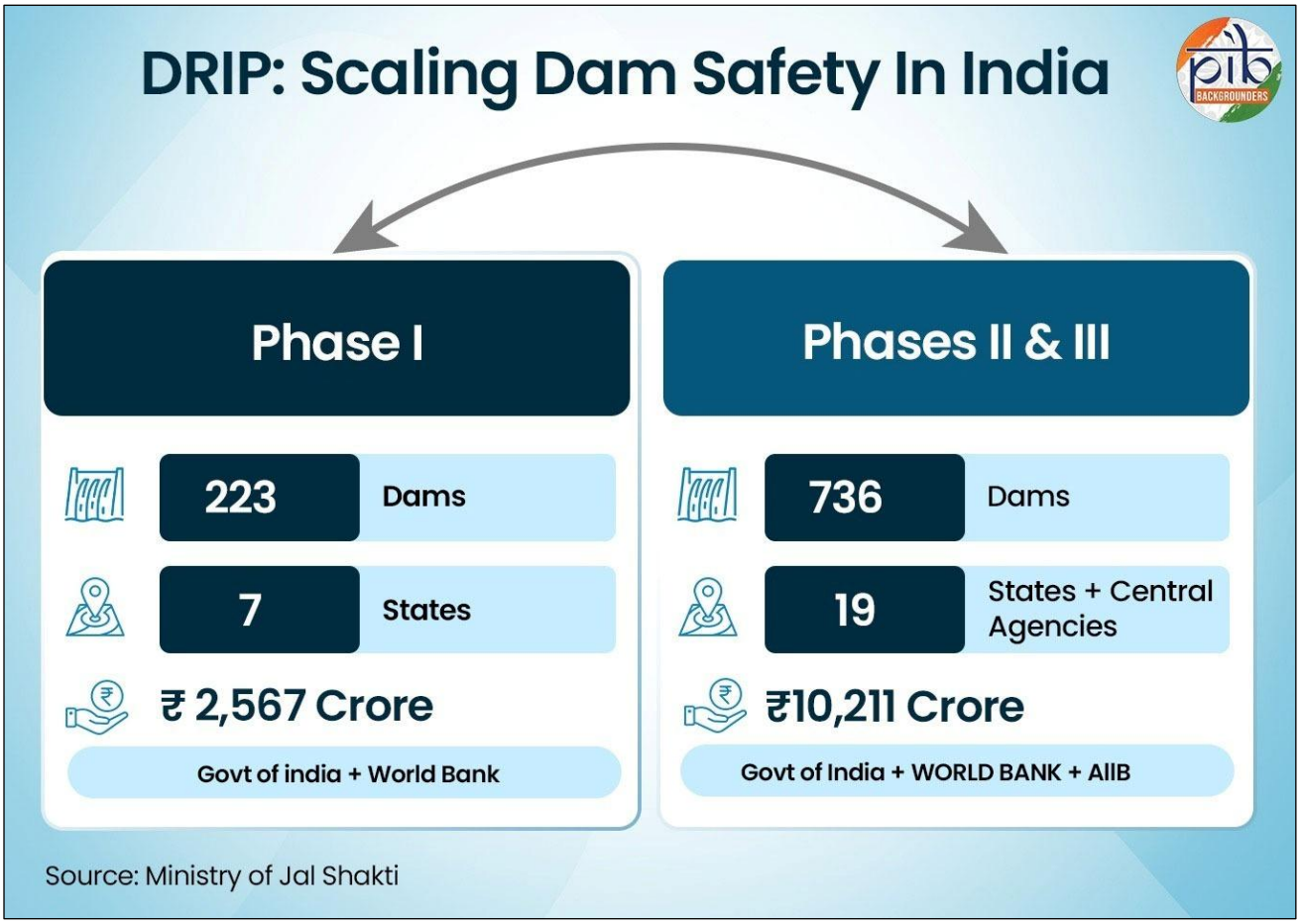
Around 98.5% of these dams, which comes to 6,448, are owned by State Governments. Central Public Sector Undertakings have 49 dams or 0.7%; private entities own 0.6% or 36 dams, and the Central Government owns 0.2% or 12 dams. Maharashtra has the highest number of specified dams, followed by Madhya Pradesh, Gujarat, Chhattisgarh, Rajasthan, Karnataka and Odisha.

Ageing infrastructure, sedimentation, changing hydrological patterns and increasing climate variability have highlighted the need for systematic rehabilitation and safety management. Analysis of 439 reservoirs in India (CWC data) shows an average 19% loss of gross storage capacity with an average reservoir age of 42 years. The average annual loss of storage is estimated at 0.74%, equivalent to about 1.81 MCM per reservoir per year.



Dam Rehabilitation & Improvement Programme (DRIP)

The flagship initiative, the **Dam Rehabilitation and Improvement Project (DRIP)**, is being implemented in three phases to improve the safety and operational performance of existing dams through structural repairs, modernisation of spillways and gates, and installation of advanced monitoring systems. DRIP is among the **largest dam rehabilitation programmes globally**, reflecting India's shift towards a systematic and risk-based approach to dam safety management.



DRIP Phase I (2012–2021)

DRIP Phase I was launched in April 2012 with support from the World Bank. The programme covered 223 dams **across seven states**, namely Jharkhand, Karnataka, Kerala, Madhya Pradesh, Odisha, Tamil Nadu and Uttarakhand. The programme contributed significantly to strengthening dam safety practices and institutional capacity in participating states and agencies. Design flood reviews, dam health inspections, and finalisation of rehabilitation proposals, and its implementation for **223 dams** completed, with rehabilitation works awarded for 144 dams. The programme focused on:

- Rehabilitation and modernisation of dam structures.
- Dam safety inspections and evaluations.
- Development of Emergency Action Plans (EAPs).
- Capacity building and training programmes.

- Introduction of the Dam Health and Rehabilitation Monitoring Application (DHARMA).

DRIP Phase II and III

DRIP Phase II & III was operationalised in **October, 2021.** The Phase-II scheme is co-financed by the World Bank and AIIB. **The total project outlay is ₹10,211 crore** (Phase II: ₹5,107 crore; Phase III: ₹5,104 crore), with ₹7,000 crore as external loan and ₹3,211 crore borne by participating states and central agencies. Phase II and III together will last for 10 years, each phase continuing for six years with two years overlap. **Rehabilitation proposals** (Project Screening Templates – PSTs) for **191 dams,** amounting to ₹5, 053 crore, have been approved. The total expenditure under DRIPII up to 31 March 2025 stands at ₹2,225 crore, with major physical **rehabilitation works completed at 43 dams.**

The scheme covers **736 dams across 19 states and three central agencies** (CWC, Bhakra Beas Management Board, and Damodar Valley Corporation). Major dams planned for safety improvement under DRIP Phases II and III include: Bhakra Dam (Himachal Pradesh), Ranjit Sagar Dam (Punjab), NTR Sagar (Telangana), Nagarjuna Sagar Dam (Telangana), Gandhi Sagar Dam (Madhya Pradesh), Kadana (Gujarat), Jirgo Dam (Uttar Pradesh), Imphal barrage (Manipur), MyntduLeshka Dam (Meghalaya), Silabati Barrage (West Bengal) and Gayathri Dam (West Bengal) among others.

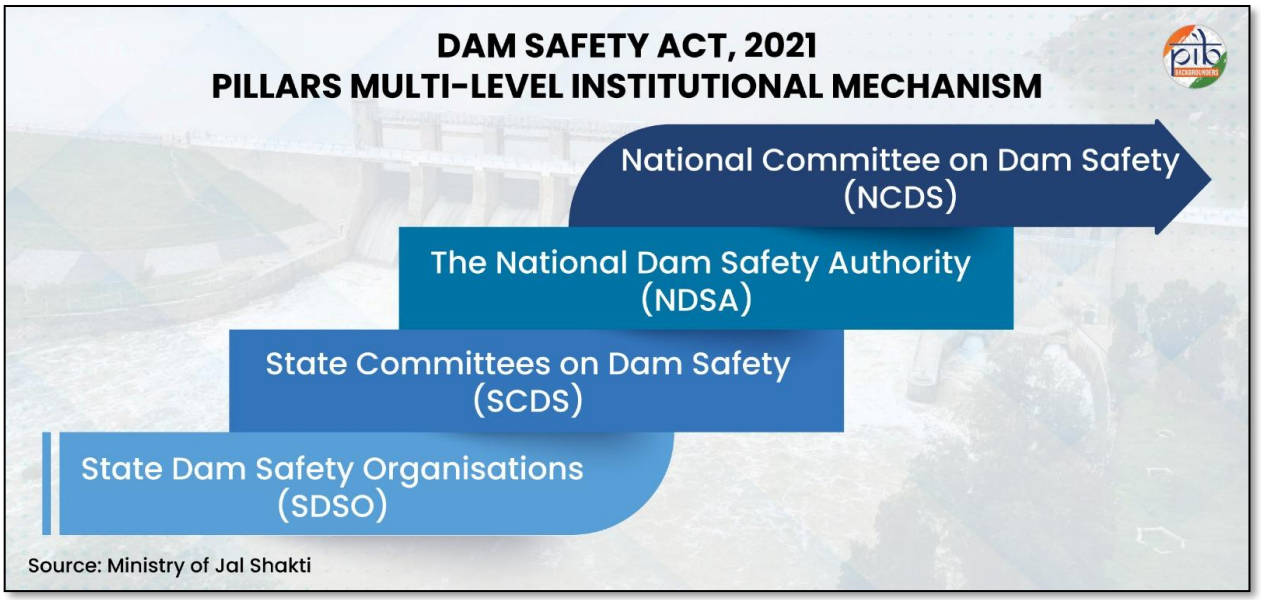
DRIP Phases II and III have four components:

- Rehabilitation of dams and associated structures to improve safety and performance.
- Institutional strengthening to enhance dam safety systems at the state and central levels.
- Revenue generation measures to support sustainable operation and maintenance.
- Project management for effective implementation.

Institutional Framework: Dam Safety Act, 2021

The Dam Safety Act, 2021 **came into force on 30 December 2021** and provides a comprehensive framework for **surveillance, inspection, operation and maintenance** of specified dams across the country. A specified dam under the Act refers to a dam that is more than 15 metres in height, or between 10 and 15 metres in height if it satisfies prescribed technical criteria. The compliance of the various provisions under the Act has now become the statutory obligations of the dam owners coupled with definite timelines.

It establishes a **four-tier institutional mechanism** comprising: the National Committee on Dam Safety (NCDS) as the apex body, the National Dam Safety Authority (NDSA) as the regulatory and implementing arm, State Committees on Dam Safety (SCDS), and State Dam Safety Organisations (SDSO) responsible for surveillance, inspection, and compliance at the state level. All 31 dam owning States have constituted SDSO.



The Act further mandates key safety provisions, including **regular inspections, installation of instrumentation systems, comprehensive dam safety evaluations, Risk Assessment Studies, Inflow Forecasting, Early Warning System, Integrated Operation of Reservoirs, Hazard Potential, and preparation of Operation & Maintenance Manual and Emergency Action Plans (EAPs).** It also places responsibility on dam owners to allocate adequate funds for maintenance and repairs, thereby linking safety compliance with sustained financial provisioning.

Some of the key achievements include:

- Registration of all 6,628 specified dams on **the Dam Health and Rehabilitation Monitoring Application (DHARMA) platform.**
- Launch of DHARMA web-based platform and mobile application for improved dam safety monitoring and data management.
- Conduct of about **13,000 dam inspections annually**, with records maintained digitally.
- Implementation of **Rapid Risk Screening of specified dams** across the country using a web-based assessment tool. So far, the exercise has been completed for 5553 specified dams.
- Publication of **20 regulations in the Official Gazette** under the **Dam Safety Act, 2021.**
- Establishment of the **National Centre for Earthquake Safety of Dams at MNIT Jaipur.**

National Committee on Dam Safety (NCDS)

The NCDS is the apex policy body under the Dam Safety Act, 2021, responsible for formulating policies and recommending regulations to ensure **uniform dam safety standards across the country**. It discharges such functions as specified in the First Schedule as may be necessary to prevent dam failure-related disasters and to maintain standards of dam safety. **It guides the national dam safety framework by setting technical and regulatory benchmarks to prevent dam-related disasters.** Since its constitution in February 2022, the NCDS has held eleven (11) meetings and has played a pivotal role in strengthening the regulatory framework for dam safety.

National Dam Safety Authority (NDSA)

NDSA shall discharge such functions as specified in the Second Schedule as may be necessary to implement the policy, guidelines and standards evolved by the National Committee for proper surveillance, inspection and maintenance of specified dams

State-Level Institutions and Dam Owners

> **"Dam owners"** means the union government or a state government or jointly by one or more governments or public sector undertaking or local authority or company and any or all of such persons or organisations, who own, control, operate, or maintain a specified dam.

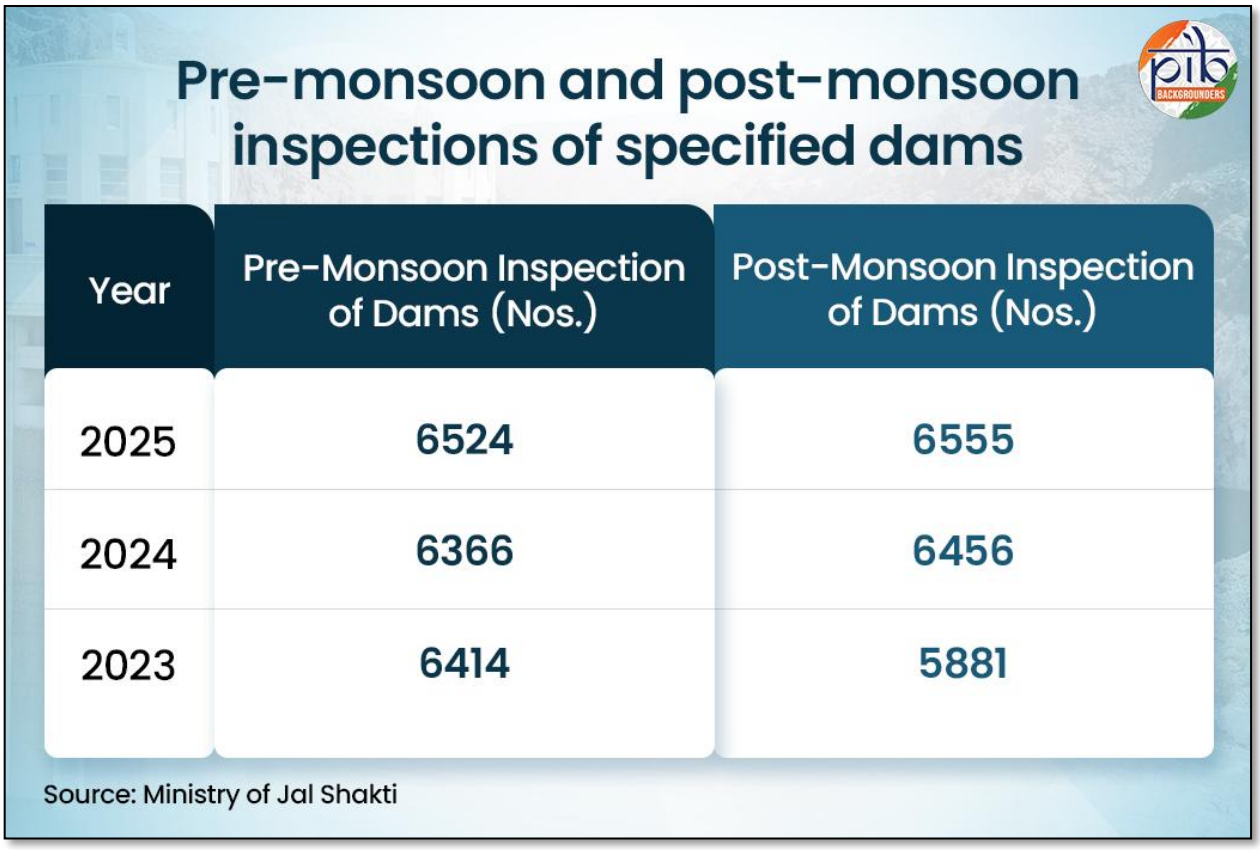
The **Dam Safety Act, 2021,** mandates the constitution of State Committees on Dam Safety (SCDS) and the establishment of State Dam Safety Organisations (SDSOs). States and Union Territories owning specified dams have established SCDS and SDSOs pursuant to the Act. SDSOs are **responsible for perpetual surveillance, inspection, and monitoring** of all specified dams within their jurisdiction; maintenance of dam databases; vulnerability and hazard classification of dams in accordance with criteria prescribed by the NDSA; and recommendation of corrective safety measures to dam owners.

Dam owners are obligated for various activities under the Act which inter alia include:

- Establish a dam safety unit at each dam.
- Conduct **pre-monsoon and post-monsoon inspections**, as well as inspections during or after any calamity or sign of distress.
- Earmark funds for maintenance & repairs.
- Prepare **Emergency Action Plan**.
- **Conduct risk assessment studies** at specified intervals.
- Compile technical documentation.
- Conduct **Comprehensive Dam Safety Evaluations** through expert panels at regular intervals.
- Establishment of Hydro-meteorological Stations & Seismological Stations.
- Installation of Instruments for dam safety
- Establish **Early Warning System**.

Mandatory Inspections

Dam owners are mandated to carry out pre-monsoon and post-monsoon inspections of all specified dams as per the regulation notified on 24.04.2024. Based on pre- and post-monsoon inspections, they are classified into three categories. **Category I indicates** critical deficiencies that may lead to failure if not addressed. **Category II includes** dams with major deficiencies requiring prompt remedial action. Category III covers dams with minor or no deficiencies. Based on post-monsoon inspections for 2025, **3 dams fall under category I and 188 dams under category II.** Depending upon the category of the dam, suitable remedial measures are taken by the dam owners in a time-bound manner.



Capacity Building

Centres of Excellence (CoEs) on Dam safety are being established at **IIT Roorkee** with Seismic Hazard Mapping and Reservoir Sedimentation as focus areas, at **IISc Bangalore** with Comprehensive Risk Assessment of dams and Advanced construction and rehabilitation and material testing for dams as focus areas. National Centre for Earthquake Safety of Dams is also being established at **MNIT Jaipur.** M. Tech Program on Dam Safety also started at IIT Roorkee and IISc Bengaluru from 2021-22.

Offences & Penalties

Chapter X of the Act provides for offences and penalties for any obstruction and refusal to comply with any direction given by or on behalf of the Central Government or the State Government or the National Committee or the Authority or the State Committee or the State Dam Safety Organisation under this Act. **Punishment includes imprisonment for a term** which may extend to one year or with fine, or with both, and if such obstruction or refusal to comply with directions results in loss of lives or imminent danger thereof, shall be punishable with imprisonment for a term which **may extend to two years.**

Looking Ahead

India's extensive dam network, built over decades, continues to underpin critical sectors of the economy. As these assets age and operate under increasingly variable climatic conditions, the focus has shifted from **expansion to safety, resilience, and lifecycle management.** The convergence of large-scale programmes such as the **DRIP,** statutory oversight under the **Dam Safety Act, 2021**, and the use of digital tools such **as the DHARMA** reflects a maturing dam safety ecosystem in India.

Together, these initiatives strengthen dam safety, improve the performance of ageing infrastructure, and enhance resilience to emerging risks.

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