

# DAM SAFETY ACT & DAM REHABILITATION PROGRAMS

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# DAM SAFETY

*Dams play an important role in the country's progress through multi-purpose usages in sectors such as irrigation, power generation, flood moderation and supply of water for drinking and industrial purposes.*



*critical infrastructure  
constructed with large  
public investment*



*unsafe dam constitutes a  
hazard to human life,  
ecology and public &  
private assets*



*Planning inadequacy,  
structural defects,  
deficiencies arising on  
a/c of ageing*



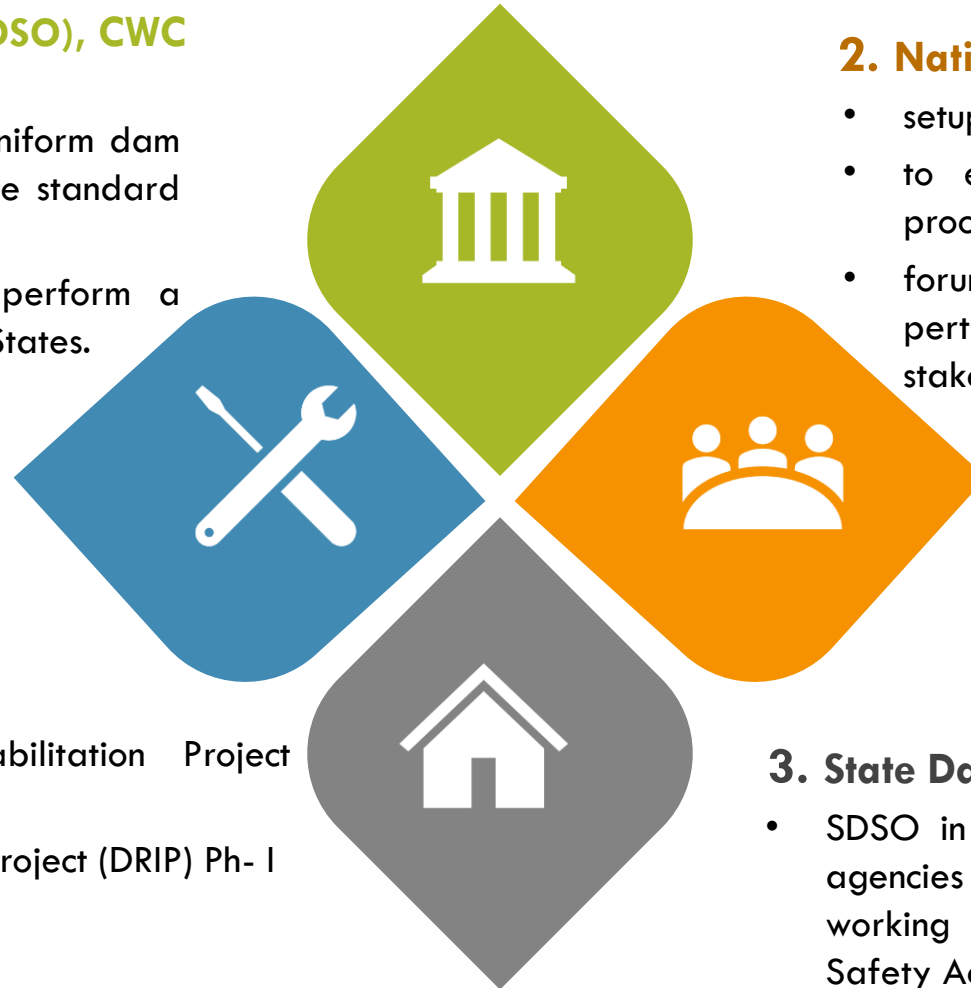
*climate change causing  
extreme  
hydrometeorological  
events*

# DAM SAFETY MECHANISM PRIOR TO DSA-2021

*Prior to enactment of the Dam Safety Act (2021), various committees, organizations, institutions of Central & State Govts. were working to ensure the safety of the dams across the country. Dam Rehabilitation Programs were also launched with the similar objectives.*

## 1. Dam Safety Organizations(DSO), CWC

- established in 1979 in CWC
- working towards development of uniform dam safety protocols by laying down the standard guidelines/ manuals.
- To assist the State Govts. and perform a coordinating and advisory role for States.
- To create dam safety awareness among the Stakeholders.



## 2. National Committee on Dam Safety (NCDS)

- setup in 1987
- to evolve uniform simplified dam safety procedures
- forum for exchange of views on issues pertaining to dam safety amongst various stakeholders

## 4. Dam Rehabilitation Programs

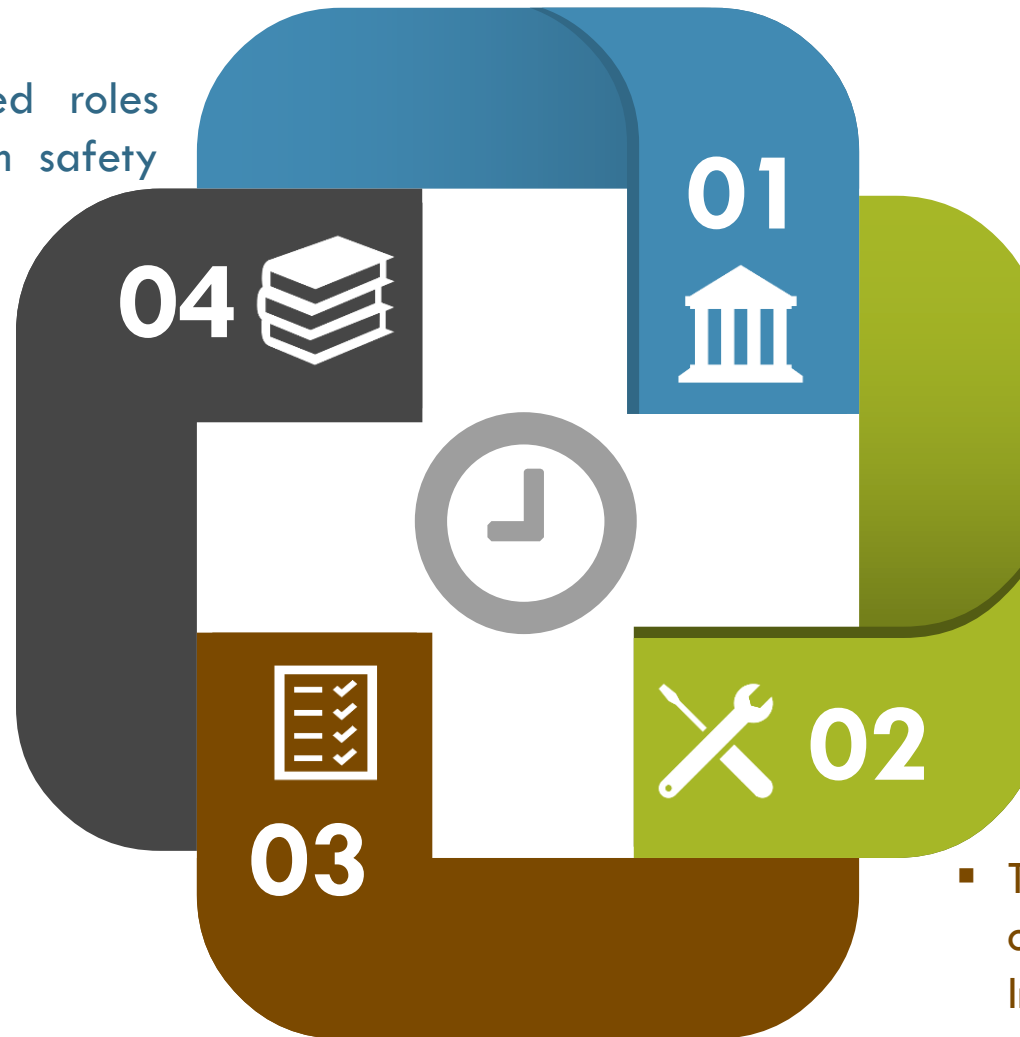
- Dam Safety Assurance and Rehabilitation Project (DSARP) (1991-99)
- Dam Rehabilitation and Improvement Project (DRIP) Ph- I (2012-21)
- DRIP Ph-II & III (2021-31)

## 3. State Dam Safety Organizations (SDSO)

- SDSO in 18 States and 4 other dam owning agencies viz. NHPC, BBMB, DVC, KSEB were working before the enactment of the Dam Safety Act, 2021

# NEED FOR DAM SAFETY LEGISLATION

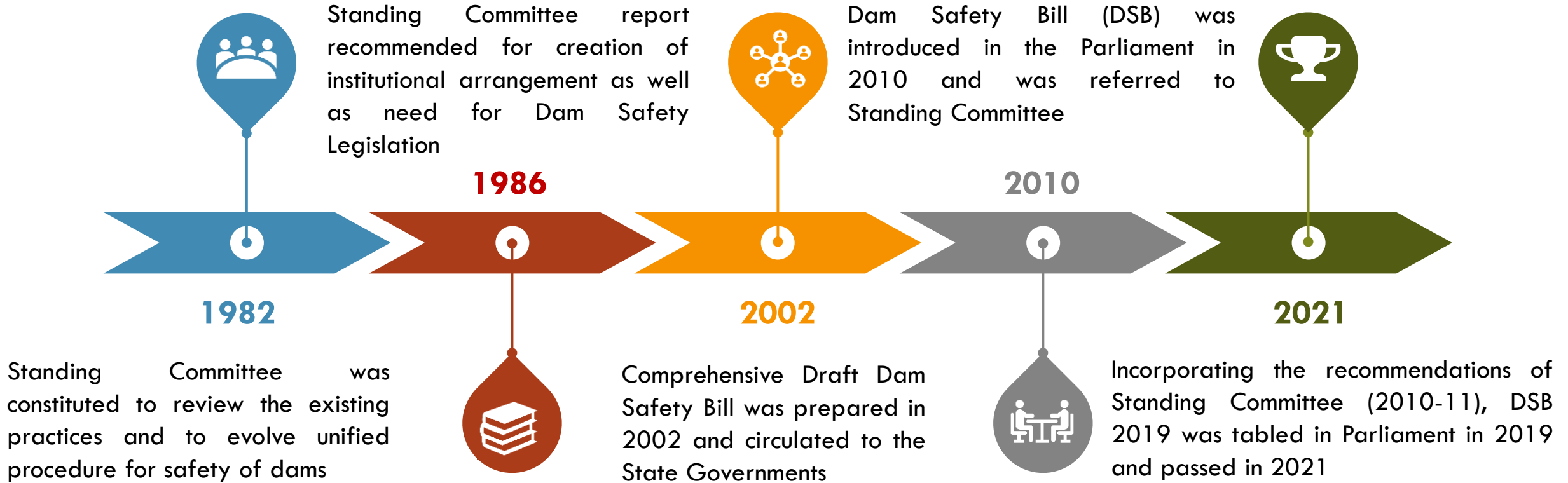
- To create institutional setup across the country
- To formulate well defined roles and responsibility of dam safety stakeholders
- To standardize dam safety protocols for implementation across the county using latest State of the Art Technologies and best global dam safety practices



- To address planning inadequacies, structural defects, deficiencies arising on account of ageing of dams.
- To ensure sufficient budget allocation for routine maintenance and repair of the dams
- To ensure proper documentation comprising of O&M Manuals, EAPs, Inspection logbooks etc. for each specified dam

# JOURNEY OF DAM SAFETY LEGISLATION

*efforts of last 40 years resulted into the enactment of the Dam Safety Act, 2021 for the safe future of Indian dams*



# DAM SAFETY ACT, 2021

*provisions of the Act have come into force with effect from 30th December, 2021*

## **Preamble of the Act:**

*“An Act to provide for surveillance, inspection, operation and maintenance of the specified dam for prevention of dam failure related disasters and to provide for institutional mechanism to ensure their safe functioning and for matters connected therewith or incidental thereto.”*



**Dam Safety Act, 2021**

# DAM SAFETY ACT, 2021

## Institutional Setup

To evolve dam safety policies and recommend necessary regulations and maintain standards of dam safety

**National Committee on Dam Safety (NCDS)**

**National Dam Safety Authority (NDSA)**

To implement the policy, guidelines and standards evolved by the NCDS

To supervise the work of SDSO and review the progress on measures recommended in relation to dam safety.

**State Committee on Dam Safety (SCDS)**

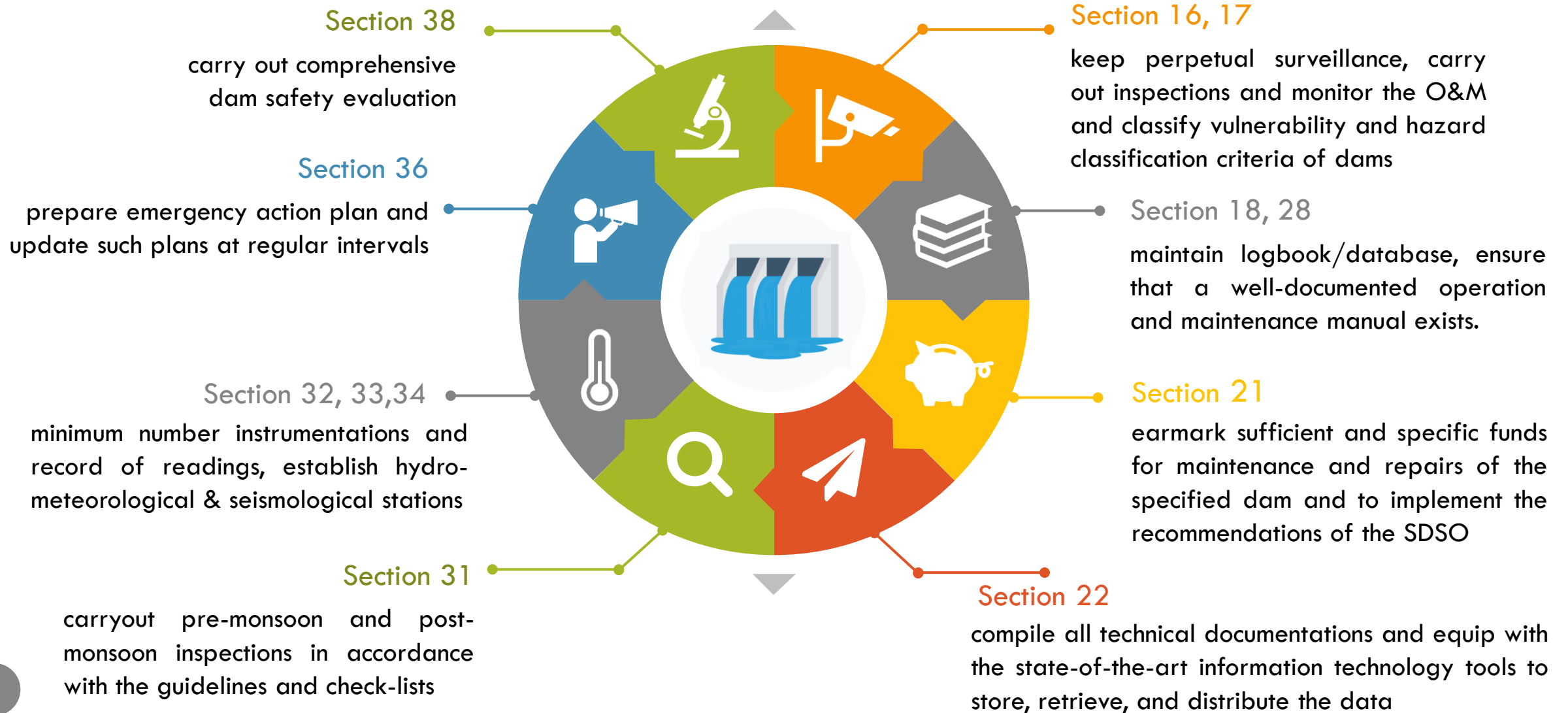
**State Dam Safety Organization (SDSO)**

To keep perpetual surveillance, carry out inspections and monitor the O&M of all specified dams

DSA, 2021

# DAM SAFETY ACT, 2021

Uniform Dam Safety Procedures and Standard Guidelines/Manuals based on the State of the Art technologies and best global practices to be evolved and followed by the dam stakeholders.

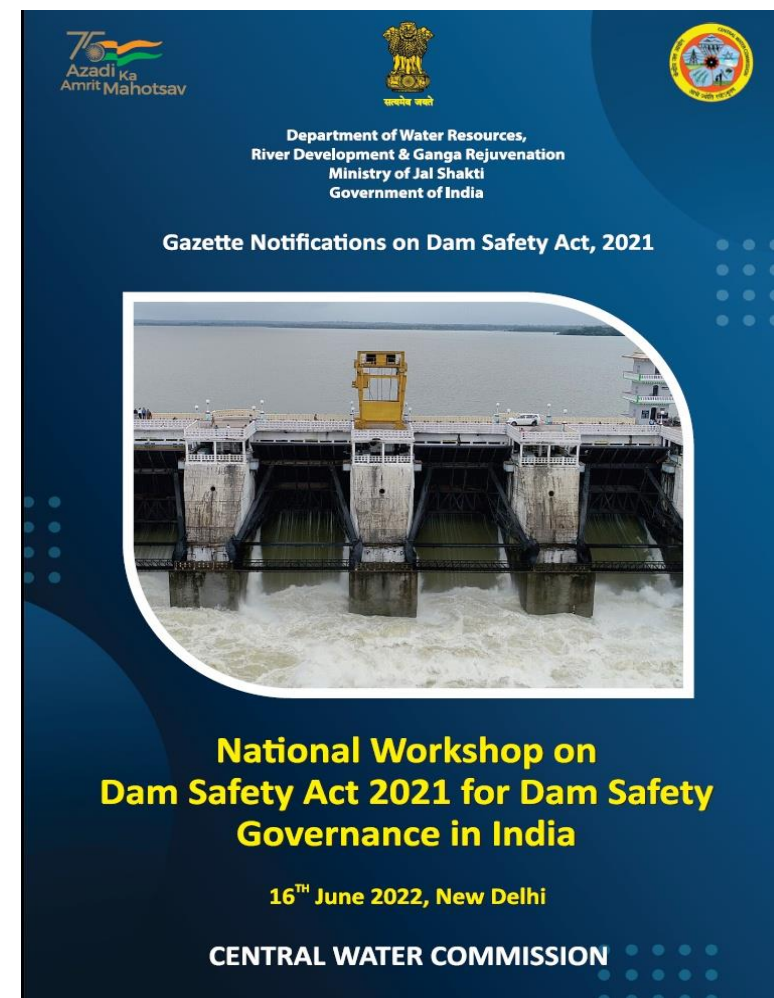




# DAM SAFETY ACT, 2021

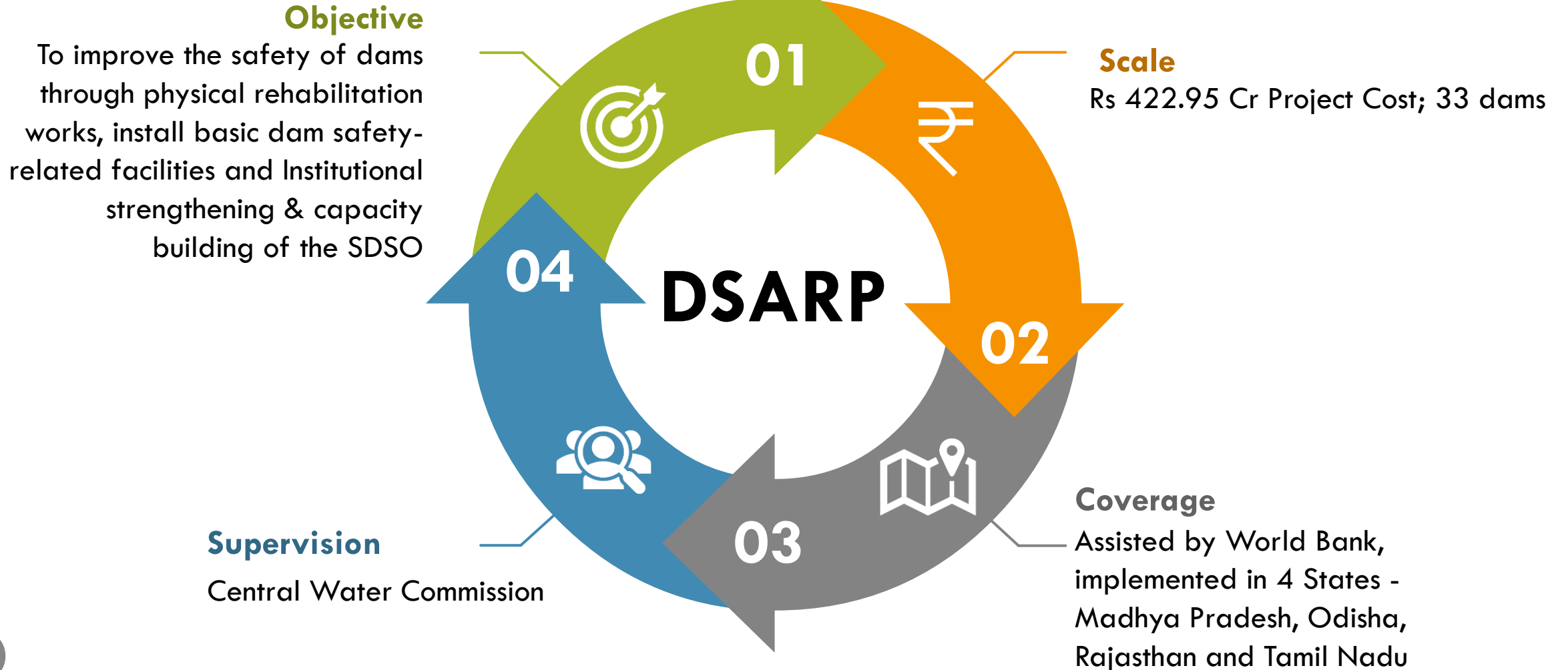
## Capacity Building and awareness of the stakeholders related to dam safety

- One of the core objective of the Act is to develop capacity building of the individuals as well as the organizations/institutions in order to create a rich dam safety culture in the country.
- As per the Section 23 of the Act, every individual responsible for safety of specified dams shall possess such qualifications and experience and shall undergo such training as may be specified by the regulations.
- A National Workshop on Dam Safety Act, 2021 for dam safety governance in India was organized on 16th June 2022 by CWC, DoWR, RD & GR, Ministry of Jal Shakti.
- NDSA is also organising meeting-cum workshop in all the four Regions in the country to sensitize and stress upon the states to implement the provisions of DSA, 2021.



# DAM REHABILITATION PROGRAMMES

## Dam Safety Assurance and Rehabilitation Project (1991-1999)



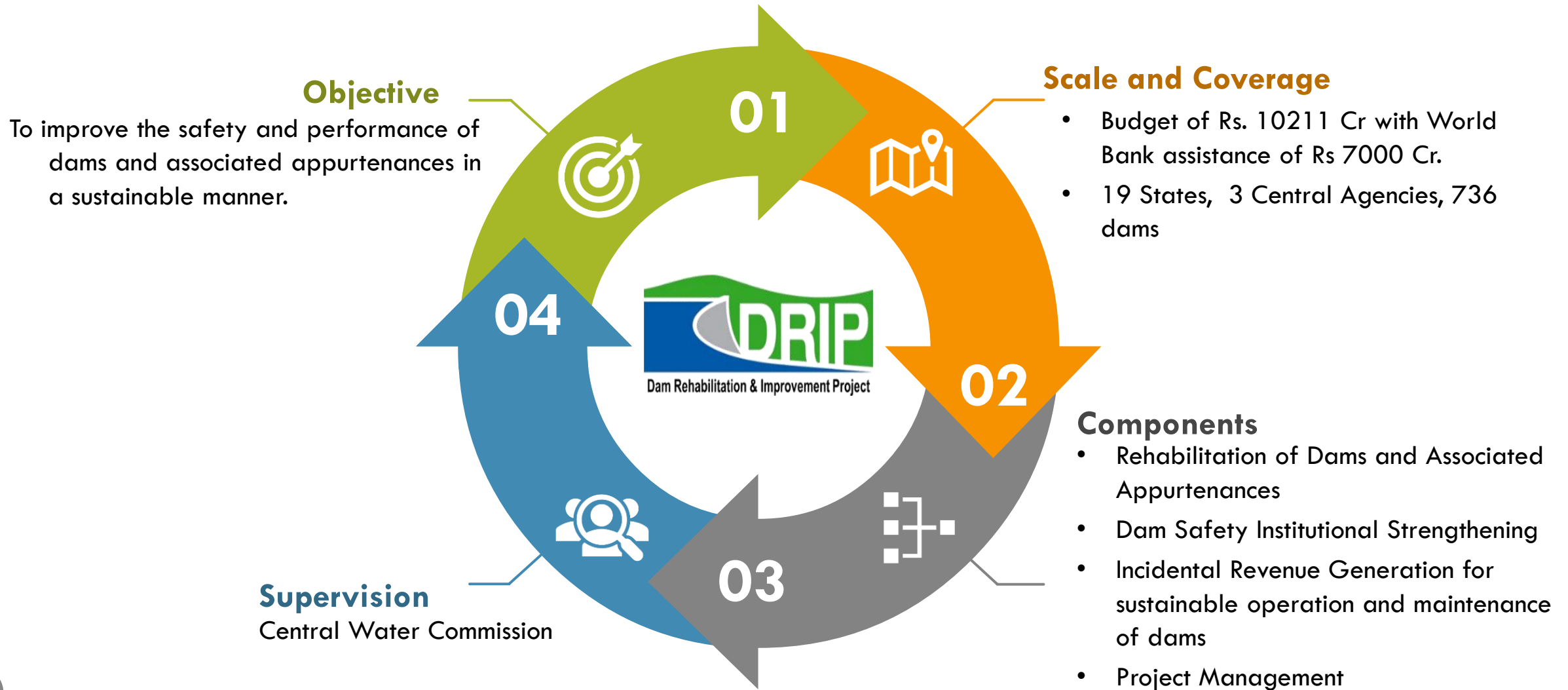
# DAM REHABILITATION PROGRAMMES

## Dam Rehabilitation and Improvement Project (2012-2021)



# DAM REHABILITATION PROGRAMMES

## Dam Rehabilitation and Improvement Project Phase II & III (2021-2031)



# KEY ACHIEVEMENT OF DRIP

*Apart from physical rehabilitation of dams, the DRIP scheme was successful in creating a dam safety environment*

## Institutional Strengthening

- Institutional setup was strengthened for sustainable dam safety culture.
- Central Project Management Unit (CPMU): At National level
- State Project Management Unit (SPMU): At State level
- Project Authorities: At dam level

## Capacity Building

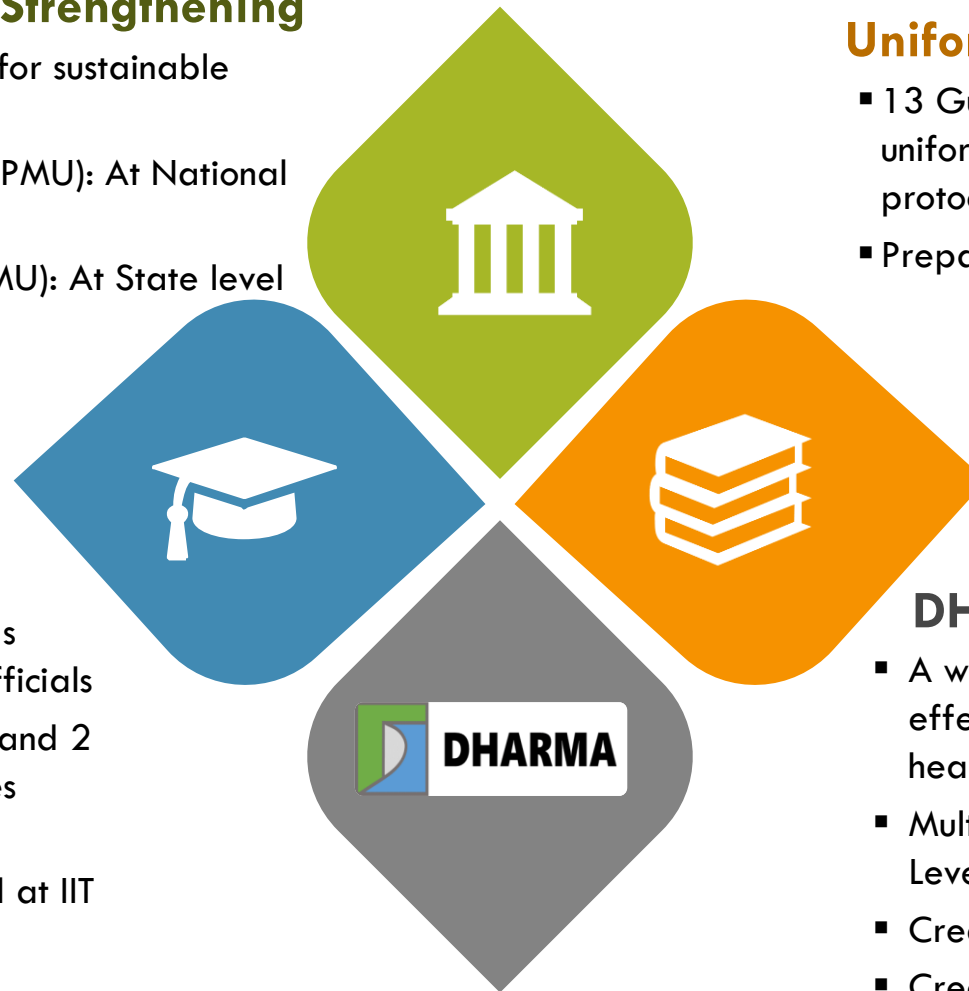
- 186 National & International trainings organized benefitting about 5500 officials
- 3 National Dam Safety Conferences and 2 International Dam Safety Conferences organized
- M.Tech courses in Dam Safety started at IIT Roorkee and IISc Bangalore

## Uniform dam safety procedures

- 13 Guidelines/Manuals were published to ensure uniform/standardized dam safety practices/protocols/guidelines/manuals across the country
- Prepared 217 EAPs and 221 O&M Manuals

## DHARMA

- A web-based asset management tool to support effective collection and management of asset and health data of dams
- Multilevel access at Central, State and Project Levels
- Credentials provided to 18 States & 27 Agencies
- Credentials to be provided to all States/Agencies in future.



# DAM SAFETY ACT & DAM REHABILITATION PROGRAMS – SIMILARITIES

## Institutional Setup

- Dam Rehabilitation Programs have strengthened the dam safety institutional setup and created sustainable dam safety culture.
- These Dam Rehabilitation Programs along with the DSO-CWC, NCDS and SDSO (established before the enactment of Act) have created a favourable environment for the implementation of the provisions of the Act.

Item	Dam Safety Act, 2021	DRIP
At Centre Level	National Committee on Dam Safety National Dam Safety Authority	National level Steering Committee, Technical Committee, Central Project Management Unit
At State Level	State Committee on Dam Safety State Dam Safety Organisation	State level Steering Committee State Project Management Unit
At Project level	Dam Safety Unit	Project Authorities

# DAM SAFETY ACT & DAM REHABILITATION PROGRAMS – SIMILARITIES

## Uniform Dam Safety Procedures and Standard Guidelines/Manuals

### Provisions of the Act to -

classify vulnerability and hazard classification criteria of dams (Section 17)



maintain a log book or database for recording therein all activities related to the surveillance and inspection and all important events (Section 18)



ensure that a well-documented operation and maintenance manual (Section 28)



### Achievement under Dam Safety Programmes

Published “Guidelines for Classifying the Hazard Potential of Dams (November 2020)”

Published Guidelines for safety inspection, O&M etc.

- Published Guidelines for preparing O&M manual for dams
- Under DRIP Ph-I, O&M Manuals of 221 dams have been prepared.

# DAM SAFETY ACT & DAM REHABILITATION PROGRAMS- SIMILARITIES

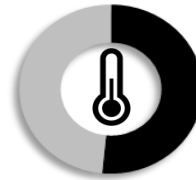
## Uniform Dam Safety Procedures and Standard Guidelines/Manuals

### Provisions of the Act to -

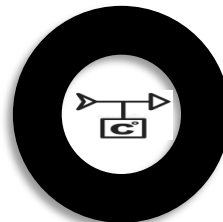
carryout pre-monsoon and post-monsoon inspections in accordance with the guidelines and check-lists (Section 31)



have a minimum number of such instrumentations and record of readings (Section 32)



- establish hydro-meteorological station (Section 33)
- establish a seismological (Section 34)



### Achievement under Dam Safety Programmes

Under DRIP Ph-I, published Guidelines for safety inspection of dams which includes “Scheduled Dam Safety Inspection Form”.

- Under DRIP Ph-I, Published Guidelines on instrumentation of dams
- instruments were installed at 118 dams.

- Published guidelines titled “*Technical Specifications of Hydro-meteorological, Geodetic, Geo-technical and Seismic Instruments*”
- Seismic Hazard Analysis Information System (SHAISYS) for site specific seismic design parameter is under finalization.



# DAM SAFETY ACT & DAM REHABILITATION PROGRAMS-SIMILARITIES

## Uniform Dam Safety Procedures and Standard Guidelines/Manuals

### Provisions of the Act to -

- prepare emergency action plan update such plans at regular intervals (Section 36)



make comprehensive dam safety evaluation (Section 38)



### Achievement under Dam Safety Programmes

- Under DRIP Ph -I, published Guidelines for preparation of EAP
- Published EAP for 217 dams
- Dissemination of EAPs through 103 Stakeholder consultation programs with participation of about 10,000 stakeholders

Under DRIP Ph-I, Dam Safety Review Panel (DSRP) Inspection of 256 dams and Design Flood Review (DFR) of 250 dams were carried out.

# DAM SAFETY ACT & DAM REHABILITATION PROGRAMS-SIMILARITIES

## Uniform Dam Safety Procedures and Standard Guidelines/Manuals

### Provisions of the Act to -

NDSA on the recommendations of the NCDS may make regulations consistent with this Act on various dam safety guidelines and standards on O&M, inspection, instrumentation, EAP, vulnerability and hazard classification, log books or database, risk assessment, comprehensive safety evaluation quality control measures etc. (Section 54)



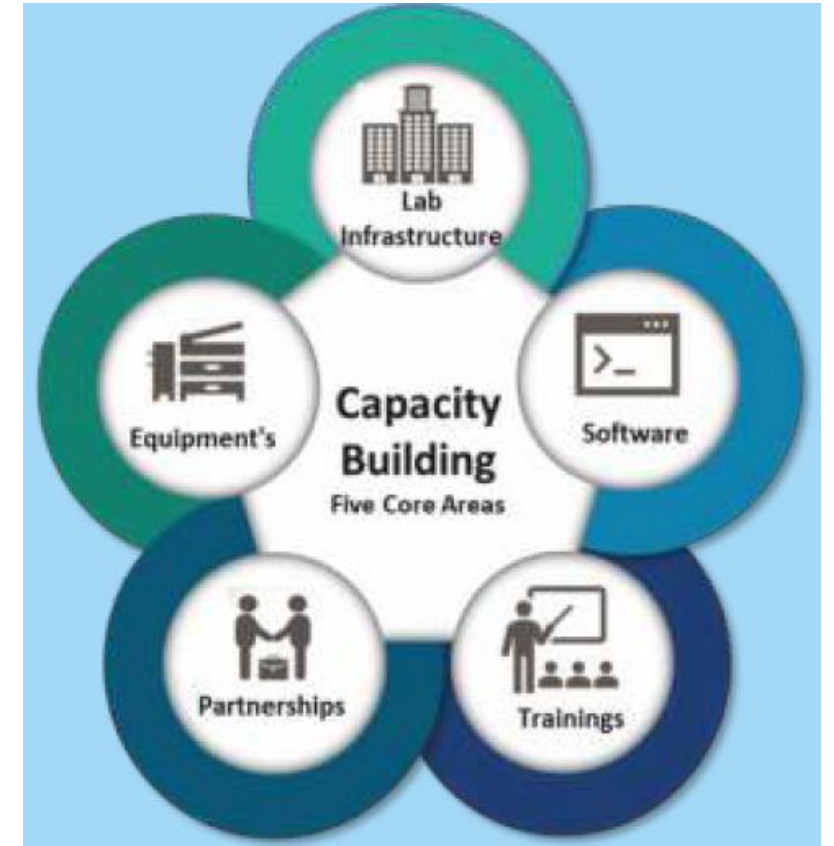
### Achievement under Dam Safety Programmes

- Under DRIP Ph-I, 13 nos. of guidelines has been published. These would assist dam owners and dam safety professionals to systematically address various emerging challenges in various domains of dam safety management.
- NDSA is in process of formulating the draft Rules and Regulations on various aspects of dam safety as per the Section-54 of the Act.
- Till such time, State Govts. have been recommended to refer guidelines and manuals published under DRIP

# DAM SAFETY ACT & DAM REHABILITATION PROGRAMS

## Capacity Building

Provisions Under DSA, 2021	Achievement Under DRIP
Section 23: every individual responsible for safety of specified dams and all activities related thereto shall possess such qualifications and experience and shall undergo such training as may be specified by the regulations.	186 customized national and international trainings benefitting about 5500 officials.
	3 National Dam Safety Conferences & 2 International Dam Safety Conferences
	IIT Roorkee and IISc Bangalore have started post graduate degree program in Dam Safety since 2021 Academic Session.



**Core Areas of Capacity Building Under DRIP**

# CONCLUSION

*Dam Rehabilitation programs have laid a solid foundation for implementation of Dam Safety Act*

The broad objective of the DSA, 2021 can be summarized as under:

- *Creation of Institutional Mechanism at Centre and State levels*
- *Development of uniform dam safety protocols, guidelines and manuals etc.*
- *Capacity building of institutions and personnel working in dam safety domain*

The above aspects were also covered in various Dam Rehabilitation Programs since 1991.

While DSA-2021 is applicable across the country, the Dam Rehabilitation Programs have limited coverage in terms of number of dams as well as number of States.

DSA-2021 has a statutory status and hence enforcement of uniform dam safety procedures/protocols, as specified, shall get facilitated.

The benefits derived from the various Dam Rehabilitation Programs specially with respect to creation of standardized protocols and capacity building needs to be scaled up to cover the whole country.

The best practices of physical rehabilitation of dams evolved under Dam Rehabilitation Programs needs to be shared through such conferences and workshops organised at Central and State levels.

**THANK YOU !**

## **GUIDELINES PUBLISHED UNDER DRIP PH- I**

1. Guidelines for Developing Emergency Action Plans for Dams (February 2016)
2. Manual for Rehabilitation of Large Dams (January 2018)
3. Guidelines for Instrumentation of Large Dams (January 2018)
4. Guidelines for Preparing Operations and Maintenance Manuals for Dams (January 2018)
5. Guidelines for Mapping Flood Risks Associated with Dams (January 2018)
6. Guidelines for Safety Inspections of Dams (January 2018)
7. Guidelines for Assessing and Managing Reservoir Sedimentation (February 2019)
8. Guidelines for Assessing and Managing Risks Associated with Dams (February 2019)
9. Guidelines for Operation Procedures for Assessing and Managing Environmental Impacts in Existing Dam Projects (November 2020)
10. Guidelines for Classifying the Hazard Potential of Dams (November 2020)
11. Manual for Assessing Structural Safety of Existing Dams (November 2020)
12. Manual for Assessing the Hydraulic Safety of Dams (June 2021)
13. Guidelines for Selecting and Accommodating Inflow Design Floods for Dams (June 2021)

## BEST PRACTICES UNDER DRIP

- **Application of Advanced repair materials for dam rehabilitation:** *Eg. Geo-membrane ;Cementitious repair mortar using crystalline technology for seepage control; High strength concrete(M-90) for spillway glacis repair etc*
- **Underwater Investigations Using State Of Art Remotely Operated vehicles:** *Hirakud dam, OWRD, Malaprabhadam, KaWRD, Konar, Maithon, and Panchet dams, DVC, Kaki and Kakkayam HEP dams, KSEB.*
- **Special Studies for Understanding Special Problems in Few Dams:** *Special studies for analysing the unusual behaviour of Idduki dam(KSEB); cracks in Konar dam(DVC) and excessive deflections in Bhakra dam(BBMB).*
- **Risk Screening Framework:** *Portfolio Risk Assessment is a new activity in dam safety management in India and beginning to practice risk-based decision system for prioritization of investments in planning dam rehabilitation activities. CWC with technical assistance from World Bank, developed a Rapid Risk Screening System Manual in year 2020. The implementation is planned under DRIP-2.*
- **Post Graduate Degree Program in Dam Safety by Apex Institutions:** *IIT Roorkee and IISC Bangalore started post graduate degree program (M.Tech.) in dam safety and rehabilitation from current academic session (2021-22). This program will bring long term sustainability of dam owners capacity to deal the emerging challenges in dam safety.*

## BEST PRACTICES UNDER DRIP....CONTD.

- **Creation of Dam safety Specific Budget Head:** *Understanding importance of dam safety as well as value of water infrastructure, Odisha WRD has created dam safety specific budget head called Dam Protection Improvement Works (DPIW) since year 2020-21 to allocated appropriate annual budget to meet the requirement of dam safety.*
- **Publication of Technical Regulation:** *13 number of guidelines and manuals prepared by pooling best of knowledge resources to standardise various procedures and guidelines related to dam safety in India.*
- **Disaster Management and Emergency Preparedness:** *Dam specific O&M Manuals and EAPs published by partner State IAs. Stakeholder Consultation Programs organised to disseminate EAPs to all stakeholders including local public.*
- **Sedimentation management:** *Scheme supports needs based de-siltation of reservoirs; to guide project owners two relevant publications under DRIP would help in long run for sedimentation management in Indian dams.*



# APPLICATION OF ADVANCED REPAIR MATERIALS FOR DAM REHABILITATION



Racking & pointing of upstream face with UV resistant, high strength crystalline technology including underwater (Malaprabha dam, KaWRD).



Upstream face geomembrane (Servalar dam, TANGEDCO).



Repair of spillway glaciis and energy dissipator with M90 concrete (Maneri Dam, UJVNL).



Dam body grouting with mix of cement, micro-silica (Almatti Dam, KaWRD).

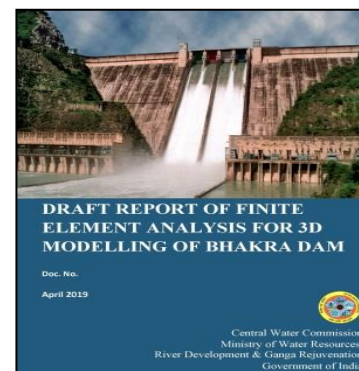
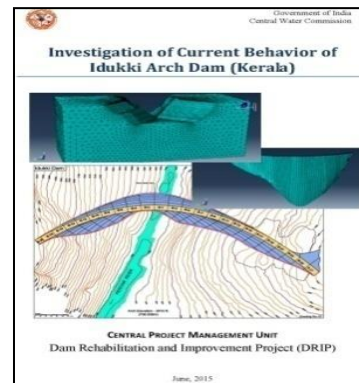
# UNDERWATER INVESTIGATIONS USING STATE OF ART ROVS



ROV for sluice emergency gate groove  
underwater repair works at Panchet dam, DVC



ROV for underwater racking & pointing work at  
Malaprabha dam, KaWRD



**Special Studies for Understanding Special Problems**