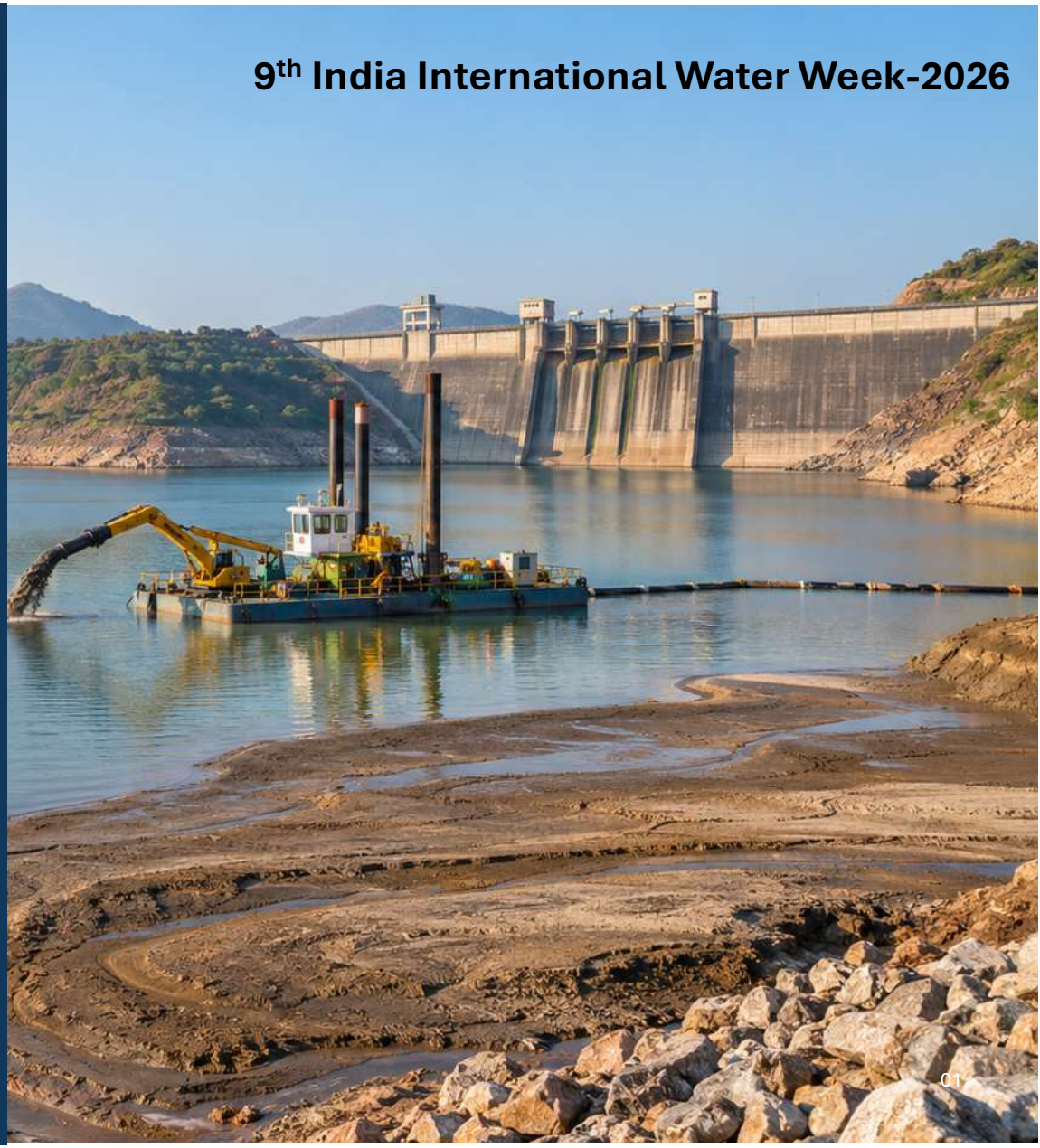
Reservoir Desiltation through Dredging / Dry Excavation

No-Cost / Revenue-Based Implementation & Way Forward

1. Restore Storage
2. Enable Beneficial Use
3. Enhance Water Security
4. Support a Sustainable Future

Saurabh Sharan • Director, Central Water Commission



Presentation Flow

From sediment risk to scalable no-cost / revenue implementation

1 → WHY

Scale, evidence and impacts

2 → EXPERIENCE

Practical challenges

3 → VIABILITY

When revenue / no-cost works

4 → ENABLERS

To address the issue and execute

5 → WAY FORWARD

From pilots to scale

The presentation focuses on what will make no-cost / revenue-based de-siltation workable and scalable through an implementation enabler Framework

Sedimentation: the Hidden Loss in Created Storage

Why it matters

Preserving existing reservoir storage is now as important as creating new storage.

18%
of world population

4%
of global freshwater

~311 BCM
created reservoir storage

1191 m^3
projected per-capita availability by 2050

Sedimentation cannot be eliminated fully; its impact can be reduced through systematic monitoring and integrated management.

Average storage reduction

Gross 15% • Live 10% • Dead 32%

Future signal

Reservoirs with >50% gross loss:
23 now → 125 projected by 2050

National assessment

165 BCM
storage in surveys

~63%
of large-reservoir live storage

>500
reservoirs analyzed

>1 BCM/yr
annual deposition

Scale of Sedimentation: Removal Alone Cannot Be the Answer



Large-volume removal is a major logistical operation

~26 BCM
estimated live-storage reduction

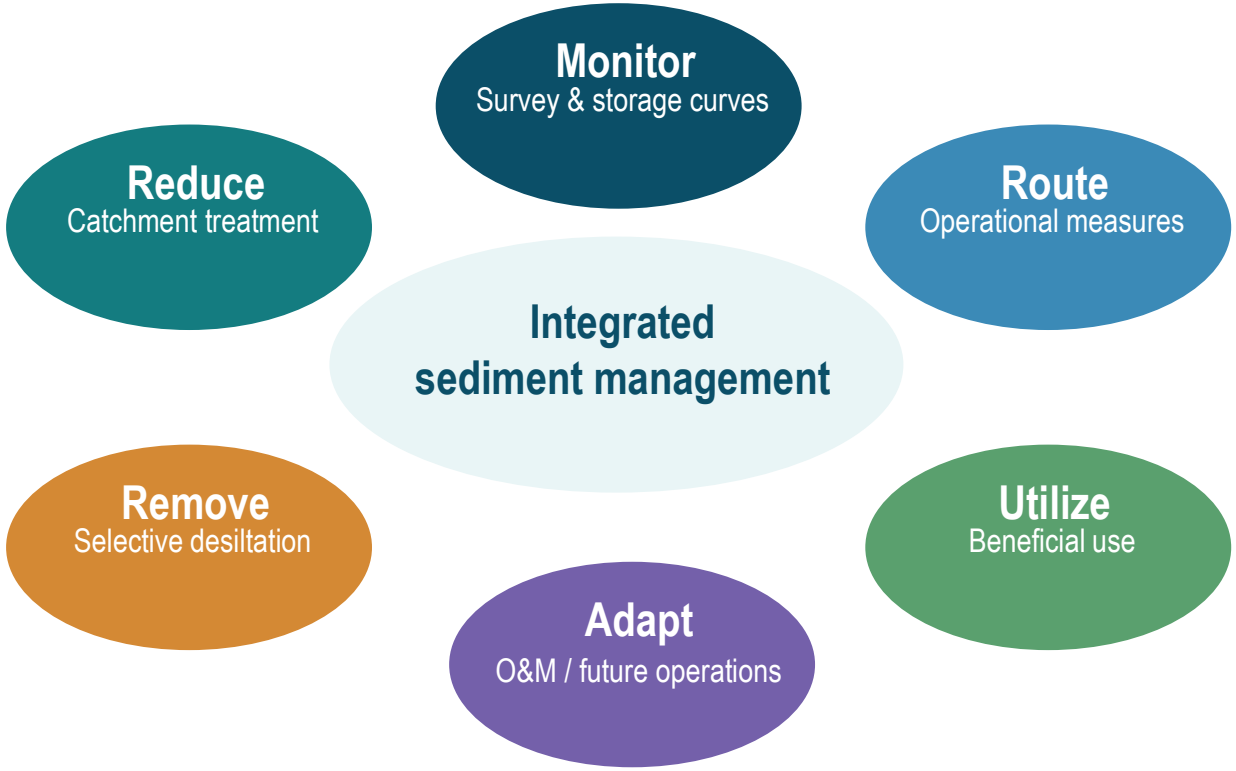
Scale signal
Equivalent order of magnitude to covering Goa with >7 m of sediment.

1. **Irrigation** Reliability
2. **Drinking water** Security
3. **Hydropower** Performance
4. **Flood** Moderation
5. **Intakes** & outlets
6. **Ecology** & morphology

De-siltation must be selective, technically justified, market-linked and part of a wider sediment-management strategy.

Integrated Sediment Management

Reservoir-specific



No single sediment-management technique suits all reservoirs. De-siltation should be selected only after assessment.

Extracted sediment may be treated as a resource rather than waste — where technically, environmentally and commercially viable.

What Field Experience Shows

The challenge is not only extraction; it is making the full chain technically clear, legally compliant and commercially workable.

Limited data
Quantity / quality uncertain

Clearance burden
Approvals reduce bidder comfort

Market uncertainty
End-use not assessed upfront

Bids with inadequate information
Timelines / logistics unrealistic

Disposal challenge
Yard, stacking & offtake

Limited vendors
Specialised capability



Experience across States is mixed — some projects are being taken up in revenue mode, while others follow conventional / other implementation models.

When Can No-Cost / Revenue Desiltation Work?

From sediment resource to a viable implementation model

Safe removable quantity
How much can be removed?

Usable sediment
What material is available?

Market demand
Is there a viable end-use market?

Full delivery cost
Extraction + processing + transport

Commercial viability?

If viable
Set reserve price, bid method and risk allocation on evidence.

Potential beneficial uses
Fill, embankments, aggregate replacement, blocks and bricks.

Bottom line
First know the resource, then the market, then decide the model.

Proposed Framework for No-Cost / Revenue Desiltation

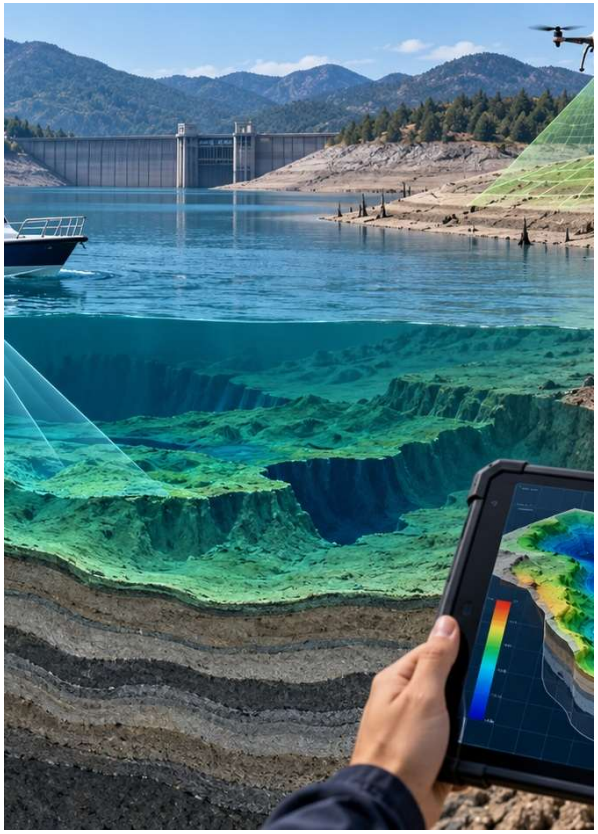
Key provisions



From scientific assessment → measured extraction → transparent accounting

Know the Resource: Survey, Characterise & Map

Assessment foundation + decision-ready outputs



Quantity & quality evidence

- GPS-enabled bathymetry + terrestrial / UAV survey up to FRL/MWL
- Sonar / GPS / sub-bottom profiler for depth and deposition pattern
- Characterise boulder / gravel, sand, clay, silt, organic matter and debris
- Test specific gravity, water content, grain size, Atterberg limits, mineralogy, geotechnical properties, contaminants and organic content

Survey ToR essentials

- Grid: ≤25 sq km: 50 × 50 m; >25 sq km: 100 × 100 m
- Core length: ≤10: 50–100 m | 10–25: 100–200 m | 25–50: 200–400 m | 50–100: 400–700 m | >100: 700–1000 m
- Locate cores at maximum deposition and practical extraction zones
- Raw / processed data, GIS files, reports and models belong to dam owner

E-A-C curves
Updated capacity

3D / isopach
Hotspots + volume

Composition maps
Sand / silt / clay

Catchment GIS
Erodibility

Life expectancy
Observed rate

Regional database
Sediment indices

Assessment is not just a quantity estimate — it is the evidence package for sediment management, DPR and procurement.

Resolve Statutory & Environmental Requirements Upfront

De-risk before tender

Routine maintenance / upkeep

Prior EC exempt subject to applicable safeguards; advance written intimation to SPCB/PCC.

Large-scale / revenue / restoration

Prior EC likely required as per applicable guidelines; Project Authority should obtain it before bidding / execution.

Sensitive legal triggers

Forest • wildlife • wetland • ESZ • biodiversity • FRA requirements operate independently.

Key legal references

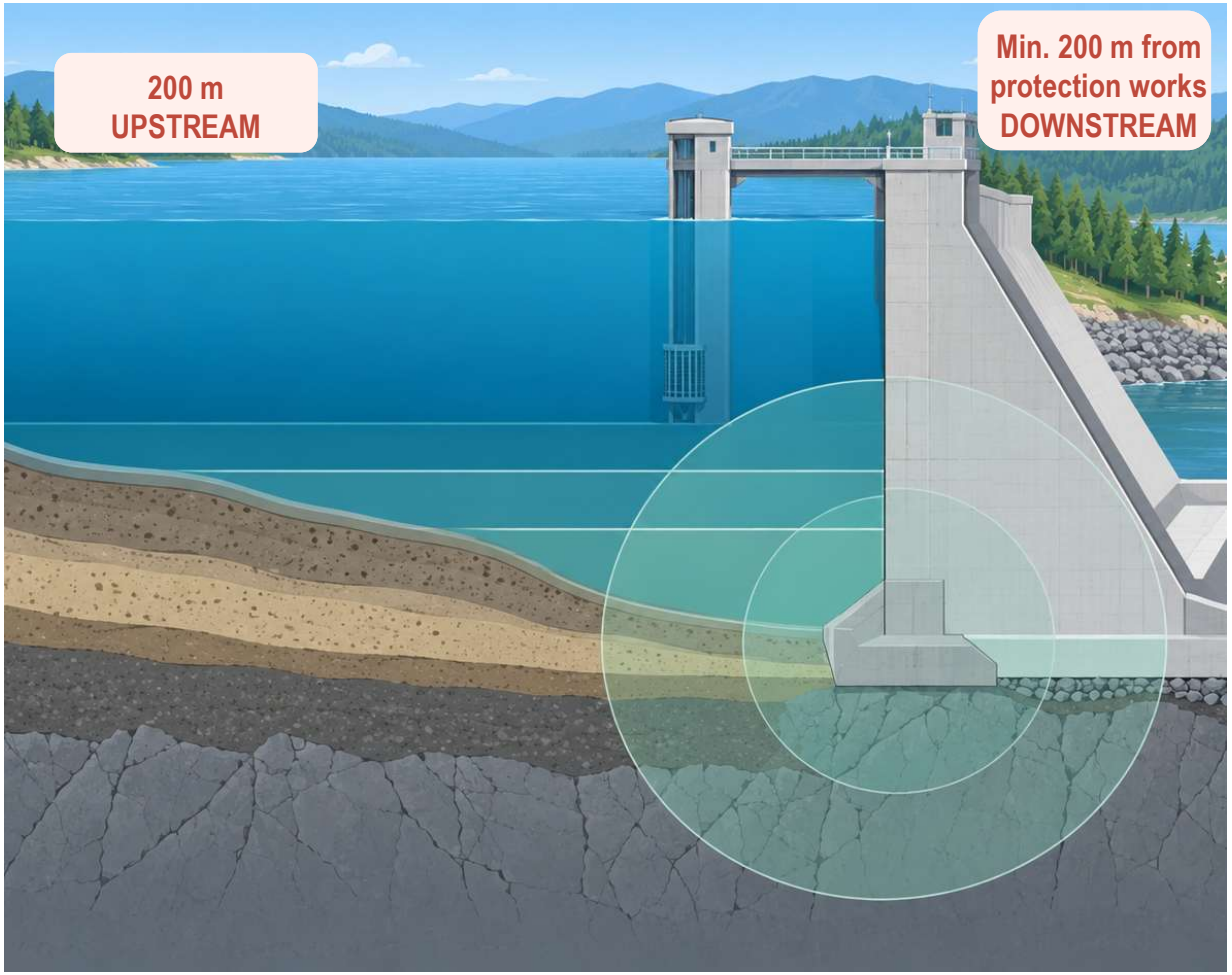
S.O. 1224(E), 28.03.2020 – specified EC exemption • O.M. 12.07.2023 – environmental safeguards • S.O. 3840(E), 30.08.2023 – continuing safeguard compliance • O.M. 21.08.2023 – SPCB/PCC monitoring and enforcement.

For recurring annual / routine maintenance, include desiltation in the O&M Manual with safeguards built into execution.

Principle: do not transfer the full statutory-clearance burden to bidders — create a clear, compliant and bankable bid environment.

Dam Safety Safeguards — Prohibited Zones

Safety first



Dam upstream

No dredging within 200 m from farthest heel / upstream slope–river bed junction, except where dam-safety / functionality need is established by proper study.

Dam downstream

No dredging within 200 m from energy-dissipation / downstream bed-protection works; tail-water requirement to be considered.

Appurtenances

No dredging within 150 m radius of foundation junction; exception where intake flow / function is obstructed by excessive sediment.

Reservoir bed + special screening

Leave undisturbed sediment: 2 m up to 15 m dam height; 3 m for 15–30 m; 5 m above 30 m. Also screen contaminated areas, rim instability / landslides and barrages / weirs.

Commercial viability cannot override dam safety.

Safe and Workable Extraction

Technology + site planning



Technology & separation

- Pneumatic desilting pumps, cutter-suction dredger or suitable pumps; blasting prohibited
- Slurry by pipeline to processing yard
- Wet separation of boulder, gravel, sand, clay, silt, organic matter etc.
- No harmful chemicals / flocculation agents
- Sand-dominant exception (>85%) for turn-key method only where bid conditions permit

Yard, access, storage & nuisance

- Adequate stacking capacity and multiple discharge points
- Avoid wetlands, streams, floodways, historical / sensitive sites
- Community nuisance and safety to be considered
- Access roads, drainage and future reuse
- Dust / wind-blown silt mitigation after drying
- Government-leased or contractor-arranged land with location map in bid

Make the Project Bankable

DPR + appraisal

Detailed Project Report (DPR)

- Project profile + hydro-met data
- Sediment diagnosis + studies
- Cost / economics + method
- EIA / EMP + clearances
- Extraction / yard / logistics
- Monitoring / audit / accounting

→

Technical Committee (TC)

Chaired by Secretary / Engineer-in-Chief or equivalent; includes Project CE, SDSO, Mining & Geology, Forest & Wildlife, CWC M&A and SE as Convener.

Accepts quantities / component costs; scrutinizes DPR, EIA/EMP and cost-benefit; recommends to STAC.

→

State Level Technical Advisory Committee (STAC)

Multi-departmental State-level body including WRD, Finance, CWC basin office, Environment / Forest, Mining, District Administration and relevant agencies.

Approves bid method, reserve price / payment schedule, variations; monitors progress and redresses disputes.

A well-prepared, realistic DPR is critical for attracting credible bids.

Choose the Appropriate Implementation Model

Risk allocation

PROJECT ECONOMICS

1	2	3	4
Strong material value + market	Value broadly offsets removal cost	Removal necessary but commercial value insufficient	Removal not justified

REVENUE TURN-KEY

Contractor extracts, separates, stacks & sells; pays Government above applicable statutory charges.

NO-COST / NEUTRAL-COST

Material value broadly offsets extraction / processing / disposal cost.

WORK-CONTRACT

Government funds removal; contractor paid for eligible quantities / services.

OTHER SEDIMENT MANAGEMENT

Catchment treatment, operational routing, monitoring or other suitable measures.

Common procurement rule: prior STAC approval + two-cover system; financial bids only for technically qualified bidders.

Contract Controls that Make the Model Workable

1

Bid structure

NIB • ITB • BDS • evaluation • forms • scope • GCC/SCC • BOQ

2

Bidder readiness

Eligibility • financial capacity • JV / consortium • legal & technical proposal

3

Method statement

Work plan • site organization • O&M safety • equipment • key personnel

4

Commercial controls

Bid / performance security • minimum assured payment • escalation template

5

Transparency

Measurement / reporting clauses • calibrated sensors • monthly dispatch • online access

6

Safety & compliance

No explosives • no over-extraction / below natural bed • court / NGT • environment • dam safety

Customize the model bid document with reservoir-specific qualification criteria, technical scope, special conditions, clearances and monitoring requirements.

Execution, Monitoring & Accountability

Make every cubic metre traceable



Digital monitoring supports quantity verification, movement tracking and compliance

Approved sectors

Only earmarked boundaries outside prohibited zones

Pre–post surveys

Joint bathymetry / topography verifies restored volume

GPS transport

Track separated material to destination

CCTV / SCADA

Monitor yard and automated quantification

Records & reports

Dispatch, soundings, registers, statutory compliance

Environmental safeguards

Turbidity, flow, flora/fauna, fish season, dust, noise, wastewater

Joint verification by Project Authority + contractor

Way Forward: From Pilots to Scalable Implementation

Action agenda



Objective: identify where sediment can be safely removed and productively used so that storage restoration becomes commercially viable — without compromising dam safety or environmental safeguards.

Thank You

Not every reservoir needs dredging, and not every dredging project can generate revenue.

The way forward is to identify where sediment can be safely removed and productively used so that storage restoration becomes commercially viable.

ASSESS | DE-RISK | CHOOSE MODEL | MONITOR | SCALE