



OPERATION AND MAINTENANCE OF ARTIFICIAL RECHARGE AND GROUNDWATER CONSERVATION STRUCTURES



TECHNICAL MANUAL AND GUIDELINES



SUSTAINABLE RECHARGE



RELIABLE WATER



RESILIENT FUTURE



OPERATION



MAINTENANCE



MONITORING



RECORD KEEPING



COMMUNITY
PARTICIPATION



RECHARGE WELL



RECHARGE SHAFT



PERCOLATION TANK



CHECK DAM



RECHARGE TRENCH



सत्यमेव जयते

Department of Water Resources,
River Development & Ganga Rejuvenation
Ministry of Jal Shakti
Government of India

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Note to Readers

- ***This manual provides a foundational framework for the maintenance of artificial recharge structures, specifically curated for practitioners and stakeholders who may not possess specialized expertise in hydrogeological sciences or recharge engineering.***
 - ***While users may consult relevant sections for specific operational needs, a holistic review of the document is recommended to ensure comprehensive understanding and the facilitation of effective O&M planning.***
 - ***The technical information has been streamlined for clarity and accessibility; however, its practical application must be appropriated according to localized site conditions and regional hydrogeological variations.***
 - ***Readers are encouraged to examine the referenced source documents and standard operating procedures cited herein to gain further technical depth and guidance.***
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Jointly prepared by



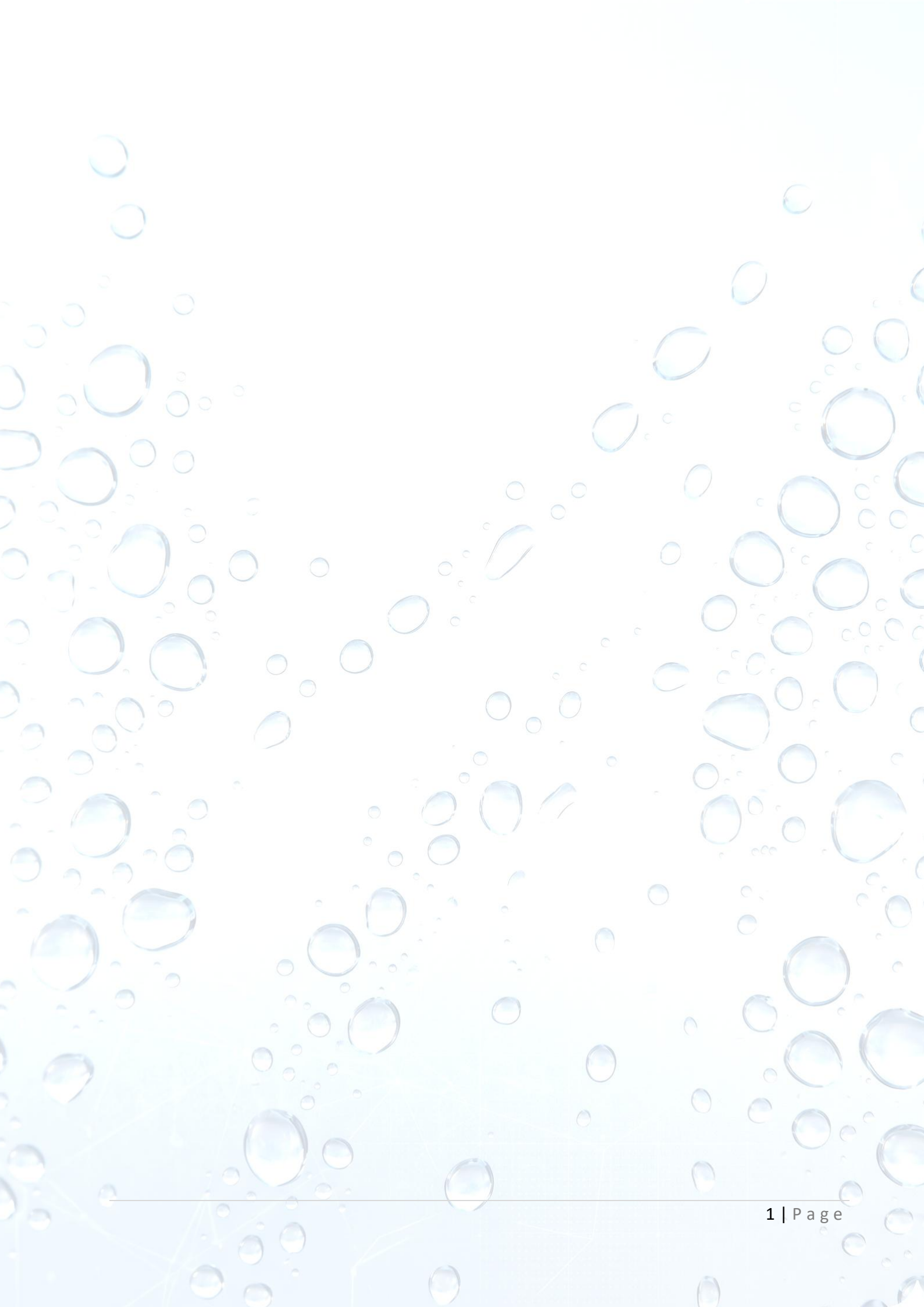
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Central Head Quarters
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Catch The Rain



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**Government of India
Ministry of Jal Shakti
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Abbreviations	
VBGRAMG	Viksit Bharat - Guarantee for Rozgar and Ajeevika Mission (Gramin)
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
O&M	Operation And Maintenance
CGWB	Central Ground Water Board
IMD	India Meteorological Department
RTRWHS	Rooftop Rainwater Harvesting Structures
NGOs	Non-Government Organisations
AR	Artificial Recharge
SoP	Standard Operating Procedures
NE	North East
SE	South East

Manual for Operation and Maintenance of Artificial Recharge & Water Conservation Structures

1. Overview and Objectives

The **Jal Sanchay Jan Bhagidari (JSJB)** initiative aims to strengthen India's journey towards water security through widespread public participation, water conservation, and groundwater recharge. Recognizing that the effectiveness of water conservation efforts depends not only on the creation of assets but also on their sustained functionality, special emphasis is placed on the operation, maintenance, repair, and renovation of existing water harvesting and groundwater recharge structures.

To ensure that these recharge structure perform optimally before the onset of the monsoon, a comprehensive pre-monsoon campaign is envisaged for the inspection, assessment, and restoration of structures such as soak pits, rooftop rainwater harvesting systems, ponds, check dams, and other recharge interventions. The initiative promotes convergence of resources from schemes such as **VBGRAMG, AMRUT, CAMPA**, and other ongoing programmes, while encouraging active participation of Gram Sabhas, Self-Help Groups, and local communities to transform water conservation into a true **Jan Andolan**.

This manual provides a comprehensive framework for the operation and maintenance (O&M) of artificial recharge and water conservation structures implemented under the schemes of the Ministry of Jal Shakti and allied departments. Drawing upon the **CGWB's Master Plan for Artificial Recharge to Groundwater**¹, the **Manual on Artificial Recharge of Ground Water**², state-level standard operating procedures, and **IMD rainfall climatology**³, the manual adopts both **structure-specific** and **agro-climatic/rainfall zone-based** approaches to ensure effective and sustainable management of water conservation assets.

Objectives

1. To provide standardized guidelines for the operation, maintenance, repair, and renovation of artificial recharge and water conservation structures across the country.
2. To ensure that existing water conservation assets remain functional, efficient, and capable of maximizing groundwater recharge and water storage potential.
3. To facilitate timely pre-monsoon inspection and maintenance of water harvesting and recharge structures for improved performance during the rainy season.
4. To define clear roles and responsibilities of implementing agencies, local bodies, communities, and other stakeholders for effective asset management.

¹ Manual on Artificial Recharge of Ground Water (Central Ground Water Board)

² Manual on Artificial Recharge of Ground Water

³ https://mausam.imd.gov.in/ind_latest/monsoon_report_2025_2.pdf

5. To promote convergence of financial and institutional resources available under various government schemes for maintenance and rejuvenation activities.
6. To encourage community participation, Gram Sabha engagement, and Jan Bhagidari in the upkeep and sustainability of water conservation infrastructure.
7. To provide region-specific and rainfall-based maintenance schedules and protocols suited to diverse hydro-climatic conditions across India.
8. To enhance the long-term sustainability, resilience, and effectiveness of water conservation interventions, thereby contributing to the objectives of Jal Sanchay Jan Bhagidari and the vision of a water-secure India

2. Reference Framework and Source Documents

The following key documents underpin this manual:

- **Manual on Artificial Recharge of Ground Water -2007⁴**, which provides guidance on technical design, site selection and maintenance considerations for recharge wells, shafts, ponds, tanks, check dams and related structures.
- **Master Plan for Artificial Recharge to Groundwater – 2020⁵**, which assesses state-wise recharge potential and recommends terrain-specific AR structures across India.
- **State SOPs for Rooftop Rainwater Harvesting Structures (RTRWHS)⁶**, e.g., the Haryana Water Resources Authority guidelines that include structured sections on design, district-wise normal rainfall, O&M, identification of defunct structures and maintenance schedules.
- Other relevant documents, such as standards from the Bureau of Indian Standards (BIS)⁷, guidance from NGOs, and specific state/city-level guidelines.

⁴ **Manual on Artificial Recharge of Ground Water** (www.cgwb.gov.in)

⁵ **Master Plan for Artificial Recharge to Groundwater – 2020**(www.cgwb.gov.in)

⁶ https://tcpharyana.gov.in/public_notice/Rainwater%20Harvesting.pdf

⁷ <https://law.resource.org/pub/in/bis/S03/is.14961.2001.pdf>

3. Zonal Rainfall and Operation and Maintenance Scheduling Framework

3.1 Rainfall Regimes in India:

The rainfall patterns in India are primarily characterized by the Southwest monsoon from June to September, along with the Northeast monsoon affecting regions like Tamil Nadu and Puducherry from October to December. The India Meteorological Department (IMD) categorizes the nation into 36 meteorological sub-divisions across four primary rainfall regions⁸: Northwest, Central, Northeast, and the South Peninsula. These regional variations directly dictate the required frequency for maintaining filters, inspecting structures, and desilting artificial recharge (AR) units.

3.2 Six O&M Zones and Indicative Annual Rainfall

For operation and maintenance planning, this manual groups States/UTs into six zones that broadly align with IMD rainfall patterns. The rainfall ranges below are compiled from IMD and national statistics (rounded):

Maintenance Zone	Included States and UTs	Estimated Annual Rainfall (mm)	Regional Characteristics
II. Indo-Gangetic & North-West Plains	Punjab, Haryana, Chandigarh, Delhi, Rajasthan plains, Uttar Pradesh, Bihar, West Bengal plains, Jharkhand	600–1,200	Primarily influenced by the SW monsoon; Rainfall in the NW sector) are lower (400–800 mm than in eastern areas.
III. Western Arid & Semi-arid	Western Rajasthan (Thar), Kachchh, and segments of Saurashtra in Gujarat	150–600	Rainfall is minimal and erratic; significant sediment loads are common during intense storm events.
IV. Central & Interior Deccan	Rest of Gujarat, Madhya Pradesh, Chhattisgarh, Maharashtra, Telangana, and interior Karnataka/Andhra Pradesh	800–1,400	SW monsoon dependency with notable inter-annual variations.

⁸ https://mausam.imd.gov.in/imd_latest/contents/index_rainfall_subdiv.php

V. Western Coast & Ghats	Coastal Gujarat (south of Surat), coastal Maharashtra, Goa, coastal/Malnad Karnataka, Kerala, Western Ghats	2,000–4,000	Intense monsoon rainfall leading to high runoff and accelerated siltation across multiple events.
VI. Eastern Coast & North-East	Odisha, coastal Andhra, Tamil Nadu & Puducherry, coastal West Bengal, NE states, A&N Islands, Lakshadweep	1,000–3,500	The NE region sees exceptionally high rainfall; the SE coast experiences a bimodal pattern with heavy Oct–Dec rains.

Table 1: The maintenance zonation in line with IMD climate zonation and related characteristics.

These defined rainfall ranges enable implementing agencies to customize operation and maintenance strategies. Generally, regions with higher rainfall or steeper terrain require more frequent structural inspections and desilting efforts.

3.3 Standard Seasonal O&M Windows:

The maintenance activities for artificial recharge structures are divided into three broad categories based on the optimal timing and the specific nature of the required interventions:

- **Pre-monsoon O&M:** This involves comprehensive inspection, deep cleaning, and necessary repairs conducted before major inflows begin. Typically scheduled between April and June, or August and September for the Northeast monsoon-dominated Southeast coast, activities include sweeping catchment areas, clearing gutters, and resetting first-flush diverters.
- **Peak-Season Checks:** These are rapid, routine inspections performed after high-intensity rainfall events during the monsoon. The primary focus is on identifying inlet blockages, monitoring silt deposition, and detecting any immediate structural distress or overflow issues to ensure continued performance.
- **Post-monsoon O&M:** Following the main recharge season (typically October–November or January–February for the southeast coast), a thorough condition assessment is conducted. This phase includes measuring water level responses, evaluating infiltration performance, and planning for structural strengthening or desilting before the next cycle.

4. General O&M Principles for all Structures:

4.1 Clean catchment, inlet and storage areas

Catchments, inlets and storage zones around AR structures must be kept free from solid waste, plastics, loose soil heaps and vegetation that impede flow or cause contamination. Periodic

cleaning prior to and during the monsoon is critical to maintain infiltration capacity and prevent choking of filters and wells.

4.2 Regular desilting based on Rainfall intensity

The frequency and extent of desilting depend on annual and event Rainfall as well as catchment characteristics. In high-rainfall zones (V and VI) and in small, steep catchments, desilting of ponds, percolation tanks, and check dams may be required every 1–3 years, whereas low-Rainfall zones with gentle slopes may be managed with longer cycles (3–5 years).

4.3 Protection from contamination:

It must be ensured that water being recharge is of appropriate quality. Stormwater from relatively clean catchments, or treated wastewater that meets Central Ground Water Board/Bureau of Indian Standards criteria and Central Pollution Control Board requirements. Sewage, industrial effluents, and Sludge management guidelines must be followed to prevent heavily contaminated urban runoff from entering AR structures through appropriate diversion, treatment, and source control measures.

4.4 Safety, signage and access control

Open wells, shafts, pits and tank embankments must be secured with covers, railings, parapets and warning signboards to prevent accidents. In urban and peri-urban settings, AR structures should be fenced and maintained with controlled access.

4.5 Monitoring, records and performance review

Consistent with this SoP and state SOPs, agencies should maintain **Operation and Maintenance Registers** or digital databases documenting rainfall, inflows, silt removal, structural condition, water levels and quality parameters. Periodic performance reviews help priorities rehabilitation and optimize future designs.

5. Structure-wise Operation and Maintenance Guidelines with Zonal Rainfall Appropriations

The operation and maintenance of artificial recharge and water conservation structures would be different on the basis of rainfall zones it lies in and frequency.

Where “higher rainfall zones” are referenced, these typically correspond to Zones I, V and VI.

Low rainfall zones” correspond to Zone III and drier parts of Zone II.

5.1 Bore-well recharge and defunct bore-well recharge

Bore-well recharge structures convey stormwater or roof runoff through silt traps and filters into dedicated recharge bores or defunct irrigation/tube wells.

Key Operation and Maintenance tasks (all zones):

- Pre-monsoon: clean silt traps and collection chambers; wash/replace filter media; inspect casing, screen and well head; ensure proper platform drainage and secure covers.
- During season: after major rainfall events, clear silt and debris from inlet structures; visually check rate of infiltration to detect clogging.
- Post-monsoon: measure groundwater levels in observation wells; if recharge performance has declined, plan redevelopment.

Rainfall-Based Maintenance Frequency

- Zones V & VI (very high rainfall:): desilt and clean silt traps after each heavy spell or at least three times per monsoon; check for fine sediment ingress more frequently.
- Zones I, II, IV (moderate rainfall:): pre- and post-monsoon cleaning plus one mid-monsoon check usually suffice, unless catchment is highly erodible.
- Zone III (arid/semi-arid): fewer events but high sediment load; clean after every significant storm even if annual rainfall is low.

5.2 Injection wells

Borewell of diameter of 4 inch and 6 inch or 8 inch and filled space annular space with filter media make conduit for the recharge of ground water through or direct recharge.

Operation and Maintenance:

- Maintain multi-stage treatment systems (settling tanks, filters, disinfection) with regular backwashing and periodic media replacement.
- Monitor injection pressure, flow rate and water quality; abnormal pressure increases indicate clogging.
- Conduct periodic redevelopment (air-lifting, surging, chemical treatment) as recommended by technical experts.

Where injection relies on monsoon flows or wastewater generation that varies seasonally, pre-operation servicing should be scheduled just before major inflow periods, typically ahead of SW or NE monsoon onset.

INJECTION WELL FOR GROUNDWATER RECHARGE – OPERATION & MAINTENANCE

Collect Rain – Store Water – Recharge Groundwater – Support Life

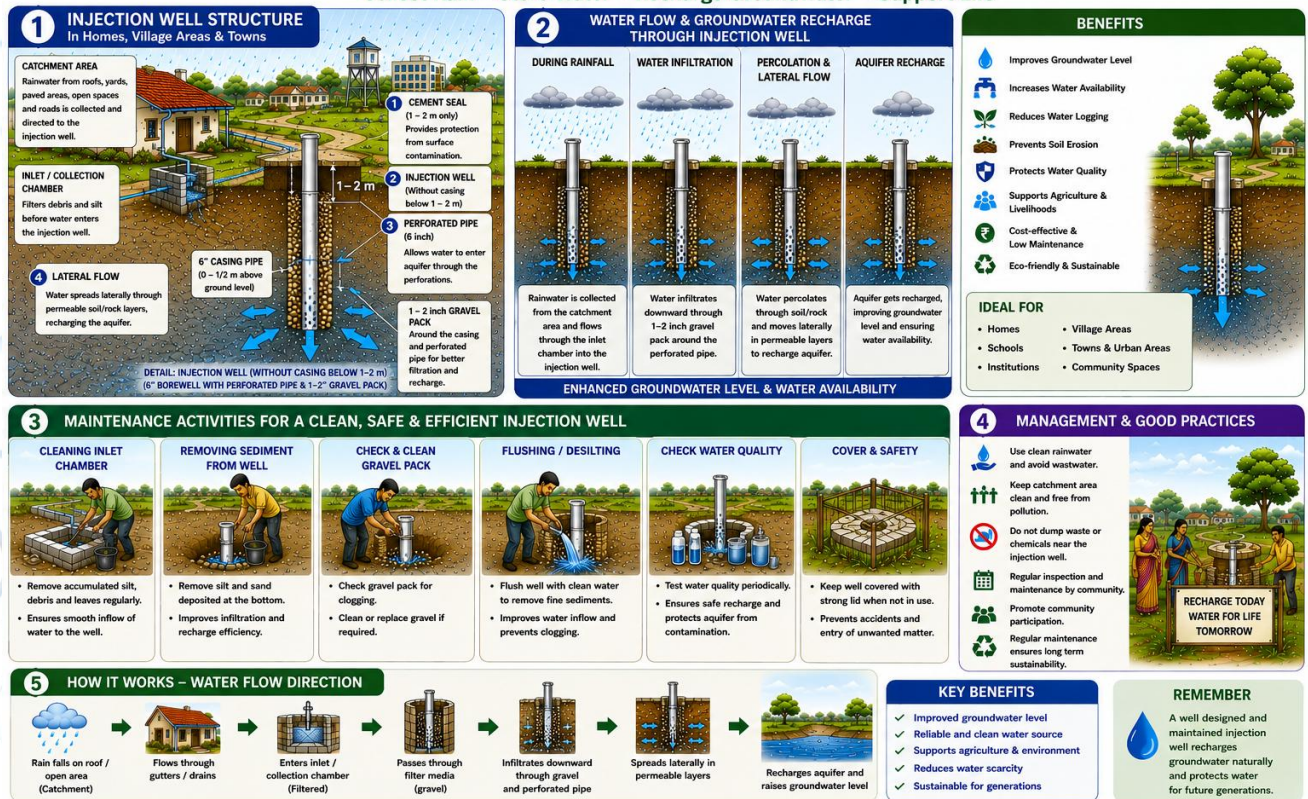


Figure 1: Operation and Maintenance activity for Injection Wells.

5.3 Recharge shafts

Recharge shafts rapidly convey water to permeable strata at depth via vertical shafts with graded filter media.

- Pre-monsoon: dewater, remove silt/debris, wash and re-lay filter media, repair lining and surrounding backfill.
- During season: after intense storms, remove debris at inlets and top grills; verify that collected water dissipates in design time.
- Post-monsoon: inspect for settlement or erosion around shaft and repair.

RECHARGE SHAFT WITH BOREWELLS & LATERAL FLOW – OPERATION & MAINTENANCE

Collect Rain – Store Water – Recharge Groundwater – Support Life

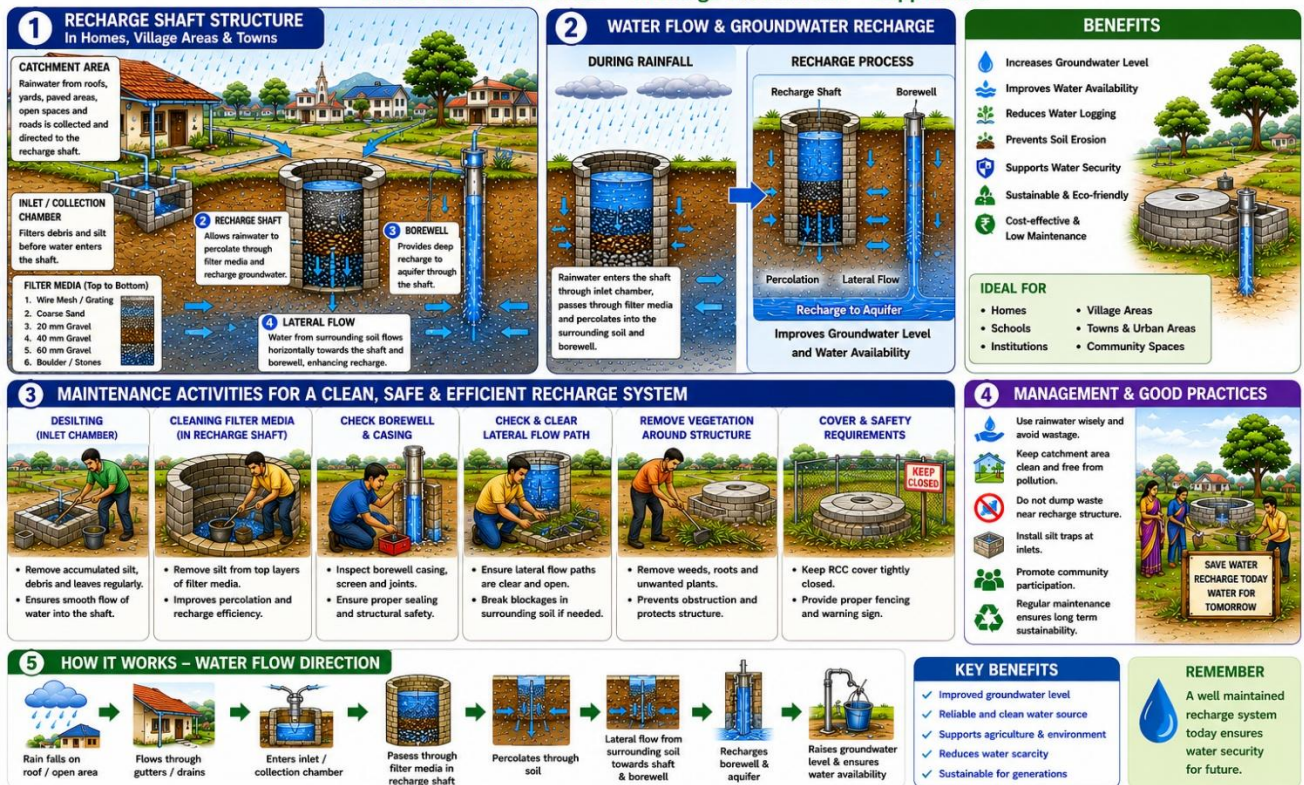


Figure 2: Operation and Maintenance activity for Recharge Shafts.

Rainfall-Based Maintenance Frequency:

In high rainfall/steep terrain (Zones I, V, NE parts of VI), shafts experience heavy sediment and require at least one mid-monsoon cleaning in addition to annual pre-monsoon cleaning.

In low-rainfall: arid areas, annual cleaning may be sufficient if data from the monitoring station confirms good percolation/infiltration.

5.4 Recharge Pits and Trenches:

Recharge pits and trenches capture roof or surface runoff in shallow excavations filled with filter graded media.

- Pre-monsoon: Clean pits/trenches and inlet drains; wash or replace filter media; loosen compacted bottom of the pit/trench.
- During season: Remove fresh silt and debris after every heavy rainfall event.
- Post-monsoon: Evaluate infiltration performance; redesign or deepen where stagnation persists.

Rainfall-Based Maintenance Frequency

In zones with high annual rainfall and high runoff coefficients (urban surfaces, rocky catchments), additional mid-season cleaning may be required, especially in Zones V and North-Eastern parts of Zone VI.

In low-rainfall but high-sediment zones (Zone III), cleaning is event-driven rather than calendar-driven.

5.5 Recharge through dug wells

Existing dug wells may be used for recharge where hydrogeology permits.

- Pre-monsoon season: clean well (remove scum, floating matter, silt), disinfect where used for drinking; maintain parapet, cover and apron.
- During season: skim floating material after inflow events; monitor turbidity.
- Post-monsoon season: monitor water level and yield; inspect masonry/lining.

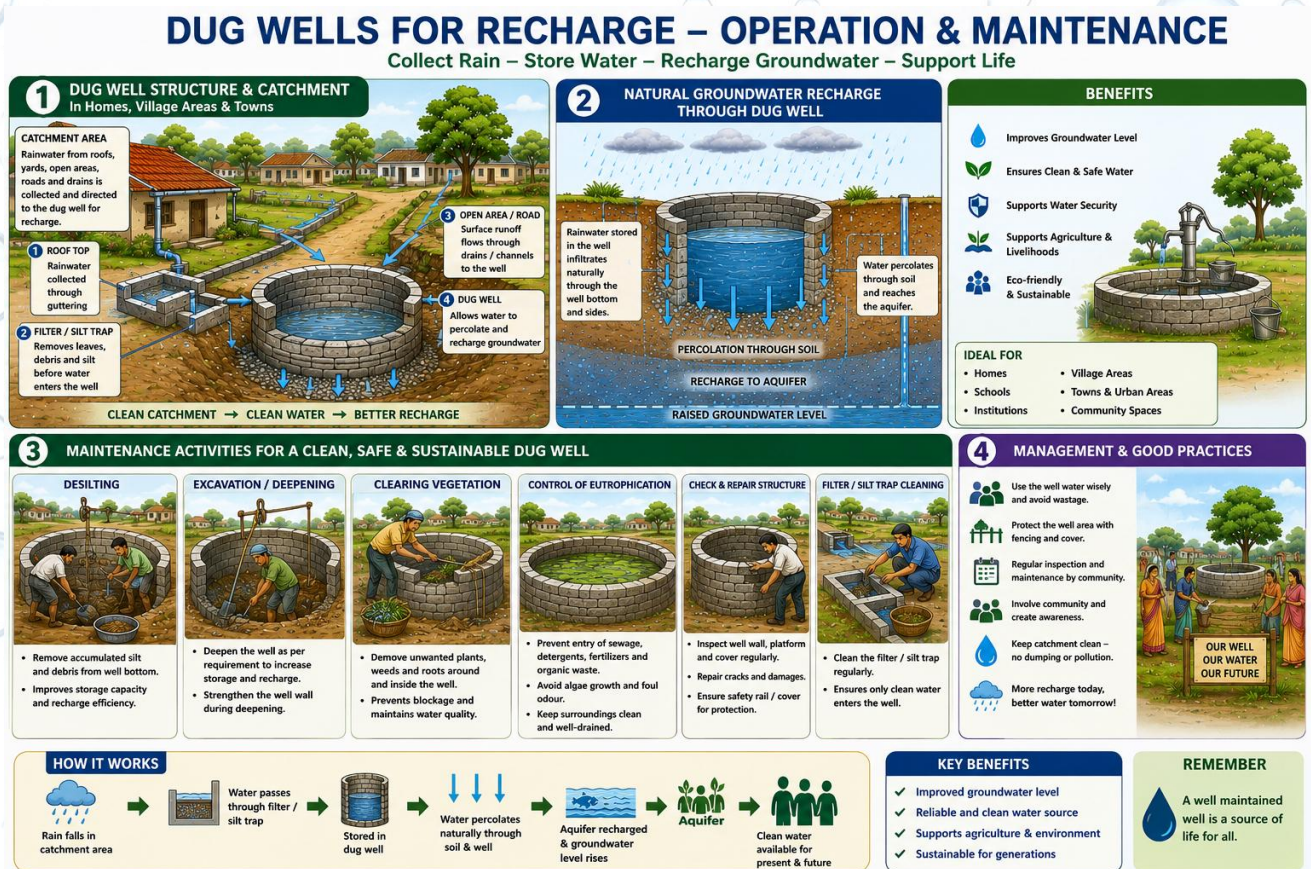


Figure 3: Operation and Maintenance activity for Dug Wells.

Higher Rainfall: zones may require more frequent skimming during prolonged wet periods, while arid zones may see fewer but more intense events requiring post-storm cleaning.

5.6 Rooftop rainwater harvesting structures (for recharge)

RTRWH are mostly constructed to harness the rooftop runoff for consumptive or recharge purposes. Roof Top Rain Water Harvesting Structure maintenance needs a structured approach.



Figure 4: Operation and Maintenance activity for Rooftop Rain Water Harvesting Structures.

For national application:

- Pre-monsoon season: clean roofs, gutters, downpipes, screens; check roof slopes and joints; test first-flush devices; open and clean filters.
- During season: after first and major storms, clear screens/inlets, operate and reset first-flush, and check for filter bypassing.
- Post-monsoon season: drain filter chambers, repair pipes and supports.

In high rainfall: zones, increased organic load and dust wash-off demand more frequent cleaning of screens and filters, typically monthly during monsoon.

In low rainfall: areas, annual pre-monsoon cleaning plus a mid-season check may suffice.

5.7 Gully Plugs, Nala Bunds and Gabion Structures

These small structures slow runoff in gullies and nalas, promoting infiltration and local recharge.

- Pre-monsoon season: inspect bunds/gabions for settlement, cracks, burrows and displacement clear upstream sections.
- During season: after storms or floods, check for overtopping signs, erosion and piping undertake prompt repairs.
- Post-monsoon season: consolidate repairs and stabilize embankments with vegetation.

In high rainfall: areas, inspection after each significant event (e.g., rainfall exceeding a threshold derived from local IMD intensity-duration statistics) is recommended, while in low rainfall regions monthly visual checks during monsoon may be adequate.

5.8 Check Dams

Check dams are vital artificial recharge structures across semi-arid and hard-rock regions.

- Pre-monsoon season: conduct structural inspections, verify spillway condition and freeboard, and identify siltation near the dam wall.
- During season: after major floods, inspect for erosion, overtopping and damage to energy dissipation arrangements.
- Post-monsoon season: desilt upstream storage area with priority near the dam; update storage-capacity estimates and plan phased desilting.

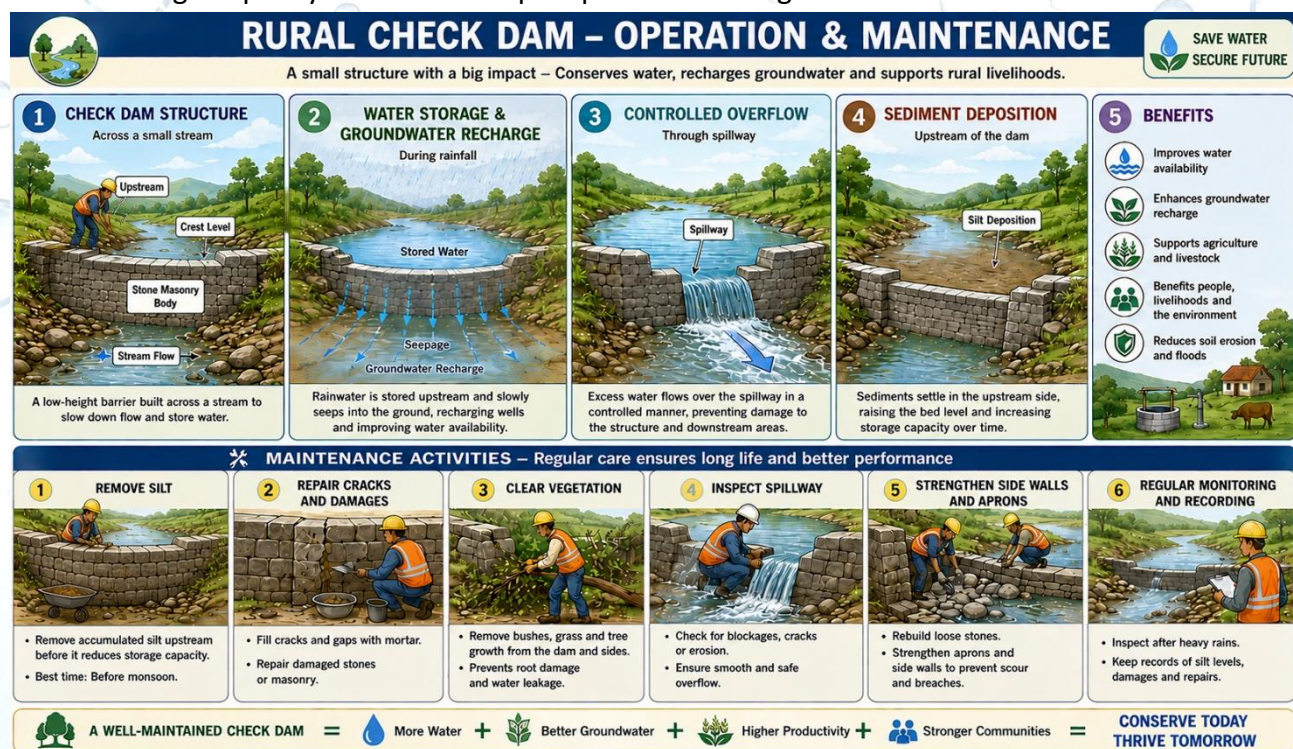


Figure 5: Operation and Maintenance activity for Check Dams.

Desilting frequency must be closely linked to rainfall and sediment yield:

In high-rainfall, high-erosion basins (e.g., parts of Zones V and VI) may require desilting every 1–2 years.

Whereas, in more stable basins may follow 3–5-year cycles based on monitoring.

5.9 Sub-surface Dykes

Sub-surface dykes are cut-off walls below streambeds used to raise upstream groundwater levels.

- Pre-monsoon season: inspect accessible parts of cut-off walls and banks; clear the streambed of heavy silt and waste.
- During season: observe stream behavior in high flow to detect flanking or bypass around the dyke.
- Post-monsoon season: monitor upstream/downstream groundwater levels to verify expected mounding; address serious erosion or seepage.

The monitoring frequency for sub surface dykes must be kept higher in zones with high rainfall and flow variability (Zones I, V, VI) as compared to arid zones.

5.10 Village Ponds, Percolation Ponds and Tanks

These structures provide both surface storage and groundwater recharge.

- Pre-monsoon season: desilt inlet areas and key bed portions; repair embankments, sluices and spillways; remove problematic weeds and close burrows.
- During season: monitor for overtopping risk, slope erosion and toe seepage.
- Post-monsoon season: assess effective capacity, plan desilting and structural strengthening.

VILLAGE POND – OPERATION & MAINTENANCE

Collect Rain – Store Water – Recharge Groundwater – Support Life

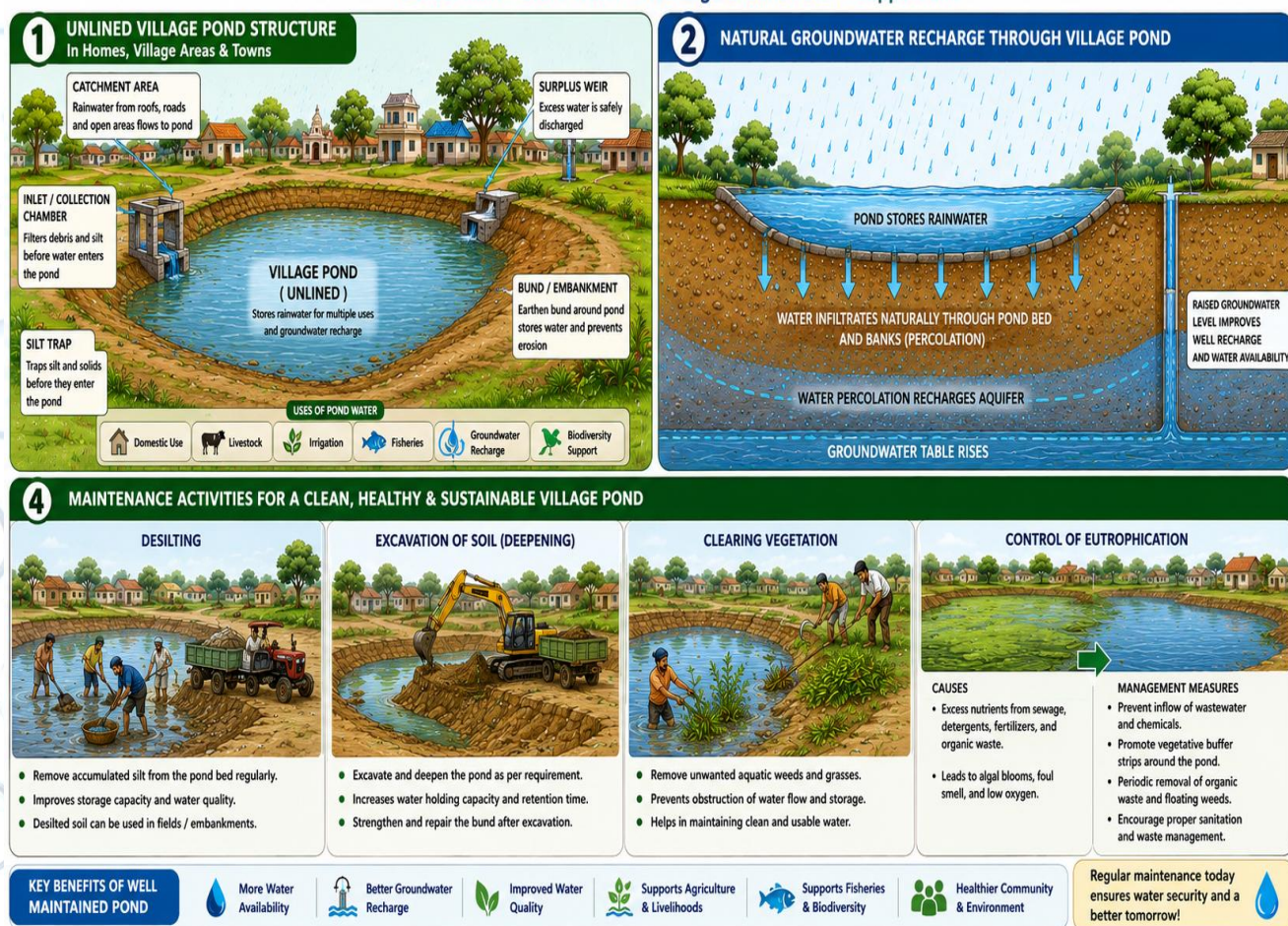


Figure 6: Operation and Maintenance activity for village pond.

High-rainfall zones with high runoff coefficients usually require more frequent desilting of percolation ponds (1–3 years), whereas low-rainfall regions may manage with longer intervals if performance monitoring confirms adequate infiltration.

5.11 Bench Terracing and Soil-and-Water Conservation Measures

Bench terracing, contour bunding and similar measures reduce slope runoff and enhance infiltration.

- Pre-monsoon season: inspect terrace risers, bunds and outlets; repair rills and breaches; reinforce vegetation.
- During season: after heavy rains, inspect for overtopping and fresh erosion.
- Post-monsoon season: consolidate repairs and strengthen vegetative cover.

In high rainfall hilly areas (Zone I), inspection must be more frequent due to landslide risk; in moderate rainfall interior areas, standard pre- and post-monsoon inspections may suffice.

5.12 Innovative/low-cost Models

For modular recharge units, injection galleries and other innovative models, operation and maintenance must follow structure-specific standard operating procedures derived from design documents. Rainfall factors should be incorporated through design runoff calculations and cleaning frequencies similar to comparable standard structures.

6. Incorporating Annual Rainfall into Operation and Maintenance Planning

6.1 Using India Meteorological Department and State Rainfall data

IMD provides gridded daily rainfall data⁹ (0.25° resolution) and normal rainfall maps. Agencies should use these datasets to:

- Determine average annual rainfall and monsoon concentration for each district or project area.
- Compute expected runoff volumes from catchments and rooftops using standard runoff coefficients.
- Decide O&M intensity indicators, such as expected silt load and number of high-intensity events triggering inspections.

7. Identification of Defunct Structures and Rehabilitation

The field teams should periodically identify defunct artificial recharge structures (non-functional or significantly underperforming structures) and record causes such as siltation, structural failure or water quality issues.

Potential actions include:

- Restoration through desilting, filter replacement and inlet redesign.
- Structural repairs or retrofitting to address seepage or foundation issues.
- Relocation or conversion to alternative uses where hydrogeological conditions have changed.

Rehabilitation planning should consider rainfall trends and projections (e.g., increased variability and intensity) as documented in national rainfall analyses.

⁹ https://mausam.imd.gov.in/imd_latest/contents/index_rainfall_subdiv.php

8. Type-wise O&M Checklist for Artificial Recharge Structures

The comprehensive structure type-wise standard operation and maintenance (O&M) checklists prepared for commonly used artificial recharge structures.

For any structure that qualifies as a "specified dam" under the Act, these checklists shall be read together with the approved O&M Manual and instructions issued by the various authorities.

For all recharge structures, the **Owner/Project Authority** shall maintain a site-level O&M register or digital database recording inspections, maintenance, incidents and key parameters (such as water levels, storage, silt removed), in line with good practices prescribed by National Dam Safety Authority (NDSA) ¹⁰for specified dams. Pre-monsoon, post-monsoon and any special inspection reports for large tanks/check dams shall be submitted to the competent authority as per prevailing dam safety procedures.

Table 2: The maintenance activities for Category 1 (Bore-well Recharge Structures)

S. No.	Type of Structure	Pre-monsoon Actions	During Season	Post-monsoon Actions	Minimum Frequency
1	Bore-well Recharge	Clean silt traps/chambers; wash/replace filter media; inspect casing, screen, and wellhead; connect only unpolluted water.	Clear silt/filters after storms; monitor recharge rates for declines; update O&M register.	Log water levels in nearby wells; plan redevelopment if performance drops.	Annual pre- and post-monsoon actions; clean traps after major storms.
2	Defunct Bore-well Recharge	Per bore-well recharge; verify pump disconnection, check for collapse/silt, and ream if needed.	Stop waste dumping; keep borehole covered and fenced; log all incidents.	Evaluate safety and effectiveness; record rehabilitation or decommissioning decisions.	As per bore-well recharge.
3	Injection Well	Service tanks/filters; replace media; test water quality; check hardware; update logbook.	Log rate/pressure; back-flush components; check for leaks and record maintenance.	Analyze injected volume and aquifer response; schedule redevelopment if efficiency drops.	Annual pre-season service; weekly operational checks or as designed.

¹⁰ <https://ndsa.gov.in/downloads>

Table 3: The maintenance activities for Category 2 (Rain Water Harvesting Structures)

S. No.	Type of Structure	Pre-monsoon Actions	During Season	Post-monsoon Actions	Minimum Frequency
4	Rooftop Water Harvesting Structure (for recharge)	Clean roof, gutters, downpipes and screens; repair slopes and joints; test first-flush device; open filter chamber and wash/replace media.	After first and major storms, clear screens and inlets; ensure first-flush is operated/reset; check for overflow or bypassing of filter; make brief entry in O&M register.	Drain and clean filter chamber if stagnant; repair damaged pipes, supports and covers.	Full pre-monsoon maintenance annually; at least two in-season checks.
5	Recharge Shaft	Dewater and remove silt/garbage; wash and re-lay graded media; repair lining and cracks; check fencing and top grating.	After intense rains, clear inlets and top grilles; ensure free entry of water; record any damage or unusual behavior.	Inspect for settlement or erosion around shaft; restore and backfill pitching.	Full cleaning at least once annually; additional mid-season cleaning in high-silt catchments.
6	Recharge Pit	Remove silt, weeds and waste from pit and inlets; wash or replace gravel-sand media; loosen sealed bottom if required.	After large storms, clear inlets and top media of fresh silt; note repeated clogging issues.	Check for percolation; if water stagnates abnormally, examine for redesign or deepening, and record the recommendation.	Thorough cleaning annually; event-based checks after major storms.
7	Recharge Trench	Clean trench bed and side drains; wash and re-lay media; repair side walls or pitching.	Inspect after heavy rains; remove debris causing blocking or scouring; document serious erosion.	Restore collapsed sections and side slopes as needed.	Annual cleaning; event-based checks.

8	Dug Well Recharge	Clean well (scum, silt); repair parapet, cover, steps, and apron; service silt trap/filter; disinfect if for drinking.	After major inflows, skim floating material and visually check turbidity; record any quality issues.	Measure change in water level/yield; inspect lining for cracks or bulging and record findings.	Full pre- and post-monsoon maintenance annually.
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Table 3: The maintenance activities for Category 3 (Stream Based Recharge Structures)

S. No.	Type of Structure	Pre-monsoon Actions	During Season	Post-monsoon Actions	Minimum Frequency
9	Gully Plug	Inspect bund/rubble across gully for settlement, cracks and burrows; clear upstream section of major obstructions.	After storms, check for overtopping, erosion and piping; repair immediately and note actions.	Consolidate repaired portions; stabilize with vegetation.	Annual pre- and post-monsoon checks plus event-based inspections after major storms.
10	Nalla Bund	Inspect bund and abutments; repair cracks and erosion; desilt upstream pocket near bund; check spillway and downstream protection.	After major runoff, check for scour at toe and abutments; plug leak paths; record serious defects and repairs.	Plan desilting where storage loss is high; restore turfing and pitching.	Detailed pre- and post-monsoon inspection; storm-time checks.
11	Gabion Structure	Inspect gabion boxes for damage or bulging; desilt upstream area.	Check for toe erosion after high flows; record all observations.	Repair damaged boxes/aprons; repack stones.	Annual full inspection and post-flood checks.
12	Check Dam	Check dam for cracks/settlement; verify freeboard. Use Dam Safety Manual for specified dams.	Inspect for erosion/damage after floods; log per safety protocols.	Desilt upstream; repair slopes; finalize inspection report.	Annual pre/post-monsoon and post-flood inspections.
13	Sub-surface Dyke (SSD)	Inspect walls for cracks; clear silt and waste from stream reach.	Monitor flow for flanking or bypass; record unusual behavior.	Track water levels; repair erosion or seepage.	Annual pre/post-monsoon and post-flood checks.

Table 4: The maintenance activities for Category 4. (Water Conservation Structures)

S. No.	Type of Structure	Pre-monsoon Actions	During Season	Post-monsoon Actions	Minimum Frequency
14	Village Pond	Desilt inlet areas and shallow bed portions; repair bunds, sluices and spillways; close animal burrows; remove problematic weeds.	Monitor for overtopping, slope erosion and toe seepage; record critical observations.	Review siltation and plan phased deeper desilting; prevent dumping/encroachment through fencing and signage.	Structural checks: Annual; Desilting: every 3–5 years ¹¹ , or as required.
15	Percolation Pond	Desilt bed to expose strata; loosen layers; repair bunds/spillway.	Observe infiltration; check soil/ inlets if water stagnates; record data.	Use local water-level data to evaluate recharge.	Annual inspection; desilt every 3–5 years.
16	Tank	Inspect embankment, sluices, and spillways; clear inlets; desilt; remove weeds.	Monitor for slides, cracks, and toe seepage during high storage; report distress.	Assess siltation loss; plan repairs; write post-monsoon note.	Pre/post-monsoon checks; periodic desilting.
17	Bench Terracing	Inspect risers, bunds, and outlets; repair rills and breaches; reinforce vegetation.	Check for overtopping and erosion after heavy rain; repair promptly.	Consolidate repairs and improve vegetative cover.	Annual and post-heavy-rain inspections

This manual has provided a consolidated, structure and zone-oriented framework to standardize the Operation and Maintenance (O&M) of artificial recharge structures. By aligning maintenance frequency with localized rainfall regimes and providing clear, actionable checklists for various structures, this document supports the overarching mission of the Jal Sanchay Jan Bhagidari initiative. The sustained functionality of these water conservation assets ultimately rests on the commitment of all stakeholders—from practitioners in the field to actively participating communities—to rigorously implement these principles, ensuring India progresses toward a truly water-secure future.

¹¹ <https://amrut.mohua.gov.in/uploads/Advisory-on-Urban-Waterbody-Rejuvenation.pdf>

Comprehensive Maintenance Checklist
Structure-wise O&M
(Annexure-I)

S. No.	Structure Type	Pre-monsoon Actions	During Season	Post-monsoon Actions	Min. Frequency
1	Bore-well Recharge	Clean silt trap/chamber; wash/replace media; inspect casing/wellhead.	Clear silt after storms; observe recharge rate; log findings.	Record water level response; plan redevelopment if performance drops.	Full pre/post annual; event cleaning.
2	Defunct Bore-well Recharge	Same as #1; verify old pump disconnected; check for internal collapse.	Prevent waste dumping; keep head covered/fenced; record incidents.	Assess effectiveness/safety; identify for rehab or decommissioning.	Same as #1.
3	Injection Well	Service tanks/filters; replace media; test water quality; check gauges.	Log injection rate/pressure; back-flush well/filters; check for leaks.	Review cumulative volume/aquifer response; schedule redevelopment.	Full-service pre-season; weekly checks.
4	Rooftop Water Harvesting	Clean roof/gutters/pipes; test first-flush; wash/replace filter media.	Clear screens after storms; reset first-flush; check for filter bypass.	Drain/clean stagnant filters; repair pipes, supports, and covers.	Full annual pre-monsoon; 2 seasonal checks.
5	Recharge Shaft	Dewater and remove silt; wash/re-lay media; repair lining/fencing.	Clear inlets/grilles after intense rains; record damage/unusual behavior.	Inspect for settlement/erosion; restore backfill and pitching.	Full annual cleaning; mid-season if high silt.
6	Recharge Pit	Remove silt/weeds/waste; wash/replace media; loosen sealed bottom.	Clear inlets/top media of fresh silt after large storms.	Check percolation; examine for redesign if stagnation persists.	Thorough annual; event-based checks.

S. No.	Structure Type	Pre-monsoon Actions	During Season	Post-monsoon Actions	Min. Frequency
7	Recharge Trench	Clean bed and side drains; wash/re-lay media; repair walls/pitching.	Inspect after heavy rains; remove debris; document serious erosion.	Restore collapsed sections and side slopes as needed.	Annual cleaning; event-based checks.
8	Recharge / Dug well	Pump out silt/scum; repair parapet/apron; clean silt trap; disinfect.	Skim floating material after inflows; visually check turbidity.	Measure water level/yield change; inspect lining for cracks.	Full annual pre- and post-monsoon.
9	Gully Plug	Inspect for settlement/cracks/burrows; clear upstream obstructions.	Check for overtopping/piping after storms; repair immediately.	Consolidate repairs; stabilize with vegetation.	Annual pre/post; event-based inspections.
10	Nalla Bund	Inspect bund/abutments; repair cracks; desilt upstream pocket.	Check for scour at toe/abutments; plug leaks; record defects.	Plan desilting if storage loss is high; restore turfing/pitching.	Detailed pre/post annual; storm checks.
11	Gabion Structure	Check for broken wires/bulging/displacement; desilt upstream.	Inspect for undermining or washout of toe after high flows.	Re-pack stones; repair damaged boxes and apron.	Annual full inspection; post-flood checks.
12	Check Dam	Inspect body/spillway for cracks/seepage; verify freeboard.	Check for overtopping/slope erosion; record in dam logbook.	Desilt upstream (near dam); restore slope protection.	Pre/post annual; post-flood checks.
13	Sub-surface Dyke (SSD)	Inspect exposed cut-off/wing walls;	Observe streams for	Monitor groundwater	Annual pre/post;

S. No.	Structure Type	Pre-monsoon Actions	During Season	Post-monsoon Actions	Min. Frequency
		clear stream of heavy silt.	flanking/bypass around dyke during high flow.	levels; repair erosion or seepage paths.	post-flood checks.
14	Village Pond	Desilt inlets/ shallow bed; repair bunds/spillways; remove weeds.	Monitor for overtopping, slope erosion, and toe seepage.	Review siltation; plan phased desilting; prevent encroachment.	Annual structural; desilt 3–5 years.
15	Percolation Pond	Desilt bed to expose permeable strata; repair bunds/spillway.	Observe infiltration; record findings if prolonged stagnation occurs.	Use nearby water-level data to assess recharge benefits.	Annual inspection; desilt 3–5 years.
16	Tank	Inspect embankment/ sluices; clear inlets; remove aggressive weeds.	Check for slides/cracks/toe seepage; record any distress.	Assess storage loss; plan desilting; prepare inspection note.	Annual pre/post; periodic desilting.
17	Bench Terracing	Inspect risers/ bunds/outlets; repair rills; reinforce vegetation.	Inspect for overtopping and fresh erosion after heavy rains.	Consolidate repairs and improve vegetative cover.	Annual; post-heavy-rain checks.

References and Bibliography

This manual is underpinned by the following key documents and institutional frameworks:

- **Manual on Artificial Recharge of Ground Water** (Central Ground Water Board)
- **Master Plan for Artificial Recharge to Groundwater – 2020** (CGWB)
- **State SOPs for Rooftop Rainwater Harvesting Structures (RTRWHS)**, including, for example, the Haryana Water Resources Authority guidelines, which provide structured sections on design, O&M, and maintenance schedules.
- Standards from the **Bureau of Indian Standards (BIS)**.
- Relevant guidance from **NGOs** and specific **state/city-level guidelines** (e.g., Bangalore Municipality).
- Guidelines and schemes of the **Ministry of Jal Shakti (MoJS)** and allied departments in India.
- Data and analysis from the **India Meteorological Department (IMD)**, particularly IMD Rainfall climatology.
- **Dam Safety Act, 2021** and the **National Dam Safety Authority (NDSA)** regulations, which inform the surveillance, inspection, operation, maintenance, and record-keeping for water retaining structures addressed in the checklists.
- National Framework for Sediment Management, **Ministry of Jal Shakti (MoJS), Department of Water Resources, River Development & Ganga Rejuvenation**

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