ENVIRONMENTAL | IMPACT ASSESSMENT | 2026

ENVIRONMENTAL IMPACT ASSESSMENT

Restoration of the Masaorambhu Stream

Desilting & Reconstruction of Seven Check Dams

LOCATION	REPORT PERIOD	STUDY TYPE
Masaorambhu Stream, Siruvani, Coimbatore	December 2024 — January 2026	Longitudinal Environmental Assessment

IMPLEMENTED BY	SUPPORTED BY	PREPARED BY
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1. Executive Summary

This Environmental Impact Assessment evaluates the ecological, hydrological, structural and socio-economic outcomes of the restoration of the Masaorambhu Stream — a tributary of the Noyyal River originating in the Western Ghats. The project restored seven damaged check dams and rehabilitated a 5.63 km stretch of the stream through desilting, reconstruction of masonry structures, bund strengthening, weed removal and ecological restoration.

The baseline assessment conducted in December 2024 revealed that most check dams were structurally damaged, with significant silt accumulation and severe weed infestation that restricted water flow and groundwater recharge. Following interventions, interim monitoring (April 2025 & September 2025) confirms that the restored structures are functioning effectively — with increased water spread areas, storage volumes and percolation potential.

KEY PROJECT OUTCOMES

86,796
CUBIC METRES SILT REMOVED

58.5 Cr
LITRES ANNUAL WATER HANDLING

~3 km
GROUNDWATER RECHARGE RADIUS

65,046
CUBIC METRES LIVE STORAGE PER CYCLE

400 ft
GROUNDWATER TABLE RISE OBSERVED

190%
INCREASE IN CROP YIELD

1,850
FARMERS BENEFITED

3,700
ACRES OF FARMLAND STABILISED

60-70%
REDUCTION IN PUMPING ENERGY

The intervention resulted in the removal of approximately 86,796 cubic metres of accumulated silt across the seven check dams. Digital survey analysis indicates that the system originally contained an estimated ~1,10,000 cubic metres of sediment, of which nearly 82% was removed.

This desilting directly enabled the creation of approximately 90,000 cubic metres of water storage volume, transforming previously silted and non-functional structures into active storage systems. Post-restoration, the check dam network now supports an effective live storage capacity of ~65,046 cubic metres per cycle. With an estimated 9 filling cycles annually, the system facilitates an annual water handling potential of approximately 5.85 lakh cubic metres (~58.5 crore litres), significantly enhancing groundwater recharge and irrigation reliability.

HEADLINE FINDING

The project demonstrates the effectiveness of decentralised water conservation infrastructure in restoring hydrological balance and strengthening climate resilience in semi-arid regions. Farmers near Check Dam 6 have reported groundwater tables rising from depths of 500 ft to just 100 ft — a recharge radius extending up to 3 km from the stream corridor.

2. Project Background

The Masaorambhu Stream Restoration Project forms part of a broader effort to strengthen water security and ecological sustainability within the Noyyal River basin — one of the important tributary systems of the Cauvery River in Tamil Nadu. The intervention focuses on restoring degraded stream infrastructure, improving groundwater recharge, and enhancing agricultural resilience in the region.

Over the past several decades, the hydrological systems within the Noyyal basin have experienced increasing stress due to urban expansion, industrial activity, and declining maintenance of traditional water harvesting infrastructure. As a result, many streams, tanks, and irrigation structures that historically supported agriculture and groundwater recharge have gradually deteriorated.

The restoration of the Masaorambhu Stream represents a targeted watershed management initiative aimed at reviving a critical tributary of the Noyyal River and restoring its role as a natural water retention and recharge system.

2.1 The Noyyal River Basin

The Noyyal River originates in the Vellingiri Hills of the Western Ghats — a region known for its high rainfall and rich biodiversity. From its origin, the river flows eastward across several districts of Tamil Nadu before merging with the Cauvery River, forming an important component of the Cauvery river basin.

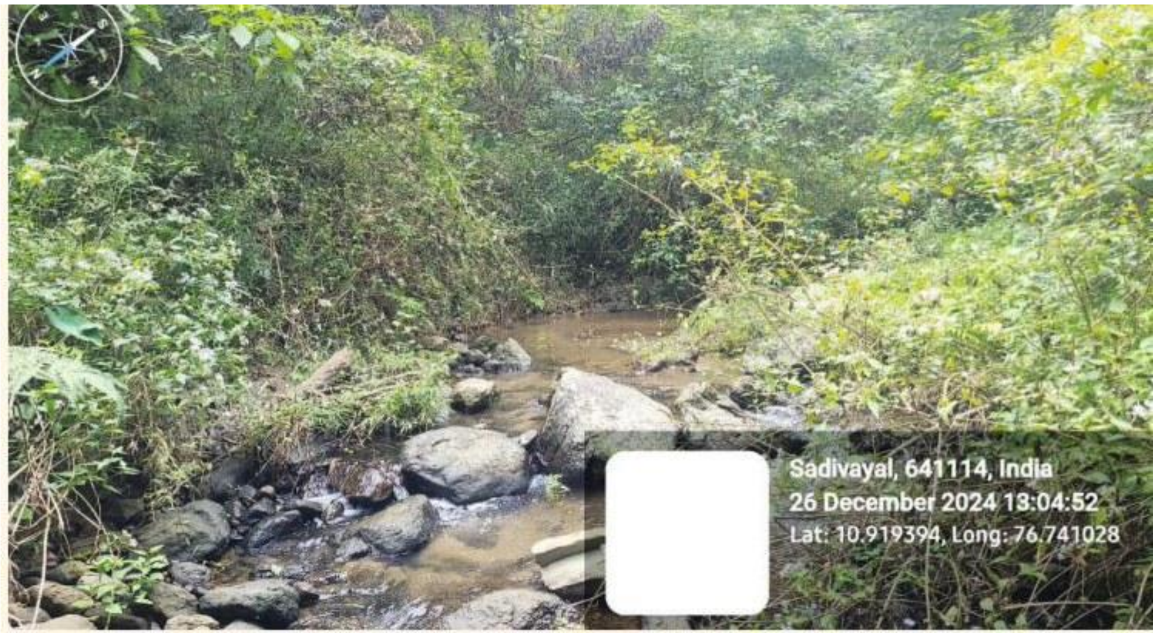
Historically, the Noyyal basin supported a well-developed traditional irrigation system consisting of interconnected tanks, ponds and channels. These water bodies formed a cascading network that captured monsoon runoff and distributed water across agricultural lands. At its peak, the basin supported irrigation across approximately 39,000 acres of agricultural land, enabling cultivation of crops such as paddy, coconut, banana and other seasonal crops.

CHALLENGES IN THE NOYYAL BASIN TODAY

- Pollution of water bodies due to untreated industrial and domestic effluents
- Encroachment and degradation of traditional water storage structures
- Reduced groundwater recharge due to sedimentation and infrastructure deterioration
- Increasing dependence on deep borewells for irrigation

2.2 The Masaorambhu Stream

The Masaorambhu Stream is one of the smaller but hydrologically significant tributaries of the Noyyal River. The stream originates in the Boluvampatti Reserve Forest located in the foothills of the Western Ghats and flows through agricultural landscapes before joining the Noyyal River. The total length of the stream within the project area is approximately 5.63 kilometres, draining runoff from a forested catchment area characterised by moderate to steep slopes and seasonal rainfall.



Inlet of the Masaorambhu Stream at the border of Reserve Forest and Patta land (Dec 2024)

Historically, a series of check dams had been constructed along the stream to capture runoff and facilitate groundwater recharge. These structures played a crucial role in regulating water flow and supporting irrigation in surrounding agricultural lands. However, prior to the restoration intervention, the stream system had deteriorated significantly due to lack of maintenance and natural wear over time.

Key Issues Identified During the Baseline

- Severe structural damage to several check dams
- Missing or collapsed weir walls in multiple locations
- Heavy accumulation of silt within the streambed and behind check dams
- Erosion of stream bunds and loss of structural stability
- Dense growth of invasive vegetation obstructing natural water flow

2.3 Need for Stream Restoration

The baseline environmental assessment clearly indicated that restoring the hydrological functionality of the Masaorambhu Stream was essential to improving water availability and strengthening agricultural sustainability in the region. The restoration strategy therefore focused on five interlocking interventions:

01	02	03	04	05
Reconstruction of Damaged Check Dams	**Large-Scale Desilting of Stream Channel**	**Clearing of Invasive Vegetation**	**Stabilisation of Stream Banks**	**Riparian Vegetation Restoration**

3. Objectives of the Intervention

The restoration of the Masaorambhu Stream was undertaken with the objective of revitalising a degraded tributary of the Noyyal River and strengthening the hydrological resilience of the surrounding watershed. The intervention focused on restoring the functional capacity of existing water retention infrastructure and improving the ecological and hydrological performance of the stream system.

Over time, the deterioration of check dams, accumulation of sediment and proliferation of invasive vegetation had significantly reduced the stream's ability to capture and retain runoff from the upstream forest catchment. Much of the rainfall runoff flowed downstream without contributing to groundwater recharge, leading to declining water availability for agriculture and increased dependence on deep groundwater extraction.

3.1 Hydrological Restoration

Restore the hydrological functionality of the stream by improving water storage capacity and enhancing groundwater recharge within the watershed.

3.2 Strengthening Water Security for Agriculture

Improve water security for farmers in surrounding villages by enhancing irrigation reliability and reducing dependence on deep borewell extraction.

3.3 Ecological Restoration of the Stream Corridor

Restore ecological conditions along the stream corridor by improving riparian vegetation and reducing environmental degradation.

3.4 Improving Watershed Resilience

Strengthen the capacity of the watershed to withstand climatic variability, support biodiversity and maintain long-term ecosystem services.

3.5 Community Participation & Sustainable Management

Promote participation of farmers, panchayats and local institutions in the long-term stewardship of the restored stream.

3.6 A Replicable Watershed Restoration Model

Establish an evidence-based, cost-effective and replicable model for watershed restoration across the Noyyal basin and similar semi-arid regions.

4. Project Scope & Interventions

The Masaorambhu Stream restoration project followed an integrated watershed management approach combining engineering restoration, ecological rehabilitation, and hydrological improvement. Interventions were designed to address both the immediate structural issues of the check dam system and the longer-term ecological integrity of the stream corridor.

4.1 Desilting of Stream Channel and Check Dams

Large-scale desilting operations were carried out across the 5.63 km stretch of the stream and within the storage areas of all seven check dams. Accumulated silt, sand deposits and organic debris were removed to restore storage capacity and stream flow continuity. Approximately 86,796 cubic metres of sediment were excavated — representing close to 82% of the total pre-restoration sediment load.

4.2 Reconstruction of Check Dams

All seven damaged or collapsed check dams were reconstructed using durable masonry and concrete construction. New weir walls, wing walls and spillways were installed to restore structural integrity and regulate water flow. Construction specifications included plain-cement-concrete foundations, M20/M25-grade mix design and structural heights between 2 m and 3 m — matching the purambokku land width to ensure free flow and minimise bund erosion.

4.3 Bund Strengthening and Stream Bank Stabilisation

Eroded stream bunds were reinforced along vulnerable sections to prevent further soil loss and protect adjacent agricultural lands. Earth excavation and shaping of the streambed created an earthen inspection track on either side of the stream, enabling future monitoring and maintenance access.

4.4 Removal of Invasive Vegetation and Debris

Dense thickets of thorny bushes and invasive vegetation that had colonised the streambed and banks were cleared to restore natural water flow and reduce sediment trapping. Logs and temporary crossings obstructing flow were also removed, in coordination with patta landowners along the corridor.

4.5 Ecological Restoration and Riparian Vegetation

Native riparian species were planted along the stabilised banks to rebuild vegetation cover, support biodiversity and enhance long-term bank stability. Community-led plantation of trees along the bunds is recommended as an ongoing sustainability measure.

4.6 Integrated Watershed Restoration Approach

The interventions were designed as a coherent package rather than isolated activities. Desilting, structural restoration, bund reinforcement and ecological rehabilitation collectively enable the stream to function again as a distributed water retention and recharge system, complementing rather than replacing the surrounding natural hydrological processes.

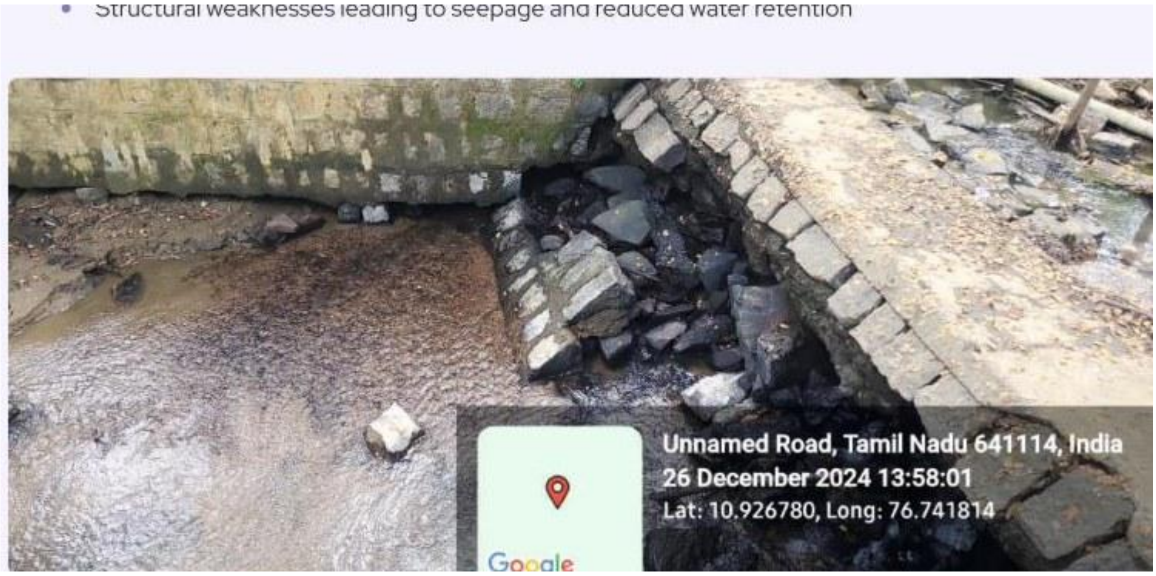
5. Baseline Environmental Conditions

A comprehensive baseline assessment was conducted in December 2024 to document the environmental, hydrological and structural conditions of the Masaorambhu Stream and its check dam system prior to the restoration interventions. The assessment involved field inspections, digital topographical surveys, community consultations and expert hydrological analysis.

5.1 Structural Condition of Check Dams

Of the seven check dams originally constructed by the Agricultural Engineering Department, virtually all were found to be in a state of severe disrepair. Multiple structures had either missing or collapsed weir walls, and several were reduced to fragmentary wing walls with no functional storage. A summary of the baseline structural assessment is presented below.

Check Dam	Baseline Condition	Key Issue	Proposed Action
Dam #1	Only wing walls, no body wall	Structural instability	Partial reconstruction
Dam #2	Completely damaged, no weir/side walls	Incomplete structure	Desilting & reinforcement
Dam #3	Severe silt, cracks & seepage	Reduced water retention	Reconstruction needed
Dam #4	Only wing walls, half weir missing	Incomplete structure	Reconstruction needed
Dam #5	Only wing walls, weir missing	Incomplete structure	Reconstruction needed
Dam #6	Severe silt, cracks & seepage	Incomplete structure	Desilting & reinforcement
Dam #7	Severe damage to wing & weir walls	Incomplete structure	Reconstruction needed

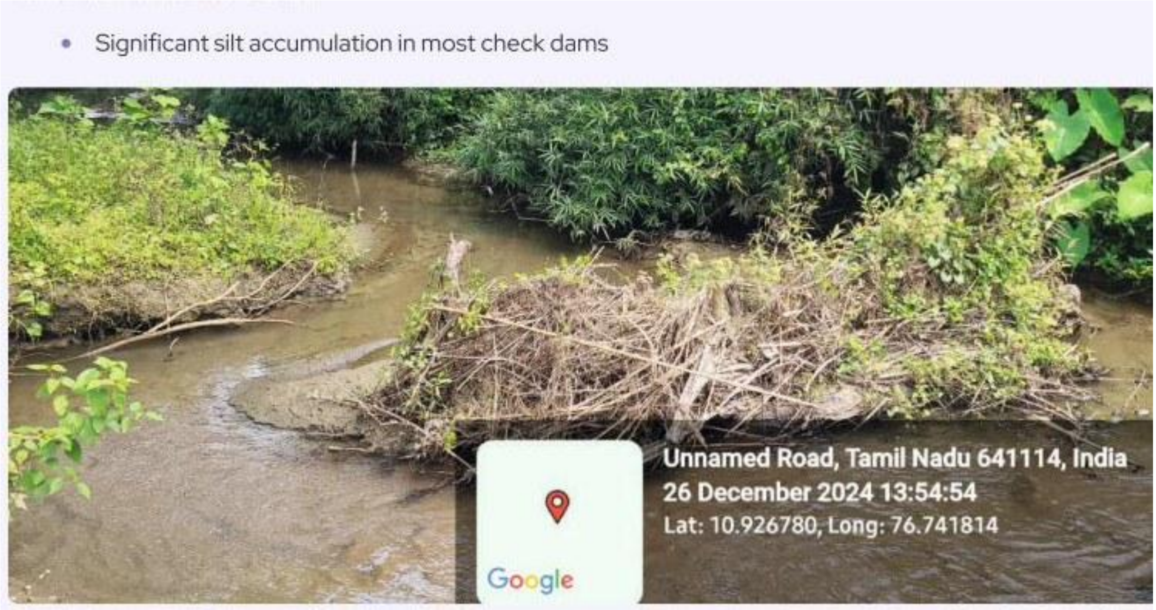


- Structural weaknesses leading to seepage and reduced water retention

Severe damage to a weir wall leading to water seepage — baseline condition (Dec 2024)

5.2 Sedimentation and Stream Morphology

Field inspections and digital topographic survey revealed heavy silt and sand deposits accumulated within check dam reservoirs and along the streambed. In several locations, sediment heights had reached close to the crest levels of the damaged structures, effectively eliminating their water retention capacity. Aggravating factors included: dense invasive vegetation trapping soil and organic matter, uncontrolled runoff eroding stream banks, absence of periodic desilting, and reduced stream channel width from sediment deposition.



- Significant silt accumulation in most check dams

Severe silt formation and vegetation obstructing water flow — pre-intervention

5.3 Vegetation and Ecological Conditions

The riparian zone was dominated by dense invasive weeds rather than native species. Sapling survival rates were below 30%, and bank erosion was widespread. The reduction in ecological integrity along the corridor limited habitat value for wildlife and contributed to sediment loading into the channel.

5.4 Hydrological Conditions

Prior to intervention, the stream's ability to regulate runoff had collapsed. Flow widths had been reduced to 5–8 feet in several segments and water retention was minimal. Farmers reported declining groundwater levels, with borewell depths exceeding 500 ft in several locations — and, in some accounts, tables falling to nearly 1,000 ft. The catchment's seasonal runoff from the Boluvampatti Reserve Forest was largely flowing through to the Noyyal River without contributing to local recharge.

5.5 Environmental and Socio-Economic Implications

The deterioration had a direct impact on the agricultural economy of Alandurai and Madhvarayapuram villages. Increased dependence on deep borewell pumping translated into higher electricity costs, frequent crop stress during dry spells, and observed human–wildlife conflict as elephants from the adjacent reserve forest entered village areas in search of water.

5.6 Need for Restoration

> The combination of structural failure, sedimentation, ecological degradation and hydrological disruption made the case for restoration unambiguous. The baseline clearly indicated that targeted infrastructure rehabilitation — combined with ecological restoration and community engagement — was essential to restoring the stream's function as a water retention and recharge system.

6. Methodology of Impact Assessment

The Environmental Impact Assessment employs a structured, mixed-method framework that combines internationally recognised evaluation criteria with multi-stage field data collection. The assessment draws on baseline observations (December 2024), interim monitoring (April and September 2025) and final impact surveys (January 2026) to measure changes across hydrological, ecological and socio-economic dimensions.

6.1 OECD-DAC Evaluation Framework

The study adopts the OECD-DAC evaluation framework, a widely recognised set of six criteria used to assess the quality, relevance and effectiveness of development interventions.

OECD Criteria	Focus of Assessment
Relevance	Alignment with watershed restoration needs
Coherence	Compatibility with other interventions and policies in the basin
Effectiveness	Improvement in water storage and groundwater recharge
Efficiency	Optimal use of desilting and reconstruction interventions

OECD Criteria	Focus of Assessment
Impact	Agricultural, ecological and livelihood outcomes
Sustainability	Long-term viability of check dams and community participation

6.2 Multi-Stage Evaluation Approach

A longitudinal evaluation approach was adopted — comparing environmental and socio-economic conditions across three key stages of the project lifecycle. This enables attribution of observed improvements to the restoration interventions and captures changes over time.

Study Stage	Timeline	Purpose
Baseline Study	December 2024	Document pre-project environmental conditions
Interim Monitoring	April 2025 & September 2025	Assess structural and hydrological performance
Impact Assessment	January 2026	Evaluate ecological, hydrological and socio-economic outcomes

6.3 Data Collection Methods

Field Surveys & Site Inspections

Detailed visits along the entire 5.63 km stretch documenting check dam condition, stream bed, sediment accumulation and bund stability.

Hydrological Measurements

Flow rate, water spread area and retention duration were documented. Storage capacity was derived from digital topographical surveys (TBM-referenced levels).

Ecological Observations

Vegetation surveys evaluated riparian condition, invasive species and regeneration. Wildlife presence and biodiversity indicators were recorded where possible.

Community Consultations

Structured interviews with farmers, landowners and panchayat representatives captured changes in groundwater availability, irrigation practices and productivity.

6.4 Data Analysis and Interpretation

Data collected through field observations, hydrological measurements and stakeholder consultations were systematically analysed to identify trends and measure improvements relative to baseline conditions. Analysis focused on hydrological performance, structural integrity, groundwater recharge, ecological improvements and socio-economic benefits. Comparative analysis across baseline, interim and impact phases allowed the study to quantify improvements in storage capacity, recharge potential, agricultural productivity and ecological health.

6.5 Limitations of the Assessment

Hydrological observations were conducted over a limited monitoring period and may not fully capture long-term seasonal variations in rainfall and groundwater recharge. Some ecological and agricultural impacts may continue to evolve as vegetation regenerates and groundwater systems stabilise. Continued monitoring of the stream system will therefore be important to validate long-term environmental benefits. Despite these limitations, the mixed-method framework provides a robust basis for assessing the environmental and socio-economic impacts of the restoration project.

7. Hydrological Impact Assessment

The hydrological impact assessment evaluates how the restoration of the Masaorambhu Stream and the reconstruction of seven check dams have influenced water storage, runoff regulation, infiltration and groundwater recharge across the watershed.

The stream originates in the Boluvampatti Reserve Forest of the Western Ghats and flows for approximately 5.63 km before joining the Noyyal River. Prior to restoration, the stream had lost much of its hydrological functionality due to heavy sedimentation, structural failure of check dams, and severe vegetation blockage. Field surveys conducted in September 2025 and January 2026 confirm that the restored structures are functioning effectively, with multiple water filling cycles recorded during the monsoon season.

7.1 Catchment Hydrology and Runoff Generation

The Masaorambhu Stream drains a relatively small but hydrologically active catchment located within the forested slopes of the Western Ghats. Based on geological mapping and field analysis, the catchment characteristics are as follows:

1.5 km^2	12 in / 24 hr	6 cumecs	1.94 TMC
CATCHMENT AREA	PEAK RAINFALL	PEAK DISCHARGE	ANNUAL RUNOFF (EST.)

During intense rainfall events, runoff from the forest catchment rapidly flows downstream through the stream channel. Prior to restoration, the absence of functional storage structures meant most of this water flowed directly into the Noyyal River without contributing to groundwater recharge. Hydrological calculations estimate the stream generates approximately 1.94 TMC of water annually through rainfall runoff, of which about 1.36 TMC remains available after accounting for evaporation, transmission losses and infiltration.

The restoration resulted in the removal of approximately 86,796 cubic metres of silt, which directly enabled the creation of nearly 90,000 cubic metres of storage volume across the check dam system. The restored series of check dams now intercept a portion of this runoff, enabling controlled storage and gradual infiltration into surrounding aquifers.

7.2 Stream Flow and Storage Capacity

The restoration significantly improved water storage capacity and stream flow continuity across the entire 5.63 km stretch. Following desilting and reconstruction, the stream channel was widened and restored to its natural alignment, enabling improved hydraulic performance.

Indicator	Baseline (Dec 2024)	Interim (Apr/Sep 2025)	Impact Observation
Water Spread Area	Limited due to heavy silt	Expanded after desilting	Significant increase across check dams
Water Flow Width	<5–8 ft in several segments	Channel restored	Flow stabilised across full width
Silt Volume	Heavy sedimentation	Large-scale desilting done	~86,796 m³ removed
Storage Capacity	Severely reduced	Structures reconstructed	Water retained across all dams

7.3 Storage Capacity of Check Dams

Hydrological calculations indicate the combined storage capacity of the check dam system is approximately 180,546 cubic metres. Baseline-to-restoration silt and storage values for each check dam are summarised below.

Check Dam	Silt Before (m³)	Residual Silt (m³)	Silt Removed / Storage Created (m³)
CD-1	1,428.94	0	19,191.15
CD-2	9,911.67	1,433.59	8,478.08
CD-3	1,131.98	~0	2,205.68
CD-4	2,973.83	670.15	2,303.68
CD-5	468.82	0	1,514.11
CD-6	4,508.84	0	5,453.05
CD-7	89,768.32	42,117.08	47,651.24
TOTAL	**1,10,192.40**	**44,220.82**	**86,796.99**

IMPORTANT DISTINCTION

- Storage created through desilting: ~86,796.99 m³
- Effective live storage capacity per cycle: ~65,046 m³

> While desilting unlocked the full storage potential, the structural configuration of the check dams governs the volume of water stored at a given time. Desilting was carried out not only within check dam basins but also along upstream channel stretches and side slopes — improving flow and recharge but not directly adding to retained storage.

7.4 Flow Measurements Across Check Dams

Field measurements conducted during monitoring visits indicate improved water discharge rates across the restored structures.

Check Dam	Flow Rate (L/s)	Daily Flow Volume
CD-1	25	2.13 million litres/day
CD-2	19	1.61 million litres/day
CD-3	18	1.52 million litres/day
CD-4	14	1.20 million litres/day
CD-5	11	0.94 million litres/day
CD-6	9	0.78 million litres/day
CD-7	6	0.51 million litres/day

7.5 Sedimentation and Storage Sustainability

Sedimentation analysis conducted during field inspections indicates approximately 8% sediment accumulation over a nine-month monitoring period — an average rate of about 1% per month. Based on this trend, full sediment accumulation within the check dams may occur after approximately 8 to 8.5 years if no maintenance is undertaken. To maintain system efficiency, periodic desilting is recommended every two to three years, ideally during drought periods when the accumulated sediment can be removed and reused as fertile soil for agriculture.

7.6 Annual Water Storage Potential

The restored system operates dynamically with multiple filling cycles during the year. Based on hydrological observations, the system undergoes approximately 9 filling cycles annually.

Parameter	Value
Storage per cycle	65,046 m^3
Number of cycles per year	9

Parameter	Value
Annual water handled	~5,85,000 m³
Equivalent volume	~58.5 crore litres (58,500 million litres)

DYNAMIC RECHARGE SYSTEM

With nine filling cycles per year, the restored check dam network handles roughly ~58.5 crore litres of water annually — a volume approximately nine times the static live storage capacity. This confirms the system functions as a dynamic recharge mechanism, significantly amplifying its hydrological impact beyond the simple storage figure.

7.7 Hydrological Benefits to Agriculture

Hydrological modelling estimates that the restored check dam system can stabilise irrigation across approximately 3,600 acres of existing agricultural land, and 240 additional acres of new wet-crop cultivation including coconut, banana and other perennial crops. This increased water availability supports both seasonal cropping and long-term agricultural productivity.

7.8 Summary of Hydrological Impacts

- Restoration of water storage capacity across the check dam series
- Reduction in runoff velocity and improved flood moderation
- Increased groundwater recharge potential across surrounding farmland
- Extended water availability during dry months for irrigation and wildlife
- Hydrological linkage restored across the full 5.63 km stream corridor

8. Structural Performance Assessment

The structural performance of the reconstructed check dams is central to the success of the restoration effort. This section evaluates the quality of construction, engineering specifications, post-monsoon performance, and structural stability of the seven reconstructed structures.

8.1 Reconstruction and Structural Improvements

All seven check dams were reconstructed using random rubble masonry with cement-concrete spillways and engineered wing walls. Where structures had completely collapsed, fresh foundations were laid with plain-cement-concrete levelling courses no less than 0.23 m thick. Where only wing walls remained, new weir walls and side walls were built to restore water retention. The reconstruction adopted a simple, cost-effective technical design prioritising structural stability and long-term durability over ornamental features.

8.2 Engineering Specifications of Reconstructed Check Dams

Each structure was designed to suit the local hydraulic regime and the purambokku (government) land width available at the site. The engineering parameters of the reconstructed dams are summarised below.

Parameter	Specification
Construction type	Random rubble masonry with concrete weir wall
Concrete grade (foundation)	M20 / M25 with cube-test verification
Foundation levelling course	Plain cement concrete, min. 0.23 m thick
Structural heights	Range of 2.0 m – 3.0 m depending on site
Length	Matched to purambokku land width for free flow
Spillway design	Engineered to handle peak discharge (~6 cumecs)

8.3 Structural Stability and Durability

Post-construction inspections indicate all seven check dams are structurally stable following the first monsoon cycle. No significant cracks, seepage or bund erosion has been observed at any of the reconstructed structures. Earthen inspection tracks along both sides of the stream enable routine monitoring and facilitate future maintenance access.

8.4 Operational Performance After Monsoon

Notably, all seven check dams attained full capacity during the very first rainfall event after reconstruction. Field inspections after monsoon confirmed: (a) effective water retention across all structures, (b) no failure of weir walls or wing walls, (c) stable bunds with no erosion, and (d) controlled spillway overflow without damaging adjacent agricultural lands.

8.5 Summary of Structural Outcomes

STRUCTURAL VERIFICATION — INTERIM STUDY

Independent technical review by a Retired Assistant Engineer (WRD, Tamil Nadu) confirmed that the project was completed in a cost-effective and quality manner within the stipulated time. The entire stretch of 5.63 km has been streamlined, vegetation cleared, and all seven check dams attained full capacity on the first monsoon. The engineer endorsed the project as a replicable model for other stream restorations in the Noyyal sub-basin.

9. Sedimentation & Storage Analysis

Sedimentation is one of the most critical factors affecting the functional performance of check dam systems. Over time, upstream runoff carries soil particles and organic matter into storage areas, gradually reducing water retention capacity. This section documents baseline sediment conditions, the scale of desilting interventions, and the sedimentation rate observed post-restoration.

9.1 Baseline Sedimentation Conditions

Field inspections during the baseline survey revealed that heavy silt and sand deposits had accumulated within the check dam reservoirs and along the streambed. In several locations, sediment heights had reached close to the crest levels of the damaged structures, effectively eliminating their water retention capacity. The accumulation was aggravated by dense invasive vegetation, uncontrolled runoff, absence of periodic desilting, and reduced channel width.

9.2 Desilting and Stream Restoration

Large-scale desilting and channel restoration works were undertaken as part of the project. Activities included: removal of accumulated silt from the streambed, clearing of sediment from check dam storage areas, widening and reshaping of the stream channel to its natural alignment, and removal of vegetation and debris obstructing flow. As a result, approximately 86,796 cubic metres of sediment were removed from the stream system — restoring storage capacity and improving hydraulic performance.

9.3 Sedimentation Analysis of Check Dams

A detailed sedimentation analysis was conducted in September 2025 and January 2026 to assess the rate of new sediment deposition within the reconstructed structures.

Check Dam	Storage Capacity (m^3)	Dam Height (m)	Sediment Height (m)	Net Capacity Remaining (m^3)
CD-3	17,762	3.00	2.70	15,985.80
CD-4	1,433.54	2.20	1.50	989.14
CD-5	1,073.70	2.00	1.70	912.65
CD-6	670.15	2.20	2.00	611.11
CD-7	1,045.29	2.20	2.00	951.22
CD-8	944.21	3.00	2.80	878.12
CD-9	42,117.08	3.00	2.80	39,168.88

TOTAL STORAGE SUMMARY

- Total Storage Capacity: 65,045.97 cubic metres
- Net Storage Capacity after Sediment Deposition: 59,496.92 cubic metres

Only a small portion of storage capacity has been affected by sedimentation during the monitoring period — confirming the effectiveness of the restoration and the stability of the reconstructed structures.

9.4 Sedimentation Rate Estimation

Using measured storage capacity and sediment deposition data, the average sedimentation rate within the check dams was calculated. Over a nine-month monitoring period, approximately 8% of total storage capacity had filled with sediment — roughly 1% per month. At this rate, full sediment accumulation to the crest height of the structures may occur after approximately 100 months (around 8 to 8.5 years) if no maintenance is undertaken. Periodic maintenance can, however, significantly extend the operational life of the structures.

9.5 Maintenance and Desilting Recommendations

To ensure long-term functionality of the restored stream system, periodic desilting is recommended as part of the maintenance strategy.

- Desilting should be undertaken every 2–3 years, particularly during drought periods when water levels are low.
- The removed silt can be reused as nutrient-rich soil for agricultural fields, providing additional benefits to local farmers.
- Routine inspection of structural components should be conducted during desilting operations to identify wear or minor damage.
- Institutional coordination between Siruthuli, panchayats and farmer groups is recommended for planning and funding periodic desilting cycles.

9.6 Summary of Sedimentation and Storage Outcomes

Indicator	Baseline	Impact
Total silt volume	Very high sediment accumulation	~86,796 m³ removed (~82% of load)
Storage capacity	Severely reduced	Fully restored
Sedimentation rate	High accumulation	Controlled at ~1% per month
Future desilting cycle	—	Every 2–3 years

10. Groundwater Recharge Impact

Groundwater recharge is one of the most critical outcomes of stream restoration and check dam interventions. The primary objective of constructing check dams across the Masaorambhu Stream was to capture seasonal runoff and allow gradual percolation of stored water into the surrounding aquifers.

The Masaorambhu Stream corridor lies within a zone identified as a high-potential groundwater recharge area — as mapped through remote sensing and GIS analysis conducted by the Institute of Remote Sensing, Anna University. This geological suitability enhances the effectiveness of the check dam system in promoting groundwater recharge. Field monitoring, farmer interviews and well observations confirm measurable improvements in groundwater availability.

10.1 Changes in Groundwater Availability

Prior to the restoration, groundwater levels in the surrounding villages had declined significantly due to reduced surface water retention and prolonged dependence on deep borewells. Farmers reported tables had fallen to depths exceeding 500 ft in some locations — and, in some accounts, nearly 1,000 ft. Following the reconstruction of the check dams, stored water behind the structures has been gradually infiltrating into the aquifers, resulting in noticeable improvements.

Indicator	Baseline	Impact	Inference
Well Depth (Average)	10–25 m	Improved recharge levels	Aquifers replenished
Borewell Depth	130–180 m	Rising water levels reported	Reduced pumping depth
Recharge Zone	Limited recharge influence	Extends ~3 km radius	Hydrological impact beyond stream

10.2 Evidence from Farmer Observations

Interviews conducted with farmers located near the reconstructed check dams provide strong qualitative and quantitative evidence of groundwater improvements following the restoration.

CASE STUDY — GROUNDWATER RECHARGE NEAR CHECK DAM 6

Farmer: Mr. K. Kanagaraj
Location: Downstream right bank of Check Dam 6
Farm size: 6 acres | **Soil:** Sandy clay | **Crop:** Coconut plantation

Before construction of the check dam, the farmer had drilled a borewell to ~800 ft, with the water table at around 500 ft below ground level. After completion, the water table rose significantly and was observed at ~100 ft below ground level — a net groundwater rise of nearly 400 ft. The farmer also reported improved soil moisture and increased coconut productivity.

Hydrological observations indicate the recharge influence from Check Dam 6 extends up to approximately 3 km radius, demonstrating the significant recharge potential of the restored structures.

10.3 Recharge Evidence from Well Observations

Groundwater recharge effects were also observed in open wells and newly constructed water supply structures in the surrounding area. A ring well constructed near Check Dam 7 within the Karunya University campus — 6.40 m diameter and 13.80 m depth — recorded a rise in water table from the bottom of the well to approximately 5 m below ground level, indicating substantial recharge even during the non-rainy season. These observations confirm that the restored check dams are actively contributing to groundwater recharge across nearby agricultural and institutional lands.

10.4 Monitoring Indicators of Hydrological Improvement

Indicator	Baseline	Expected Change	Verification Method
Groundwater level	Low water availability	+15–25% recharge improvement	Field surveys & farmer feedback
Stream flow duration	Seasonal flow only	+20–30 days extended flow	Visual & hydrological observation
Soil moisture	Low soil moisture in fields	+10–15% increase	Field observation & soil monitoring

10.5 Well Sampling Observations

Location	Well Depth (Baseline)	Impact
Near CD-1	25 m	Improved groundwater recharge
Near CD-3	15 m	Increased water availability
Near CD-6	12 m	Shallow recharge observed

10.6 Overall Recharge Impact

- Groundwater recharge improvement: 15–25% increase in groundwater levels
- Recharge influence zone: Up to 3 km radius from stream corridor
- Increased soil moisture supporting agricultural productivity
- Reduced dependency on deep borewell pumping

11. Agricultural Productivity Impact

Agricultural productivity in the villages surrounding the Masaorambhu Stream is closely linked to groundwater availability and soil moisture conditions. Prior to the restoration, declining groundwater levels and irregular surface water flow significantly affected irrigation reliability and crop productivity. The reconstruction of the check dams and restoration of the stream channel have significantly improved water retention within the watershed — resulting in increased groundwater recharge and improved soil moisture levels in nearby agricultural lands.

11.1 Improvements in Soil Moisture and Irrigation Reliability

Water stored behind the structures gradually infiltrates into surrounding aquifers and increases soil moisture levels in nearby farmland. Farmers reported that improved groundwater recharge has reduced irrigation stress and enabled more consistent water supply during dry periods. In addition, the weed removal and vegetation clearing along stream banks has improved water flow and reduced sediment trapping in the channel.

Indicator	Baseline	Interim	Impact	Inference
Vegetation Cover	Dense invasive weeds	Cleared along stream	Native regeneration	Riparian ecology improved
Sapling Survival	<30%	Plantation initiated	Expected 70–80%	Ecosystem recovery
Bank Stability	Poor and eroded	Bund strengthening	Stabilised banks	Reduced erosion

11.2 Groundwater and Irrigation Improvements

Improved groundwater recharge has had a direct impact on irrigation availability for lands surrounding the stream corridor. Farmers report that borewells and open wells with previously low or unreliable yield now provide more consistent water supply through the irrigation season.

11.3 Hydrological Improvements Supporting Agriculture

Indicator	Baseline	Expected Change	Verification
Groundwater level	Low availability	+15–25% improvement	Field surveys
Stream flow duration	Seasonal flow only	+20–30 days extended	Visual monitoring
Soil moisture	Low soil moisture	+10–15% increase	Field observations

11.4 Crop Productivity Improvements

Improved water availability and soil moisture have directly contributed to higher crop yields in several farms near the restored stream corridor. Farmers cultivating perennial crops such as coconut and arecanut reported significant improvements in crop growth, fruit size and overall yield following restoration of the check dams. More regular irrigation cycles have also resulted in healthier plant growth and improved agricultural output.

11.5 Case Study: Coconut Farm Productivity

A detailed case study of a coconut farm located near Check Dam No. 6 demonstrates the direct agricultural benefits of improved groundwater recharge.

BEFORE RESTORATION	AFTER RESTORATION
2,100	**4,000**
coconuts harvested	*coconuts harvested*
420 g	**560 g**
avg. weight per coconut	*avg. weight per coconut*
₹18	**₹27**
avg. price per coconut	*avg. price per coconut*

PRODUCTIVITY GAIN

This represents an estimated productivity increase of approximately 190% in coconut yield, combined with a 33% increase in fruit weight and 50% increase in market price per coconut — significantly increasing farm income and economic resilience for the farmer.

11.6 Overall Agricultural Impact

- Improved groundwater availability for irrigation
- Increased crop productivity and yield quality
- Reduced irrigation costs and energy consumption
- Increased resilience of agricultural systems to seasonal drought
- Enhanced soil moisture supporting long-term crop health

Field Survey team with Farmer

12. Energy & Cost Savings Impact

Improved groundwater availability resulting from the restoration of the Masaorambhu Stream has led to significant reductions in energy consumption and irrigation costs for farmers in the surrounding villages. Prior to reconstruction, declining groundwater levels forced farmers to rely heavily on deep borewell pumping for irrigation — with borewells operating for extended periods to draw water from depths exceeding several hundred feet.

Following the restoration intervention, increased groundwater recharge has significantly improved borewell yield and reduced pumping depth requirements. Farmers can now irrigate fields more efficiently with lower energy consumption — generating both direct economic benefits for farmers and indirect energy savings for the local electricity distribution system.

12.1 Reduction in Groundwater Pumping Requirements

Improved groundwater recharge has reduced the depth from which water needs to be pumped for irrigation. In several farms located near the restored stream corridor, farmers reported that borewell water levels have risen significantly following construction of the check dams. The improved water table has reduced pump operating time and lowered the electricity required for water extraction — and also reduces wear and tear on pumping equipment, extending the lifespan of irrigation infrastructure.

12.2 Electricity Consumption Reduction

Interviews conducted during the impact assessment indicate substantial reductions in electricity consumption for irrigation pumping. One farmer reported that prior to restoration, electricity costs for irrigation pumps were significantly higher due to low borewell yield. Following groundwater recharge improvements, electricity consumption for irrigation has reduced considerably.

BEFORE PROJECT

₹6,000 – ₹7,500

electricity cost (per 2 months)

→

AFTER PROJECT

₹2,000 – ₹3,000

electricity cost (per 2 months)

60–70% REDUCTION IN IRRIGATION ENERGY COSTS

This represents a reduction of approximately 60–70% in irrigation energy costs for individual farmers. The reduction in energy consumption for pumping represents a significant overall power saving for the agricultural community, particularly in areas dependent on borewell irrigation.

12.3 Energy Savings at Community Level

Similar benefits were reported by multiple farmers located near the stream corridor. As a result, the cumulative impact of improved groundwater recharge has produced substantial energy savings across the agricultural landscape of Alandurai and Madhvarayapuram villages.

- Lower electricity demand for agricultural pumping
- Reduced pressure on rural power distribution networks
- Improved energy efficiency in irrigation systems

12.4 Cost Efficiency of Water Resource Management

The project demonstrates that investments in watershed restoration and groundwater recharge infrastructure can generate significant long-term cost savings. Based on the interim expert study, the unit cost of restoration was approximately ₹143 per cubic metre of silt removed (inclusive of bund strengthening) and approximately ₹15 lakhs per check dam constructed. Considering the scale of silt removal (~86,796 m^3) and the enduring hydrological and agricultural benefits, the project represents exceptional cost-efficiency relative to conventional deep-borewell irrigation approaches.

12.5 Summary of Energy and Cost Benefits

Indicator	Impact
Reduction in irrigation electricity cost	60–70% decrease
Reduced groundwater pumping depth	Significant improvement
Improved irrigation efficiency	Higher water availability
Community energy savings	Reduced agricultural power demand
Unit cost of silt removal	₹143 per m^3 (incl. bund strengthening)
Unit cost per check dam (reconstruction)	₹15 lakhs

13. Ecological & Biodiversity Impact

The restoration of the Masaorambhu Stream has generated important ecological benefits by improving riparian vegetation, restoring natural habitats, and creating reliable water sources for wildlife. The stream originates from the forested slopes of the Western Ghats and flows through areas that form part of the broader ecological landscape supporting diverse flora and fauna.

Prior to the intervention, the ecological health of the stream corridor had deteriorated significantly due to heavy sedimentation, structural failure of check dams, and extensive growth of invasive vegetation. The reconstruction of check dams and removal of invasive vegetation have restored water retention along the corridor, creating multiple small water bodies that support biodiversity and improve habitat connectivity.

13.1 Restoration of Riparian Vegetation

One of the key ecological outcomes has been the restoration of riparian vegetation along the banks of the stream. During the baseline, dense invasive weeds and unmanaged vegetation had degraded the natural riparian habitat. As part of the restoration works, invasive vegetation was cleared, and stream banks were stabilised through bund strengthening and plantation activities. These measures have enabled the gradual regeneration of native vegetation species — improving soil stability, reducing erosion, and creating microhabitats for a variety of plant and animal species.

Indicator	Baseline	Impact Observation	Inference
Riparian vegetation	Sparse and degraded	Regeneration observed	Habitat restoration
Vegetation cover	Dense invasive weeds	Native vegetation returning	Improved ecological balance
Stream bank stability	Erosion observed	Stabilised via bund strengthening	Reduced soil loss

13.2 Improvement in Wildlife Habitat

The restored check dams have created a series of small water bodies along the stream, providing reliable water sources for wildlife species inhabiting the surrounding forest areas. Prior to the restoration, water availability in the stream was seasonal and limited, which restricted wildlife usage of the area. Following reconstruction, water is now retained for longer durations after rainfall, creating stable habitats that attract birds, mammals, reptiles and amphibians.

Indicator	Baseline	Impact Observation	Inference
Wildlife presence	Limited sightings	Elephants observed drinking water	Reliable water source restored
Bird population	Low bird activity	Increased bird sightings	Improved habitat conditions
Aquatic ecosystem	Minimal aquatic life	Fish & amphibian presence increasing	Improved water retention

13.3 Reduction in Human–Wildlife Conflict

HUMAN–WILDLIFE CONFLICT REDUCTION

Local farmers reported that elephants previously entered agricultural lands and nearby settlements in search of water during dry periods — often resulting in crop damage and increased risk of conflict.

> Following the restoration of the stream and creation of permanent water sources, elephants have been observed using the water stored behind the check dams for drinking. As a result, wildlife is less likely to move into agricultural fields in search of water. Forest officials have confirmed that animal movement near human settlements has reduced — the animals now drink water at the first upstream check dam and then return to the forest.

13.4 Ecological Indicators of Recovery

Indicator	Baseline	Impact
Riparian vegetation	Degraded	Regenerating
Bird population	Limited	Increasing
Wildlife water access	Seasonal availability	Permanent water sources
Habitat connectivity	Fragmented	Improved along stream corridor

13.5 Overall Ecological Impact

- Restoration of riparian vegetation along the stream corridor
- Increased presence of birds and other wildlife species
- Creation of permanent water sources for wildlife
- Improved habitat connectivity across the watershed
- Reduction in human–wildlife conflict through improved water availability

14. Social & Community Impact

The restoration of the Masaorambhu Stream has generated significant positive social impacts for the communities residing in the surrounding villages — particularly in Alandurai and Madhvarayapuram Panchayats. The project has improved water availability, strengthened agricultural livelihoods, and enhanced community resilience to seasonal water scarcity.

Prior to the restoration, the deteriorated condition of the stream and damaged check dams had resulted in limited water retention and declining groundwater levels. This situation created substantial challenges for farmers and local households who relied heavily on groundwater for irrigation and domestic needs. Through the reconstruction of seven check dams and the restoration of the stream channel, the project has improved water availability across the watershed — resulting in measurable improvements in agricultural productivity, irrigation reliability and household water security.

1,850
FARMERS DIRECTLY BENEFITED

3,700
ACRES OF FARMLAND UNDER STABILISED IRRIGATION

70-80%
HOUSEHOLDS REPORTING IMPROVED WATER ACCESS

14.1 Improved Water Access for Communities

The restored check dams now retain water for longer periods after rainfall events, allowing groundwater recharge and increasing the reliability of nearby wells and borewells. Farmers reported that water stored behind the check dams gradually infiltrates into surrounding aquifers — resulting in improved groundwater availability across nearby farmland and residential areas. This has reduced the uncertainty associated with irrigation and improved the overall resilience of farming activities.

14.2 Community Feedback and Perceptions

Community consultations and farmer interviews conducted during the impact assessment indicate a strong positive perception of the restoration project. Farmers expressed satisfaction with the improved water availability and the positive effects on agricultural productivity.

Indicator	Result
Households reporting improved water access	~70–80%
Irrigation duration	+25–30% increase
Community participation in monitoring	High
Satisfaction with restoration	Strong positive perception

14.3 Livelihood Improvements

Improved water availability has strengthened the livelihoods of farming households in the project area. Better groundwater recharge has enabled farmers to maintain more reliable irrigation cycles and improve crop productivity. The increase in water availability has reduced the risk of crop failure during dry periods, providing farmers with greater confidence in maintaining agricultural activities. Reduced irrigation costs and energy savings have further contributed to increased economic stability for farming households.

14.4 Community Participation and Ownership

Community participation has been an important factor in the success of the project. Farmers and local residents expressed willingness to support maintenance activities such as periodic desilting and monitoring of the stream corridor. A stakeholders' committee with local farmers and residents has been formed, and they are regularly updated on the project's progress. Committee members also visit the site during both rainy and dry seasons to check if any additional interventions are needed.

14.5 Strengthening Community Resilience

By improving water availability and supporting agricultural productivity, the restoration project has strengthened the resilience of local communities to environmental stress and climate variability. Reliable access to water allows farmers to better manage irrigation during dry seasons and reduces the risk associated with unpredictable rainfall patterns.

14.6 Summary of Social Impact

- Improved access to water for irrigation and domestic use
- Increased irrigation duration and agricultural reliability
- Reduced water stress for farming households
- Increased community participation in monitoring and maintenance
- Strengthened rural livelihoods and economic stability

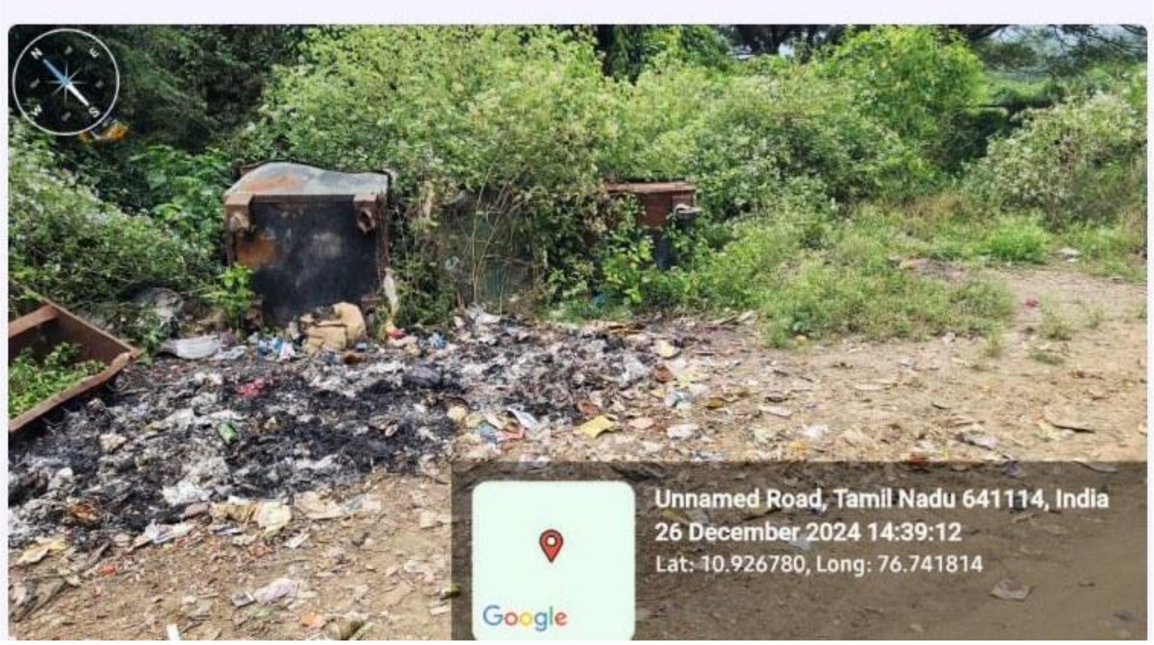
15. Environmental Risks & Challenges

While the restoration of the Masaorambhu Stream has generated significant hydrological, ecological and socio-economic benefits, the Environmental Impact Assessment also identified a number of environmental risks that require attention to ensure the long-term sustainability of the project. These challenges are primarily related to localised pollution sources and human activities occurring near certain segments of the stream corridor. If left unaddressed, these issues could gradually affect water quality and ecological health within the restored ecosystem.

The identification of these risks does not diminish the success of the restoration effort but highlights the need for continued environmental management and coordinated action among local authorities, institutions and community stakeholders.

15.1 Solid Waste Dumping

During field inspections, localised dumping of solid waste was observed in areas near Check Dam 6. The waste consisted primarily of household refuse and construction debris disposed along the stream banks. Improper disposal of waste in riparian areas poses several environmental risks, including potential contamination of surface water during rainfall runoff, obstruction of stream flow and drainage pathways, and degradation of habitat conditions for aquatic and riparian species.



Waste dumping into the stream and bunds by community near Check Dam #6

Panchayat has taken actions to address this by introducing daily home collection of waste by green friends. This is making a change in the waste dumping practices alongside the Check dam/ stream

15.2 Sewage Inflow into the Stream

Another environmental concern identified during the assessment is the presence of untreated or partially treated wastewater entering the stream near the Siruvani Road section. Sewage inflow into natural water bodies can lead to nutrient enrichment and eutrophication, reduction in dissolved oxygen levels, and degradation of water quality for downstream users. While the current impact on water quality appears limited due to dilution during rainfall events, continued discharge may gradually affect ecological health. Installation of appropriate sewage treatment systems would significantly reduce this risk.

Sewage discharge observed near the Siruvani road section

15.3 Institutional Wastewater Discharge

The assessment noted the potential discharge of wastewater from nearby educational and institutional campuses located within the broader watershed. While these institutions maintain internal wastewater management systems, ensuring that only properly treated water is released into the natural drainage system is essential to prevent contamination of the stream. Institutional collaboration and environmental compliance will therefore play an important role in safeguarding the restored stream ecosystem.

Outlet pipe from a nearby institutional campus discharging into the stream

15.4 Summary of Environmental Risks

Issue	Location	Recommendation
Waste dumping	Near Check Dam 6	Strengthen Panchayat waste management & awareness
Sewage inflow	Near Siruvani Road	Installation of sewage treatment infrastructure
Institutional discharge	Nearby campuses	Ensure treated-water release & environmental compliance

15.5 Risk Mitigation and Environmental Management

To address the identified environmental risks and maintain the ecological health of the stream, the following actions are recommended:

- Implementation of solid waste management programs in nearby villages
- Installation of sewage treatment facilities to prevent untreated wastewater discharge
- Periodic water quality monitoring along the stream corridor
- Awareness programs to discourage dumping of waste along the stream banks
- Strengthening collaboration between local authorities, institutions, and community groups

15.6 Long-Term Environmental Safeguards

> The successful restoration of the Masaorambhu Stream has created a valuable water resource and ecological corridor within the region. Protecting this asset will require continued environmental stewardship and responsible management practices. By addressing the identified risks and strengthening local environmental governance, the restored stream system can continue to deliver long-term benefits in terms of water security, ecosystem health and sustainable agricultural livelihoods.

16. OECD-DAC Evaluation Framework

The Environmental Impact Assessment applies the OECD-DAC evaluation framework to systematically assess the relevance, coherence, effectiveness, efficiency, impact and sustainability of the intervention. This framework enables a structured analysis of how the restoration of the stream and reconstruction of seven check dams contributed to hydrological recovery, ecological restoration and livelihood improvements.

The assessment draws from baseline study findings (December 2024), interim monitoring observations (April and September 2025) and final impact observations — supported by field surveys, stakeholder consultations and hydrological measurements.

16.1 RELEVANCE

Focus of Assessment:

How well did the project address environmental challenges and water management needs of the Masaorambhu Stream ecosystem and surrounding communities?

Key Findings & Inference:

The baseline revealed most check dams were structurally damaged, heavily silted and unable to retain water. Dense invasive vegetation blocked flow and groundwater had declined significantly. Interventions — desilting, reconstruction, bund strengthening, weed removal — directly addressed these issues. The project was highly relevant to hydrological restoration needs and community water security concerns.

16.2 COHERENCE

Focus of Assessment:

How well does the project align with other watershed restoration initiatives and government policies in the Noyyal basin?

Key Findings & Inference:

The project aligns strongly with Siruthuli's broader mission of reviving the Noyyal watershed and with Tamil Nadu's water conservation priorities. It complements — without duplicating — government-led interventions in the basin, and the partnership with Titan (CSR) leverages private-sector funding for public ecological benefit. The approach is coherent with best-practice decentralised watershed management.

16.3 EFFECTIVENESS

Focus of Assessment:

Did the project achieve its intended hydrological, ecological and socio-economic outcomes?

Key Findings & Inference:

Hydrologically effective: ~86,796 m^3 silt removed, ~65,046 m^3 live storage restored, ~58.5 crore litres of annual water handling. Ecologically effective: riparian vegetation regenerating, wildlife using restored water bodies, reduced human–wildlife conflict. Socio-economically effective: 1,850 farmers / 3,700 acres benefited, 190% productivity increase in case-study farm, 60–70% reduction in irrigation electricity costs.

16.4 EFFICIENCY

Focus of Assessment:

Were project resources used efficiently in relation to outcomes achieved?

Key Findings & Inference:

Unit costs of ₹143 per m^3 silt removed (incl. bund strengthening) and ₹15 lakhs per check dam reconstructed represent cost-effective resource deployment. All seven structures attained full capacity on first monsoon — demonstrating that construction quality was well matched to hydraulic demand. Use of desilted nutrient-rich sediment as agricultural input generates secondary value.

16.5 IMPACT

Focus of Assessment:

What broader environmental and socio-economic changes resulted from the project?

Key Findings & Inference:

Groundwater recharge extended up to 3 km radius from the stream corridor. Groundwater tables rose from ~500 ft to ~100 ft in documented cases. Coconut yield increased from 2,100 to 4,000 fruits per farm, with fruit weight up 33% and market price up 50%. Community resilience, biodiversity and wildlife habitat all measurably improved.

16.6 SUSTAINABILITY

Focus of Assessment:

Are the outcomes likely to continue over the long term?

Key Findings & Inference:

All structures remain stable after first monsoon. Sedimentation rate estimated at ~1%/month — implying a 2–3 year maintenance cycle for desilting. A stakeholder committee of farmers and residents has been formed for ongoing monitoring. Forest officials confirm reduced wildlife conflict. Residual sediment in CD-2, CD-4 and CD-7 indicates periodic desilting should be planned to maintain optimal performance.

17. Sustainability & Maintenance Plan

The long-term sustainability of the Masaorambhu Stream restoration depends on maintaining the structural integrity of the reconstructed check dams, preserving the ecological health of the stream corridor, and ensuring periodic maintenance of the water retention structures. While the restoration intervention has successfully revived the hydrological functionality of the stream, continued maintenance is essential to ensure that the benefits of the project are sustained over time.

The Environmental Impact Assessment therefore recommends a structured sustainability and maintenance plan involving periodic desilting, ecological management, community participation and institutional coordination.

17.1 Periodic Desilting and Sediment Management

Sedimentation is a natural process in stream systems — particularly in catchments located in forested and hilly terrains such as the Western Ghats. Runoff from upstream slopes carries soil particles and organic matter that gradually accumulate within the storage areas of check dams. Based on the observed sedimentation trends (~1% per month), periodic removal of accumulated silt will be necessary.

Activity	Recommended Frequency	Purpose
Desilting of check dams	Every 2–3 years	Maintain water storage capacity
Stream channel clearing	Annual inspection	Prevent vegetation blockage
Sediment reuse	During desilting cycles	Use fertile silt for agricultural fields

17.2 Structural Maintenance of Check Dams

Although the reconstructed check dams have been built using durable materials and modern construction techniques, periodic inspections are required to ensure that the structures continue to perform effectively. Maintenance activities should focus on identifying and addressing minor structural issues before they develop into major problems.

Maintenance Activity	Purpose
Inspection of masonry and concrete structures	Detect cracks or seepage
Inspection of bunds and spillways	Prevent erosion and overflow damage
Clearing debris and vegetation	Maintain unobstructed water flow
Repair of minor structural defects	Ensure long-term durability

Post-monsoon inspections should be conducted annually to evaluate the structural stability of the check dams and identify any maintenance requirements.

17.3 Ecological Management of the Stream Corridor

Riparian vegetation plays a critical role in stabilising stream banks, reducing erosion, and improving habitat conditions for wildlife. Maintaining healthy vegetation cover along the stream banks will help preserve the ecological integrity of the watershed.

- Removal of invasive plant species along the stream corridor
- Protection of newly planted saplings to ensure high survival rates
- Monitoring of riparian vegetation health
- Prevention of waste dumping and environmental degradation

17.4 Community Participation and Local Stewardship

Community participation is essential for long-term success. Farmers and residents who benefit directly from improved water availability are well positioned to play an active role in maintaining the restored infrastructure. Local farmers expressed willingness to support periodic maintenance activities, monitoring of water flow, and protection of the stream corridor from waste dumping.

Potential Community-Led Initiatives

- Participation in periodic desilting operations
- Monitoring of illegal waste disposal along the stream
- Reporting structural damage or blockages
- Supporting plantation and vegetation protection activities

17.5 Institutional Collaboration for Long-Term Management

Long-term sustainability will require coordination between multiple stakeholders — including local government bodies, environmental organisations and community groups. Institutions such as Siruthuli, the Panchayat administration and local farmer groups can play an important role in coordinating maintenance activities.

Areas of Institutional Support

- Periodic technical inspections
- Environmental monitoring of the stream
- Funding support for maintenance activities
- Awareness programs on watershed conservation

17.6 Long-Term Sustainability Outlook

LONG-TERM OUTLOOK

With appropriate maintenance and continued community engagement, the reconstructed check dams are expected to provide long-term benefits in water security, agricultural productivity and ecological health.

- Sustained groundwater recharge across the watershed
- Continued improvement in agricultural productivity
- Maintenance of ecological habitats along the stream corridor
- Long-term resilience of the watershed to climate variability

18. Phase-2 Expansion Strategy

The successful restoration of the Masaorambhu Stream under Phase-1 has demonstrated the effectiveness of check dam reconstruction and stream desilting as a strategy for improving groundwater recharge, enhancing agricultural productivity and restoring ecological balance within the watershed.

Building on these positive outcomes, a Phase-2 expansion strategy has been proposed to further strengthen hydrological resilience through the construction of additional upstream check dams.

18.1 Rationale for Phase-2 Expansion

Hydrological analysis indicates that the upstream sections of the Masaorambhu Stream still have substantial untapped potential for water retention. During peak rainfall events, large volumes of runoff from the forest catchment flow downstream without being captured.

Benefits of Upstream Expansion

- Increased water storage capacity within the watershed
- Improved groundwater recharge across surrounding agricultural lands
- Reduction in runoff velocity and soil erosion
- Enhanced drought resilience for downstream communities

18.2 Proposed Upstream Check Dams

Phase-2 proposes the construction of three additional check dams upstream of the existing structures, particularly above the current Check Dam 1. These structures will capture runoff generated in the forested catchment area before it flows downstream into the restored section.

Proposed Check Dam	Location	Expected Function
New CD-A	Upstream forest catchment	Capture early runoff from hill slopes
New CD-B	Midstream upper section	Enhance groundwater recharge
New CD-C	Near upstream channel junction	Stabilise stream flow and reduce erosion

18.3 Additional Water Storage Capacity

Based on preliminary engineering estimates, the additional check dams could provide an estimated combined storage capacity of approximately 115,500 cubic metres.

Structure	Estimated Storage Capacity
Upstream Check Dam 1 (CD-A)	~56,000 m^3
Upstream Check Dam 2 (CD-B)	~49,000 m^3
Upstream Check Dam 3 (CD-C)	~10,500 m^3
TOTAL ADDITIONAL STORAGE	~115,500 m^3

EXPANDED SYSTEM SCALE

When combined with the existing Phase-1 storage capacity, the expanded system will significantly increase the watershed's ability to retain and recharge rainfall runoff. If the seven existing check dams are also raised by 1.00–1.20 m, total water storage could be raised nearly three times the present level at relatively modest incremental cost.

18.4 Expanded Groundwater Recharge Potential

The addition of upstream check dams will further enhance groundwater recharge within the watershed. By capturing runoff at multiple points along the stream corridor, the expanded system will allow water to infiltrate gradually into the underlying aquifers.

- Increased recharge of groundwater aquifers across nearby agricultural lands
- Extended duration of surface water flow in the stream channel
- Improved soil moisture conditions for downstream farms
- Reduced reliance on deep borewell extraction

18.5 Strengthening Watershed Resilience

The Phase-2 expansion strategy will strengthen the resilience of the watershed to climate variability and changing rainfall patterns. This approach supports a distributed water storage model, which is widely recognised as an effective strategy for sustainable watershed management in semi-arid and monsoon-dependent regions.

18.6 Strategic Importance of Phase-2

Key Strategic Outcomes Expected from Phase-2

- Increased watershed storage capacity
- Expanded groundwater recharge benefits
- Greater agricultural productivity across the region
- Enhanced ecological restoration of the stream corridor
- Improved resilience to climate variability

19. Key Learnings & Replicability

The restoration of the Masaorambhu Stream provides valuable insights into the effectiveness of decentralised watershed management interventions in improving water security, agricultural productivity and ecological health. The project demonstrates how relatively modest infrastructure investments — when supported by proper hydrological planning and community participation — can generate substantial environmental and socio-economic benefits.

19.1

Restoration of Check Dams Enhances Groundwater Recharge

Rehabilitating existing water infrastructure is an efficient and cost-effective approach to strengthening groundwater resources in semi-arid regions. Groundwater levels improved significantly near restored check dams, with recharge benefits extending up to ~3 km from the stream corridor.

19.2

Stream Desilting Improves Hydrological Continuity

Removal of ~86,796 m^3 of accumulated silt restored the natural flow dynamics of the stream and enabled check dams to retain water effectively. This underscores the importance of periodic desilting as an essential component of watershed management.

19.3

Community Participation Strengthens Sustainability

Local farmers and residents demonstrated strong interest in protecting and maintaining the restored infrastructure. Projects that actively involve local communities in planning, implementation and maintenance are more likely to achieve long-term success.

19.4

Integrated Interventions Deliver Multi-Dimensional Benefits

Beyond water storage and recharge, the project contributed to: increased agricultural productivity and farm income, reduced energy for pumping, ecological restoration, reduction in human–wildlife conflict, and enhanced community resilience to climate variability.

19.5

Potential for Replication Across the Noyyal River Basin

The Noyyal basin contains numerous deteriorated streams and water retention structures. The Masaorambhu model can be replicated across other tributaries to revive the broader watershed — an approach endorsed by the Water Resources Department engineer who reviewed the project.

19.6

A Replicable Restoration Blueprint

The project offers a clear blueprint: (1) baseline hydrological & structural survey, (2) digital topographical survey to quantify sediment volumes, (3) engineered reconstruction with verified quality, (4) community engagement and stewardship mechanism, (5) OECD-DAC longitudinal evaluation. This model is directly transferable to other small stream systems.

19.7

Overall Learning

Small-scale, well-designed interventions — when implemented with appropriate engineering, ecological and social considerations — can deliver significant watershed-scale benefits. Continued investment in watershed restoration, supported by local stewardship and institutional collaboration, can play a vital role in addressing water scarcity.

20. Conclusion

The restoration of the Masaorambhu Stream represents a substantial and measurable success in decentralised watershed management. Implemented by Siruthuli with CSR support from Titan and independently evaluated by Right Dots, the project has transformed a degraded 5.63 km stream corridor with seven damaged check dams into a functional water retention and groundwater recharge system — supporting thousands of farmers, restoring ecological connectivity and providing measurable socio-economic benefits.

The scale of the intervention — approximately 86,796 m^3 of silt removed, ~65,046 m^3 of live storage restored, and ~58.5 crore litres of annual water handling — is matched by the depth of its impact. Groundwater tables near Check Dam 6 have risen by nearly 400 ft. A documented coconut farm has seen productivity increase by 190%. Elephants from the adjacent Reserve Forest now access water at the restored check dams rather than venturing into farmland — reducing human–wildlife conflict. Farmers report 60–70% reductions in electricity costs for irrigation pumping.

These outcomes have been validated across three dimensions: (1) hydrological evidence from digital topographical surveys and flow measurements, (2) structural verification from an independent Retired Assistant Engineer of the Water Resources Department, and (3) socio-economic evidence from community consultations and farmer case studies.

The project's success is attributable to the integration of engineering restoration with ecological rehabilitation and community participation. Desilting alone could not have restored hydrological continuity without structural reconstruction of the check dams; reconstruction alone could not have sustained ecological recovery without bund strengthening and riparian vegetation restoration; and none of these could be sustained without the active stewardship of local farmers and panchayats.

At the same time, the assessment identifies real risks that require continued attention — solid waste dumping near Check Dam 6, localised sewage inflow near Siruvani Road, and institutional wastewater discharge. Addressing these through waste management, sewage treatment and institutional compliance will be essential to preserving water quality and ecological health.

Looking forward, the proposed Phase-2 expansion — comprising three additional upstream check dams and raising the crest heights of existing structures by 1.0–1.2 m — has the potential to nearly triple the watershed's water storage capacity and extend the recharge influence zone well beyond the current 3 km radius.

A REPLICABLE MODEL FOR WATERSHED RESTORATION

The Masaorambhu Stream restoration demonstrates a scalable, cost-effective, community-anchored model that can be replicated across the 34 tributaries of the Noyyal basin and comparable semi-arid catchments. With a unit cost of approximately ₹143 per cubic metre of silt removed and ₹15 lakhs per reconstructed check dam, the model represents exceptional cost-efficiency relative to conventional deep-borewell irrigation or centralised water infrastructure approaches.

The project thus stands as both a completed restoration of significant environmental and socio-economic value, and a reference case for future watershed restoration initiatives — illustrating how corporate CSR funding, specialised implementation capacity, independent impact assessment, and local community ownership can converge to deliver durable environmental outcomes.

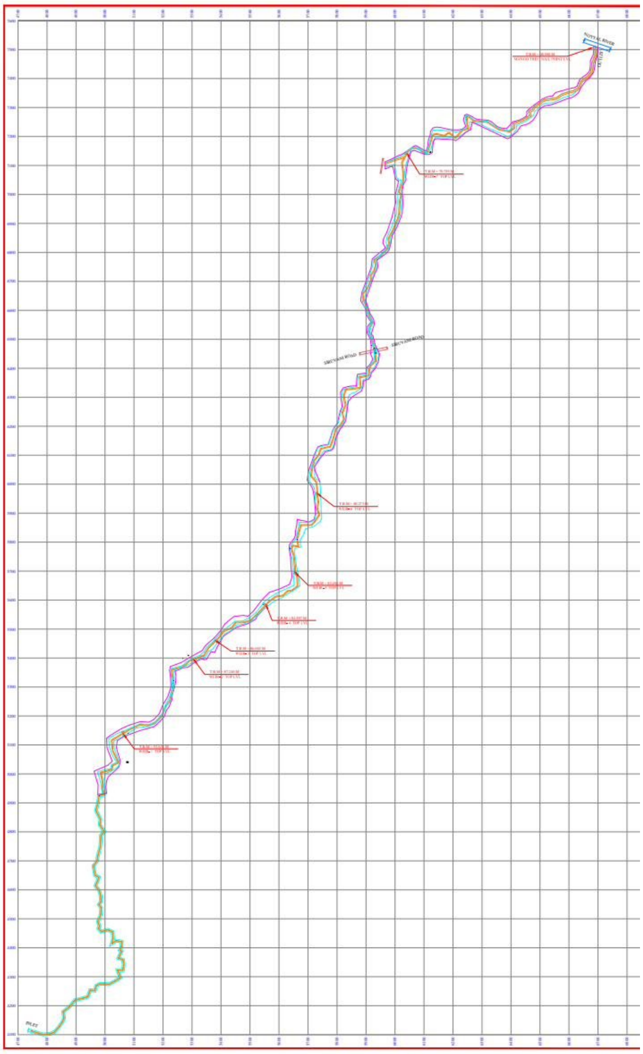
21. Annexures: Check Dam Survey Data

This section presents detailed before/after survey data for each of the seven reconstructed check dams, along with digital topographical survey maps of the full 5.63 km stream corridor.

Annexure A | Digital Topographical Surveys

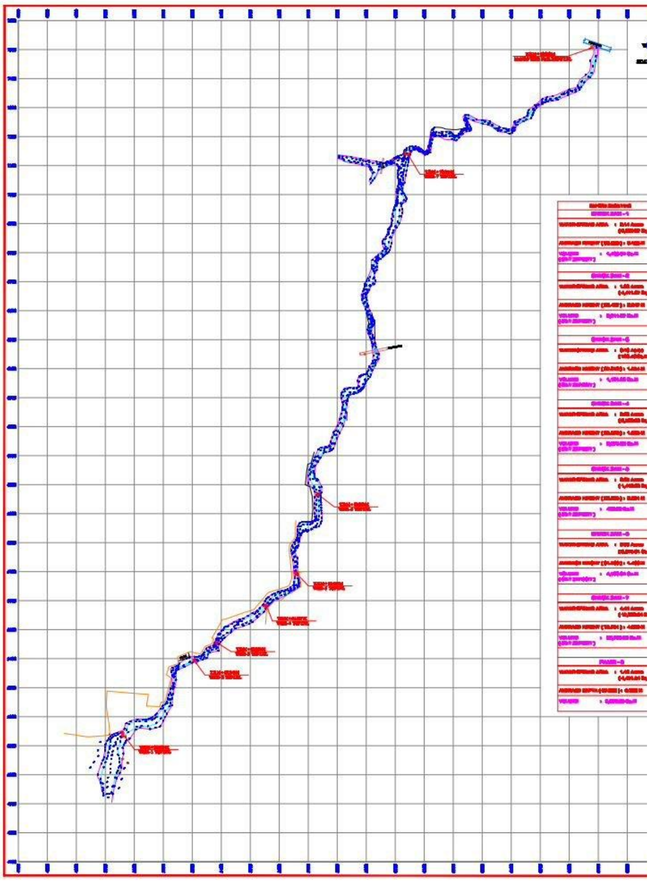
Digital topographical surveys were conducted before and after desilting to quantify sediment volumes and storage capacity. The surveys were carried out with reference to a Temporary Benchmark (TBM) at the stream inlet (TBM = 100.00).

BEFORE DESILTING



Stream profile prior to intervention — Dec 2024

AFTER DESILTING



Stream profile post-restoration — 2025/2026

Annexure B | Check Dam Before/After Comparison

The following tables document the water spread area, average height, sediment volumes and storage created for each check dam along the Masaorambhu Stream — derived from the digital topographical surveys and site inspections.

CHECK DAM 01

BEFORE-AFTER COMPARISON

Parameter	Before Desilting	After Desilting
Water Spread Area	0.96 acres (3,884.98 m²)	2.14 acres (8,660.27 m²)
Average Height	0.165 m	2.051 m
Volume of Silt Deposit	641.02 m³	—
Volume of Storage Created	—	17,762 m³
Total Silt Removed	—	19,191.15 m³

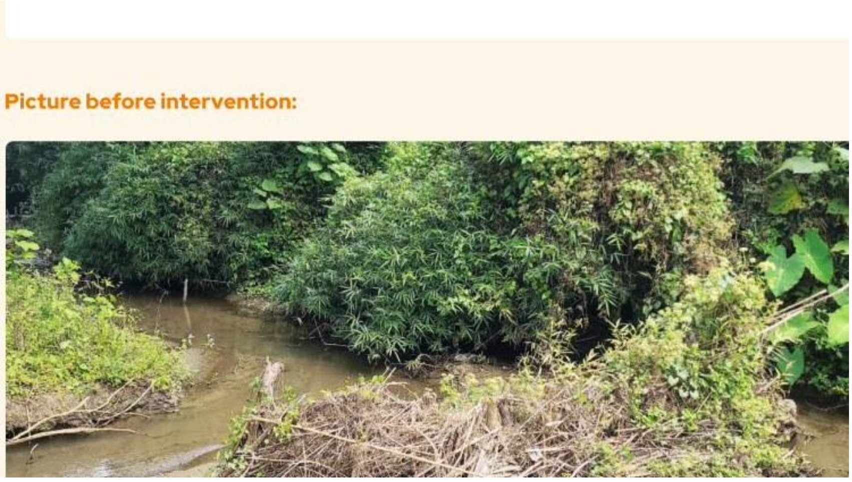
Check Dam #1 — only wing walls and no weir wall at baseline (Dec 2024). Water flow width of just 5–8 feet and no storage area.

Check dam #1 with reconstructed Check dam and huge water storage area

CHECK DAM 02

BEFORE-AFTER COMPARISON

Parameter	Before Desilting	After Desilting
Water Spread Area	0.78 acres (3,156.54 m^2)	1.09 acres (4,411.07 m^2)
Average Height (of silt)	2.247 m	0.325 m
Volume of Silt Deposit	7,092.74 m^3	1,433.59 m^3
Total Silt Removed	—	8,478.08 m^3



Check Dam #2 — only wing walls and no weir wall at baseline.

Reconstructed Check dam #2 and desilting is complete

CHECK DAM 03

BEFORE-AFTER COMPARISON

Parameter	Before Desilting	After Desilting
Water Spread Area	0.36 acres (1,456.86 m²)	0.18 acres (728.43 m²)
Average Height	1.554 m	1.474 m
Volume of Silt Deposit	2,263.96 m³	—
Volume of Storage Created	—	1,073.70 m³
Total Silt Removed	—	2,205.68 m³

Check Dam #3 — severe silt accumulation, cracks and seepage in the weir; almost inaccessible at baseline.

Check dam #3 after reconstruction and desilting

CHECK DAM 04

BEFORE-AFTER COMPARISON

Parameter	Before Desilting	After Desilting
Water Spread Area	0.70 acres (2,832.79 m^2)	0.69 acres (2,792.33 m^2)
Average Height	1.065 m	0.24 m
Volume of Silt Deposit	3,016.92 m^3	670.15 m^3
Total Silt Removed	—	2,303.68 m^3

Check Dam #4 — only wing walls and no weir wall at baseline.

Check dam #4 after reconstruction and desilting

CHECK DAM 05

BEFORE-AFTER COMPARISON

Parameter	Before Desilting	After Desilting
Water Spread Area	0.78 acres (3,156.54 m²)	0.35 acres (1,416.39 m²)
Average Height	0.331 m	0.738 m
Volume of Silt Deposit	1,044.81 m³	—
Volume of Storage Created	—	1,045.29 m³
Total Silt Removed	—	1,514.11 m³

Check Dam #5 — only wing walls and no weir wall at baseline.

Check dam #5 after reconstruction and desilting

CHECK DAM 06

BEFORE-AFTER COMPARISON

Parameter	Before Desilting	After Desilting
Water Spread Area	1.44 acres (5,827.47 m²)	0.76 acres (3,075.61 m²)
Average Height	1.466 m	0.307 m
Volume of Silt Deposit	8,543.07 m³	—
Volume of Storage Created	—	944.21 m³
Total Silt Removed	—	5,453.05 m³

Check Dam #6 — only wing walls and severe damage to weir wall at baseline.

Check dam #6 after reconstruction and desilting

CHECK DAM 07

BEFORE-AFTER COMPARISON

Parameter	Before Desilting	After Desilting
Water Spread Area	4.91 acres (19,870.06 m²)	4.44 acres (17,968.04 m²)
Average Height	4.996 m	2.344 m
Volume of Silt Deposit	99,270.81 m³	42,117.08 m³
Total Silt Removed	—	47,652.28 m³

Check Dam #7 — no wing walls and no weir wall at baseline; the largest silt removal on the corridor.

WPVX+WW4, Madawarayapuram, Tamil Nadu 641114, India
12 April 2025 13:13:17
Lat: 10.945820, Long: 76.749298

Check dam #6 after reconstruction and desilting

Summary Across All Check Dams

All seven check dams have been reconstructed, desilting is complete, and invasive weeds have been removed — leading to better water flow, storage and percolation across the 5.63 km corridor. In total, approximately 89,966 cubic metres of silt have been removed across Check Dam 1 through Phase 8.

7	89,966 m³	5.63 km
CHECK DAMS RECONSTRUCTED	TOTAL SILT REMOVED	STREAM CORRIDOR RESTORED

ENVIRONMENTAL IMPACT ASSESSMENT

Restoration of the Masaorambhu Stream

Implemented by: **SIRUTHULI**
Supported by: **TITAN COMPANY**
Prepared by: **RIGHT DOTS**

Social Impact Assessment Partner | www.rightdots.org

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