NAMMA NEERSETU – ROAD RUNOFF DIVERSION AND RECHARGE LINKAGE SYSTEM FOR CONNECTING URBAN STREETS TO NEARBY PONDS IN BENGALURU

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Introduction:

Bengaluru, long regarded as one of India's most dynamic metropolitan hubs, is today confronted with two simultaneously worsening water-related crises: recurrent urban flooding during the monsoon season and a steadily declining groundwater table throughout the rest of the year. These two problems, seemingly opposite in character, share a common root cause in the city's rapid and largely unplanned expansion of impervious surfaces, particularly its road network. As roads multiply and existing ones are widened and resurfaced, the natural capacity of the urban landscape to absorb rainwater diminishes correspondingly, pushing ever-larger volumes of runoff into drainage systems that were never designed to handle them. The result is road flooding that regularly disrupts livelihoods, damages property, and poses serious risks to public health and mobility.

At the same time, the lakes and ponds that once served as Bengaluru's natural stormwater sinks and groundwater recharge zones have been progressively severed from their feeder catchments by roads, buildings, and encroachments. With no water flowing in to compensate for evaporation and extraction, these waterbodies shrink each year, accelerating the groundwater crisis affecting millions of residents. The Namma NeerSetu project addresses this paradox directly by proposing a simple, low-cost linkage system that captures road runoff, passes it through a basic filtration unit to remove sediment and debris, and channels it to a nearby pond or recharge structure. The term NeerSetu, meaning 'Water Bridge' in Kannada, reflects the project's core idea of re-establishing the broken connection between urban roads and the waterbodies they once naturally fed. The system design is illustrated in the schematic cross-section below. The project aligns closely with India's National Water Policy, the Smart Cities Mission, and multiple United Nations Sustainable Development Goals, including SDG 6 (Clean Water and Sanitation), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action).

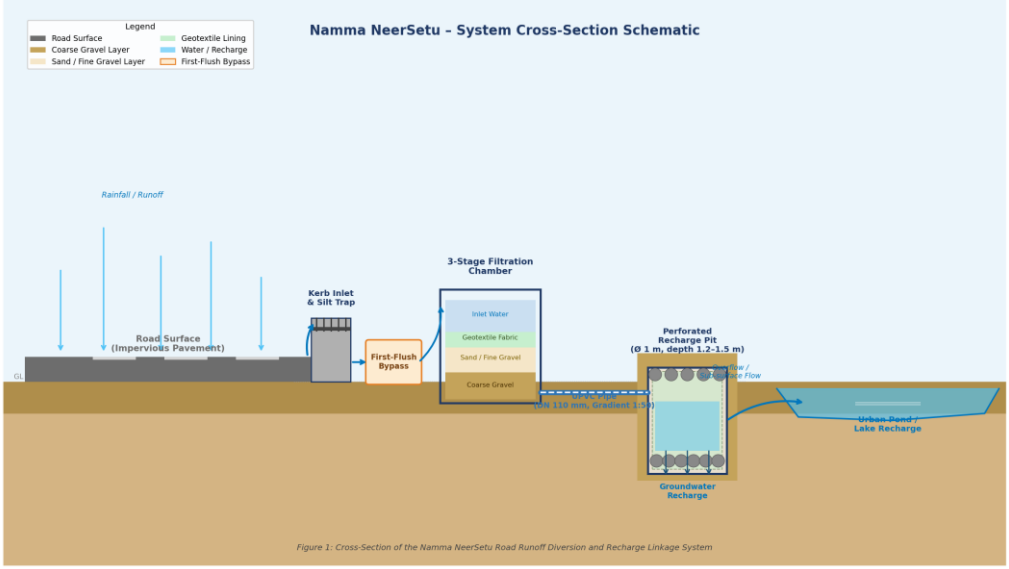


Figure 1: Cross-Section of the Namma NeerSetu Road Runoff Diversion and Recharge Linkage System

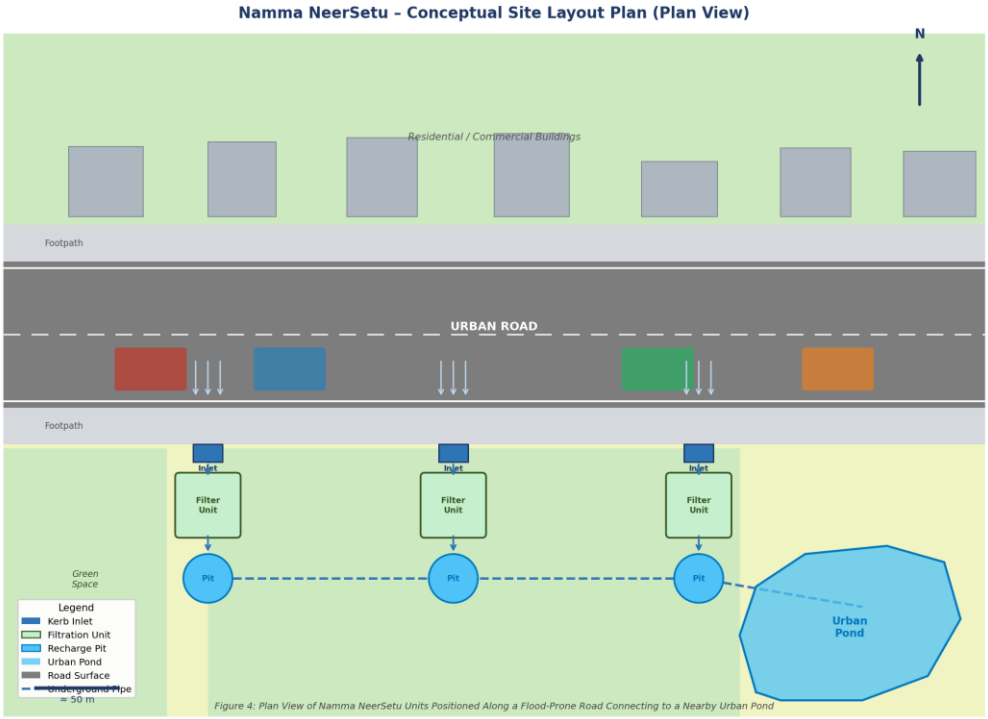


Figure 2: Plan View of Namma NeerSetu Units Positioned Along a Flood-Prone Road Connecting to a Nearby

Objectives:

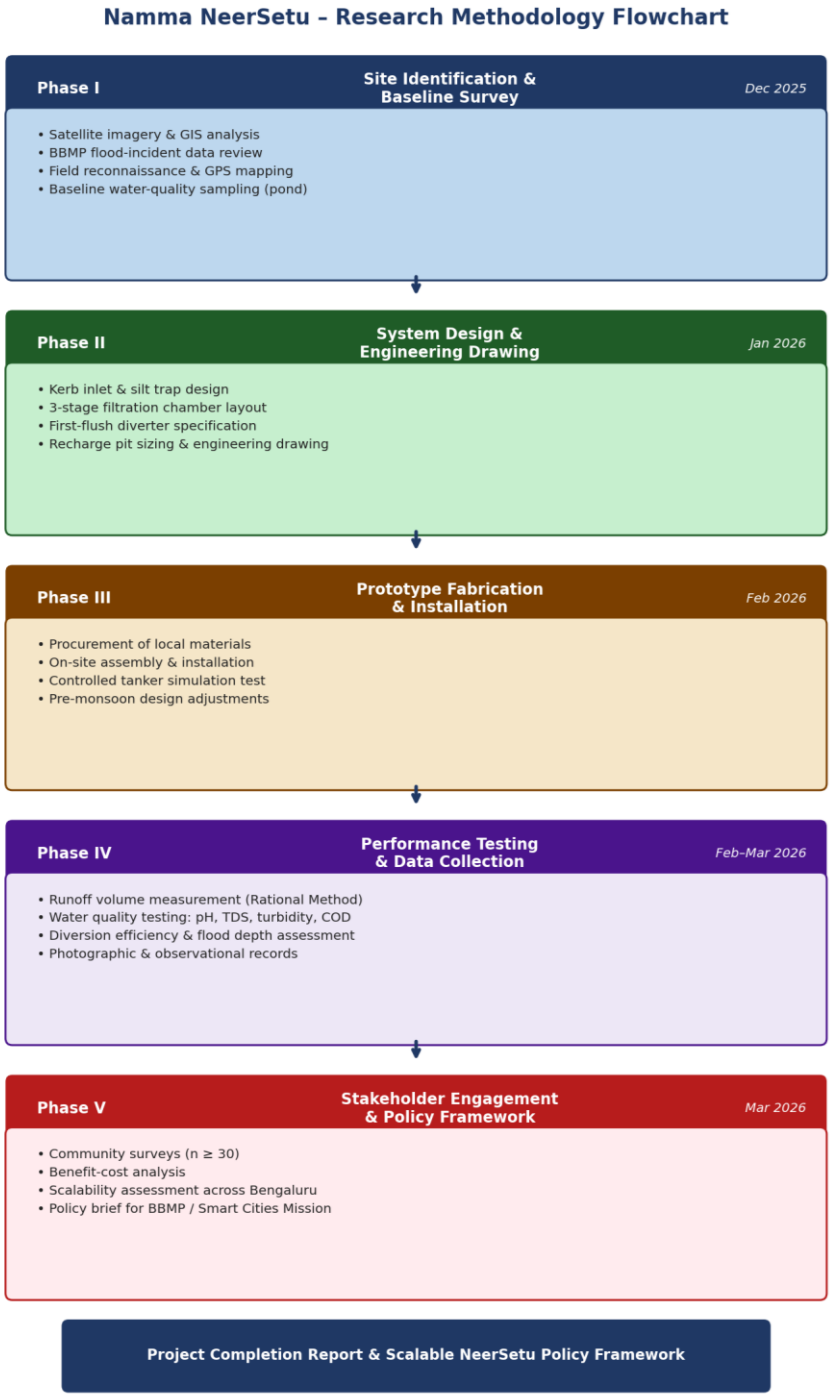
To study the existing road runoff and waterlogging pattern in one selected road stretch in Bengaluru.

1. To identify nearby ponds, lakes or recharge wells that can receive diverted road runoff from this selected stretch.
2. To design a simple “Namma NeerSetu” linkage system (inlet, filter and recharge/pond connection) for the selected stretch, with basic drawings and approximate cost.

3. To estimate the potential runoff volume that can be diverted/recharged through this system for a typical rain event and discuss the likely benefits for flood reduction and groundwater/pond recharge.

Methodology:

The project follows a structured five-phase approach that combines desk research, field investigation, engineering design, prototype construction, performance testing, and stakeholder consultation. The methodology flowchart below illustrates the sequential phases and key activities.



Phase I – Site Identification and Baseline Survey (December 2025)
The team will review ward-level drainage records, BBMP flood-incident data, and satellite imagery to identify a road segment in Bengaluru that experiences regular waterlogging during monsoon rainfall and lies within a practicable diversion distance of a lake, pond, or designated recharge zone. Field visits will be conducted to record the road's longitudinal and cross-sectional gradient using a digital clinometer, to photograph drainage inlet conditions, and to document the current state and water quality of the candidate receiving waterbody. Baseline samples will be collected from the pond for turbidity, pH, total dissolved solids, and chemical oxygen demand analysis to serve as a pre-intervention reference.

Phase II – System Design and Engineering Drawing (January 2026)
Drawing on the site survey data, the team will prepare a complete engineering design for the NeerSetu unit. The system will consist of a grated kerb inlet with a sediment sump, a three-stage filtration chamber packed with coarse gravel, fine gravel and sand, and a layer of nonwoven geotextile fabric, a first-flush diverter to exclude the most contaminated initial portion of each rainfall event, a UPVC or HDPE pipe conduit connecting the filter outlet to the recharge structure, and a covered perforated recharge pit approximately one metre in diameter and 1.2 to 1.5 metres deep. All components will be drawn to scale and a detailed material list with approximate market costs will be prepared.

Phase III – Prototype Fabrication and Installation (February 2026)
The prototype will be assembled using locally procured materials under the guidance of the project supervisors and installed at the selected site. A controlled flow simulation using a water tanker will be conducted to verify hydraulic continuity through the system, to check that the filter media functions without early clogging, and to confirm that the first-flush diverter operates as intended. Any design adjustments identified during this controlled test will be incorporated before the system is exposed to actual monsoon runoff.

Phase IV – Performance Testing and Data Collection (February – March 2026)
During monitored rainfall events, the team will measure runoff volume entering the system, diversion volume at the recharge pit, and road-surface drainage time before and after installation. Water samples will be collected at the inlet, after the filtration chamber, and at the recharge pit and analysed with portable field test kits for turbidity, pH, total dissolved solids, and chemical oxygen demand. The Rational Method formula $Q = CiA$ will be used to cross-check measured values against calculated estimates, where C is the road runoff coefficient, i is rainfall intensity in millimetres per hour, and A is the contributing road area in square metres.

Phase V – Stakeholder Engagement and Scalability Assessment (March 2026)
Structured mini-surveys and informal interviews will be conducted with at least thirty respondents comprising local residents, shopkeepers, and ward-level BBMP officials to gauge perceived effectiveness, willingness to participate in routine maintenance, and interest in replication at other sites. A simple benefit-cost comparison will be prepared, and the findings will be compiled into a scalable policy brief recommending how the NeerSetu

model could be integrated into BBMP's storm water drain plans and Smart City infrastructure programmes.

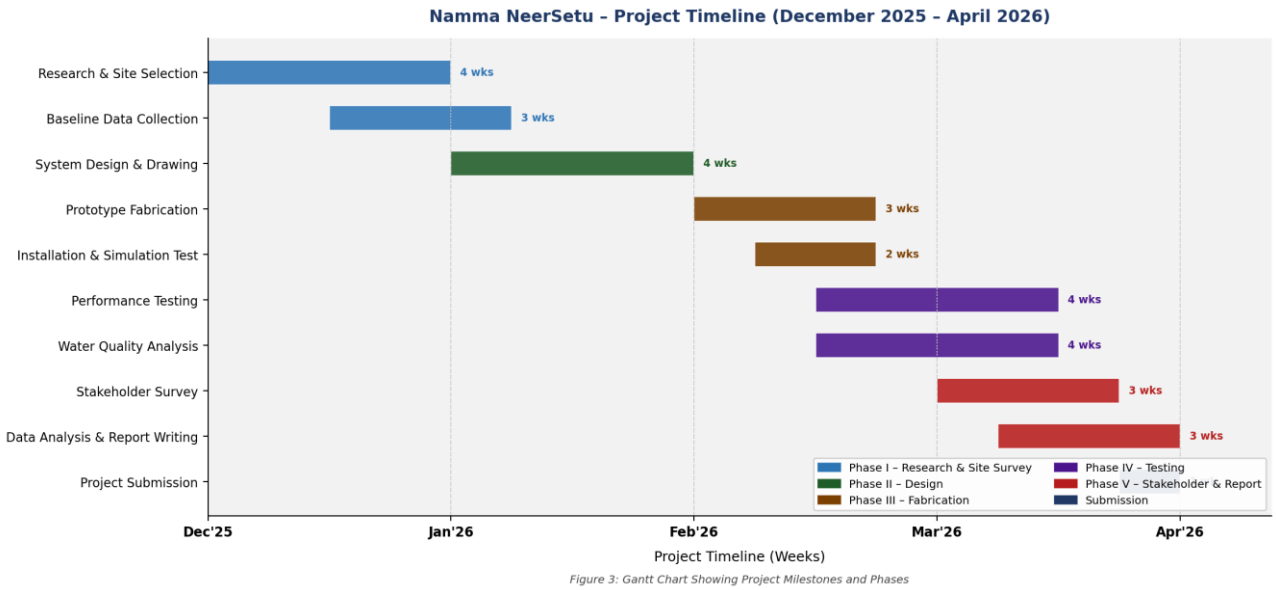


Figure 4: Project Timeline – Gantt Chart Showing Phase-Wise Milestones (December 2025 – April 2026)

Result and Conclusion:

Based on preliminary hydrological calculations for the selected site — assuming a contributing road area of approximately 200 square metres, a runoff coefficient of 0.85 typical of paved urban roads, and a design rainfall intensity of 15 millimetres per hour — the NeerSetu system is expected to divert between 0.7 and 1.0 cubic metres of stormwater per hour. This level of diversion is anticipated to reduce road-surface flooding depth by roughly 30 to 50 percent for a storm of two-year return period. The three-stage filtration module is projected to achieve turbidity reductions of 60 to 75 percent, bringing treated water quality within acceptable limits for pond recharge and soil infiltration as specified by CPCB guidelines. The recharge pit, sized appropriately for the laterite soils common to much of Bengaluru, should facilitate groundwater infiltration of 200 to 400 litres per rain event.

In conclusion, the Namma NeerSetu project demonstrates that a low-cost, locally fabricated, and easily maintainable road runoff diversion system can meaningfully address two of Bengaluru's most pressing urban water challenges simultaneously. By channelling road runoff toward the city's diminishing ponds and depleted groundwater, the project creates measurable value at both the ecological and community levels. The prototype provides proof of concept for decentralised stormwater management that can be replicated across hundreds of flood-prone road stretches in the city without requiring large capital investments or complex infrastructure.

References:

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Future Scope:

The Namma NeerSetu project, while focused on a single pilot road stretch, is designed with scale in mind and opens several promising directions for expansion and deeper research.

1. A GIS-based citywide mapping exercise could identify and rank all flood-prone road segments in Bengaluru's 198 wards by their proximity to existing waterbodies, enabling a phased municipal rollout guided by technical feasibility and community readiness.
2. The current prototype's manual monitoring could be upgraded by integrating low-cost IoT sensors for flow rate, turbidity, and recharge pit level, enabling real-time performance tracking through a civic dashboard accessible to BBMP ward engineers and the public.
3. The filtration module could be enhanced with biochar, zeolite, or other locally available adsorbent materials to handle runoff from high-traffic arterial roads where hydrocarbon and heavy metal contamination is a greater concern.
4. The NeerSetu framework could be adapted and tested in other Karnataka cities and Tier-2 urban centres across peninsular India that face comparable flooding and groundwater depletion challenges.
5. If the integrated kerb-inlet, first-flush diverter, and modular filter assembly incorporates a novel and non-obvious design element, a utility patent application could be pursued through the KSCST Patent Information Centre.
6. A long-term lifecycle cost-benefit study would allow NeerSetu units to be formally proposed as a mandatory component of new road construction and resurfacing projects under BBMP and national highway authority contracts.