SMART INDIA HACKATHON 2025

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TITLE PAGE

- **Problem Statement ID – SIH25065**
- **Problem Statement Title- Designing and development of an application for on spot assessment of Roof Top Rain water harvesting and artificial recharge potential and size of the RTRWH and AR.**
- **Theme- SMART AUTOMATION**
- **PS Category- Software**
- **Team ID- Synapse Overflow**
- **Team Name - Synapse Overflow**

Synapse Overflow

NIRANJALI

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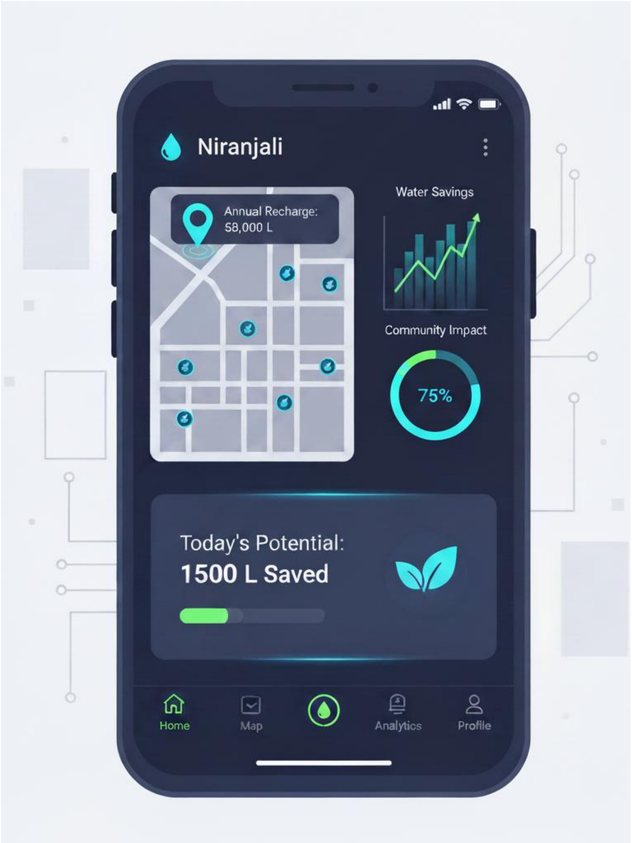
Our solution:

- **One-stop Web/Mobile App:** That gives on-spot feasibility, recommended RTRWH/AR designs, cost & subsidy-ready reports.
- **User Flow:** user enters location (pin drop) → guided inputs (roof area, roof type, residents, open space) → system returns feasibility, dimensions, cost in a visually appealing and comprehensive manner. Chatbot explains in simple language and answers queries in a fun way.
- **Core Outputs:** Feasibility (High/Med/Low), recommended structure (pit/trench/shaft/tank), dimensioning, annual litres recharged, payback period & subsidy packs.
- **Innovation Highlights:**
    1. Smart AI Chatbot-guided UX
    2. Centralized RTRWH Data Summary; Personalized statistical dashboard.
    3. Leaderboard - Track & rank users by rainwater saved
    4. Smart Grouping - Nearby users can collaborate to reduce RTRWH costs
    5. Live Impact Monitor - Real time tracking of water conservation progress
    6. Gamified adoption & subsidy information.
    7. IOT add-ons for live water usage. Scalable to water management system.



TECHNICAL APPROACH

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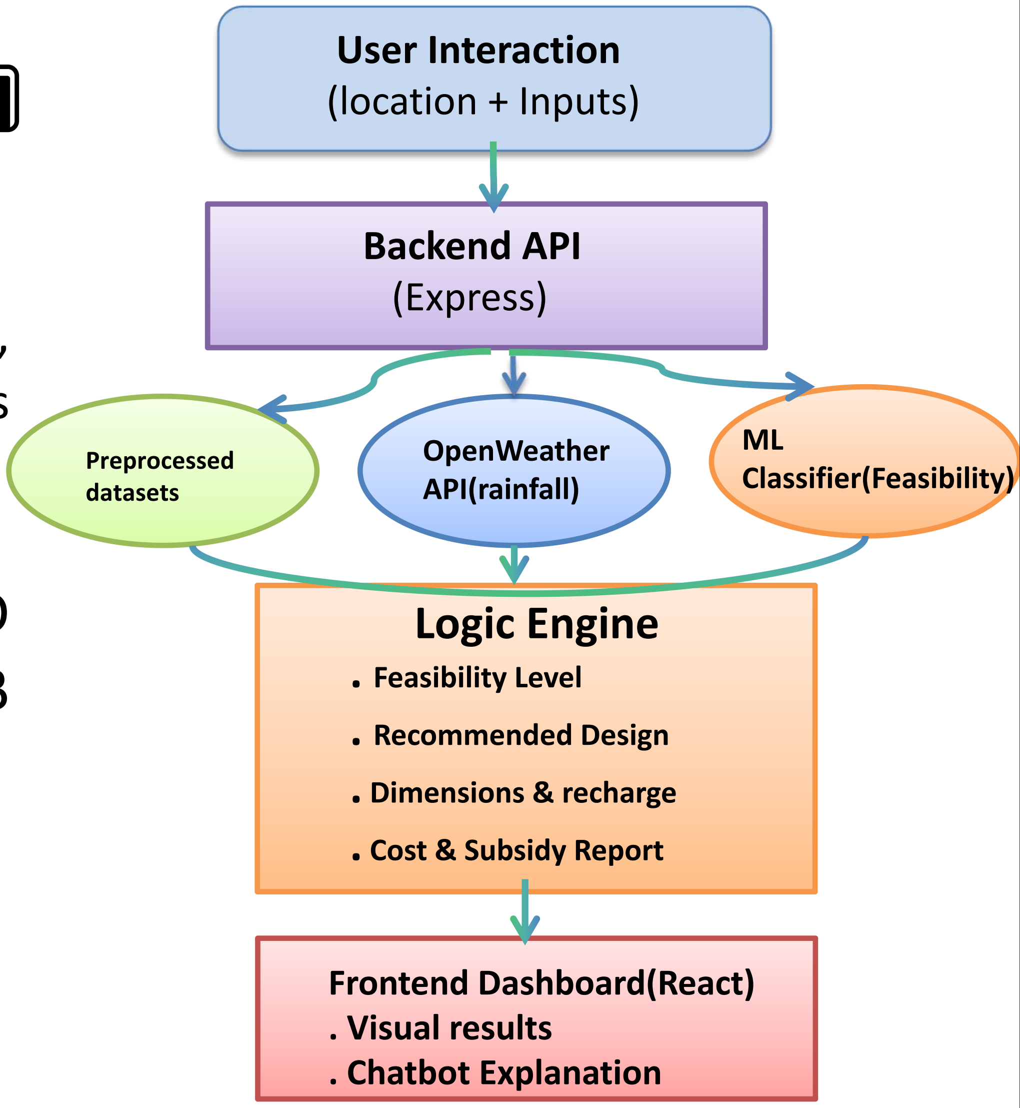
Frontend: React.js | Leaflet.js | Chart.js | Tailwind CSS | Flutter | Figma

Backend: Node.js + Express | API Layer (Weather, AI) | Proj4/Turf.js | ML (Scikit-learn, offline → Node.js rules).

Database: MongoDB Atlas | IMD Rainfall | Bhuvan/ISRO LULC | CGWB Groundwater Datasets.

DevOps: GitHub/GitHub Actions | Render | Docker | Postman



FEASIBILITY AND VIABILITY

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FEASIBILITY SUMMARY

1 **Feasibility strengths:**

Uses pre-processed official GIS + simple live APIs *(Open Weather)*
Avoids heavy , live data parsing
Relies on a lightweight and explainable engine *(Rules + Lightweight ML).*

2 **Economic Viability:**

Strong potential for funding through CSR mandates, government environmental grants, and partnerships with urban local bodies.

3 **Operational viability:**

Modular cloud deploy (frontend + backend + DB), scalable to state/national roll-out; subsidy pack enables govt adoption.

PRIMARY RISKS AND MITIGATIONS

1 **Risk:** Live Bhuvan/WMS complexity

Mitigation: Preloaded and simplified GeoJSON shapefiles.

2 **Risk**: Data gaps for some villages

Mitigation: fallback to district averages & user-entered overrides. Gradually improving accuracy as we acquire data and train AI & ML models.

3 **Risk:** Moving beyond initial grant funding to a self-sustaining model is a critical hurdle

Mitigation: Adopt a freemium model. Offer a free public platform supported by a premium analytics dashboard. Government partnerships.

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IMPACT AND BENEFITS

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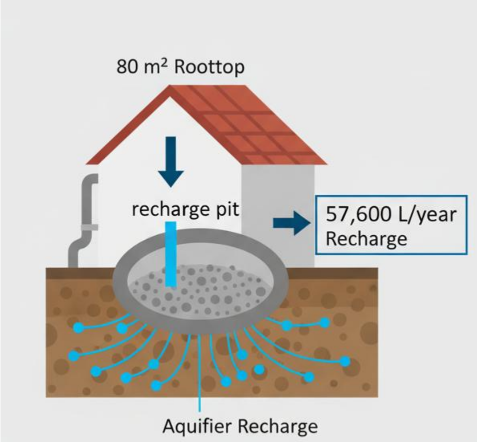

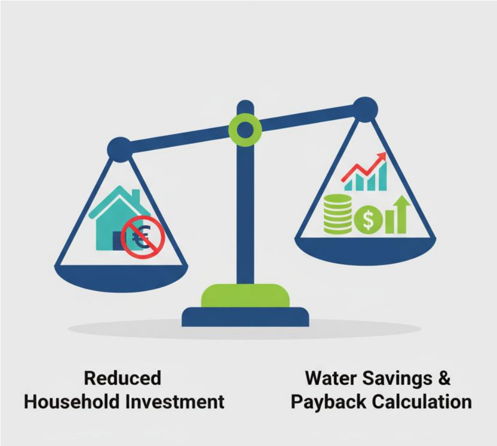

Social:

Empowers communities with local language guidance to boost participation in groundwater conservation.

Environmental:

Prevents runoff loss; Flood and Drought mitigation; Urban planning; Promotes Sustainability.

Economic:

Cost–savings with quick payback; shared pits cut household investment.

Scalability & policy:

Automated subsidy & maintenance plans speed govt uptake; dashboards help municipalities prioritize zones.

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RESEARCH AND REFERENCES

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Primary datasets / references: ISRO-Bhuvan, CGWB (groundwater & aquifer data), IMD / OpenWeather (rainfall), Jal Shakti / CGWB design guidelines (RTRWH sizing).

SIH official portal

Research: NIH (National Institute of Hydrology), Roorkee — research papers on rainwater harvesting & recharge structures.

TERI (The Energy and Resources Institute)— papers on urban water management & harvesting potential.

QGIS + GDAL/OGR — open-source GIS tools to preprocess shapefiles.

ChatGPT for research compilation and suggestions.