Shantiniketan High School, Zankhvav, Gujarat

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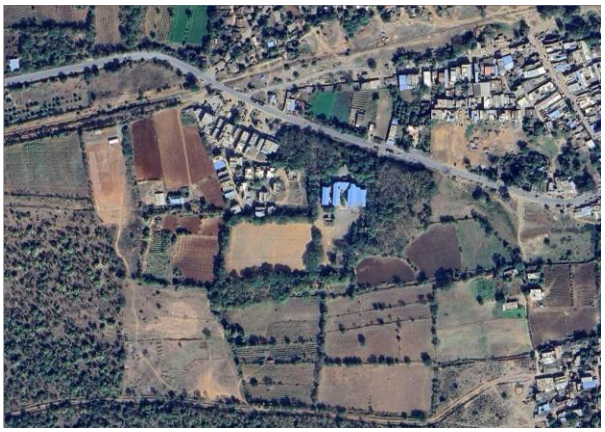
(Data Generated for JAAI West Zone Conference 14-16 Nov 2025)

Rainwater Harvesting, Terrain-Based Recharge Assessment Solar Installation, Carbon Sequestration Study



1 RAINWATER HARVESTING ANALYSIS

RWH Formula:

$$RWH = P \times A \times C$$

Where:

- **P** = Mean annual rainfall (in meters)
- **A** = Surface area (m^2)
- **C** = Runoff coefficient

Runoff Coefficients:

- Rooftop: **0.875**
- Paved: **0.7**
- Unpaved: **0.6**
- Green: *(Excluded from RWH, used for carbon sequestration only)*

Data Considered:

- **Rainfall Data (CHIRPS - Last Three Years):**

Year	Rainfall (mm)	Rainfall (m)
2024	1474.65	1.4747
2023	941.16	0.9412
2022	1255.48	1.2555

- **Mean Annual Rainfall (P)** = (1.4747 + 0.9412 + 1.2555) / 3 = **1.2238 m/year**

- Surface Area Data:

Surface Type	Area (m^2)	Runoff Coefficient
Roof	1,655.97	0.875
Paved	2,354.83	0.7
Unpaved	8,714.64	0.6
Green	29,667.41	*(Excluded)*

RWH Calculations:

- **RWH (Roof)** = 1.2238 × 1,655.97 × 0.875 = **1,776.90 m^3**
- **RWH (Paved)** = 1.2238 × 2,354.83 × 0.7 = **2,014.93 m^3**
- **RWH (Unpaved)** = 1.2238 × 8,714.64 × 0.6 = **6,398.10 m^3**

Total Annual Harvestable Rainwater

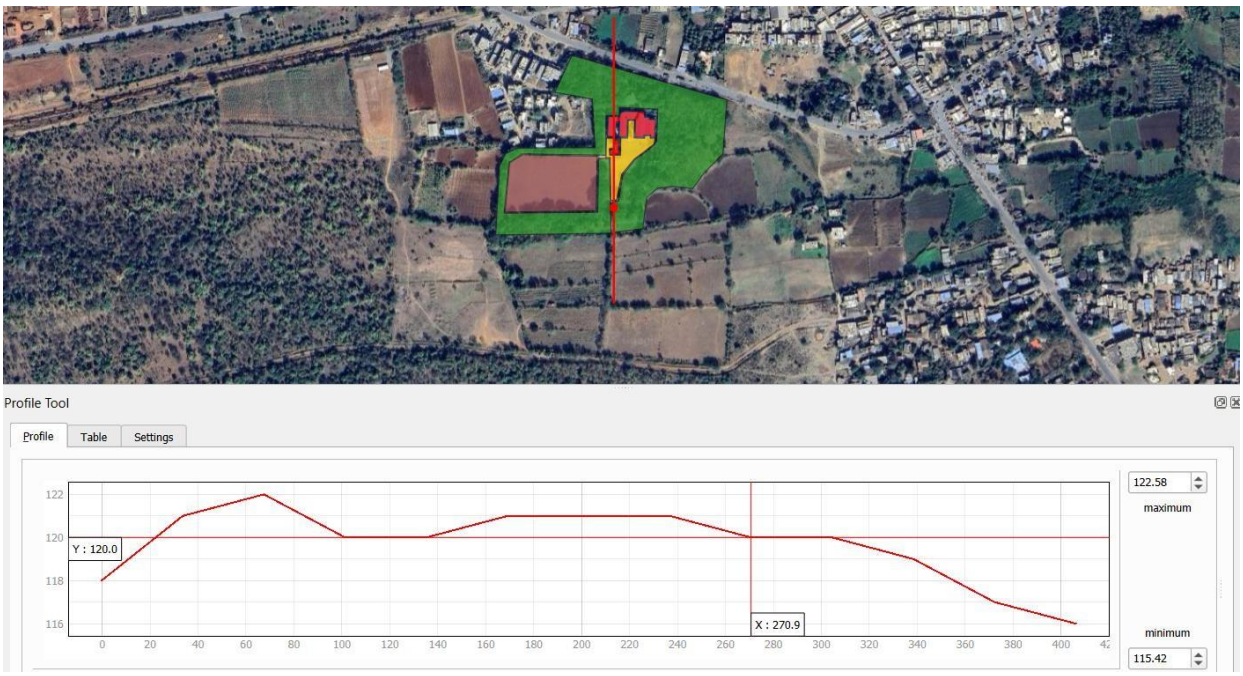
Total RWH = 1,776.90 + 2,014.93 + 6,398.10 = 10,189.93 m^3/year = **10,189,930 liters/year**

TERRAIN PROFILE ANALYSIS

Profile 1: North–South

Elevation Range: 115.42 m to 122.58 m → **Relief: ~7.16 m**

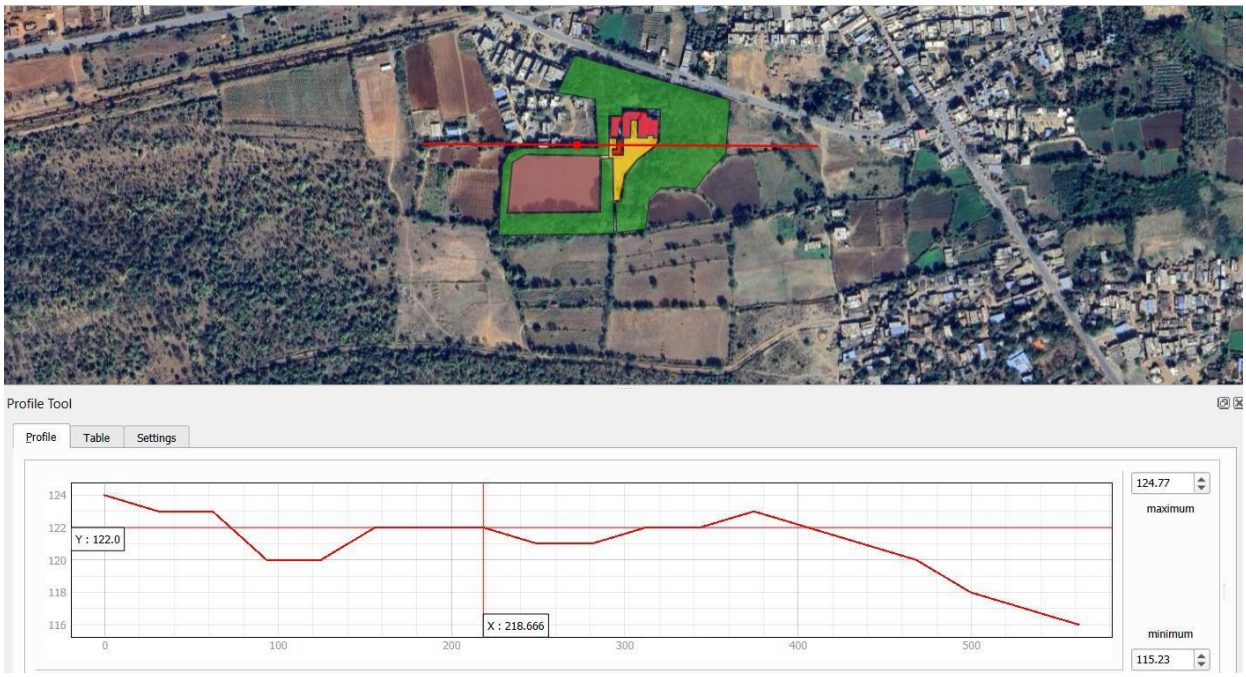
- **Slope Pattern:** Gentle decline from north to south
- **Drainage Implication:** Runoff expected toward southern boundary; ideal for recharge interventions at south periphery



Profile 2: East–West

Elevation Range: 115.23 m to 124.77 m → **Relief: ~9.54 m**

- **Slope Pattern:** Prominent drop toward western edge
- **Drainage Implication:** Rainwater likely moves westward; suggests trenching/storage units along western border



RECOMMENDATIONS: STORAGE & RECHARGE ZONES

- Prioritize **southern** and **western** edges for recharge pits and tanks
- Use **vegetated swales** and **bio-retention** areas in low-lying zones
- Add **eco-awareness signage** near green areas
- Explore **permeable paving** in key paved zones for infiltration support

2 POTENTIAL OF RWH WATER THAT CAN BE USED FOR TOILET FLUSHING, GARDENING, TREES

- Rain Water Harvesting Potential: 10,189.93 m^3/year
- If RWH water is used *for toilet flushing* then the number of students whose flushing needs can be met in a year is: 3,859
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 5,583 m^2
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 1,698

Formulas (with planning assumptions) :

Number of students who can flush for the school year :
Assumptions: 220 school days, 6 L per flush, 2 flushes per student per day
Supported Flushing = RWH (L) / (6 L/flush × 2 flushes/student/day × 220 days)

Garden area watering supported annually :
Assumption: 5 L/m²/day year-round (365 days)
Garden Area = RWH (L) / (5 L/m²/day × 365 days)

Number of trees watering supported in the dry season :
Assumptions: 50 L/tree/day, dry season = 120 days
Trees Supported = RWH (L) / (50 L/tree/day × 120 days)

Notes:
Unit equivalence used: ***1 m³ = 1 kL = 1,000 liters.***
If a school uses low-flow fixtures (e.g., 4 L/flush), swap ***6*** *with* ***4*** *in the formula to show a conservative/efficient scenario.*

References:

Flush volume (6 L/flush baseline): *WHO/UNICEF Joint Monitoring Programme (JMP) documentation and sector guidance indicate typical modern cistern volumes of* ***~6 L/flush*** *(with dual-flush/low-flow options ~3–4.5 L).*

Garden water demand (5 L/m²/day): *Based on FAO irrigation planning practice using crop evapotranspiration (ETc). FAO Irrigation & Drainage Paper 56 (Allen et al.) gives the ETc methodology.*

Tree water need (50 L/tree/day): *Practical planning baseline used in municipal/urban forestry guidance for* ***medium-sized*** *trees under warm conditions. This aligns with typical dry-season irrigation allowances derived from canopy size and ET; it's an assumption you can scale by species/size if schools provide*

3 CARBON SEQUESTRATION POTENTIAL (GREEN ZONE)

- **Total Green Area** = 29,667.41 m²
- **IPCC Standard Rate** = 0.9 kg CO_2/m²/year
- **Estimated Annual CO_2 Sequestration** = 29,667.41 × 0.9 = **26,700.67 kg CO_2/year = 26.70 metric tons CO_2/year**

4 SOLAR INSTALLATION

- Refer to : https://ecosjwestzone.org/solar-dashboard/ for Province/School information.
- Installed On Grid kW Capacity (shown as Hostel Zankhvav) : 29 kW
- Installed Off Grid kW Capacity : 0
- Zero Bill Status: Not clear

5 Legend

- RWH: Rain Water Harvesting
- CHIRPS: Climate Hazards Group InfraRed Precipitation with Station data (It is a quasi-global dataset that blends satellite infrared imagery with ground-based rain gauge observations.)
- IPCC: Intergovernmental Panel on Climate Change (a United Nations body that assesses the science related to climate change, its causes, impacts, and possible solutions.)
- Carbon Sequestration: the process of capturing carbon dioxide (CO2) from the atmosphere and storing it long-term in reservoirs like oceans, soil, trees. For the report the Trees/Greenery area in the school is considered.