Loyola High School, Margao, Goa

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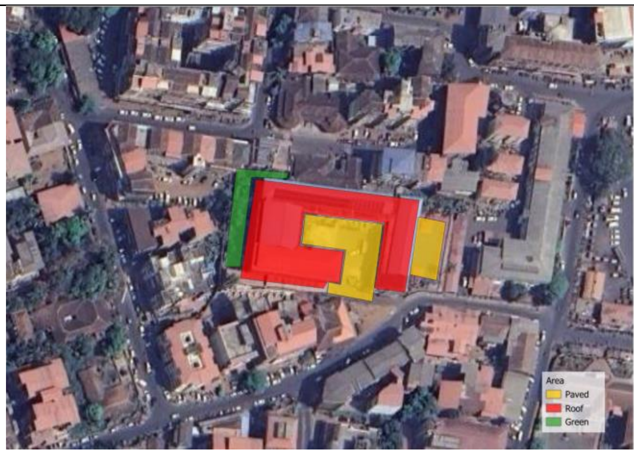
(Data Generated for JAAI West Zone Conference 14-16 Nov 2025)

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



1 RAINWATER HARVESTING ANALYSIS

RWH Formula

RWH = P × A × C

Where:

- **P** = Mean annual rainfall (in meters)
- **A** = Surface area (m²)
- **C** = Runoff coefficient

Runoff Coefficients Used:

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

Data Considered:

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

Year	Rainfall (mm)	Rainfall (m)
2024	4645.75	4.6458
2023	2595.88	2.5959
2022	3289.46	3.2895

- **Mean Annual Rainfall (P)** = (4.6458 + 2.5959 + 3.2895) / 3 = **3.5104 m/year**

- **Surface Area Data**

Surface Type	Area (m^2)	Runoff Coefficient
Roof	2488.53	0.875
Paved	1176.19	0.7
Green	369.88	— (excluded)

RWH Calculations

- RWH (Roof) = 3.5104 × 2488.53 × 0.875 = 7,648.99 m^3
- RWH (Paved) = 3.5104 × 1176.19 × 0.7 = 2,884.72 m^3
- Total Annual Harvestable Rainwater (**Total RWH**) = 7,648.99 + 2,884.72
= **10,533.71 m^3** = **10,533,710 liters/year**

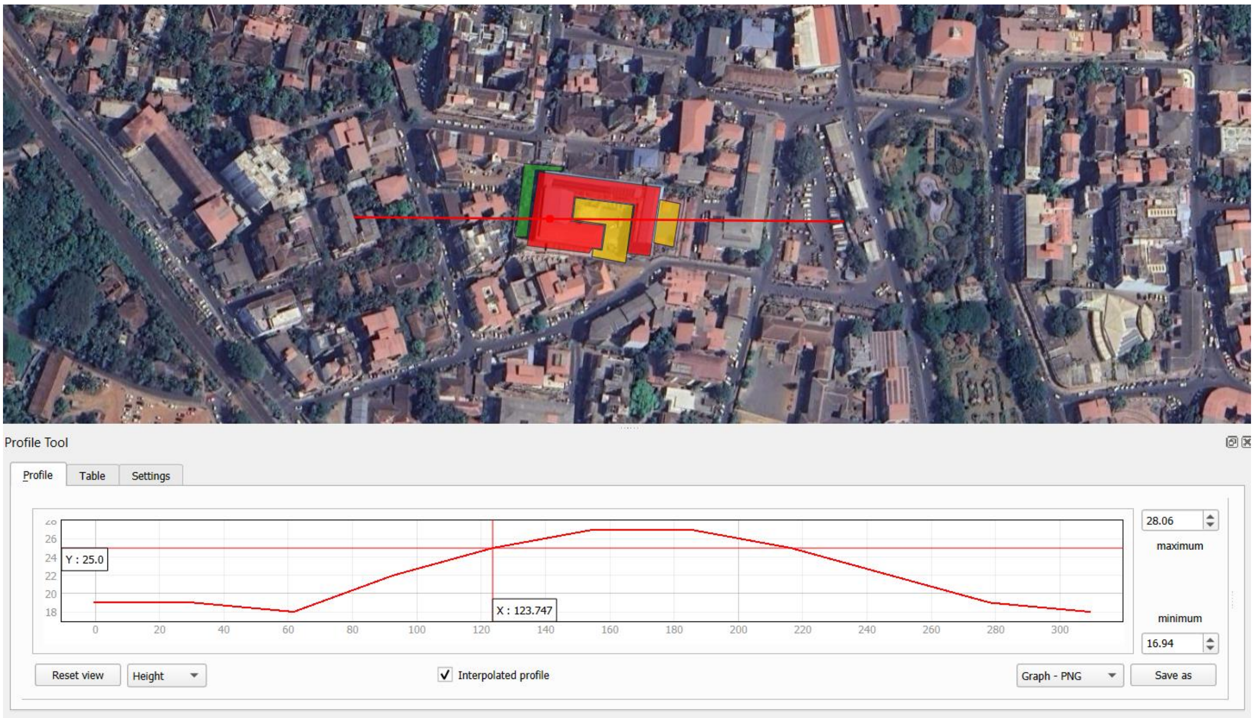
TERRAIN PROFILE ANALYSIS

Profile 1: North–South

- Elevation Range: 20.29 m to 27.71 m → Relief: ~7.42 m
- Slope Pattern: Slopes gently downward from center to south
- Drainage Implication:
Likely southward flow; suggest locating recharge wells or tanks near southern edge

Profile 2: East–West

- Elevation Range: 16.94 m to 28.06 m → Relief: ~11.12 m
- Slope Pattern: Consistent eastward fall
- Drainage Implication:
  Concentration of surface runoff expected toward the eastern periphery—ideal for recharge trenches or infiltration pits there



Recommendations: Storage & Recharge Zones

- Prioritize **eastern and southeastern corners** for recharge installations
- Use **permeable paving** near hardscapes for passive infiltration
- Install **visual signboards** in green area to raise eco-awareness among students
- Include **sediment filters** at rooftop downpipes before storage tanks
- Given the **high rainfall**, explore **above-ground rain barrels** or underground tanks with overflow to recharge zones

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

- Rain Water Harvesting Potential: 10,533.71 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: 3,990
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 5,772 m^2
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 1,756

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

- **Total Green Area** = 369.88 m²
- **IPCC Standard Sequestration Rate** = 0.9 kg CO_2/m²/year
- **Estimated Annual CO_2 Sequestration** = 369.88 × 0.9 = **332.89 kg/year** = **0.33 metric tons CO_2/year**

4 SOLAR INSTALLATION

- Refer to : https://ecosjwestzone.org/solar-dashboard/ for Province/School information.
- Installed On Grid kW Capacity : 47 kW
- Installed Off Grid kW Capacity : 0
- Zero Bill Status: Yes

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.