St. Britto's High School, Mapusa, 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

- 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	4904.07	4.9041
2023	2714.42	2.7144
2022	3264.90	3.2649

- **Mean Annual Rainfall (P):** (4.9041 + 2.7144 + 3.2649) / 3 = 3.6278 m/year

- **Surface Area Data**

Surface Type	Area (m²)	Runoff Coefficient
Roof	2,871.80	0.875
Paved	1,951.80	0.7
Unpaved	4,679.48	0.6
Green	3,352.13	— (excluded)

RWH Calculations

- **RWH (Roof)** = 3.6278 × 2,871.80 × 0.875 = **9,089.79 m³**

- **RWH (Paved)** = 3.6278 × 1,951.80 × 0.7 = **4,957.38 m³**

- **RWH (Unpaved)** = 3.6278 × 4,679.48 × 0.6 = **10,177.65 m³**

- Total Annual Harvestable Rainwater (**Total RWH**) = 9,089.79 + 4,957.38 + 10,177.65 = **24,224.82 m³/year** = **24,224,820 liters/year**

**TERRAIN PROFILE ANALYSIS**

Profile 1: North–South

- **Elevation Range:** 16.46 m to 53.54 m → **Relief: ~37.08 m**

- **Slope Pattern:**
  Gradual elevation in the middle, sharp fall toward the south

- **Drainage Implication:**
  Surface runoff will favor southern zones — recommend placing major recharge structures near southern boundary
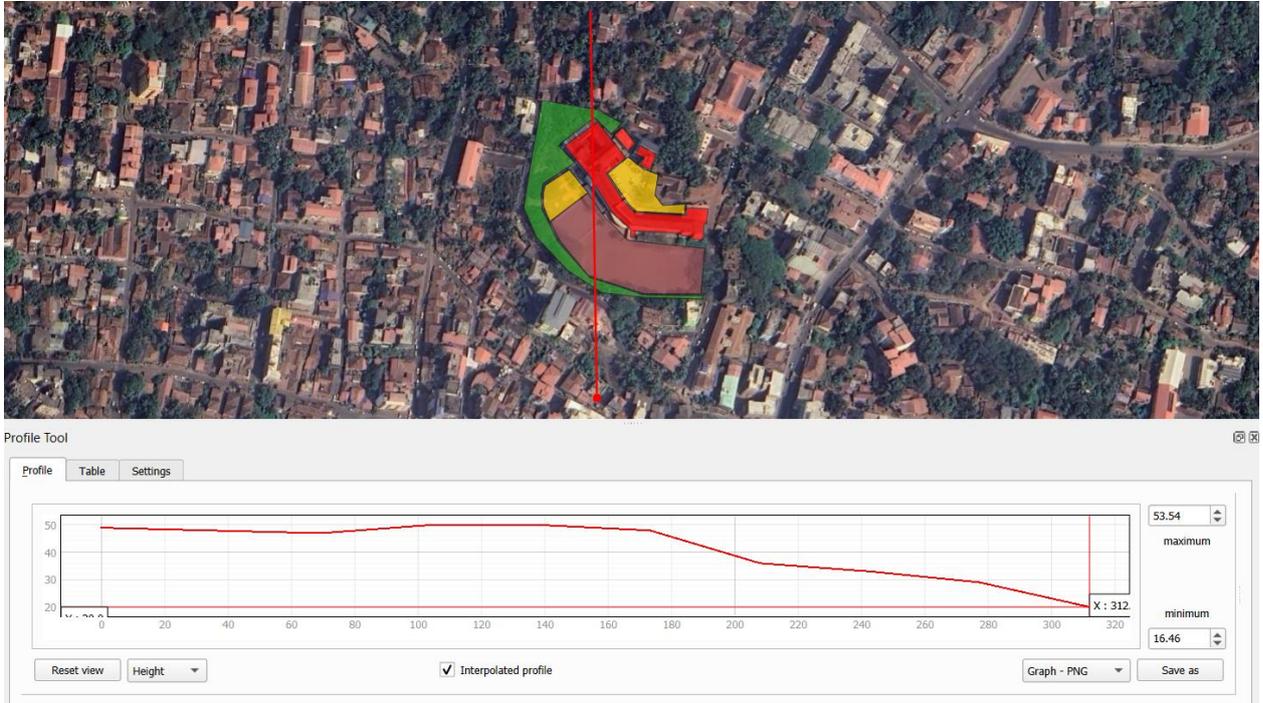
Profile 2: East–West

- **Elevation Range:** 15.46 m to 52.54 m → **Relief: ~37.08 m**

- **Slope Pattern:**
  Peak in central-eastern region; gradual slope westward and eastward

- **Drainage Implication:**
  Potential for water pooling in both corners; distributed recharge trenches are advisable
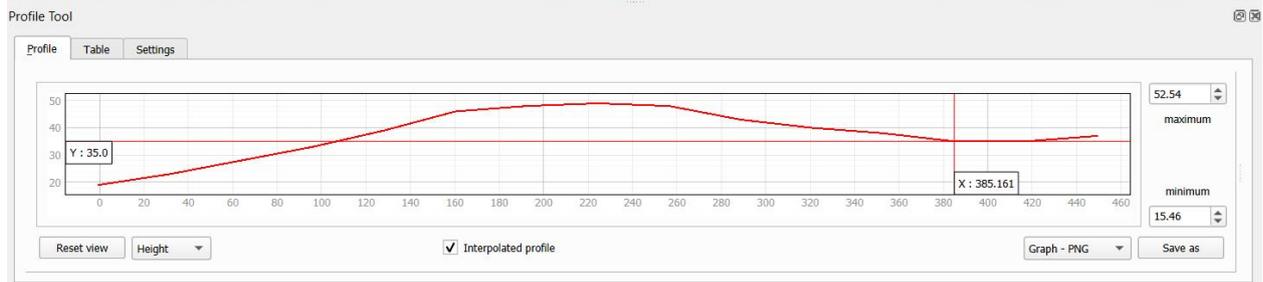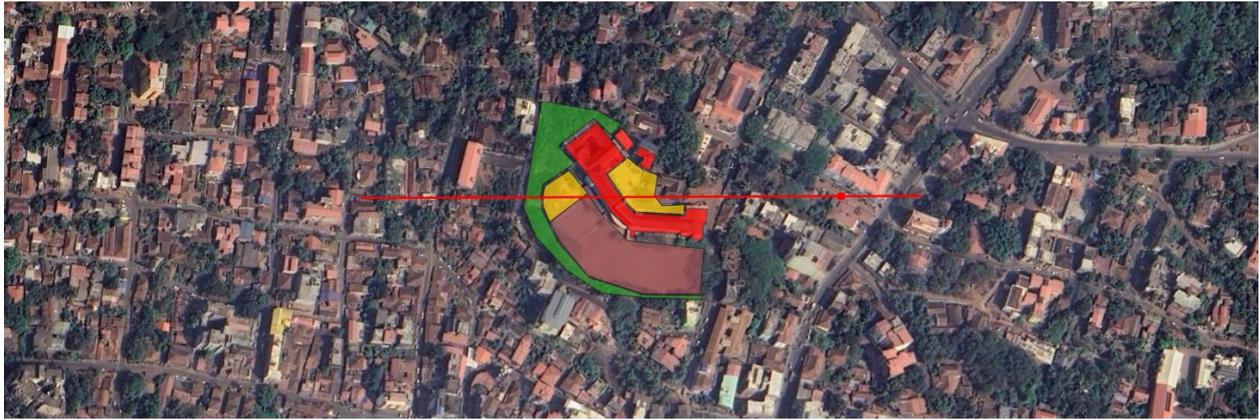
Recommendations: Storage & Recharge Zones

- Prioritize **southern and western** edges for primary recharge trenches

- Use green area for **eco-awareness activities** and **signage**

- Consider **distributed detention basins** on eastern and western slopes

- Leverage **unlined soak pits** and **check bunds** to slow down runoff on high-slope areas

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

- Rain Water Harvesting Potential: 24,224.84 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: 9,176
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 13,274 m^2
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 4,037

> *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 Area:** 3,352.13 m²

- **Sequestration Rate (IPCC):** 0.9 kg CO_2/m²/year

- **Estimated Annual CO_2 Sequestration:** 3,352.13 × 0.9 = **3,016.92 kg/year = ~3.02 metric tons CO_2/year**

4 SOLAR INSTALLATION

- Refer to : https://ecosjwestzone.org/solar-dashboard/ for Province/School information.
- Installed On Grid kW Capacity : 30 kW
- Installed Off Grid kW Capacity : 6
- 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 (CO_2) 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.