St. Xavier's High School, Manmad, Bombay

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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 (m^2)
- **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	786.48	0.7865
2023	596.47	0.5965
2022	767.19	0.7672

- **Mean Annual Rainfall (P)** = (0.7865 + 0.5965 + 0.7672) / 3 = **0.7167 m/year**

- **Surface Area Data**

Surface Type	Area (m^2)	Runoff Coefficient
Roof	4,125.46	0.875
Paved	1,762.18	0.7
Unpaved	18,671.07	0.6
Green	2,326.16	— (excluded)

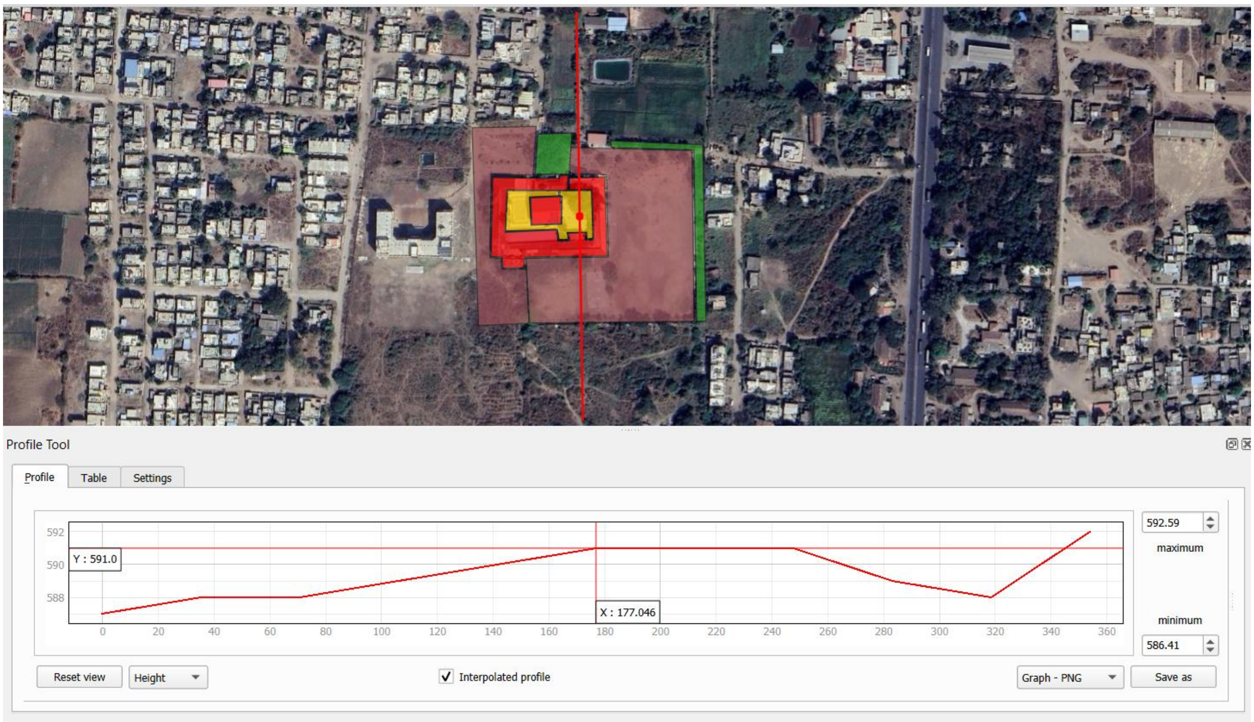
RWH Calculations

- **RWH (Roof)** = 0.7167 × 4,125.46 × 0.875 = **2,584.74 m^3**
- **RWH (Paved)** = 0.7167 × 1,762.18 × 0.7 = **882.59 m^3**
- **RWH (Unpaved)** = 0.7167 × 18,671.07 × 0.6 = **8,026.67 m^3**
- Total Annual Harvestable Rainwater **(Total RWH)** = 2,584.74 + 882.59 + 8,026.67 = **11,494.00 m^3** = **11,494,000 liters/year**

TERRAIN PROFILE ANALYSIS

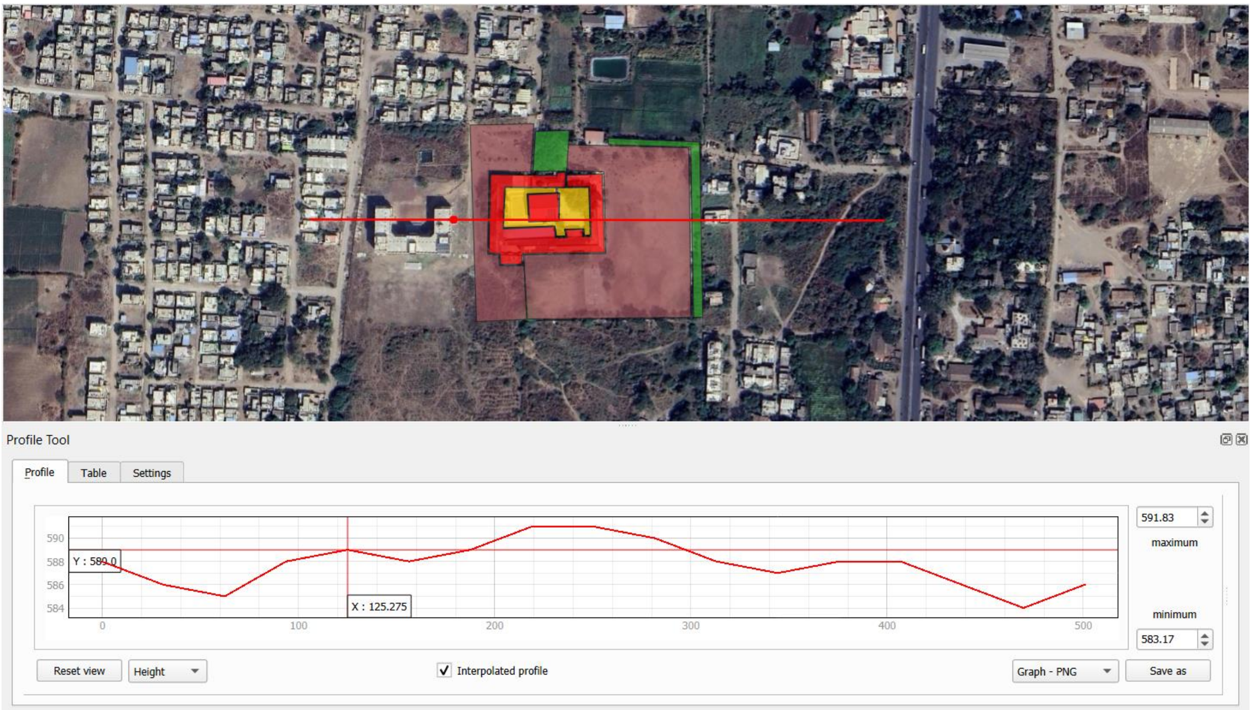
Profile 1: North–South

- Elevation Range: **586.41 m to 592.59 m** → **Relief: ~6.18 m**
- **Slope Pattern:**
  - Gradual rise from south to north; highest point at the northern boundary
- **Drainage Implication:**
  - Southward slope facilitates drainage flow, suitable for placing recharge pits or soakaways in southern zones



Profile 2: East–West

- Elevation Range: **583.17 m to 591.83 m → Relief: ~8.66 m**
- **Slope Pattern:**
    - Gentle undulating terrain, sloping away from central built-up area toward east and west
- **Drainage Implication:**
    - Potential for dual recharge basins or storage channels on both flanks



Recommendations: Storage & Recharge Zones

- **Primary recharge pit locations**: South and southeast edge of campus
- **Secondary recharge**: Small trenching possible along east-west flanks
- **Green space enhancement**: Tree planting around green belt can further boost sequestration
- **Community visibility**: South-facing green zone is suitable for signage or eco-awareness displays

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

- Rain Water Harvesting Potential: 11,494 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: 4,354
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 6,298 m^2
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 1,916

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** = 2,326.16 m²
- **IPCC standard sequestration rate** = 0.9 kg CO_2/m²/year
- **Estimated Annual CO_2 Sequestration** =
  2,326.16 × 0.9 = **2,093.54 kg/year** = **2.09 metric tons CO_2/year**

4 SOLAR INSTALLATION

- Refer to : https://ecosjwestzone.org/solar-dashboard/ for Province/School information.
- Installed On Grid kW Capacity (English Medum): 15 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 (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.