St. Xavier's High School, Manickpur, 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 (m)
- **A** = Catchment area (m^2)
- **C** = Runoff coefficient
    - Rooftop: 0.875
    - Paved: 0.7
    - Unpaved: 0.6
    - Green: Excluded from RWH (used only for carbon sequestration)

Data Considered:

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

Year	Rainfall (mm)	Rainfall (m)
2024	3,505.81	3.506
2023	2,407.67	2.408
2022	3,228.79	3.229

- **Mean Annual Rainfall (P)** = (3.506 + 2.408 + 3.229) / 3 = **3.0477 m/year**

- **Surface Area Data**

Surface Type	Area (m^2)	Runoff Coefficient
Roof	823.43	0.875
Paved	767.48	0.7
Unpaved	2,455.89	0.6
Green	688.83	— (excluded)

RWH Calculations

- RWH (Roof) = 3.0477 × 823.43 × 0.875 = 2,199.09 m^3
- RWH (Paved) = 3.0477 × 767.48 × 0.7 = 1,631.19 m^3
- RWH (Unpaved) = 3.0477 × 2,455.89 × 0.6 = 4,486.33 m^3

Total Annual Harvestable Rainwater

- Total RWH = 2,199.09 + 1,631.19 + 4,486.33 = 8,316.61 m^3 = 8,316,610 liters/year

TERRAIN PROFILE ANALYSIS

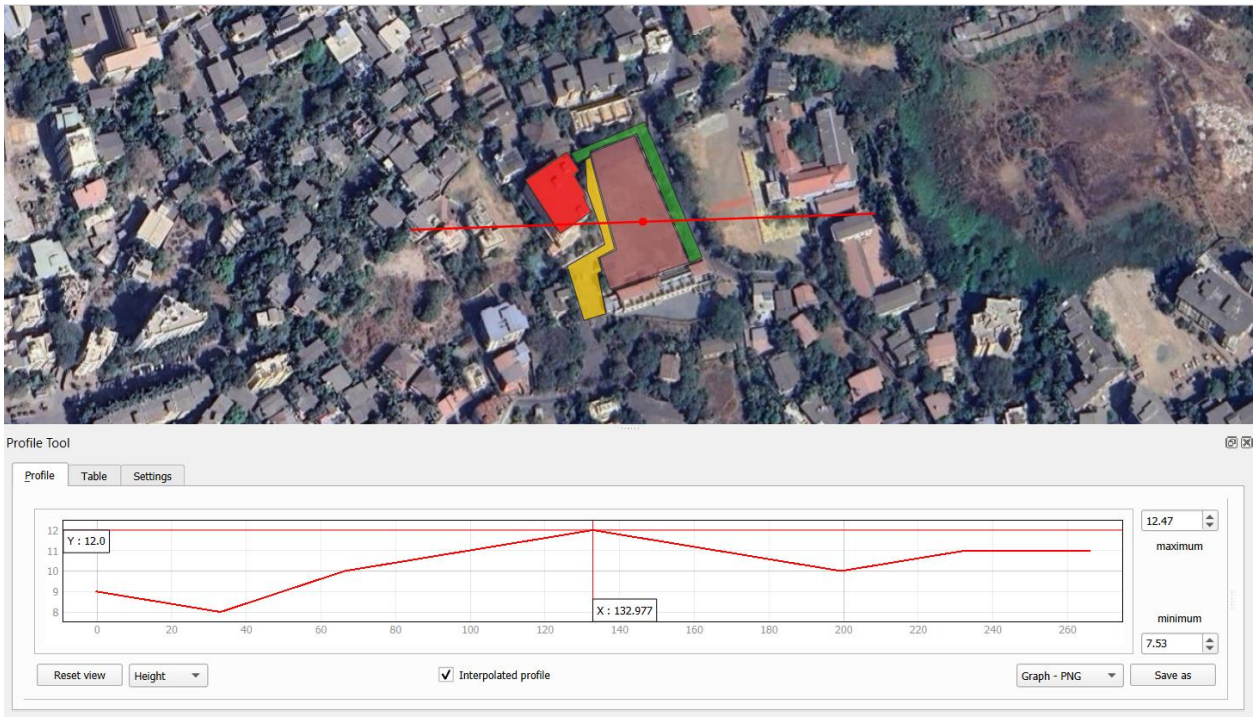
Profile 1: North–South

- Elevation Range: 7.41 m to 13.59 m → Relief: ~6.18 m
- Slope Pattern:
  - Gradual slope from north to south with steady descent after the midpoint
- Drainage Implication:

- Southern boundary is best suited for water collection and recharge structures

Profile 2: East–West

- Elevation Range: 7.53 m to 12.47 m → Relief: ~4.94 m
- Slope Pattern:
  - Slight dip in the center and rise towards both ends
- Drainage Implication:
  - Water accumulates near central low point, making it suitable for bioswales or retention basins



Recommendations: Storage & Recharge Zones

- Prioritize south-central area for main recharge pit or detention tank
- Consider shallow surface channels to direct runoff from roof and paved zones
- Integrate signage or eco-awareness features near the green zone or recharge pit

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

- Rain Water Harvesting Potential: 8,316.61 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: 3,150
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 4,557 m^2
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 1,386

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 = 688.83 m²
- Using IPCC standard sequestration rate: 0.9 kg CO_2/m²/year
- Estimated Annual CO_2 Sequestration = 688.83 × 0.9 = 619.95 kg/year = 0.62 metric tons CO_2/year

4 SOLAR INSTALLATION

- Refer to : https://ecosjwestzone.org/solar-dashboard/ for Province/School information.
- Installed On Grid kW Capacity : Data not available
- Installed Off Grid kW Capacity : Data not available
- 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.