St. Xavier's High School, Nashik, 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 (m²)
- **C** = Runoff coefficient
    - 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	854.52	0.8545
2023	645.98	0.6460
2022	945.63	0.9456

- **Mean Annual Rainfall (P) = (0.8545 + 0.6460 + 0.9456) / 3 = 0.8154 m/year**

- **Surface Area Data**

Surface Type	Area (m^2)	Runoff Coefficient
Roof	5,702.99	0.875
Paved	2,524.78	0.7
Unpaved	15,668.91	0.6
Green	9,066.70	— (excluded)

RWH Calculations

- **RWH (Roof)** = 0.8154 × 5,702.99 × 0.875 = **4,069.49 m^3**
- **RWH (Paved)** = 0.8154 × 2,524.78 × 0.7 = **1,439.73 m^3**
- **RWH (Unpaved)** = 0.8154 × 15,668.91 × 0.6 = **7,655.38 m^3**

Total Annual Harvestable Rainwater

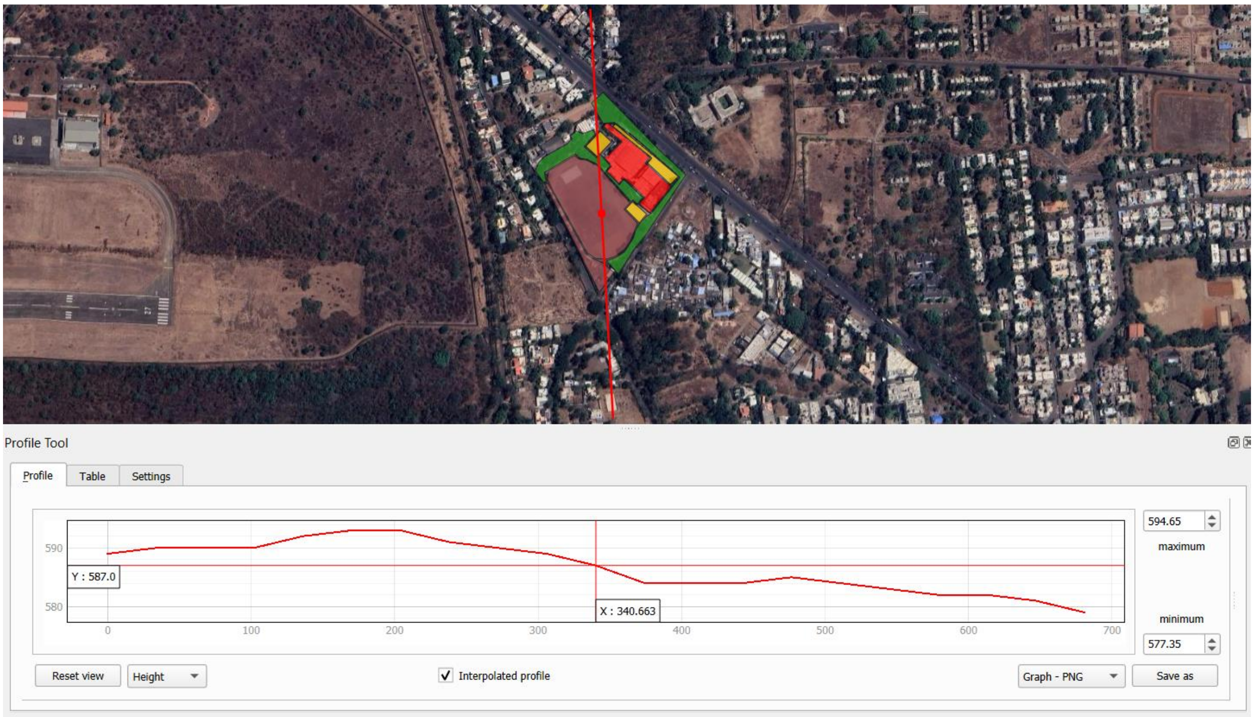
- Total RWH = 4,069.49 + 1,439.73 + 7,655.38 = 13,164.60 m^3 = 13,164,600 liters/year

TERRAIN PROFILE ANALYSIS

Profile 1: North–South

- **Elevation Range**: 577.35 m to 594.65 m → **Relief: ~17.30 m**
- **Slope Pattern**:
  - High point near center (~594.6 m), sloping gradually both north and south
- **Drainage Implication**:

- Southward flow dominant, ideal for placing recharge tanks or trenches along the southern boundary



Profile 2: East–West

- **Elevation Range**: 587.41 m to 593.59 m → **Relief: ~6.18 m**
- **Slope Pattern**:
  - Gentle undulations, with **western and eastern low points**
- **Drainage Implication**:
  - Surface water is likely to accumulate in **east and west corners**, offering options for **distributed recharge solutions**

Recommendations: Storage & Recharge Zones

- Prioritize **south and southeastern zones** for **main recharge pits**
- East and west flanks can support **secondary recharge or detention basins**
- Consider **integrating signage or eco-awareness features** within green areas

Given the **moderate rainfall**, focus on **maximizing retention and slow infiltration** using permeable features.

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

- Rain Water Harvesting Potential: 13,164.6 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: 4,987
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 7,213 m^2
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 2,194

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** = **9,066.70 m²**
- IPCC standard sequestration rate: **0.9 kg CO_2/m²/year**
- **Estimated Annual CO_2 Sequestration** = 9,066.70 × 0.9 = **8,160.03 kg/year** = **8.16 metric tons CO_2/year**

4 SOLAR INSTALLATION

- Refer to : https://ecosjwestzone.org/solar-dashboard/ for Province/School information.
- Installed On Grid kW Capacity : 19 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 (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.