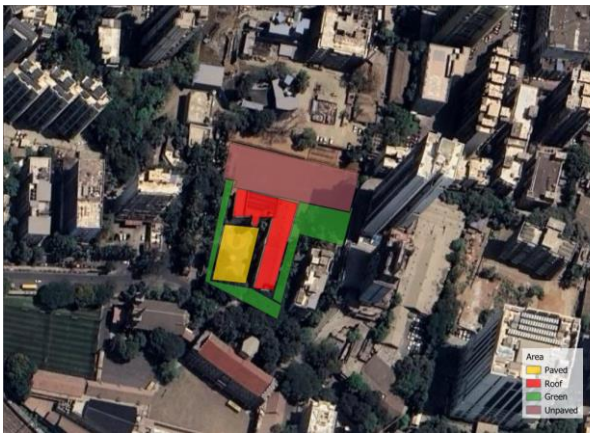
St.Mary's High School (SSC), Mazgaon, Bombay

(For any queries, clarifications kindly email: jaaiwzc25@gmail.com)

(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

Area-Based RWH Formula:

RWH = P × A × C

Where:

- **P** = Mean annual rainfall (in meters)
- **A** = Area of the surface (m^2)
- **C** = Runoff coefficient
    - Rooftop: 0.875
    - Paved: 0.7
    - Unpaved: 0.6
    - Green areas are excluded from RWH but used for sequestration.

Data Considered:

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

Year	Rainfall (mm)	Rainfall (m)
2024	3,671.24	3.671
2023	2,697.01	2.697
2022	3,371.12	3.371

- **Mean Rainfall (P)** = (3.671 + 2.697 + 3.371) / 3 = **3.246 m/year**

- **Surface Area Data**

Surface Type	Area (m^2)	Runoff Coefficient (C)
Roof	1,117.84	0.875
Paved	766.39	0.7
Unpaved	2,118.27	0.6
Green	1,546.66	— (for CO_2 only)

RWH Calculations

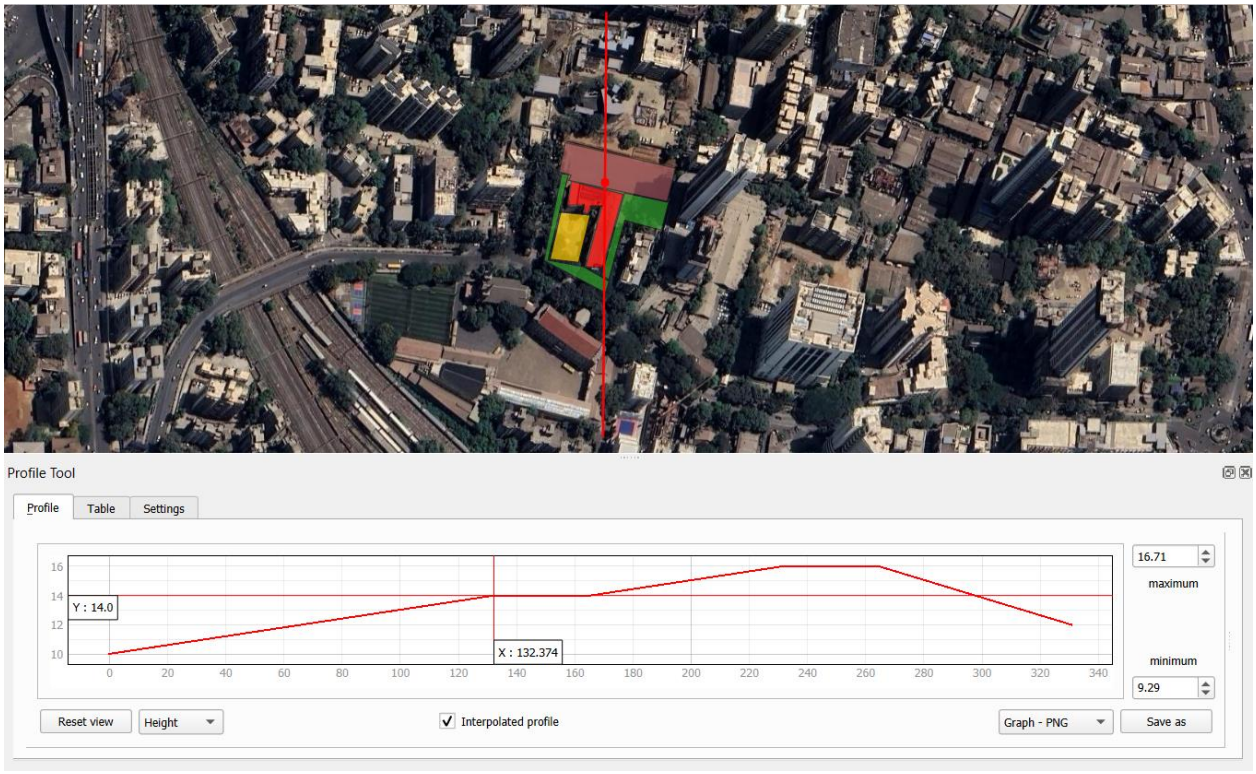
- **RWH from Rooftop** = 3.246 × 1,117.84 × 0.875 = **3,171.10 m^3**
- **RWH from Paved Area** = 3.246 × 766.39 × 0.7 = **1,743.33 m^3**
- **RWH from Unpaved Area** = 3.246 × 2,118.27 × 0.6 = **4,120.67 m^3**
- **Total Annual Harvestable Rainwater** = **3,171.10 + 1,743.33 + 4,120.67 = 9,035.10 m^3** = **9,035,100 liters**

TERRAIN PROFILE ANALYSIS

Profile 1: North–South Direction

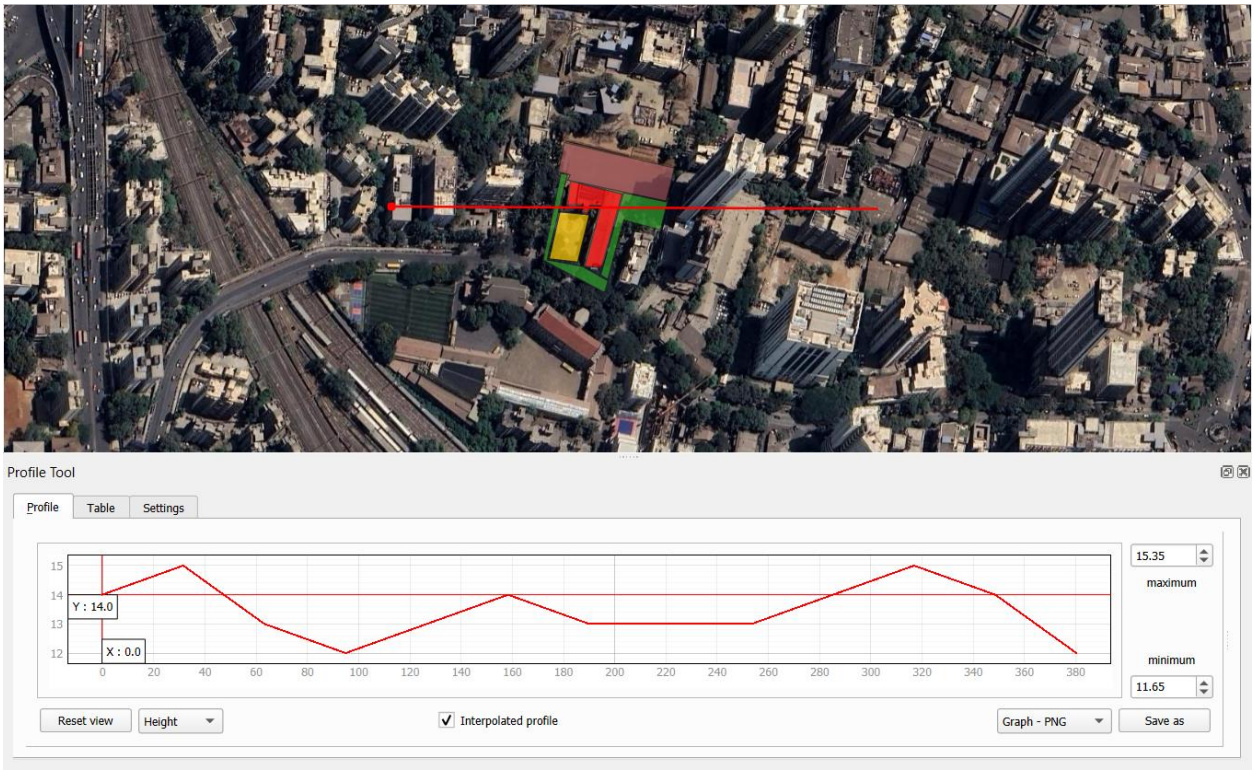
- **Elevation Range**: 9.29 m to 16.71 m → **Relief: ~7.42 m**
- **Slope Pattern**:
    - Gradual rise to a mid-point high near the buildings, then declines toward both ends.
- **Drainage Implication**:
    - Central high area near the built-up zone, runoff disperses to both north and south.

- **North and south boundaries** offer potential for recharge and detention zones.



Profile 2: East–West Direction

- **Elevation Range**: 11.65 m to 15.35 m → **Relief: ~3.70 m**
- **Slope Pattern**:
  - Multiple shallow undulations with peaks and troughs.
  - Slight rise westward then a gradual fall toward the eastern boundary.
- **Drainage Implication**:
  - Water can collect in the central depressions and eastern end.
  - **Eastern periphery** is suitable for **storage/recharge structures**.



Recommendations: Storage & Recharge Zones

- **Eastern and southern edges** are viable for **recharge pits or shallow collection tanks**.
- **Roof and paved runoff** can be directed via channels toward these low-lying areas.
- Central green space provides an opportunity for **bioswales** or **percolation trenches**.

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

- Rain Water Harvesting Potential: 9,035.1 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: 3,422
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 4,951 m^2
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 1,506

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 Zone)

- **Total Green Area** = **1,546.66 m²**
- Using standard IPCC factor of **0.9 kg CO_2/m²/year**:
- **Estimated Carbon Sequestration** = 1,546.66 m² × 0.9 kg CO_2/m²/year = **1,392.00 kg CO_2/year** = **1.39 metric tons CO_2/year**
- This green area supports carbon offsetting and biodiversity benefits within the campus.

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 : 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 (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.