

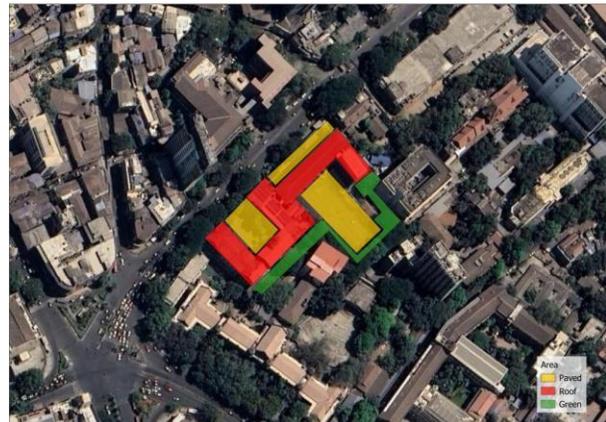


St. Xavier's High School ,Fort, Bombay

(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:

$$RWH = P \times A \times C$$

Where:

- **P** = Mean annual rainfall (in meters)
- **A** = Area of the surface (m²)
- **C** = Runoff coefficient
 - Rooftop: 0.875
 - Paved: 0.7
 - Green areas are excluded from RWH calculations (used for sequestration)



Data Considered:

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

Year	Rainfall (mm)	Rainfall (m)
2024	3,501.243	3.501
2023	2,651.1501	2.651
2022	3,134.5908	3.135

- **Mean Rainfall (P) = $(3.501 + 2.651 + 3.135) / 3 = 3.095$ m/year**

Surface Area Data

Surface Type	Area (m ²)	Runoff Coefficient (C)
Roof	3,702.29	0.875
Paved	2,895.83	0.7
Green	1,360.20	Excluded from RWH

RWH Calculations

- **RWH from Rooftop = $3.095 \times 3,702.29 \times 0.875 = 10,034.25$ m³**
- **RWH from Paved Area = $3.095 \times 2,895.83 \times 0.7 = 6,297.92$ m³**
- **Total Annual Harvestable Rainwater = $10,034.25 + 6,297.92 = 16,332.17$ m³
= 16,332,170 liters**

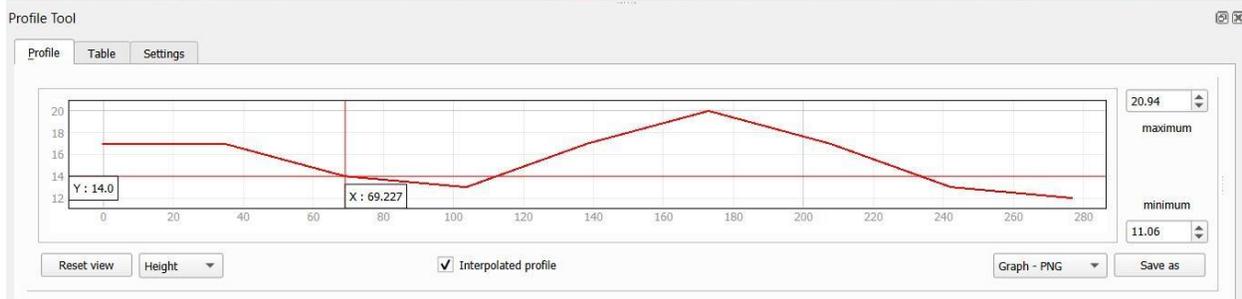
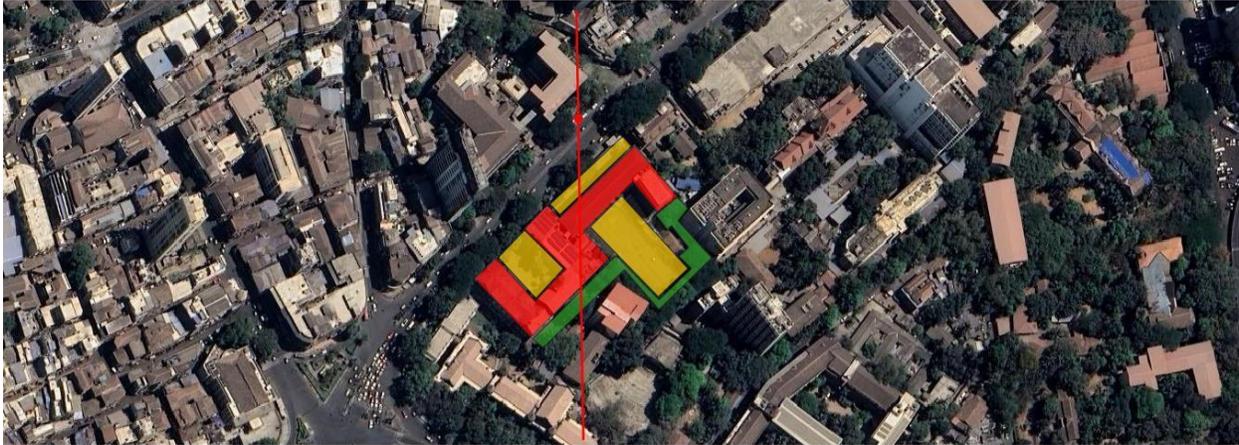
TERRAIN PROFILE ANALYSIS

Profile 1: North–South Direction

- **Elevation Range: 11.06 m to 20.94 m → Relief: -G.88 m**
- **Slope Pattern:**
 - Low-lying start (south), rise to a central ridge, and then gradual slope northward.

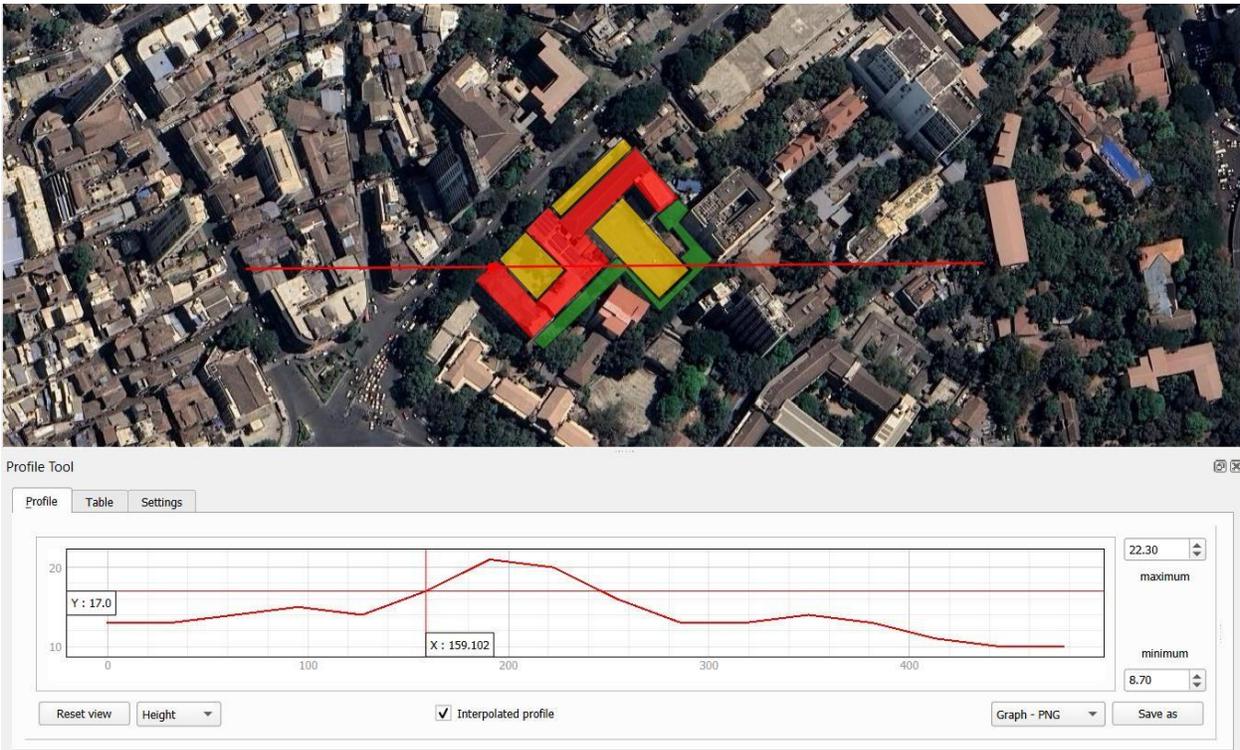


- **Drainage Implication:**
 - Central ridge directs runoff to both north and south edges.
 - Suitable **collection zones** exist along southern and northern boundaries.



Profile 2: East–West Direction

- **Elevation Range:** 8.70 m to 22.30 m → **Relief:** ~13.60 m
- **Slope Pattern:**
 - Rise from the west to central high ground, followed by descent toward the east.
- **Drainage Implication:**
 - Central ridge again governs runoff direction.
 - **Eastern and western edges** ideal for recharge wells or collection tanks.



Recommendations: Storage & Recharge Zones

- **East and south:** ideal for **ground recharge pits** based on elevation profiles.
- **Roof drainage:** should be routed into tanks or recharge beds on **lower-elevation ends**.
- Consider placing **signage or selfie point** in front of the green area + water structures to increase visibility and awareness.

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

- Rain Water Harvesting Potential: 16,332.17 m³/year
- If RWH water is used *for toilet flushing* then the number of students whose flushing needs can be met in a year is: 6,186
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 8,949 m²
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 2,722



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 = $RWH (L) / (6 L/\text{flush} \times 2 \text{ flushes}/\text{student}/\text{day} \times 220 \text{ days})$

Garden area watering supported annually :

Assumption: 5 L/m²/day year-round (365 days)

Garden Area = $RWH (L) / (5 L/\text{m}^2/\text{day} \times 365 \text{ days})$

Number of trees watering supported in the dry season :

Assumptions: 50 L/tree/day, dry season = 120 days

Trees Supported = $RWH (L) / (50 L/\text{tree}/\text{day} \times 120 \text{ days})$

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 (ET_c). FAO Irrigation & Drainage Paper 56 (Allen et al.) gives the ET_c 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 = 1,360.20 m²**
- Using the IPCC standard average of **0.9 kg CO₂/m²/year** for mixed vegetation (urban trees, hedges, grass):
- **Estimated Carbon Sequestration = 1,360.20 m² × 0.9 kg CO₂/m²/year = 1,224.18 kg CO₂/year = 1.22 metric tons CO₂/year**
- This represents the school's **natural carbon sink** through on-site vegetation and contributes to overall urban sustainability.



4 SOLAR INSTALLATION

- Refer to : <https://ecosjwestzone.org/solar-dashboard/> for Province/School information.
- Installed On Grid kW Capacity : 35 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.