



St. Xavier's College Fort Bombay

Xavier Institute of Communications Fort Bombay

Xavier Institute of Management & Research Fort
Bombay

Note: These three institutes are adjacent to each other located within a cluster.

(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

RWH Formula:

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

Where:

- **P** = Mean annual rainfall (in meters)
- **A** = Surface area (m²)



- **C = Runoff coefficient**
 - Rooftop: 0.875
 - Paved: 0.7
 - Green: Excluded from RWH (used for carbon sequestration only)

Data Considered:

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

Year	Rainfall (mm)	Rainfall (m)
2024	3,501.24	3.501
2023	2,651.15	2.651
2022	3,134.59	3.135

- **Mean Annual Rainfall (P) = $(3.501 + 2.651 + 3.135) / 3 = 3.096$ m/year**

- **Surface Area Data**

Surface Type	Institution	Area (m ²)	Runoff Coefficient
Rooftop	St. Xavier's College	3,929.90	0.875
Rooftop	Xavier Institute of Communications (XIC)	2,577.73	0.875
Rooftop	Xavier Institute of Management (XIMR)	562.07	0.875
Paved (shared)	College + XIC	$833.12 + 789.72 = 1,622.84$	0.7

RWH Calculations

1 St. Xavier's College:

- **RWH (Roof) = $3.096 \times 3,929.90 \times 0.875 = 10,622.74$ m³**

2 Xavier Institute of Communications (XIC):

- **RWH (Roof) = $3.096 \times 2,577.73 \times 0.875 = 6,992.39$ m³**

3 Xavier Institute of Management (XIMR):

- **RWH (Roof) = $3.096 \times 562.07 \times 0.875 = 1,521.60$ m³**



Shared Paved Surface:

- **RWH (Paved) = $3.096 \times 1,622.84 \times 0.7 = 3,523.83 \text{ m}^3$**

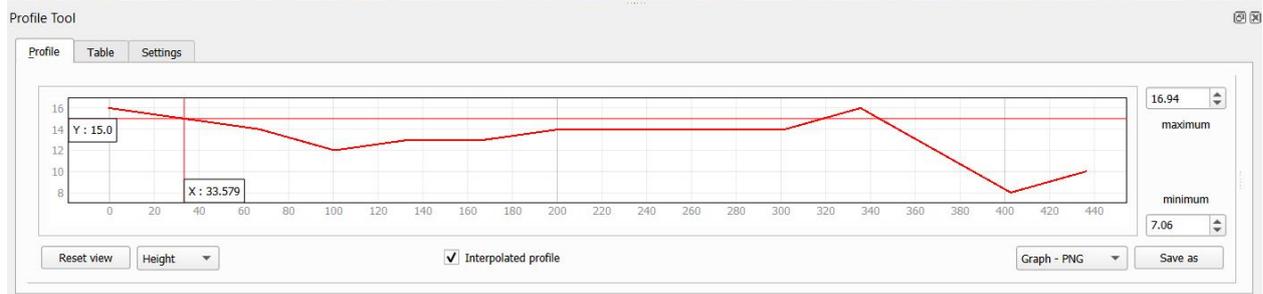
Total Annual Harvestable Rainwater

Institute	Rooftop RWH (m ³)	Paved RWH (m ³ , Shared)	Total RWH (m ³)	Total RWH (liters)
St. Xavier's College	10,622.74	3,523.83	14,146.57	14,146,570 L
XIC	6,992.39	3,523.83	10,516.22	10,516,220 L
XIMR	1,521.60	0	1,521.60	1,521,600 L

TERRAIN PROFILE ANALYSIS (Shared for all three)

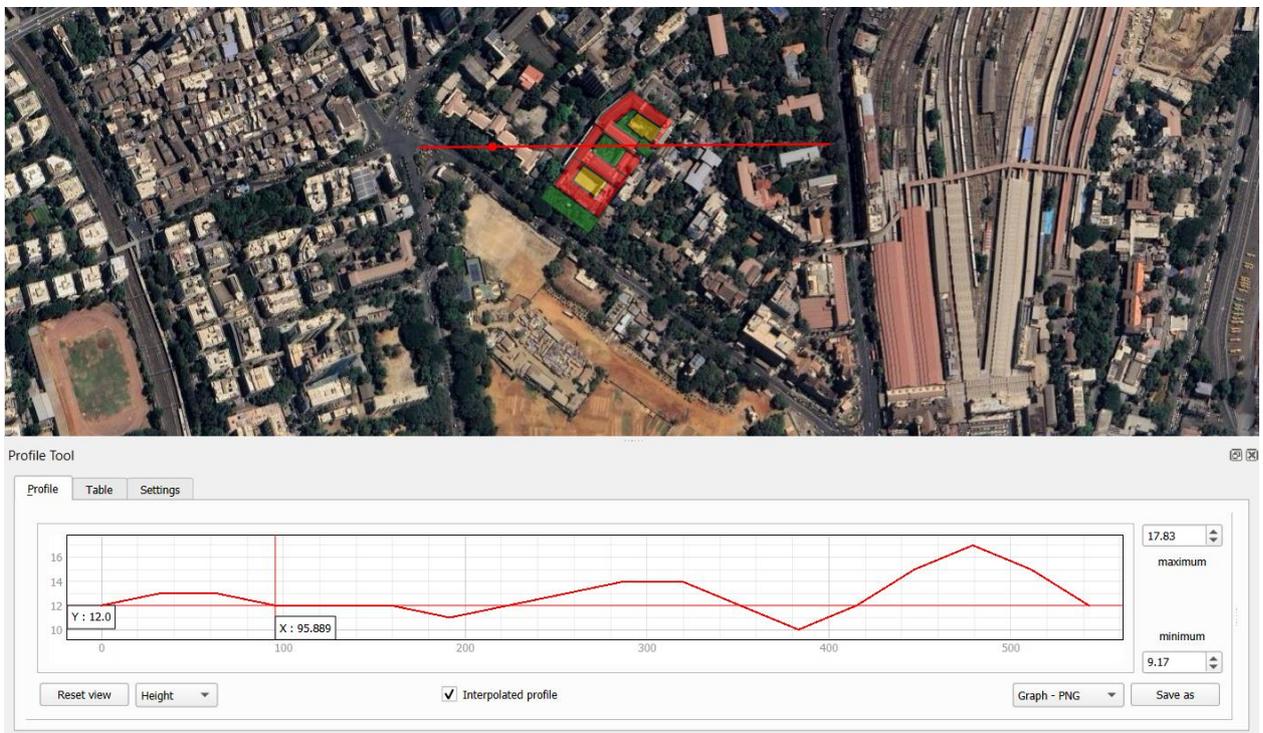
Profile 1: North–South

- Elevation Range: 7.06 m to 16.94 m → Relief: ~9.88 m
- Slope Pattern:
 - Slight undulations with a noticeable slope down toward the south and southeast.
- Drainage Implication:
 - Southern sections are ideal for runoff collection and recharge pits.



Profile 2: East–West

- Elevation Range: 9.17 m to 17.83 m → Relief: ~8.66 m
- Slope Pattern:
 - Multiple mounds and depressions; elevation generally falls toward the east.
- Drainage Implication:
 - Eastern edges have potential for storage tanks or filtration trenches.



Carbon Sequestration Potential

Institute	Green Area (m ²)	Sequestration Rate	Estimated CO ₂ Sequestration
St. Xavier's College	2,579.79	0.9 kg/m ² /year	2,321.81 kg = 2.32 t/year
XIC	699.07	0.9 kg/m ² /year	629.16 kg = 0.63 t/year
XIMR	—	—	— (no green area reported)

Recommendations: Shared Storage & Recharge Zones



- **South and southeast corners** (lowest elevation) are optimal for **storage tanks** and **ground recharge**.
- **Eastern edge** offers potential for **rain gardens** or **percolation pits**.
- Direct runoff from roof and paved surfaces using **sloped channels** or **surface drains** into the identified recharge zones.
- Promote green zones as **carbon sinks**, with potential for signage and awareness activities (e.g., eco-selfie point).

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

- Rain Water Harvesting Potential: 26,184.39 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: 9,918
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 14,348 m²
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 4,364

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 (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

- Total Green Area =
- IPCC Standard Rate: 0.9 kg CO₂/m²/year
- Estimated CO₂ Sequestration =

4 SOLAR INSTALLATION

- Refer to : <https://ecosjwestzone.org/solar-dashboard/> for Province/School information.
- Installed On Grid kW Capacity : 192 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.