St. Xavier's School, Shrirampur, Pune

(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

Runoff Coefficients:

- Rooftop: **0.875**

- Paved: **0.7**

- Unpaved: **0.6**

- Green: *Excluded from RWH (used for carbon sequestration only)*

Data Considered:

- **Rainfall Source: CHIRPS – Last Three Years**

Year	Rainfall (mm)	Rainfall (m)
2024	806.29	0.8063
2023	638.06	0.6381
2022	856.78	0.8568

- **Mean Annual Rainfall (P)** = (0.8063 + 0.6381 + 0.8568) / 3 = **0.7671 m/year**

Surface Area Data:

Surface Type	Area (m²)	Runoff Coefficient
Roof	2,754.30	0.875
Paved	6,132.26	0.7
Unpaved	2,207.91	0.6
Green	1,287.00	Excluded

RWH Calculations

- **RWH (Roof)** = 0.7671 × 2,754.30 × 0.875 = **1,847.31 m³**

- **RWH (Paved)** = 0.7671 × 6,132.26 × 0.7 = **3,297.35 m³**

- **RWH (Unpaved)** = 0.7671 × 2,207.91 × 0.6 = **1,015.42 m³**

Total Annual Harvestable Rainwater

Total RWH = 1,847.31 + 3,297.35 + 1,015.42 = **6,160.08 m³ = 6,160,080 liters/year**
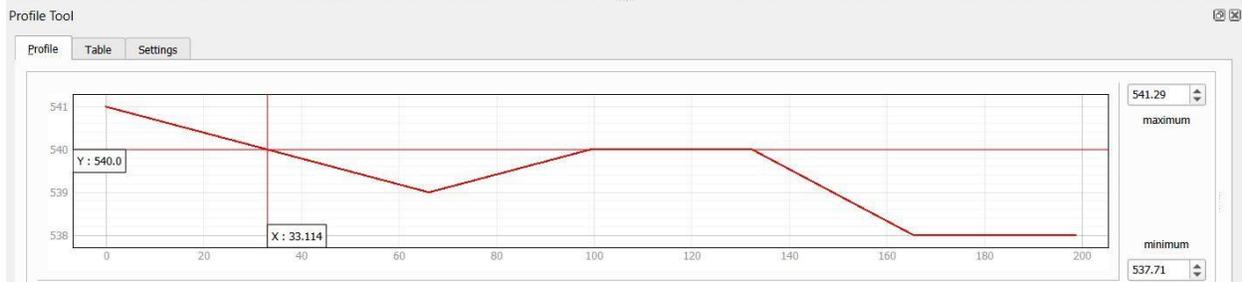
TERRAIN PROFILE ANALYSIS

Profile 1: North–South

- **Elevation Range**: 537.71 m to 541.29 m

- Relief: ~3.58 m

- **Slope Pattern**:
 Mostly flat terrain with slight variation toward the southern edge.

- Drainage Implication:

  Some potential for water pooling at southern boundary. Minimal surface flow; infiltration-based recharge preferred.

Profile 2: East–West

- **Elevation Range**: 534.42 m to 541.58 m

- Relief: ~7.16 m

  - **Slope Pattern**:
    Consistent drop toward the eastern end.

- Drainage Implication:
  Eastern drainage dominance. Consider recharge zones or tanks along eastern edge.
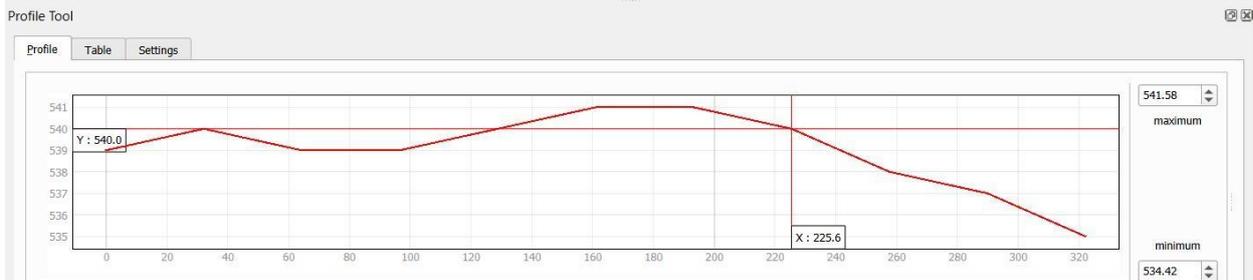
RECOMMENDATIONS: STORAGE s RECHARGE ZONES

- Prioritize **eastern and southern boundaries** for water collection or recharge trenching.

- Use **permeable pavement** in paved zones to reduce runoff intensity.

- Install **eco-awareness boards** around green areas to support student engagement.

- Explore **storage tank retrofitting** to collect rooftop runoff for reuse.

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

- Rain Water Harvesting Potential: 6,160.08 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: 2,333

- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 3,375 m^2

- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 1,026

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** = 1,287.00 m²

- **Sequestration Rate** (IPCC): 0.9 kg CO_2/m²/year

- Estimated Annual CO_2 **Sequestration** = 1,287.00 × 0.9 = 1,158.30 kg/year = 1.16 metric tons CO_2/year

4 SOLAR INSTALLATION

- Refer to : https://ecosjwestzone.org/solar-dashboard/ for Province/School information.
- Installed On Grid kW Capacity : 10 kW
- Installed Off Grid kW Capacity : 0
- Zero Bill Status: Yes

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.