St Xavier's High School, Kolhapur

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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

Runoff Coefficients:

- 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	1084.04	1.0840
2023	605.43	0.6054
2022	1040.17	1.0402

- Mean Annual Rainfall (P) = (1.0840 + 0.6054 + 1.0402) / 3 = 0.9099 m/year

- Surface Area Data:

Surface Type	Area (m^2)	Runoff Coefficient
Roof	7,529.00	0.875
Paved	2,956.70	0.7
Unpaved	22,449.19	0.6
Green	8,866.33	— (excluded)

RWH Calculations

- **RWH (Roof)** = 0.9099 × 7,529.00 × 0.875 = **5,997.27 m^3**
- **RWH (Paved)** = 0.9099 × 2,956.70 × 0.7 = **1,885.61 m^3**
- **RWH (Unpaved)** = 0.9099 × 22,449.19 × 0.6 = **12,309.25 m^3**

Total Annual Harvestable Rainwater

Total RWH = 5,997.27 + 1,885.61 + 12,309.25 = 20,192.13 m^3 = 20,192.130 liters/year

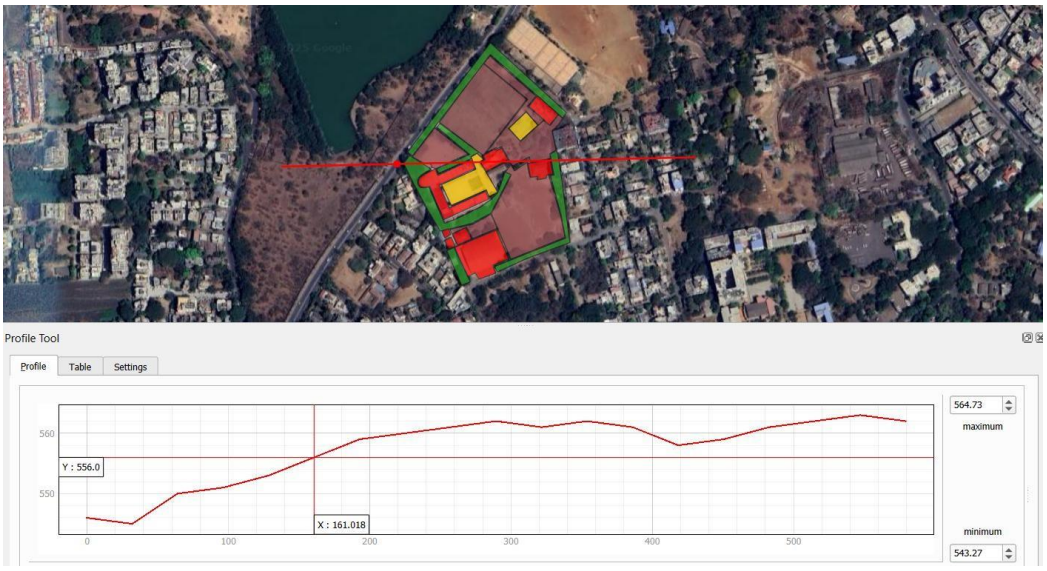
TERRAIN PROFILE ANALYSIS

Profile 1: North-South

- Elevation Range: 555.33 m to 563.67 m → Relief: ~8.34 m
- **Slope Pattern:** Gentle rise towards the northern side, with central plateau
- **Drainage Implication:** Water movement favors south and southwest edges; recharge pits effective along southern zones

Profile 2: East–West

- Elevation Range: 543.27 m to 564.73 m → Relief: ~21.46 m
- **Slope Pattern:** Distinct westward decline with undulating mid-slopes
- **Drainage Implication:** Opportunity to establish recharge trenches and staggered pits along western flank for improved infiltration



Recommendations: Storage & Recharge Zones

- Prioritize **southern and southwestern edges** for main recharge tanks/pits
- Develop **staggered trenches along western boundary** to enhance infiltration
- Use permeable paving in semi-paved courtyards to increase percolation
- Consider educational signage and eco-awareness features around green zones

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

- Rain Water Harvesting Potential: 20,192.13 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: 7,648
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 11,064 m^2
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 3,365

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/m^2/day year-round (365 days)
Garden Area = RWH (L) / (5 L/m^2/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 m^3 = 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 = 8,866.33 m²**
- IPCC standard sequestration rate = 0.9 kg CO_2/m²/year
- Estimated Annual CO_2 Sequestration = 8,866.33 × 0.9 = 7,979.70 kg/year = 7.98 metric tons CO_2/year

4 SOLAR INSTALLATION

- Refer to : https://ecosjwestzone.org/solar-dashboard/ for Province/School information.
- Installed On Grid kW Capacity : Not Available
- Installed Off Grid kW Capacity : Not Available
- 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.