St. Xavier's High School, Gandhinagar, Gujarat

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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:

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

Where:

P = Mean annual rainfall (in meters)

A = Surface area (m^2)

C = Runoff coefficient

Runoff Coefficients Used:

- 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	1240.16	1.2402
2023	804.63	0.8046
2022	1144.67	1.1447

- **Mean Annual Rainfall (P)** = (1.2402 + 0.8046 + 1.1447) / 3 = **1.0632 m/year**

- ## Surface Area Data

Surface Type	Area (m^2)	Runoff Coefficient
Roof	6,844.32	0.875
Paved	8,462.93	0.7
Unpaved	25,384.43	0.6
Green	20,306.28	Excluded

RWH Calculations

- **RWH (Roof)** = 1.0632 × 6,844.32 × 0.875 = **6,377.27 m^3**
- **RWH (Paved)** = 1.0632 × 8,462.93 × 0.7 = **6,287.87 m^3**
- **RWH (Unpaved)** = 1.0632 × 25,384.43 × 0.6 = **16,193.23 m^3**

Total Annual Harvestable Rainwater = 6,377.27 + 6,287.87 + 16,193.23 = **28,858,370 liters / year**

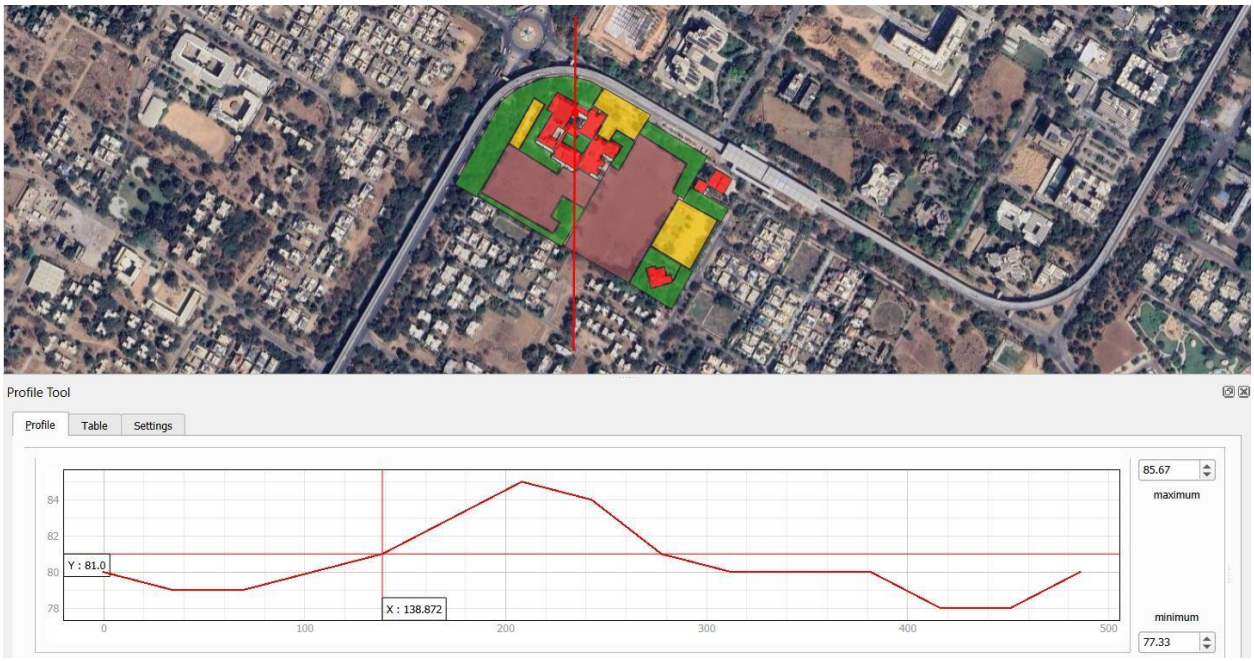
TERRAIN PROFILE ANALYSIS

Profile 1: North–South

- **Elevation Range:** 77.33 m to 85.67 m
- **Relief:** ~8.34 m
- **Slope Pattern:** Gradual incline toward north

- ## Drainage Implication:

Southward flow is likely; ideal locations for recharge pits are southern corners.



Profile 2: East–West

- **Elevation Range:** 74.04 m to 85.96 m
- **Relief:** ~11.92 m
- **Slope Pattern:** High in central-northern zone, sloping outward

- ## Drainage Implication:

  Western boundary offers potential for lateral recharge trenches.

Recommendations: Storage & Recharge Zones

- Create **combined recharge/storage pits** near southern and western zones.
- Consider **permeable paving** in hardscape redesign to boost infiltration.
- Utilize green space for **outreach signage** and Eco Club activities.
- Explore underground tank options beneath sports field for **dual use** and water security.

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

- Rain Water Harvesting Potential: 28858.99 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: 10,931
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 15,813 m^2
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 4809

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:** 20,306.28 m²
- **Sequestration Factor (IPCC standard):** 0.9 kg CO_2/m²/year
- Estimated CO_2 Sequestration:

  20,306.28 × 0.9 = **18,275.65 kg/year** = **18.28 metric tons/year**

4 SOLAR INSTALLATION

- Refer to : https://ecosjwestzone.org/solar-dashboard/ for Province/School information.
- Installed On Grid kW Capacity : 10 kW (shown as "Gandhinagar" as per data provided).
- 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.