St. Xaviers High School, Kalol, Gujarat

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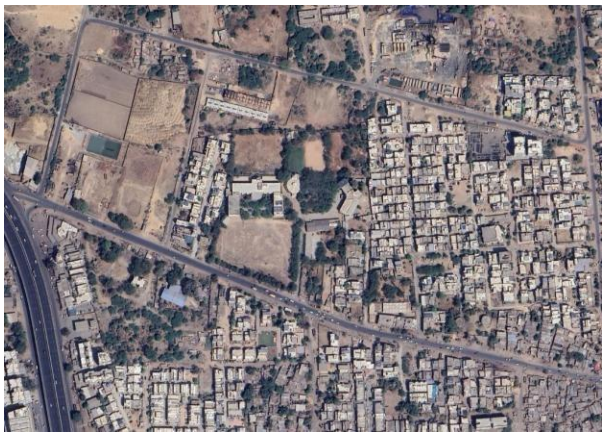
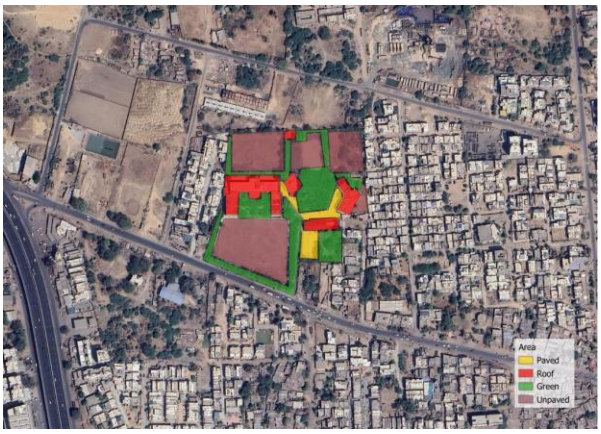
(Data Generated for JAAI West Zone Conference 14-16 Nov 2025)

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:

- 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	1203.10	1.2031
2023	749.62	0.7496
2022	1082.62	1.0826

- **Mean Annual Rainfall (P)** = (1.2031 + 0.7496 + 1.0826) / 3 = **1.0118 m/year**

- ## Surface Area Data

Surface Type	Area (m^2)	Runoff Coefficient
Roof	4,588.04	0.875
Paved	1,917.54	0.7
Unpaved	14,020.34	0.6
Green	9,868.73	— (excluded)

RWH Calculations

- **RWH (Roof)** = 1.0118 × 4,588.04 × 0.875 = **4,055.87 m^3**
- **RWH (Paved)** = 1.0118 × 1,917.54 × 0.7 = **1,357.77 m^3**
- **RWH (Unpaved)** = 1.0118 × 14,020.34 × 0.6 = **8,510.15 m^3**

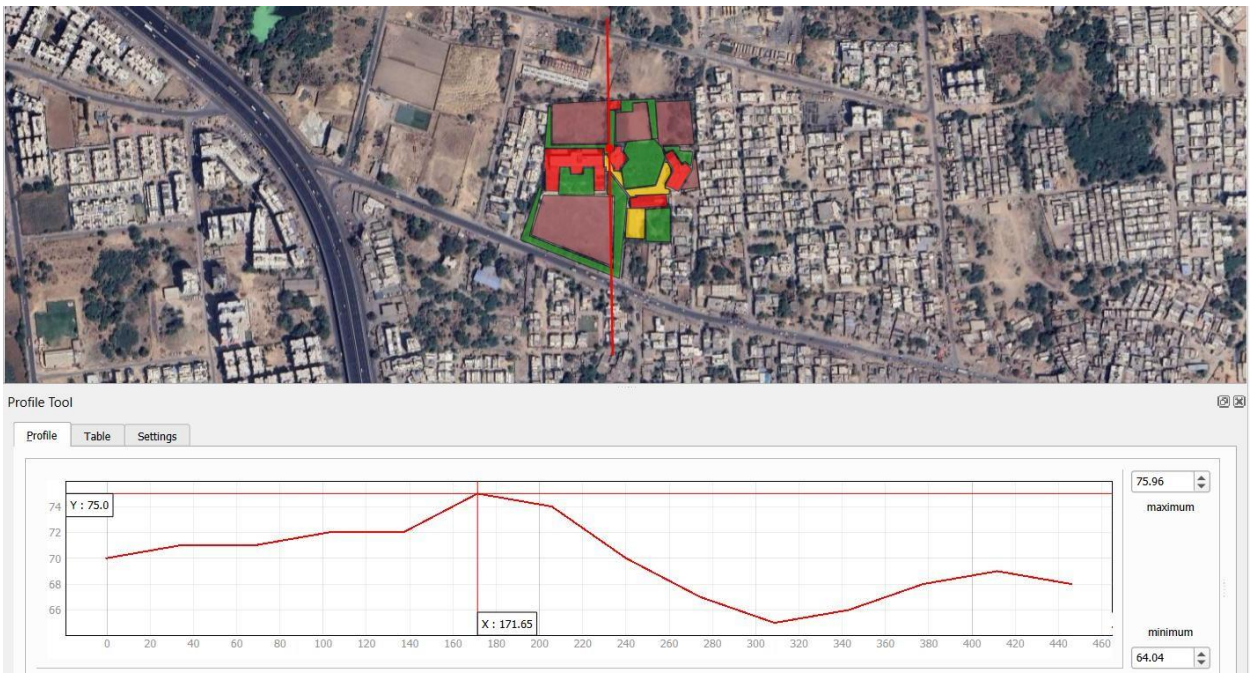
Total Annual Harvestable Rainwater = 4,055.87 + 1,357.77 + 8,510.15 = 13,929.79 m^3 = 13,323,790 liters/year

TERRAIN PROFILE ANALYSIS

Profile 1: North–South

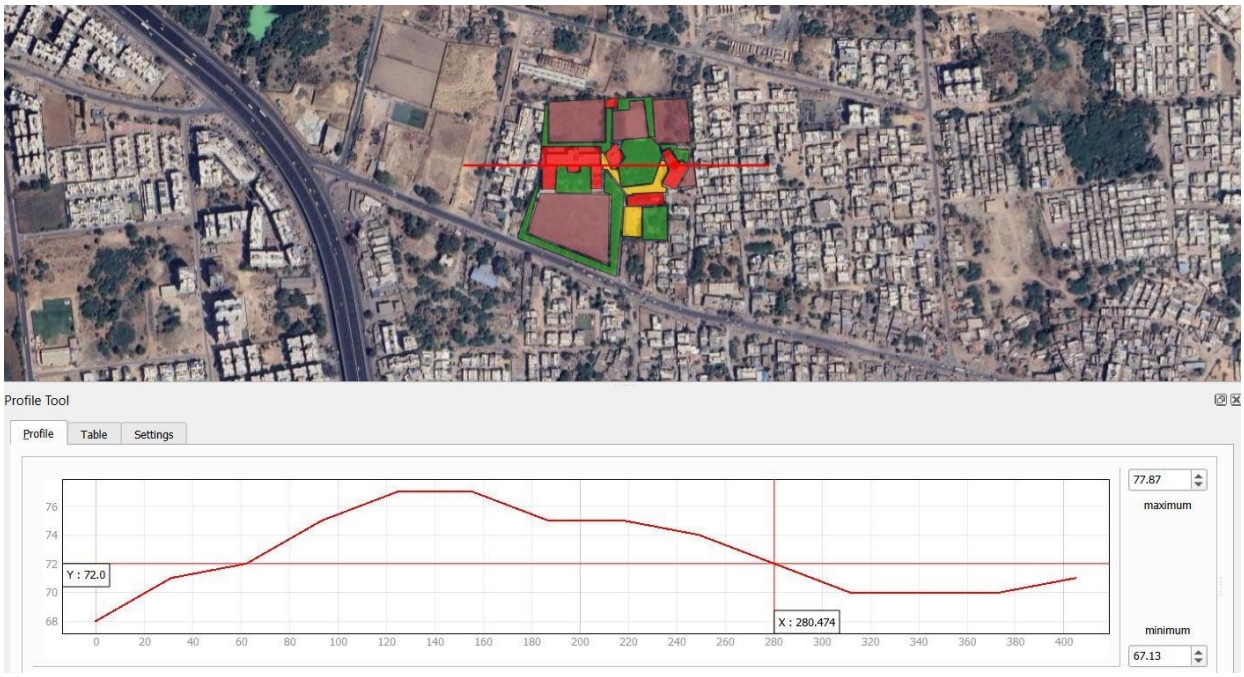
- **Elevation Range:** 64.04 m – 75.96 m → **Relief: ~11.G2 m**

- **Slope Pattern:** General rise from south to center; drop near north
- **Drainage Implication:** Recharge interventions should target **southern and northern ends**



Profile 2: East–West

- **Elevation Range:** 67.13 m – 77.87 m → **Relief: ~10.74 m**
- **Slope Pattern:** Slight central high point; runoff moves both east and west
- **Drainage Implication:** Opportunity for **trench placement at both flanks**



RECOMMENDATIONS: STORAGE & RECHARGE ZONES

- Prioritize **southern and northern boundaries** for recharge structures
- Consider **double-sided recharge** to handle bi-directional terrain slope
- **Explore roofwater collection tanks and underground recharge pits**
- Use **green zones** for biodiversity education and carbon offset signage

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

- Rain Water Harvesting Potential: 13,923.79 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: 5,274
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 7,629 m^2
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 2,320

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** = 9,868.73 m²
- **IPCC standard sequestration rate** = 0.9 kg CO_2/m²/year
- **Estimated Annual CO_2 Sequestration =**
  9,868.73 × 0.9 = **8,881.86 kg/year = 8.88 metric tons CO_2/year**

4 SOLAR INSTALLATION

- Refer to : https://ecosjwestzone.org/solar-dashboard/ for Province/School information.
- Installed On Grid kW Capacity : 20 kW
- Installed Off Grid kW Capacity : 7
- Installed Off Grid kW Capacity : 5
- 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.