Rosary High School, Vadodra, 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

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 areas are excluded from RWH calculations

Data Considered:

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

Year	Rainfall (mm)	Rainfall (m)
2024	1276.50	1.2765
2023	909.94	0.9099
2022	1279.38	1.2794

- **Mean Annual Rainfall (P) =** (1.2765 + 0.9099 + 1.2794) / 3 = 1.1553 m/year

- Surface Area Data:

Surface Type	Area (m^2)	Runoff Coefficient
Roof	4,970.24	0.875
Paved	2,317.37	0.7
Unpaved	5,893.47	0.6
Green	7,231.18	— (used for CO_2 only)

RWH Potential Calculations

RWH Formula:

$RWH = P \times A \times C$

- **RWH (Roof)** = 1.1553 × 4,970.24 × 0.875 = **5,022.60 m^3**
- **RWH (Paved)** = 1.1553 × 2,317.37 × 0.7 = **1,87G.61 m^3**
- **RWH (Unpaved)** = 1.1553 × 5,893.47 × 0.6 = **4,08G.13 m^3**

Total Annual Harvestable Rainwater = 10,991.34 m^3 = 10,991,340 liters/year

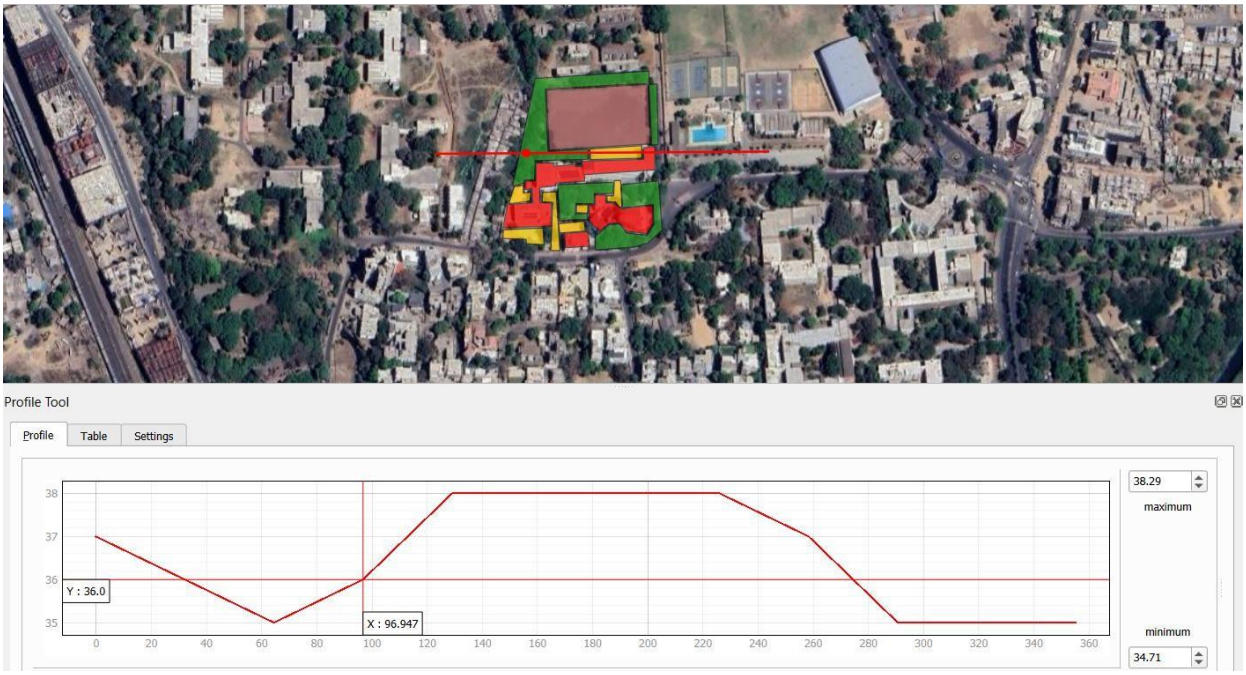
Terrain Profile Analysis North-

South Profile

- **Elevation Range**: 36.71 m to 40.29 m → Relief: **~3.58 m**
- **Slope Pattern**: Mild northward rise from central low
- **Drainage Implication**: Central basin may retain water longer; potential to create recharge pits on southern end

East–West Profile

- **Elevation Range**: 34.71 m to 38.29 m → Relief: **~3.58 m**
- **Slope Pattern:** Slight incline toward east and west ends
- **Drainage Implication:** Flow bifurcates east-west from center; suggest staggered trench layout



Storage & Recharge Recommendations

- Prioritize center and southern pockets for infiltration trenches or shallow recharge wells.
- Integrate vegetated bioswales in eastern zone for overland flow.
- Add educational signage for students near green pockets to enhance eco- awareness.
- Encourage tank harvesting along roof drainage lines in southeast cluster of buildings.

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

- Rain Water Harvesting Potential: 10,991.34 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: 4,163
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 6,022 m^2
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 1831

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** = 7,231.18 m²
- **IPCC Rate** = 0.9 kg CO_2/m²/year
- **Estimated CO_2 Sequestration** = 7,231.18 × 0.9 = **6,508.06 kg/year = 6.51 metric tons CO_2/year**

4 SOLAR INSTALLATION

- Refer to : https://ecosjwestzone.org/solar-dashboard/ for Province/School information.
- Installed On Grid kW Capacity : 30 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.