St. Paul's High School, Belgaum, Goa

(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 × A × 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	1587.13	1.5871
2023	958.60	0.9586
2022	1499.37	1.4994

- **Mean Annual Rainfall (P)** = (1.5871 + 0.9586 + 1.4994) / 3 = **1.3484 m/year**

- **Surface Area Data**

Surface Type	Area (m²)	Runoff Coefficient
Roof	2,002.99	0.875
Paved	1,319.65	0.7
Unpaved	5,014.74	0.6
Green	7,034.42	— (excluded)

RWH Calculations

- **RWH (Roof)** = 1.3484 × 2,002.99 × 0.875 = **2,362.42 m³**
- **RWH (Paved)** = 1.3484 × 1,319.65 × 0.7 = **1,243.72 m³**
- **RWH (Unpaved)** = 1.3484 × 5,014.74 × 0.6 = **4,060.35 m³**

Total Annual Harvestable Rainwater

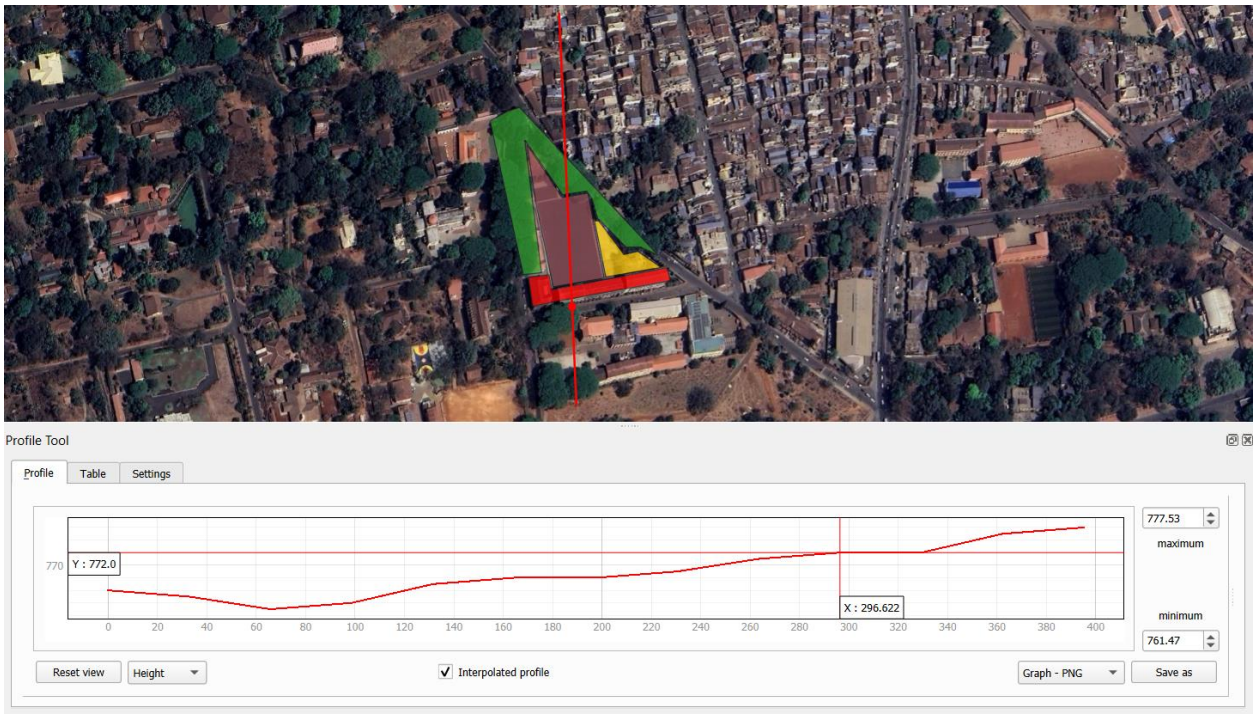
- **Total RWH** = 2,362.42 + 1,243.72 + 4,060.35 = **7,666.49 m³** = **7,666,490 liters/year**

TERRAIN PROFILE ANALYSIS

Profile 1: North–South

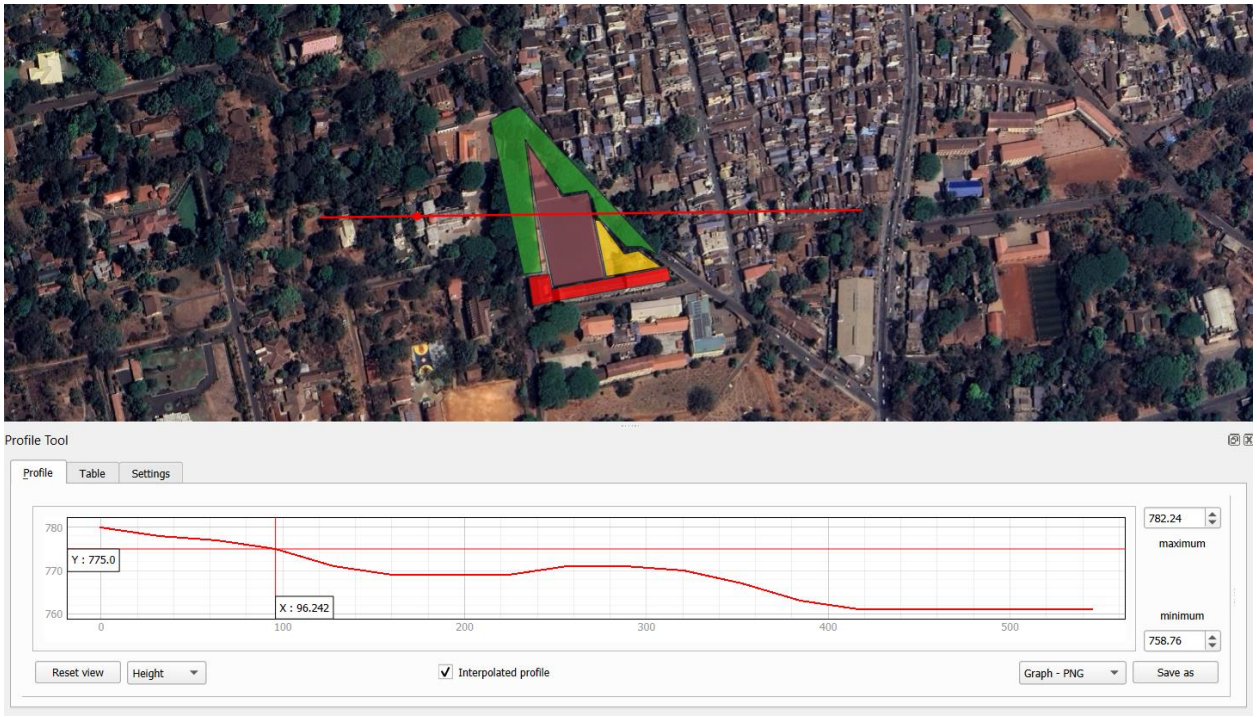
- **Elevation Range:** 761.47 m to 777.53 m → **Relief: ~16.06 m**

- **Slope Pattern:**
  Northward rising terrain, gentle incline from center toward northern boundary
- **Drainage Implication:**
  South and southeast drainage dominance; recharge features best placed along southern boundary



Profile 2: East–West

- **Elevation Range:** 758.76 m to 782.24 m → **Relief: ~23.48 m**
- **Slope Pattern:**
  High relief east-to-west drop suggests lateral movement of runoff
- **Drainage Implication:**
  Opportunity for constructing staggered trenches or storage along western edges



Recommendations: Storage & Recharge Zones

- Prioritize **southern and western boundaries** for recharge trenches or storage tanks
- Include **vegetated swales** along contour in western areas
- Consider **permeable paving** options in paved zones to enhance infiltration
- Install **eco-awareness signage** around green zones to support educational goals

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

- Rain Water Harvesting Potential: 7,666.49 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: 2,904
- If RWH water is used *for Gardening* then the garden area that can be supported annually is : 4,201 m^2
- If RWH water is used for watering of trees, then the number of trees that can be irrigated annually is: 1,278

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** = 7,034.42 m²
- **IPCC standard sequestration rate:** 0.9 kg CO_2/m²/year
- **Estimated Annual CO_2 Sequestration** = 7,034.42 × 0.9 = **6,331.00 kg/year** = **6.33 metric tons CO_2/year**

4 SOLAR INSTALLATION

- Refer to : https://ecosjwestzone.org/solar-dashboard/ for Province/School information.
- Installed On Grid kW Capacity : 52 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 (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.