Carbon Management and CO_2 Emission Reduction Process at SRM University-AP

SRM University–AP has a documented process for managing its carbon footprint and reducing its carbon dioxide emissions. Every year an independent Energy, Environment and Green Audit, carried out by a BEE-certified energy auditor, measures the energy used on campus and converts it into tonnes of CO_2. The result is recorded in a CO_2 balance sheet, which also shows how much CO_2 the campus neutralises and how much remains. The university then acts on the findings through renewable energy, energy-efficient equipment, clean cooking fuel, electric vehicles, waste recycling, tree plantation and a costed plan of energy-saving proposals.

The main figures for 2024–25 are:

- **16,310.1 tonnes** of CO_2 emitted from electricity, diesel and LPG (Scope 1 and Scope 2).
- **532 kW** rooftop solar plant generating 6,22,714 kWh a year and avoiding 510.6 tonnes of CO_2.
- **841.5 tonnes** of CO_2 neutralised in the year, as recorded in the balance sheet.
- **13 energy-saving proposals** that will cut 16,50,964 kWh a year (9 per cent of electricity use), worth Rs. 170.0 lakhs a year, with a payback of 1.36 years.

2. The Carbon Management Process

The university follows four steps each year, and each step is supported by a document that can be shown as evidence.

- **Measure.** The audit team collects twelve months of electricity, diesel and LPG data and makes field measurements. Under the Environmental Management System, Scope 1 (fuels) and Scope 2 (purchased electricity) are accounted.
- **Convert to CO_2.** Each fuel is multiplied by a stated emission factor: 0.82 kg CO_2 per kWh of electricity, 2.64 kg per litre of diesel and 3.0 kg per kg of LPG.
- **Reduce and neutralise.** The campus runs reduction measures (Section 4) and counts the CO_2 offset by solar generation and trees.
- **Review and plan.** The audit gives a costed list of energy-saving proposals and the management recommendations for moving towards net-zero carbon emission (Section 5).

3. Carbon Footprint, 2024–25

Grid electricity is the largest source of emissions, at about 92 per cent of the total. Of the total energy used on campus (1,91,69,459 kWh including solar and diesel-generator output), 95.4 per cent came from the grid, 3.2 per cent from rooftop solar and 1.4 per cent from the diesel generators. Diesel use of 3,35,502 litres is made up of 2,56,522 litres for transport and 78,980 litres for the generators. LPG is used only for cooking.

Table 1. CO_2 balance sheet, 2024–25

Energy carrier	Annual quantity	Emission (t CO_2)	Share
Electricity (grid)	1,82,86,800 kWh	14,995.2	91.9%
Diesel	3,35,502 litres	885.7	5.4%
LPG	1,43,070 kg	429.2	2.6%
Total emission		**16,310.1**	**100%**

Table 2. CO_2 neutralised, 2024–25

Component	Basis	Tonnes CO_2	Share of emission
Rooftop solar PV	6,22,714 kWh	510.6	3.1%
Electricity (DG)	2,59,945 kWh	213.2	1.3%
Mature trees	5,398 trees	117.7	0.7%
Total neutralised		**841.5**	**5.2%**
Balance to be neutralised		**15,468.6**	**94.8%**

4. Actions Already in Place

4.1 Rooftop solar power

A grid-tied 532 kW solar plant on the roofs of the hostel and laboratory blocks feeds power into the medium-voltage panel. In 2024–25 it generated 6,22,714 kWh, which avoided 510.6 tonnes of CO_2 and is the largest single reduction on campus. The audit also recommends a fixed panel-cleaning schedule, which can add about 1 per cent to output at no cost.



Figure 1. Rooftop solar panels on the hostel and laboratory blocks

4.2 Energy-efficient equipment

The audit records several measures that keep electricity demand, and therefore emissions, lower. All streetlights on campus are LED lamps on a timer, switching on and off automatically. The management has committed to replacing the remaining tube lights with LED in phases. Most ceiling fans are energy-efficient BLDC fans that draw about 35 W each, more than 50 per cent less than conventional fans. Air-conditioned rooms are set at 24°C in line with BEE norms, and most of the air conditioners are BEE star rated.

4.3 Biogas from food waste

A 6 m³ biogas plant converts about 100 kg of mess and canteen food waste a day into 6 to 8 m³ of cooking gas, which is used in the Annapurani Mess. This replaces part of the LPG that would otherwise be burned (LPG accounts for 429.2 tonnes of the annual emission) and keeps organic waste from decomposing in the open.



Figure 2. Biogas plant: feed hopper and digester dome, and control panel

4.4 Electric vehicles

The University runs battery-operated electric vehicles, including an electric mini-bus seating up to 20 for group transport, which produce no tailpipe emission. One vehicle runs four to five hours a day on campus tours, covering 30 to 40 km per charge from a charging point inside the campus, and some faculty members use electric two-wheelers for official travel. Each journey moved from diesel to electric reduces the 2,56,522 litres of diesel used for transport.

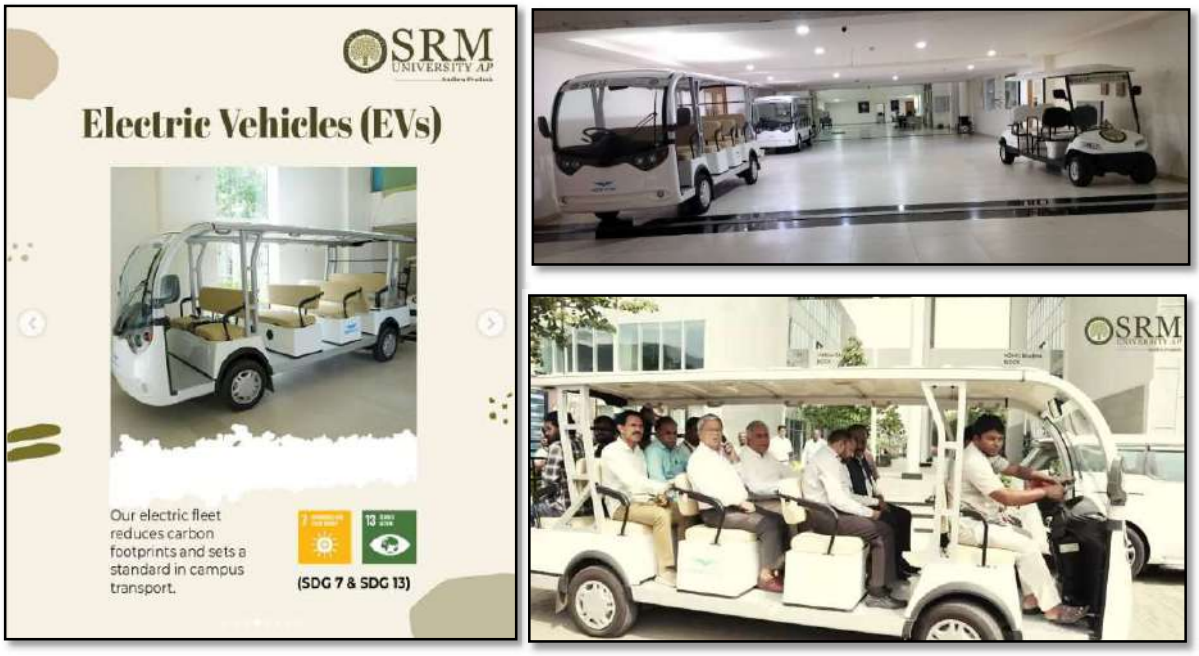


Figure 3. Battery-operated electric vehicles on the campus

4.5 Waste recycling and tree cover

Food waste from the messes and quarters is mixed with fallen leaves and converted to vermicompost, which the gardening team uses as organic manure instead of chemical fertiliser. The campus also has 5,398 mature trees, which absorb about 117.7 tonnes of CO_2 a year (21.8 kg per tree), along with 82,062 flowering shrubs, 34,031 Mexican grass and 1,06,332 ground covers.



Figure 4. Vermicompost made from campus food and leaf waste

5. Planned Reductions and Targets

The audit has identified 13 energy conservation proposals. If all are carried out, the university will save 16,50,964 kWh of electricity a year, equal to 9 per cent of its use. Applying the balance-sheet factor of 0.82 kg CO_2 per kWh, this is about 1,354 tonnes of CO_2 avoided a year, more than the 841.5 tonnes now neutralised. The total investment is Rs. 230.9 lakhs and the saving is Rs. 170.0 lakhs a year, a simple payback of 1.36 years (16.3 months). Four of the proposals, including cleaner solar panels and correcting the transformer tap position, cost nothing to carry out.

Table 3. Largest energy conservation proposals (audit)

Proposal	Saving (kWh a year)	Investment (Rs. lakhs)	Payback
Active additive in chiller units (oil fouling)	4,25,700	32.0	0.73 yr
Heat transfer additive in chilled water system	4,25,700	32.0	0.73 yr
EC BLDC fans in air handling units	3,75,000	134.25	3.48 yr
Load-end capacitors at distribution boards	91,434	6.0	0.64 yr
Belt-driven AHU blower losses	56,800	6.8	1.2 yr
All 13 proposals	**16,50,964**	**230.9**	**1.36 yr**

Alongside these, the management has set the following actions to move towards net-zero carbon emission:

- Plant more trees on campus, involve students in planting, and record every tree.
- Convert existing street lighting to solar-powered, battery-operated lights.
- Identify the most fuel-hungry vehicles and rework or replace them.
- Hold regular training for transport staff on keeping vehicles in good condition.
- Develop a Miyawaki dense native forest, as recommended in the audit, to add to carbon capture.

6. Evidence for Submission

Table 4. Evidence summary for the carbon management metric

Element	Key data
Carbon measurement	16,310.1 t CO_2 (Scope 1 and 2), with stated emission factors
Renewable energy	532 kW solar; 6,22,714 kWh; 510.6 t CO_2 avoided
Energy efficiency	LED streetlights on timer; BLDC fans; AC at 24°C
Clean fuel	Biogas plant: 100 kg waste a day, 6–8 m^3 gas a day
Low-carbon transport	Electric vehicles and charging point on campus
Carbon sink	5,398 mature trees; 117.7 t CO_2 a year
Plan and targets	13 proposals: 16,50,964 kWh and about 1,354 t CO_2 a year; net-zero actions