



# SUSTAINABILTY AUDIT REPORT

## For Public Affairs Centre (PAC)


SAGE Sustainability

Evoma Business Centre
Bengaluru-66
91-80-43711619
Email:contact@sagesustainability.in

# Sustainability Audit and Report

## *Acknowledgements*

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PAC took initiatives for energy and water conservation, opting for self-sufficiency and taking climate action through initiatives such as roof top solar installations and rain water harvesting. However, there was no clear information or analysis on how well the systems were performing and what other actions could PAC take to become more sustainable.

SAGE Sustainability works with organizations to assess their sustainability footprint and enables them to take appropriate actions. Energy, water, emissions, waste and biodiversity audits were conducted on 11th of January and16th of March 2019 followed by a stakeholder consultation. Clarifications were sought from the finance team in case of any discrepancy of the data. For the purpose of the audit the general overall assumptions are made on a 5 day work week leading to a 250 working days in a year. While for some facilities an eight hour work day is considered; some facilities are required round the clock and so accordingly the assumptions were made.




Dr Shashi K.
CEO, SAGE Sustainability

# Energy Audit

| Objective/Information | Requirement | Details |
|---|---|---|
| **1.1 Scope of the Audit** | **Audit objective is to establish baseline; measure progress of interventions carried out in the previous years; plan for continual improvement.**<br>▪ Energy quantification on demand side and recommendations on optimization.<br>▪ Energy quantification on supply side.<br>▪ Awareness on energy reduction.<br>▪ Establishing a normative -<br>▪ Solutions for optimizing energy consumption.<br>▪ Savings from reduced use of BESCOM power | **How Achieved/Recommendations**<br>▪ Demand side-equipment wattage noted during audit; usage hours estimated.<br>▪ Supply side-Actual bills from BESCOM and bills for DG, LPG estimated. Solar power data measured for audit period. And also estimated from dual metering.<br>▪ Awareness assessment- Stakeholder consultation.<br>▪ Normative- Standardizing energy use per person/area to monitor the progress.<br>▪ Solutions- Analysis of existing vs best practice.<br>▪ |
| **1.2 Assumptions and Methodology:**<br>▪ Baseline year 2015<br>▪ Audit year 2019<br>▪ Solar installation 2016 | **Assumptions were taken to establish annual and monthly consumption and trends. Actual BESCOM data from before solar installations helped establish the power requirement.**<br>▪ Data was collected for plugged in load, lighting, ventilation, building audit.<br>▪ Assumptions: For running of facilities and server 24*7 for 365 days. For other load, 250 working days and 8-hour workday is assumed. | **Recommendations for better data measurement**<br>▪ Daily/weekly/monthly recording of solar power generated.<br>▪ Sub-metering for plugged in load, facilities and pump.<br>▪ Sub-metering and solar recording can help in better estimations. |
| **1.3: Demand side Analysis** | **Energy consumed on the campus (end use-2019)**<br>**Day and Night lighting, space conditioning, plug in load and facilities.** | **End-use Energy consumption (%age)**<br>▪ Day Lighting = 3.40%<br>▪ Night Lighting =11.92%<br>▪ Space conditioning =11.08 %<br>▪ Space conditioning 24*7=24.33%<br>▪ Plug in load=27.56%<br>▪ Facilities-24/7=21.71% |
| **1.4 Supply side analysis** | **Energy consumed on the campus (per Annum) (2019)** | **Supply side energy consumption**<br>▪ BESCOM-11674 kWh<br>▪ Solar-7558.57 kWh<br>▪ DG-74.18kWh<br>▪ LPG -170.4kg |

**Audit Findings:**

- Total Electricity consumed is 19,306 kWh in 2018-19.
- Solar power generated from a 9.9kWp system is 7558kWh in 2018-19.
- From baseline year - BESCOM and DG consumption decreasing, and solar power is increasing till the audit year – dependence on renewable energy increasing.
- This has resulted in overall savings of about 70,000 INR cumulatively from baseline to audit year (2015-2019).

- Measurement of about 20 solar units a day during the audit period as well as from the estimates is less than the initial projections calculated in feasibility studies. Sub-metering can help substantiate that.
- Transport energy has been increasing from 2015-16 to 2018-19.

## Baseline normalized:

- PAC has 21,000 sq. ft. or 1951 sqm of built up area.
- Energy Performance Index (EPI) is a measure of total energy consumed in a specific built up area, EPI (PAC) = 0.82 kWh/sqm/month.
- Normalized energy use helps organizations compare themselves with other organizations, peers, benchmarks and standards. Energy in kilo watt hour per sqm per month (kWh/sqm/month) or year is one of the most commonly used criteria such as ECBC (Energy Conservation Building Code, GRIHA (Green Rating for Integrated Habitat Assessment)and BEE (Bureau of Energy Efficiency).

| Institutions/Organizations | Recommended EPI |
|---|---|
| ▪ (ECBC) Compliant Building for moderate climate | ▪ 5.1 kWh/sqm/month |
| ▪ GRIHA (Institutional) | ▪ 7.5 kWh/sqm/month |
| ▪ BEE (moderate climate) | ▪ 7.83 kWh/sqm/month |

## Recommendations for energy reduction

- Energy reduction – kWh/sqm/month -10% reduction annually.
- Despite having low EPI, there is a scope for improving the index further and keeping the benchmark high.
- Energy reduction can also be achieved through behavioral changes such as switching off lights, using less printers and less air conditioning wherever possible.
- This can be achieved through energy star appliances, switching to LEDs and reducing water pumping requirements.
- ROI calculations for changing external nightlight points to LED is approximately 3 years and can lead to further economic savings and reduction in scope II emissions as well.

# Carbon Audit

| Objective/Information | Requirement | Details |
|---|---|---|
| **2.1 Scope of the Audit** | **Audit objective is to establish baseline; measure progress of interventions carried out in the previous years; plan for continual improvement.**<br>▪ Carbon neutrality status- Scope I and II.<br>▪ Solutions for reducing emissions.<br>▪ Initial assessment of Scope III emissions | **How achieved?**<br>▪ Scope I and II emission calculations based on onsite energy consumption as well as BESCOM supply.<br>▪ Data from end use water, energy consumption and stakeholder interest and inclination mapping<br>▪ Through data collected from transport bills, vehicles including air transport, stationary bills etc. |
| **2.2 Assumptions and Methodology:**<br>▪ Baseline year 2015<br>▪ Audit year 2019<br>▪ BESCOM emission factors as published | **Data collection and general assumptions:**<br>▪ All energy data as required for section 1. | **Recommendations for better data measurement**<br>▪ Maintaining transport / taxi bills with details of make of vehicle and distance covered will be helpful for better estimations. |
| **2.3: Campus emissions** | **Scope I emissions**<br>Direct emissions from owned or controlled sources<br>**Scope II emissions**<br>Scope II emissions are from purchased electricity | **Campus emissions in 2018-19**<br>▪ Scope I emissions are 0.577 tonnes.<br>▪ Scope II emissions are 0.817 tonnes |
| **2.4 Scope III emissions** | **Scope III emissions**<br>**All indirect emissions that occur in the value chain (upstream and downstream)-** For PAC examples of Scope III are transport, stationary, consumables etc. | **Scope III emissions**<br>Only transport make for significant emissions. |

**Audit findings:**

- Campus emissions - 1.38 tonnes (Scope I and Scope II) -Leading to Near Carbon Neutral Campus.
- Scope III emissions were estimated taking into account only transport related emissions, as emissions from other purchases have been found to be miniscule. Transport emissions are around 88.23 tonnes in 2018-19.
- Scope I emissions have reduced from baseline year at 1695 kg to 577 kg in audit year primarily because of the reduced DG usage.
- Scope II emissions from BESCOM electricity has also reduced substantially.

**Key recommendations:**

- Clear policy direction on carbon neutrality.
- Scope I, II emissions can be reduced through less use of DG, LPG and reducing electricity consumption by means and measures mentioned in energy, water, waste and biodiversity sections.
- Reduce the transport emissions by opting for video conferencing where possible.

# Water Audit

| Objective/Information | Requirement | Details |
|---|---|---|
| **3.1 Scope of the Audit** | **Audit objective is to establish baseline; measure progress of interventions carried out in the previous years; plan for continual improvement.**<br>▪ Establish baseline and measure progress on water efficiency and usage as a result of interventions carried out in the previous years.<br>▪ Quantification of water on demand side and supply side.<br>▪ Standardize water use per person to monitor the progress.<br>▪ Provide solutions for optimizing water use.<br>▪ Water quality assessment based on the test report. | **Methodology**<br><br>Baseline: In the absence of water meter or sub-meters, assumptions were made for water usage, observations and measurements were made.<br>Quantification: Flow rate of each tap measured.<br>Standardize- assessment per capita calculated.<br>Optimal solutions- water usage, analysis based on current vs best practices. |
| **3.2 Assumptions and Methodology:**<br>▪ Audit year data can be taken as baseline.<br>▪ Rainwater harvesting system put in place in 2015-16. | **Data collection and general assumptions:**<br>▪ Audit was conducted for all water outlets and flow rates were measured for all the taps and fixtures in washrooms, pantry, roof top and gardening outlets.<br>▪ Gardening - 4 to 5 hours of watering every alternate day except when it rains, total of 113 days.<br>▪ RWH: long term rainfall pattern from 1980s to 2005 is taken as basis. Also 100 year data from 1900 to 2000. Runoff coefficient at 0.9.<br>▪ Washroom- calculations per person 3-4 times a day assuming one full tank and one-half flush and hand washing four times. Allocation of visitors and staff members is calculated for working days.<br>▪ Utensil cleaning: On working days for an hour.<br>▪ Other cleaning- Working days<br>▪ Caretaker water use is assumed at 100 lpcd for 365 days.<br>▪ Drinking water-Can capacity measured.<br>▪ Some missing data from drinking water-extrapolated from previous month data. | **Recommendations for better data measurement**<br>▪ Installation of water meters for main usage such as washrooms, gardening and caretaker home. |
| **2.3: Demand side** | **Water consumed on the campus (Audit year)** | ▪ Total water consumption is 2076 kL of which rainwater is 15 kL and bottled water is 18 kL. The rest of the water used is borewell which is 2043 kL. |

## Audit findings:

- About 2000 kL of water consumed annually makes PAC a very light user of water.
- Current Rainwater system allows 28000 litre of water storage and helps harvest 267 kL of water optimizing half of the total roof area. Total days serviced in a year are 47.
- Contour bunding of 200 m along with four recharge pits helps in water percolation which has helped PAC become self-reliant in water. Nearly 64 million litres of water get percolated for GW recharge (Conservative estimate).
- Gardening or landscaping is the primary end use that consumes most water, followed by office domestic water and caretaker's domestic water use.
- Water quality analyzed is free from E coli and other bacteria. It has high levels of TDS.
- Many taps, health faucets including those on the roof top and garden have high to very high flow rates.

## Baseline normalized:

- Water consumption at PAC is 39 lpcd (litre per capita per day)*
- The water consumption norm in an office building as per IS codes is 45 lpcd.
- The best practice of water consumed in litres per capita per day vary from 20-22. (Adobe Complex, Noida, Vatika Business Park Gurgaon and DLF SEZ at Chennai)

## Key Recommendations

- Fixing aerators in water fixtures that can reduce water flow rates.
- Drinking water can be switched to an appropriate RO system with an ROI of less than a year.
- Gardening water reduction through altering watering times, mulching and composting.
- Recycling grey water and using it for landscaping/gardening purposes.
- Additional rainwater can be harvested from the full roof area and that can lead to additional days serviced through rainwater, provided additional storage capacity is there.

*Accounting for potable water consumption.

# Waste Audit

| Objective/Information | Requirement | Details |
|---|---|---|
| **4.1 Scope of the Audit** | **Audit objective is to establish baseline; measure progress of interventions carried out in the previous years; plan for continual improvement.**<br>▪ Establish baseline and measure progress on waste handling<br>▪ Quantification of waste generated.<br>▪ Provide solutions for optimizing waste handling. | **Methodology**<br>▪ Baseline- observations, measurements, consultations and analysis.<br>▪ Quantification- Assessment of various waste categories such as wet, dry, e waste and sanitary waste. Waste from caretaker family also included.<br>▪ Optimizing- Aspirations and intentions of stakeholders vs best practices available, compliance, also tying with water conservation measures. |
| **4.2 Assumptions and Methodology:**<br>▪ Audit year data is taken as baseline which is 2018-19. | **Data collection and general assumptions:**<br>▪ Waste quantity observed from bins/day and calculated per week.<br>▪ Inputs from Sustainability team and caretaker family on waste handling and quantities. | **Recommendations for better data measurement**<br>▪ Segregation of waste at source.<br>▪ Proper storage and handling of waste. |
| **4.3: Quantification** | **Waste generated in the campus in the audit year** | ▪ Total Waste generated by the campus 744.6 kg.<br>▪ Wet waste = 461.25 kgs<br>▪ Dry waste = 234.50 kgs<br>▪ E-waste = 12 kgs<br>▪ Sanitary waste = 36.85 kgs |

**Audit findings:**

- Around 700 kg of waste is generated on the campus which can be classified as wet waste, dry waste, e-waste and sanitary waste.
- Although quantity of the waste generated is not significant, waste management requires focus of the organization.
- Biomass available at the campus is not utilized optimally. While it can be used for mulching and composting, it is currently disposed and burnt in pits.
- Sanitary waste in small quantities, however not incinerated.
- Wastewater drains out of the campus untreated.

**Baseline normalized:**

- Around 17 kg of waste per capita per annum is only a little over a kilogram of waste produced by every employee of the organization per month.

**Key Recommendations:**

- Segregation of waste at source.
- Colour coded bins for different category of waste, for ex paper, plastic, e-waste etc.

- E waste can be collected in store and can be disposed of once in a quarter. Similarly, occasional hazardous waste such as light bulbs and batteries can be disposed of at a collection centre.
- Setting up a composting unit that can process dry leaves along with wet waste from office as well as caretaker family.
- If composting is being carried out on the campus, the target can be set to maintain per capita waste generated.
- Mulching-some of the biomass can be used as a direct mulch for keeping the plants well protected from direct heat. Leaves can also be stored in netted sacs and put around the trees.
- Sanitary waste incinerator may be installed.
- Phytorid treatment option for grey or both grey and black water will make recycled water available for landscaping.
- Estimated cost of Phytorid installation can be around INR 7 to 8 Lakhs.

# Biodiversity Audit

| Objective/Information | Requirement | Details |
|---|---|---|
| **5.1 Scope of the Audit** | **Audit objective is to establish baseline; measure progress of interventions carried out in the previous years; plan for continual improvement.**<br>▪ To have a baseline on all flora and fauna.<br>▪ Calculate biodiversity index<br>▪ To arrive at a plan to increase biodiversity at the campus. | **How achieved**<br>Baseline: Available from year 2017 for flora<br>Baseline on fauna collected in current audit.<br>Biodiversity index- Simpson index calculated<br>Plan to increase-solutions provided |
| **5.2 Assumptions and Methodology:**<br>▪ Baseline conducted for trees in the year 2017-18. | **Data collection and general assumptions:**<br>▪ Baseline audit listed 33 species and 181 individuals.<br>▪ Simple biodiversity index is measure of biodiversity in a given area.<br>▪ Simpson index -measure of diversity which takes into account the number of species present as well as relative abundance of each species. | **Recommendations for better data measurement**<br>Labelling is already done for many trees, it can also be done for herbs and shrubs.<br>Charts and pictures of spotted fauna would help in mapping changes in biodiversity. |
| **5.3: Faunal and Floral Biodiversity** | **Flora & Fauna in the campus** | ▪ Current audit revealed 505 plus individuals and 94 species of Flora.<br>▪ Simple biodiversity at PAC is 0.1861.<br>▪ While Simpson Index (D) = 0.027; Simpson Index (1-D) in 2019 = 0.973. This can be interpreted that biodiversity at the campus is high. |

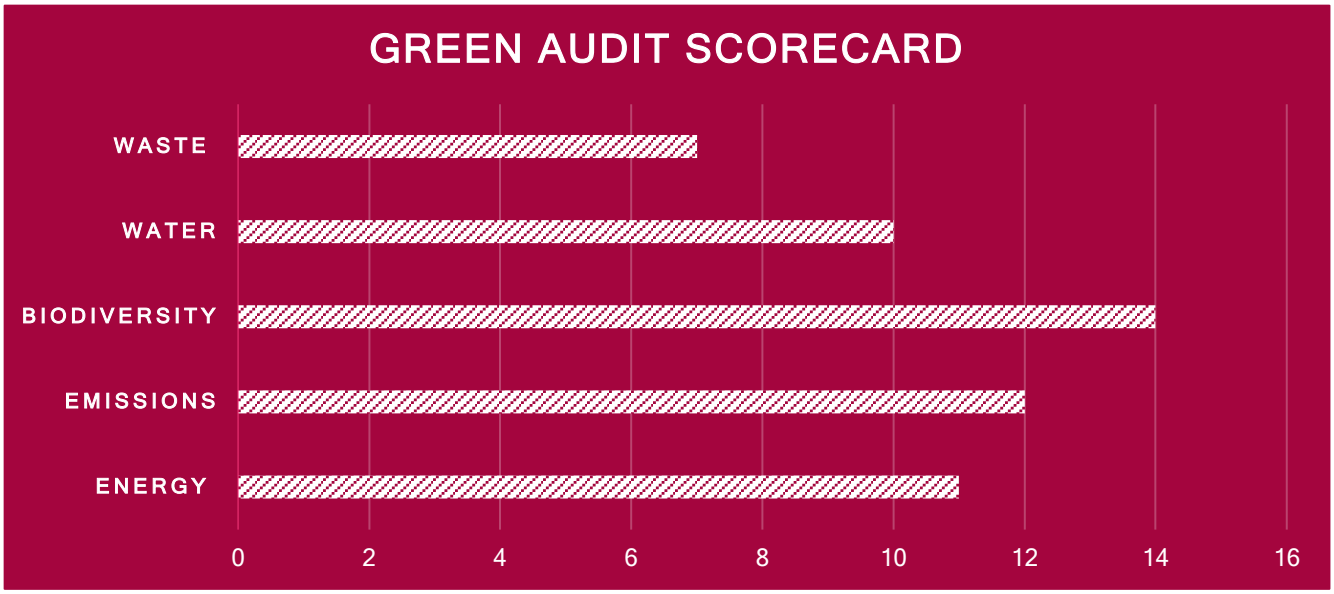
**Audit findings:**

- PAC is a biodiversity rich campus.
- PAC biodiversity index for plants (Simpson1-D) is quite high which is 0.973.
- PAC faunal diversity has reports on spotting mammals, reptiles, birds, amphibians and insects.
- There is a vegetable garden that has spinach, coriander, knol-kohl, tapioca growing, however these plants appear stunted because of nutritional deficiency (may be NPK).

**Key Recommendations:**

- For increasing biodiversity and paving way for climate resilience, drought tolerant varieties can be planted and nurtured
- Plant rotation from root crops to stem crops to leaf crop in a given patch ensures nutrition recovery and balance.
- Reporting on biodiversity and sightings on the website can enhance the interest of the stakeholders.
- Mulching is important especially during the dry season.
- Ground cover of drought resistant grass would help in percolation of rainwater.
- Soil testing at two to three different sections in the campus may be required to assess deficiency of nutrients.

# Green Audit Scorecard 2018-19




This scorecard takes into account policy, compliance, practices, stakeholder concern & aspirations, absolute volume/usage/weight/normative values and comparison with peers/benchmark standards. 18 would be perfect score for each parameter.

# Sustainability Dashboard 2018-19