7.1.6 Quality audits on environment and energy regularly undertaken by the Institution:

* **Any other relevant documents.**

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1	Green , Energy and Environment **Audit Report** for Academic Year: **2017-18**
2	Green , Energy and Environment **Audit Report** for Academic Year: **2016-17**
3	Green , Energy and Environment **Audit Report** for Academic Year: **2015-16**
4	Green , Energy and Environment **Audit Report** for Academic Year: **2014-15.**

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HSN/SAC : 998399/Other professional, technical and business services

SAPTHAGIRI COLLEGE OF ENGINEERING
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Hesaraghatta Main Road,
Bangalore 560057
Karnataka
Place of Supply : 29 / Karnataka

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For TUV India Private Ltd.

Authorised Signatory

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Gap Analysis Study Report

Green Audit | Energy Audit | Environmental Audit

Academic Year 2017-18

SAPTHAGIRI
College of Engineering
Creating Tomorrow

SAPTHAGIRI COLLEGE OF ENGINEERING

14/5, Chikkasandra, Hesaraghatta
Main Road, Bangalore – 560057

Prepared By,

TÜVNORD

TUV India Private Limited

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1. Acknowledgement

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2. About TÜV: A Brief

TÜV India Pvt Ltd was incorporated in India in the Year 1989 and is a premier organization in the field of Certification and Inspection. The company is a subsidiary of TÜV Nord group, which has been working for last 150 Years in the field of Quality, Safety, Health, Standardization, Certification, and Inspection. It has presence in over 70 countries and offers expert services through a global network. With more than 15000 professionals worldwide TÜV Nord has a turnover of over 1 billion Euros.

TÜV India offers entire range of services in certification and inspection in India and South Asia with our contingent of professionally qualified and industry experienced Auditors and Inspectors. With a strong team of qualified Engineers having diversified experience in the field of Building Construction, Maintenance, quality assurance, examination of Buildings in distress and related rehabilitation works.

We at TÜV ensure to optimize customer operational efficiencies and thereby maximize customer satisfaction

3. Audit Objective and Scope

3.1 Audit Objective

Sapthagiri College of Engineering (SCE) is an engineering college in Bangalore, India started in the year 2001. It is affiliated to Visvesvaraya Technological University (VTU), Belgaum and approved by the All India Council for Technical Education. The college is located at Chikkasandra, Hesarghatta Main Road, Bangalore in 6 acres of land, huge lung space & with good infrastructure.

The college mandates for the use sustainable techniques and practices to mitigate climate change and march towards carbon neutrality in the coming years and complying with environmental regulations and ensure the best practices to be Green and Safe institute for higher learning.

So as an Institute with more emphasis on higher learning, they want to practice and impart the sustainable culture to all the stakeholders including their students and enable them to apply it in their day to day activities.

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In the mean time they wanted to have a gap analysis study in line with their environmental goals and the indented objective is to have continual improvement and adopt best practices by identifying the gaps through a third party study.

The Study is based on the information made available to TÜV India and on the contract conditions.

3.2 Audit Scope & Boundary

The scope of work includes gap analysis of the college campus as per applicable regulations and standards relating to water consumption, waste water disposal, electricity consumption, waste handling, biodiversity assessment and safety practices.

The assessment boundary includes the following building infrastructure:

- Faraday Block (B Block)
- Academic Block (A Block)
- Administrative Block
- Civil Block (C Block)
- Girls Hostel & Boys Hostel
- College Canteen
- Gym
- Oper Spaces & Gardens

4. Methodology

The Study team having diversified experience in auditing ISO 14001, ISO 45001, ISO 14064, ISO 50001, GRI reporting, AA1000AS, GHG Accounting and Sustainability validations/ Verifications along local EHS legislations is identified and formed to conduct the study.

The team verified all applicable environmental aspects as per the GRI (Global Reporting Initiative) Sustainability Reporting Standards for the entire campus including the EHS (Environment and Health Safety) safety requirements to evaluate institution's intent towards the Sustainability and EHS safety in combating climate change as well as their role towards carbon neutrality, GHG mitigation measures, communications to stakeholder and their concerns.

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The detailed study was conducted and the gaps (findings) are presented in the table format. The team visited the campus and reviewed the findings & related supporting evidences and records to arrive at the conclusions.

5. Study Team

The in-service verification and inspection were carried out by TUV India Pvt Ltd Sustainability Assessor Mr. Nilesh Kumar who are qualified personnel for carrying out green audit.

The study was conducted from 17/01/2019 to 18/01/2019 for the academic year 2017-18. (1st August 2017 to 31st July 2018)

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6 GRI Indicators & Gap Analysis

Environmental GRI indicators considered in this green auditing are water, energy, waste, carbon footprint and biodiversity.

6.1 Energy

Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment. An old incandescent bulb uses approximately 60W to 100W while an energy efficient light emitting diode (LED) uses only less than 10 W. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices.

The energy consumption within the organization includes fuel consumption like diesel for DG sets & buses; Petrol consumption in college owned cars, lab & lawn movers; LPG consumption in canteen & labs and electricity consumption.

The total petrol consumption is 723 litres & the total diesel consumption is 28177 litres.

6.2 Water

The organization withdraws ground water as well as surface water from municipality. The water is used only for domestic use like usage in toilets, hostels, and housekeeping and for gardening. If water treatment system is installed at canteen and chemical laboratories the amount of water lost through outlets can be recycled and utilized for gardening and toilet uses. Awareness programs for the management of sustainable water use will be highly beneficial in this college.

6.3 Waste

The composting facility of the college for the treatment of biodegradable waste generated from the canteen, office, vegetable garden, and from the college campus cleaning operations is not adequate. Different methods such as pit composting, vermi-composting, bacterial composting using bacterial consortium may be used to treat the biodegradable waste. Bottles, plastics, cans, broken glass wares, tins etc., may be recycled or sold out. A model solid waste treatment system can be established in the college as a part of awareness program to the students.

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6.4 Carbon Footprint

Scope 1 and scope 2 emissions are determined as per the GHG protocol. Scope 1 emissions include direct emissions produced by burning of fuels and scope 2 emissions include indirect emissions generated by the electricity consumed.

Table 1: CO2 Emissions from Gasoline Consumption

Gasoline Source	Gasoline Consumption (Litres)	CO_2 EF (g CO2 / litre)	CH_4 EF (g CO2 / litre)	100 year GWP	N_2O EF (g CO2 / litre)	100 Year GWP	CO_{2e} (grams)
Passenger Car	560	2319.431	0.100385	25	0.021134	298	1303814
Others (Lab & Lawn Movers)	163	2319.431	0.100385	25	0.021134	298	379503
Total	723						1683317

Taking 5% uncertainty into consideration, CO2 emissions from gasoline consumption can be arrived at **1767.48 Kg CO2e**

Table 2: CO2 Emissions from Diesel Consumption

Diesel Source	Diesel Consumption (Litres)	CO_2 EF (g CO2 / litre)	CH_4 EF (g CO2 / litre)	100 year GWP	N_2O EF (g CO2 / litre)	100 Year GWP	CO_{2e} (grams)
Bus	17693	2676.32	0.004985	25	0.004692	298	47379072
Genset	6320.23	2676.32	0.004985	25	0.004692	298	16924582
Motor Car	4164.13	2676.32	0.004985	25	0.004692	298	11150885
Total	28177.36						75454539

Taking 5% uncertainty into consideration, CO2 emissions from diesel consumption can be arrived at Kg **79227.27 KgCO2e**

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Table 3: CO2 Emissions from LPG Consumption

Month	No. of cylinder	Wt. of each cylinder (Kg)	LPG Consumption (Kg)	Emission Factor (Kg CO_2e/Kg Combusted)	Gross Emission (Kg CO2e)	Uncertainity (5%)	Net Emission (Kg CO2e)
Jun-18	60	19	1140	3.03	3454.2	172.71	3626.91
Jul-18	61	19	1159	3.03	3511.77	175 5885	3687.3585
Aug-18	59	19	1121	3.03	3396.63	169 8315	3566.4615
Sep-18	73	19	1387	3.03	4202.61	210 1305	4412.7405
Oct-18	68	19	1292	3.03	3914.76	195.738	4110.498
Nov-18	64	19	1216	3.03	3684.48	184.224	3868.704
Dec-18	63	19	1197	3.03	3626.91	181 3455	3808.2555
Jan-19	65	19	1235	3.03	3742.05	187 1025	3929.1525
Feb-19	70	19	1330	3.03	4029.9	201.495	4231.395
Mar-19	64	19	1216	3.03	3684.48	184.224	3868.704
Apr-19	69	19	1311	3.03	3972.33	198 6165	4170.9465
May-19	74	19	1406	3.03	4260.18	213.009	4473.189
Jun-19	72	19	1368	3.03	4145.04	207.252	4352.292
Jul-19	70	19	1330	3.03	4029.9	201.495	4231.395
Total	932		17708		53655.24	2682.762	56338.002

As seen from the table, CO2 emissions from LPG consumption can be arrived at **56338.002 KgCO2e**

Table 4: Total CO2e Emissions

Emission Category	Kg CO_2e Emissions
Scope 1	137333
Scope 2	114420.37
Total	**248709.848**

The total carbon emissions for the academic 2017-18 is 251753.4 Kg CO2e

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6.5 Biodiversity

Biodiversity is facing serious threats from habitat loss, pollution, over consumption and invasive species. Species are disappearing at an alarming rate and each loss affects nature's delicate balance and our quality of life. Without this variability in the living world, ecological systems and functions would break down, with detrimental consequences for all forms of life, including human beings. Newly planted and existing trees decrease the amount of carbon dioxide in the atmosphere. Trees play an important ecological role within the urban environment, as well as support improved public health and provide aesthetic benefits to cities. In one year, a single mature tree will absorb up to 48 pounds of carbon dioxide from the atmosphere, and release it as oxygen. The amount of oxygen that a single tree produces is enough to provide one day's supply of oxygen for people.

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Table 5: Trees in the Campus

Sl. No.	Common Name	Scientific Name
1	Coconut	*Cocos nucifera*
2	Mahogany	*Swietenia mahogany*
3	Neermaruthu	*Terminalia arjuna*
4	Bottle brush tree	*Callistemon lanceolatus*
5	Jamun	*Syzygium cumini*
6	Pink shower tree	*Cassia javanica*
7	Tulip tree	*Spathodea campanulata*
8	Cannon ball tree	*Couroupita guinensis*
9	Copper pod tree	*Peltaphorum pictoratum*
10	Drumstick tree	*Moringa olifera*
11	Mast tree	*Polyalthia longifolia*
12	Teak	*Tectona grandis*
13	Mangium	*Acacia mangium*
14	Acacia	*Acacia longifolia*
15	Champak tree	*Michelia champcca*
16	Rain tree	*Samanea saman*
17	Tree jasmine	*Murraya paniculata*
18	Anjili	*Artocarpus hirsutus*
19	Neem	*Azadirachta indica*
20	Chickoo tree	*Achras sapota*
21	Jack fruit tree	*Artocarpus heterophyllus*
22	Pride of India	*Lagerstroemia speciosa*
23	Casuarina tree	*Casuarina equisetifolia*
24	Indian gooseberry	*Emblica officinalis*
25	Devil's tree	*Alstonia scholaris*
26	Rosewood	*Dalbergia sisso*
27	Pink Trumpet tree	*Tebubia impegtinosa*
28	Elangi	*Mimusops elengi*
29	Purple orchid tree	*Bauhinia purpurea*
30	Mango tree	*Mangifera indica*
31	Kanikonna	*Cassia fistula*

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Gap Analysis Study Report

Green Audit | Energy Audit | Environmental Audit

Academic Year 2016-17

SAPTHAGIRI COLLEGE OF ENGINEERING

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5. Study Team

The study was conducted on 22/01/2018 for the academic year 2016-17 (1st August 2016 to 31st July 2017) by TUV India Pvt Ltd sustainability auditor.

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6 GRI Indicators & Gap Analysis

Environmental GRI indicators considered in this green auditing are water, energy, waste, carbon footprint and biodiversity.

6.1 Energy

This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliance, natural gas and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment.

The following recommendations are advised:

- It is preferable to purchase electricity from a company that invests in new sources of renewable and carbon-neutral electricity.
- Installation of LED lamps instead of CFL and replacing the old tube lights with the new LED tubes.
- 5–star rated Air Conditioners, Fans and CFLs should be used.
- Cleaning of tube-lights/bulbs to be done periodically, to remove dust over it.

6.2 Water

This indicator addresses water consumption, water sources, irrigation, storm water, appliances and fixtures. A water audit is an on-site survey and assessment to determine the water use and hence improving the efficiency of its use.

During the survey, no loss of water is observed, neither by any leakages, nor by over flow of water from overhead tanks.

Minimize wastage of water and use of electricity during water filtration process, if used, such as RO filtration process and ensure that the equipment's used for such usage are regularly serviced. Gardens should be watered by using drip/sprinkler irrigation system to minimise water use.

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6.3 Waste

This indicator addresses waste production and disposal of different wastes ike paper, food, plast c, biodegradable, construction, glass, dust etc. and recycling. Furthermore, solid waste often includes wasted material resources that could otherwise be channelled into better se vice through recycling, repair, and reuse. Solid waste generation and management is a burning issue. Unscientific handling of solid waste can create threats to everyone.

Waste generat on from tree droppings and lawn management is a major solid waste generated in the campus.

E-waste generated in the campus is very less in quantity. Administration conducts the awareness programmes regarding E-waste Management with the help of various departments. The E-waste anc defective item from computer laboratory is being stored properly and disposed to the proper facility.

6.4 Carbon Footprint

Scope 1 and scope 2 emissions are determined as per the GHG protocol. Scope 1 emissions include direct emissions produced by burning of fuels and scope 2 emissions include indirect emissions generated by the electricity consumed.

Tab e 1: CO2 Emissions from Gasoline Consumption

Gasoline Source	Gasoline Consumption (Litres)	CO_2 EF (g CO2 / litre)	CH_4 EF (g CO2 / litre)	100 year GWP	N_2O EF (g CO2 / litre)	100 Year GWP	CO_{2e} (grams)
Passenger Car	645	2319.431	0.100385	25	0.021134	298	1501714
Others (Lab & Lawn Movers)	175	2319.431	0.100385	25	0.021134	298	407442
Total	820						1909156

Taking 5% uncertainty into consideration, CO2 emissions from gasoline cons mption can be arrived at **2004.61 Kg CO2e**

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Table 2: CO2 Emissions from Diesel Consumption

Diesel Source	Diesel Consumption (Litres)	CO_2 EF (g CO2 / litre)	CH_4 EF (g CO2 / litre)	100 year GWP	N_2O EF (g CO2 / litre)	100 Year GWP	CO_{2e} (grams)
Bus	19645	2676.32	0.004985	25	0.004692	298	52606221
Genset	5968	2676.32	0.004985	25	0.004692	298	15981366
Motor Car	5248.13	2676.32	0.004985	25	0.004692	298	14053667
Total	30861.13						82641253

Taking 5% uncertainty into consideration, CO2 emissions from diesel consumption can be arrived at Kg **86773.32 KgCO2e**

Table 3: CO2 Emissions from LPG Consumption

Month	No. of cylinder	Wt. of each cylinder (Kg)	LPG Consumption (Kg)	Emission Factor (Kg CO_{2e}/Kg Combusted)	Gross Emission (Kg CO2e)	Uncertainity (5%)	Net Emission (Kg CO2e)
Jun-18	64	19	1216	3.03	3684.48	184.224	3868.704
Jul-18	64	19	1216	3.03	3684.48	184.224	3868.704
Aug-18	62	19	1178	3.03	3569.34	178.467	3747.807
Sep-18	71	19	1349	3.03	4087.47	204.3735	4291.8435
Oct-18	66	19	1254	3.03	3799.62	189.981	3989.601
Nov-18	65	19	1235	3.03	3742.05	187.1025	3929.1525
Dec-18	67	19	1273	3.03	3857.19	192.8595	4050.0495
Jan-19	68	19	1292	3.03	3914.76	195.738	4110.498
Feb-19	69	19	1311	3.03	3972.33	198.6165	4170.9465
Mar-19	64	19	1216	3.03	3684.48	184.224	3868.704
Apr-19	69	19	1311	3.03	3972.33	198.6165	4170.9465
May-19	71	19	1349	3.03	4087.47	204.3735	4291.8435
Jun-19	69	19	1311	3.03	3972.33	198.6165	4170.9465
Jul-19	72	19	1368	3.03	4145.04	207.252	4352.292
Total	941		17879		54173.37	2708.6685	56882.0385

As seen from the table, CO2 emissions from LPG consumption can be arrived at **56882.03 KgCO2e**

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Table 4: Total CO2e Emissions

Emission Category	Kg CO_2e Emissions
Scope 1	145659
Scope 2	138320
Total	**283979**

The total carbon emissions for the academic 2016-17 is 283979 Kg CO2e

6.5 Biodiversity

The trees of the college have increased the quality of life, not only the college fraternity but also the people around of the college in terms of contributing to our environment by providing oxygen, improving air quality, climate amelioration, conservation of water, preserving soil, and supporting wildlife, controlling climate by moderating the effects of the sun, rain and wind. Leaves absorb and filter the sun's radiant energy, keeping things cool in summer. Many spices of birds are dependent on these trees mainly for food and shelter. Nectar of flowers and plants is a favourite of birds and many insects. Leaf – covered branches keep many animals, such as birds and squirrels, out of reach of predators. Different species display a seemingly endless variety of shapes, forms, texture and vibrant colours. Even individual trees vary their appearance throughout the course of the year as the seasons change.

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7. Reference Standards & Regulations

- GRI Standards
- GHG Protocol Corporate Standard
- National Building Code 2016
- ISO 14064
- ISO 14040/44 Life Cycle Assessment
- ISO 46001 Water Efficiency Management
- ISO 14046 Water Footprint Standards
- True Rating Methodology For Waste Management
- Standards & Biodiversity By IISD
- IS 5216 - Guide for Safety Procedures and Practices in Electrical Works

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Gap Analysis Study Report

Green Audit | Energy Audit | Environmental Audit

Academic Year 2015-16

SAPTHAGIRI
College of Engineering
Creating Tomorrow

SAPTHAGIRI COLLEGE OF ENGINEERING
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1. Acknowledgement

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2. About TÜV: A Brief

TÜV India Pvt Ltd was incorporated in India in the Year 1989 and is a premier orgar ization in the field of Certification and Inspection. The company is a subsidiary of TÜV Nord group, which has been working for last 150 Years in the field of Quality, Safety, Health, Standardizatic n, Certification, and Inspection. It has presence in over 70 countries and offers expert services through a global network. With more than 15000 professionals worldwide TÜV Nord has a turnover of ove- 1 b llion Euros.

TÜV India offers entire range of services in certification and inspection in India and South Asia with our contingent of professionally qualified and industry experienced Auditors and Inspectors. With a strong team of qualified Engineers having diversified experience in the field of Building Construction, Maintenance, quality assurance, examination of Buildings in distress and related rehabilitation works.

We at TÜV ensure to optimize customer operational efficiencies and thereby maximize customer satisfaction

3. Audit Objective and Scope

3.1 Audit Objective

Sapthagiri College of Engineering (SCE) is an engineering college in Bangalore, Ind a started in the year 2001. It is affiliated to Visvesvaraya Technological University (VTU), Belgaum and approved by the All India Council for Technical Education. The college is located at Chikkasandra, Hesarghatta Main Road, Bangalore in 6 acres of land, huge lung space & with good infrastructure.

The college mandates for the use sustainable techniques and practices to mit gate climate change and march towards carbon neutrality in the coming years and complying with environmental regulations and ensure the best practices to be Green and Safe institute for higher learning.

So as an Institute with more emphasis on higher learning, they want to practice and impart the sustainable culture to all the stakeholders including their students and enable them to apply it in their day to day activities.

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In the mean time they wanted to have a gap analysis study in line with their environmental goals and the indented objective is to have continual improvement and adopt best practices by identifying the gaps through a third party study.

The Study is based on the information made available to TÜV India and on the contract conditions.

3.2 Audit Scope & Boundary

The scope of work includes gap analysis of the college campus as per applicable regulations and standards relating to water consumption, waste water disposal, electricity consumption, waste handling, biodiversity assessment and safety practices.

The assessment boundary includes the following building infrastructure:

- Faraday Block (B Block)
- Academic Block (A Block)
- Administrative Block
- Civil Block (C Block)
- Girls Hostel & Boys Hostel
- College Canteen
- Gym
- Open Spaces & Gardens

4. Methodology

The Study team having diversified experience in auditing ISO 14001, ISO 45001, ISO 14064, ISO 50001, GRI reporting, AA1000AS, GHG Accounting and Sustainability validations/ Verifications along local EHS legislations is identified and formed to conduct the study.

The team verified all applicable environmental aspects as per the GRI (Global Reporting Initiative) Sustainability Reporting Standards for the entire campus including the EHS (Environment and Health Safety) safety requirements to evaluate institution's intent towards the Sustainability and EHS safety in combating climate change as well as their role towards carbon neutrality, GHG mitigation measures, communications to stakeholder and their concerns.

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The detailed study was conducted and the gaps (findings) are presented in the table format. The team visited the campus and reviewed the findings & related supporting evidences and records to arrive at the conclusions.

5. Study Team

The study was conducted on 13/12/2016 for the academic year 2015-16 (1st August 2015 to 31st July 2016) by TUV India Pvt Ltd sustainability auditor.

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6 Indicators & Gap Analysis

Environmental indicators considered in this green auditing are water, energy, waste, carbon footprint and biodiversity.

6 1 Energy

This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances, natural gas and vehicles. All the departments with common facility centers are using a incandescent lamp where increasing consumption of electricity observed. The street lights in front of main gate of campus are HID type and other street lights in campus are of sodium vapour lamp also increasing major consumption of electricity for lighting purpose. In group of study area more electricity is consumed in administrative office, Computer laboratory, Science departments and library.

6.2 Water

This indicator addresses water consumption, water sources, irrigation, storm water, appliances and fixtures. A water audit is an on-site survey and assessment to determine and improve efficiency water use. In survey water used at bathrooms, toilets, laboratory, kitchen, garden, shower and of as well as leakages and over flow of water from overhead tanks is also been evaluated. The data collected from all the departments is examined and verified. For monitoring of water use number of times of filling of tanks per day, time for overflowing, rate of flow, water wasted in liters per day due to overflowing is periodically supervised by water management and water harvesting committee members. Data submitted by the departments it examined according to leakages, rate of flow of leakages, use for washing, use of water for cleaning etc by committee.

6.3 Waste

Hazardous materials represent significant risks to human health and ecological integrity. They often persist in the environment leaving a legacy of land and water contamination for generations. Many accumulate in the tissues of organisms and become concentrated within food chains, leading to cancer, endocrine disruption, birth defects, and other tragedies. The minimization, safe handling, and ultimate elimination of these materials are essential to the long-term health of the planet.

The hazardous waste is disposed off along with the medical college waste to a designated waste management facility.

6.4 Carbon Footprint

Scope 1 and scope 2 emissions are determined as per the GHG protocol. Scope 1 emissions include direct emissions produced by burning of fuels and scope 2 emissions include indirect emissions generated by the electricity consumed.

Table 1: CO2 Emissions from Gasoline Consumption

Gasoline Source	Gasoline Consumption (Litres)	CO_2 EF (g CO2 / litre)	CH_4 EF (g CO2 / litre)	100 year GWP	N_2O EF (g CO2 / litre)	100 Year GWP	CO_2e (grams)
Passenger Car	708	2319.431	0.100385	25	0.021134	298	1648393
Others (Lab & Lawn Movers)	228	2319.431	0.100385	25	0.021134	298	530839
Total	936						2179232

Taking 5% uncertainty into consideration, CO2 emissions from gasoline consumption can be arrived at **2288.19 Kg CO2e**

Table 2: CO2 Emissions from Diesel Consumption

Diesel Source	Diesel Consumption (Litres)	CO_2 EF (g CO2 / litre)	CH_4 EF (g CO2 / litre)	100 year GWP	N_2O EF (g CO2 / litre)	100 Year GWP	CO_2e (grams)
Bus	20143	2676.32	0.004985	25	0.004692	298	53939786
Genset	5648	2676.32	0.004985	25	0.004692	298	15124456
Motor Car	5476	2676.32	0.004985	25	0.004692	298	14663867
Total	31267						83728109

Taking 5% uncertainty into consideration, CO2 emissions from diesel consumption can be arrived at Kg **87314.51 KgCO2e**

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Table 3: CO2 Emissions from LPG Consumption

Month	No. of cylinder	Wt. of each cylinder (Kg)	LPG Consumption (Kg)	Emission Factor (Kg CO_2e/Kg Combusted)	Gross Emission (Kg CO2e)	Uncertainity (5%)	Net Emission (Kg CO2e)
Jun-18	68	19	1292	3.03	3914.76	195.738	4110.498
Jul-18	63	19	1197	3.03	3626.91	181.3455	3808.2555
Aug-18	64	19	1216	3.03	3684.48	184.224	3868.704
Sep-18	69	19	1311	3.03	3972.33	198.6165	4170.9465
Oct-18	65	19	1235	3.03	3742.05	187.1025	3929.1525
Nov-18	66	19	1254	3.03	3799.62	189.981	3989.601
Dec-18	69	19	1311	3.03	3972.33	198.6165	4170.9465
Jan-19	64	19	1216	3.03	3684.48	184.224	3868.704
Feb-19	70	19	1330	3.03	4029.9	201.495	4231.395
Mar-19	68	19	1292	3.03	3914.76	195.738	4110.498
Apr-19	64	19	1216	3.03	3684.48	184.224	3868.704
May-19	65	19	1235	3.03	3742.05	187.1025	3929.1525
Jun-19	71	19	1349	3.03	4087.47	204.3735	4291.8435
Jul-19	72	19	1368	3.03	4145.04	207.252	4352.292
Total	938		17822		54000.66	2700.033	56700.693

As seen from the table, CO2 emissions from LPG consumption can be arrived at **56700.69 KgCO2e**

Table 4: Total CO2e Emissions

Emission Category	Kg CO_2e Emissions
Scope 1	146902
Scope 2	144725
Total	**291627**

The total carbon emissions for the academic 2015-16 is 291627 Kg CO2e

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6.5 Biodiversity

In present survey, focus has been given on assessment of present status of diversity in form of plants, insects and birds from college campus and efforts made by the college authorities for nature conservation

Primary survey of college campus was undertaken for assessment of floral and faunal diversity. The list of plants which includes trees, shrubs, climbers, herbs have been prepared and documented for its further ecological importance.

During the assessment of biodiversity we tried to understand the previous contribution of the institution in Biodiversity conservation through the involvement of students and staff members. Efforts were made to understand changes in vegetation pattern, av faunal (birds) migration (if any) and other faunal components. The flowering pattern of trees, shrubs and climbers were observed to understand the pollinators and dispersal agents. The observation on faunal components including insects and birds has also been done by random sampling method and visual observations in the campus.

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Gap Analysis Study Report

Green Audit | Energy Audit | Environmental Audit

Academic Year 2014-15

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5. Study Team

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6 Environmental Indicators & Gap Analysis

Environmental indicators considered in this green auditing are water, energy, waste, carbon footprint and biodiversity.

6.1 Energy

Lights are negligibly operated during day time. The lights are operated manually As per the replacement policy the college should install T5 tubes in the class rooms in place of conventional tube lights. The CFL lamps should be replaced by the LED lamps A dedicated stabilizer can be installed and the lighting load can be transferred. With the help of voltage regulation, further energy savings are possible from the fluorescent lamps.

The building is designed to make best use of day light and avoid the heat in-grace. Blinds are available to control unnecessary heat in - grace. In addition it is confirmed that there is no unnecessary operation of the equipment which add up the heat.

The equipment like photocopiers, fax machines are shutdown when not in use, computers are turned to sleep mode whenever not in use.

6.2 Water

One water leakage from tap was identified in the Boys hostel third floor and other in the college boy's washroom. Except the two occurrences, no leaking taps, pipes, valves were identified in the college premise.

AC is operated mainly in the months of March, April, May & June. Condensed water is collected and utilized for gardening.

The college premise is kept clean. Thus the chances of litter polluting water table are negligible. There is a dedicated RO plant installed inside the college premise. The water quality is checked in-house.

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6.3 Waste

Canteen waste is properly discarded to a designated place. The internal correspondences and various functionalities are taken care by the electronic means like emails and ERP system to minimize paper waste generation.

Hazardous waste is disposed along with the medical college waste to a designated waste management facility.

6.4 Carbon Footprint

Scope 1 and scope 2 emissions are determined as per the GHG protocol. Scope 1 emissions include direct emissions produced by burning of fuels and scope 2 emissions include indirect emissions generated by the electricity consumed.

Table 1: CO2 Emissions from Gasoline Consumption

Gasoline Source	Gasoline Consumption (Litres)	CO_2 EF (g CO2 / litre)	CH_4 EF (g CO2 / litre)	100 year GWP	N_2O EF (g CO2 / litre)	100 Year GWP	CO_{2e} (grams)
Passenger Car	748	2319.431	0.100385	25	0.021134	298	1741523
Others (Lab & Lawn Movers)	248	2319.431	0.100385	25	0.021134	298	577403
Total	996						2318926

Taking 5% uncertainty into consideration, CO2 emissions from gasoline consumption can be arrived at **2434.87 Kg CO2e**

Table 2: CO2 Emissions from Diesel Consumption

Diesel Source	Diesel Consumption (Litres)	CO_2 EF (g CO2 / litre)	CH_4 EF (g CO2 / litre)	100 year GWP	N_2O EF (g CO2 / litre)	100 Year GWP	CO_{2e} (grams)
Bus	21143	2676.32	0.004985	25	0.004692	298	56617629
Genset	5744	2676.32	0.004985	25	0.004692	298	15381529
Motor Car	5596	2676.32	0.004985	25	0.004692	298	14985208
Total	32483						86984366

Taking 5% uncertainty into consideration, CO2 emissions from diesel consumption can be arrived at Kg **91333.58 KgCO2e**

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Table 3: CO2 Emissions from LPG Consumptior

Month	No. of cylinder	Wt. of each cylinder (Kg)	LPG Consumption (Kg)	Emission Factor (Kg CO_2e/Kg Combusted)	Gross Emission (Kg CO2e)	Uncertainity (5%)	Net Emission (Kg CO2e)
Jun-18	66	19	1254	3.03	3799.62	189.981	3989.601
Jul-18	63	19	1197	3.03	3626.91	181.3455	3808.2555
Aug-18	64	19	1216	3.03	3684.48	184.224	3868.704
Sep-18	68	19	1292	3.03	3914.76	195.738	4110.498
Oct-18	65	19	1235	3.03	3742.05	187.1025	3929.1525
Nov-18	66	19	1254	3.03	3799.62	189.981	3989.601
Dec-18	67	19	1273	3.03	3857.19	192.8595	4050.0495
Jan-19	64	19	1216	3.03	3684.48	184.224	3868.704
Feb-19	71	19	1349	3.03	4087.47	204.3735	4291.8435
Mar-19	68	19	1292	3.03	3914.76	195.738	4110.498
Apr-19	64	19	1216	3.03	3684.48	184.224	3868.704
May-19	67	19	1273	3.03	3857.19	192.8595	4050.0495
Jun-19	71	19	1349	3.03	4087.47	204.3735	4291.8435
Jul-19	70	19	1330	3.03	4029.9	201.495	4231.395
Total	934		17746		53770.38	2688.519	56458.899

As seen from the table, CO2 emissions from LPG consumption can be arrived at **56459 KgCO2e**

Table 4: Total CO2e Emissions

Emiss on Category	Kg CO_2e Emissions
Scope 1	150228
Scope 2	148985
Total	**299213**

The total carbon emissions for the academic 2014-15 is 299213 Kg CO2e

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6.5 Biodiversity & Ecology

The College has not explored the possibility of green building certification. The building is a cement concrete modern structure and has not used any natural materials or traditional local architectural concepts however the class rooms require only about 50 % artificial lighting and corridors which are quite specious as good as little less than half of a classroom are also used thought out and they get 100% sunlight throughout the working period. Fans are required depending on seasonal variations.

Vanmahotsva (tree plantation festival) is celebrated with cultural expressions like street plays, poster making and tree plantation drives where in staff and students have planted several types of tree saplings in their localities and public places and tree saplings were a so planted in the College garden area.

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Environment and Energy Policy

Sapthagiri College of Engineering (SCE) is an **ISO 9001:2015 and 14001:2015** certified campus, following a series of voluntary ISO standards on Quality and Environmental Management Systems (Q&EMS). The Environment and Energy Policy is our guiding document that enables the SCE to achieve continual improvement over time.

SCE strives towards developing Environment and Energy efficiency through following strategies:

- ✓ SCE always aims to eliminate or reduce all forms of environmental pollution and encourages all faculty members, staff, students and others to do the same.
- ✓ The College always Raises awareness of environmental issues among its staff/students/visitors and encourages initiatives leading towards a clean environment.
- ✓ SCE promote the 3 R's for waste in the following order: Reduce, Reuse and Recycle and provide convenient waste collection points and guidance for the disposal of Paper, Cardboard, Glass, Plastic, Electrical equipments and white goods, Hazardous waste, e-wastes

Environmental best practices within SCE campus

SCE work within the framework of the Energy & Environment Policy and consider the environment as a 'living' entity that we sustain and protect even as we go about our daily activities.

Key focus areas

- Water management
- Waste management
- Energy management
- Air quality and Green cover

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WATER MANAGEMENT:

- SCE minimizes the consumption of water by

- Encouraging to report leaks and rectifying them promptly
- Progressively replacing / supplementing baths with shower facilities in hostels, staff quarters and guest houses, if needed.
- Exploring options for using waste / roof water wherever possible
- Establishing rain water harvesting schemes in all buildings of the campus
- Minimizes the consumption of electricity where opportunities arise by
- Progressive replacement of light bulbs with energy efficient ones
- Encouraging staff and residents to turn off electrical appliances when not in use
- Conserving energy by promoting the use of daylight
- Conducting frequent preventive and corrective maintenance

WASTE MANAGEMENT:

- ❖ Solid waste management

- Domestic Waste: This is collected from homes, hostels and residential facilities on the campus.
- Garden waste: This includes trimmed away branches, dried leaves, and all manner of garden waste – used in gardens
- Food waste: used in BIO GAS PLANT
- Degradable waste: from cafeterias and eating joints is composter.
- Paper, metals, plastics and glass are recycled by giving them to approved scrap vendors.
- Biomedical waste: generated waste handled to MMIS for safe disposal.
- Hazardous waste: The major component in this category is generated out of the maintenance activity of vehicles & DG Sets – handled to MMIS for safe disposal from their disposed to Authorized recyclers
- An incinerator is used to dispose non biodegradable waste to maintain clean and pollution free environment in the campus.
- The college campus is completely free from plastic bags and cups
- E-waste: including desktop computers and accessories, compact fluorescent lights, printer cartridges are collected through separate waste streams and disposed to Authorized recyclers

Green campus is maintained through adequate tree plantation by the college NSS Unit and the maintenance cell.

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ENERGY MANAGEMENT

Energy conservation is an ever-present theme in the planning and developing of all our campus facilities. We are also increasing our energy procurement mix with an increase in renewable sources like solar energy.

A few of the measures taken by us to make the SCE campus energy efficient:

- Upgrade of the air-conditioning systems. This is achieved by replacement of dated air-conditioning units with power-efficient star rated units. Central air conditioning systems adopting state of the art water cooled screw chillers, and unitary air-conditioner controls with automation system for buildings with sensors for efficient cooling and automatic switching on and off depending on occupancy and fixed time schedule are installed replacing old systems. Environment-friendly gas systems are used in all cooling systems.
- Energy efficiency measures. Few measures undertaken are: reduce maximum load, and introduction of measures to improve quality of power by exchanging energy efficient transformers, pumps, detuned filters for capacitor banks, and CFL /LED lighting. Auto synchronization panels for load optimization and energy efficient power equipment as certified by Bureau of Energy Efficiency (BEE).
- Roof top Solar PV systems: SCE has partially shifted from conventional energy use to renewable energy use and sourcing. This is being achieved by installing solar PV rooftop systems on Civil block in the first phase with a capacity of 50 kilowatts peak (kWp)

AIR QUALITY MONITORING:

- To control vehicle emissions on our campus authorized person who check the vehicle Emission certificate

- Trees and shrubs are the 'environmental lungs' of the campus. These lungs soak up harmful carbon dioxide and convert it to oxygen. We try to develop all available open spaces through arboriculture and greenery.

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