# GREEN AUDIT REPORT

SH SACRED HEART COLLEGE Autonomous

November 2018

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# SACRED HEART COLLEGE

## THEVARA

November 2018

OTTOTRACTIONS
Energy-Engineering-Environment

# Certification

*This is to certify that*

*The Ottotractions has conducted Green Audit of Sacred Heart College, Thevara, Ernakulam during the year 2018. This is to certify that the data collection has been carried out diligently and truthfully. All reasonable professional skill, care and diligence had been taken in preparing the green audit report and the contents thereof are a true representation of the facts. Adequate training provided to personnel involved in daily operations after implementation of recommendations.*

*Er. B V Suresh Babu*
*Accredited Energy Auditor,*
*Bureau of Energy Efficiency.*

OTTOTRACTIONS TRIVANDRUM Accredited Energy Auditor, AEA-39

*Dated this 16th day of December 2018*
*Thiruvananthapuram*

OTTOTRACTIONS
Energy-Engineering-Environment

Green Audit Report
Sacred Heart College, Thevara
2018 November

**Green Audit Team**

| | | |
|---|---|---|
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## About OTTOTRACTIONS

**OTTOTRACTIONS** established in 2005, is an organization with proven track record and knowledge in the field of energy, engineering, and environmental services. They are the first Accredited Energy Auditor from Kerala for conducting Mandatory Energy Audits in Designated Consumers as per Energy Conservation Act-2001. Government of Kerala recognized and appreciated **OTTOTRACTIONS** by presenting its prestigious **"The Kerala State Energy Conservation Award 2009"** for the best performance as an Energy Auditor.

# Acknowledgment

We were privileged to work together with the administration and staff of Sacred Heart College, Thevara for their timely help extended to complete the audit and bringing out this report. We thank Rev. Dr. Johnson X. Palackappillil CMI, Principal and Dr. K M Johnson, **IQAC Coordinator& HOD, English** for their advises and support during audit.

With gratitude, we acknowledge the diligent effort and commitments of all those who have helped to bring out this report.

We also take this opportunity to thank the bona-fide efforts of team OTTOTRACTIONS for unstinted support in carrying out this audit.

We thank our consultants, engineers and backup staff for their dedication to bring this report.

Thank you.

B V Suresh Babu
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# Contents

# 1 Introduction

## 1.1 Background

All across the developed countries, educational institutions are now moving to a sustainable future by becoming carbon neutral and greener spaces. They are taking responsibility for their environmental impact and are working to neutralize those effects. To become carbon neutral, institutions are working to reduce their emissions of greenhouse gases, cut their use of energy, use energy efficient equipment, use more renewable energy, plant and protect green cover and emphasize the importance of sustainable energy sources. Institutions that have committed to becoming carbon neutral have recognized the threat of global warming and are therefore committing to reverse the trend. Studies on this line has not struck roots in most of the developing countries-especially among students.

The Sustainable Development Goals (SDGs), launched by the United Nations in 2015, are an excellent vehicle for driving this change. They represent an action plan for the planet and society to thrive by 2030. The SDGs provide a window of opportunity for creating multidimensional operational approaches for climate change adaptation. They address poverty, hunger and climate change, among other issues central to human progress and

sustainable development, such as gender equality, clean water and sanitation, and responsible consumption and production.

The Green Audit of Sacred Heart College, Thevara aims to assist campus to reduce their carbon footprint and educate tomorrow's leaders about strategies for carbon mitigation using their campus as a model. Also this audit covers institutes responses towards SDGs by covering SDG 3,6,7,11,13,15. The green audit also aims to educate students and teachers on the concept of carbon footprint and to enable the students to collect data pertaining to the carbon emissions and carbon sequestration in their campus and to calculate the specific carbon footprint of the campus.

The project also suggests plans to make the campus carbon neutral or even carbon negative by implementing carbon mitigation strategies in areas such as,

a. Energy
b. Transportation
c. Waste minimisation
d. Carbon Sequestration etc.

The major objectives of the audit are:

- To make aware students and teachers on the concept of carbon footprint.
- To calculate the specific carbon footprint of the campus and classify it as carbon negative, neutral or positive.
- To create carbon mitigation plans to reduce their footprint based on the data generated.

## Sacred Heart College, Thevara

The Sacred Heart college established in 1944 by the CMI missionary fathers – reputed educational pioneers managing over 500 educational institutions across India and abroad - on the enchanting shores of Vembanadu backwaters on Thevara Island in Kochi, surrounded by lush greenery and located away from urban bustle, the 3-storeyed majestic structure on the eleven acre campus, spacious in dimensions, simple and elegant in design, is an aesthetic treat. Ever since its origin, the college - fondly called 'Thevara College'- has followed its core philosophy: holistic vision, i.e., harmony of the intellectual, physical and spiritual endeavors enshrined nits motto, *cor rectum inquirit scientiam* (a righteous heart seeks after wisdom).

The college was awarded the highest rating of **FIVE STAR** in the NAAC accreditation in 2000, and in the 2007 re-accreditation, the feat was replicated with **A+ (91.7)**. In 2013,

the college was awarded **A Grade** (CGPA 3.30). In the NIRF ranking the College has always found a place among the first 60 Colleges. Academically the college's record has been consistent and commendable, with top ranks and cent percent results almost a routine in many branches such as English, Commerce, Economics, Physics and Zoology.

On the sporting arena, the college's credentials have been unrivalled maintaining I or II position in the MG University in games for the past many years, with many of our sportspersons representing the University, the State and the Country. In the University Youth Festival, the College has been the champions consistently for the past three years.

In the national surveys, for the **Best Fifty Colleges**, undertaken by prestigious media agencies such as *The Week*, and *India Today*, Sacred Heart College was ranked one among the best 30 colleges for science, 40 for arts and 30 for Commerce in the country, while notching up the commendable I **rank** consistently since 2006, among colleges in Kerala.

| | | |
|---|---|---|
| . Students | Girls | 1603 |
| | Boys | 941 |
| | Total Students | 2544 |
| Staffs | Teaching | 152 |
| | Non-Teaching | 60 |
| | Total Staffs | 212 |
| Total Occupancy of the college | | 2756 |

Total student strength of the campus is **2544**. For calculating per capita carbon emission estimation, the student strength is taken into account.

# 2 METHODOLOGY

## 2.1. Sensitisation

Low Carbon campus initiatives are successful when everyone in the campus is engaged including students, teachers and staff. A team of students, teachers and staff were formed to participate in the audit. A sensitisation among students and teachers on the concept of carbon footprint was conducted.

During the audit the students and staffs were sensitised on the project and trained to be a part of the data collection team. This helped in conducting the survey in a participatory mode so that the awareness will penetrate to the grass root level. During the data collection field visit it was stressed that the team will spread these ideas to their homes and friends. This will help in a horizontal and vertical spread of the message to a wider group. It is assumed that through 2668 occupants of these two campuses will reach same number of households. This message will spread to at least 10672 individuals (Assuming that each house has four members average).

## 2.2 Estimation of carbon footprint

A carbon footprint is the amount of greenhouse gases—primarily carbon dioxide—released into the atmosphere by a particular human activity. A carbon footprint can be a broad

measure or be applied to the actions of an individual, a family, an event, an organization, or even entire nation. It is usually measured as tons of $CO_2$ emitted per year, a number that can be supplemented by tons of $CO_2$-equivalent gases, including methane, nitrous oxide, and other greenhouse gases.

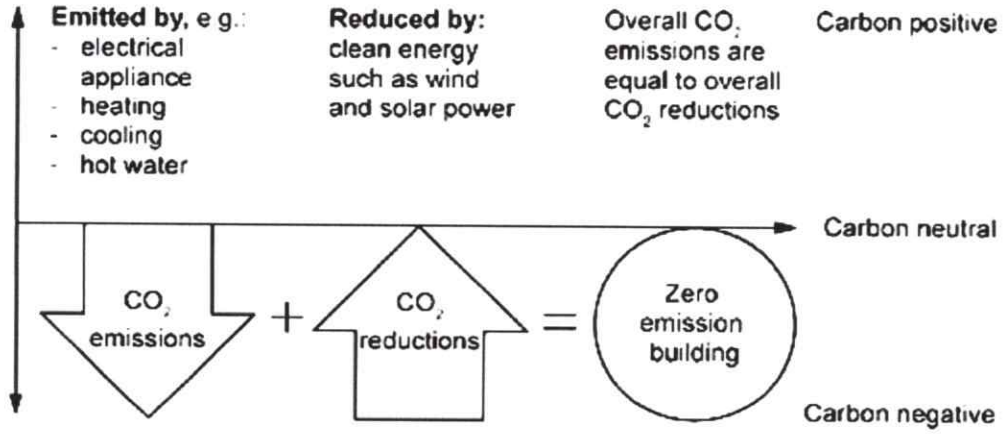
Global Warming Potential (GWP) is a measure of how much heat a greenhouse gas traps in the atmosphere up to a specific time horizon, relative to carbon dioxide. The Global Warming Potential (GWP) was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of one ton of a gas will absorb over a given period of time, relative to the emissions of one ton of carbon dioxide ($CO_2$).

| Global Warming Potentials (IPCC Second Assessment Report) | | | | | |
|---|---|---|---|---|---|
| Species | Chemical formula | Lifetime (years) | Global Warming | | |
| | | | 20 years | 100 years | 500 years |
| Carbon dioxide | CO2 | variable § | 1 | 1 | 1 |
| Methane * | CH4 | 12±3 | 56 | 21 | 6.5 |
| Nitrous oxide | N2O | 120 | 280 | 310 | 170 |
| HFC-23 | CHF3 | 264 | 9100 | 11700 | 9800 |
| HFC-32 | CH2F2 | 5.6 | 2100 | 650 | 200 |
| HFC-41 | CH3F | 3.7 | 490 | 150 | 45 |
| HFC-43-10mee | C5H2F10 | 17.1 | 3000 | 1300 | 400 |
| HFC-125 | C2HF5 | 32.6 | 4600 | 2800 | 920 |
| HFC-134 | C2H2F4 | 10.6 | 2900 | 1000 | 310 |
| HFC-134a | CH2FCF3 | 14.6 | 3400 | 1300 | 420 |
| HFC-152a | C2H4F2 | 1.5 | 460 | 140 | 42 |
| HFC-143 | C2H3F3 | 3.8 | 1000 | 300 | 94 |
| HFC-143a | C2H3F3 | 48.3 | 5000 | 3800 | 1400 |
| HFC-227ea | C3HF7 | 36.5 | 4300 | 2900 | 950 |
| HFC-236fa | C3H2F6 | 209 | 5100 | 6300 | 4700 |
| HFC-245ca | C3H3F5 | 6.6 | 1800 | 560 | 170 |
| Sulphur hexafluoride | SF6 | 3200 | 16300 | 23900 | 34900 |
| Perfluoromethane | CF4 | 50000 | 4400 | 6500 | 10000 |
| Perfluoroethane | C2F6 | 10000 | 6200 | 9200 | 14000 |
| Perfluoropropane | C3F8 | 2600 | 4800 | 7000 | 10100 |
| Perfluorobutane | C4F10 | 2600 | 4800 | 7000 | 10100 |
| Perfluorocyclobutane | c-C4F8 | 3200 | 6000 | 8700 | 12700 |
| Perfluoropentane | C5F12 | 4100 | 5100 | 7500 | 11000 |
| Perfluorohexane | C6F14 | 3200 | 5000 | 7400 | 10700 |

The methodology for carbon footprint calculations are still evolving and it is emerging as an important tool for green house management. In the present study carbon emission data from the campus is estimated under four categories viz.

a. Energy
b. Transportation
c. Waste minimisation
d. Carbon Sequestration

**Carbon neutrality** refers to achieving net zero GHG emission by balancing the measured amount of carbon released into atmosphere due to human activities, with an equal amount sequestrated in carbon sinks. It is crucial to restrict atmospheric concentrations of GHGs released from various socio-economic, developmental and life style activities using biological or natural processes. It is recognized that addressing climate change is not as simple as switching to renewable energy or offsetting GHG emissions. Rather, providing an opportunity for innovation in new developmental activities for viable and effective approach to address the problem.




## Energy

In the campus carbon emission from energy consumption is categorised under two headings viz. energy from Electrical and Thermal. Energy used for transportation is calculated under transportation sector.

A detailed energy audit is conducted to understand the energy consumption of the campus. Information on total connected loads, their duration of usage and documents like electricity bills are evaluated. Connected loads are calculated by conducting a survey on electrical equipment on each location. Duration of usage was found out by surveying the users. The survey of equipment was conducted in a participatory mode.

The fuel consumption of cooking like LPG and biomass were studied by analysing the annual fuel bills and usage schedules during the study. Discussions were carried out with the concerned individuals who actually operate the cooking system.

## Transportation

The campus has public transport system in place, 2 buses are being deployed for transporting students and staff.

Carbon emission from transportation is calculated by using the following formula:

Carbon Emission = Number of each type of vehicles × Avg. fuel consumed per year ×

Emission factors (based on the fuel used by the vehicle)

## Waste Minimisation

The waste generated from the campus is also responsible for the greenhouse gas emission. So in order to calculate the total carbon foot print of the campus it is necessary to estimate the greenhouse gas emission from the waste generated in the campus by the activity of the students, teachers and staffs.

The calculation of the waste generated has been conducted by keeping measuring buckets for collecting the waste generated in a day. This waste so generated was calculated by weighing it.

## Carbon Sequestration

Carbon sequestration is the process involved in the long-term storage of atmospheric carbon dioxide. Trees remove carbon dioxide from the atmosphere through the natural process of photosynthesis and store the carbon in their leaves, branches, stems, bark, and roots.

Carbon sequestrated by a tree can be found out by using different methods. Since this study is employed the volumetric approach, the calculation consists of five processes.

- Determining the total weight of the tree
- Determining the dry weight of the tree
- Determining the weight of carbon in the tree
- Determining the weight of $CO_2$ sequestrated in the tree
- Determining the weight of $CO_2$ sequestrated in the tree per year

Detailed calculations and results are given in the technical supplements of this document.

# 3 RESULTS AND DISCUSSIONS

## 3.1 CARBON FOOTPRINT ESTIMATION

### 3.1.1 ENERGY

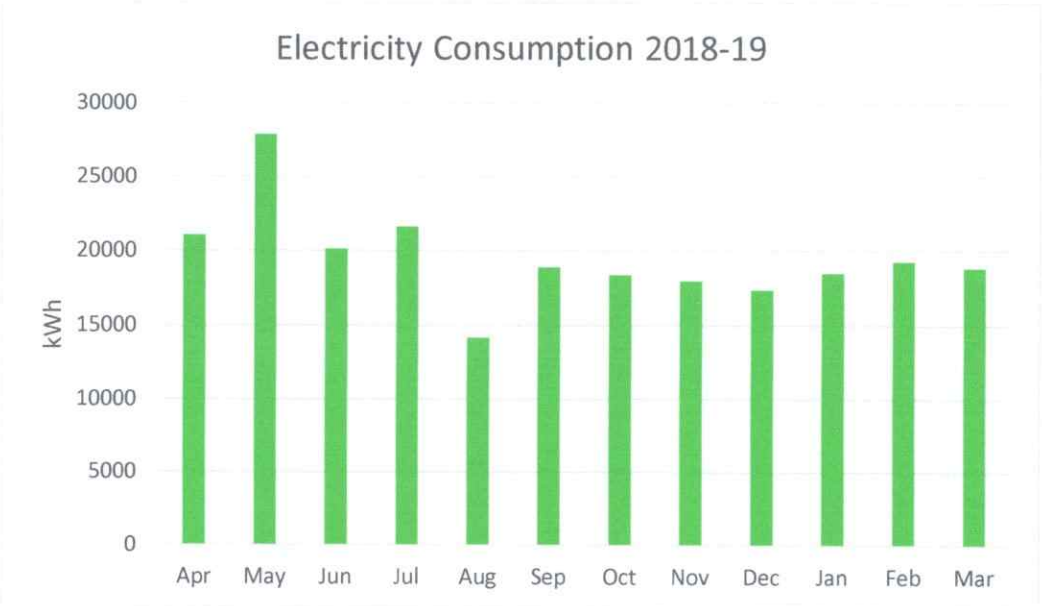
#### a. Electricity

Electricity is purchased from KSEB under HT category , the details are given below. A 10 kWp Solar Power Plant is installed in the campus.

| Base Line Energy Data (2018-19) (Annual) | | |
|---|---|---|
| SACRED HEART COLLEGE, THEVARA | | |
| 1 | Annual Electricity Consumption (kWh) | 215242 |
| 2 | Annual Solar Generation (kWh) | 13447 |
| 3 | Annual Diesel Consumption (kg) | 122 |
| 4 | Annual Biogas consumption (m3) | 1500 |
| 5 | Annual Electricity Cost (Lakhs Rs) | 18.67 |
| 6 | Annual Diesel Cost (Lakhs Rs) | 0.11 |
| 7 | Total Annual Energy Cost (Lakhs Rs) | 18.78 |
| 8 | Rs/Kwh (avg) Electricity | **7.89** |

The audit boundaries of SH College use electricity from these connections from the substation. Different feeders are available from the substation to the SH College operation.

## Electricity Bill Analysis




The electricity consumption for the year 2018-19 is given above.

## Specific Energy Consumption

| OTTOTRACTIONS- ENERGY AUDIT | | |
|---|---|---|
| Energy Performance Index (18-19) | | |
| 1 | Total building area ($m^2$) | 18830 |
| 2 | Annual Electricity Consumption Grid (kWh) | 215242 |
| 3 | Annual Electricity Consumption Solar (kWh) | 13447 |
| 4 | Annual Diesel (Converted kWh) | 1491 |
| 5 | Annual Biogas (Converted kWh) | 6105 |
| 6 | Annual LPG (Converted kWh) | 1716 |
| 7 | Total Energy in kWh | 238001 |
| 8 | Specific Energy Consumption kWh/$m^2$ | 12.64 |

**The specific energy consumption is 12.64kWh/$m^2$**

### 3.3. Waste Generation total

The major concern of waste management will be focused on the solid waste produced by the campus. Solid wastes produced in the campus are mainly of three types, food waste, paper

waste, and plastic waste. Food wastes produced in the campus are mainly by two means. The vegetable wastes produced in the kitchen during the food preparation. The food waste produced by the students and staffs of the campus after the consumption of meals. The degradable waste is treated in the biogas plant, the biogas generated is used in the kitchen.

Degradable Waste

| Degradable Waste Generation (2018) | |
|---|---|
| **SACRED HEART COLLEGE, THEVARA** | |
| Waste generated in kg per day | 50.025 |
| Waste generated in kg per Yr | 1096 |
| Normalisation Value for **campus waste generation** is 0.06 | |

Non-Degradable waste

| Solid non degradable Waste Generation (2018) | |
|---|---|
| **SACRED HEART COLLEGE, THEVARA** | |
| Non degradable Waste generated per day | 8 |
| Waste generated in kg per Yr | 171 |
| Normalisation Value for solid waste is 0.06 | |

## Carbon Emission Profile (2018-19)

Carbon emissions in the campus due to the day-to-day activities are calculated and is discussed below. The emission factors considered for estimation and its units are given.

| Carbon Foot Print (2018-19) | | | |
|---|---|---|---|
| Sl. No. | Particulars | Consumption | Tonne of $CO_2e$ |
| 1 | Annual Electricity Consumption (kWh) | 215242 | 176.50 |
| 2 | Annual LPG Consumption in kg | 123 | 0.18 |
| 3 | Annual Diesel Consumption (kg) | 122 | 0.39 |
| 4 | Annual Diesel Consumption (kg)(Transport) | 10009 | 31.03 |
| 5 | Annual Biogas Consumption in $m^3$ | 1500 | 2.10 |
| 6 | Annual Solar Generation kWh | 13447 | 11.03 |
| 7 | Food Waste in kg/yr. | 1096 | 0.69 |
| 8 | Paper Waste in kg/yr | 171 | 0.10 |
| 9 | Plastic Waste in kg/yr | 105 | 0.04 |
| 6 | Total Carbon Foot Print $tCO_2e/yr$ | | 222.05 |

| Emission Factors | | |
|---|---|---|
| Item | Factor | Unit |
| LPG | 0.0031 | $tCo_2e/kg$ |
| Electricity | 0.00082 | $tCo_2e/kWh$ |
| Diesel | 0.0032 | $tCo_2e/kg$ |
| Food Waste | 0.00063 | $tCo_2e/kg$ |
| Paper Waste | 0.00056 | $tCo_2e/kg$ |
| Plastic Waste | 0.00034 | $tCo_2e/kg$ |

## 3.4. CARBON SEQUESTRATION

All the activities including energy consumption and waste management have their equivalent carbon emission and they positively contribute to the carbon footprint of the campus. Carbon sequestration is the reverse process, at which the emitted carbon dioxide will get sequestrated according to the type of carbon sequestration employed. Even though there are many natural sequestration processes are involved in a campus, the major type of sequestration among them is the carbon sequestration by trees.

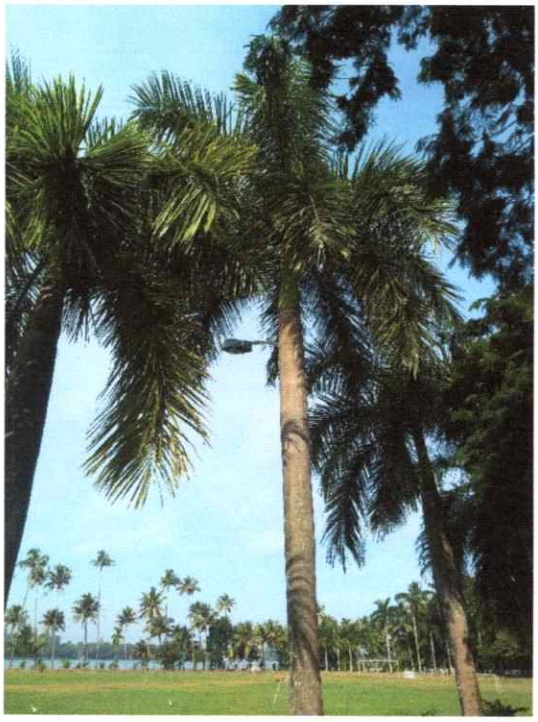
Trees sequestrate carbon dioxide through the biochemical process of photosynthesis and it is stored as carbon in their trunk, branches, leaves and roots. The amount of carbon sequestrated by a tree can be calculated by different methods. In this study, the volumetric approach was taken into account, thus the details including CBH (Circumference at Breast Height), height, average age, and total number of the trees, are required. Details of the trees in the campus compound are given in the Table 3.18. Detailed table is included in the technical supplement.

| Carbon Sequestration (18) | |
|---|---|
| Particular | $tCO_2e$ |
| Carbon sequestration SH College | 7.97 |

Carbon sequestrated by a tree can be found out by using different methods. Since this study is employed the volumetric approach, the calculation consists of five processes.

- Determining the total weight of the tree
- Determining the dry weight of the tree
- Determining the weight of carbon in the tree
- Determining the weight of $CO_2$ sequestrated in the tree
- Determining the weight of $CO_2$ sequestrated in the tree per year

Carbon sequestrated by each species of trees in the campus compound is given in the Table.3.19 Detailed calculation results are listed out in the tables provided in the technical supplements of 'Carbon sequestration'.



| Sl No | Scientific Name | Habit |
|---|---|---|
| 1 | Acacia chundra | T |
| 2 | Aegle marmelos | T |
| 3 | Alangium salvifolium | T |
| 4 | Alstonia scholaris | T |
| 5 | Annona squamosa | T |
| 6 | Antiaris toxicaria | T |
| 7 | Aporusa lindleyana | T |
| 8 | Artocarpus altilis | T |
| 9 | Artocarpus hetrophyllus | T |
| 10 | Artocarpus hirsutus | T |
| 11 | Butea monosperma | T |
| 12 | Careya arborea | T |
| 13 | Cinnamomum zeylanicum | T |
| 14 | Citrus limon | T |
| 15 | Cocos nucifera | T |
| 16 | Couropitia guianensis | T |
| 17 | Cynometra travancorica | T |
| 18 | Diospyros buxifolia | T |
| 19 | Diospyros ebony | T |
| 20 | Elaeocarpus tuberculatus | T |
| 21 | Ficus benghalensis | T |

| | | |
|---|---|---|
| 22 | Ficus racemosa | T |
| 23 | Ficus religiosa | T |
| 24 | Flacourtia montana | T |
| 25 | Garcinia gummigutta | T |
| 26 | Garcinia xanthochymus | T |
| 27 | Gliricidia sepium | T |
| 28 | Glochidion ellipticum | T |
| 29 | Holoptelia integrifolia | T |
| 30 | Hopea sp | T |
| 31 | Hopea parviflora | T |
| 32 | Humboldtia bourdillonii | T |
| 33 | Mallotus philipinensis | T |
| 34 | Mangifera indica | T |
| 35 | Meiogyne ramarawii | T |
| 36 | Michelia champaca | T |
| 37 | Mimusops elengi | T |
| 38 | Moringa oleifera | T |
| 39 | Murraya koenijii | T |
| 40 | Myristica fragrans | T |
| 41 | Neolamarkia cadamba | T |
| 42 | Pajanalia longifolia | T |
| 43 | Percea americana | T |
| 44 | Phyllanthus emblica | T |
| 45 | Pimenta dioica | T |
| 46 | Polyalthia longifolia | T |
| 47 | Pongamia pinnata | T |
| 48 | Pouteria lucuma | T |
| 49 | Psidium guajava | T |
| 50 | Punica granatum | T |
| 51 | Samania saman | T |
| 52 | Saraca asoka | T |
| 53 | Spondias pinnata | T |
| 54 | Strychnos nuxvomica | T |
| 55 | Swetinia macrophylla | T |
| 56 | Symplochos laurina | T |
| 57 | Syzygium cumini | T |
| 58 | Syzygium samarangense | T |
| 59 | Tabebua rosea | T |
| 60 | Tamarindus indicus | T |
| 61 | Tectona grandis | T |
| 62 | Terminalia arjuna | T |
| 63 | Tetrameles nudiflora | T |
| 64 | Vatica chinensis | T |
| 65 | Vatteria indica | T |
| 66 | Writia tinctoria | T |

## CARBON FOOTPRINT OF THE CAMPUS (2019-20)

Various carbon emitting activities such as consumption of energy, transportation and waste generation leads to the total emission of **222.07 $tCO_2e$** per year by the campus. The total carbon sequestration by trees in the campus compound is **7.97 $tCO_2e$**.

Thus, the current carbon footprint of the campus will be the difference of total carbon emission and total carbon sequestration/mitigation. the following table shows the carbon footprint level of 2018-19.

| tCO2e to be mitigated for carbon neutral campus (2019-20) | | | |
|---|---|---|---|
| Amount of carbon emission tCO2e | Amount of carbon sequestration tCO2e | Amount of carbon mitigated through renewable energy tCO2e | To be mitigated tCO2e |
| 222.05 | 7.97 | 11.03 | 203.05 |

### Specific CO2 Footprint

| Total Carbon Emission | | |
|---|---|---|
| 1 | Total Carbon Foot Print tCO2e/yr | 222.05 |
| 2 | Carbon Sequestered | 7.97 |
| 3 | CO2 Offset by Solar Power Plant | 11.03 |
| 4 | Effective Carbon footprint | 203.05 |
| 5 | Total No of Students | 2456.00 |
| 6 | Specific Carbon Footprint kg $CO_2e$/Student/Yr | 82.67 |

The total specific carbon emission is estimated as 82.67kg of $CO_2e$ per student for the year 2018S. As discussed earlier the campus is installed 10kWp solar power plant, which is a grid tied one. The plans to mitigate the CO2 emission is discussed in the next section.

# 4 Carbon Mitigation Plans

The total emission of the carbon dioxide per student is 79.82 kg per year. Emission reduction plans were prepared to bring the existing per capita carbon footprint to zero or below so as to bring the campus a carbon neutral or carbon negative campus.

This can be achieved in many ways but, every alternate plan must be in such a way that, it must fulfill the actual purpose of each activity that is considered.

Here, three major methods are taken in to account as the plans for reducing the carbon emission of the campus.

- Resource optimisation
- Energy efficiency
- Renewable energy

## RESOURCE OPTIMISATION

The effective use of resources can limit its unnecessary wastage. Optimal usage of the resources (such as fuels) can save the fuel and can also reduce the carbon emission due to its consumption. This technique can be effectively implemented in the 'transportation' and 'waste' sectors of the campus.

## WASTE MINIMISATION

Optimal utilisation of paper and plastic stationaries can reduce the frequency of purchase of items. This can reduce the unnecessary wastage of money as well as the excess production of waste. In the case of food, proper food habits and housekeeping practices can optimise its usage.

Currently, SH College is taking an appreciable effort to reduce the unnecessary production of wastes. But the campus still has opportunities to reduce the generation of waste and can improve much more. Resource optimisation can be effectively implemented in all type of waste generated in the campus and the campus can expect about 50% reduction the total waste produced.

## ENERGY EFFICIENCY

Energy efficiency is the practice of reducing the energy requirements while achieving the required energy output. Energy efficiency can be effectively implemented in all the sectors of the campus.

## FUELS FOR COOKING

The campus can install a solar water heater to rise the water temperature to a much higher level, then it has to consume only very less amount of thermal energy for preparing the same amount of food. This can make a positive benefit to the campus by saving money, energy and can reduce the carbon emission of the campus due to thermal energy consumed for cooking.

## TRANSPORTATION

Energy efficiency of the transportation sector is mainly depended on the fuel efficiency of the vehicles used. Here mileage of the vehicle (kmpl - Kilometres per Litre) is calculated to assess the fuel efficiency of the vehicle. Percentage of closeness is the ratio of actual mileage of the vehicle to its expected mileage. If the percentage of closeness of mileages of each vehicle is greater than that of its average, then the efficiency status of the vehicle is considered as 'Above average' and else, it is considered as 'Below average'

## Renewable Energy

A 10kWe solar power plants is installed in the campus and a 120kWe solar plant is under implementation, which will help offsetting the carbon foot print. The details of these projects are given in the concerned chapters.

## Carbon Mitigation Proposals

**After analyzing the historical and measured data the following projects are proposed to make the campus carbon neutral. The projects are from energy efficiency and renewable energy. The further additions in the green cover increase will also give positive impact in the carbon mitigation.**

| OTTOTRACTIONS- ENERGY AUDIT | | | | | | |
|---|---|---|---|---|---|---|
| SACRED HEART COLLEGE, THEVARA | | | | | | |
| Greenhouse Gas Mitigation through Major Energy Efficiency Projects | | | | | | |
| Sl No | Projects | Energy saved(Yearly) | | Sustainability (Years) | First year ton of CO2 mitigated | Expected Tons of CO2 mitigated through out life cycle |
| | | (kWh) | MWh | Years | | |
| 1 | Energy Saving in Lighting by replacing existing 220 No's T12 Lamps to 18W LED Tube | 13620 | 13.62 | 10 | 9.94 | 99.42 |
| 2 | Energy Saving in Lighting by replacing existing 43 No's T8 Lamps to 18W LED Tube | 2384 | 2.38 | 10 | 1.74 | 17.40 |
| 3 | Energy Saving in Lighting by replacing existing 122 No's CFLs to 9W LED Tube | 1004 | 1.00 | 10 | 0.73 | 7.33 |
| 4 | Energy Saving by replacing existing 382 No's in-efficient ceiling fans with Energy Efficient Five star fans | 15402 | 15.40 | 10 | 11.24 | 112.44 |
| | Total | 32410 | 32 | 10 | 24 | 237 |

| OTTOTRACTIONS- ENERGY AUDIT | | | | | | |
|---|---|---|---|---|---|---|
| SACRED HEART COLLEGE, THEVARA | | | | | | |
| Greenhouse Gas Mitigation through Renewable Energy Projects | | | | | | |
| Sl No | Projects | Energy saved(Yearly) | | Sustainability (Years) | First year ton of CO2 mitigated | Expected Tons of CO2 mitigated through out life cycle |
| | | (kWh) | MWh | Years | | |
| 1 | Installation of 120 kW Solar Power Plant (Ongoing) | 153300 | 153.30 | 10 | 111.91 | 1119.09 |
| | Total | 153300 | 153 | 10 | 112 | 1119 |

| OTTOTRACTIONS- ENERGY AUDIT | | | | | | |
|---|---|---|---|---|---|---|
| Executive Summary | | | | | | |
| Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects | | | | | | |
| SACRED HEART COLLEGE, THEVARA | | | | | | |
| Sl No | Projects | Investment | Cost saving | SPB | Energy saved | |
| | | (Lakhs Rs) | (Rs)/Yr | Months | kWh/Yr | toE/Yr |
| 1 | Energy Saving in Lighting by replacing existing 220 No's T12 Lamps to 18W LED Tube | 0.99 | 1.27 | 9.36 | 13620 | 1.17 |
| 2 | Energy Saving in Lighting by replacing existing 43 No's T8 Lamps to 18W LED Tube | 0.19 | 0.22 | 10.46 | 2384 | 0.21 |
| 3 | Energy Saving in Lighting by replacing existing 122 No's CFLs to 9W LED Tube | 0.11 | 0.09 | 14.08 | 1004 | 0.09 |
| 4 | Energy Saving by replacing existing 382 No's in-efficient ceiling fans with Energy Efficient Five star fans | 5.73 | 2.00 | 34.34 | 15402 | 1.32 |
| | **Total** | **7.02** | **3.59** | **17.06** | **32410.22** | **2.79** |
| (The saving are projected as per the assumed operation time observed based in the discussions with the plant officials. The data of saving percentages are taken from BEE guide books and field measurements. toE is tonne of oil equivalent) | | | | | | |

| OTTOTRACTIONS- ENERGY AUDIT | |
|---|---|
| Energy Saving in Lighting by replacing existing 220 No's T12 Lamps to 18W LED Tube | |
| **Existing Scenario** | |
| 220 numbers of T12 lamps were identified during the energy audit field survey in the laundry. During discussion with staffs it is observed that the average utility of these fittings are of 80%. | |
| **Proposed System** | |
| The existing T12 may be replaced to LED tube of 18 W in phased manner and the savings will be of 67 % (inclusive of improved light output and reduced energy consumption) | |
| **Financial Analysis** | |
| Annual working hours (hr) | 2400 |
| No of fittings | 220 |
| Total load (kW) | 12.10 |
| Annual Energy Consumption (kWh) | 20328 |
| Expected Annual Energy saving for replacing all fittings (kWh) | 13620 |
| Cost of Power | 9.31 |
| Annual saving in Lakhs Rs (1st year) | 1.27 |
| Investment required for complete replacements [@Rs 450 per fittings](Lakhs Rs) | 0.99 |
| Simple Pay Back (in Months) | 9.36 |

| OTTOTRACTIONS- ENERGY AUDIT | |
|---|---|
| Energy Saving in Lighting by replacing existing 43 No's T8 Lamps to 18W LED Tube | |
| **Existing Scenario** | |
| 43 numbers of T8 lamps were identified during the energy audit field survey in the laundry. During discussion with staffs it is observed that the average utility of these fittings are of 80%. | |
| **Proposed System** | |
| The existing T8 may be replaced to LED tube of 18 W in phased manner and the savings will be of 60 % (inclusive of improved light output and reduced energy consumption) | |
| **Financial Analysis** | |
| Annual working hours (hr) | 2400 |
| No of fittings | 43 |
| Total load (kW) | 2.37 |
| Annual Energy Consumption (kWh) | 3973 |
| Expected Annual Energy saving for replacing all fittings (kWh) | 2384 |
| Cost of Power | 9.31 |
| Annual saving in Lakhs Rs (1st year) | 0.22 |
| Investment required for complete replacements [@Rs 450 per fittings](Lakhs Rs) | 0.19 |
| Simple Pay Back (in Months) | 10.46 |

| OTTOTRACTIONS- ENERGY AUDIT | |
|---|---|
| Energy Saving in Lighting by replacing existing 122 No's CFLs to 9W LED Tube | |
| **Existing Scenario** | |
| 122 numbers of CFLs were identified during the energy audit field survey in the laundry. During discussion with staffs it is observed that the average utility of these fittings are of 80%. | |
| **Proposed System** | |
| The existing CFLs may be replaced to LED tube of 9 W in phased manner and the savings will be of 35 % (inclusive of improved light output and reduced energy consumption) | |
| **Financial Analysis** | |
| Annual working hours (hr) | 2400 |
| No of fittings | 122 |
| Total load (kW) | 1.71 |
| Annual Energy Consumption (kWh) | 2869 |
| Expected Annual Energy saving for replacing all fittings (kWh) | 1004 |
| Cost of Power | 9.31 |
| Annual saving in Lakhs Rs (1st year) | 0.09 |
| Investment required for complete replacements [@Rs 450 per fittings](Lakhs Rs) | 0.11 |
| Simple Pay Back (in Months) | 14.08 |

| OTTOTRACTIONS- ENERGY AUDIT | |
|---|---|
| Energy Saving by replacing existing 382 No's in-efficient ceiling fans with Energy Efficient Five star fans | |
| **Existing Scenario** | |
| There are 382 numbers of ceiling fans installed in the facility with minimum 8 hrs a day operation. All are conventional type and most of them are very old. | |
| **Proposed System** | |
| There is an energy saving opportunity in replace the existing fans with new five star labelled fans. The five star labelled fans give a savings up to 30% with higher service value (air delivery/watt). | |
| **Financial Analysis** | |
| Annual working hours (hrs) | 2400 |
| Total numbers of ordinary fans | 382 |
| Total load (kW) | 26.74 |
| Annual Energy Consumption (kWh) | 51341 |
| Expected Annual Energy saving, for total replacement(kWh) | 15402 |
| Cost of Power (Rs) | 13.00 |
| Annual saving in Lakhs Rs (1st year) | 2.00 |
| Investment required for a total replacement (Lakhs Rs)[@1500 Rs per Fan with 50W at full speed] | 5.73 |
| Simple Pay Back (in Months) | 34.34 |

| Installation of 120 kW Solar Power Plant | |
|---|---|
| **Existing Scenario** | |
| There is a good potential of solar power electricity generation. The availability of sunlight is very high. There are some canopies available in the proposed site, but by having proper trimming of trees this may be avoided. If the SPVs are place in the roof top it will help improving RTTV (Roof Thermal Transmit Value) of the building. | |
| **Proposed System** | |
| It is proposed to have a Solar Power Plant of 120 kW at the beginning stage. The state and central government is pushing and giving good assistance to the installation. It can be installed as an internal grid connected system which is much cheaper than off grid system. Now days the technology provides trouble free grid interactive and connected system. The installation will provide 25yrs trouble free generation with only 20% efficiency loss at the 25th year. | |
| **Financial Analysis** | |
| Proposed Solar installed Capacity (kW) | 120 |
| Total average kWh per day expected (3.5kWh/day average) | 420.00 |
| Total annual Generating Capacity (kWh) | 153300 |
| Cost of energy generated annually Lakhs Rs | 14.26 |
| Investment required (INR lakh)(Approx) | 46.00 |
| Simple Pay Back (in Months) lakh Rs | 38.72 |
| Life cycle in Yrs | 25 |
| Total Saving in Life Cycle (Approx) Rs Lakh | 356.42 |

# 5 Conclusion

The carbon emission from different sectors namely, Energy, Transportation and wastes were calculated using standard procedures. Carbon sequestration by the trees present in the campus was also estimated. From these the total carbon footprint of the campus was arrived at.

| Net Carbon Emission after implementing Energy Efficiency projects and Renewable Energy Projects Proposed | | |
|---|---|---|
| 1 | Total Carbon Foot Print tCO2e/yr | 222.05 |
| 2 | Carbon Sequestered tCO2e/yr | 7.97 |
| 3 | Carbon mitigated by solar power plant (Implemented) tCO2e/yr | 11.03 |
| 4 | Carbon mitigated by Energy Efficiency (Proposed) tCO2e/yr | 23.66 |
| 5 | Carbon mitigated by solar power plant (Proposed) | 111.91 |
| 6 | Effective Carbon footprint tCO2e/yr | 67.48 |
| 7 | Total No of Students | 2456.00 |
| 8 | Specific Carbon Footprint kg CO2e/Student/Yr | **27.48** |

From this study it was found that carbon footprint of the campus to be 26.53 $kgCO_2e$/ student/ Year in place of current footprint ie. 79.82 $kgCO_2e$/ student/ Year. This will be achieved after implementing energy efficiency projects and commissioning of proposed 120kWp solar power plant.

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# Technical Supplements

| SACRED HEART COLLEGE, THEVARA | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Electricity Bill Analysis 2018-19 | | | | | | | | | | | | | |
| Months | kWh | | | | kVA | | | | PF | | | Rs (Total) | Rs/kWh |
| | Z1 | Z2 | Z3 | Total | Z1 | Z2 | Z3 | Max | PF | Penalty | Incentive | | |
| Apr | 8961 | 4394 | 7672 | 21026 | 60.58 | 33.44 | 22.44 | 60.58 | 0.9 | 0 | -1418 | 128728 | 6.12 |
| May | 9005 | 6729 | 12157 | 27891 | 51 | 28 | 20 | 51 | 0.9 | 0 | 0 | 127544 | 4.57 |
| Jun | 9592 | 3878 | 6643 | 20112.5 | 65.01 | 35.31 | 23.74 | 65.005 | 0.9 | 0 | -1476 | 128432 | 6.39 |
| Jul | 9761 | 4333 | 7507 | 21600.4 | 66.05 | 35.63 | 21.75 | 66.051 | 0.87 | 2668.7 | 0 | 135879 | 6.29 |
| Aug | 8916 | 2058 | 3187 | 14161 | 70.16 | 38.88 | 24.87 | 70.16 | 0.87 | 2677 | 0 | 129912 | 9.17 |
| Sep | 12685 | 2452.5 | 3777 | 18914.5 | 82.23 | 58.13 | 32.69 | 82.23 | 0.92 | 0 | -1402 | 151204 | 7.99 |
| Oct | 12285 | 2412 | 3703 | 18400.333 | 84.09 | 47.682 | 28.266 | 84.09 | 0.92 | 0 | -1305 | 160026 | 8.70 |
| Nov | 12314 | 2163 | 3503 | 17980 | 90.09 | 35.46 | 27.46 | 90.09 | 0.92 | 0 | -1127 | 162505 | 9.04 |
| Dec | 11486 | 2330 | 3556 | 17372 | 87.62 | 45.76 | 20.83 | 87.62 | 0.92 | 0 | -1094 | 154899 | 8.92 |
| Jan | 12149 | 2594 | 3784 | 18527 | 78.28 | 40.93 | 27.66 | 78.28 | 0.92 | 0 | -1170 | 158811 | 8.57 |
| Feb | 13221 | 2311 | 3770 | 19302 | 85.83 | 37.63 | 27.15 | 85.83 | 0.93 | 0 | -1815 | 166369 | 8.57 |
| Mar | 12677 | 2296 | 3865 | 18838 | 78.63 | 78.63 | 38.23 | 23.62 | 0.92 | 0 | -1179 | 160662 | 8.53 |
| Average | 11966.67 | 2327.02 | 3643.17 | 17936.85 | 82.12 | 47.89 | 28.39 | 70.38 | 0.92 | 334.63 | | 155548.56 | 7.89 |
| Total | 143600.00 | 27924.25 | 43718.00 | 215242.25 | 985.40 | 574.65 | 340.73 | | | 4015.50 | | 1866582.71 | |

**Form 5**

| Sl. No | Name of tree (common name/ scientific name) | Circumference | Stem diameter (cm) | Height of trees (m) | Total weight of tree (Kg) | Weight of carbon in the tree* (tCO2e) | No.of similar trees | Total carbon sequestrated | Carbon Sequestrated by each species | Average age (years) | Average carbon sequestration per day |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *Aporusa lindleyana* | 43 | 13.69 | 4 | 31.11 | 0.04 | 1 | 0.041 | 0.041 | 10 | 0.000011 |
| 2 | *Baccaurea courtallensis* | 23 | 7.32 | 8 | 17.80 | 0.02 | 1 | 0.024 | 0.024 | 20 | 0.000003 |
| 3 | *Persea macrantha* | 28 | 8.91 | 4 | 13.19 | 0.02 | 1 | 0.018 | 0.018 | 4 | 0.000012 |
| 4 | *Rhodomyrtus tomentosa* | 71 | 22.60 | 5 | 106.03 | 0.14 | 1 | 0.141 | 0.141 | 14 | 0.000028 |
| 5 | *Syzygium jambos* | 36 | 11.46 | 3 | 16.36 | 0.02 | 1 | 0.022 | 0.022 | 14 | 0.000004 |
| 6 | *Syzygium hemisphericum* | 34 | 10.82 | 6 | 29.18 | 0.04 | 1 | 0.039 | 0.039 | 10 | 0.000011 |
| 7 | *Canthium parviflorum* | 19 | 6.05 | 5 | 7.59 | 0.01 | 1 | 0.010 | 0.010 | 15 | 0.000002 |
| 8 | *Syzygium cumini* | 17 | 5.41 | 9 | 10.94 | 0.01 | 1 | 0.015 | 0.015 | 10 | 0.000004 |

total no. of trees = **136**

carbon sequestrated by trees in the campus = **8.39** **tCO2e**

**total sequestration per day = 7.4863E-05**

INTERNAL QUALITY ASSURANCE CELL

*Heartian*

# ENVIRONMENT AND ENERGY POLICY

# 2018

**Reviewed on 2018**

Dr. Johson Xavier (Prasant) Palacakppillily CMI

Principal

Thevara, India

## Sacred Heart College (Autonomous) Thevara

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## VISION, MISSION AND GRADUATE ATTRIBUTES

### VISION

Fashioning of an enlightened society founded on a relentless pursuit of excellence, a secular outlook on life, a thirst for moral values as well as an unflinching faith in God.

### MISSION

"To provide an environment

- that facilitates the holistic development of the individual
- that enables the students to play a vital role in the nation building process and contribute to the progress of humanity.
- that disseminates knowledge even beyond the academia.
- that instils in the students, a feel for frontier disciplines and cultivates a concern for the environment.

by setting lofty standards in the ever-evolving teacher-learner interface."

### GRADUATE ATTRIBUTES (HEARTIAN DNA)

Faith in God and faith in oneself

Physical and mental fitness

Self-awareness and emotional intelligence

Intercultural and ethical competency evidenced through a readiness to serve humanity (SH) & planet

Critical thinking, problem solving and research aptitude

Deep discipline knowledge

Readiness to take the first step (leadership)

Teamwork and communication skills (career readiness)

## INTRODUCTION

Sacred Heart's Environment and energy policy stems from the motto, vision and mission statements of the college and as an institution excellence, it is our responsibility to creatively respond to the continuing deterioration of ecosystems on which we depend for our well-being as a society. The integration of safer ecosystems and environmental protection, efforts to meet the basic needs of human beings and to provide a better quality of life for all, and the integration of environmental and developmental concerns will lead to a safer and more prosperous future. Sacred Heart with its innovative initiatives and excellent leadership in higher learning is committed to society to assume a major role in environment protection and climate change moderation. Sacred Heart adapts itself to the *Swachh Bharath Abhiyan*, the most significant campaign by the Government of India, through its active participation in generating power through renewable energy sources. With nearly 304 million Indians without access to electricity, and about 500 million people, still dependent on solid bio-mass for cooking, it may be acknowledged that the country has to still go a long way on securing its energy security objective. While India strives to achieve a double-digit growth rate in its national income, making clean energy available to all of its citizens, ought to be included as a key component of the poverty alleviation programmes. Sacred Heart College, with its capacity as an autonomous institution has introduced serval innovative ideas for green initiatives, energy efficiency and sustainability in the campus.

## POLICY STATEMENT

The protection of environment is a global issue and it is not an isolated problem of any area or nation. This has to be addressed collectively by everyone in society as the world is such small unit and everything is interconnected irreversible. Everything affects everyone and a nuclear test carried out in one part of the world will be carried by winds to any other part of the world. Human survival depends not only on human well-being but also on the well-being and protection of the environment. Man's scientific and technological progress has deposited him with far greater power over nature, which has resulted in the unthinking use of power and the infinite penetration of nature and environment. There is a great youth revolution is taking place in Europe under the leadership of the young Greta Tunberg, while the world nations have pledged themselves to the sustainable development goals, with very pertinent areas like sustainable cities and communities (Goal No. 11), responsible consumption and production

(Goal No. 12), Climate Action (Goal No. 13), life below water (Goal No. 14), life on land (Goal No. 15) and partnership for the goals (goal 17), expected to be attained by 2030.

Government of India has formulated National Mission for Sustainable Agriculture (NMSA) for promoting sustainable agriculture through a series of healthy practises such as; 'Improved crop seeds, 'Water Use Efficiency', 'Pest Management', 'Improved Farm Practices', shifting to environmental friendly technologies, adoption of energy efficient equipment, conservation of natural resources and integrated farming. Therefore, as a responsible higher education institution, it is our responsibility to have a policy for the protection and upliftment of sustainable development considering all the stakeholders associated with the institution.

The Environment and Energy Policy of Sacred Heart College applies to the main campus and the East campus as well as to all academic, curricular, and extracurricular activities and programs of the College. It will help us to embed efficiency and environmental awareness into our every-day activities, such as minimising the impact on the environment and cutting pollution and waste by using energy efficiency measures; for example, switching off lights, minimising waste, pooling of vehicles, plastic free campus, using carry bags, promotion of bicycles, organic farming and production of consumable products etc. In 2018, College received the Biodiversity Award from the Government of Kerala for its efforts in the field of environmental protection and organic farming. The East Campus of the College is designed in what is known as the Green Building, with innovative architectural features to have an eco-friendly campus. The reorganization of existing institutional arrangements is a necessity of the time, and requires a strong government policy perspective in terms of environmental aspects.

## *ENVIRONMENT AND ENERGY USAGE PRINCIPLES FOR SACRED HEART*

**College Environment Policy -** SH College has a strong environment policy and it always put effort in conveying the same to the students, local people and other stakeholders. The policy goes thus: Sacred Heart College is committed to protection and promotion of life on the planet. It believes in 'go-green and grow green'. As a matter of practice, it shall;

- Seek to spread and deepen awareness on environment issues and an environment friendly life-style among the academic community and neighbourhood community ☒

- Pay special attention to minimizing waste, especially plastic waste that doesn't degrade, with 'zero waste'. This is an ideal management properly implementing with advance planning. Therefore, we take utmost care while conducting of the activities/programmes/celebrations to avoid or minimize the use of disposables and flex banners. ☒

- Introduced and practiced recycling the material that doesn't degrade, at the student level through Entrepreneurship Development Cell, and at the college level, by establishing a paper recycling unit in due course ☒

- Tap renewable energy resources including solar energy, rain water harvesting etc. as much as possible. ☒

- Protect and promote diversity, especially of indigenous and coastal flora and fauna and their documentation. ☒

- Promote organic vegetable and food production by students and local community with the involvement of students and faculty. ☒

Heartians pledge to fulfil its commitment to the environment through the following levels of actions:

1. Achieving transparency about our environment and energy impact, giving importance to our own carbon footprint, through institutional reporting.
2. Integrating energy and environmental considerations into the design of all new infrastructural facilities at Sacred Heart.
3. Improving operational efficiency and minimising impact on the environment.
4. improving resource efficiency in operations, especially for key resources such as energy and water.
5. Adopt a sustainable water conservation and water management philosophy.
6. Strive towards a GREEN CAMPUS
7. Continuous monitoring and reviewing of objectives to achieve continual improvement in environmental and climate performance.
8. Preserve and enhance biodiversity in both campuses.
9. Educate the administrators, students, teaching and staff with seminars and sessions on environment sustainability

10. Focussing on renewable energy systems like solar energy and wind energy.
11. Focussing on increasing water efficiency and sustainable waste management.
12. Funding for research and Development on environmental aspects, challenges, issues and solutions.
13. Foster innovation through the use of innovative technologies to minimise atmospheric emission and energy consumption.
14. Engage in dialogue with the stakeholders, co-operate with universities and industry, and actively work with national and international organizations in the areas of environment, energy efficiency and sustainable development.
15. Review environmental policy and systems to ensure continued applicability and relevance of its purpose.
16. support various local communities to engage in environmental friendly initiatives and practices.
17. Efforts must be taken to improve environmental knowledge and awareness among public and student and teaching community to gain support, consensus, and commitment of individuals in the identification, preparation, implementation, monitoring and evaluation of environmental programmes.
18. This policy will be communicated to the administrators, students, teaching and non-teaching staff via the Sacred Heart mail system. It will be made available to the public through the College website (https://www.shcollege.ac.in)
19. Gobar Gas plant - The management residence kitchen energy needs are being managed by a huge gobar gas plant. Water boiling in the college canteen is entirely done on energy generated from bio-gas from kitchen waste.
20. Car Pooling - Two teams of staff members practice carpooling so as to save energy and save money.

## GREEN CAMPUS GOALS

- Improving the carbon efficiency by 50% by 2025, compared to 2019.
- Reduce local air pollution emissions by 2025 by promoting the use of public transportation, and
- Banning the entry of vehicles in campus.
- Promote pooling of vehicles by teachers
- Celebrate NO VECHICLE DAY once in a month

- Promotion of Khadi material in the campus
- Complying with the applicable international, regional and national environmental regulations, as well as legal requirements regarding energy consumption and energy efficiency.
- Awards and recognition to students and teachers who use bicycle regularly.
- Taking additional measures by reducing energy consumption
- Considering environmental aspects and energy efficiency in all major investment and procurement decisions- adopt a green procurement philosophy
- incorporate environment education through curricular and extracurricular activities.
- Follow the government measures like GREEN PROTOCOL and beyond in all the programmes of the college.
- SH Centre for Organic Farming Ornithology and Biodiversity (SHCOOB)- Monitor and guide the activities at extension centre at Arayankav. Development of extension center is to promote bio-diversity, organic farming, ornithology, and community environment education.
- Promotion of Extension Centre Ecotourism Habitat at Araynkavu
- Cooperate and collaborate with likeminded regional, national and international organisations.
- Teach students and community regarding various ecological problems facing the Earth.
- To develop expertise in the fields of water quality management, water conservation, environment audit, bio-diversity (flora-fauna) assessment and documentation,
- Create an incentive system for teachers and students to implement sustainable use of eco-friendly practices in the home and personal lifestyle.

## CONCLUSION

Until recently, environmental issues have been ignored by all and no one seems to be concerned. Decision makers at all levels were worried about profit and whose main objective were generally focused on profit maximization. At present, people started realizing that the environmental system is a key to development and that it has a finite capacity to provide for human needs. At Sacred Heart, ample concern is given to the environment as the institution

aims towards sustainability. New approaches and a holistic policy is needed to address the present-day challenges involving all relevant partners and sectors. Heartians shall strive to fulfil our obligations and commitments to the environment as a truly responsible global citizen. The policy will be reviewed in the second week of July every year by the designated committee. Green Campus provides an opportunity to create a clean environment in the campus and surrounding areas. Sacred Heart College takes the initiative to make organic products such as jam, squash, processed rice and rice flour to serve as role model for community and also to support and strengthen the agriculture. This document is an attempt to lay the basis for the development and use of health and environmental indicators in sustainable development planning. As an institution of higher learning, Sacred Heart can play a key role to harmonise health, environment and development process more effectively in society.

SACRED HEART COLLEGE Autonomous

*Heartian*

# Waste Management Policy

## Sacred Heart College

**(Autonomous)**

**Thevara, kochi 682 013**

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## Introduction

As Sacred Heart College has been making very distinctive contributions in the field of environment and sustainability, it shall pay considerable attention to minimize the production of waste on the campus. This policy envisages to guarantying the moral, social and legal responsibilities of the College in creating an environment-friendly and sustainable world devoid of waste and exploitation of nature. This policy is a guidance document to the faculty, staff and students to behave responsibly in the production of waste, waste segregation, storage, handling, transport and disposal.

## The Policy vision

The policy envisions a community which is acutely conscious of the anthropogenic condition of the world and therefore strives to create an ecologically healthy, prospering and resource efficient community, where waste is considerably reduced, recycled, reused and disposed of using an environment friendly safe method.

## Policy objectives

- Create consciousness among faculty and students about the ways in which waste is generated and the means by which they can reduce waste generation and manage the waste they produce.
- Orienting them to adopt appropriate technologies for processing and managing solid, liquid and e-waste.
- Give appropriate training to segregate hazardous and non-hazardous waste and dispose of them using appropriate method without creating further environmental pollution.
- Follow the five "R" principle of reduce, reuse, recycle, refuse and regenerate
- Maintain the campus plastic free

## Solid waste management:

Students shall be instructed to avoid generating waste. Solid waste shall be isolated and deposited in the YELLOW bins dedicated for the purpose on all floors. Food waste shall be used to feed to poultry on the campus, if more in quantity, be supplied to piggery. The ongoing project by Zoology department shall focus on training in bio-waste management using VERMICOMPOSTING technology. A biogas plant is installed to manage bio-waste from canteen and the generated gas is used in the canteen. There shall have separate bins for degradable and non-degradable items in each class room; red painted for plastic and related stuff, and green ones for paper. Waste from various rooms shall be collected in the waste segregation centre and scrutinized for segregation. The segregated waste can be sold to the MoU signed agency for recycling. Waste paper shall be used for the startup venture of PAPER PENS (PERPEN). Precaution shall be taken not to bring disposables such as PET bottles, Thermocol, paper plates or cups to the campus. Steel glasses and plates stored by the SDO and the NSS units shall be used during camps. An incinerator shall be installed in the campus to burn garbage.

## Liquid waste management:

Liquid waste generated in the wash areas (bath rooms, toilets), labs, canteen and snack area (Foodies' Corner) shall be passed through drains to absorb into the earth midway through the college ground. Canteen wastewater shall be managed through sedimentation pits which are cleared periodically of the waste and the rest of the water shall pass into the traditional drain.

## E-waste management:

The agreement between M/s Aspire Greens and the college shall take care of the safe disposal of e-waste. The following items are identified by the agency as e-waste and agency shall dispose of this waste safely.

| | | |
|---|---|---|
| Camera | CPU | CRT Monitor |
| Hard Disk | Mother Board | LCD Monitor |
| Mobile | Mouse | N Computing Terminals |
| Network Rack | Network Switches | Photo Copier |
| Printer | Scanner | SMPS |
| UPS | Cable Box | Fax Machines |

| | | |
|---|---|---|
| Laptops | Server computer | Pump |
| PCBs | Inverters | Bio Medical Equipment |
| Refrigerator | Compressor | Lead Acid Batteries |
| Copper Cables | Electrical Switches | Miscellaneous E Waste |

## Waste recycling system:

The following measures shall be in place for waste recycling:

1. All one-side used papers shall be utilized for routine printing activities.
2. Used papers shall be put to use for making paper pens as a startup venture
3. Saleable materials like paper bits, plastic waste including accumulated PET bottles etc shall regularly be sold to recycling agents thus generating some income for outreach activities
4. Ballpoint pens shall be put to REUSE by inserting new REFIL and sold at cheaper rate through HONESTY SHOP.
5. Recycled water from the treatment plant shall be used in the Hostel.

## Hazardous Chemical Waste Management:

Use of hazardous liquid chemicals generating hazardous fumes shall be avoided using fume hoods installed in the laboratories. Hazardous waste generated shall be handed over periodically to the Kochi Corporation treatment yards.

## Clean Campus Committee of the College

| | |
|---|---|
| Dr. Johnson X. Palackappillil | Principal (Chairman) |
| Dr. Sebastian John | Bursar |
| Dr. Johnson K M | IQAC Coordiantor |
| Dr. Didimose K V | Dean of Student Affairs |
| Mr. Sandeep Sunny | Faculty- Physical Education |
| Ms. Ragam P. M. | NSS Programme Officer |
| Dr. Joseph Varghese | NSS Programme Officer |
| Mr. Abin Ambily | Student Development Officer |
| Ms. Rakhi Menon | Student Counsellor |
| Mr. P. M. Joseph | Work Supervisor |

Student Representatives (Three from Student Council)

INTERNAL QUALITY ASSURANCE CELL

# Water Conservation Policy 2016

**Revised in 2018**

**Sacred Heart College**
**(Autonomous)**
**Thevara**

## CONTENTS

# 1. VISION, MISSION, GRADUATE ATTRIBUTES

## VISION

Fashioning of an enlightened society founded on a relentless pursuit of excellence, a secular outlook on life, a thirst for moral values as well as an unflinching faith in God.

## *MISSION*

To provide an environment

- that facilitates the holistic development of the individual
- that enables the students to play a vital role in the nation building process and contribute to the progress of humanity.
- that disseminates knowledge even beyond the academia.
- that instils in the students, a feel for frontier disciplines and cultivates a concern for the environment.

by setting lofty standards in the ever-evolving teacher-learner interface.

## GRADUATE ATTRIBUTES (HEARTIAN DNA)

Faith in God and faith in oneself

Physical and mental fitness

Self-awareness and emotional intelligence

Intercultural and ethical competency evidenced through a readiness to serve humanity(SH)

&planet

Critical thinking, problem solving and research aptitude

Deep discipline knowledge

Readiness to take the first step (leadership)

Teamwork and communication skills (career readiness)

## 2. INTRODUCTION

Water scarcity is a pressing challenge both for urban and rural community in India. However, the urban community very specifically face increasing challenges to their water supply because of complex interactions like, drought, high-rise of infrastructure, population growth, lack of planning, conversion of wetland, and other natural and human factors. The prospect of climatic change adds to the difficulty of planning sustainable water supply systems, on account of both the increasing uncertainty about future supply and demand for water and of predicted reductions in water availability. As a result, Sacred Heart College, with its credentials in academic and its voluntary involvement in sustainable development programmes have enacted several policies and resolutions to create a wide-ranging set of water conservation requirements, as well as water rate structures designed to conserve water. The purpose of the revision of Sacred Heart College Water Conservation Policy 2018 is to provide the college and the local community with the means to reduce water demands by making them aware with prescribed water conservation policy in the personal and community level for water conservation.

## 3. WATER CONSERVATION POLICY GOALS

The primary goal of Sacred Heart College water conservation policy is to achieve water neutrality by 2025. The college is implementing water-efficient fixtures in its new constructions in campuses, ensuring 100% treatment and recycling of sewage and rainwater harvesting. East campus sewage will be treated using state of the art technologies and will be recycled for use in flush tanks and irrigation. Student and staff engagement play a major role in our water sustainability strategy. Reducing water consumption and protecting water quality shall be the key objectives of sustainable policy of Sacred Heart College. The College views water from the three inter-related dimensions of Efficient Conservation, Responsible Consumption and Restoring and Retaining surface and groundwater.

One critical issue of efficient water conservation is the salty ground water in many areas of the College and the management has implemented standard metering infrastructure and procedures across the campuses. IQAC has made an assessment and review and separately metred the water usage and identified the areas in which water usage was greatest and supported the management to prioritize those areas for improvements and maintenance. College has also

integrated rain water harvesting into the consumption side of the campus water cycle. IQAC takes special attention to improve water governance by building awareness among staff, students and involvement of water plumbers in the campus. For e.g. Water is used in the college in every conceivable way—for departments labs, individual purpose and agricultural and cleanliness needs. Teaching, non-teaching and student community have no idea of how much water is being used, or at what cost. It was the consistent effort of the management and the IQAC that made a drastic difference in the implementation of efficient methods at various sites.

## 4. INITIATIVES BY SACRED HEART COLLEGE

Sacred Heart College is working towards making the facilities more and more water sustainable. This has been achieved with the use of water efficient fixtures, waste water treatment technologies, rain water harvesting and smart metering for monitoring.

1. Ensuring improvement of the water and water dependent natural resources at surrounding areas in the campus.
2. Installation of Aerators in all new wash basins across the campuses. Aerators provide a constant flow rate of 0.5GPM through variable pressure gauge for optimizing water use to a great extent.
3. Flow regulator taps in urinals: Installation of flow regulator taps in the urinal system in the toilet block at East Campus, Fr. Archangel hall and first floor at main block.
4. Sewage Treatment Plant: Sewage Treatment Plant at East Campus will become functional by 2021 in conformation with the parameters specified by the local pollution control board.
5. Water conservation storages: With the support of RUSA, the college management is working hard to establish a rain water harvesting system with a capacity of 10,00,000 litres at Main Campus and East Campus. The system will become functional by 2021.
6. Ferro Cement Tanks: College also owns one Ferro cement tank of about 30,000 litres capacity for water harvesting.
7. Surface water conservation through ponds and wells: College campus is blessed with three natural wells and supplementary tanks. We have a 20,000 litre supplementary tank for fish breeding, one water percolation pit of 10 feet depth for water recharging.

## 5. PROVISIONS

Sacred Heart Promotes water conservation and water reuse efficiency measures as essential elements of sound water resource management. College encourages all its stakeholders to support policies and programmes for water conservation that would achieve:

1. A sustainable balance between demand, management and reduce waste through accurate accounting of water volume.
2. Water conservation education to all the stakeholders of Sacred Heart College
3. Research and implementation of practices that promote efficient use of water.
4. Coordination between water planning and other aspects of facility planning and management in association with local government body

## 6. GOALS AND PLANS

1. Maximize water use efficiency and minimize wastage of water.
2. All existing buildings to be used for water conservation and rain water harvesting.
3. Promote investment in and maintenance of efficient water infrastructure and green infrastructure in all future development plans.
4. Promote appropriate innovative water and wastewater management technologies and services.
5. Provide incentives to students and teachers for efficient water use and conservation.
6. Provide training on the water conservation measures adopted by the college to all the students, staff and other stakeholders of the college and nearby community.
7. Ensure awareness about the water conservation policy of the college among all the stakeholders.
8. Establish waste treatment and recycling centres.
9. Create awareness about the cost-effectiveness of water conservation projects among students and local community.
10. Consistency in levels of project implementation at Sacred Heart College.
11. Improve water quality. For example, create awareness about garbage disposals among public and take the leadership to make Pandit Karuppan Road neat and clean.

12. Recycle non-sewage and greywater for on-site use (such as toilet flushing, landscape irrigation, and more generally, consider the water quality requirements of each water use)
13. Build relationships between environmental, societal leaders and policy makers to identify obstacles and opportunities to increase the role of conservation and efficiency in making urban water supply systems sustainable.
14. Community programmes: Organise various outreach programmes under the leadership of NSS, Boomithrasena, Agriculture Club and other student bodies.
15. Monitor and collect information related to the water bodies at Thevara.
16. Encourage research, development and implementation of water conservation techniques in relation to the ecological needs and responses.
17. Increase understanding of water and its movement including groundwater and its interaction with surface water, and the effects of climate change on water resources among student and teaching community.
18. Inform, educate and increase awareness regarding the importance of water to life, and the need for conservation and efficient use of water.
19. Protect the lakes and rivers and the land surrounding Sacred Heart.
20. SH Centre for Organic Farming Ornithology and Biodiversity (SHCOOB)- Monitor and guide the activities at extension centre at Arayankav. This has been established to protect many species at risk and restoring organic farming among the villagers at Arayankvu.
21. SH College Lake View Protection Action Plan was established in 2017 to safeguard the lake at the backyard of the college. Student volunteers clean the river banks of the lake every week under the leadership of various clubs.

## 7. CONCLUSION

Efficient water storage can be a viable solution to water conservation. This means that the College should take serious effort to protect the surrounding environment and available water resources. Regardless, as an institution of higher learning, Sacred Heart College shall have a moral responsibility to promote and propagate the message among the academic community and society as well. Over the past few years, the College has undertaking a number of initiatives to utilize water more efficiently and effectively within the campus. Sacred Heart, being and urban institute, believes that it has a major role to play among the increasingly stressed urban

population. Prevention of the degradation of lakes, water bodies and land shall be a priority of the College. As a centre of excellence in academics, it shall provide alternative ways and support to the policy makers with practical alternative systems for the benefit of society. This includes awareness campaign for the protection of lakes and land, study on climatic change, reaching out to the public through water-testing, and water literacy programmes, soil testing etc. Understanding relationships between environmental and societal factors and academia's support for water conservation measures can help planners and policy makers to identify obstacles and opportunities to increase the role of conservation and efficiency in making urban water supply systems sustainable. Policy plays a very important role in natural resource management as it lays out a government framework for guiding long-term decisions, and evolves in the light of healthy interactions between academia and administrative leadership.

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OTTOTRACTIONS
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