Green Audit Report

For

SCMS School of Technology and Management

Prepared by

SCMS
WATER INSTITUTE

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1.0 Introduction

1.1 Background

SCMS Cochin campus at Kalamassery, Kochi has a strength of 135 staff and 662 students out of which 207 students reside in the campus.The campus is bordered on west side by NH-47 and on the east and north by tributaries of Periyar River. SCMS School of Technology and Management (SSTM) runs their MBA and MCA programs from this campus. SCMS School of Technology and Management, Cochin (SSTM) is accredited by National Assessment and Accreditation Council (NAAC) with A" Grade. MBA of SSTM is accredited by NBA for 3 years since 2020.

The major source of water for the campus is the tributary of Periyar River. Electricity for the entire campus is provided by Kerala State Electricity Board. SSTM block houses a canteen where around 800 people have food every day.

Figure 1.1 provides a Google Earth bird's eye view of the area and location of the SCMS campus in reference to the landmarks and neighboring areas discussed above. Key facts about the site are provided in Table 1.1. Detailed site plan is given in figure 1.2.

Figure 1.1 Location of SCMS Cochin School of Business at Muttom, Ernakulam

Table 1.1- Key facts about the site

Name of Project	SCMS Cochin School of Business
Address	Muttom, Aluva, Ernakulam
Average Annual Rainfall	2882 mm
Water source	Tributary of River Periyar
Water harvesting system	Roof top system that collects rain water falling on roof.
Water treatment system	Coagulation settling, disinfection
Wastewater treatment system	Activated Sludge Process
Total roof area	~ 2000 m^2
Water harvesting potential	~ 6000 KL
Average daily water demand	~ 44127 Litres
Average daily energy demand	~ 2100 Units
Average daily waste produced	~ 100 kg
Total built-up area	13727.85 m^2

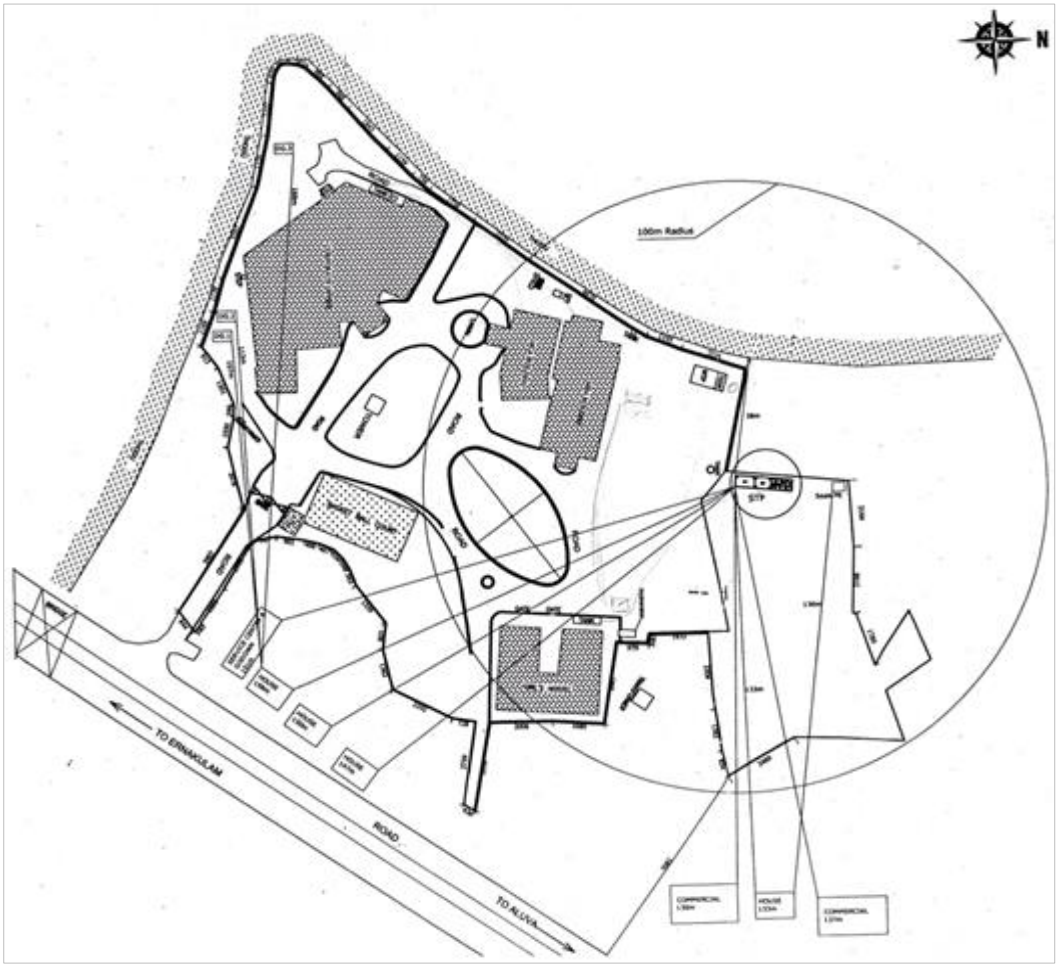

Figure 1.2 Detailed site plan of SCMS Campus

1.2 What is Green Audit?

Green audit is the process of assessing the environmental impact of an organization, process, project, product etc. Green Audit can be defined as a basic management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental aspects of organisations, management systems and equipments are performing. The aim of the audit is to facilitate management control on environmental practices and to enable the organization to assess compliance with its policies including meeting regulatory requirements.

1.3 Methodology

Key components of green audit conducted at SCMS Cochin campus included

(i) Pre-audit planning

a. Preliminary literature review of concepts and methodologies related to green audit.

b. Discussion with the management staff on various systems installed in the campus.

c. Awareness creation and interaction with the staff and student on the concept of green audit.

d. Walk through the entire campus to understand the nature of water use, energy use and waste management systems in the campus.

(ii) Data collection

a. Development of questionnaire format to identify all water/energy using fixtures/ equipments and examine water/energy use patterns for individual buildings in the campus

b. Collection of secondary data from compilation of electricity bills, collating records of pumps, generators, A/C plant, water quality analysis reports, water and waste water treatment equipment details, civil and electrical drawings etc.

c. Semi -structured interview with maintenance manager, technicians, plumber, and housekeeping staff on current situation and the past trends in water consumption, electricity consumption, waste management, wastewater generation etc.

(iii) Data processing, analysis and interpretation

The existing trends and patterns in water usage, energy usage and waste generation and management is analyzed in this step from the data collected in the previous step.

(iv) Audit recommendations and reporting

Based on the understanding from green audit, recommendations are given to improve the existing environmental performance of the campus and are documented in a report format.

2.0 Water Audit

A water audit is a systematic review of a site to identify opportunities to improve its water use efficiency. The site may be a public water utility, facility (institutional or commercial properties like malls, office, schools etc.) or a household. Audit recommendations are developed based on surveys and assessments of water-using hardware, fixtures, equipment, landscaping, and management practices at the site. Water audit involves tracking, assessing and validating all components of flow from the site of withdrawal or treatment through the water distribution system and into the consumer's properties. Water auditing examines the major areas of water use, including human consumption, personal hygiene & sanitation, washing, cleaning, laundry, gardening etc. Water auditing is an ongoing process and rarely stays consistent in a site or system over time. Therefore in order to gauge progress from adopted water conservation and cutbacks, water audit should be performed on a regular basis. In addition it provides convincing overview of the water use trends, effectiveness of conservation measures and potential cost and water savings.

2.1 Water supply

The major source for the water in the campus is the river water from the tributary of Periyar River and water supplied by Kerala Water Authority (KWA). The alternate source of supply is the well water, which is not regularly used at present due to iron content. A pump of 5HP is used to lift the water from the river to a treatment plant of 135 KLD capacity.

2.2. Water treatment facilities

The raw water is pumped from the river. The pump is controlled by a floating arrangement in the holding tank which draws water as per requirement. The pump feeds the water into three flash mixers connected in series to which alum as a coagulant, lime for pH correction and

chlorine for disinfection are respectively added. The feeding into the three mixers is controlled by dosing pumps. The feed rate in the dosing pumps is predefined by lab tests. Then the water is fed into an up flow settling tank. The chemically settled water is collected in the holding tank. The water from the holding tank is passed through a sand filter for the removal of finer particles. Backwashing is done at a frequency of one time per day for about 10 minutes. Then the water is passed through the activated carbon filter and UV disinfection system. Activated carbon filter is used for the removal of excess chlorine from disinfection. UV treatment acts as a secondary disinfection system. This water is then passed into the storage tank. Lay out of water treatment plant is given figure 2.1.

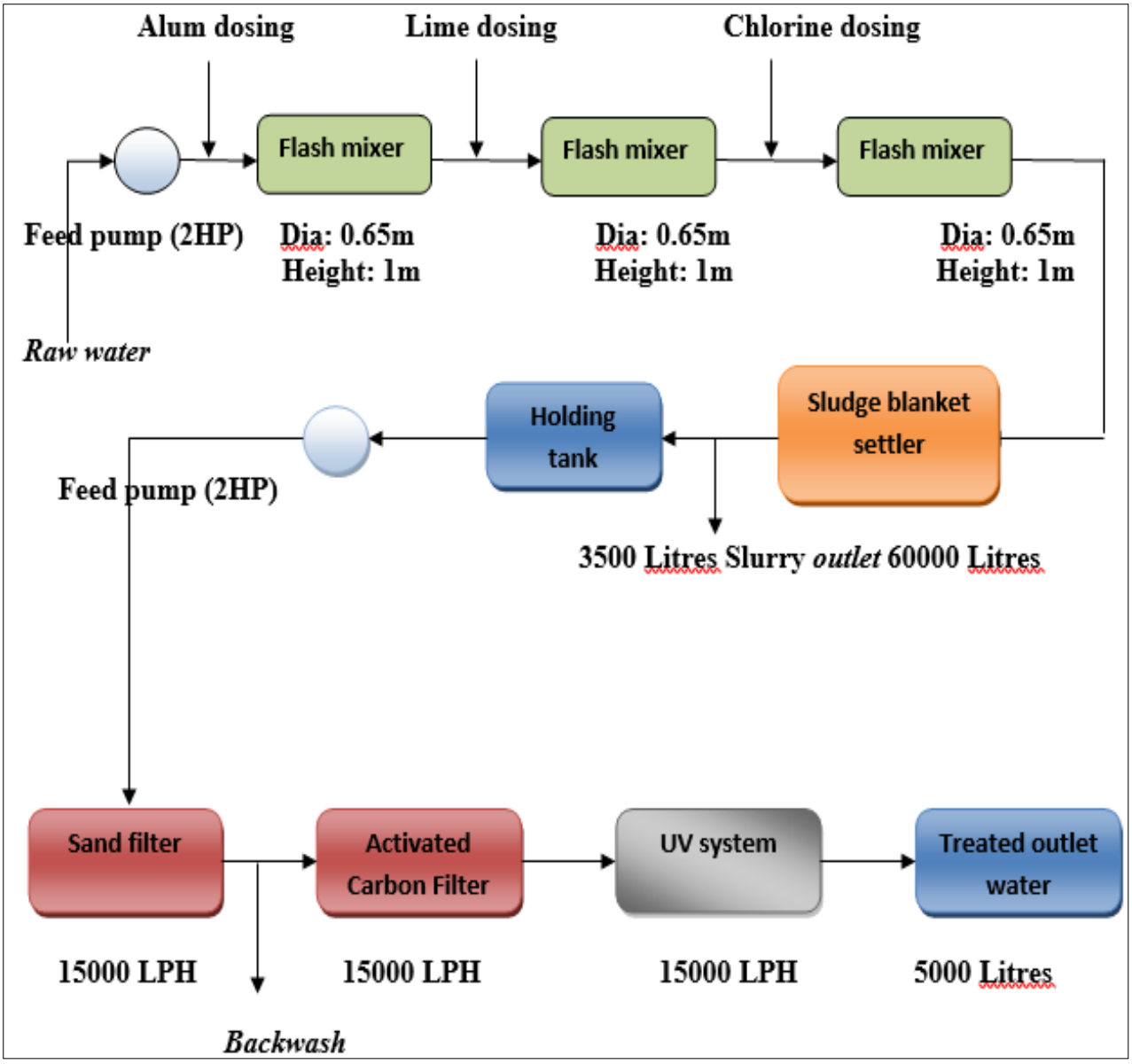

Fig 2.1: Layout of water treatment plant

Fig.2.2 The audit team examining water treatment plant

2.3. Waste water treatment facilities

A sewage treatment plant (STP) of 104 KLD is being setup to treat the sewage generated in the campus. The waste water generated from various buildings such as hostels, canteen etc is first passed through bar screen to remove floating matter and then to oil trap to remove oil and grease which otherwise may clog the pipes or interfere with biological treatment. The sewage from the oil trap is collected in collection tank 1 which is then overflowed to collection tank 2. The overflow water is then carried to STP.

In STP, the overflow sewage collected in the collection tank, is passed to diffused aeration tank for aeration. The aerated sewage passed to the settling tank and a portion of sludge collected is returned to aeration tank and the remaining is disposed off. The sewage is then passed through pressure sand filter using two filter pumps. To adsorb the foul gases, filtered sewage is next passed through activated carbon filter. At the end disinfection is done to remove the pathogens.

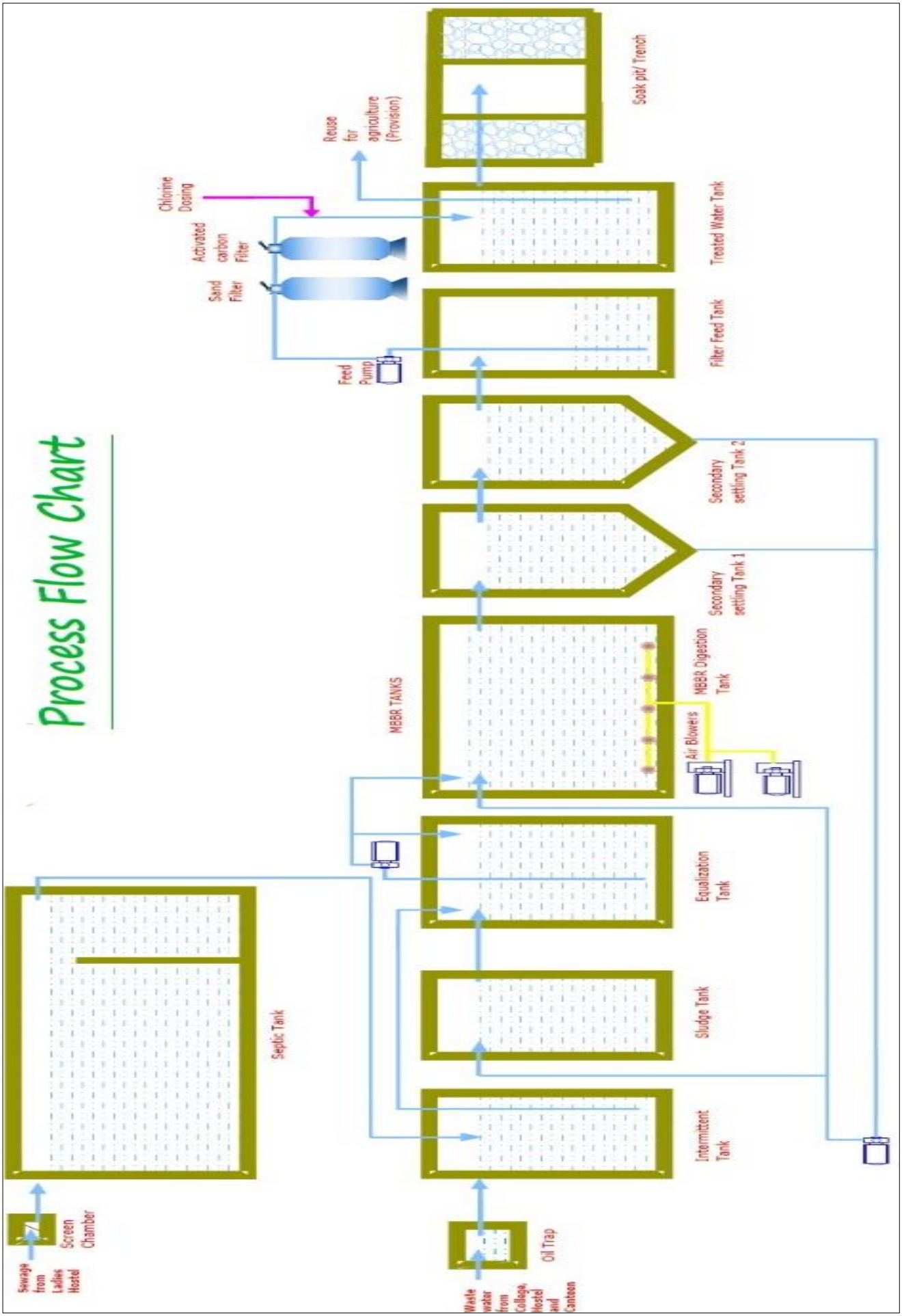

Fig 2.3 Layout of wastewater treatment plant

Fig 2.4 The audit team examining sewage treatment plant

2.4 Data processing and analysis

- **Water use diagram**

SSTM building, Office building, canteen and ladies hostel were closed due to Covid-19 from March 2020 to August 2021. Classes where conducted in online mode and only few staff were present at the campus due to Covid protocol restrictions. Due to these cant able to conduct a survey using questionnaire; so the water consumption is calculated based on the semi structured interview conducted with technicians and based on water bills. Figure 2.5 shows the water use diagram for various blocks at SCMS Cochin campus based on the survey. It can be seen that flushing (30%), floor wash (23%) and bathing (14%) are the activities that dominates water usage. There were no leakages that were observed or reported during the audit exercise at SSTM.

Even though the hostels were closed during March 2020 to August 2021, there is immense water consumption is visible in hostel block, which is because of SCMS girl's hostel in Muttom campus was utilized as 'Covid Care Center' with a

capacity of 113 during this period. It is done as a social responsibility of SCMS Group of Educational Institutions.

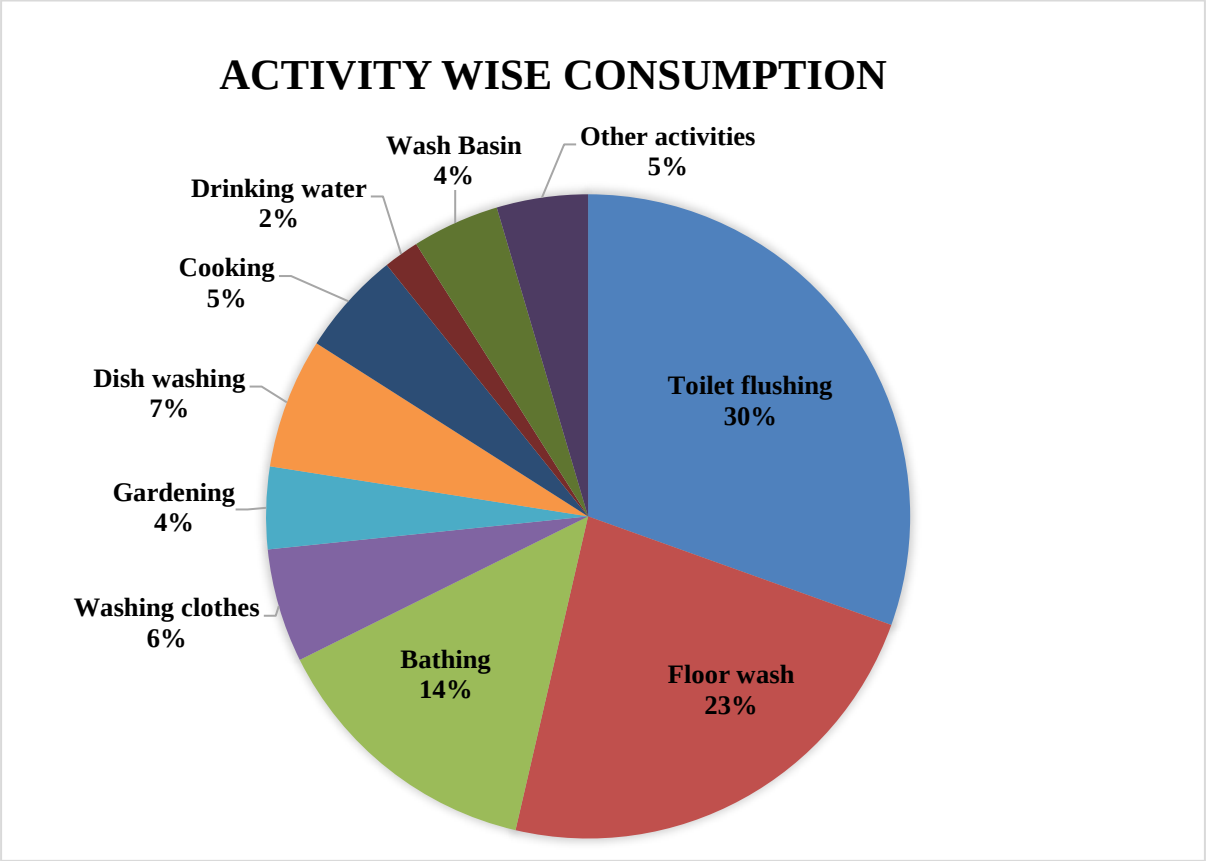

Fig. 2.5 Composition of total water use (44127 litre) at SSTM (in percentage)

The consumption according to the different blocks (figure 2.6) shows that hostel building consume most quantity of water (55%) followed by canteen (31%).

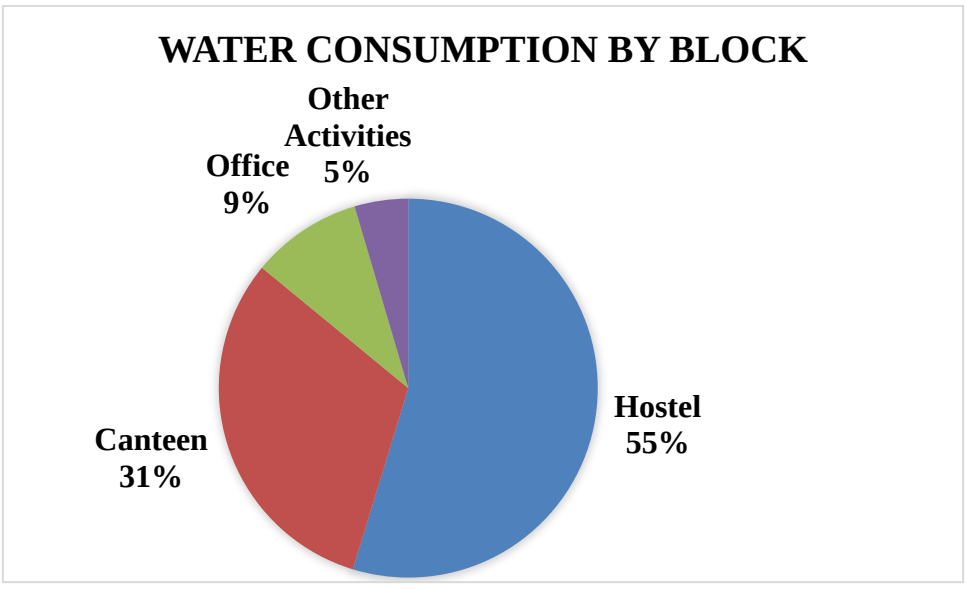

Fig.2.6 Composition of total water use (44127 L) at SSTM

Fig. 2.7 Green audit team interviewing canteen staff for water demand calculation

2.5 Water circuit diagram

Water circuit diagram shows how the water flows from the source to the consumers. It also identifies the position of pumps and other treatment facilities. Based on the walk through surveys, discussions with staff and managing committee a water circuit diagram was prepared as shown in the figure 2.8. One of the major source of the water is the river water and is treated in the Water Treatment Plant. From there, the water is pumped into a collection tank having a capacity of 5000 L using two pumps of 2HP. The water is then passed into two underground tanks, at the corporate office and at the ladies hostel building, having a capacity of 25,000 L each. Using a 5HP pump, water is pumped to seven overhead tanks of corporate office building, out of which 6 tanks are of capacity 5000 L each and one having capacity of 1000 L which is meant for AC. From these tanks, the water is distributed into the SSTM block using the natural flow. From the underground tank near the ladies hostel building, the water is pumped into four overhead tanks each having a capacity of 5000 L using 5HP pump. The other source of water is supply by KWA, it is collected in two tanks each having a capacity of 5000 L and then using a 5HP pump, water is pumped to overhead tank with a capacity of 5000 L. This water is used for drinking purpose in the campus and also for cooking activities in the canteen.

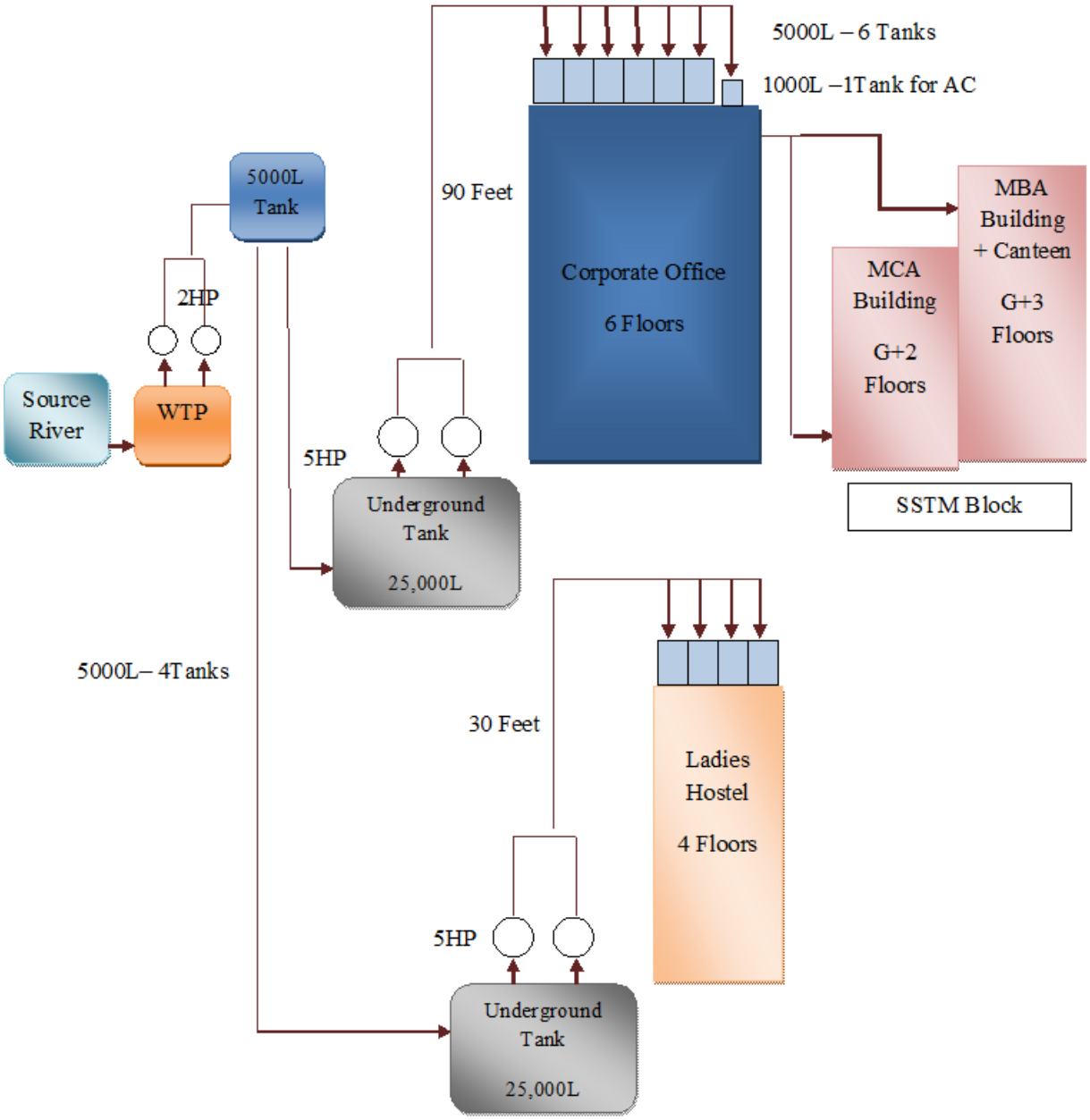

Fig.2.8 Water Distribution Network at SSTM Campus

2.6 Waste water collection network

The waste water collection network shows the path flow of the waste water from various buildings into the Sewage Treatment Plant (STP). The sewage from the corporate office building and that from the SSTM bock is collected together in a main collection tank. The sewage from the ladies hostel building is kept in a collection tank which is near to the hostel building itself. It is then collected to the main collection tank, which is composed of two chambers i.e., one allows settling and the other collects the overflow and then, it is passed into the STP.

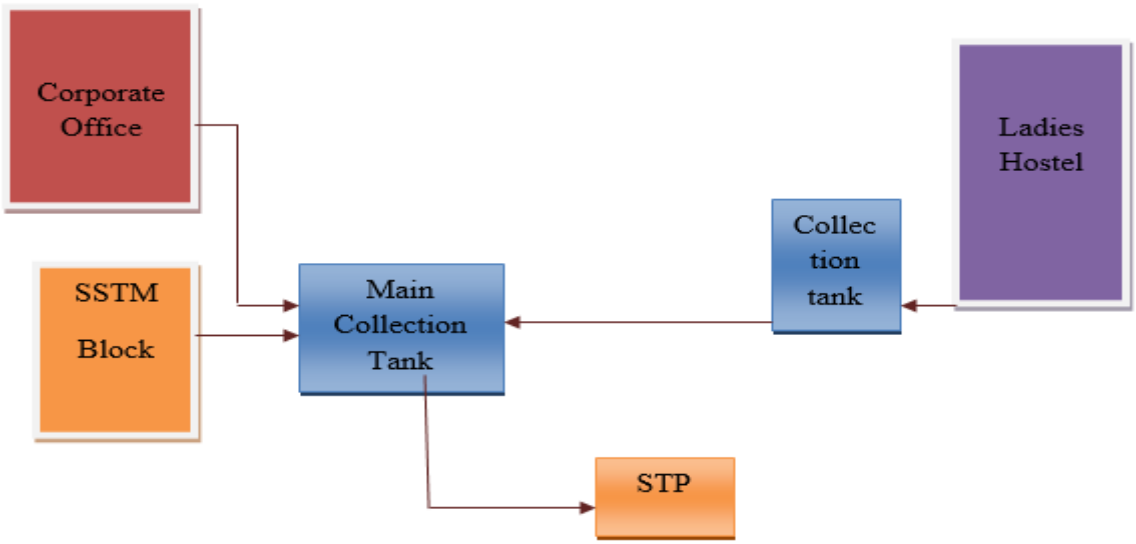

Fig. 2.9 Wastewater Circuit Diagram

2.7 Rain water harvesting status and potential

Rain water harvesting is the accumulation and deposition of rainwater for reuse on site rather than allowing it to runoff. Proper rainwater harvesting can conserve large quantity of fresh water which otherwise get wasted. In the campus, presently rain water harvesting is done for administration block only. Due to flood in 2018, the rainwater harvesting system got damaged and the green audit team recommended to reinstall the system. The roof area under rain water harvesting include, open terrace on sixth floor, third floor and second floor.

The total roof area utilized for rain water harvesting at present = 1168m^2

Total water collected = 3504 KL (For an average annual rainfall of 3 meters)

Water collected in the open terrace of administration block is collected and carried to the tank near water treatment plant.

Inclusion of the roof area in SSTM block also can increase the rain water being harvested.

The total roof area available from SSTM = 790 m^2

Thus, the total potential for rainwater collection = 2370 KL

3. Energy Audit

3.1 What is energy audit?

An energy audit is an inspection, survey and analysis of energy flows for energy conservation in a building, process or system to reduce the amount of energy input into the system without negatively affecting the output.Reducing energy consumption while

maintaining or improving human comfort, health and safety are of primary concern. The primary objective of Energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs. Energy Audit provides a “bench-mark"(Reference point) for managing energy in the organization and also provides the basis for planning a more effective use of energy throughout the organization.

3. 2 General descriptions about energy consuming appurtenances/activities in the campus

There is a Corporate Office, School of Technology & Management (SSTM), ladies hostel and a guest house within the campus. MBA classes are located in the main corporate office building. Electricity for the entire campus is provided by Kerala State Electricity Board (KSEB). In 2019 SCMS has applied for installation of solar panels with a capacity to generate 250 kW energy under scheme 1 and 2 of KSEB; the project is not yet implemented due to covid pandemic.

B.com and MCA classes are located in SSTM building. Currently 10 classrooms are occupied. There are 2 libraries, 2 computer labs, 3 faculty rooms, 1 office room, 1 Principal’s room, and 2 rooms for HoDs of different departments in the building. Classrooms, one faculty room and libraries are provided with ceiling fans and LED lights. Other rooms are air conditioned and lighted with LED lights. Corridors are artificially lighted with LED and CFL lamps. Toilets are provided in each floor and are lighted with LED lights. A canteen is located in the ground floor of SSTM building.

Ladies hostel has 78 rooms with total inmates of 207. There are around 4 students in each room. Apart from that there is a wardens’ room, 3 study rooms and one computer room having 4 computers with LED monitors. Out of 78 rooms 6 are air conditioned rooms. All rooms are bath attached. Each bathroom is lighted with one LED lights. There are 3 LED lights and 2 ceiling fans in each room. Corridors are artificially lighted with CFL and LED lights. There are 3 heaters and water filters. 24 hours Wi-Fi facility is available.

A guest house is available in the same building of ladies hostel. It has 5 fully-furnished air conditioned rooms.

A gymnasium is located next to the corporate office building.

3.3 Methodology followed

- Data collection
    - Walk through audit- collection of type and number of energy consuming appurtenances
    - Informal interviews with staffs and students- usage pattern, lab and class timings, office working hours
- Data analysis- Identification of major energy consuming areas
- Identification of energy conservation opportunities

3.4 Energy consumption status of the campus

Monthly energy consumption pattern for each building as well as total consumption for all the blocks have been evaluated (Figure 3.1 to figure 3.6). During March 2020 to August 2021 SCMS campus were closed due to Covid-19 pandemic; only ladies hostel building inside the campus were working as 'Covid Care Center' under Government control. So the electricity consumption during that time is calculated using electricity bills. The criteria for calculation of electricity consumption during other years are described below.

SSTM BLOCK

Working days: 25; Holidays: 5

Ceiling fan

Power consumed per hour= 40-60w, Assume 50w

Working hours= class time= 8 hours

Total number= 67

Lighting

Power consumed per hour for LED tube light = 18W

Working hours = 8

Total number = 238

Power consumed by LED bulb = 9w

Working hours = 8

Total number = 14

Air Conditioning

Capacity = 8.3 ton (common for 3 rooms)

Working hours = 8

Capacity = 5ton (1 each in 2 labs)

Working hours = 8

Capacity = 1 ton (1 each in 3 rooms)

Working hours = 8

Computer

Lab 1

Total CRT monitors = 6

Total LED monitors = 42

Power consumed by CRT=280w

Power consumed by LED = 60 W

Working hours = 6 hours per week

Assume 40 students in each batch (assumed that LED monitors are filled first)

Number of LED used = 35

Number of CRT used = 5

Lab 2

Total LED monitors = 42

Power consumed by LED = 60 W

Working hours = 6 hours per week

Assume 40 students in each batch (assumed that LED monitors are filled first)

Number of LED used = 40

MCA lab

Total LED monitors = 52

Power consumed by LED = 60 W

Working hours = 6 hours per week

Research lab

Total LED monitors = 15

Power consumed by LED = 60 W

Working hours = 6 hours per week

Principal room, HoD's room, Faculty rooms and Office room

Total LED monitors = 43

Power consumed by LED = 60 W

Working hours = 7 hours each day

Projector

Total number = 5

Power consumed by 1 unit = 300w

Working hours = 3hr per day

EQUIPMENT	**POWER in kWh**
Ceiling fan	670
Lighting	882
AC 1 ton	600
AC 5 ton	2000
AC 8.3 ton	1660
Projector	112.5
Computers	699.5
Total	6624

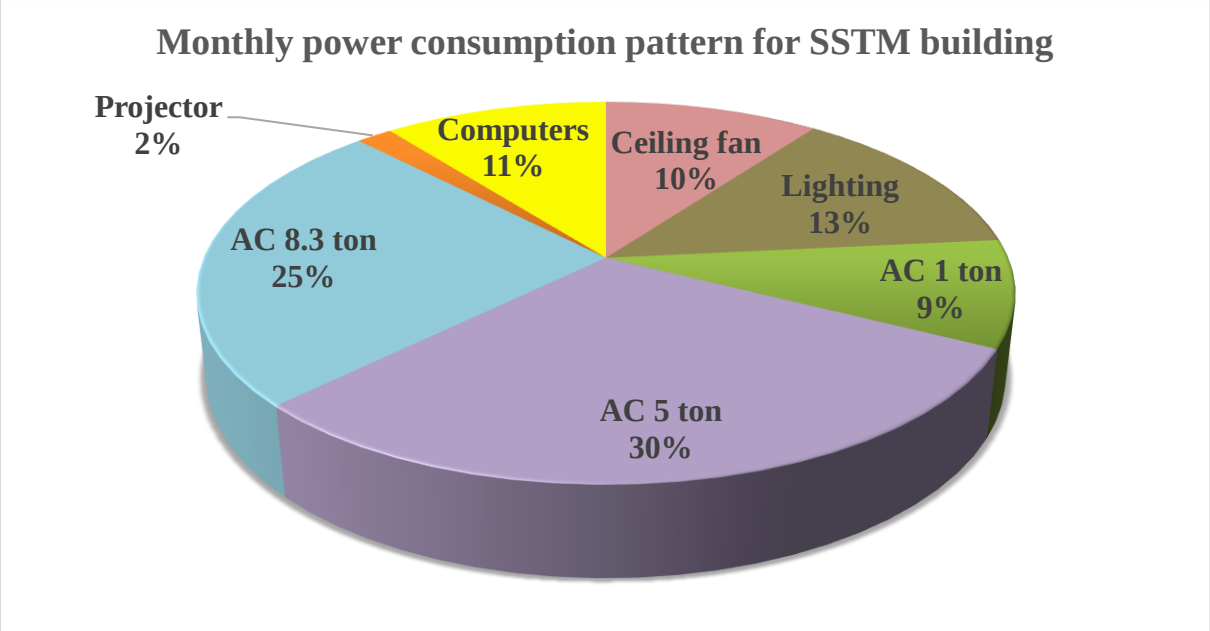

Figure 3.1 Energy consumption pattern for SSTM

From the pie chart above it can be seen that the major power consuming equipment in SSTM block is air conditioners (64%).

CANTEEN

Working Days: 30

Working hours: 6:30 AM to 9 AM; 12:30 PM to 1:30 PM; 3:30 PM to 5 PM; 7:00 PM to 9:00 PM (7hrs)

Ceiling fan (50 W)

Total number: 25

LED Tubes (18 W)

Total number: 21

Refrigerator (1500 Watt hour per day)

Number: 3 (1 for cool drinks; 1 for ice creams; 1 for milk)

Coffee maker (800 W)

Number: 1

Working 3 hrs per day (neglecting 4.2 W for standby mode)

Mixer (750 W)

Number: 2

Working 2 hrs per day

Grinder (600 W)

Number: 1

Working 3 hrs per day

Television (80 W)

42” LED

Number: 1

Working 6 hrs per day

ITEM	CONSUMPTION(kWh)
Fan	262.5
Tubes	79.38
Refrigerator	135
Coffee maker	72
Mixer	90
Grinder	54
TV	1.44
Total	694.32

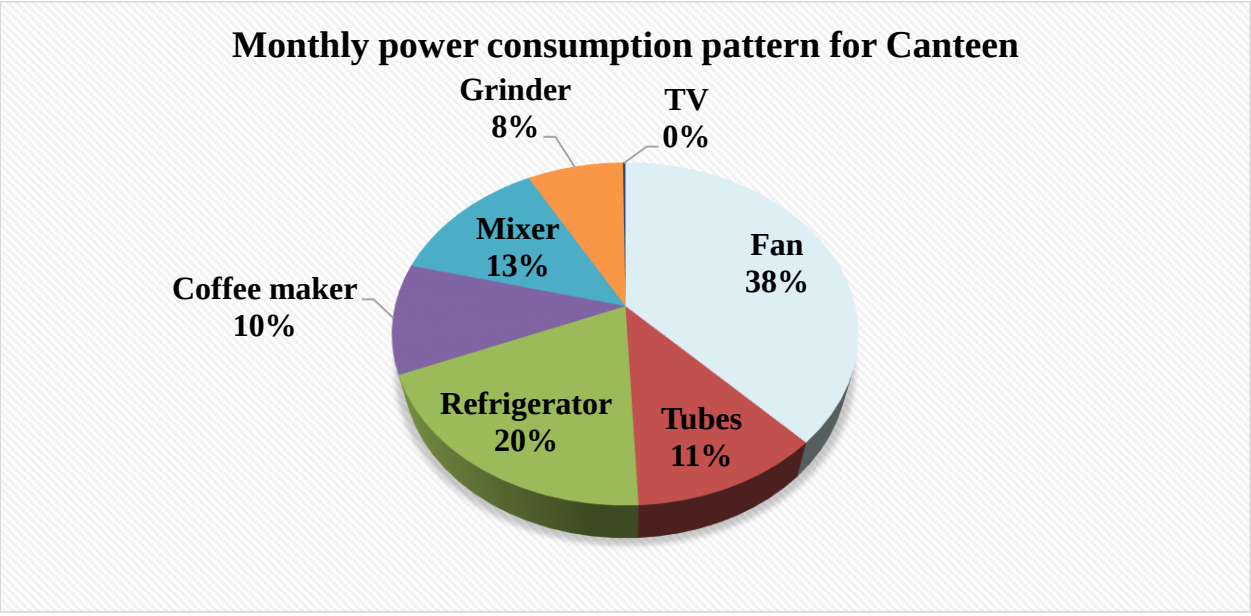

Figure 3.2 Energy consumption pattern for Canteen

From the pie chart shown above it is seen that major power consuming component is ceiling fan (38%) followed by refrigerators (20%).

HOSTEL

Number of rooms occupied = 78 (6 rooms A/C included)

Number of inmates = 207

Students per room = 4 (approx.)

Working days: 25

Holidays: 5

Ceiling fan (capacity: 50 W)

Total number = 161 (2 per room + 5 common)

Working hours: 15 hrs. (working days)

24 hrs. (holidays)

Lighting

Tube light (18 W)

Total number: 303 (3 per room + 70 common)

Out of 70 common, only 35 are in use

Working hours: 10 hrs (rooms, working days)

8 hrs. (rooms, holidays)

15 hrs. (common, per day)

LED (9 W)

Total number: 79 (bathrooms)

Working hours: 3 hrs per day

Plug point

Total number: 234 (3 per room)

Laptop charging (50 W)

Working days: 8 hrs.

Holidays: 10hrs

Iron box (1100 W)

Total number: 50

Working hrs. 1hr per day (only on working days)

Wi-Fi modem (6 W)

Total number: 11

Working full time all days

Heater (2000 W)

Total number: 3

Working hours: 8 hrs all days

Water filter (75 W)

Total number: 2

Full time working

LED monitor system (60 W)

Total number: 5

Working hours: 4 hrs on working days and 8 hrs on holidays

Television (80 W)

LED – 1 Nos.

Working hours: 15hrs per day

EQUIPMENT	**TOTAL CONSUMPTION(kWh)**
Ceiling fan	3984.75
Tube light	1499.76
CFL	63.99
Plug point(iron)	1375
Plug point(laptop)	936
Wi-Fi modem	47.52
Computers	42

Heater	1440
Water filter	108
AC (6 rooms)	6963.66
Television	36
Pump	111.9
Total	16608.58

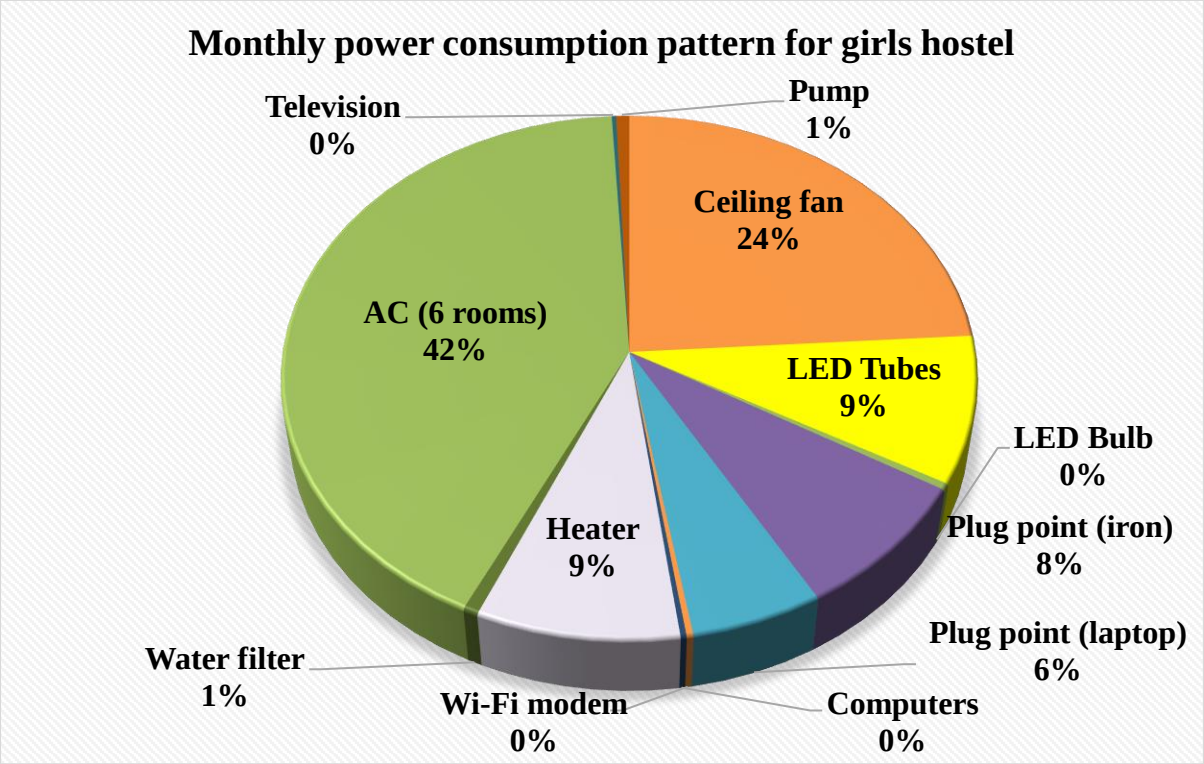

Figure 3.3 Energy consumption pattern for hostel

From the pie chart above we can see that major power consuming component is air conditioners (42%) followed by ceiling fans (24%).

GUEST HOUSE

(Assuming 12 days occupied per month)

Total rooms: 5

Lighting

LED Tube (18 W)

Number: 8

Working hours: 5 hrs

LED bulb (9 W)

Number: 6

Working hours: 2 hrs

A/C (1 ton per room)

Total number: 5

Working hours: 12hrs

Television (1 per room – 80 W)

Working hrs. 3hrs

Washing machine (500 W)

Number: 1

Working hrs: 5 hrs

Plug point (2per room)

Laptop (50 W)

Working hrs: 2hrs

Phone (8 W)

Working hrs: 4 hrs

Wi-Fi modem (1 Nos, 8 W)

Working full day

Refrigerator (1500 W per day)

Number: 5

Heater (2000 W)

Number: 5

Working hrs: 1 hr

Water filter (75 W)

Number: 2

Working hrs: 1hr

EQUIPMENT	POWER (kWh)
Lighting	19.872
AC	2880
Washing machine	30
Others (phone, laptop, TV, water filter)	24.12
Wi-Fi modem	2.304
Refrigerator	90
Heater	120
Total	3166.296

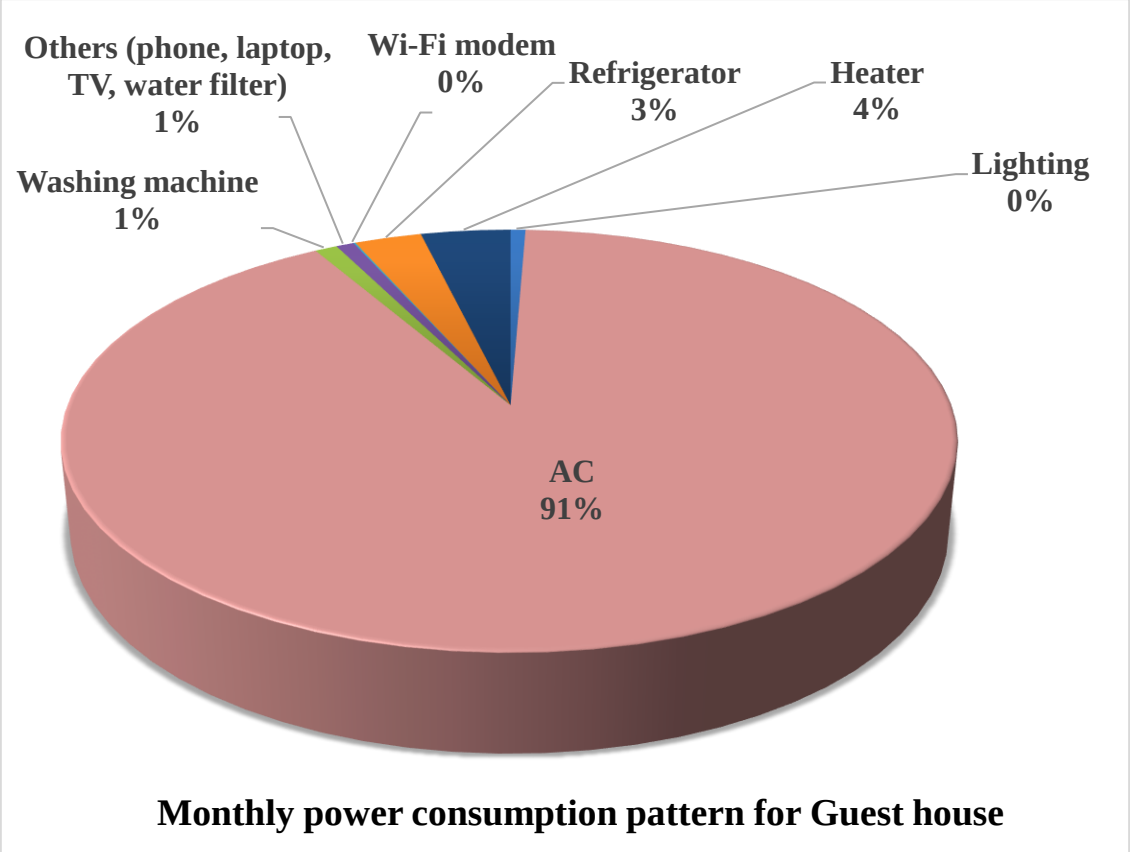

Figure 3.4 Energy consumption pattern for guest house

From the pie chart above it can be seen that major power consuming equipment in guest house is air conditioner (91%).

SSTM COMPARISON

CATEGORY	POWER CONSUMPTION (kWh)
Class room	893.05
Faculty + office	2884.35
Labs	2384.55
Library	312.95
Common area	149.10
Canteen	694.32
Total	7318.32

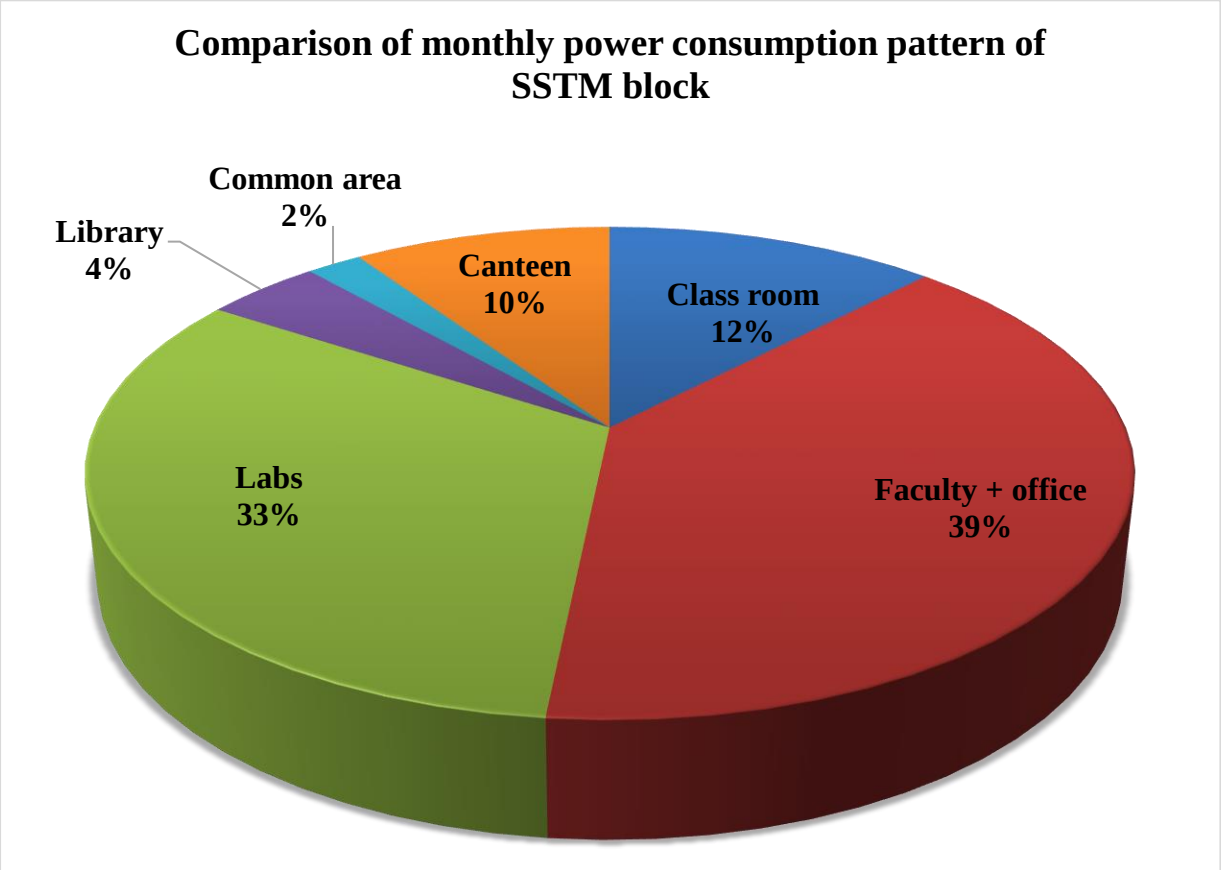

Figure 3.5 Comparison of energy consumption in various sections at SSTM

From the pie chart shown above it can be seen that power consumption is more in faculty rooms and office rooms (39%) followed by computer labs (33%). This high value is due to the use of air conditioners.

TOTAL POWER CONSUMPTION DATA

BUILDING	POWER CONSUMPTION (kWh)
Main building	26713.49
SSTM	6624.00
Hostel	16608.58
Canteen	694.32
Guest room	3166.30
Gym	484.42
ETP	3222.72
WTP	5371.20
Total	62885.02

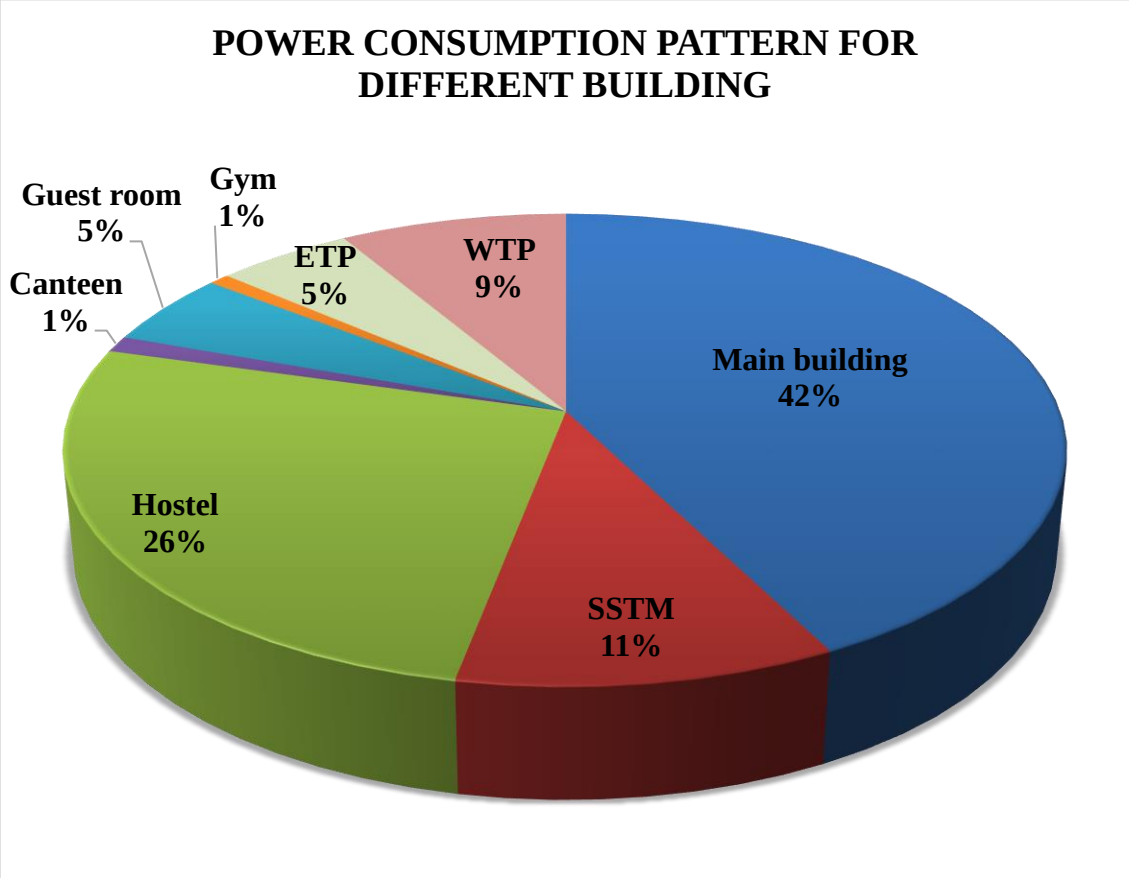

Figure 3.6 Comparison of energy consumption pattern for various buildings in the campus

4. SOLID WASTE AUDIT

Waste audit encompasses the entire spectrum of waste collection, segregation, reuse, recycle, incineration and landfill. Appropriate suggestions and justifications are put forth to improve the efficiency of the system as a whole.

4.1 Waste Generation in Campus

Waste generated in the campus varies from paper, plastic, cloth, glass, food and sanitary items. Their sources include hostels, offices, mess, canteens, kitchen, staff quarters, guest house and academic blocks. The waste that is generated from all these sources if not handled properly may pose a serious health and environmental hazards. The wastes generated from various activities in the campus are mentioned below.

- **CANTEEN**

  Food waste of 60kg is generated per day from the canteen. Other wastes including paper, plastic and special wastes of 1 kg is generated per day within the canteen. Before taking wastewater to wastewater treatment plant, the sediments are separated in a tank provided outside the canteen which is later on removed manually, dried and burnt in garbage burner.

- **ACADEMIC BLOCKS**

  Rubbish of about 10 kg is collected daily and burnt in garbage burner. Mixed paper wastes generated at 1 kg per day is taken by Plan @ Earth for recycling. Carton waste is generated at 0.12 kg per day and is taken by Plan @ Earth for recycling

- **HOSTEL**

  Daily 2 sacks of wastes including paper, plastic, sanitary items, bags etc weighing 1.5 kg for each sack are collected and burnt in the garbage burner. Plastic bottles are sorted and taken by Plan @ Earth for recycling.

- **LIBRARY**

  Newspapers and magazines generated at 15.5 kg/day are taken by Plan @ Earth for recycling

- **E-WASTE**

  E-waste of around 313 kg generated every year is stored in a yard from which it is periodically collected by Plan @ Earth for recycling

4.2 Methodology

SCMS Cochin campus includes an academic block of 4 floors, SSTM building of 3 floors, ladies hostel of 4 floors and a full time working canteen which provides food for 450 people at a time. To evaluate the trends of waste generation and waste management techniques adopted at campus, interviews were conducted with the cleaning staffs, administrative officers and students. The amount of waste generated, major sources of waste and frequency of waste collection were enquired from the cleaning staffs. The details about the sources of waste generation in the campus are shown in Table 4.1.

Table 4.1 Sources of wastes

SL NO	SOURCE	TYPES
1	Hostels	Paper, plastics, cloth, electronic items, leather, rubber, sanitary.
2	Academic Areas	Paper, plastic, electronic items, sanitary items, food
3	Canteen	Food, plastics, paper, gunny bags
4	Guest House	Paper, plastics, food, sanitary items
5	Office Buildings	Paper, plastic

Table 4.2 Frequency of waste collection from various sources

SL NO	SOURCE	FREQUENCY OF COLLECTION
1	Academic Block	Once a day
2	Hostels	Once a day
3	Canteen	Twice a day
4	Road Side Dustbins	Once a week
5	Guest House	Once a week

Table 4.3 Composition and quantity of waste generated in the campus

SL NO.	WASTE TYPE	WEIGHT (kg per day)	PERENTAGE BY WEIGHT
1	Food Waste	60	59.87
2	Newspapers/mixed papers	18.24	18.20
3	Magazines	1	1.00
4	Carton	0.12	0.12

5	Rubbish (Paper waste, Plastic etc)	20	19.96
6	E- Waste	0.85 (313 kg per annum)	0.85
	Total	**100.21**	**100**

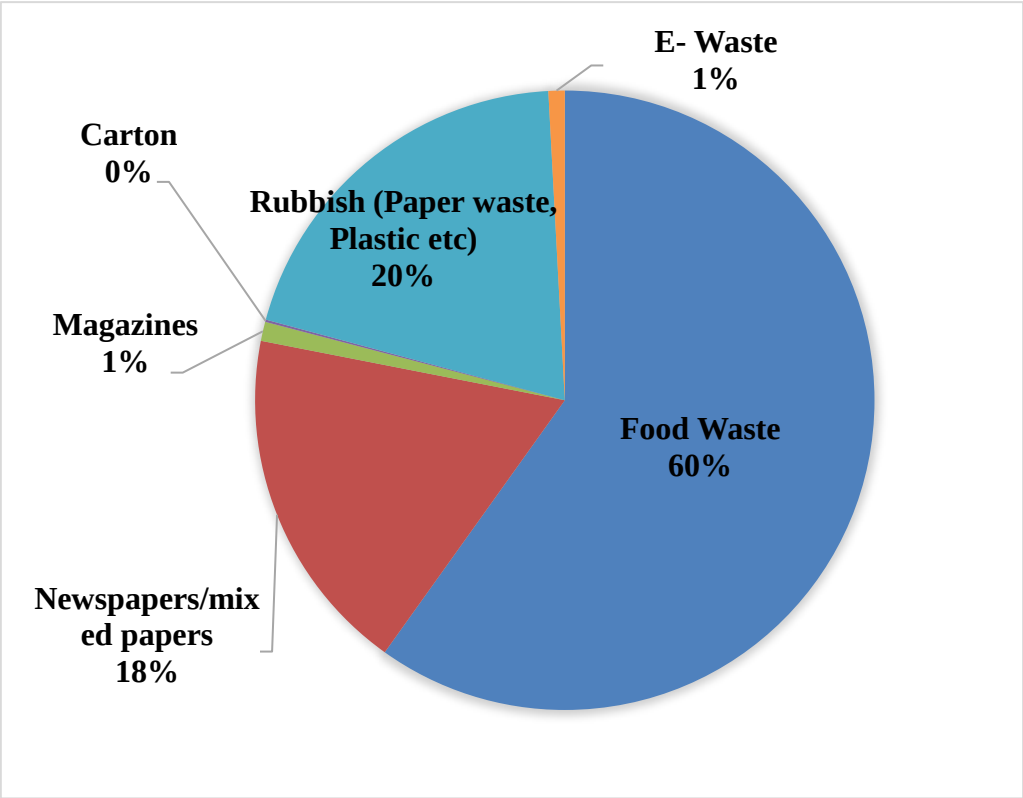

Figure 4.1. Percentage by weight of annually generated waste in the campus

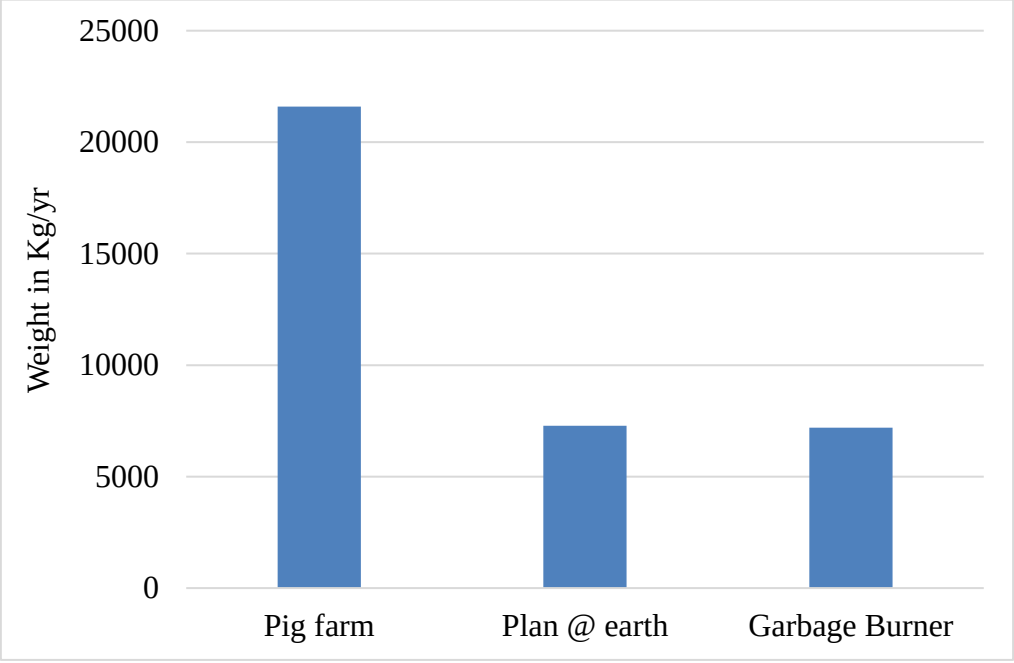

Figure 4.2. Existing waste disposal methods

4.3 Waste management initiatives

SSTM serves as a living laboratory of sustainable practices by integrating academia, student life and campus operations, researching new solutions through campus practices for sustainable waste management. Students have played a vital role in encouraging environmental consideration in every functional facet of the institution. An efficient management of waste starts with regular collection of waste generated. This task has been made easier by placement of dustbins at appropriate places. Dustbins are placed at canteens, each corridor of all the buildings, roadsides, etc. Covered dustbins are used in order to prevent breeding of infectious vectors. The plastic bottles from the hostels, canteen and campus are sorted by the workers which is further collected by plan @ Earth for recycling. Campus wastes dominantly paper , plastic, thermocole, sanitary, ceramic, etc. which can neither bereused nor recycled and other combustible wastes from each buildings are collected by the cleaning staffs of the campus which is later on burnt in the garbage burner each day.

SSTM is now making a conscious effort to establish the campus as a **'zero waste'** zone, through a slew of scientific and environment-friendly measures. A number of initiatives have been put in place to promote the concept of **'reduce, reuse and recycle'** and contribute mite to protecting the environment.

A) <u>Management of Paper Waste</u>

Papers are segregated based on the following basic paper grade categories:

- Magazines
- Mixed Paper
- Old Newspapers
- Carton

Mixed paper is a broad category that often includes items such as discarded mail, telephone books, paperboard and catalogues. High grade deinked paper is made of high grade paper such as letterhead, copier paper, envelopes, and printer and convertor scrap that has gone through the printing process. One-sided used papers are collected and sent back to offices, dispensaries, provisional stores, etc. for reuse as scratch pads. Double-sided used papers are collected, accumulated and sold for recycling by Plan @ Earth.

Figure 4.3. Green audit team interviewing housekeeping staff

B) <u>Management of Food Waste</u>.

Food wastes and all other organic wastes from canteen are taken daily to a pig farm located at Idukki. The amount of organic matter being retained at the campus is nil.

Figure 4.4. Tank outside canteen for removing sediments before water is taken to ETP

C) <u>Management of Combustible Waste</u>

A garbage burner of capacity 150 kg is installed at the campus in which the combustible wastes like paper, plastic, wrappers, gunny bags, paper bags, clothes, sanitary waste etc are burnt daily. The ashes and residues from the garbage burner are removed once in a month which is used for gardening. No fuel is used for burning the waste.

Figure 4.5. Garbage Burner at SCMS campus

D) <u>Management of Recyclable Waste</u>

Wastes including newspapers, magazines, cartons, mixed papers, plastic bottles and E-wastes (cabinets, monitor, keyboard, mouse, motherboard, hard discs, switch ports, UPS, CD s, SMPS, LCD projector, printers, battery etc) are collected by Plan @ Earth periodically for recycling.

Figure 4.6 Green audit team inspecting garbage burner

Figure 4.7. E-waste storage yard at SSET

About PLAN @ EARTH

Plan @ Earth is a non-profit organization registered as an NGO at Travancore Cochin Literary. Plan @ earth collects waste paper, plastic and E wastes from the campus and recycles them. Recycling of one ton of paper wastes saves 17 trees, 3.3 cubic meter landfill space and 7000 gallons of water.

SCMS, Cochin received a green certificate for saving 144 trees on 2015, 23 trees on 2017, 155 trees on 2019 and 155 trees on 2020 by ensuring recycling of 8482 kg, 1381 kg, 9121 kg and 9112 kg of used paper respectively; also 1250 kg E-waste recycled in 2019 through WOW (Wealth Out of Waste) project by Plan @ Earth.

Figure 4.8. Green certificate awarded to SCMS in 2015

Figure 4.9. Green certificate awarded to SCMS in 2017

Figure 4.10. Green certificate awarded to SCMS in 2019

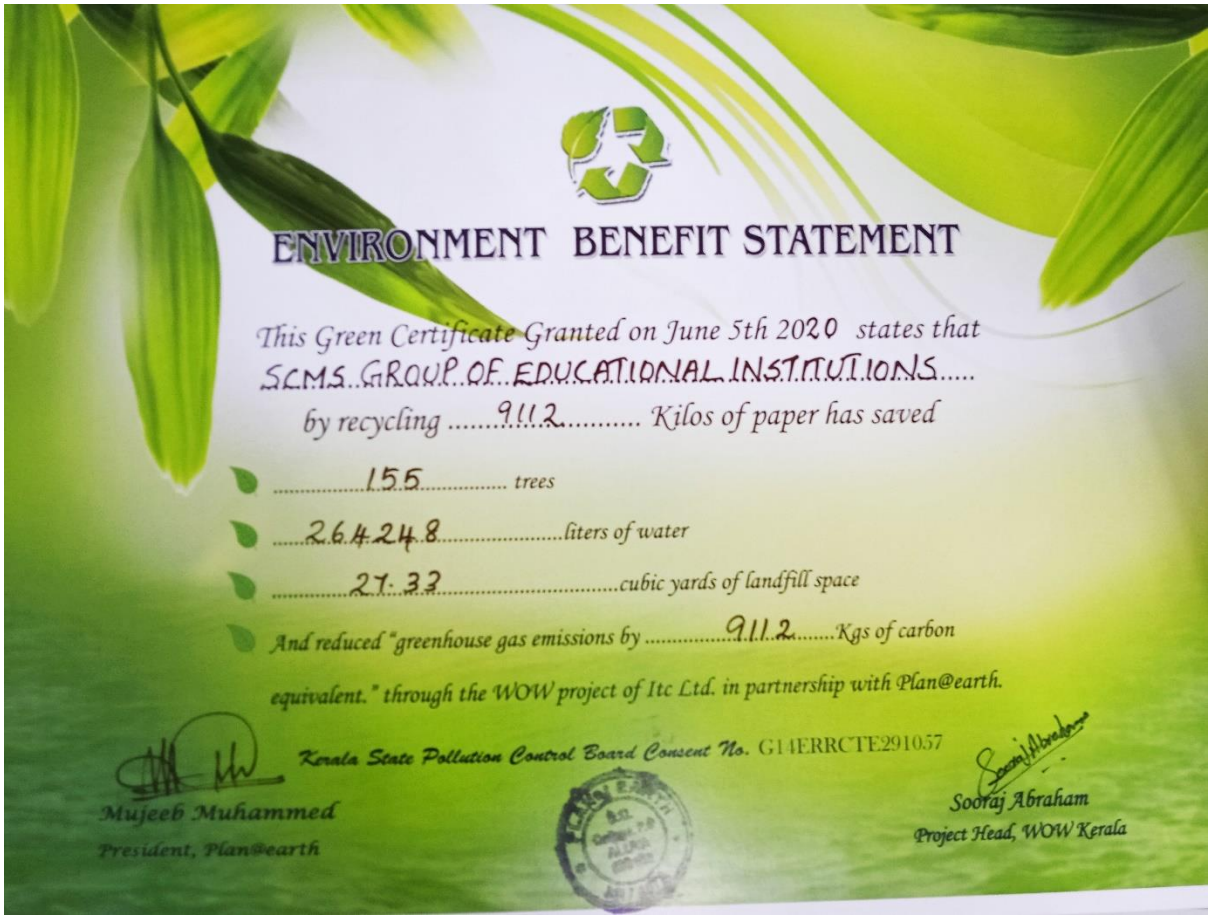

Figure 4.11. Green certificate awarded to SCMS in 2020

5. SUMMARY OF FINDINGS & RECOMMENDATIONS

5.1 Audit recommendations for potential water saving

Based on the information collected and observations, the following can be recommended to reduce water use and increase its efficiency.

- *Replacement of existing single flush cisterns with dual flush cisterns at the end of their useful life:* At present the toilet commodes have 10 litre flush which can be replaced with 3/6 litres or 2/4 litres dual flush cisterns. Dual flush WCs operate on a split button with the user having the option of which one to use. Usually the smaller button operates the shorter flush of 3 litres which is adequate for flushing liquid waste, while the larger button is for 6 litres flush for more substantial waste. This can reduce water use by around 30-40%.
- *Extent the rainwater harvesting facility to SSTM block along with the reinstallation of rainwater harvesting system damaged during the flood:* Total 5874 KL water can be

harvested, which helps to increase the water quality, especially to reduce the iron content.

- *Can install treatment facility for the removal of excess iron from the open well.*
- *Initiate the practice of reusing the treated wastewater from ETP for irrigation purposes. Also increase the treatment efficiency and reuse the effluent in flushing systems, because the 30% of water usage in the campus is only for flushing.*
- *Awareness to the students and staff regarding the importance of conservation of water*
- *Can plan for incentives for those who consumes less water in hostels.*

5.2 Audit recommendations for potential Energy saving

- It is recommended to continue the practice of replacing fluorescent lamps and CFL lights in the campus with LED tubes and bulbs at the end of utility period of currently installed fluorescent lamps and CFL since they consumes much less energy compared to fluorescent lamps. During 2019-21 about 843 LED tubes and 125 LED bulbs has installed in the campus by replacing the fluorescent and CFL lights, which has helped to reduce the energy consumption for lighting by 49 percent.
- Let the good practice of replacing of CRT monitor with LED monitors to be continued. LED monitors typically require about 20% of the power required for a CRT monitor with the same screen area. In addition, the amount of heat generated by an LED monitor is considerably less than a CRT monitor, resulting in a lower load on air conditioning. Building cooling needs may be decreased by up to 20%. During 2019-21 about 140 CRT monitors have already been replaced in the campus with LED monitors at the end of their useful life during 2015-2021 and this reduced the energy consumption by computers up to 25%.
- From the discussions with the authorities, it is understood that the institution has already initiated steps with KSEB for installing solar panels which will reduce power consumption.
- Air conditioned rooms may be provided with doors having automatic closing mechanism and windows with tinted glass to reduce load on the air conditioning system.
- Natural ventilation and lighting can be utilized in class rooms for energy saving.

- It is advisable to shift classrooms in 2nd floor of SSTM building to 3rd floor where more ventilation and natural lighting is available throughout the day. This will reduce unnecessary usage of artificial lighting. Currently classrooms in 3rd floor are not used except during examinations and certain other occasions.
- Switch off the photocopier machine at the main outlet itself when not in use; similarly printer in office rooms also should not be kept in stand by and sleep mode which consumes power.
- Do not leave laptop/ mobile charger on throughout the night, also make sure the chargers are unplugged after charging, continues charging even after full charge consume more energy.
- Switch on heater only when required.
- Switch of water cooler during night time.

Overall the energy consumption has reduced to ~2100 units from 3000 units (during last audit) by the replacement of florescent and CFL lights with LED lights and replacement of CRT monitors with LED monitors. Keep following this practices along with installation of solar panels will help SCMS campus to become a 'Net zero energy campus'.

5.3 Audit recommendations for waste management

- Place dustbins with different colour codes, so that waste can be separated into different types like (plastic, paper, food etc.) at source itself.
- Provide more dustbins in gardens, corridors, roadsides, and canteen and make students more aware of using it effectively.
- Use covered dustbins instead of open dustbins in order to prevent breeding of infectious vectors.
- The waste collected from various places in the campus for burning in garbage burner, may be kept in closed pits or in storage rooms.
- May think of steps to recycle the plastic waste generated in campus by collaborating with Kerala government's 'Suchitwa Mission' project.
- Awareness among students and staff to reduce wastage of food in the canteen.

- Encourage reuse of one-side printed papers for less important documentation or for reuse as scratch pads in offices and faculty rooms.
- Sorting the waste before garbage burning should be given utmost priority.
- Existing initiative for recycling paper and e-waste in association with plan@earth in very good and may be sustained.

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