



ST. XAVIER'S COLLEGE FOR WOMEN ALUVA

Audit Report (2020-21) Environment, Energy and Green initiatives



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I. INTRODUCTION

Background

Conservation of environment is cardinal to the sustenance of life on earth. Environmental audit is an effective management tool towards evolving sustainable development strategies and has become mandatory since the declaration of National Environmental Policy 2006. It is a systematic process of identifying and assessing whether the practices and initiatives of any institution or establishment are sustainable and eco-friendly that help in improving human activities which could reduce the adverse effects on the environment. The auditing is visualized to detect and monitor changes in the environment to improve the quality in terms of different components such as air, water soil, pollution levels, energy consumption, water management, biodiversity, carbon footprint as well as human induced hazards. It has been recognized that the maintenance of healthy environment is the responsibility of both the state and every citizen.

In view of the emerging environmental cause NAAC, an autonomous body under UGC has included environmental audit in the accreditation methodologies of colleges and universities. Again, a thorough understanding on the need of the environmental quality has now become an integral part of the educational system. Environmental audit of educational institutions is an effort towards environmental sustainability in the campus.

Scope of Environmental Audit

Being a prominent institution of higher learning, St. Xavier's college for women, Aluvais quite aware of its responsibility towards environmental issues and wellbeing, the role in education, research, policy formation and information exchange necessary for a sustained environmental campaign and activities. The audit is the outcome of a combined effort of an expert group and the college community. It provides a base line data on the environment like the energy utilization, quality of water, soil, air, the quantitative assessment of solid waste as well as biodiversity status of the campus, that certainly find useful in planning the various future activities with reduced or no impact on the environment. The details presented here constitute a consolidated environmental audit for the year 2020-21.

Objectives of Environmental Audit

1. To examine the current practices in the college campus which can impact on the environment.
2. To identify and analyse significant environmental issues.
3. Set up goal, vision and mission for green practices in the campus enabling effective conservation and utilization of resources.
4. Establish and implement effective environment management.
5. To conduct continuous assessment and evaluation for shaping healthy practices that help to nurture a green campus.

Benefits of Environmental Audit

- Help to protect the environment in the campus.
- Identify cost saving methods through energy conservation, water conservation and waste minimization.
- Enhancement of biodiversity resources.
- Reduction in carbon dioxide emission making the campus climate friendly.
- Impart a good image to the institution through its clean and green campus.
- Empower the College to frame a better environmental performance.

About the College

St. Xavier's College for Women was established in the year 1964 by the Congregation of Teresian Carmelites (C.T.C.) and is currently affiliated to the Mahatma Gandhi University, Kottayam. The college started with four pre-degree batches of 238 students and 22 teachers. Later it attained the status of Degree College in 1968 and currently it offers 17 Undergraduate, 7 Postgraduate, 3 Research Programs along with a number of Add-on courses and skill development Certificate Programmes. The college has flourished into an esteemed institution in 56 years with its focus on quality education and all round development of the womenfolk and Teaching Learning is at the core of the institutional ethos.

At present the college is situated in an area of about seven acres within the Aluva Municipality and along the south bank of Periyar River. The college has now 1840 students and 93 faculty members with commendable infrastructure and facilities such as hostels and

sports amenities. As recognition of its endeavours and achievements in curricular, co-curricular and extra-curricular areas, NAAC has accredited the college with CGPA of 3.33 in 2017. In addition to this, as part of the Institution's Innovation Council, the College was rated with Five Stars by the Ministry of Education, Govt. of India in 2020. The institution also provides an inclusive platform that enhances the strength and capabilities of students coming from diverse backgrounds. In the M.G. Youth Festival "Article 14" and in All Kerala Youth Festival 2019-20, the students representing the college bagged a number of individual and group prizes.

The campus has its striking ambiance alludes to one of its cardinal principles of Reduce, Re-use and Recycle. Both faculty and students have taken several initiatives to preserve and protect the environment. The college has over twenty registered and unregistered clubs. Energy and Environment Conservation Club, Boomithrasena Club and Nature and Biodiversity Club are the prominent ones which concern campus environment and its conservation. These clubs have been designed to foster unity amongst students through participation in meaningful activities like nature studies, conservation of the natural environment and implementation of eco-friendly practices. Active participation in clubs allows students to become intimately connected to their institution as well as environment while discovering their strengths and passions as well.

Motto

On the path of knowledge, love and service

Vision

St Xavier's College for women envisions the empowerment of women through academic excellence and spiritual enlightenment for their educational, social and cultural enhancement.

Mission

The institution provides an ideal academic environment for lifetime learning, nurturing the students as responsible woman and resourceful global citizens, committed to national and cultural values.

Quality policy

St. Xavier's College for Women is committed to empower women through science, commerce and arts for the spiritual, social and cultural development of the society through the following initiatives

- Strengthening moral, ethical and environment consciousness among staff and students
- Learner centric environment for the holistic development of students
- Upgrading the competence of faculty to global standards and make them espouse all the innovative and model technologies in teaching-learning process.
- Updating time to time improvement in the quality management system.
- Promoting entrepreneurial skill through class room sessions and training programmes
- Inculcating secular cultural consciousness and unity in diversity through multicultural events.



II. ENERGY AUDIT

As Agenda 21, identified in Ch 7 "promoting sustainable energy and transport systems in human settlements" is the prime way to achieving the goal of sustainability. It made aware of saving energy, as a basis for living systems and opportunity for all human activity encouraging renewable energy techniques and technologies in general, besides the use of energy efficient materials in particular. Further it demands an integrated approach to the provision of energy and other infrastructure needs. Increasing the efficiency of energy use to reduce its polluting effects and to promote the use of renewable energies must be a priority in any action taken to protect the urban environment. It is possible by conducting energy audit, which addresses the escalating energy-related economic and environmental liability for proper energy management.

Objectives

- ❖ Identification of major energy resources of the campus
- ❖ Generation of energy consumption profile of the campus
- ❖ Identification of sustainable energy avenues existing in the campus

Methodology

A team from ACCESSD visited St. Xavier's College for Women, Aluva Campus to assess the energy resources and their consumption pattern. The faculty and non-teaching staff members of St. Xavier's College assisted the team with data collection. Information on energy sources, the quantity of consumption, its pattern of use, wastage, etc. were entered in standard data sheets. Besides, rigorous field visits, interviews, and discussions were conducted with the institute authorities.

Table 1 Energy sources and consumption profile

Contract demand	72 kVA
Power Unit	kWh
Zone	Cumulative
Annual electricity consumption	58242 kWh
Annual electricity charge	Rs.484316 /-
Average energy charges at the campus	Rs. 8.32 / kWh
Annual diesel & petrol consumption (DG set)	131 Liters
Annual LPG consumption	781.2 kg
Annual fuel cost (LPG, Petrol & Diesel)	Rs.46734

Electricity is the prime source of energy noted in St. Xavier's College for Women, is provided by Kerala State Electricity Board (KSEB). The other forms of energy noticed were LPG and diesel. In addition, the campus is equipped with a small solar power and biogas are the renewable sources of energy. The campus also generates biogas from food waste that considerably substitutes current LPG usage (Table 2).

Table 2 St. Xavier's College Energy inputs, annual consumption and cost

Energy inputs	Unit	Annual consumption	Energy equivalent		Average cost/unit (Rs)	Total cost	
			kWh	%		Rs	%
Electrical	kWh	58242.0	58242	82.32	8.32	484316	91.2
Diesel	Litre	131.0	1676	2.37	77.86	10200	1.92
LPG	kg	776.4	10833	15.31	47.06	36534	6.88
Total			70751	100		531050	100

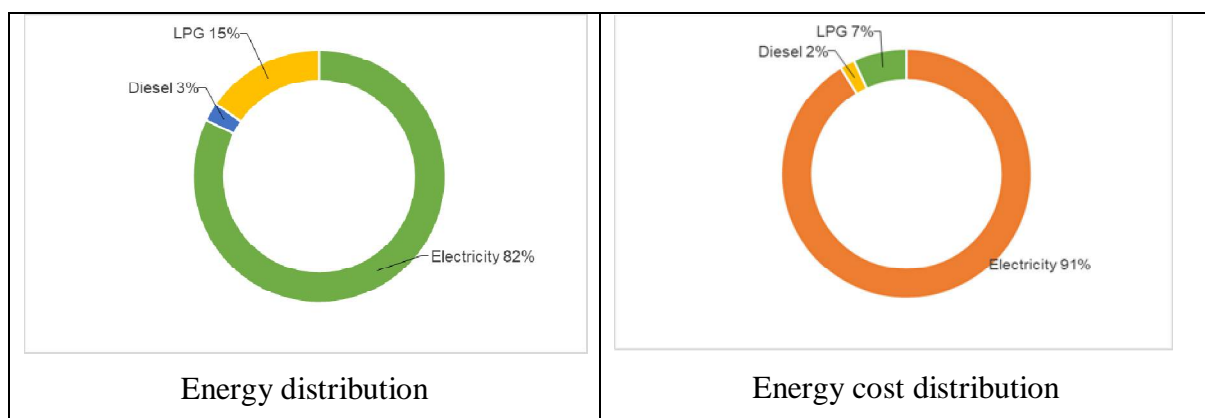


Fig. 1 Energy distribution and energy cost distribution of the campus

Specific energy consumption

The specific electrical energy consumption is the electrical energy consumed per unit. In the case of St. Xavier's College, the specific electrical energy consumption was calculated as the electrical energy consumption per person and electrical energy consumption per square meter of built-up-area (kWh/m^2).

In order to calculate the specific energy consumption, the total number of the persons present in the campus (including students, staffs and non-teaching staffs) and the total built up are considered.

Monthly variation in the specific energy consumption (Fig. 2 and Fig. 3) reveals the changing activities of the campus. The consolidated yearly specific energy consumption computed is 3.59 kWh/M²/year and 72.68 kWh/person/year respectively.

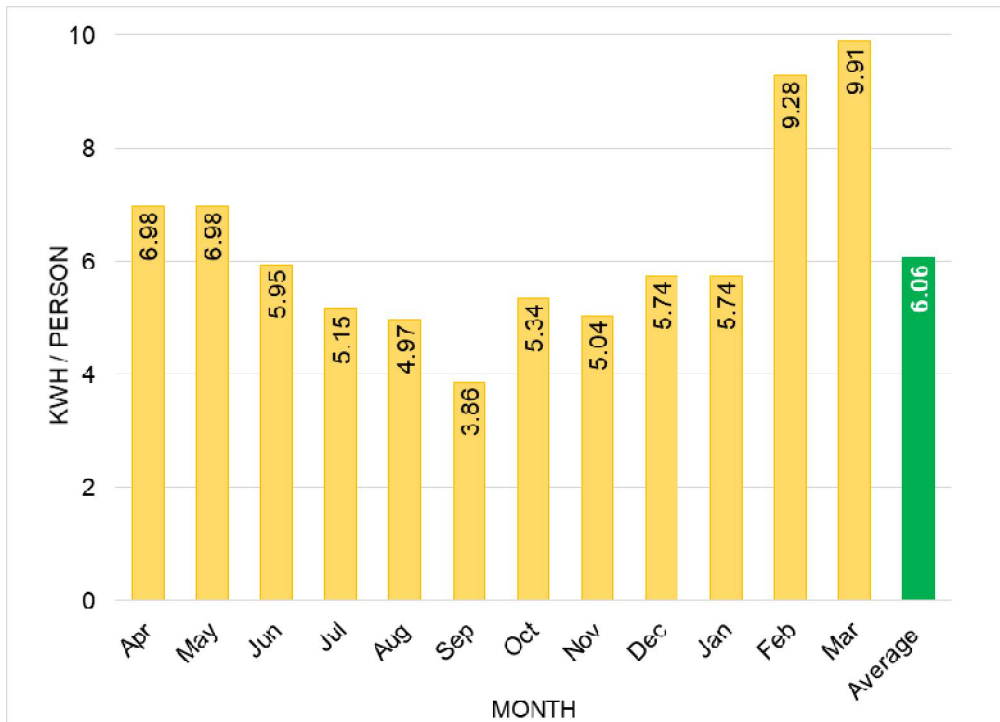


Fig 2 Monthly specific energy consumption per person

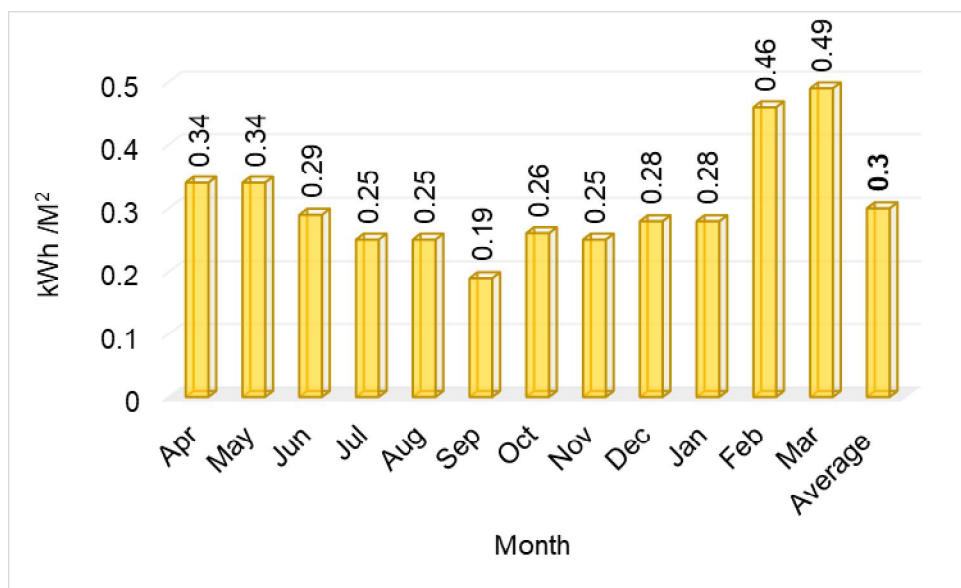


Fig 3 Monthly specific energy consumption per sq. meter

1. Electrical Energy

In 2020-21 electrical energy consumption of the campus was 58242 kWh (Table 2) with a monthly average of 4853.5 kWh. Month wise electricity consumption is presented in Fig. 4

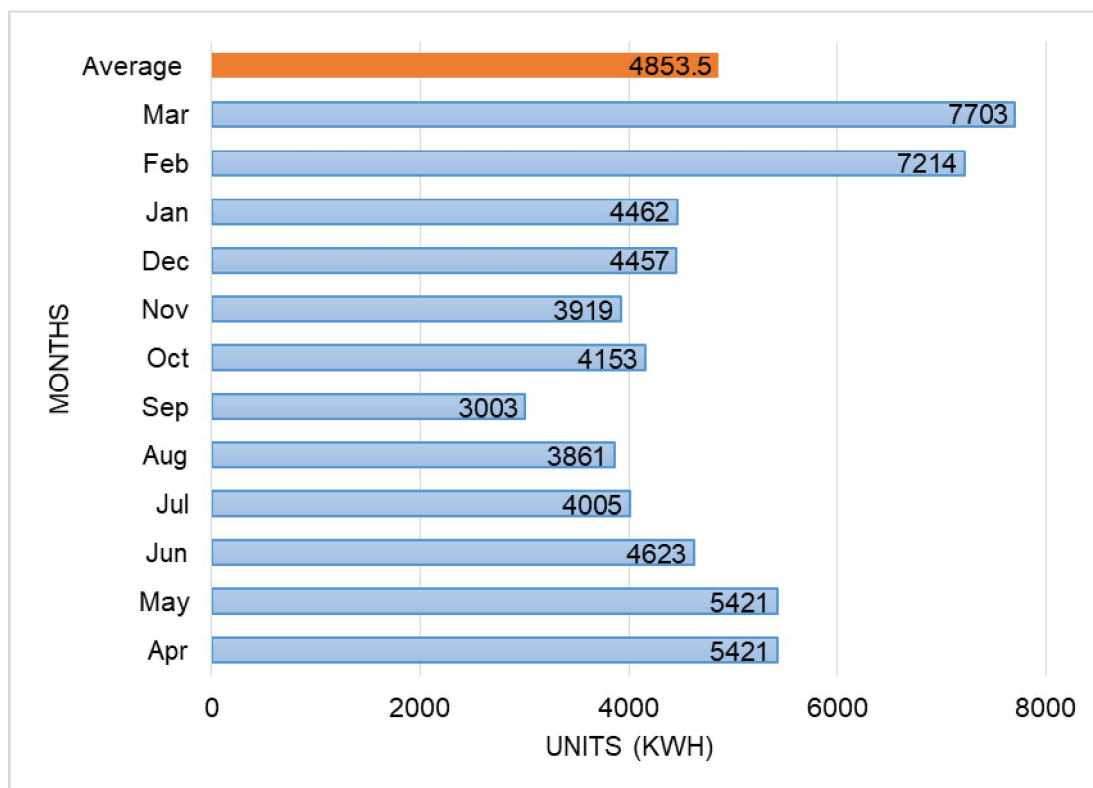


Fig 4 Monthly electrical energy consumption (kWh)

Maximum energy consumption was noted during February while September recorded the minimum. The college is well equipped with electricity supply. Now the college has shifted to renewable energy sources like solar energy by establishing solar panel of 3KV. The department of Physics is fully running on this. The office partially depends on this energy. There are two generators in the college running on diesel. Each department has computers, printers, fans, plug points, tube lights, bulbs, etc. The list is given below (table 3).

Table 3. List of electrical equipment

Department	Fan	Tube light	Plug points	Speaker	Refrigerator	Computer
Commerce	83	51	50	11		11
Physics	46	23	305	7		30
Malayalam	26	7	44	7		4

Chemistry	19	20	25	4		4
Microbiology	14	28	43	3	3	3
Mathematics	14	14	17	6		2
Economics	22	20	33	2		2
Botany	29	37	38	6	1	1
Zoology	33	33	43	6	1	1
English	29	21	14			11
Commerce (Self financing)	43	20		11		2
Office	20	20	61			12
Computer Centre	4	10	31			31

In addition to these equipment, the following items were also noticed.

1. Exhaust fans – Three nos.
2. A hot plate
3. A table fan
4. A U.V. tube
5. Telephones - 26
6. An induction
7. 13 mike
8. A bell
9. Photocopier - 10 nos
10. Printer - 29 nos
11. Projector - 21 nos
12. Refrigerator - 8 nos
13. Spectrometer - 10 nos
14. A Laser
15. Table lamps - 2 nos
16. Photodiode - 1
17. Distilled water coil - 1
18. Spectroscopy- 3 nos
19. CRO - 6 nos

- 20. Distillation unit - 3 nos
- 21. A pH meter
- 22. An Electronic balance
- 23. A water bath
- 24. Power plugs - 3 nos
- 25. Spotlight (Auditorium) - 4 nos
- 26. Television - 4 nos
- 27. Camera - 48 nos

Monthly electricity bill amount paid by the institution is shown in Fig. 5. The institution paid Rs.484316 for the consumption of 58242 kWh units of electricity (Table 2). As observed in consumption units, the institution paid huge amount of money for the month of February (Rs. 59673) while relatively less in the month of September (Rs. 27582)

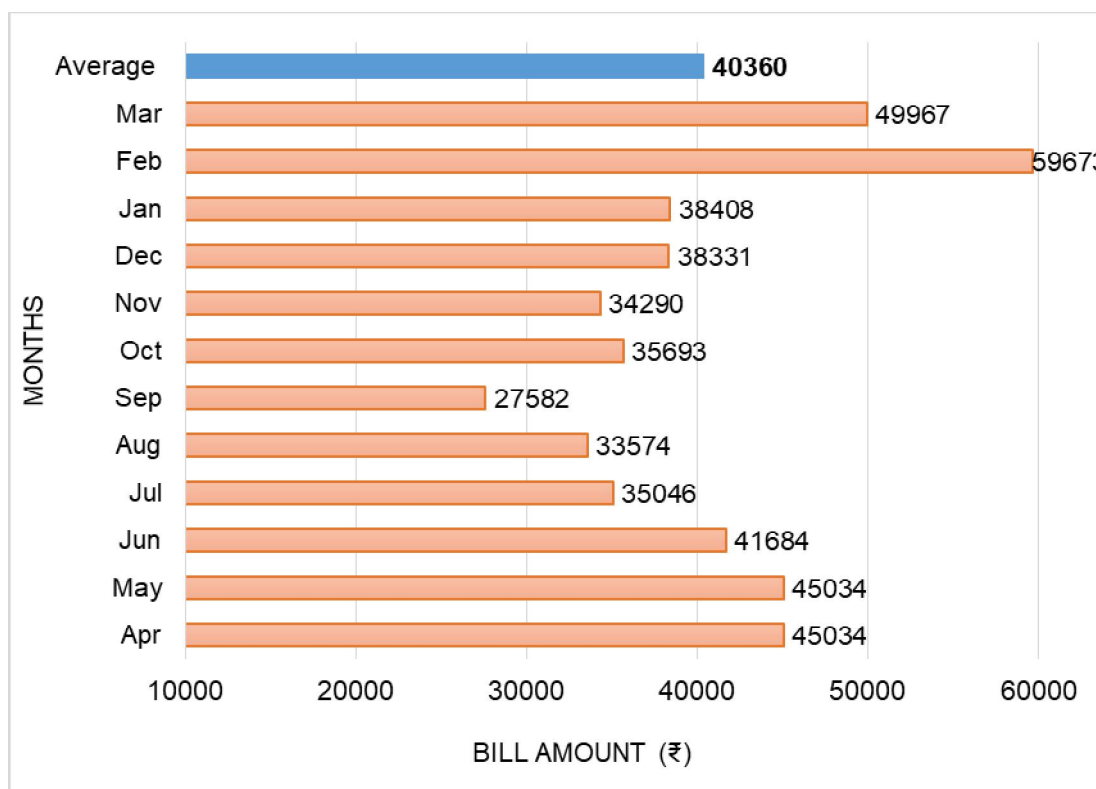


Fig 5 Monthly electrical bill payment (Rs)

2. Diesel consumption

The institution has two buses and a mini bus for traveling purposes. These vehicles were operated with diesel and petrol. The campus has diesel generator (DG) uninterrupted power supply. So annually the institution was spending Rs.10200 for fuel consumption, Rs. 6200 for diesel and Rs. 4000 for petrol. The annual diesel consumption of the campus was estimated at approximately 131 L which accounts for about 2.37% (1676 kWh) of the total energy equivalent.

3. LPG

LPG utilization is noted in convent, hostel and labs. Totally 54 cylinders were used by the campus with a split of 42 small cylinders (14.2 kg) by convent; 6 small cylinders by laboratory; two big (19kg) and four small cylinders consumption by the hostel. In addition to LPG, the institution is using biogas and firewood for cooking. Annually 776.4 kg of LPG was consumed by St. Xavier's College, with an expenditure of Rs. 36534 /-. LPG consumption contributes nearly 15.31% (10833 kWh) of the total annual energy utilization of the campus.

Renewable energy avenues of the campus

Renewable energy

Renewable energy plays significant role in energy security and in reducing greenhouse gas emissions. St. Xavier's campus has visualized the avenues of renewable sources of energy and their environmental output. Accordingly, it searched for the appropriate technologies and possible subsidies. Further, its usage help to reduce energy demand and reduce fossil fuel use, which is the largest source of carbon dioxide emission. Because of the energy conservation, the College campus took the following avenues and morphed into a smart energy consumer.

1. Solar
2. Biogas plants

1. Solar Energy

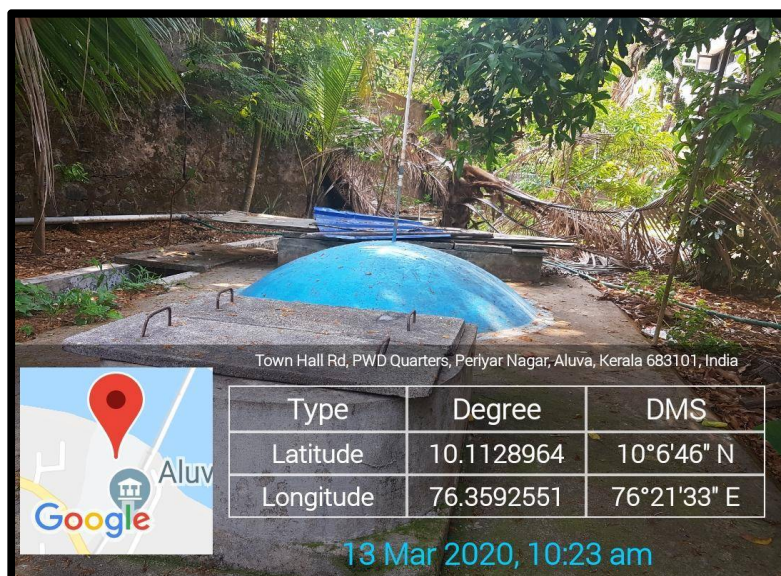
The renewable energy is good for the planet and for people, the institution has installed a solar power unit as it is conscious about the need of energy conservation. It shares a fraction of the annual power requirement of the college. Even then the institution hopes to extend its pursuit of solar energy in future. The college is planning for wheel to grid solar system in the campus.



Fig. 6 Solar power Unit

2. Biogas plants

Biogas plant has been recognised as a suitable technology for improving energy access, waste management and sanitation. Biogas plants also provide a residue of organic waste after anaerobic digestion which has superior nutrient qualities and considerable environmental benefits by reducing GHG emissions like CO₂, methane, and nitrous oxide.



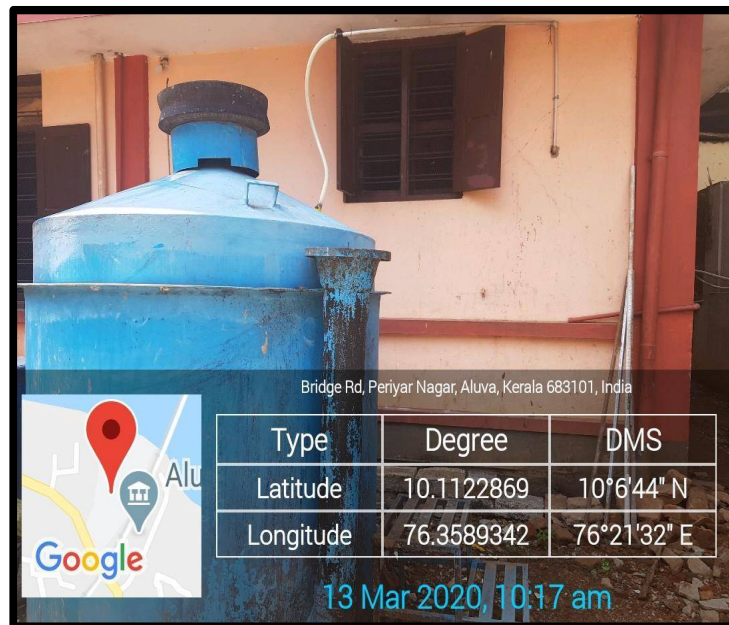


Fig. 7 Biogas plants

Healthy practices

The college encourages sustainable energy in every aspect/activities particularly its energy requirements through -

- Solar Photo Voltaic (SPV) System
- Biogas plant
- Solar Water Heater

Recommendations

- ❖ Use smart power strips to avoid “Phantom loads,”
- ❖ Replace energy-saving appliances to conserve energy.
- ❖ Make a regular check-up on the gadgets to improve their efficiency.
- ❖ Non-usable CFLs can be exchanged with LED bulbs through the KSEB energy-saving program.
- ❖ Unplug and turn off electrical appliances when not in use or after use.

III. WATER AUDIT

Water auditing is a method of getting an objective water balance by measuring the flow of water from the outlet point or treatment through the distribution system and into the areas where it is used before being discharged. People around the world are becoming more aware about the importance of water to their daily lives. This awareness crosses political and social boundaries. In many places, people have difficulty in accessing clean drinking water which is often polluted. In future, as demand for water increases, water audits will become more important for conserving water.

Objectives

The water audit of St. Xavier's is carried out in order to list out the availability, use, purification, and recycling of the water resources of campus and to suggest recommendations if need any.

Methodology

A team from ACESD visited St. Xavier's and provided datasheets in order to collect data. The students, teachers and non-teaching staffs along with the ACESD members collected the data and filled up the datasheets.

Water Sources

The campus has three wells. The water from the first two wells is used on a daily basis, whereas the water from the third well is only used for construction purposes. The water supplied by the Kerala Water Authority is also used in the campus. Two rainwater harvesting plants have been constructed in the campus to store rainwater. The main source of water for cultivation is water taken directly from the Periyar River.

Water quality

The Department of Microbiology of the college periodically tested the microbiological count of the water from the different sources and validated that water can be used for drinking.

Water usage and storage

Water usage refers to the use of water from various sources for various activities such as use in the canteen, hostels, academic buildings, gardens, grounds etc. Since it is a residential institution, its water consumption is relatively high. Water is used on campus for both drinking and non-drinking purposes. Non-drinking purposes include toilet and bathing, watering plants, construction activities etc.

There are numerous water outlets for students and water coolers for the departments in the college campus. It is found that approximately 198 taps, 17 coolers, 10 faucets and 25 flush tanks are in working condition within the campus.

Table 1 Details of main outlets in the campus

Sl. No	Main outlets	Number
1	Taps	198
2	Coolers	17
3	Faucets	10
4	Flush tanks	25

The campus has 13 storage tanks including two rainwater harvesting tanks and two filtration tanks.

Table 2 Details of storage tanks in the campus

Sl. No.	Building	No. of storage tanks
1	Mount Carmel Block	2
2	Jesus Block	5
3	St. Joseph Block	3
4	Hostel	2
5	Convent	1

Main initiatives of 2020- 2021:

- Celebrated world water day 2021 “*water2me campaign*”, on 18th December 2020 for the wise-use and conservation of water resources.
- A project named “*Kulirekam Kulirmayrekam*” was launched on March 16th 2021 by placing water filled pots to feed birds.



Kulirekam Kulirmayrekam- water for birds

Suggestions

- Water coolers that aren't working should be replaced as early as possible
- Conduct periodic water quality assessment.
- Conduct awareness programme for students about water conservation
- Re-strengthening the existing water management practices

Conclusion

The water audit is an effective tool for evaluating the campus's available water sources and usage patterns. Also, it provides scientific methods to improve water conservation by controlling water loss and indiscriminate consumption.

There is a primary filtration tank for filtering the water from Periyar river, and the large well. By conducting the audit it was observed that there was no water leakage through the taps. It might be due to the periodic inspection and timely maintenance. Periodic assessment of microbial count in the KWA and well water were also carried out.

Due to the covid pandemic situation, the number of students and faculties were very less, so that the water consumption rate was also comparatively minimum.

IV. WASTE AUDIT

A waste audit is a method for assessing the waste generated by the organization to determine the types, sources, and amounts of wastes produced within the timeframe. Apart from this, the audit examines the current waste reduction practices and evaluates its effectiveness. In short this kind of appraisal will provide baseline data to determine priorities that suits the organization's needs and establish waste reduction recommendations or advocate modifications to existing waste management activities which ultimately contribute towards sustainability.

Objectives

- To document the status of solid and liquid waste generated in the campus.
- To review the prevailing waste disposal methods, healthy practices and suggest measures to improve the existing waste management strategies.

Methodology

Data collection was performed through frequent field visits, direct observations and assessments as well as communication with responsible persons. Besides, informations were also collected using well devised data sheets and also from institutional report.

General findings and healthy practices

- The campus has efficient mechanisms for collecting and treating both solid and liquid wastes. A proper segregation of waste into biodegradable and non-biodegradable categories is practiced in the campus.
- It is revealed that the major solid wastes generated in the campus falls under nine categories that include paper, plastic, glass, damaged furniture, biodegradable waste (food, sweeping waste, crop waste etc.), construction and demolition waste, biomedical waste, e-waste and others
- Among the 3 academic blocks, Jesus Block contributes maximum waste in the campus. Jesus Block is comprised of several science departments and labs (Physics, Zoology, Botany and Chemistry), Administrative wing, Computer centre, Indoor stadium etc.

- Paperless culture is encouraged in the campus by the use of digital platforms for communication, e- filing, administration, class lectures etc.
- Implementation of new software's like 'Likha'-College academic management software for internal marks and attendance entry and software for administrative purposes transformed the administrative sector to e-governance in all areas of its service that resulted in the reduction of paper waste significantly.
- Radio Frequency Identification (RFID) Technology is installed for the automation of library usage which includes book tagging, desktop reader, portable hand-held reader, anti-theft Gate reader and self check- in /check-out Kiosk. Besides, On-line Public Access Catalogue (OPAC) application in the library functions in a networked environment with Maestro Nuvo Software facilitating cataloguing, circulation, quick access information and book reserving which considerably reduces the use of papers.
- A public address system is used for general communications.
- Most of the paper wastes are given to the scrap dealers for recycling and rest are being deposited in landfill or burned in incinerator.
- Use of single use plastic is strictly banned in the campus which results in the reduction of plastic waste to considerable amount.
- Plastic wastes further generated are collected and stacked in designated places from where it is disposed through vendors.
- The college employs adequate number of support staff for the collection, segregation and disposal of waste on campus and the same is done without compromising the sanitation and hygiene protocols.
- Solid waste is segregated at source and for that a large number of waste bins are provided in the campus.
- Solid waste is segregated at source, for that several dust bins are placed in each building of the campus from where housekeeping staffs take the wastes regularly.
- Toilets of girls are provided with napkin vending machines and waste bins are cleared on daily basis by hygiene staff. Incinerators are installed in the campus to dispose sanitary napkins and biomedical needles.
- Liquid waste on campus comprises mainly of the waste water from the canteens, toilets, laboratories etc.
- The liquid wastes from laboratory, bathrooms, toilets, canteens etc. are effectively managed in the campus. It is being collected and disposed properly by flowing it to safely built pits.

- Exhaust fans are fixed in the labs to expel hazardous vapours if any, produced there.
- E- wastes that are beyond repair are collected systematically and sold out to vendors on annual basis.
- Though not regular, bio-degradable waste is used for vermi-composting
- Biogas unit (3 numbers) has been established in the campus for the management of food waste produced in the hostel and convent. The biogas generated is used for cooking purposes in the respective buildings.
- Various programmes like paper bag making programme, cloth bag distribution, educational talks etc. were conducted to give awareness on the dangerous impacts of plastic.
- The use of steel plates and glasses for dining purpose is encouraged in the campus
- Execution of various green initiatives (cleaning drives) conducted within the campus and Aluva municipality are testimonies of the institution's allegiance to clean environment.
- The formation of different clubs like 'Green Army' that address the problem of plastic waste and 'Bhoomithrasena' which helps in strengthening the commitments of the students towards environmental protection are the other major highlights of the campus.
- Students participated in Green Election campaign, 'Haritham' a project initiated by Ernakulum collectorate as part of state panchayat election 2020.

Recommendations

1. Periodic appraisal of different kinds of waste and its quantified data are required for the effective waste management in the campus.
2. A waste management committee should be established for the proper monitoring of waste management activities in the campus.
3. Construction and Demolition waste can be handed over to merchants for reuse of the materials
4. Organic manure produced from the biogas and vermi compost should be effectively used for farming and horticulture.
5. Proper maintenance of biogas unit and incinerators is essential for the better waste management programmes in the campus.
6. Effective implementation of green protocols in the campus.

Conclusion

The current evaluation provides a glimpse on the waste and its management in the campus. The general observations in the report serve as an opportunity for improving the waste management strategies in the campus. The recommendations that are highlighted may lead to a prosperous future in the context of green campus and thus in sustainable environment and community development.

V. BIODIVERSITY AUDIT

Biodiversity Audit includes observations and analytic findings of rapid assessment of biotic components in a specific area. It highlights the current status of flora and fauna and suggestions for better management of biodiversity and green campus.

Objectives

- To assess the vegetation and floral components
- To enumerate the invertebrate fauna (dragonflies/damselflies and butterflies)
- To document the vertebrate fauna (fishes, reptiles, birds and mammals)
- To identify and document the invasive alien species
- To suggest suitable conservation measures

Biodiversity assessment methods

The biodiversity assessment team perambulated the campus covering all the paths, roads and criss-crossed the habitats wherever it is necessary for detailed or specific observations of flora and fauna. Standard protocols were followed for the assessment of faunal and floral components. Focal animal sampling, visual encounter method, point count and visual estimation, transect walk etc. are the specific assessment methods followed. Informal talks with the staff, inmates, security personnel and gardeners were made to get additional information.

Visual estimation of vegetation cover was made during the transect walks across the campus. Enumerations of individual species of trees, shrubs, herbs, climbers, garden species; alien and exotic species were noted and categorised into native species, garden as well as introduced species and the invasive-exotic species. The emerging vegetation and saplings in the altered land is categorised as secondary vegetation. Photographs were taken in certain cases for identification and confirmation of species. A systematic survey of fauna was carried out by direct observations and indirect evidences. Regional flora and authentic field guides were used for the identification. Field gadgets such as Nikon Ranger 8x40 binoculars, Nikon SLR camera, Garmin Global Positioning System (GPS) etc. were used in the field assessment.

Observations and Findings

a) Vegetation and floral components

Based on our observation, the vegetation composition is considerably rich and diverse. Altogether a total of 127 species of plants were recorded that falls under about 60 families. The vegetation composition includes trees, woody shrubs and climbers, shrubs and herbs. Considering the use value, a large proportion is ornamental garden varieties, which is followed by fruit trees, medicinal herbs, trees of timber value and some rare and native species. Being closer to the railway line and public transportation facilities some exotic and invasive plants are also observed. Following are the list of plants observed from the campus.

Sl. No	Scientific Name	Common Name	Family	Habit
1.	<i>Acalypha hispida</i>	Chenille plant	Euphorbiaceae	Shrub
2.	<i>Acampe praemorsa</i>	Warty acampe	Orchidaceae	Epiphytic Shrub
3.	<i>Acmella paniculata</i>	Toothache plant	Asteraceae	Herb
4.	<i>Adiantum latifolium</i>	Broadleaf maidenhair	Pteridaceae	Fern
5.	<i>Agave vivipara</i>	Caribbean agave	Asparagaceae	Herb
6.	<i>Allamanda cathartica</i>	Golden trumpet	Apocynaceae	woody shrub
7.	<i>Alocasia macrorrhizos</i>	Giant taro	Araceae	Shrub
8.	<i>Alocasia × mortfontanensis</i>	Elephants ear plant	Araceae	Herb
9.	<i>Aloe vera</i>	Aloe vera	Asphodelaceae	Succulent Herb
10.	<i>Amorphophallus paeoniifolius</i>	Elephant foot yam	Araceae	Shrub
11.	<i>Annona muricata</i>	Soursop	Annonaceae	Tree
12.	<i>Annona reticulata</i>	Bullock's heart	Annonaceae	Tree
13.	<i>Annona squamosa</i>	Custard apple	Annonaceae	Tree
14.	<i>Anthurium andraeanum</i>	Flamingo flower	Araceae	Herb
15.	<i>Aristolochia indica</i>	Garudakkodi	Aristolochiaceae	Climber
16.	<i>Artabotrys zeylanicus</i>	Manoranjini	Annonaceae	Shrub
17.	<i>Artocarpus heterophyllus</i>	Jack fruit tree	Moraceae	Tree
18.	<i>Asparagus racemosus</i>	Sathavari	Asparagaceae	Climber
19.	<i>Asystasia gangetica</i>	Creeping foxglove	Acanthaceae	Herb
20.	<i>Azadirachta indica</i>	Neem tree	Meliaceae	Tree
21.	<i>Bauhinia variegata</i>	Camel's foot	Caesalpiniaceae	Tree
22.	<i>Bambusa vulgaris</i>	Common bamboo	Poaceae	Woody grass
23.	<i>Begonia coccinea</i>	Scarlet begonia	Begoniaceae	Herb
24.	<i>Browallia sp.</i>	Bush violet	Solanaceae	Herb
25.	<i>Caladium bicolor</i>	Elephant's ear	Araceae	Herb
26.	<i>Callistemon lanceolatus</i>	Common red bottlebrush	Myrtaceae	Tree
27.	<i>Calotropis gigantea</i>	Crown flower	Apocynaceae	Shrub
28.	<i>Cassia fistula</i>	Indian laburnum	Fabaceae	Tree
29.	<i>Casuarina equisetifolia</i>	Whistling pine	Casuarinaceae	Tree

30.	<i>Catharanthus roseus</i>	Periwinkle	Apocynaceae	Herb
31.	<i>Cheilocostus speciosus</i>	crêpe ginger	Costaceae	Shrub
32.	<i>Cinnamomum malabratrum</i>	Country cinnamon	Lauraceae	Tree
33.	<i>Cinnamomum zeylanicum</i>	Ceylon Cinnamon	Lauraceae	Tree
34.	<i>Citrus limon</i>	Lemon	Rutaceae	Tree
35.	<i>Citrus maxima</i>	Pomelo	Rutaceae	Tree
36.	<i>Clerodendrum paniculatum</i>	Pagoda Flower	Lamiaceae	Shrub
37.	<i>Clitoria ternatea</i>	Butterfly Pea	Fabaceae	climber
38.	<i>Crotalaria retusa</i>	Rattleweed	Fabaceae	Shrub
39.	<i>Cocos nucifera</i>	coconut tree	Arecaceae	Tree
40.	<i>Codiaeum variegatum</i>	Garden croton	Euphorbiaceae	Shrub
41.	<i>Coleus aromaticus</i>	Mexican mint	Lamiaceae	Herb
42.	<i>Coleus scutellarioides</i>	Coleus	Lamiaceae	Shrub
43.	<i>Colocasia esculenta</i>	Taro	Araceae	Shrub
44.	<i>Cordyline fruticosa</i>	Tiplant	Asparagaceae	Shrub
45.	<i>Crateva magna</i>	Varuna	Capparaceae	Shrub
46.	<i>Cressa cretica</i>	Littoral bind weed	Convolvulaceae	Herb
47.	<i>Cuphea hyssopifolia</i>	False heather	Lythraceae	Shrub
48.	<i>Cyanthillium cinereum</i>	Little Ironweed	Asteraceae	Herb
49.	<i>Cycas circinalis</i>	Queen Sago	Cycadaceae	Tree
50.	<i>Cynodon dactylon</i>	Bermuda grass	Poaceae	Grass
51.	<i>Cyrtostachys renda</i>	lipstick palm	Arecaceae	Tree
52.	<i>Dactyloctenium aegyptium</i>	Egyptian crowfoot grass	Poaceae	Grass
53.	<i>Dracaena trifasciata</i>	Mother-in-law's tongue	Asparagaceae	Herb
54.	<i>Duranta erecta</i>	Pigeon Berry	Verbenaceae	Shrub
55.	<i>Eleusine indica</i>	Indian goosegrass	Poaceae	Grass
56.	<i>Eragrostis unioloides</i>	Chinese Lovegrass	Poaceae	Grass
57.	<i>Euphorbia cotinifolia</i>	Red Spurge	Euphorbiaceae	Shrub
58.	<i>Euphorbia nivulia</i>	Leafy Milk Hedge	Euphorbiaceae	Shrub
59.	<i>Euphorbia tirucalli</i>	Pencil Cactus	Euphorbiaceae	Shrub
60.	<i>Euphorbia × lomi</i>	Crown-of-Thorns	Euphorbiaceae	Shrub
61.	<i>Ficus auriculata</i>	Elephant Ear Fig	Moraceae	Tree
62.	<i>Flacourtia inermis</i>	lovi-lovi	Salicaceae	Tree
63.	<i>Gomphrena globosa</i>	Globe Amaranth	Amaranthaceae	Herb
64.	<i>Excoecaria cochinchinensis</i>	Chinese croton	Euphorbiaceae	Shrub
65.	<i>Heliconia psittacorum</i>	Parrot's beak	Heliconiaceae	Shrub
66.	<i>Hibiscus rosa-sinensis</i>	China rose	Malvaceae	Shrub
67.	<i>Ipomoea mauritiana</i>	Morning Glory	Convolvulaceae	climber
68.	<i>Ixora coccinia Hybrid</i>	Ixora	Rubiaceae	Shrub
69.	<i>Jasminum auriculatum</i>	Mulla	Oleaceae	Climbing shrub
70.	<i>Jasminum grandiflorum</i>	Pitchi	Oleaceae	Climbing shrub
71.	<i>Jatropha curcas</i>	Barbados nut	Euphorbiaceae	Shrub
72.	<i>Juniperus chinensis</i>	Chinese juniper	Cupressaceae	Tree
73.	<i>Kalanchoe pinnata</i>	Air Plant	Crassulaceae	Succulent
74.	<i>Lantana camara</i>	Red-sage	Verbenaceae	Shrub

75.	<i>Limnophila indica</i>	Indian marsh weed	Plantaginaceae	Aquatic herb
76.	<i>Ludwigia perennis</i>	Water primrose	Onagraceae	Herb
77.	<i>Mangifera indica</i>	Mango	Anacardiaceae	Tree
78.	<i>Manilkara zapota</i>	Sapota	Sapotaceae	Tree
79.	<i>Megathyrsus maximus</i>	Guinea grass	Poaceae	Grass
80.	<i>Melastoma malabathricum</i>	Kathali	Melastomataceae	Shrub
81.	<i>Mirabilis jalapa</i>	Four o'clock flower	Nyctaginaceae	Herb
82.	<i>Moringa oleifera</i>	Drumstick	Moringaceae	Tree
83.	<i>Mukia maderaspatana</i>	Madras Pea Pumpkin	Cucurbitaceae	Climber
84.	<i>Murraya paniculata</i>	Orange Jasmine	Rutaceae	Shrub
85.	<i>Murraya koenigii</i>	Curry leaf tree	Rutaceae	Tree
86.	<i>Musa × paradisiaca</i>	Banana	Musaceae	Shrub
87.	<i>Mussaenda frondosa</i>	Dhobi tree	Rubiaceae	Shrub
88.	<i>Myristica fragrans</i>	Nutmeg	Myristicaceae	Tree
89.	<i>Nephelium lappaceum</i>	Rambutan	Sapindaceae	Tree
90.	<i>Nerium oleander</i>	French willow	Apocynaceae	Shrub
91.	<i>Nyctanthes arbor-tristis</i>	Parijatham	Oleaceae	Shrub
92.	<i>Nymphaea nouchali</i>	Blue Water-lily	Nymphaeaceae	Aquatic herb
93.	<i>Passiflora edulis</i>	Passion fruit	Passifloraceae	Climber
94.	<i>Passiflora foetida</i>	Buah Passion Fruit	Passifloraceae	Climber
95.	<i>Pentas lanceolata</i>	Egyptian starcluster	Rubiaceae	Shrub
96.	<i>Peperomia pellucida</i>	pepper elder	Piperaceae	Herb
97.	<i>Phyllanthus amarus</i>	Carry me seed	Phyllanthaceae	Herb
98.	<i>Phyllanthus emblica</i>	Indian gooseberry	Phyllanthaceae	Tree
99.	<i>Phyllanthus myrtifolius</i>	Mousetail plant	Phyllanthaceae	Shrub
100.	<i>Pimenta dioica</i>	All Spice	Myrtaceae	Tree
101.	<i>Piper longum</i>	Long pepper	Piperaceae	Climbing shrub
102.	<i>Pistia stratiotes</i>	Water lettuce	Araceae	Herb
103.	<i>Plumbago auriculata</i>	Blue plumbago	Plumbaginaceae	Shrub
104.	<i>Plumeria pudica</i>	Bridal bouquet	Apocynaceae	Shrub
105.	<i>Polyalthia longifolia</i>	False ashoka	Annonaceae	Tree
106.	<i>Polyscias fruticosa</i>	Ming aralia	Araliaceae	Shrub
107.	<i>Pouteria campechiana</i>	Canistel	Sapotaceae	Tree
108.	<i>Pouzolzia zeylanica</i>	Pozolz's bush	Urticaceae	Herb
109.	<i>Psidium guajava</i>	Common guava	Myrtaceae	Tree
110.	<i>Scadoxus multiflorus</i>	Blood lilly	Amaryllidaceae	Herb
111.	<i>Spathiphyllum wallisii</i>	Peacelilly	Araceae	Herb
112.	<i>Spathoglottis plicata</i>	Philippine ground orchid	Orchidaceae	Shrub
113.	<i>Stenotaphrum secundatum</i>	St. Augustine grass	Poaceae	Grass
114.	<i>Syzygium cumini</i>	Black plum	Myrtaceae	Tree
115.	<i>Tabernaemontana divaricata</i>	Crape jasmine	Apocynaceae	Shrub
116.	<i>Thottea siliquosa</i>	Alpam	Aristolochiaceae	Shrub
117.	<i>Thuja occidentalis</i>	White cedar	Cupressaceae	Tree
118.	<i>Thunbergia grandiflora</i>	Blue sky flower	Acanthaceae	Climbing shrub
119.	<i>Torenia bicolor</i>	Kakkapoovu	Scrophulariaceae	Herb

120.	<i>Tradescantia spathacea</i>	Oyster plant	Commelinaceae	Herb
121.	<i>Tridax procumbens</i>	Coatbuttons plant	Asteraceae	Herb
122.	<i>Turnera ulmifolia</i>	Yellow alder	Passifloraceae	Shrub
123.	<i>Tylophora asthmatica</i>	Indian ipecac	Apocynaceae	Climber
124.	<i>Zeuxine longilabris</i>	Long-lipped Zeuxine	Orchidaceae	Herb
125.	<i>Zingiber officinale</i>	Ginger	Zingiberaceae	Rhizomatous herb
126.	<i>Zinnia elegans</i>	Common Zinnia	Asteraceae	Herb
127.	<i>Ziziphus jujuba</i>	Jujube	Rhamnaceae	Tree

List of Butterflies

Sl.No.	Scientific name	Common Name
Family Papilionidae		
1	<i>Pachliopta hector</i>	Crimson rose
2	<i>Papilio demoleus</i>	Lime butterfly
3	<i>Troides minos</i>	Sahyadri birdwing
4	<i>Papilio polytes</i>	Common mormon
Family Pieridae		
5	<i>Captopsilia Pomona</i>	Common emigrant
6	<i>Eurema hecabe</i>	Common grass yellow
7	<i>Leptosia nina</i>	Psyche
Family Nymphalidae		
8	<i>Euploea core</i>	Common Indian crow
9	<i>Parantica aglea</i>	Glassy blue tiger
10	<i>Tirumala limniace</i>	Blue tiger
11	<i>Junonia iphita</i>	Chocolate pansy
12	<i>Melanitis leda</i>	Common evening brown
13	<i>Mycalesis mineus</i>	Dark branded bush brown
14	<i>Mycalesis perseus</i>	Common bush brown
15	<i>Orsotrioena medus</i>	Medus brown
16	<i>Ypthima baldus</i>	Common five-ring
17	<i>Ypthima huebneri</i>	Common four-ring
18	<i>Ypthima ceylonica</i>	Ceylon four-ring
Family Lycaenidae		
19	<i>Jamides celeno</i>	Common cerulean
20	<i>Zizina otis</i>	Lesser grass blue
21	<i>Rathind aamor</i>	Monkey puzzle
Family Hesperidae		
22	<i>Borbo cinnara</i>	Rice swift
23	<i>Gangara thyrasis</i>	Giant red eye

List of Birds

Sl. No.	Common Name	Scientific Name	Family
1	House crow	<i>Corvus splendens</i>	Corvidae
2	Large-billed crow	<i>Corvus macrorhynchos</i>	Corvidae
3	Common tailorbird	<i>Orthotomus sutorius</i>	Cisticolidae
4	Plain prinia	<i>Prinia inornata</i>	Cisticolidae
5	Glamorous reed warbler	<i>Acrocephalus stentoreus</i>	Acrocephalidae
6	Barn swallow	<i>Hirundo rustica</i>	Hirundinidae
7	Red-whiskered bulbul	<i>Pycnonotus jocosus</i>	Pycnonotidae
8	Common myna	<i>Acridotheres tristis</i>	Sturnidae
9	Oriental magpie-robin	<i>Copsychus saularis</i>	Muscicapidae
10	Pale-billed flowerpecker	<i>Dicaeum erythrorhynchos</i>	Dicaeidae
11	Purple-rumped sunbird	<i>Leptocoma zeylonica</i>	Nectariniidae
12	Purple sunbird	<i>Cinnyris asiaticus</i>	Nectariniidae
13	Loten's sunbird	<i>Cinnyris lotenius</i>	Nectariniidae
14	Paddyfield pipit	<i>Anthus rufulus</i>	Motacillidae
15	Feral pigeon	<i>Columba livia domestica</i>	Columbidae
16	Greater coucal	<i>Centropus sinensis</i>	Cuculidae
17	Asian koel	<i>Eudynamis scolopaceus</i>	Cuculidae
18	Indian swiftlet	<i>Aerodramus unicolor</i>	Apodidae
19	White-breasted waterhen	<i>Amaurornis phoenicurus</i>	Rallidae
20	Red-wattled lapwing	<i>Vanellus indicus</i>	Charadriidae
21	Little tern	<i>Sternula albifrons</i>	Laridae
22	Whiskered tern	<i>Chlidonias hybrida</i>	Laridae
23	Little cormorant	<i>Microcarbo niger</i>	Phalacrocoracidae
24	Indian cormorant	<i>Phalacrocorax fuscicollis</i>	Phalacrocoracidae
25	Purple heron	<i>Ardea purpurea</i>	Ardeidae
26	Intermediate egret	<i>Ardea intermedia</i>	Ardeidae
27	Great egret	<i>Ardea alba</i>	Ardeidae
28	Little egret	<i>Egretta garzetta</i>	Ardeidae
29	Indian pond heron	<i>Ardeola grayii</i>	Ardeidae
30	Black-crowned night heron	<i>Nycticorax nycticorax</i>	Ardeidae
31	Black-headed ibis	<i>Threskiornis melanocephalus</i>	Threskiornithidae
32	Brahminy kite	<i>Haliastur indus</i>	Accipitridae
33	Common kingfisher	<i>Alcedo atthis</i>	Alcedinidae
34	Stork-billed kingfisher	<i>Pelargopsis capensis</i>	Alcedinidae
35	White-throated kingfisher	<i>Halcyon smyrnensis</i>	Alcedinidae
36	Pied kingfisher	<i>Ceryle rudis</i>	Alcedinidae
37	Asian green bee-eater	<i>Merops orientalis</i>	Meropidae
38	Blue-tailed bee-eater	<i>Merops philippinus</i>	Meropidae

39	Coppersmith barbet	<i>Megalaima haemacephala</i>	Megalaimidae
40	White-cheeked barbet	<i>Megalaima viridis</i>	Megalaimidae
41	Greater flameback	<i>Chrysocolaptes guttacrastatus</i>	Picidae
42	Common Flameback	<i>Dinopium javanense</i>	Picidae
43	Black-rumpedflameback	<i>Dinopium benghalense</i>	Picidae
44	Rose-ringed parakeet	<i>Psittacula krameri</i>	Psittaculidae
45	Indian golden oriole	<i>Oriolus kundoo</i>	Oriolidae
46	Black drongo	<i>Dicrurus macrocercus</i>	Dicruridae
47	Ashy drongo	<i>Dicrurus leucophaeus</i>	Dicruridae
48	Greater racket-tailed drongo	<i>Dicrurus paradiseus</i>	Dicruridae
49	Rufous treepie	<i>Dendrocitta vagabunda</i>	Corvidae

List of Mammals

Sl. No.	Common Name	Scientific Name	Family
1.	Palm civet	<i>Paradoxurus hermaphroditus</i>	Viverridae
2.	Grey mongoose	<i>Herpestes edwardsii</i>	Herpestidae
3.	Layard's striped squirrel	<i>Funambulus Layardi</i>	Sciuridae
4.	Lesser bandicoot-rat	<i>Bandicota bengalensis</i>	Muridae
5.	House rat	<i>Ratus rattus</i>	Muridae
6.	House mouse	<i>Mus musculus</i>	Muridae
7.	Indian flying fox	<i>Pteropus giganteus</i>	Pteropodidae
8.	Fulvous fruit bat	<i>Rousettus leschenaulti</i>	Pteropodidae

Other Vertebrates and invertebrates

Being closer to the river, the campus habitat harbours many species of reptiles, amphibians and mammals. Systematic and seasonal study would add many interesting species to the campus checklist. From the rapid assessment and discussions with the campus inmates the following species were sighted in the campus area.

The reptiles found in the campus includes, common garden lizard, Monitor Lizard, common skink and snake varieties such as Indian cobra (*Naja naja*), Rat snake (*Ptyas mucosa*), Common krait, Wolf snake (*Lycodon aulicus*), Checkered keelback (*Xenochrophis piscator*), Common vine snake (*Ahetulla nasuta*) and Common kukri snake (*Oligodon arnensis*)

In addition to the above, the campus has good diversity of butterflies and moth, dragonflies and damselflies, spiders and many other pollinators and plant pest insects.

Recommendations

- Since the location of the campus has proximity to the River Periyar, it is recommended to choose soil-binding native trees (eg. *Madhuca neriifolia* - Aattiluppa, *Humboldtia vahliana* - Karapunna/Attuvanji, *Benstonea thwaitesii*-Screwpine/Kaitha, *Ochlandra scriptoria* - Bamboo Reed, *Bambusa bambos* - Bamboo) and shrubs where ever it is required replanting.
- Towards the riverine part of the campus, adequate care may be taken to preserve the ecological balance, particularly the erosion.
- Few native trees that can be planted inside the campus include *Crateva magna* - Neermathalam, *Thespesia populnea* - Poovarasu/Pooparuthi, *Vateria indica* - Vellapine, *Hydnocarpus pentandra* - Marotti, *Carallia brachiata* - Kara, *Cinnamomum riparium* - Cheru vayana, *Calophyllum inophyllum* - Punna.etc.)
- Periodic monitoring and removal of alien and invasive species would enhance restoration of native and wetland species.
- Allow natural regeneration of the endemic and native species wherever it is possible.
- Garden wastes out of trimming and disposal of excess seedlings should be done carefully to avoid further invasion into the natural areas.

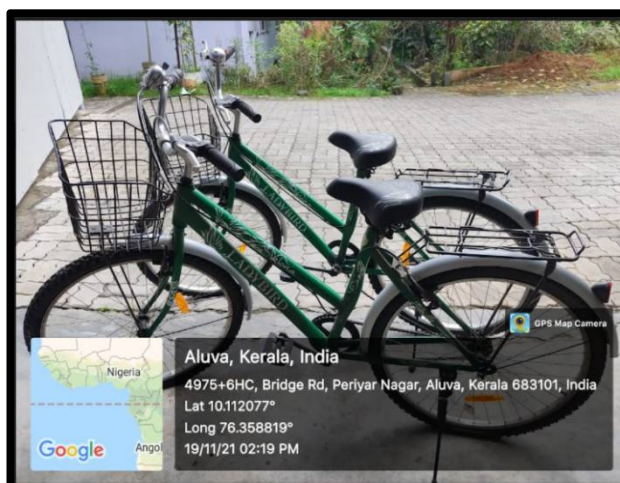
Conclusion

Academic Institutions, especially colleges and universities in India are known for their rich and diverse campus establishments. Most of these establishments are found to have supported the coexistence of natural landscapes in the form of plantations and gardens simultaneously with the built up areas. The institutions that located in urban areas with such natural as well as plantation landscapes have proven themselves to be the lungs of the surrounding areas. St Xavier's College for women is located in the heart of Aluva town with its diverse and rich biodiversity components and no doubt it contributes significantly to the ecological and environmental services to the town.

VI. GREEN INITIATIVES

Apart from disseminating education and influencing society through awareness, St. Xavier's has established amazing and unique programmes aimed at contributing to the environment in a variety of ways. Some of the major green initiatives of the campus are as follows:

1. **Bicycles:** Three bicycles are kept on the college campus to educate students about the importance of using fuel-free vehicles and are distributed to staff and students for use on campus.



2. **Plastic free campus:** An awareness campaign is conducted by the NSS Unit of the campus for reducing the use of plastic in the campus. As part of this a green protocol is maintained and green army is formed in order to monitor the plastic use.



3. **Distribution of paper bag:** A paper bag design competition is conducted by the Bhoomithrasena club of the college, and the collected bags are distributed in and outside the campus. Around 5000 paper bags are prepared by the students.
4. **Installation of Off-Grid Solar panel:** An Off-Grid Solar panel is installed on the top of the college main building, in order to reduce the dependence of college to electrical energy.



5. **Shifting of LED bulbs:** A notable initiative in the campus is the shifting of regular bulbs and tubes to LED bulbs. 25 percent of regular bulbs and tubes are replaced to reduce power consumption.
6. **Rainwater Harvesting:** The campus has an efficient rainwater harvesting plant to harvest the rainwater. This is the main source of water for cleaning and gardening purposes.



7. **Biogas plant:** There is a biogas plant, which decompose the degradable waste produced within the campus in a healthy manner. The gas produced by the plant is used for cooking in the college hostel.



8. **Environment Audit Survey:** The Department of Economics has carried out an environment audit survey by preparing datasheets to collect data from the students of the department.
9. **Lockdown birding challenge:** A birding challenge was organized by the Zoology Department in association with Popular Citizen Science Event and *ebird.org* from 27 March to 16 May 2020. Lakshmi Satyapal of I B.Sc. Zoology Model 1 could contribute for 48 days in a stretch and she deserved a special mention in the *birdcount.in* website for her contributions.
10. **Micro green challenge:** The community extension program of the college has arranged a **Microgreen challenge** in association with the Zoology Department and NSS Unit. Dr.Revathy.S, Assistant Professor, Department of Zoology also gave a radio talk in *Radio Suno Qatar FM* on microgreens and their importance for health on 28- 04-2020.

12. World Water Day Celebration: The World Water Day was celebrated by conducting “*water2me campaign*”, on 18th December 2020 for the wise-use and conservation of water resources.

13. Water for birds: A project named “*Kulirekam Kulirmayekam*” was launched on March 16th 2021 by placing water filled pots to feed birds.



14. Execution of software: The College has set up software named as ‘**Likha**’ for the academic management and the administrative sector has been moved to e-governance in all areas because of the software for administrative purposes and thereby reduce the paper waste.

15. ACADEMIA 2020-21: The college celebrates an Academic Week (ACADEMIA) every year with a theme and the modus operandi works on three level: Institutional, Departmental and Students. In 2020-21 academic year, the institution adopted “**Environmental Concerns**” as a theme, which is a global issue. At institutional level the theme of the academic week was **Health@Habitat**. Behalf of this, a number of lecture series was conducted by different departments on the theme via online. Apart from lecture series various green programmes are also organized by the departments by participating students.

16. Green outreach programmes: A number of green outreach programmes are conducted within the campus and nearby areas including Cochin Corporation and Aluva Municipality. Some of them are:

- i) Mangrove Conservation:** A programme for the conservation of mangroves was proposed by the College and the saplings of mangroves were prepared by the students at Vaduthala, Kochi on 9th February 2021



- ii) Clean Kochi Drive:** As part of GREEN KOCHI MISSION, the NSS Unit of the College took part in the Clean Kochi Drive by cleaning Kaloor 44 Division, Ernakulam.



- iii) Green election campaign:** During the 2020 Panchayath Elections, students from our campus worked to raise awareness about the Green Election. The students of the college gave an awareness class for Grama Panchayat Authority about the need of Green Protocol in the whole election process.

VII. SWOC ANALYSIS

SWOC analysis is a framework for identifying and analysing the strengths, weaknesses, opportunities, and challenges of an organization. It aids in the process of planning for improvement, competitiveness, and excellence. SWOC analysis of an Environmental Audit in college can result in an efficient green strategy that can positively impact management's decision-making procedures. It aids in the development of proper management initiatives, demands, and expectations in the pursuit of environmental sustainability.

The analysis revealed the institution's potential for developing a suitable and eco-friendly campus. Based on the SWOC analysis, it is possible to create a green management plan that can be integrated into St. Xavier's broad range of prosperity. Based on the identified weaknesses and challenges, appropriate corrective actions can be taken. Thus, the analysis serves as a foundation for revising or updating the environmental policy. The SWOC analysis is expected to sharpen and increase the precision of Environmental Audit as a tool for moulding the path to environmental sustainability of the institution.

Domain	Strength	Weakness	Opportunity	Challenge
Energy	<ul style="list-style-type: none"> • Green initiatives and best practices to conserve energy • Provision for tapping further renewable energy (solar power and biogas) • General awareness and energy consciousness of campus • Conducive climate and geographical position • Environment stewardship and social commitment 	<ul style="list-style-type: none"> • Over dependence on non-renewable energy sources • Lack of standardised system to account carbon footprint 	<ul style="list-style-type: none"> • Further potential for extracting renewable energy (solar power, wind energy, hydro power and waste derived biogas) • Human resource utilisation for energy consumption monitoring and carbon accounting • Opportunity to reduce carbon footprint • Possibility to implement energy management system 	<ul style="list-style-type: none"> • Increasing energy demand • Carbon emission accounting • Increase in transportation • Infrastructure development • Carbon neutral campus
Water	<ul style="list-style-type: none"> • Rain water harvesting potential • Year-round water resources • Water storage facility and groundwater recharge • Geographical location facilitating water drainage and storage 	<ul style="list-style-type: none"> • Underutilization of roof-top rainwater harvesting potential 	<ul style="list-style-type: none"> • Scope for Increased rain water harvesting • Grey-water recycling 	<ul style="list-style-type: none"> • Increasing per capita water usage • Waste water generation and treatment • Pollution-testing and prevention

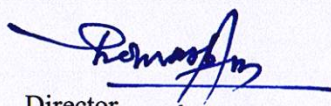
	<ul style="list-style-type: none"> • Campus-wide awareness and consciousness • Green water initiatives 			
Waste	<ul style="list-style-type: none"> • Food waste derived biogas generation facility • Green policies and initiatives • Plastic ban • Emphasis on digital platforms • Existence of institutional green policy 	<ul style="list-style-type: none"> • Lack of periodic appraisal of waste generation 	<ul style="list-style-type: none"> • Biodegradable waste derived energy production potential • Waste to wealth programmes • Waste derived bio-fertiliser production 	<ul style="list-style-type: none"> • E-waste generation and disposal • Reduction of paper usage and wastage • Waste minimisation through reuse, reduce and recycling
Biodiversity	<ul style="list-style-type: none"> • Geographical position • Substantial floral and faunal diversity • Natural tranquillity • General campus attitude to live with nature • Sense of belonging and compassion towards nature • Agroforestry practices 	<ul style="list-style-type: none"> • Disproportion of native vegetation • Limited conservation area • Lack of sufficient technical knowledge 	<ul style="list-style-type: none"> • Green initiatives to foster rare and endemic plants and animals • Butterfly park or garden • Medicinal plant garden 	<ul style="list-style-type: none"> • Resource utilisation • Infrastructure development • Developments in the surroundings (e.g. railway and roads)

ENVIRONMENTAL AUDIT CERTIFICATE

The Environmental Audit presented herein was carried out in accordance with accepted standard procedures mandated for environmental audits and academic institution governance. The college provided the necessary information for assessment, which greatly aided in drawing audit conclusions. The data provided has been thoroughly assessed and clarified using the available documents. The institution enthusiastically supported the physical inspection and interviews. Interactions were held on a regular basis with college authorities, selected faculty and administrative staff members.

The green policy and audit process have been set to ensure that St. Xavier's academic and administrative communities adhere to good practices and derived values. The institution's potential and work habits, provide strength for the implementation of the much-desired environmental cause. The environment friendly approach to resource utilisation (water and energy), waste management, biodiversity conservation and best practices are admirable. It is also found that the pollution status (environmental quality) is highly appreciable, and the quality indicator values are clearly within national standards.

The healthy practices and steps taken up by the college can help to maintain its green status as a model of environmental sustainability.



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