SIR SYED COLLEGE,
TALIPARAMBA, KANNUR, KERALA

Green Campus Audit Report

Biodiversity, Carbon, Energy, Water and Waste Management

2023-2024

KERALA STATE BIODIVERSITY BOARD

KERALA STATE BIODIVERSITY BOARD

Certificate of Green Campus Audit

This is to certify that **"Sir Syed College,** Karimbam Post, Taliparamba, Kannur, Kerala, 670142" has successfully undergone **"Green Campus Audit"** from April, 2024 to June 2024, to assess the green initiatives and efforts carried out by the college to keep the Campus environment friendly so as to fullfill the respective components of Sustainable Development Goals (SDGs).

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Audit team & Prepared by

Dr. Vimalkumar C.S.
Principal Scientific Officer, KSBB

Dr. Sreedharan K.
Research Officer, KSBB

Dr. Baijulal B.
Senior Research Officer, KSBB

Dr. Akhila S. Nair
Senior Research Officer, KSBB

Design & Layout
Praveen K. P

Green Audit Committee - Sir Syed College

Adv. P Mahamood Manager

Dr. Ismail Olayikkara Principal

Bushra N, Asst. Prof. Zoology, Green Auditing Convener

Dr. Tajo Abraham, Asst. Prof.,Dept. of Botany IQAC Coordinator

Members

Dr. Abdussalaam,
Asst. Prof., Dept of Botany
Dr. Sreeja P, Asst. Prof.Botany
Dr. Shackira AM, Asst. Prof. Botany
Dr. Gayatri R Nambiar,
Asst. Prof.of Botany
Jazeel K, Asst. Prof. Botany
Sneha C, Asst. Prof. Forestry
Azhar Ali A, Asst. Prof. Forestry
Dr. Siraj PP, Asst. Prof.Commerce

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Kerala State Biodiversity Board
Kailasam, T.C.24/3219, No. 43,
Belhaven Gardens, Kowdiar P.O.,
Thiruvananthapuram - 695 003
Ph.No: 0471 - 2724740
E-mail ID - keralabiodiversity@gmail.com
Website - www.keralabiodiversity.org

Content

Executive Summary

Green auditing was conducted at Sir Syed College, Taliparamba, Kannur District, Kerala. In this comprehensive study, environmental practices and sustainability was meticulously examined across five key domains: Biodiversity, energy, carbon storage, water quality and waste management. The biodiversity audit highlights the importance of preserving and enhancing campus's ecological diversity, recommending initiatives such as green spaces development, native plant promotion, and conservation programs.The floristic analysis of revealed the presence Herbs (71 Nos), Shrubs (21 Nos), Trees (72 Nos), Aroids (10 Nos), Ferns (27 Nos) and Bamboos (15 Nos.). The number of Trees species in the campus has higher, followed by herbs and Shrubs.It also indicated that, the campus is rich in plant diversity with uniform distribution.

The faunal aspects covered in the assessment include selected groups of invertebrates and vertebrates. Butterflies and moths, Dragonflies and Damselflies are the invertebrate groupsconsidered while birds and mammals under vertebrates. Different habitats and rich vegetation with varieties of garden and flowering species attract good diversity of butterflies into the campus. A total of 86 species of butterflies were noted during the assessment. They belong to five different families such as Hesperidae, Lycaenidae, Nymphalidae, Papilionidae, Pieridae. A total of 40 species of birds belong to 24 families were noted. The campus habitat harbours many species of reptiles, amphibians and mammals. 18spiders were found belongs to 11 families.

In the energy audit's analysis phase, provided a comprehensive understanding of the institution's energy landscape, including sources and consumption patterns. Total energy use and equipment consumption were assessed to identify potential efficiency improvements. Data from different sectors were scrutinized based on criteria like energy-saving potential, costs, payback time, technical feasibility, and compatibility. This strategic framework established energy-saving measures by identifying consumption patterns. Overall, the analysis phase offered a holistic overview of the college's energy usage, guiding actionable recommendations for enhanced efficiency and sustainability.

Water audit evaluates water use and management practices of the institution and identify interventions for improved water use efficiency. This study help to reduce water consumption for different sections in the institution and identify and quantify the areas of excessive water usage and water losses, suggest ways and means for reduction in water use and losses.

A carbon audit is a comprehensive assessment of an organization's carbon footprint, which is the total amount of greenhouse gases, primarily carbon dioxide, emitted directly or indirectly as a result of its activities. The audit involves quantifying the emissions associated with various aspects of an organization's operations, including energy consumption, transportation, waste management, and other relevant factors.

The audit provides valuable insights into commuting habits and their environmental impact. The limited use of personal vehicles and cycling, along with a high reliance on motorized transport—even for short distances—highlights the need for enhanced infrastructure and incentives to promote sustainable commuting, including the adoption of electric vehicles (EVs). By addressing these issues and encouraging eco-friendly transportation options, Sir Syed College can play a crucial role in reducing its carbon footprint, improving student health, and fostering a more sustainable campus environment.

The audit team could observe that the college has implemented a number of green initiatives to ensure the sustainable management of both biodegradable and nonbiodegradable wastes in the campus. There were programs also conducted to make the students and teachers aware of the importance of sustainable waste management. The college Bhoomithrasena club is taking care to maintain the cleanliness of the campus by all its possible ways. The practices, findings, remarks, and recommendations emphasized in this waste management audit report will help to improve the waste management practices and resource usage at the college. This may help to guide the authorities in framing appropriate strategies for a green campus and sustainable environment.

The college has launched distinctive and impactful green initiatives and outreach programs aimed at fostering environmental sustainability and enhancing human well-being, involving not only the student community but also staff and the general public. As part of the audit, these initiatives and outreach activities have been meticulously identified and documented, underscoring their significance as indicators of the college's dedication to environmental stewardship and societal responsibility.

Collectively, these audits serve as a holistic roadmap for transforming campus into a model of environmental responsibility and sustainability. By integrating the recommendations outlined in this report, we not only enhance the ecological integrity of the institution but also foster a culture of environmental awareness and responsibility among students, faculty, and staff. This comprehensive approach positions institution as a leader in the pursuit of a greener, more resilient future, aligning with global sustainable development goals (SDGs), Kunming-Montreal Global Biodiversity Framework and showcasing our dedication to creating a positive impact on both the local and global environment.

Introduction

Global warming and climate change pose significant threats to our planet and demand immediate attention and action. The consequences of these phenomena are far-reaching, with rising temperatures, erratic rainfall patterns, and more frequent extreme weather events wreaking havoc on ecosystems, wildlife, and human livelihoods. The impact of climate change is not limited to environmental concerns alone; it also exacerbates vulnerabilities and inequalities, hitting marginalised communities the hardest. Displacement and conflicts arise as people are forced to migrate due to the adverse effects of climate change, further destabilising societies. Additionally, climate change is linked to the spread of diseases, as altered weather patterns create favourable conditions for disease vectors and infectious agents to thrive, exemplified by the COVID-19 pandemic. Urgent action is imperative to mitigate the catastrophic consequences of climate change. This includes reducing greenhouse gas emissions, transitioning to renewable energy sources, enhancing resilience to climate impacts, and adopting sustainable practices across various sectors. In the fight against climate change, industries and other institutions can play a pivotal role by incorporating green auditing into their operations. **Considering its importance, the National Assessment and Accreditation Council (NAAC) made a rule that all higher education institutions in India must do a green audit. This is important because NAAC gives a grade to institutions that shows how good their education, facilities, research etc. Now, with the green audit, it also reflects how well they're taking care of the environment.**

Green auditing is a rigorous and methodical procedure that encompasses a thorough evaluation of an organization's environmental performance, scrutinises its adherence to environmental regulations, and assesses its commitment to sustainable practices. Green auditing helps to establish accountability, foster transparency, and promote sustainability across diverse sectors, including industries, organizations, and institutions.

Green audits within educational institutions play a dual role. On one hand, they meticulously examine and evaluate the ecological impact of the institution's operational endeavours, thereby promoting the adoption of sustainable practices. This includes scrutinising resource consumption, waste management, and energy efficiency, among other factors. On the other hand, green audits impart a profound educational experience upon students, instilling within them a sense of environmental responsibility. As students witness their campus embracing environmentally conscious measures, they are encouraged to incorporate similar principles into their own lifestyles. Furthermore, the impact of green audits extends beyond immediate tangible results. These audits contribute to the creation of "green campuses," where the physical environment is consciously moulded to align with sustainable principles. Such campuses exemplify a holistic commitment to environmental welfare, often characterised by energy-efficient buildings, green spaces, waste reduction initiatives, and sustainable transportation options.

The concept of green institutions should not be confined only within the Institution and should be extended to the surrounding areas. In this way, various "inreach" programs or internal-focused initiatives and outreach programs can be conducted as part of spreading the concept of green institutions to rural, tribal and urban communities. Such programs are for activities focused on green enterprise development and environmental protection. Academic research projects, dissertations and theses can be linked to such activities as part of promoting the concept of green colleges for educational institutions and such a trend should be encouraged among students and staff members. Such outreach programs can be implemented in a more efficient manner by integrating them with existing government schemes related to biodiversity conservation. Public scepticism about government schemes related to biodiversity conservation activities is prevalent, especially in rural areas. Hence, government schemes aimed at reaching rural areas to provide clean and safe water, along with initiatives for the conservation of biodiversity and education about the importance of sanitation, will help to inculcate a sense of environmental responsibility among stakeholders and build such a society. In today's rapidly changing world, the imperative for sustainable practices has become increasingly evident, urging institutions to rethink their approach towards environmental stewardship. Colleges, as pivotal centers of education and community influence, stand at the forefront of this paradigm shift. Green auditing emerges as a proactive strategy for colleges to assess and enhance their environmental performance, offering a structured framework to integrate sustainability principles into their core operations. By undertaking green audits, colleges embark on a journey towards fostering environmental awareness, resource efficiency, and sustainable practices within their campuses.

Green Auditing – Definition

Green auditing, also known as environmental auditing or sustainability auditing, is a process used by organizations to assess, measure, and evaluate their environmental performance and impact. The goal of green auditing is to identify areas where an organization can improve its environmental practices, reduce its ecological footprint, and operate more sustainably. This process typically involves reviewing and analyzing

various aspects of the organization's operations, such as energy usage, waste management, pollution control, and resource consumption. Green auditing often includes conducting site visits, collecting data, analyzing records, and engaging with stakeholders to gain a comprehensive understanding of the organization's environmental practices. Based on the findings of the audit, recommendations are made for implementing strategies and initiatives to enhance environmental performance and compliance with regulations and standards. Green auditing is an essential tool for organizations committed to sustainability and responsible environmental stewardship.

Green audit is the tool of management system used methodologically for protection and conservation of the environment. In a school setting, a green audit can play a crucial role in promoting environmental sustainability. This involves evaluating and managing various aspects of schools environmental impact. Parameters such as energy consumption, waste management, biodiversity conservation and water quality can be assessed to identify areas for improvement. Implementing eco-friendly practices such as energy efficient system, waste reduction strategies and water conservation measures contributes to a healthier environment within the school premises.

Comprehensive Objectives of Green Auditing in Educational Institutions

Green auditing in educational institutions serves as a pivotal tool for fostering sustainable practices, environmental responsibility, and holistic resource management. The overarching objectives encompass a multifaceted approach to environmental stewardship and sustainability within these institutions:

1. **Prudent Resource Utilisation:** Ensure the prudent utilisation of natural resources in alignment with national environmental policies, emphasizing responsible stewardship of resources among students, faculty, and staff.
2. **Safeguarding the Environment:** Curtail potential threats to human health and safeguard the environment by identifying, analysing, and mitigating environmental challenges while discerning the reciprocal impacts of the institution on its surroundings.
3. **Empowering Informed Decision-Making:** Furnish foundational data that empowers educational institutions to effectively evaluate and manage shifts, hazards, and risks within the environment, facilitating informed decision-making.
4. **Meticulous Environmental Performance Assessment:** Meticulously assess the institution's environmental performance, evaluating the efficacy of measures adopted to achieve predefined objectives and targets.
5. **Continuous Improvement:** Identify diverse pressures compelling educational institutions to enhance their environmental performance, fostering an ecosystem of continuous improvement in sustainability and harmony between the institution and its environment.

Key Elements of Green Auditing in Educational Institutions

1. **Comprehensive Evaluation:** Conduct a thorough assessment of the institution's environmental performance, covering resource usage, waste management, emissions, and compliance with environmental regulations.
2. **Systematic Approach:** Follow a structured and systematic process, including planning, data collection, analysis, risk identification, and development of improvement strategies.
3. **Data-Driven Objectives:** Adopt standardised criteria for green auditing objectives, tailored to the institution's goals and regulatory requirements, while addressing data challenges related to access, quality, and accuracy.
4. **Compliance and Adherence:** Assess the institution's compliance with environmental regulations and its commitment to sustainable practices, ensuring adherence to legal frameworks and responsible environmental practices.
5. **Objectivity and Independence:** Prefer external environmental audits conducted by independent teams with specialized skills, ensuring objectivity in the assessment of environmental performance.
6. **Long-Term Sustainability:** Recognize that green auditing is a long-term process aimed at achieving sustainable environmental change and improvement, acknowledging that significant changes may take time to implement effectively.
7. **Documentation and Verification:** Rely on supporting documents and verifiable information to ensure compliance with environmental requirements and regulatory standards.
8. **Integration with Management Systems:** Integrate green auditing into the institution's management systems, incorporating it as a vital tool for assessing, evaluating, and managing environmental performance within the educational framework.
9. **Goal-Oriented:** Align the institution's environmental performance with its environmental policy, goals, and objectives, ensuring compliance with relevant standards and regulatory requirements.
10. **Environmental Education and Engagement:** Disseminate environmental information among students and staff, conduct training and awareness programs, and foster engagement through green practices, competitions, and awards.
11. **Continuous Improvement Strategies:** Evaluate current practices, identify necessary adjustments, and develop targeted strategies for promoting sustainability within the institution, spanning areas such as resource consumption, energy efficiency, and waste reduction.

By embracing these objectives and elements, green auditing in educational institutions not only supports environmental conservation but also nurtures a culture of sustainability, knowledge dissemination, and responsible resource management among students, staff, and faculty.

Relevance for Conducting Green Auditing at Educational Institutions

In an era where environmental sustainability has become an imperative, educational institutions are increasingly recognizing their pivotal role in fostering a greener future. The concept of green auditing has emerged as a vital tool for assessing and enhancing

the ecological footprint of these institutions. Green auditing, a systematic assessment of an organization's environmental impact and resource consumption, has emerged as a vital instrument for educational institutions to align their operations with ecological sustainability. This detailed note explores the multifaceted relevance of conducting green auditing within educational institutions, emphasizing its significance in mitigating environmental footprint, promoting eco-literacy, and catalyzing positive changes that resonate far beyond campus borders.

Green auditing provides a structured framework to comprehensively assess an institution's Biodiversity, energy usage, water consumption, waste management practices, and overall carbon footprint. By identifying areas of excessive consumption and inefficiency, institutions can strategize targeted measures to minimize resource use, reduce waste generation, and lower their environmental impact. This not only aligns with global Sustainable DevelopmentGoals (SDGs) but also establishes the institution as a responsible steward of the environment. It serves as an educational tool itself, enabling individuals to understand the ecological consequences of their actions and decisions. When students are exposed to the real-world implications of wasteful practices, they are more likely to adopt environmentally friendly behaviors both within and beyond the campus. This cultivates a generation of environmentally aware citizens who are equipped to make informed choices and advocate for sustainable policies in their future endeavors.

Educational institutions often function as influential role models within their communities. By conducting green audits and subsequently implementing sustainable practices, these institutions send a powerful message to students, local businesses, and the general public about the importance of environmental stewardship. When a college or university demonstrates its commitment to sustainability through actions such as energy-efficient infrastructure, waste reduction initiatives, and renewable energy adoption, it encourages others to follow suit. This ripple effect can catalyze broader societal changes and contribute to the normalization of sustainable practices.

Educational institutions are hubs of research and innovation, and green auditing can fuel interdisciplinary studies related to sustainability. Audits provide a wealth of data that can be used to explore innovative solutions to environmental challenges. From developing novel waste management techniques to investigating renewable energy integration, the audit findings can serve as a foundation for students and researchers to devise impactful projects that contribute to a more sustainable future.

Green auditing stands as a pivotal practice for educational institutions aiming to fulfill their role as agents of positive change in the realm of sustainability. By mitigating environmental impact, fostering eco-literacy, inspiring broader community action, enhancing resource efficiency, and contributing to innovation, educational institutions exemplify the transformative potential of green audits. In a world where environmental challenges demand collective efforts, these institutions emerge as beacons of hope, equipping current and future generations with the tools and knowledge needed to navigate the complex landscape of sustainability.

Green Campus Auditing and ISO Certification
Green Campus Auditing

Green campus auditing is a systematic process aimed at assessing and improving the environmental performance of educational institutions. The primary objectives are to enhance sustainability, reduce environmental impact, and promote eco-friendly practices. Key areas of focus in green campus auditing include:

1. Energy Management: Evaluating energy consumption patterns, identifying opportunities for energy efficiency, and reducing the carbon footprint.
2. Water Conservation: Assessing water usage, implementing conservation measures, and reducing water waste.
3. Waste Management: Analyzing waste generation, promoting recycling, and minimizing landfill contributions.
4. Sustainable Transportation: Encouraging the use of bicycles, walking, carpooling, and public transportation to reduce emissions.
5. Biodiversity and Landscaping: Enhancing green spaces, preserving native species, and promoting biodiversity on campus.
6. Awareness and Education: Educating the campus community about sustainability practices and fostering a culture of environmental stewardship.

ISO Certification

ISO certification involves adhering to internationally recognized standards that provide a framework for effective environmental and energy management. Two key ISO standards relevant to green campus auditing are:

1. ISO 14001 - Environmental Management Systems (EMS):
- Focuses on improving environmental performance by efficient resource use and waste reduction.
- Requires institutions to establish an environmental policy, identify environmental impacts, set objectives, and pursue continual improvement.
2. 2. ISO 50001 - Energy Management Systems (EnMS):
- Provides a framework for managing energy performance, efficiency, and consumption.
- Includes requirements for measuring, documenting, and reporting energy use.

Steps for Green Campus Auditing and ISO Certification

- Initial Assessment: Conduct a baseline evaluation of current environmental practices and performance.
- Planning: Develop an action plan with specific goals, timelines, and responsibilities.
- Implementation: Execute the action plan, focusing on areas such as energy efficiency, waste reduction, and water conservation.
- Monitoring and Measurement: Continuously monitor and measure the effectiveness of implemented strategies.
- Internal Auditing: Regularly conduct internal audits to ensure compliance with the action plan and ISO standards.

- Management Review: Review performance outcomes and make necessary adjustments for improvement.
- Certification: Engage a third-party certification body to audit and certify the campus for ISO 14001 or ISO 50001.
- Continuous Improvement: Implement feedback and continuously enhance environmental performance.

Benefits

- Environmental Performance: Improved sustainability and reduced environmental impact.
- Reputation: Enhanced reputation and stakeholder confidence.
- Cost Savings: Financial savings through efficient resource use.
- Compliance: Adherence to legal and regulatory requirements.

By conducting a thorough green campus audit and achieving ISO certification, educational institutions can demonstrate their commitment to environmental sustainability, promote eco-friendly practices, and achieve continuous improvement in their environmental performance

Different Green Auditing Components at Sir Syed College

About the College

A BRIEF HISTORICAL SKETCH

Sir Syed College, was established in 1967 by a handful of educational visionaries of Kannur under CDMEA (Cannanore District Muslim Educational Association) with a vision to impart moral and liberal education to the public, especially socio politically backward minority communities of North Malabar region. The college, named after Sir Syed Ahmed Khan, the founder of Aligarh Muslim University, was started in 1967 as a junior college under the University of Kerala. It came under the University of Calicut in 1968 and under Kannur University in 1996. The institution was re-accredited by NAAC with A grade in 2017. Today Sir Syed College is one of the biggest post graduate institutions under Kannur University. The college at present offers Undergraduate programmes in Botany, Chemistry, Forestry, Physics, Mathematics, Statistics, Zoology, Arabic, Economics, Functional English, History, Malayalam, Commerce and Multimedia and Communication; Post Graduate Programmes in Arabic, Botany, Chemistry, Physics and Commerce. Apart from that the departments of Botany, Chemistry and Commerce are research centers as well.

The college has a strength of 2219 students, 76 Faculty Members and 36 non-teaching staff. Thirty of the Faculties are Ph.D holders and 20 have M.Phil degrees. There are 19 research guides attached to the research departments of Chemistry and Botany and 29 Research Scholars are working under them. 32 scholars have been awarded Ph.D from these research centres so far (19 Botany, 9 Chemistry and 4 Hindi). Many Faculties are engaged in minor and major research projects funded by various agencies. The members of the faculty have contributed extensively to literature in their respective fields. 53 books have been published by the faculties out of which one has attained national award. About 500 research papers of faculties and students have been published in various international

and national journals. The Publication division of the college publishes the research journal, SEARCH. The college boasts of an extensive library with 42781 books, 80 journals and INFLIBNET facility. The other facilities offered by the college include Sir Syed IT Centre, UGC aided Coaching Centre, Career Guidance and Counselling Cell, Photostat Centre, Gymnasium, Health Club, Sports Pavilion, Ladies Retreat room etc. There are separate hostels for men and women and an indoor stadium funded by UGC with four courts. An ambitious project of the institution, the PG and Research block as GOLDEN JUBILEE BUILDING with four floors, is under construction.

The students are provided ample opportunities for co-curricular and extra curricular activities through National Cadet Corps, National Service Scheme and different clubs like Language Club, Farm Club, Forestry Club, Hindi Club. ED Club, Film Club, Music Club, Tourism Club, Literary Club, Media Club Cultural Forum, Arts Forum, Science Forum etc. The Internal Quality Assurance Cell, Tutorial Scheme, Grievance Redressal Cell, Parent Teachers Association, College Co-Operative Society etc. ensure that the students get an ideal environment congenial to bring out the best in them. The college office ensures that the maximum number of students get scholarships and endowments. Presently more than half of the students are enjoying the benefits of different scholarships and endowments.

Hortus Sir Syedicus, the district medicinal plants demonstration garden developed by the Garden Club and NSS with the financial aid of State Medicinal Plants Board is one of a kind under the Kannur University. Sir Syed College is a front runner in academics with the maximum number of students becoming toppers year after year. The college has also left its mark on account of its envious success, excellent performance and participation in the arts festivals and many a time students from this institution have represented the University and State at sports meets across the country.

The institution is extremely proud that in its 56 years of glorious existence it has stood true to its mission of changing the social fabric of North Malabar region. The role played by Sir Syed College is undeniable and pivotal in the cultural, political, economic and social mapping and development of the region.

Objectives

- To inspire the students to generate and disseminate new knowledge and to contribute constructively in the field of research.
- To emerge as an epic center of groundbreaking findings, with thrust given on research especially in areas of social utility.
- To motivate the students to bring out their creative potential and to nurture the spirit of critical thinking along with equipping them with the skills needed to adapt better to the changing global scenario.
- To constantly strive for a value-based holistic learning by integrating traditional and innovative learning practices to match the highest quality standards.
- To stress practical application of knowledge, attitudes and skills as well as to sensitize

and engage students in issues of gender equality, human rights and ecology in order to make them socially responsible citizens.
- To ensure inclusive education by making it accessible to all sections of society.
- To develop a sense of unity in all areas of knowledge

To uplift educationally, socially & economically underprivileged sections of the society of north Malabar region and to mold the society which is able to contribute to the national integration by providing affordable quality education while expanding our academic horizons to bring the institution at par with the leaders of higher education.

- Strive for excellence in education and research and prepare young minds for imbibing knowledge, skills, and sensitivity.

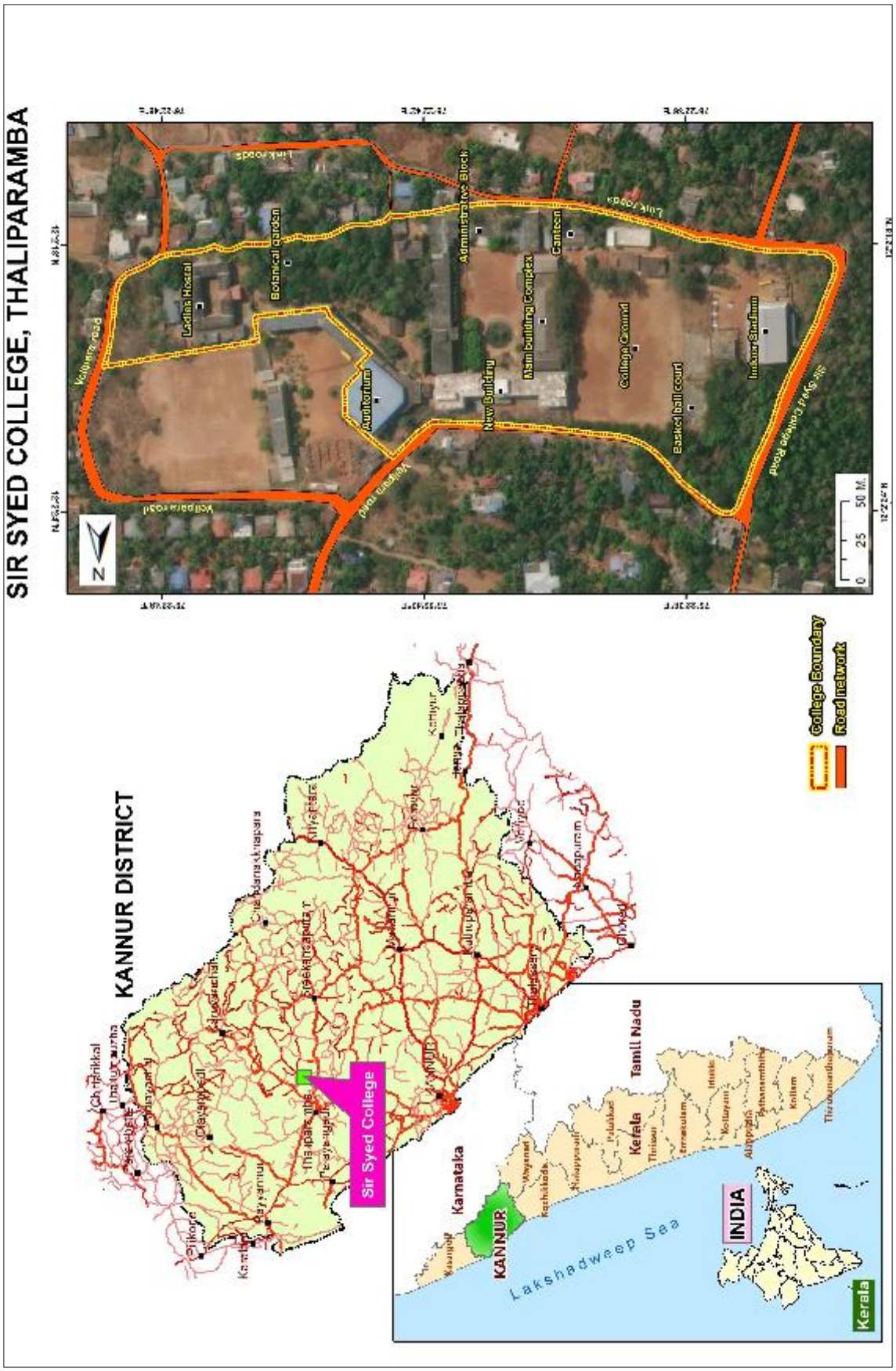


Fig. 1 Location map of Sir Syed College

Fig. 2 Accessibility map of Sir Syed College

Fig. 3. Google earth image of Sir Syed College

Fig. 4. Layout map showing infrastructure/basic information of Sir Syed College

Sir Syed College


We Share
Clean Air


Taliparamba,KL,India
Bacariya Nagar Road, Taliparamba, Taliparamba, 670142, KL, India
Lat 12.039012, Long 75.377929
05/02/2024 10:40 AM GMT+05:30
Note : Captured by GPS Map Camera


GPS Map Camera
Kannur, Kerala, India
29QH+P56, Kerala 670142, India
Lat 12.039051°
Long 75.378084°
02/05/24 11:07 AM GMT +05:30
Google


SUCCESSION LIST OF PRINCIPALS


SUCCESSION LIST OF PRINCIPALS


NCC
NCC
NCC
NCC

METHODOLOGY OF GREEN AUDIT

PRE - AUDIT ACTIVITIES

Select and Schedules
Facilities to Audit

Based on

- Selection criteria
- Priorities assigned

Select audit team members

- Confirm their availability
- Assignment audit responsibilities

Contact facility and plan audit

- Discuss audit program
- Obtain background information
- Prepare questionnaire (if necessary)
- Define scope
- Determine applicable requirement
- Note priority topics
- Modify or adopt protocols

ACTIVITIES AT SITE

Identify and understand management control system

- Review background information
- Opening meeting
- Orientation tour of facility
- Review audit plan
- Confirm understanding of internal controls

Assess management control systems

- Identify strengths and weaknesses of internal controls
- Adapt audit plan and resource allocation
- Define testing and verification strategies

Gather audit evidence

- Apply testing and verification strategies
- Collect data
- Ensure protocol steps are completed
- Review all findings and observations
- Ensure that all findings are factual
- Conduct further testing if required

Evaluate audit findings

- Develop complete list of findings
- Assembles working papers and documents
- Integrate and summarize findings
- Prepare report for closing meeting

Report findings to facility

- Present findings at closing meting
- Discuss findings with plant personnel

POST - AUDIT ACTIVITIES

Issues draft report

- Correct closing report
- Determine distribution list
- Distribute draft report
- Allow time for corrections

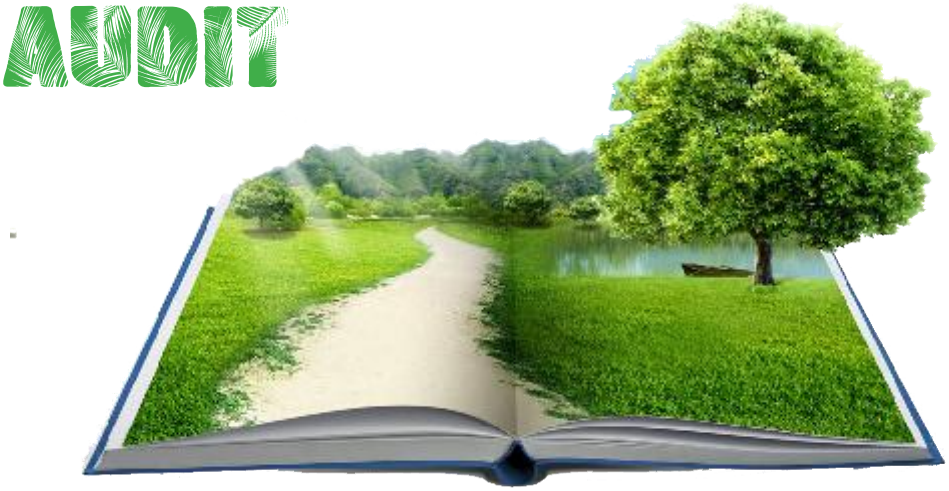
Issue final report

- Correct draft report
- Distribute final report
- Highlight requirement for action plan
- Determine action plan preparation deadline
- Action plan preparation and implementation
- Based on audit findings in final report

Follow-up on action plan

Source: International Chamber of Commerce- Position paper on Environmental Audit adopted November 29, 1989.

BIODIVERSITY AUDIT



Biodiversity, the variety of life on Earth, is essential for the functioning and stability of ecosystems, providing numerous ecological, economic, and social benefits. However, in recent years, biodiversity loss has become a significant global concern due to human activities, such as habitat destruction, overexploitation of natural resources, pollution, and climate change. To address this issue effectively, there is a growing need to assess and monitor biodiversity through comprehensive evaluations known as biodiversity audits.
Biodiversity assessment involves the systematic collection and analysis of data to quantify and understand the diversity of species, ecosystems, and genetic variability within a given area. It serves as a fundamental tool for identifying and evaluating changes in biodiversity over time, identifying critical habitats and species, and setting conservation priorities. Biodiversity audits, on the other hand, are the specific processes by which organizations, governments, or conservation groups evaluate and measure the status of biodiversity within a defined region, be it a specific ecosystem, protected area, or an entire country.
Flora assessment is a critical component of biodiversity audits, focusing specifically on the plant life within a given area. It involves the systematic inventory and evaluation of plant species, their distribution, abundance, and ecological roles. Flora assessment is crucial for identifying rare, endangered, or endemic plant species. Conservation efforts can then be targeted to protect these species and their habitats, ensuring the preservation of biodiversity.
Flora assessment plays a vital role in biodiversity audits as it provides crucial information about the plant life within an ecosystem. By understanding the diversity and distribution of plant species, conservationists and policymakers can make informed decisions to protect and manage ecosystems effectively, contributing to the overall preservation of biodiversity and ecological sustainability.

Biodiversity audit

A biodiversity audit is a comprehensive assessment of the variety of life forms within a specific ecosystem or geographical area. It involves documenting and analyzing the diversity of species, including plants, animals, fungi, and microorganisms, as well as

their habitats and ecological interactions. Biodiversity audits provide valuable insights into the health and resilience of ecosystems, helping to inform conservation efforts, land management strategies, and policy decisions. By quantifying and understanding the richness and distribution of species, biodiversity audits contribute to the preservation of biological resources and the maintenance of ecosystem services essential for human well-being.

Objectives

- To assess the vegetation and floral components
- To estimate the abundance of each species, such as rare, common, or dominant, to assess their ecological importance.
- To enumerate the invertebrate fauna (Birds/dragonflies/damselflies and butterflies)
- To document the vertebrate fauna (reptiles and mammals)
- To identify and document the invasive alien species
- To suggest suitable conservation measures

METHODOLOGY

FLORA ASSESSMENT:

- **Identify Plant Species:** Conduct plant surveys to identify and document plant species present on campus. Use field guides, expert botanists, and digital apps for species identification.
- **Collect Specimens:** Collect plant specimens for further identification and verification, if required.
- **Note Distribution:** Record the location of each plant species to create species distribution maps.
- **Quantify Abundance:** Estimate the abundance of each species, such as rare, common, or dominant, to assess their ecological importance.

FLORAL ASSESSMENT







Floristic Composition

Vegetation and floristics are the study of the composition, structure, and function of plant communities. It is an important tool for understanding and managing ecosystems. Vegetation and flora analysis can be used to understand how ecosystems function. By understanding the composition and structure of plant communities, we can better understand how they interact with other components of the ecosystem, such as soil, water, and wildlife. It can be used to monitor environmental change. By tracking changes in plant communities over time, we can identify the impacts of human activities, such as climate change, pollution, and deforestation. Besides, it can be used to plan land use by understanding the potential impacts of different land use practices on plant communities, we can make informed decisions about how to use our land in a sustainable way. It is important that, vegetation and flora analysis can be used to conserve biodiversity. By identifying areas with high biodiversity and understanding the factors that are important for their conservation, we can protect these important ecosystems.

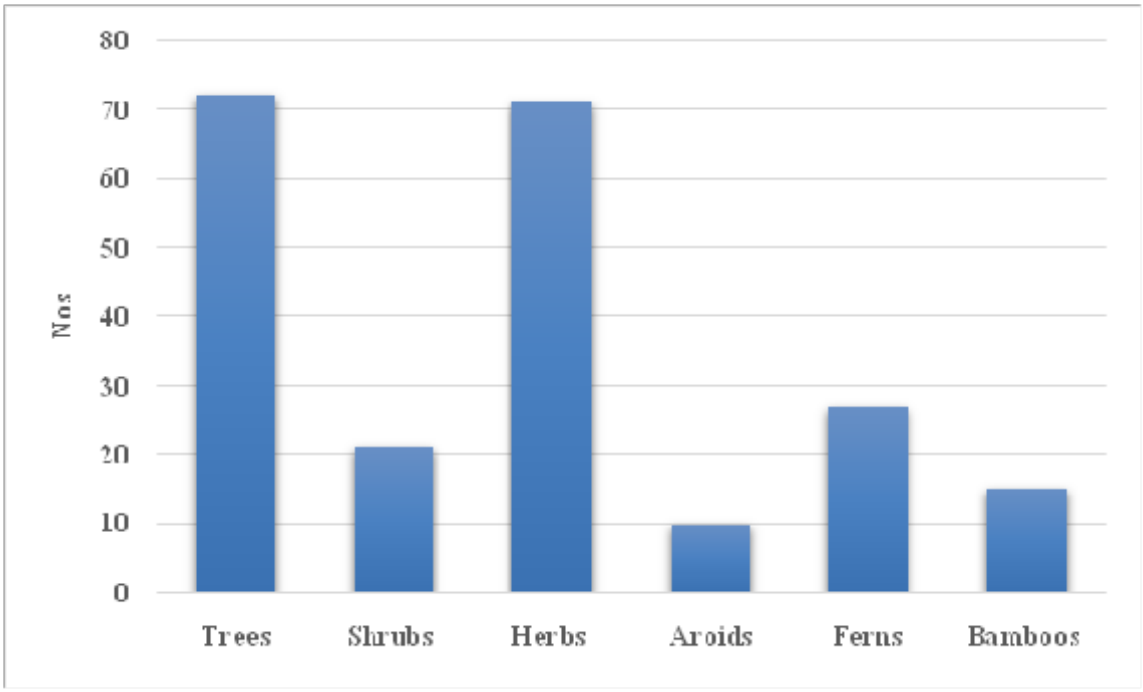
RESULTS

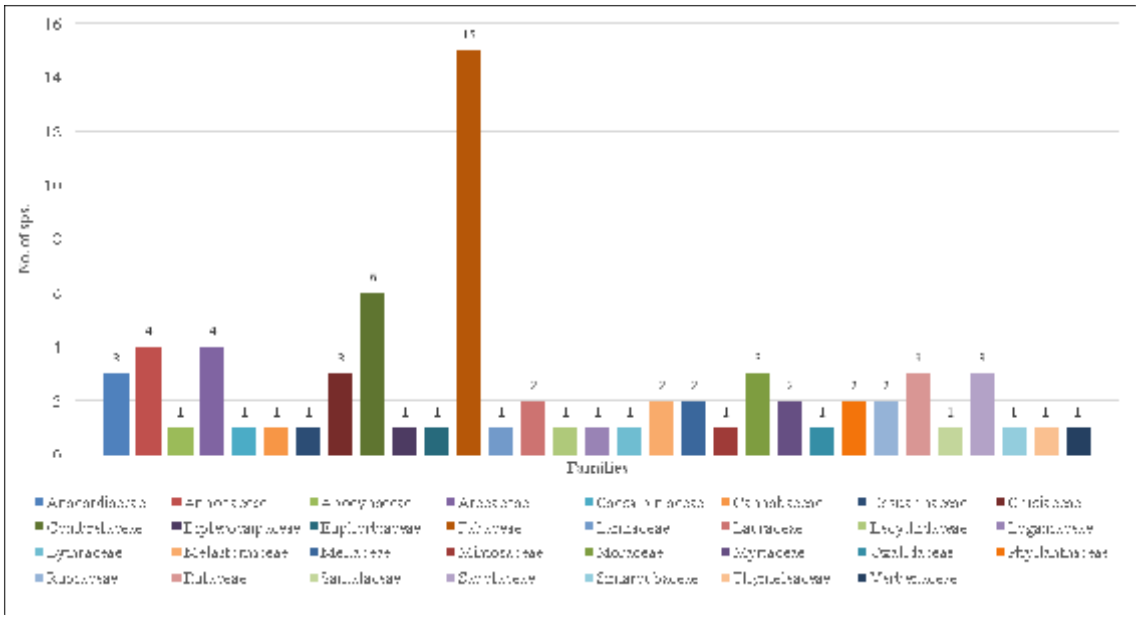
Vegetation profile and community structure

The vegetation profile ofSir Syed College Campusincludes Herbs (71 Nos), Shrubs (21 Nos), Trees (72 Nos), Aroids (10 Nos), Ferns (27 Nos) and Bamboos (15 Nos.). The number of Treesspecies in the campus has higher, followed byherbs and Shrubs.

Vegetation profile of the Sir Syed College Campus

Category	Estimated Number
Trees	72 species, 450 individuals
Shrubs	21 species
Herbs	71 species
Aroids	10
Ferns	27
Bamboos	15
Medicinal Plants	172 species
Star plants	Complete (27species)
Indoor plants	19 species





No. of Trees and total number of families

Checklist Of Flora Found In The Campus.

Sl. No.	Botanical Name	Common Name	Family	No. of Plants	IUCN status
1	*Acacia auriculiformis*	Acacia	Fabaceae	16	LC
2	*Adenantherapavonina*	Manjadi	Mimosaceae	2	LC
3	*Aegle marmelos*	Koovalam	Rutaceae	1	NT

4	*Albizia lebbeck*	Nenmenivaka	Fabaceae	2	LC
5	*Alstoniascholaris*	Ezhilampala	Apocynaceae	1	LC
6	*Anacardium occidentale*	Kashumavu	Anacardiaceae	4	LC
7	*Annona muricata*	Mullatha	Annonaceae	1	NE
8	*Annona reticulata*	Atha	Annonaceae	3	LC
9	*Annona squamosa*	Custard apple	Annonaceae	1	LC
10	*Aquilaria malaccensis*	Outhu	Thymeleaceae	2	CR
11	*Artocarpus heterophyllus*	Plavu	Moraceae	4	NE
12	*Averrhoa bilimbi*	Bilimbi	Oxalidaceae	1	NE
13	*Azadirachta indica*	Veppu	Meliaceae	4	LC
14	*Bauhinia purpurea*	Purple bauhinia	Fabaceae	21	LC
15	*Bridelia retusa*	Mulluvenga	Phyllanthaceae	9	LC
16	*Caesalpinia sappan*	Pathimukham	Fabaceae	8	LC
17	*Careya arborea*	Pezhu	Lecythidaceae	4	NE
18	*Caryotaurens*	Choondapana	Arecaceae	6	LC
19	*Cassia fistula*	Kanikkonna	Fabaceae	12	LC
20	*Casuarina equisetifolia*	Kattadi	Casuarinaceae	25	LC
21	*Chrysophyllumcainito*	Star apple	Sapotaceae	1	LC
22	*Cinamomummalabatrum*	Vayana	Lauraceae	2	LC
23	*Cinnamomum verum*	Karuva	Lauraceae	1	NE
24	*Citharexylum spinosum*	Parijatham	Verbenaceae	2	NE
25	*Cocos nucifera*	Thengu	Arecaceae	3	NE
26	*Dalbergia latifolia*	Eetti	Fabaceae	2	VU
27	*Elaeisguineensis*	Enthappana	Arecaceae	1	LC
28	*Ficus bengalensis*	Peral	Moraceae	1	LC
29	*Ficus racemosa*	Atthi	Moraceae	1	LC
30	*Garcinia andamanica*	Burma fal	Clusiaceae	1	NE
31	*Garcinia gummi-gutta*	Kudampuli	Clusiaceae	2	NE
32	*Garcinia xanthochymus*	Pinar	Clusiaceae	2	NE
33	*Gliricidia sepium*	Sheemakonna	Fabaceae	16	LC
34	*Gmelina arborea*	Kumizh	Lamiaceae	5	LC
35	*Hopea ponga*	Nayuripp	Dipterocarpaceae	1	VU
36	*Lannea coromandelica*	Uthi	Anacardiaceae	1	NE
37	*Largerstroemia speciosa*	Manimaruth	Lythraceae	1	LC
38	*Leucaena leucocephala*	Peelivaka	Fabaceae	7	LC
39	*Libidibiacoriaria*	Divi divi	Fabaceae	1	LC
40	*Macaranga peltata*	Vatta	Euphorbiaceae	21	NE
41	*Mangifera indica*	Mavu	Anacardiaceae	9	LC
42	*Manilkara zapota*	Sapotta	Sapotaceae	2	LC
43	Melicopelunu-ankenda	Kanala	Rutaceae	4	LC
44	*Memecylonedule*	Kasavu	Melastomaceae	1	LC
45	*Memecylonranderianum*	Koovachekki	Melastomaceae	1	NE
46	*Mimusopselengi*	Ilanji	Sapotaceae	2	LC

47	*Mitragynaparvifolia*	Poochakadamb	Rubiaceae	1	NE
48	*Morindacitrifolia*	Noni	Rubiaceae	1	LC
49	*Peltophorumpterocarpum*	Copperpod	Fabaceae	51	LC
50	*Phyllanthus emblica*	Nelli	Phyllanthaceae	11	LC
51	*Polyalthia longifolia*	Aranamaram	Annonaceae	57	LC
52	*Pongamia pinnata*	Ungu	Fabaceae	3	LC
53	*Psidium guajava*	Pera	Myrtaceae	1	LC
54	*Pterocarpus marsupium*	Venga	Fabaceae	1	NT
55	*Pterocarpus santalinus*	Rakthachandanam	Fabaceae	2	EN
56	*Samanea saman*	Mazhamaram	Fabaceae	5	LC
57	*Santalum album*	Chandanam	Santalaceae	9	VU
58	*Saracaasoca*	Asokam	Caesalpiniaceae	1	VU
59	*Simarouba glauca*	Lakshmitharu	Simaroubaceae	2	LC
60	*Strychnos nux-vomica*	Kanjiram	Loganiaceae	3	NE
61	*Swietenia macrophylla*	Mahagani	Meliaceae	12	EN
62	*Syzygiumcumini*	Njaval	Myrtaceae	17	LC
63	*Tamarindus indica*	Puli	Fabaceae	1	LC
64	*Terminalia arjuna*	Neermaruth	Combretaceae	16	LC
65	*Terminalia bellerica*	Thanni	Combretaceae	15	LC
66	Terminalia catappa	Nattubadam	Combretaceae	3	LC
67	Terminalia chebula	Kadukka	Combretaceae	1	LC
68	*Terminalia cuneata*	Neermaruth	Combretaceae	3	NE
69	*Terminalia paniculata*	Poomaruth	Combretaceae	6	LC
70	*Trema orientalis*	Amatthali	Cannabaceae	1	LC
71	*Wodyetiabifurcata*	Foxtail palm	Arecaceae	3	CD
72	*Zanthoxylum rhetsa*	Mullilam	Rutaceae	6	LC

SHRUBS

Sl. No.	Botanical Name	Common Name	Family	IUCN status
1	*Acalypha amentacea*	Copperleaf, Red Hot Cat's Tail	Euphorbiaceae	LC
2	*Adenium obesum*	Desert Rose, Impala Lily	Apocynaceae	LC
3	*Agave vivipara*	Ghost Agave	Asparagaceae	LC
4	*Anisomelesmalabarica*	Malabar Catmint	Lamiaceae	LC
5	*Bougainvillea glabra*	Paper Flower, Lesser Bougainvillea	Nyctaginaceae	LC
6	*Brideliastipularis*	Not widely known	Phyllanthaceae	LC
7	*Caesalpinia pulcherrima*	Pride of Barbados, Red Bird of Paradise	Fabaceae	LC

8	*Calotropis gigantea*	Crown Flower, Giant Milkweed	Apocynaceae	LC
9	*Carica papaya*	Papaya	Caricaceae	NE
10	*Chromolaena odorata*	Siam Weed, Christmas Bush	Asteraceae	G5
11	*Cycas revoluta*	Sago Palm	Cycadaceae	LC
12	*Dendrocalamusstrictus*	Iron Bamboo	Poaceae (Bambu-soideae)	NE
13	*Ensetesuperbum*	Rock Banana	Musaceae	LC
14	*Ficus hispida*	Fuzzy Fig, Hairy Fig	Moraceae	LC
15	*Hibiscus rosa-sinensis*	Chinese Hibiscus, Shoeblackplant	Malvaceae	LC
16	*Hyptissuaveolens*	Bushmint, Pignut	Lamiaceae	LC
17	*Jatropha multifida*	Coral Plant, Physic Nut	Euphorbiaceae	LC
18	*Tabernaemontanadivaricata*	Crepe Jasmine	Apocynaceae	LC
19	*Tecoma stans*	Yellow Elder, Trumpet Bush	Bignoniaceae	LC
20	*Turnera subulate*	White Alder	Passifloraceae	LC
21	*Turneraulmifolia*	Ramgoat-Dashalong, Yellow Alder	Passifloraceae	LC

Herbs

Sl. No.	Botanical Name	Common Name	Family	IUCN status
1	*Abelmoschus rugosus*	Not widely known	Malvaceae	NE
2	*Achyranthes aspera*	Prickly Chaff Flower, Devil's Horsewhip	Amaranthaceae	LC
3	*Acmella calva*	Not widely known	Asteraceae	NE
4	*Aerva lanata*	Mountain Knot-grass, Woolly Aerva	Amaranthaceae	LC
5	*Ageratum conyzoides*	Billygoat Weed, Goatweed, Chick Weed	Asteraceae	G5
6	*Aloe vera*	Aloe Vera	Asphodelaceae	LC
7	*Alternanthera bettzickiana*	Red Threads	Amaranthaceae	LC
8	*Alternanthera brasiliana*	Brazilian Joyweed	Amaranthaceae	LC
9	*Alysicarpus vaginalis*	Not widely known	Fabaceae	G5
10	*Anisomeles indica*	Catmint Bush	Lamiaceae	LC
11	*Asystasiadalzelliana*	Not widely known	Acanthaceae	LC
12	*Asystasiagangetica*	Chinese Violet	Acanthaceae	LC

13	*Axonopuscompressus*	Broadleaf Carpet Grass	Poaceae	NE
14	*Bidens sulphurea*	Not widely known	Asteraceae	LC
15	*Biophytumsensitivum*	Not widely known	Oxalidaceae	LC
16	*Blumea laevis*	Smooth Blumea	Asteraceae	LC
17	*Boerhaviadiffusa*	Red Spiderling, Tar Vine	Nyctaginaceae	LC
18	*Caladium bicolor*	Angel Wings	Araceae	LC
19	*Callisia repens*	Turtle Vine, Creeping Inchplant	Commelinaceae	LC
20	*Capsicum frutescens*	Chili Pepper	Solanaceae	LC
21	*Catharanthus pusillus*	Tiny Periwinkle	Apocynaceae	LC
22	*Catharanthus roseus*	Madagascar Periwinkle	Apocynaceae	LC
23	*Celosia argentea*	Silver Cock's Comb, Quail Grass	Amaranthaceae	LC
24	*Centella asiatica*	Asiatic Pennywort, Indian Pennywort	Apiaceae	LC
25	*Centratherum intermedium*	Not widely known	Asteraceae	LC
26	*Chrysopogonaciculatus*	Not widely known	Poaceae	LC
27	*Cleome viscosa*	Tickweed, Asian Spiderflower	Cleomaceae	LC
28	*Commelinabenghalensis*	Benghal Dayflower	Commelinaceae	LC
29	*Commelinadiffusa*	Climbing Dayflower	Commelinaceae	LC
30	*Costusspeciosus*	Crepe Ginger	Costaceae	LC
31	*Crassocephalumcrepidioides*	Not widely known	Asteraceae	LC
32	*Cyanotis cristata*	Not widely known	Commelinaceae	LC
33	*Cynodondactylon*	Bermuda Grass, Dog's Tooth Grass	Poaceae	LC
34	*Desmodiumgangeticum*	Not widely known	Fabaceae	LC
35	*Dieffenbachia seguine*	Dumb Cane, Mother-in-law's Tongue	Araceae	LC
36	*Dipteracanthusprostratus*	Not widely known	Acanthaceae	LC
37	*Ecliptaprostrata*	False Daisy	Asteraceae	LC
38	*Elephantopusscaber*	Hogweed	Asteraceae	LC
39	*Eleutheranthera ruderalis*	Not widely known	Asteraceae	LC
40	*Emilia sonchifolia*	Lilac Tasselflower	Asteraceae	LC
41	*Episciacupreata*	Flame Violet	Gesneriaceae	LC
42	*Euphorbia hirta*	Asthma Plant, Pill-bearing Spurge	Euphorbiaceae	LC
43	*Evolvulusnummularius*	Not widely known	Convolvulaceae	LC
44	*Gomphrena globosa*	Globe Amaranth	Amaranthaceae	LC
45	*Heliconia psittacorum*	Parrot's Beak	Heliconiaceae	LC

46	*Heteropogoncontortus*	Black Spear Grass	Poaceae	LC
47	*Impatiens minor*	Small Balsam	Balsaminaceae	LC
48	*Ischaemumbarbatum*	Not widely known	Poaceae	G2
49	*Ischaemum indicum*	Not widely known	Poaceae	LC
50	*Justicia procumbens*	Water Willow	Acanthaceae	LC
51	*Laporteainterrupta*	Not widely known	Urticaceae	LC
52	*Leucas aspera*	Not widely known	Lamiaceae	LC
53	*Melochiacorchorifolia*	Common Melochia	Malvaceae	LC
54	*Mimosa pudica*	Sensitive Plant	Fabaceae	LC
55	*Mitracarpushirtus*	Not widely known	Rubiaceae	LC
56	*Mollugo pentaphylla*	Carpetweed	Molluginaceae	LC
57	*Naregamia alata*	Not widely known	Rubiaceae	LC
58	*Panicum trypheron*	Not widely known	Poaceae	LC
59	*Pennisetum polystachyon*	Mission Grass	Poaceae	LC
60	*Peperomia pellucida*	Shiny Bush, Pepper Elder	Piperaceae	LC
61	*Phyllanthus amarus*	Stonebreaker, Seed-under-leaf	Phyllanthaceae	LC
62	*Pilea microphylla*	Artillery Plant	Urticaceae	LC
63	*Portulaca oleracea*	Purslane	Portulacaceae	LC
64	*Scoparia dulcis*	Licorice Weed	Scrophulariaceae	LC
65	*Spermacoceocymoides*	Not widely known	Rubiaceae	LC
66	*Synedrellanodiflora*	Not widely known	Asteraceae	LC
67	*Tradescantia spathacea*	Moses-in-the-Cradle, Boat Lily	Commelinaceae	LC
68	*Tradescantia zebrina*	Wandering Jew	Commelinaceae	LC
69	*Tridax procumbens*	Coat Buttons	Asteraceae	LC
70	*Vernonia cinerea*	Ironweed	Asteraceae	LC
71	*Wedeliatrilobata*	Creeping Oxeye, Bay Biscayne Creeping-oxeye	Asteraceae	LC

Aroids

Sl. No.	Botanical Name	Common Name	Family	IUCN status
1	*Amorphophallus bonaccordensis*	-	Araceae	NE
2	*Amorphophallus hohenackeri*	-	Araceae	NE
3	*Amorphophallus konkanenesis*	-	Araceae	NE
4	*Amorphophallus mysorensis*	-	Araceae	NE
5	*Amorphophallus smithsonianus*	-	Araceae	NE
6	*Amorphophallus sylvaticus*	-	Araceae	NE
7	*Amorphophallus bulbifer*	-	Araceae	LC

8	*Amorphophallus commutatus*	-	Araceae	LC
9	*Amorphophallus nicolsonianus*	-	Araceae	NE
10	*Amorphophallus paeoniifolius*	Elephant foot yam	Araceae	LC

Ferns

Sl. No.	Botanical Name	Common Name	Family	IUCN status
1	*Acrostichumaureum*	Golden leather fern	Pteridaceae	LC
2	*Adiantum caudatum*	Common maiden-hair fern	Pteridaceae	LC
3	*Adiantum philippense*	Philippine maid-enhair fern	Pteridaceae	LC
4	*Angiopterisevecta*	Giant fern	Marattiaceae	NE
5	*Asplenium crinicaule*	-	Aspleniaceae	LC
6	*Asplenium phyllitidis*	Hart's-tongue fern	Aspleniaceae	LC
7	*Azolla rubra*	Red water fern	Salviniaceae	LC
8	*Blechnum gibbum*	Dwarf tree fern	Blechnaceae	LC
9	*Blechnum occidentale*	-	Blechnaceae	LC
10	*Bolbitissubcrenata*	-	Dryopteridaceae	NE
11	*Ceratopteristhalictroides*	Water sprite	Pteridaceae	LC
12	*Cheilanthes tenuifolia*	-	Pteridaceae	LC
13	*Christella dentate*	-	Pteridaceae	LC
14	*Christella parasitica*	-	Pteridaceae	LC
15	*Diplaziumbrachylobum*	-	Athyriaceae	LC
16	*Drynariaquercifolia*	Oak-leaf fern	Polypodiaceae	LC
17	*Equisetum hyemale*	Scouring rush	Equisetaceae	LC
18	*Lindsaeaensifolia*	-	Lindsaeaceae	LC
19	*Lygodiumflexuosum*	Climbing fern	Lygodiaceae	NE
20	*Marsilea quadrifolia*	European water clover	Marsileaceae	LC
21	*Microlepiaspeluncae*	-	Dennstaedtiaceae	LC
22	*Microsorumscolopendria*	Polypody fern	Polypodiaceae	LC
23	*Neofinetia falcata*	Samurai orchid	Orchidaceae	NE
24	*Nephrolepis cordifolia*	Fishbone fern	Nephrolepida-ceae	LC
25	*Nephrolepisexaltata*	Boston fern	Nephrolepida-ceae	LC
26	*Nephrolepis falcata*	Sword fern	Nephrolepida-ceae	NE
27	*Ophioglossumnodicule*	Adder's tongue fern	Ophioglossaceae	LC

BAMBOOS

Sl. No.	Botanical Name	IUCN status
1	*Bambusa multiplex*	NE
2	*Bambusamizorameana*	NE
3	*Bambusa pallida*	NE
4	*Bambusatulda*	NE
5	*Dendrocalamusbrandisii*	NE
6	*Dendrocalamusmembranaceus*	NE
7	*Dendrocalamusbrandisii*	NE
8	*Gigantochloamigrowhiata*	NE
9	*Gigantochloanigrociliata*	NE
10	*Gigantochloaandamanica*	NE
11	*Gigantochloanamanica*	NE
12	*Ochlandra scriptoria*	NE
13	*Ochlandrasetigera*	NE
14	*Ochlandratravancorica*	NE
15	*Thyrsostachyssiamensis*	NE

Adiantum latifolia

Asplenium phyllitidis

Blechnum gibbum

Drynaria quercifolia

Equisetum hyemale

Microsorum scolopendria

Microsorum

Selaginella martensii

Nephrolepis exaltata

Neofinetia falcata

Nephrolepis cordifolia

Nephrolepis exaltata

Nephrolepis falcata

Pteris ensiformis

Pteris vittata

Passiflora edulis

Antigonon leptopus

Biophytum sensitivum

Calotropis gigantea

Macaranga peltata

Hibiscus rosa-sinensis

Cycas circinalis

Bougainvillea glabra

Bridelia retusa

Cassia fistula

Combretum indicum

Mangifera indica

Cascabela thevetia

Mangifera indica

Anacardium occidentale

Syzygium cumini

Azadirachta indica

Ficus racemosa

Terminalia bellirica

Nephrolepis

Gmelina arborea

Santalum album

Asparagus racemosus

Terminalia arjuna

Swietenia mahagoni

Plumbago zeylanica

Aloe vera

Adhatoda vasica

Leucas aspera

Commelina benghalensis

Bambusa pallida

Madhuca longifolia

Bambusa arundinacea

Ficus microcarpa

Aegle marmelos

Bauhinia scandens

Oroxylum indicum

Desmodium gangeticum

Orthosiphon stamineus

Strobilanthes ciliatus

FAUNA ASSESSMENT

Fauna assessment is a crucial aspect of biodiversity audits, focusing on the evaluation of animal life within a specific area. It involves the systematic study of animal species, their populations, habitats, and ecological interactions.The presence, abundance, and diversity of animal species can serve as indicators of the overall health and stability of ecosystems. Fauna assessment helps identify ecological imbalances and potential threats to biodiversity. Fauna assessment helps identify endemic species, which are found exclusively in a particular geographic region. Protecting these unique species is crucial for preserving the distinctiveness of local biodiversity. Assessing fauna allows for the identification of invasive animal species that can negatively impact native ecosystems. Detecting and managing invasive species is essential for preventing biodiversity loss and ecosystem disruption. Fauna assessment is a vital component of biodiversity audits as it offers critical information about animal species and their interactions within ecosystems. This knowledge aids in making informed decisions for conservation and sustainable management, ensuring the long-term survival and well-being of both animal populations and the broader biodiversity of the region.

Methodology

Camera Trapping: Use camera traps to capture images of elusive and nocturnal animals, helping identify different species.

Bird watching: Conduct birdwatching surveys to record various bird species present on campus.

Habitat Specific Surveys: Conduct specific surveys for reptiles, mammals, insects, and other fauna groups, using appropriate methods for each.

Data Analysis:

Identify Endangered or Threatened Species: Cross-reference the recorded species with regional and national red lists to identify endangered or threatened species.

Calculate Species Richness: Calculate the species richness for each habitat type to assess biodiversity hotspots.

Analyze Species Distribution: Use GIS tools to map the distribution of various species across the study area.

CHECKLIST OF FAUNA FOUND IN AND AROUND THE CAMPUS.

BIRDS

Sl. No.	Scientific Name	Common Name	Status	
1	*Acritillas indica*	Yellow-browed Bulbul	Alcedinidae	LC
2	*Acrocephalus dumetorum*	Blyth's Reed Warbler	Monarchidae	LC
3	*Aegithina tiphia*	Common Iora	Monarchidae	LC
4	*Centropus sinensis*	Greater Coucal	Pycnonotidae	LC
5	*Chloropsisaurifrons*	Golden-fronted Leafbird	Muscicapidae	LC
6	*Cinnyris asiaticus*	Purple Sunbird	Corvidae	LC
7	*Columba livia*	Rock Pigeon	Columbidae	LC
8	*Copsychussaularis*	Oriental Magpie-Robin	Cuculidae	LC
9	*Corvus macrorhynchos*	Large-billed Crow	Dicruridae	LC
10	*Corvus splendens*	House Crow	Corvidae	LC
11	*Cyornistickelliae*	Tickell's Blue Flycatcher	Turdidae	LC
12	*Cypsiurusbalasiensis*	Asian Palm Swift	Megalaimidae	LC
13	*Dendrocittavagabunda*	Rufous Treepie	Picidae	LC
14	*Dicrurus aeneus*	Bronzed Drongo	Oriolidae	LC
15	*Dicrurus leucophaeus*	Ashy Drongo	Dicruridae	LC
16	*Dicrurusparadiseus*	Greater Racket-tailed Drongo	Cisticolidae	LC
17	*Eudynamysscolopaceus*	Asian Koel	Pycnonotidae	LC
18	*Geokichlacitrina*	Orange-headed Thrush	Pycnonotidae	LC
19	*Glaucidium radiatum*	Jungle Owlet	Pycnonotidae	LC
20	*Halcyon smyrnensis*	White-throated Kingfisher	Nectariniidae	LC
21	*Haliasturindus*	Brahminy Kite	Chloropseidae	LC
22	*Hierococcyxvarius*	Common Hawk-Cuckoo	Accipitridae	LC
23	*Hypothymisazurea*	Black-naped Monarch	Psittaculidae	LC
24	*Leptocomazeylonica*	Purple-rumped Sunbird	Nectariniidae	LC
25	*Loriculusvernalis*	Vernal Hanging Parrot	Cuculidae	LC
26	*Meropsorientalis*	Asian Green Bee-eater	Meropidae	LC
27	*Milvus migrans*	Black Kite	Aegithinidae	LC
28	*Muscicapadauurica*	Asian Brown Flycatcher	Accipitridae	LC
29	*Orioluskundoo*	Indian Golden Oriole	Phylloscopidae	LC
30	*Oriolusxanthornus*	Black-hooded Oriole	Muscicapidae	LC
31	*Orthotomussutorius*	Common Tailorbird	Corvidae	LC
32	*Pellorneumruficeps*	Puff-throated Babbler	Timaliidae	LC
33	*Pericrocotusflammeus*	Orange Minivet	Apodidae	LC
34	*Phylloscopusnitidus*	Green Warbler	Campephagidae	LC
35	*Psilopogonviridis*	White-cheeked Barbet	Oriolidae	LC
36	*Pycnonotuscafer*	Red-vented Bulbul	Dicruridae	LC

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37	*Pycnonotusgularis*	Flame-throated Bulbul	Cuculidae	LC
38	*Pycnonotusjocosus*	Red-whiskered Bulbul	Acrocephalidae	LC
39	*Terpsiphone paradisi*	Indian Paradise Flycatcher	Muscicapidae	LC
40	*Yungipicus nanus*	Brown-capped Pygmy Woodpecker	Strigidae	EN

CHECKLIST OF BUTTERFLIES

Sl. No.	Scientific Name	Common Name	Status	
1	*Acraea violae*	Tawny coster	Nymphalidae	-
2	*Arhopalacentaurus*	Centaur oakblue	Lycaenidae	-
3	*Ariadne merione*	Common castor	Nymphalidae	-
4	*Athymaperius*	Common sergeant	Nymphalidae	-
5	*Athymaranga*	Black vein sergeant	Nymphalidae	-
6	*Calaenorrhinusleucocera*	Common-spotted flat	Hesperidae	-
7	*Caleta decidia*	Angled pierrot	Lycaenidae	-
8	*Castaliusrosimon*	Common pierrot	Lycaenidae	-
9	*Catapaecilma major*	Common tinsel	Lycaenidae	LC
10	*Catopsilia Pomona*	Common emigrant	Pieridae	-
11	*Catopsiliapyranthe*	Mottled emigrant	Pieridae	-
12	*Ceporanedina*	Lesser gull	Pieridae	-
13	*Cepora Nerissa*	Common gull	Pieridae	-
14	*Cheritrafreja*	Common imperial	Lycaenidae	-
15	*Chiladeslajus*	Lime blue	Lycaenidae	LC
16	*Chiladespandava*	Plains cupid	Lycaenidae	-
17	*Cirrochroathais*	Tamil yeoman	Nymphalidae	-
18	*Coladeniaindrani*	Tricolor pied flat	Hesperidae	-
19	*Cuphaerymanthis*	Rustic	Nymphalidae	-
20	*Curetis thetis*	Indian sunbeam	Lycaenidae	-
21	*Delias eucharis*	Common jezebel	Pieridae	-
22	*Discolampa ethion*	Banded-blue pierrot	Lycaenidae	-
23	*Elymnias caudate*	Tailed palm fly	Nymphalidae	-
24	*Euploea core*	Common-indian crow	Nymphalidae	-
25	*Euremablanda*	Three-spotgrass yellow	Pieridae	-
26	*Euremahecabe*	Common-grass yellow	Pieridae	LC
27	*Euthalia aconthea*	Common baron	Nymphalidae	LC
28	*Gangarathyrsis*	Giant redeye	Hesperidae	-
29	*Graphiumagamememnon*	Tailed jay	Papilionidae	-
30	*Graphiumantiphates*	Five-bar swordtail	Papilionidae	-
31	*Graphiumdoson*	Common jay	Papilionidae	-

32	*Graphiumteredon*	Southern bluebottle	Papilionidae	-
33	*Halpehindu*	Moores ace	Hesperidae	-
34	*Hypolimnasbolina*	Great eggfly	Nymphalidae	LC
35	*Hypolimnasmisippus*	Danaid eggfly	Nymphalidae	-
36	*Jamides celeno*	Common cerulean	Lycaenidae	-
37	*Junoniaatlites*	Grey pansy	Nymphalidae	-
38	*Junoniaatlites*	Peacock pansy	Nymphalidae	-
39	*Junoniaiphita*	Chocolate pansy	Nymphalidae	-
40	*Junonialemonias*	Lemon pansy	Nymphalidae	-
41	*Kaniska canace*	Blue admiral	Nymphalidae	-
42	*Lambrix salsala*	Chestnut bob	Hesperidae	-
43	*Loxuraatymnus*	Yamfly	Lycaenidae	-
44	*Melanitisleda*	Common-evening brown	Nymphalidae	-
45	*Moduzaprocris*	Commander	Nymphalidae	-
46	*Mycalesisperseus*	Common-bush brown	Nymphalidae	LC
47	*Nacadubaberoe*	Opaque six- lineblue	Lycaenidae	-
48	*Neopithecopszalmora*	Common quaker	Lycaenidae	-
49	*Neptishylas*	Common sailer	Nymphalidae	-
50	*Oriensgoloides*	Common dartlet	Hesperidae	LC
51	*Orsotriaenamedus*	Medus brown	Nymphalidae	-
52	*Pachlioptaaristolochiae*	Common rose	Papilionidae	LC
53	*Pachliopta hector*	Crimson rose	Papilionidae	LC
54	*Pantoporiahordonia*	Common lascar	Nymphalidae	-
55	*Papilio buddha*	Malabar-banded peacock	Papilionidae	-
56	*Papilio clytia*	Common mime	Papilionidae	-
57	*Papilio dravidarum*	Malabar raven	Papilionidae	-
58	*Papilio helenus*	Red helen	Papilionidae	LC
59	*Papilio liomedon*	Malabar-banded swallowtail	Papilionidae	-
60	*Papilio paris*	Paris peacock	Papilionidae	-
61	*Papilio polymnestor*	Blue mormon	Papilionidae	-
62	*Papilio polytes*	Common mormon	Papilionidae	-
63	*Paranticaaglea*	Glassy tiger	Nymphalidae	-
64	*Pareronia hippie*	Common wanderer	Pieridae	-
65	*Parthenos sylvia*	Clipper	Nymphalidae	-
66	*Phalantaphalantha*	Common leopard	Nymphalidae	LC
67	*Rachana jalindra*	Banded royal	Lycaenidae	-
68	*Rapala manea*	Slate flash	Lycaenidae	LC
69	*Rathinda amor*	Monkey puzzle	Lycaenidae	LC
70	*Sarangesadasahara*	Common small flat	Hesperidae	LC
71	*Spalgisepeus*	Apefly	Lycaenidae	-
72	*Spindasisvulcanus*	Common silverline	Lycaenidae	-
73	*Suastusminuta*	Small palm bob	Hesperidae	-

74	*Surendra quercetorum*	Common-acacia blue	Lycaenidae	-
75	*Tagiadesgana*	Suffused snow flat	Hesperidae	LC
76	*Tagiadesjapetus*	Common snow flat	Hesperidae	-
77	*Tagiadeslitigiosa*	Water snow flat	Hesperidae	-
78	*Talicadanyseus*	Red pierrot	Lycaenidae	-
79	*Tanaecialepidea*	Grey count	Nymphalidae	-
80	*Telicotabambusae*	Dark palm-dart	Hesperidae	-
81	*Tirumala limniace*	Blue tiger	Nymphalidae	LC
82	*Tirumala septentrionis*	Dark blue tiger	Nymphalidae	-
83	*Troidesminos*	Southern birdwing	Papilionidae	LC
84	*Udaspesfolus*	Grass demon	Hesperidae	-
85	*Ypthimaasterope*	Common five ring	Nymphalidae	-
86	*Ziculahylax*	Tiny grass blue	Lycaenidae	-

SPIDERS

Sl. No.	Scientific name	Family
1	*Argiope pulchella*	Aranediae
2	*Camaricusmangei*	Aranediae
3	*Carhotusvidus*	Aranediae
4	*Clubionadrassodes*	Nephilidae
5	*Ctenus indicus*	Saltisidae
6	*Cyrtophoracitricola*	Saltisidae
7	*Gasteracanthageminata*	Saltisidae
8	*Hasariusadansomi*	Saltisidae
9	*Hersilia savignyi*	Saltisidae
10	*Heteropodavenetoria*	Sparassidae
11	*Hyllus semicupreus*	Ctenidae
12	*Nephila pilipes*	Clubionidae
13	*Oxyopesjavanus*	Hersilidae
14	*Plexipuspaykuli*	Thomisidae
15	*Plexipuspetersi*	Uloboridae
16	*Rheneflavigera*	Oxyopidae
17	*Theridionmanjithor*	Theridiidae
18	*Zosisgeniculata*	Sparassidae

Butterflies


Angled castor


Blackwein sergeant


Blue Banded Pierrot


Blue tiger


Blue mormon


Brown awl


Chocolate pansy


Clipper


Commander


Common Banded Demon


Common baron


Common blue bottle


Common cerulean


Common four ring


Common Hedge Blue.


Common Imperial


Common Indian crow


Common lascar


Common line blue


Common pierrot


Common silverline


Fulvous Pied Flat


Monkey puzzle


Spotted Small Flat


Chestnut bob


Common Banded Awl


Common bush brown


Common mormon


Common rose


Golden angle


HERBAL PLANTS & HOME REMEDIES
National Medicinal Plants Board
DISCA International- CFP,


2022


SHANTHI STHALL
A BIODIVERSITY CONSERVATION PROJECT
KERALA STATE BIODIVERSITY BOARD


BOTANICAL GARDEN
Medicinal Plant Demonstration Garden

1.Butterfly Garden

The Butterfly Garden at sir syed college, under the supervision of the Zoology Department and sponsored by the Kerala Biodiversity Board, is a remarkable initiative aimed at conserving butterfly species and promoting biodiversity awareness. The garden boasts more than 86 identified species of butterflies and features a variety of elements essential for their habitat. Additionally, the garden includes an interpretation centre designed to educate school students and the public about butterflies, moths, and nature.

The primary objectives of the Butterfly Garden are,

- To conserve butterfly species and their habitats,
- To educate students and the public about the importance of biodiversity,
- To provide a living laboratory for ecological and zoological studies.

The Butterfly Garden is home to over 86 species(identified) of butterflies, demonstrating the success of the habitat design and maintenance efforts. Some notable species found in the garden include,Common Mormon (*Papilio polytes*),Lime Butterfly (*Papilio demoleus*),Common Grass Yellow (*Euremahecabe*),Peacock Pansy (*Junoniaalmana*),Crimson Rose (*Pachliopta hector*) etc.

Habitat Design

The garden is designed to support butterflies at all stages of their life cycle with the following elements:

Host Plants: Various host plants are strategically placed to support the larval stages of different butterfly species.

Foraging Areas: Nectar-rich flowering plants provide a consistent food source for adult butterflies.

Breeding Areas: Secluded and undisturbed areas allow butterflies to breed and lay eggs.
Water Bodies: Small water bodies and damp areas provide hydration and necessary minerals to butterflies.

Interpretation Centre

The Interpretation Centre associated with the Butterfly Garden is a valuable resource for educating visitors about butterflies, moths, and nature. It serves the following purposes:
Educational Displays: Informative exhibits on butterfly species, their life cycles, and their ecological importance.

Interactive Activities: Hands-on activities and interactive displays to engage visitors, particularly school students.

Workshops and Seminars: Regular workshops and seminars on butterfly, moth conservation, gardening, and biodiversity are organized for students and the community.
School Programs: Tailored educational programs for school students to learn about butterflies and their habitats.

Research Projects: Opportunities for college students and researchers to study butterfly behavior, life cycles, and ecological interactions.

Public Awareness: Programs and activities aimed at raising awareness about the importance of biodiversity and conservation efforts

The Butterfly Garden at sir Syed College, complemented by the Interpretation Centre, is a vital resource for conservation, education, and research. By fostering a diverse butterfly population and providing comprehensive educational programs, the garden and centre play a crucial role in promoting biodiversity awareness and understanding among students and the community.

II MOTH STUDY CENTRE

The Moth Study Centre, situated within the Zoology Department, is a pioneering initiative aimed at studying and preserving moth biodiversity. The centre was established under the expert supervision of Dr. RsmShamsudheen, a renowned authority in moth diversity, ecology, and evolution.

Objectives

1. To collect and identify diverse species of moths.
2. To serve as a knowledge-sharing hub for researchers, common people, and educators.
3. To contribute to the conservation of moth species through extensive research and documentation.

Supervision

Dr. RsmShamsudheen leads the Moth Study Centre with his extensive expertise in the field. His work focuses on the diversity, ecology, and evolutionary aspects of moths, making him a valuable asset to the centre's operations.

Collections

The centre has successfully collected and identified more than 500 species of moths. These species represent a wide array of families, including:

- Erebidae
- Crambidae
- Sphingidae
- Geometridae

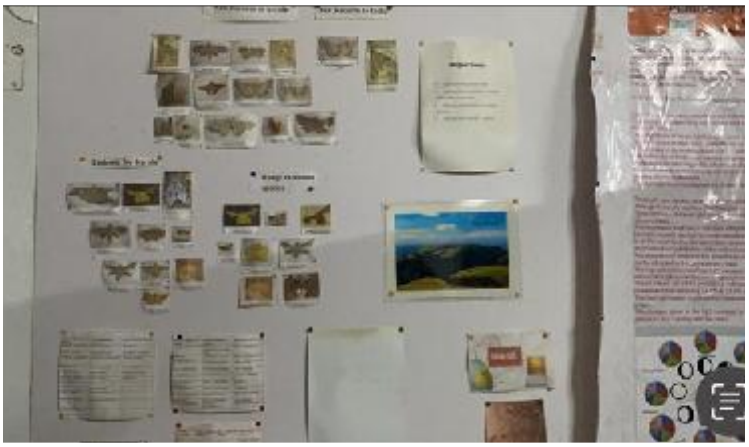
The rich diversity of moths in the collection highlights the centre's dedication to comprehensive research and documentation.

Knowledge Sharing

The Moth Study Centre is not just a research facility but also a centre for knowledge dissemination. It plays a crucial role in educating various stakeholders, including:

- Researchers
- Common people
- Teachers

Through workshops, seminars, and interactive sessions, the centre ensures that valuable information about moth biodiversity is shared widely, fostering a deeper understanding and appreciation for these important insects.



The Kunming-Montreal Global Biodiversity Framework (GBF)

1. Reducing threats to biodiversity

TARGET 1: Plan and Manage all Areas To Reduce Biodiversity Loss
TARGET 2: Restore 30% of all Degraded Ecosystems
TARGET 3: Conserve 30% of Land, Waters and Seas
TARGET 4: Halt Species Extinction, Protect Genetic Diversity, and Manage Human-Wildlife Conflicts
TARGET 5: Ensure Sustainable, Safe and Legal Harvesting and Trade of Wild Species
TARGET 6: Reduce the Introduction of Invasive Alien Species by 50% and Minimize Their Impact
TARGET 7: Reduce Pollution to Levels That Are Not Harmful to Biodiversity
TARGET 8: Minimize the Impacts of Climate Change on Biodiversity and Build Resilience

2. Meeting people's needs through sustainable use and benefit-sharing

TARGET 9: Manage Wild Species Sustainably To Benefit People
TARGET 10: Enhance Biodiversity and Sustainability in Agriculture, Aquaculture, Fisheries, and Forestry
TARGET 11: Restore, Maintain and Enhance Nature's Contributions to People
TARGET 12: Enhance Green Spaces and Urban Planning for Human Well-Being and Biodiversity
TARGET 13: Increase the Sharing of Benefits From Genetic Resources, Digital Sequence Information and Traditional Knowledge

3. Tools and solutions for implementation and mainstreaming

TARGET 14: Integrate Biodiversity in Decision-Making at Every Level
TARGET 15: Businesses Assess, Disclose and Reduce Biodiversity-Related Risks and Negative Impacts
TARGET 16: Enable Sustainable Consumption Choices To Reduce Waste and Overconsumption
TARGET 17: Strengthen Biosafety and Distribute the Benefits of Biotechnology
TARGET 18: Reduce Harmful Incentives by at Least $500 Billion per Year, and Scale Up Positive Incentives for Biodiversity
TARGET 19: Mobilize $200 Billion per Year for Biodiversity From all Sources, Including $30 Billion Through International Finance
TARGET 20: Strengthen Capacity-Building, Technology Transfer, and Scientific and Technical Cooperation for Biodiversity
TARGET 21: Ensure That Knowledge Is Available and Accessible To Guide Biodiversity Action
TARGET 22: Ensure Participation in Decision-Making and Access to Justice and Information Related to Biodiversity for all
TARGET 23: Ensure Gender Equality and a Gender-Responsive Approach for Biodiversity Action

ENERGY AUDIT

Energy audits play a crucial role in effective energy management by enabling organizations to identify opportunities for improving energy efficiency and reducing consumption. These audits involve a detailed analysis of an organization's energy performance, encompassing equipment, systems, and processes. Based on thorough measurement and observation, energy audits assess energy use, efficiency, and consumption. They are essential for identifying and prioritizing opportunities to enhance energy performance, minimize energy waste, and achieve related environmental benefits. Outputs of the audits include information on current energy use and performance, along with ranked recommendations for improvements in energy performance and financial benefits, as outlined in ISO 50002:2014.

The importance of energy audits extends beyond procedural elements to encompass a documented analysis of energy efficiency, consumption, and use. Rooted in meticulous data scrutiny, these comprehensive assessments are fundamental for identifying sustainable energy usage and developing strategies to enhance energy performance. A key aspect of the energy audit process is the analysis of energy sources and the review of energy efficiency technologies. This analysis forms the basis for defining energy performance indicators, offering quantitative measures of an organization's energy efficiency journey, and setting an energy baseline to gauge future progress. By providing a structured framework for assessment and action, energy audits foster a dynamic cycle of continuous improvement. In a world focused on resource optimization and ecological responsibility, energy audits are potent tools that propel sustainability and economic prudence. This methodical approach equips organizations with strategic insights, contributing to a global shift towards a greener, more sustainable future.

The energy audit conducted at Sir Syed College, Taliparamba follows the ISO 50001 and ISO 50002:2014 standards, which offer a comprehensive framework for conducting energy

Sir Syed College

audits and implementing energy management systems. The ISO 50001 standard provides a systematic approach to managing energy use, requiring organizations to establish an energy management system (EnMS) that includes energy policy, planning, implementation, and evaluation. A crucial aspect of this standard is the energy audit, which serves as the foundation for identifying and prioritizing energy efficiency measures. The ISO 50002:2014 standard specifically outlines the requirements and methodology for conducting energy audits. It provides a structured approach to data collection, analysis, and the development of energy efficiency recommendations. The energy audit process, especially in the context of Indian campuses, typically involves a comprehensive assessment of the campus's energy consumption. This includes identifying major energy-consuming systems and processes, collecting data from utility bills, equipment inventories, and on-site measurements, and interviewing campus facilities staff to understand operational characteristics.

Objectives

The energy audit conducted at Sir Syed College, offering a systematic approach to managing energy use and implementing energy management systems. The primary objectives include:

- To assess and document the college's current energy consumption, identifying major energy-consuming systems and collecting detailed data from utility bills, equipment inventories, on-site measurements, and staff interviews.
- To evaluate energy performance against industry benchmarks, identify opportunities for technological upgrades, process improvements, and behavioral changes, and formulate actionable recommendations for enhancing energy efficiency and sustainability.
- To develop a robust energy management plan that includes continuous monitoring, evaluation, and improvement of energy performance, while establishing an energy baseline as a reference for measuring future progress.
- To engage and train stakeholders, including faculty, staff, and students, in energy management practices, fostering a culture of energy awareness and ensuring compliance with ISO 50001 and ISO 50002:2014 standards.

Methodology

KSBB has developed an innovative approach for performing energy audit at Sir Syed College. This method integrates principles from the International Chamber of Commerce's Environmental Audit recommendations and follows the guidelines outlined in section 5 (Performing an energy audit) of the ISO 50002:2014 standard, as illustrated in the energy audit process diagram. The energy audit process, in line with ISO 50002:2014, includes energy audit planning, initiating meetings and data collection, creating a measurement plan, conducting on-site assessments, conducting in-depth analysis, producing an energy audit report, and concluding meetings. The integrated energy audit process adopted by KSBB follows a step-by-step sequence as furnished below.

Energy audit planning : The planning of the energy audit activities should be carried out well before the site visit, based on the scope and objective of the audit.

Opening meeting : Initial discussions has to be carried out to brief authorities regarding the energy audit objectives, defined energy audit scope, boundaries and methods, and to review the arrangement for the energy audit.

Audit team constitution and training : A comprehensive team with competent officials and students with competent officials and students can be formulated to conduct audit. They team may be trained about the modalities of energy audit, their roles, responsibilities, cooperation and other expected requirements from them.

Preparation of formats and questionnaires It is essential to prepare structured formats and pre-prepared questionnaires tailored to the audit's scope. This rich data forms the foundation for rigorous analysis and actionable recommendations to enhance energy performance and sustainability. Preparation of a clear cut check list is highly essential. It includes key documents to be collected and key person to be interviewed of the client organisation, who may provide significant detail about operational routines, recent and planned changes, technical improvements, or specific areas of concern is also critical.

Site Visit & Data collection : Data collection is a pivotal phase in the energy audit, involving a meticulous approach to gather comprehensive information on energy consumption, equipment use, operational patterns, and other relevant parameters.

Measurement plan : A meticulous measurement plan is a crucial aspect of the energy audit methodology, outlining the strategic approach for quantifying energy consumption, usage, and efficiency. It should include tools, techniques, and parameters for on-site assessment.

Energy Analysis

Analyze Consumption Patterns: Use the collected data to analyze energy consumption patterns and identify peak usage periods, base loads, and seasonal variations. Visualize the data using graphs and charts to facilitate understanding.

Identify Inefficiencies: Compare the facility's energy performance with industry benchmarks and best practices. Identify areas of inefficiency, including outdated equipment, suboptimal operating practices, and maintenance issues.

Evaluate Energy-Saving Opportunities: Investigate potential energy-saving measures, such as equipment upgrades, process optimizations, and behavioral changes. Assess the feasibility and potential impact of each measure.

Cost-Benefit Analysis

Estimate Savings: Calculate the potential energy savings for each identified measure. Use historical data and energy models to estimate the reduction in energy consumption.

Determine Implementation Costs: Estimate the costs associated with implementing each energy-saving measure, including equipment costs, installation, and any required modifications to existing systems.

Perform Financial Analysis: Conduct a cost-benefit analysis for each measure, considering factors such as payback period, return on investment (ROI), and net present value (NPV). Prioritize measures based on their financial viability and impact on energy performance.

Develop Recommendations

Formulate Actionable Recommendations: Based on the analysis, develop a set of actionable recommendations for improving energy efficiency. Include both short-term and long-term measures, and provide detailed implementation plans for each.

Create an Energy Management Plan: Develop a comprehensive energy management plan that outlines strategies for continuous monitoring, evaluation, and improvement of energy performance. Include procedures for regular reviews and updates to the plan.

Energy audit Report Preparation

Draft the Energy Audit Report: Prepare a detailed report summarizing the findings of the energy audit. Include sections on data analysis, identified inefficiencies, recommended measures, and financial analysis.

Provide Supporting Documentation: Include all relevant data, calculations, and technical documentation to support the findings and recommendations. Ensure the report is clear, concise, and accessible to both technical and non-technical stakeholders.

Presentation and Review

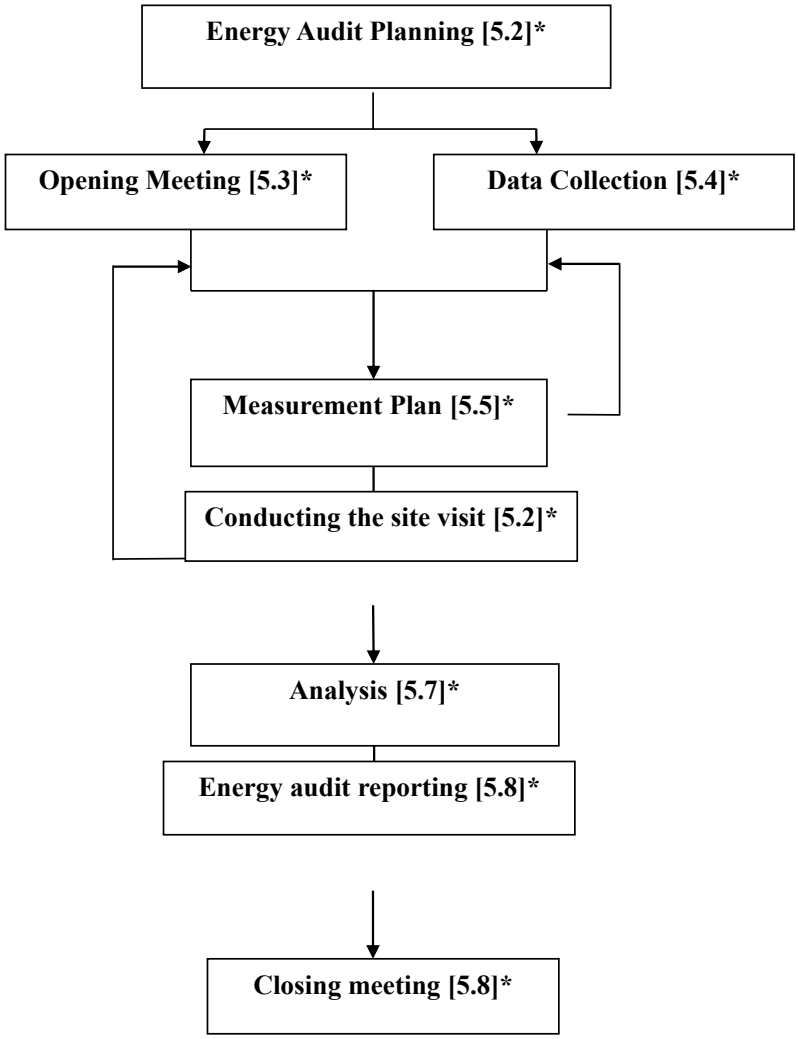
Present Findings to Management: Conduct a presentation to facility management and other key stakeholders, summarizing the audit findings and recommendations. Highlight the potential benefits of implementing the proposed measures.

Solicit Feedback: Encourage feedback and questions from the management team to ensure a thorough understanding of the recommendations and address any concerns. Adjust the recommendations as needed based on the feedback received.

Implementation and Follow-Up

Support Implementation: Provide support during the implementation of the recommended measures, including technical guidance and project management assistance.

Monitor Progress: Establish a system for monitoring the progress of implementation and tracking energy savings. Use energy performance indicators to measure the impact of the implemented measures.



Flow Chat 1 : Energy audit process flow Diagram as per ISO 50002:2014
** Represents the corresponding sections of ISO 50002:2014*

PRE-AUDIT STATE

Energy audit planning

The planning of the energy audit activities were carried out during the April 2024, based on the scope and objective of the audit. In this regard, preliminary data on the college were collected from their website and also by the telephonic interaction with the college authorities.

Opening meeting

A virtual meeting took place on April 6th, 2024. The purpose of the opening meeting is to

brief college authorities regarding the energy audit objectives, defined energy audit scope, boundaries and methods, and to review the arrangement for the energy audit.

Audit team constitution and training

A comprehensive team with competent officials and students is constituted for the purpose and the team is designated as the lead energy auditor.They were initially trained about the modalities of energy audit, their roles, responsibilities, cooperation and other expected requirements from them.

Preparation of formats and questionnaires

Based on the preliminary inputs provided by the college authorities a comprehensive Format is prepared for the data collection. In addition, a semi-structured questionnaire was meticulously designed to capture qualitative insights and perspectives. The Criteria for evaluation and time period were preplanned. The facilities, equipment and services required for the audit was informed to the institute. A clear cut check list is prepared in connection with the energy audit with key documents to be collected and key person to be interviewed of the college, who may provide significant detail about operational routines, recent and planned changes, technical improvements, or specific areas of concern.

DURING THE AUDIT

Site Visit & Data collection

Site visits for data collection were carried out from 2nd to 3rd May, 2024. The process of gathering data utilized organized templates and questionnaires that were prepared in advance. It covers diverse factors, from energy sources and utilization patterns to facility layout and equipment specs. Visited all departments and interacted with department heads, librarian, hostel warden etc. Collaborative interactions with stakeholders ensured a thorough grasp of the organization's energy landscape.

Measurement plan : It covered actual metering of certain points in the electrical system along with areas of major consumption. It allowed confirming data collected and identify patterns/issues in energy consumption. As it is being an educational organization no other measuring instruments is used usually use in the industries. when necessary, and wireless tech for real-time data collection to ensure accuracy without constant on-site presence.
Analyzing Energy Sources and Consumption Patterns: During the energy audit, a comprehensive analysis was conducted to investigate the college's current energy sources and comprehend the corresponding consumption patterns. The assessment encompassed electricity, fossil fuels, renewable energy options, and distinct energy inputs tailored for specific purposes. Detailed records were compiled for each energy source, encompassing its category, quantity, and designated application.

Reviewing energy bills: In the course of its daily activities, an organization employs a

range of energy types such as electricity, diesel, gasoline, liquefied petroleum gas (LPG), natural gas, etc. These energy bills offer a valuable means to evaluate the organization's total energy utilization and the specific equipment's consumption tendencies. Consequently, during the audit process, these relevant bills were thoroughly examined, providing valuable insights into the volume of energy expended. Moreover, they facilitated the identification of discernible patterns in energy usage linked to different energy sources and equipment units.

Evaluating Energy Efficiency Technologies and Measures : During the energy audit, a comprehensive assessment was conducted to explore potential alternative energy sources and innovative energy-saving measures. This involved examining the feasibility of adopting technologies such as solar panels, energy-efficient lighting, insulation improvements, and upgraded equipment.

Daily energy consumption Calculation

Calculate Total Power Consumption (in watts):Total Power=P×N
Calculate Energy Consumption in Watt-Hours: Energy (Wh)=Total Power (W) × Time (hours)
Convert Energy Consumption to Kilowatt-Hours (kWh): Energy (kWh)= Energy (Wh)/1000

Auditing of Energy Management

Sl.No	Parameters	Response
1.	Electricity bill amount for the last year	15,40,318
2.	Total energy consumption last year	146697
3.	Average monthly energy usage	12224
4.	Number of LPG cylinders used	Physics– 1(Rs.3000 p.a.)
5.	Amount paid for LPG cylinders for last year	Zoology -1(Rs. 1700 p.a.)Botany – 1 (C/o Chemistry)Chemistry –12 cylinders MDH– 120 Nos.p.a.(Rs.1,02,000) Canteen + ladies hostel(same kitchen)-118 Nos(
6.	Firewood used per month and amount of money spent?	1500 kg
7.	Mention Amount spent for petrol/diesel/others for generators? (should mention number of liters used)	Building No: 2 – Diesel: 120 College Office – Petrol 630 Liter Ladies Hostel–300 ltr Diesel

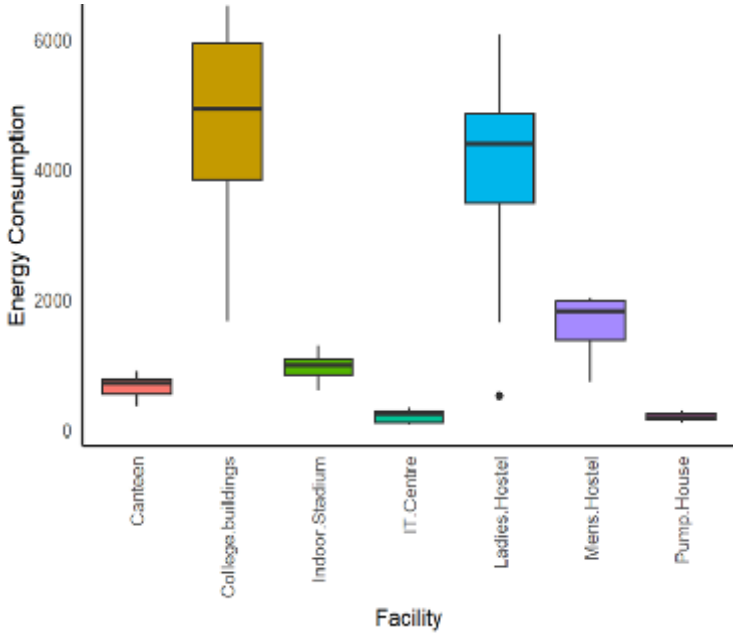
8.	Are there any energy saving methods employed in the campus?	We are replaced all the tube light, lamp with LED batten and LED light. All the newly replacing instruments or buying instruments are eco-friendly and less energy consuming.
9.	Does the institution have an energy management policy?	yes
10.	Howdoyoumanageandtrackenergyconsumption?	Yes
11.	Howfrequentlyinstitutionconductenergyaudits?	
12.	No.ofstreetlightsinyourcampus?	06
13.	Are there any alternativeenergy sources/ non-conventional energy sources in stalled in yourcampus?	Solar System–85 K.B
14.	Doyourun"switchoff"drillsatcampus?	No
15.	Is the institution actively engaged in energy efficiency programs?	Yes Urjakiranprogrammes Boomitrasena club
16.	Energy Efficient Lighting Fixtures	Yes –Less energy consuming LED lights and LED battens are used.
17.	Energy Efficient Fans	NIL
18.	Energy Efficiency in Appliances & Equipment	yes
19.	Energy Sub-Metering	
20.	Solar water heating system	NIL
21.	Others	

Appliances	Power of the instrument in Watt (W)	Used hours/day	No. of Appliances	Energy consumption/ day
Desktops and Laptops		1-7 hrs	159	18800
Air conditioners		5-7	16	32000
CFL bulbs	5 W, 12 W	5-7	64 nos	4608
Photocopiers/ printers		5-7	33	35200

LED lights		5-8	283	2547
Fans		5-8	300	80800
Tube lights/ LED batten			340	5350
Electrical Equipments			15	600
Inverters	5 K, 3K		11	45000
Heaters			1	1022
CCTVDVR	IDVR, DVR		28	160
Water pumps			14	31500
Refrigerators		24 hrs	6	1800
Other appliances and miscellaneous equipments	Induction cooker, Kettle, Hot air oven, Electric kettles, deep freezer etc.		57	35400
Energy used for construction and other purposes and some instruments used by the college is seems to be missing in the data documented (It is noted that other than the energy of the equipments installed lots of energy is consumed for construction/ other purposes)			Anticipated energy sued	112693
Average daily use			407480	
Average Energyusagepermonth12224400			12224 (kWh)	

Month	College buildings	IT Centre	Indoor Stadium	Canteen	Ladies Hostel	Mens Hostel	Pump House	Total Energy Consumption
Mar-24	4892	349	850	402	4954	1716	301	13464
Feb-24	5976	344	945	501	4363	1953	290	14372
Jan-24	6508	123	1032	706	4438	1988	279	15074
Dec-23	5104	216	1120	912	5112	1437	252	14153
Nov-23	4984	109	1295	854	4842	2024	226	14334
Oct-23	3904	109	1086	797	4603	1982	207	12688
Sep-23	6300	199	1086	782	3629	1684	188	13868
Aug-23	1980	78	1086	768	3015	1024	145	8096
Jul-23	4224	342	847	739	3775	1251	102	11280
Jun-23	5936	283	609	682	513	745	140	8908
May-23	1664	283	747	567	1647	2014	178	7100
Apr-23	3661	283	886	371	6063	1936	160	13360
Total	55133	2718	11589	8081	46954	19754	2468	146697

Avg. Monthly energy con-sumption	4594.42	226.5	965.75	673.42	3912.83	1646.17	205.67	12224.75



Data Analysis

In the energy audit's analysis phase, data collected from the college's website, phone interviews, and site visits were meticulously examined. This provided a comprehensive understanding of the institution's energy landscape, including sources and consumption patterns. Total energy use and equipment consumption were assessed to identify potential efficiency improvements. Data from different sectors were scrutinized based on criteria like energy-saving potential, costs, payback time, technical feasibility, and compatibility. This strategic framework established energy-saving measures by identifying consumption patterns. Overall, the analysis phase offered a holistic overview of the college's energy usage, guiding actionable recommendations for enhanced efficiency and sustainability.

Recommendations

The energy audit team has observed that the college has already undertaken numerous initiatives to enhance energy efficiency on its campus. These initiatives include replacing traditional tube lights and lamps with energy-efficient LED battens and LED lights. This switch not only reduces energy consumption but also provides better lighting quality and longer lifespan for the fixtures.The college has also prioritized the procurement of eco-friendly and energy-efficient instruments whenever new equipment is purchased or existing ones are replaced. This approach ensures that the campus infrastructure

continuously evolves towards greater sustainability and lower energy usage.In addition to these measures, the college has installed a solar power system with a capacity of 85 kB. This solar system contributes to the campus's energy supply, reducing reliance on conventional energy sources and promoting the use of renewable energy.Furthermore, the college has taken steps to maintain electrical safety and efficiency by properly covering most electrical wires, switch boxes, and stabilizers. This precaution prevents damage and potential energy loss, ensuring the electrical systems operate safely and efficiently.The college has also engaged in community and student involvement through energy-saving campaigns such as the Urjakiran programs. These campaigns raise awareness about energy conservation and encourage responsible energy use. Additionally, initiatives supported by the Boomitrasena club further emphasize the college's commitment to promoting sustainable practices within the campus community.These proactive steps indicate a strong commitment to energy conservation and sustainability. However, to further enhance the overall energy efficiency of the campus, the audit team has provided additional recommendations, which are outlined below. These recommendations aim to build on the existing efforts and help the college achieve even greater energy savings and environmental benefits.

- Improving Energy Usage Documentation :The main observation is the lack of proper documentation regarding energy usage and expenditures. The audit team faced difficulties in obtaining accurate and timely data related to energy consumption and the energy-consuming instruments. Additionally, concerns about the accuracy of some provided data were evident, as highlighted by the presence of outliers in the boxplot of energy consumption pattern. To address these issues, it is recommended to establish a comprehensive documentation system for energy usage and costs, enhance data collection processes with a proper meter reading systems, conduct regular data verification, provide staff training on accurate record-keeping. These measures will improve the accuracy and reliability of energy consumption data, facilitating better energy management, cost savings, and sustainability.
- Addressing Discrepancies in Energy Consumption : The audit team has noted a discrepancy between the overall energy consumption of the institute and the total number of devices along with their usage duration, indicating significant energy leaks or undocumented energy usage. Discussions with internal audit team members revealed that a substantial amount of electricity was used for ongoing renovation works. However, data on energy utilization for these renovation activities is also lacking. Therefore, it is strongly recommended to re-evaluate the overall energy consumption of the institute, correlating it with the number of devices and their usage duration after the renovation work is completed. Additionally, it is crucial to identify and rectify devices that continue to draw power from outlets even when not in use, a phenomenon known as "phantom load". Addressing this concealed energy consumption can lead to potential cost savings and enhanced energy conservation.
- Recommendation for Centralized Solar Hybrid Kitchen :During the audit period, the audit team observed that renovation work has commenced in the college canteen, men's hostel kitchen, and women's hostel kitchen. It is recommended to centralize these three separate kitchens into a single, unified kitchen. This centralized kitchen should be equipped with a Solar Hybrid Kitchen system to enhance energy efficiency.

A centralized kitchen would streamline operations, reduce redundancy, and optimize resource usage, while the Solar Hybrid Kitchen system would significantly cut down on energy consumption and promote sustainability. This approach would not only improve operational efficiency but also align with the institution's commitment to energy conservation.

- Implementation and Enforcement of Energy Management Policy : The college has informed, in response to the questionnaire, that the institution has an energy management policy; however, the details were not furnished to the audit team. Hence, it is suggested to not only create but also enforce a comprehensive energy management policy for the institution. This policy should outline energy-saving practices, equipment usage guidelines, and energy conservation initiatives.
- Upgrade to Energy-Efficient Appliances: Replace older devices with highly energy-efficient alternatives rated 4-5 stars. These appliances are designed to minimize energy consumption, resulting in reduced utility expenses and greater ecological sustainability.
- Effective E-Waste Management: Address the substantial accumulation of electronic waste (e-waste) within various departments. While adhering to government regulations for e-waste disposal may take time, promptly implement rigorous measures for e-waste disposal. Establish a designated e-waste storage area with accurate documentation until the complete disposal process is carried out.
- Establish Student and Teacher Energy Management Group: Following ISO 50001 standards, create a dedicated student and teacher group within the college to promote energy consciousness. They will integrate energy management into the college's overarching endeavors.
- Energy Conservation Awareness Program: Conduct an energy conservation awareness program to sensitize all stakeholders. This collaborative initiative empowers students with invaluable knowledge and fosters a profound sense of responsibility toward energy conservation, contributing to a more environmentally friendly future.
- Power Management for Computers: Encourage students to power off computers, projectors, and other devices when not in active use. Additionally, suggest lowering the brightness settings of computer screens to conserve energy.
- Promote "Power-Down" Practices: Initiate "power-down" exercises to promote the practice of switching off lights, devices, and machines when they're not actively needed. This simple habit can effectively minimize energy wastage.
- Explore Funding Opportunities: Explore potential monetary rewards, funding opportunities, or financial support available for initiatives focused on enhancing energy efficiency. These resources can assist in mitigating the initial expenses associated with adopting energy conservation measures.
- Enhance Natural Light and Airflow: Identify key campus areas like auditoriums, libraries, seminar rooms, conference halls, hallways, cafeterias, and gyms, where students often gather and usually depend on electric lighting. Promote studentsto correctly use windows and doors. Explore the feasibility of replacing traditional light fixtures with skylights to harness natural light and warmth effectively. Ensure the efficient functioning of ventilation and exhaust systems. Abundant natural light significantly reduces the necessity for artificial lighting in corridors and rooms, promoting energy efficiency.

- HVAC Maintenance: Maintain heating, ventilation, and air conditioning (HVAC) systems optimally. Regularly clean or replace air filters as recommended to prevent energy waste and excessive consumption. Implement a maintenance schedule and label filters with installation dates for easy tracking.
- Efficient Cooling and Heating Systems: Ensure that cooling and heating systems operate efficiently. Regular servicing and upkeep of these systems can result in reduced energy consumption.

POST-AUDIT STATE

Energy audit reporting

A comprehensive audit report has been prepared, drawing upon the data and information gathered during the audit process. This report serves as a thorough record of the college's present energy landscape, encompassing various aspects related to energy consumption, sources, and operational practices. The report highlights the college's commendable efforts to enhance energy efficiency, showcasing several noteworthy initiatives. The report extends beyond acknowledging these positive actions; it adopts a forward-thinking approach by offering a set of carefully considered recommendations. These recommendations are tailored to further fortify the college's commitment to energy conservation and overall sustainability. They provide practical insights and actionable strategies that, if put into practice, have the potential to yield substantial energy savings, reduce environmental impact, and foster a heightened sense of energy responsibility within the college community.

Action Plan

To operationalise the findings and recommendations of energy audit, a robust action plan is imperative. The plan presents a comprehensive approach for the college to implement energy-saving measures, elevate sustainability efforts, and cultivate a sense of energy responsibility within its community. By adopting these proposals, the college can reduce its carbon footprint, lower energy expenditures, and contribute to fostering a greener future.

Follow-up activities

Implementing the recommendations derived from the energy audit plays a pivotal role in curbing energy consumption, consequently leading to a reduction in carbon emissions. This contributes significantly to the organization's broader efforts to diminish its carbon footprint. The recommendations stemming from the energy audit adopt a 'top-down' approach, ensuring that senior stakeholders, such as the principal and department heads, grasp and engage with the objectives. This, in turn, motivates other staff members to actively participate in the college's energy management initiatives, providing a structured framework for involving both teachers and students in the collective pursuit of energy management. Following an energy audit, it is crucial to carry out a series of follow-up activities aimed at implementing the identified energy-saving opportunities. These measures not only result in measurable reductions in energy expenses but often lead to substantial cost savings within the first year, surpassing the initial implementation costs.

Comprehensive Energy Management Policy for Sir Syed College, Taliparamba, Kerala

Introduction: As a responsible institution committed to academic excellence and sustainable practices, Sir Syed College, Taliparamba is dedicated to fostering an environment that prioritizes energy efficiency, conservation, and environmental consciousness. This Energy Management Policy, which strictly follows ISO 50001 (Developing an Energy Management System), outlines our institution's commitment to effectively manage energy resources, reduce energy consumption, and contribute to a greener and more sustainable future.

Policy Statement: At Sir Syed College, Taliparamba, we pledge to:

1. Energy Conservation Awareness Program: Conduct regular energy conservation awareness programs to educate students, staff, and faculty members about the importance of energy conservation, efficient energy usage, and sustainable practices.
2. Formation of Energy Management Group: Establish an Energy Management Group comprising dedicated students and teachers to lead and oversee energy-related initiatives, campaigns, and projects within the college.
3. Optimized Energy Utilization: Develop and implement a comprehensive energy management plan that focuses on optimizing energy utilization across campus facilities, including classrooms, laboratories, administrative areas, and hostels.
4. Setting Tangible Targets: Set quantifiable energy consumption reduction targets in alignment with national and international standards, and continuously strive to achieve these goals through proactive measures.
5. Data-Driven Decision-Making: Utilize energy consumption data to make informed decisions regarding energy-saving measures, identify opportunities for improvement, and implement effective strategies.
6. Regular Energy Audits: Conduct periodic energy audits to assess energy usage patterns, identify areas of inefficiency, and develop action plans to address energy wastage.
7. Continuous Improvement: Foster a culture of continuous improvement by regularly reviewing and refining energy management practices, policies, and initiatives based on feedback, new technologies, and best practices.
8. Renewable Energy Integration: Explore and invest in renewable energy sources such as solar power, wind energy, and other sustainable alternatives to reduce our carbon footprint and reliance on non-renewable energy sources.
9. Green Infrastructure Development: Incorporate energy-efficient designs and technologies in new construction and renovation projects to enhance the overall energy performance of campus buildings and facilities.
10. Stakeholder Engagement: Collaborate with students, staff, faculty, and local communities to raise awareness, share knowledge, and actively involve all stakeholders in energy management efforts.

Conclusion: The Energy Management Policy of Sir Syed College, Taliparambaunderscores our commitment to create a sustainable and environmentally conscious campus. Through concerted efforts, we aim to optimize energy utilization, minimize wastage, and contribute to a cleaner and greener Kerala. By embracing energy-efficient practices and fostering a culture of environmental responsibility, we envision a future where Sir Syed College, Taliparambastands as a shining example of energy conservation and sustainability in education.

This policy shall be communicated to all stakeholders, integrated into the college's operational framework, and periodically reviewed and updated to ensure its effectiveness and alignment with changing energy management needs.

TRANSPORTATION

Auditing the transportation systems in Kerala colleges is critical for multiple reasons. Primarily, it ensures compliance with safety regulations and operational guidelines, which are essential for minimizing risks associated with student transport. Regular audits can identify potential risks and inefficiencies in transportation practices, providing a foundation for actionable recommendations aimed at enhancing safety and operational effectiveness. By rigorously evaluating transportation systems, colleges can undertake proactive measures to improve service quality, reduce costs, and maintain accountability to stakeholders, including students and parents.

The transportation audit at Sir Syed College in Thalipparamba, Kannur, holds significant importance due to Kerala's unique and expansive transportation landscape. Kerala boasts a vast road network stretching 230,934.18 kilometers, with a road density three times the national average at 548 kilometers per 100 square kilometers (Kumar & Srinivasan, 2017). This extensive network, while indicative of Kerala's excellent connectivity, presents unique challenges, particularly in the context of increasing motor vehicle registrations and road safety concerns. The audit aims to highlight the necessity of transportation audits to ensure accessible, efficient, and safe commuting options for students and staff at Sir Syed College. Transportation systems in colleges are crucial for ensuring that students can access educational facilities conveniently and safely. These systems typically comprise a fleet of college-operated buses serving designated routes, designed specifically to accommodate the influx of students and staff during peak hours. By enhancing student attendance, reducing tardiness, and promoting greater academic engagement among the student body, effective transportation systems play a vital role in the educational process. In addition to buses, students and teachers may rely on public transport, personal vehicles, bikes, cycles, or walking. The diversity of transportation options necessitates a thorough audit. Auditing transportation systems is fundamental to ensuring that safety regulations and operational guidelines are met. Compliance with these regulations is crucial for sustaining a safe

environment for students during their commutes. Regular audits help to uphold these standards, fostering a culture of accountability and diligence within the transportation framework of educational institutions

The methodology adopted for collecting transportation data as part of Sir Syed College's green auditing process was systematic and comprehensive. This data collection effort was organized on a departmental basis, encompassing a wide range of transportation modes used by both students and staff. From each department and the college office, the number of individuals opting for various transportation methods, which included auto-rickshaws, bikes, cars, cycles, public transport, and walking, was recorded. Additionally, the distances covered by each mode of transportation were diligently recorded. This meticulous approach facilitated a detailed assessment of transportation preferences and patterns within the college community. The data collection process was executed in such a way as to capture transportation behaviors accurately. Subsequently, the compiled information was used to calculate the total distances covered by each mode of transportation. This comprehensive data not only provided valuable insights into the transportation landscape of Sir Syed College but also serves as a foundational resource for assessing the environmental impact of transportation choices and developing strategies to promote sustainable and eco-friendly commuting options within the campus community.

Transportation Preferences in Sir Syed College (in %)

Auto Rick-shaw	Bike	Car	Cycle	Public Transport	Walking	College bus
0.91	0.14	2.18	0.14	54.47	13.37	18.86

The transportation audit data from Sir Syed College reveals a diverse usage of various transport modes by students. This report details the percentage utilization of each transportation option, highlighting prevailing trends in student commuting preferences. Among the various modes of transportation, public transport accounts for an overwhelming majority of 54.47%. This high percentage indicates a strong reliance on public transportation systems by students, suggesting that these services are vital for their daily commuting needs. Such a trend may reflect the affordability and accessibility of public transport in the regions surrounding the college, making it a preferred choice for students. The college bus service holds a significant position, utilized by 18.86% of students. This high percentage indicates that the institution's transportation offerings are valued, as they provide a safe, convenient, and reliable option for commuting to campus. The appeal of college buses lies in their direct connectivity to the college, which can enhance the overall student experience by reducing the uncertainties commonly associated with public transport alternatives.

In contrast, the usage of personal vehicles is notably low, with cars utilized by only 2.18% of students, while bikes and auto rickshaws show even lower percentages at 0.14% and 0.91%, respectively. This low preference for personal vehicles could indicate student considerations regarding cost, parking availability, and the environmental impact of private transport. The modest utilization of personal vehicles signifies a broader inclination towards shared

transport options, suggesting that students may prioritize convenience and accessibility over vehicle ownership.

Interestingly, the audit data reveals that only 0.14% of students choose cycling as their mode of transportation, indicating potential barriers such as inadequate infrastructure or a lack of incentives for cycling as a reliable option. Additionally, walking is a notable mode of transport, with 13.37% of students preferring it, which underscores a preference for non-motorized commuting options. The relatively high percentage of students walking is largely attributed to hostel residents who use this mode of transport.

The transportation audit data highlights a notable scarcity of electric vehicles (EVs) utilized by students at Sir Syed College. Despite the growing global emphasis on sustainability and the environmental benefits that electric vehicles offer, their presence on campus remains minimal. This limited usage may be attributed to various factors, such as the high initial cost of electric vehicles, insufficient charging infrastructure within the college premises, and a lack of awareness regarding the advantages of EVs among the student population. Addressing these barriers could promote the integration of electric vehicles into the campus transportation ecosystem, thus contributing to a more sustainable future for the college community.

Interestingly, 20% of students reside within a 5-kilometer radius of Sir Syed College, with 10.5% living as close as 2.5 kilometers from the college. Despite the short distance, many of these students still opt for public transportation, cars, bikes, or autos for their daily commute. This intriguing trend suggests a reliance on motorized transport even for short distances, highlighting potential areas for improvement in encouraging sustainable and eco-friendly commuting options. Promoting more sustainable transportation methods among students living in close proximity to the college is essential for several reasons. Firstly, it can significantly reduce the institution's carbon footprint, contributing to broader environmental conservation efforts. Secondly, encouraging non-motorized transport options like walking and cycling can improve students' physical health and well-being. To address this issue, the college could implement several strategies. Improving infrastructure for pedestrians and cyclists, such as well-maintained sidewalks, dedicated bike lanes, and secure bike parking, would make these options more attractive and feasible. Additionally, the college could introduce incentives for using non-motorized transport, such as rewards programs, discounts on campus services, or wellness initiatives that highlight the health benefits of walking and cycling.

The audit provides valuable insights into commuting habits and their environmental impact. The limited use of personal vehicles and cycling, along with a high reliance on motorized transport—even for short distances—highlights the need for enhanced infrastructure and incentives to promote sustainable commuting, including the adoption of electric vehicles (EVs). By addressing these issues and encouraging eco-friendly transportation options, Sir Syed College can play a crucial role in reducing its carbon footprint, improving student health, and fostering a more sustainable campus environment.

Recommendations

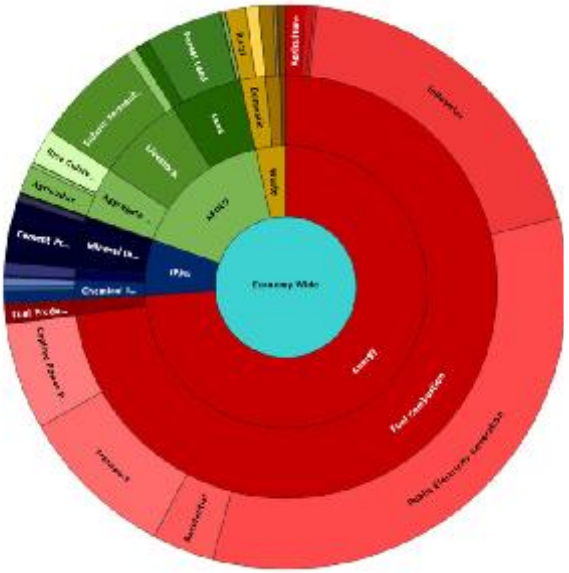
- Sir Syed College should install EV charging stations on campus and offer incentives such as discounts on campus services or priority parking for EV users. These steps will support and promote the adoption of electric vehicles, contributing to a more sustainable campus and reducing the college's carbon footprint.
- Construct well-maintained sidewalks with proper lighting to ensure safe walking conditions for students. Additionally, design direct and convenient routes between important campus locations and upgrade signages to guide pedestrians efficiently. To promote walking, the college could organize campus-wide walking challenges, offer incentives for meeting walking goals, and create walking trails that connect to popular campus destinations
- Designate and construct bicycle lanes to facilitate safer cycling routes. Create a cycling-friendly environment with well-marked lanes and crossings to ensure the safety and convenience of both pedestrians and cyclists. This will encourage students to choose cycling as an eco-friendly mode of transport.
- Host events that celebrate walking and cycling, such as "Cycle to College Day" or walking challenges, to foster a culture of active commuting and enhance community engagement among students.
- Expanding the bus fleet to accommodate increasing student numbers and reduce overcrowding, coupled with optimizing service frequency to minimize wait times and provide more flexible travel options, is crucial. Implementing an online reservation system will allow students to book seats in advance, enhancing seat management and journey planning.
- Real-Time Tracking Systems: Implement real-time tracking for colleges bus services to allow students to easily access information about bus locations and arrival times.
- Ensure strict adherence to safety and regulatory standards focused on evaluating compliance with vehicle safety, driver qualifications, and insurance coverage. Additionally, implement ongoing education for staff and students about these regulations to foster a culture of safety and responsibility.
- Optimized routes enable buses to take the shortest and most efficient paths, reducing the distance travelled and the amount of fuel consumed. This, in turn, decreases emissions significantly.
- Increase hostel capacity by constructing new buildings and optimizing existing spaces to accommodate more students. Upgrade amenities and utilities within hostels, such as kitchen facilities, study areas, and recreational spaces, to improve the living environment.
- Constructing additional parking facilities with a thoughtful design that prioritizes efficiency, sustainability, accessibility, and safety is essential for meeting the current and future parking demands on campus. By undertaking this initiative, the college can provide a more accommodating environment for students and staff, ultimately improving their overall campus experience.
- Implement a bicycles sharing program within the college to make bicycles readily available to students and staff for short-distance commuting. This initiative can significantly reduce the dependence on motorized vehicles and promote physical activity.

- Encourage students and staff of the college to engage in bike sharing and carpooling arrangements. Implement a carpooling platform or app to facilitate ride-sharing and reduce the number of single occupancy vehicles on campus
- Collaborate with local authorities to implement traffic safety measures around the college, including speed limits, proper signage, and regular maintenance of roads. Continuously monitor transportation patterns and conduct regular transportation audits to assess the effectiveness of sustainability initiatives. Use the data collected to make informed decisions and improvements.
- Organize awareness campaigns, workshops, and incentives to promote eco-friendly commuting options. Offer workshops on sustainable mobility, environmental consciousness, and the benefits of adopting eco-friendly transportation modes. Raise awareness about responsible road behaviour and the consequences of traffic violation. Collaborate with behavioural psychologists to design and implement behaviour change programs that motivate individuals to choose eco-friendly transportation options.
- Form a Transportation Monitoring Committee (TMCG) including students, faculty, administration, and transport providers to assess and oversee transportation options. Task the TMCG with regular data collection on commuting patterns and satisfaction, and require them to present periodic reports with recommendations to the administration for continuous improvement in transportation services.

CARBON AUDITING

CARBON ACCOUNTING: EMISSIONS AND SEQUESTRATION

Greenhouse gas (GHG) emissions, primarily resulting from human activities, are the primary drivers of global climate change. These emissions, including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), create a greenhouse effect in the Earth's atmosphere, resulting in elevated global temperatures and consequential environmental impacts. It is imperative to comprehend and address these emissions to effectively combat climate change. To comprehensively calculate carbon emissions and manage their environmental impact, organizations and institutes need to follow a structured framework. Calculating carbon emissions is a crucial process in understanding and mitigating the impact of human activities on the environment. It involves gathering accurate data related to specific activities, such as energy consumption, transportation, or industrial processes, and then applying appropriate emission factors to quantify the amount of greenhouse gases released into the atmosphere. These emission factors, often provided by organizations like the Intergovernmental Panel on Climate



Economy Wide Emissions in India,
Source : GHG Platform, India

Change (IPCC), represent the emissions intensity of those activities. The resulting calculation, typically expressed in units of carbon dioxide equivalent (CO2e), serves as a valuable tool for assessing an entity's environmental footprint, setting reduction targets, and designing strategies to combat climate change. Accurate carbon emission calculations are essential for governments, businesses, and individuals to take informed steps towards a more sustainable and low-carbon future. This pivotal practice empowers stakeholders to comprehend and address the far-reaching impacts of human activities on the planet's climate, as detailed in this report, with a primary focus on the methodology prescribed by the IPCC. The IPCC's methodology involves two key components: "Activity Data" and "Emission Factors." Activity data represents quantitative measurements of specific activities, such as energy consumption and transportation, while emission factors are numerical values that express the emissions intensity associated with these activities. Accurate data collection and application of emission factors enable the quantification of greenhouse gas emissions in units of carbon dioxide equivalent (CO2e). This practice forms the foundation for understanding environmental impact, setting reduction targets, and shaping sustainable practices and policies. Inventories." The basic equation for calculating emissions is:

Emissions (in Co2e) = Activity Data x Emission Factor

Activity Data: This component of the equation refers to quantitative measurements of the specific activity or process under consideration. It essentially answers the question: "How much of this activity occurred?" Activity data can take various forms depending on the nature of the emission source:

- **Energy Consumption:** If you are calculating emissions from energy use, such as electricity or fuels, you need data on the amount of energy consumed. This data is typically measured in units like kilowatt-hours (kWh) for electricity or gallons or liters for fuels. It represents the activity of energy consumption.
- **Vehicle Use:** For emissions related to vehicle use, you'll need data on factors such as the distance traveled (in miles or kilometers) and fuel consumption (in gallons or liters). This data quantifies the activity of driving or operating vehicles.
- **Fugitive Emissions:** In cases involving fugitive emissions, like refrigerants leaking from air conditioning systems, you might need data on the type of refrigerant used, leak rates, and equipment specifications. This data characterizes the fugitive emissions activity.

Emission Factor: Emission factors, as defined by the Intergovernmental Panel on Climate Change (IPCC), are integral to global efforts in addressing climate change. They serve as representative values linking the release of greenhouse gases (GHGs) to specific human activities or processes. These factors are crucial components in the development of national greenhouse gas inventories, forming the basis for climate action and policy formulation at both national and international levels. Emission factors, often expressed as emissions per unit of activity, enable the estimation of GHG emissions from diverse sources such as energy production, transportation, and industrial processes. Their specificity and accuracy are paramount in assessing progress toward emission reduction goals.

In the realm of greenhouse gas (GHG) inventories and climate change mitigation, the concept of "tiers" is a critical framework that enables countries and organizations to systematically classify and assess the level of detail and accuracy in estimating GHG emissions. These tiers, often associated with the guidelines outlined by the Intergovernmental Panel on Climate Change (IPCC), serve as a valuable tool for improving the transparency, comparability, and reliability of GHG data.

Tier 1: At the foundational level, Tier 1 involves using default values or generic emission factors. These factors are generally broad and may not capture the unique characteristics of a specific region or activity. Tier 1 is often employed by countries or organizations with limited resources or data availability. While it provides a basic estimate of emissions, it may not reflect the intricacies of local conditions.

Tier 2: Tier 2 represents an intermediate level of estimation. In this tier, emission factors are tailored to the specific country or region. This approach takes into account more localized data and characteristics, resulting in a more accurate assessment of GHG emissions. Tier 2 is suitable for regions with access to some data but not yet fully detailed inventories.

Tier 3: At the highest level of detail and accuracy, Tier 3 involves using country-specific or site-specific data and emission factors. This tier requires comprehensive data collection and analysis, often involving direct measurements and precise calculations. Tier 3 inventories are considered the most accurate and are essential for regions committed to robust emissions reporting.

The choice of tier depends on the country's or organization's capacity, data availability, and the desired level of accuracy. While Tier 1 provides a basic estimate, Tier 2 enhances the precision, and Tier 3 offers the highest level of confidence in GHG emissions estimation. Over time, the goal is for countries and organizations to progress towards higher tiers as they develop more sophisticated data collection and analysis capabilities.

Understanding GHG Scopes: A Framework for Emissions Categorization

In the realm of greenhouse gas (GHG) accounting and reporting, the concept of "scope" plays a pivotal role in systematically categorizing and understanding emissions. These scopes serve as distinct lenses through which organizations and entities view their carbon footprint. The three scopes, as defined by the Intergovernmental Panel on Climate Change

(IPCC), offer a structured approach to dissecting GHG emissions. Scope 1 encompasses direct emissions stemming from sources under the organization's ownership or control. Scope 2 shifts the focus to indirect emissions related to purchased electricity consumption, arising from sources external to the organization but integral to its operations. Lastly, Scope 3 casts the widest net, covering a multitude of indirect emissions from activities across the entire value chain, extending beyond the organization's immediate control. This framework not only aids in precise emissions measurement and reporting but also empowers organizations to develop comprehensive strategies for reducing their overall carbon footprint. By delineating emissions into these scopes, organizations can holistically assess their environmental impact and make informed decisions to mitigate climate change effectively.

- **Scope 1** accounts for direct GHG emissions originating from sources directly owned or controlled by the institute, such as emissions from internal combustion processes or their own vehicle fleet. Notably, this scope includes emissions from fossil fuel combustion but separates direct CO2 emissions from biomass combustion and other GHGs not covered by the Kyoto Protocol for separate reporting.
- **Scope 2** addresses GHG emissions indirectly linked to purchased electricity consumption. These emissions occur at the facilities where electricity is generated and are tied to the electricity purchased by the organization.
- **While Scope 1 and Scope 2** are fundamental, Scope 3 is optional but valuable. It encompasses all other indirect emissions resulting from the institute's activities but originating from sources beyond their direct ownership or control. Scope 3 widens the perspective, covering emissions related to supply chains, employee commutes, business travel, and more.

Calculation of carbon emission from

A. Carbon emission from LPG cylinders used in the college (Scope 1)

Total number of LGP cylinder used during the year	volume of the domestic LPG cylinder	Emission CO_2e/year*	Emission ton CO_2e/year
89	14.2	3728	3.72

B. Carbon emission from diesel used for electricity generation (Scope 1)

Total annual Consumption of diesel (Litre)	Emission CO_2e/year*	Emission ton CO_2e/year
75	198.75	0.19

C. Carbon emission from purchased electricity (Scope 2)

Total annual Consumption	Unit	Emission Factor* kg CO_2e/kWh	Emission CO_2e/year	Emission ton CO_2e/year
146697	kWh	0.81	118824.57	118.82

*** Tire 2 Emission factor** (India specific) as per Baseline Carbon Dioxide Emission Database Version 18.0 for the Indian Power Sector, Government of India Ministry of Power, Central Electricity Authority has been taken.

D. Emission from transport (Scope 3)

MODE OF TRANSPORT				TOTAL DISTANCE PER DAY	WORKING DAYS	TOTAL DISTANCE	kg CO_2	tons of CO_2
AUTO RICKSHAW				99	179	17721	1346.796	1.34
FOUR-WHEELER				1352	179	242008	26839.26	26.83
PUBLIC TRANSPORT				11206.08	179	2005888	7020.559	7.02
TWO-WHEELER				2073.7	179	371192	14096.25	14.09
COLLEGE BUS	KL 59 T 2933	Kannur to Sir Syed College and back	44	178	179	31862	111.51	0.11

	KL 59 L 7636	Irikkur to Sir Syed College and back	50					
	KL 59 H 7840	Kannur to College and back	44					
	KL 59 N 3928	Pazhayangadi to College and back	40					
								49.39

*http://www.ghgprotocol.org/calculation-tools/alltools & 2006 IPCC Guidelines for National Greenhouse Gas Inventories were followed. The average mileage for the vehicles was assumed as follows: 15 kilometres per litre for cars, 50 kilometres per litre for bikes, and 30 kilometres per litre for auto rickshaws. The number of passengers per bus was estimated at 50 for public transport/college buses. Emission factors were subsequently calculated based on these parameters.

E. Carbon emission from burning of woody biomass (Scope 3)

Total annual wood Consumption	Carbon emission**
900 kg	1.47 tonne Carbon

**For calculation of Carbon emission from the burning of woody biomass, IPCC-LULC Guidelines was followed (Carbon emission from woody biomass = Quantity of non-renewable biomass × Net calorific value of the non-renewable biomass × CO_2 emission factor for the biomass fuel). Where Tire 1 IPCC default values for NCV biomass of 0.015 TJ/tonne and CO_2 emission factor of 109.6 tCO2/TJ were taken (IPCC, 1996).

F. Carbon emission from waste (Scope 1)

Waste generation	Emission factor Emission	Emission	Global Warming Potential	Carbon equivalent	Emission CO_2e/year	Emission ton CO_2e/year
420	0.355	149.10 CH4	27.2	4055.52	**4471.74**	**4.47**
	0.991	416.22 CO2	1	416.22		

No	Activity	Emission in Tonnes
A	Carbon emission from LPG cylinders used in the college (Scope 1)	3.72
B	Carbon emission from diesel used for electricity generation (Scope 1)	0.19
C	Carbon emission from purchased electricity (Scope 2)	118.82
D	Emission from transport (Scope 3)	49.39
E	Carbon emission from burning of woody biomass (Scope 3)	1.47
F	Carbon emission from waste (Scope 1)	4.47
G	Emissions from various events and miscellaneous emissions	12
Total		**190.06**

Carbon Stock Estimation in Trees Using Allometric Equations (Non-Destructive Method)

I. AGB = 34.4703 – 8.0671*DBH + 0.6589*(DBH2)

Sl. No.	Name of the tree species	Girth at Breast Height	Diameter at Breast Height	AGB	BGB	Total Biomass Green	Dry Weight	Carbon Content	CO_2 equivalent	CO_2 equivalent in Ton
1	*Acacia mangium* Willd.	27	8.6	13.83	3.73	17.56	12.73	6.37	23.36	0.02
2	*Aegle marmelos* (L.) Correa	27	8.6	13.83	3.73	17.56	12.73	6.37	23.36	0.02
3	*Aegle marmelos* (L.) Correa	30	9.55	17.52	4.73	22.25	16.13	8.07	29.59	0.03
4	*Albizia lebbeck* (L.) Benth.	20	6.37	9.82	2.65	12.47	9.04	4.52	16.57	0.02
5	*Annona muricata* L.	35	11.15	26.44	7.14	33.58	24.35	12.18	44.66	0.04
6	*Annona reticulata* L.	40	12.74	38.64	10.43	49.07	35.58	17.79	65.23	0.07
7	*Annona squamosa* L.	22	7.01	10.3	2.78	13.08	9.48	4.74	17.38	0.02
8	*Annona squamosa* L.	35	11.15	26.44	7.14	33.58	24.35	12.18	44.66	0.04
9	*Aquilaria malaccensis* Lam.	28	8.92	14.94	4.03	18.97	13.75	6.88	25.23	0.03
10	*Artocarpus heterophyllus* Lam.	32	10.19	20.68	5.58	26.26	19.04	9.52	34.91	0.03
11	*Averrhoa bilimbi* L.	25	7.96	12.01	3.24	15.25	11.06	5.53	20.28	0.02
12	*Azadirachta indica* A. Juss.	20	6.37	9.82	2.65	12.47	9.04	4.52	16.57	0.02
13	*Azadirachta indica* A. Juss.	20	6.37	9.82	2.65	12.47	9.04	4.52	16.57	0.02
14	*Azadirachta indica* A. Juss.	25	7.96	12.01	3.24	15.25	11.06	5.53	20.28	0.02
15	*Azadirachta indica* A. Juss.	25	7.96	12.01	3.24	15.25	11.06	5.53	20.28	0.02
16	*Azadirachta indica* A. Juss.	28	8.92	14.94	4.03	18.97	13.75	6.88	25.23	0.03
17	*Bauhinia purpurea* L.	40	12.74	38.64	10.43	49.07	35.58	17.79	65.23	0.07
18	*Caryota urens* L.	20	6.37	9.82	2.65	12.47	9.04	4.52	16.57	0.02
19	*Casuarina equisetifolia* L.	20	6.37	9.82	2.65	12.47	9.04	4.52	16.57	0.02

20	*Chrysophyllum cainito* L.	30	9.55	17.52	4.73	22.25	16.13	8.07	29.59	0.03
21	*Cinamomum malabatrum* (Burm. F) Presl	21	6.69	9.99	2.7	12.69	9.2	4.6	16.87	0.02
22	*Cinamomum malabatrum* (Burm. F) Presl	34	10.83	24.39	6.59	30.98	22.46	11.23	41.18	0.04
23	*Citharexylum spinosum* L.	25	7.96	12.01	3.24	15.25	11.06	5.53	20.28	0.02
24	*Dalbergia latifolia* Roxb.	19	6.05	9.78	2.64	12.42	9	4.5	16.5	0.02
25	*Elaeis guineensis* Jacq.	35	11.15	26.44	7.14	33.58	24.35	12.18	44.66	0.04
26	*Ficus racemosa* L.	22	7.01	10.3	2.78	13.08	9.48	4.74	17.38	0.02
27	*Garcinia gummi-gutta* (L.) Robs.	25	7.96	12.01	3.24	15.25	11.06	5.53	20.28	0.02
28	*Gmelina arborea* Roxb. Ex Sm.	25	7.96	12.01	3.24	15.25	11.06	5.53	20.28	0.02
29	*Lannea coromandelica* (Houtt.) Merr.	35	11.15	26.44	7.14	33.58	24.35	12.18	44.66	0.04
30	*Largerstroemia speciosa* (L.) Pers.	20	6.37	9.82	2.65	12.47	9.04	4.52	16.57	0.02
31	*Largerstroemia speciosa* (L.) Pers.	20	6.37	9.82	2.65	12.47	9.04	4.52	16.57	0.02
32	*Macaranga peltata* (Roxb.) Mull.Arg.	35	11.15	26.44	7.14	33.58	24.35	12.18	44.66	0.04
33	*Mangifera indica* L.	25	7.96	12.01	3.24	15.25	11.06	5.53	20.28	0.02
34	*Manilkara zapota* (L.) P. Royen.	20	6.37	9.82	2.65	12.47	9.04	4.52	16.57	0.02
35	*Mimusops elengi* L.	19	6.05	9.78	2.64	12.42	9	4.5	16.5	0.02
36	*Mimusops elengi* L.	20	6.37	9.82	2.65	12.47	9.04	4.52	16.57	0.02
37	*Phyllanthus emblica* L.	37	11.78	30.87	8.33	39.2	28.42	14.21	52.1	0.05
38	*Polyalthia longifolia* (Sonn.) Thwaites	35	11.15	26.44	7.14	33.58	24.35	12.18	44.66	0.04
39	*Polyalthia longifolia* (Sonn.) Thwaites	38	12.1	33.33	9	42.33	30.69	15.35	56.28	0.06
40	*Pongamia pinnata* (L.) Pierre	20	6.37	9.82	2.65	12.47	9.04	4.52	16.57	0.02

41	*Pongamia pinnata* (L.) Pierre	24	7.64	11.3	3.05	14.35	10.4	5.2	19.07	0.02
42	*Santalum album* L.	25	7.96	12.01	3.24	15.25	11.06	5.53	20.28	0.02
43	*Santalum album* L.	31	9.87	19.04	5.14	24.18	17.53	8.77	32.16	0.03
44	*Santalum album* L.	32	10.19	20.68	5.58	26.26	19.04	9.52	34.91	0.03
45	*Santalum album* L.	36	11.46	28.56	7.71	36.27	26.3	13.15	48.22	0.05
46	*Strychnos nux-vomica* L.	30	9.55	17.52	4.73	22.25	16.13	8.07	29.59	0.03
47	*Swietenia macrophylla* G. King	35	11.15	26.44	7.14	33.58	24.35	12.18	44.66	0.04
48	*Tamarindus indica* L.	20	6.37	9.82	2.65	12.47	9.04	4.52	16.57	0.02
49	*Tectona grandis* L.f.	20	6.37	9.82	2.65	12.47	9.04	4.52	16.57	0.02
50	*Tectona grandis* L.f.	22	7.01	10.3	2.78	13.08	9.48	4.74	17.38	0.02
51	*Tectona grandis* L.f.	25	7.96	12.01	3.24	15.25	11.06	5.53	20.28	0.02
52	*Tectona grandis* L.f.	34	10.83	24.39	6.59	30.98	22.46	11.23	41.18	0.04
53	*Terminalia arjuna* (Roxb.) Wight & Arn	35	11.15	26.44	7.14	33.58	24.35	12.18	44.66	0.04
54	*Terminalia bellerica* (Gaertn.) Roxb.	36	11.46	28.56	7.71	36.27	26.3	13.15	48.22	0.05
55	*Terminalia catappa* L.	34	10.83	24.39	6.59	30.98	22.46	11.23	41.18	0.04
56	*Terminalia catappa* L.	38	12.1	33.33	9	42.33	30.69	15.35	56.28	0.06
57	*Wrightia tinctoria*	32	10.19	20.68	5.58	26.26	19.04	9.52	34.91	0.03

II. AGB = exp {-2.134 + 2.530 * ln (DBH)}

Sl. No.	Name of the tree species	Girth at Breast Height	Diameter at Breast Height	AGB	BGB	Total Biomass Green	Dry Weight	Carbon Content	CO_2 equivalent	CO_2 equivalent in Ton
58	*Anacardium occidentale* L.	60	19.11	206.45	55.74	262.19	190.09	95.05	348.52	0.35
59	*Azadirachta indica* A. Juss.	42	13.38	83.78	22.62	106.4	77.14	38.57	141.42	0.14
60	*Bridelia retusa* (L.) A. Juss.	60	19.11	206.45	55.74	262.19	190.09	95.05	348.52	0.35
61	*Cinnamomum verum* J. S. Presl	46	14.65	105.39	28.46	133.85	97.04	48.52	177.91	0.18
62	*Delonyx regia* (Hook.) Raf.	50	15.92	130.06	35.12	165.18	119.76	59.88	219.56	0.22
63	*Delonyx regia* (Hook.) Raf.	57	18.15	181.21	48.93	230.14	166.85	83.43	305.91	0.31
64	*Ficus racemosa* L.	45	14.33	99.66	26.91	126.57	91.76	45.88	168.23	0.17
65	*Gliricidia sepium* (Jacq.) Walp.	56	17.83	173.23	46.77	220	159.5	79.75	292.42	0.29
66	*Holarrhena pubescens* Wall. Ex G. Don	56	17.83	173.23	46.77	220	159.5	79.75	292.42	0.29
67	*Lannea coromandelica* (Houtt.) Merr.	48	15.29	117.43	31.71	149.14	108.13	54.07	198.26	0.2
68	*Libidibia coriaria* (Jacq.) Willd.	45	14.33	99.66	26.91	126.57	91.76	45.88	168.23	0.17
69	*Macaranga peltata* (Roxb.) Mull.Arg.	48	15.29	117.43	31.71	149.14	108.13	54.07	198.26	0.2
70	*Macaranga peltata* (Roxb.) Mull.Arg.	53	16.88	150.82	40.72	191.54	138.87	69.44	254.61	0.25
71	*Memecylon edule* Roxb.	45	14.33	99.66	26.91	126.57	91.76	45.88	168.23	0.17
72	*Memecylon randerianum*	45	14.33	99.66	26.91	126.57	91.76	45.88	168.23	0.17
73	*Mitragyna parvifolia* (Roxb.) Korth.	45	14.33	99.66	26.91	126.57	91.76	45.88	168.23	0.17
74	*Phyllanthus emblica* L.	60	19.11	206.45	55.74	262.19	190.09	95.05	348.52	0.35
75	*Polyalthia longifolia* (Sonn.) Thwaites	42	13.38	83.78	22.62	106.4	77.14	38.57	141.42	0.14

76	*Polyalthia longifolia* (Sonn.) Thwaites	45	14.33	99.66	26.91	126.57	91.76	45.88	168.23	0.17
77	*Polyalthia longifolia* (Sonn.) Thwaites	47	14.97	111.31	30.05	141.36	102.49	51.25	187.92	0.19
78	*Polyalthia longifolia* (Sonn.) Thwaites	52	16.56	143.69	38.8	182.49	132.31	66.16	242.59	0.24
79	*Polyalthia longifolia* (Sonn.) Thwaites	54	17.2	158.16	42.7	200.86	145.62	72.81	266.97	0.27
80	*Polyalthia longifolia* (Sonn.) Thwaites	56	17.83	173.23	46.77	220	159.5	79.75	292.42	0.29
81	*Psidium guajava*	45	14.33	99.66	26.91	126.57	91.76	45.88	168.23	0.17
82	*Pterocarpus marsupium* Roxb.	56	17.83	173.23	46.77	220	159.5	79.75	292.42	0.29
83	*Pterocarpus santalinus* L.f.	45	14.33	99.66	26.91	126.57	91.76	45.88	168.23	0.17
84	*Santalum album* L.	42	13.38	83.78	22.62	106.4	77.14	38.57	141.42	0.14
85	*Simarouba glauca* DC.	45	14.33	99.66	26.91	126.57	91.76	45.88	168.23	0.17
86	*Strychnos nux-vomica* L.	49	15.61	123.74	33.41	157.15	113.93	56.97	208.89	0.21
87	*Swietenia macrophylla* G. King	52	16.56	143.69	38.8	182.49	132.31	66.16	242.59	0.24
88	*Syzygium cumini* (L.) Skeels	44	14.01	94.12	25.41	119.53	86.66	43.33	158.88	0.16
89	*Syzygium cumini* (L.) Skeels	45	14.33	99.66	26.91	126.57	91.76	45.88	168.23	0.17
90	*Syzygium cumini* (L.) Skeels	51	16.24	136.77	36.93	173.7	125.93	62.97	230.89	0.23
91	*Tectona grandis* L.f.	54	17.2	158.16	42.7	200.86	145.62	72.81	266.97	0.27
92	*Terminalia arjuna* (Roxb.) Wight & Arn	42	13.38	83.78	22.62	106.4	77.14	38.57	141.42	0.14
93	*Terminalia bellerica* (Gaertn.) Roxb.	56	17.83	173.23	46.77	220	159.5	79.75	292.42	0.29
94	*Terminalia catappa* L.	50	15.92	130.06	35.12	165.18	119.76	59.88	219.56	0.22
95	*Terminalia chebula* Retz.	45	14.33	99.66	26.91	126.57	91.76	45.88	168.23	0.17
96	*Terminalia cuneata* Roth.	44	14.01	94.12	25.41	119.53	86.66	43.33	158.88	0.16
97	*Trema orientalis* (L.) Bl.	41	13.06	78.8	21.28	100.08	72.56	36.28	133.03	0.13
98	*Wodyetia bifurcate*	60	19.11	206.45	55.74	262.19	190.09	95.05	348.52	0.35
99	*Zanthoxylum rhetsa* (Roxb.) DC.	50	15.92	130.06	35.12	165.18	119.76	59.88	219.56	0.22

III. AGB = 42.69 – 12.800*(DBH) + 1.242*(DBH)2

Sl. No.	Name of the tree species	Girth at Breast Height	Diameter at Breast Height	AGB	BGB	Total Biomass Green	Dry Weight	Carbon Content	CO_2 equivalent	CO_2 equivalent in Ton
100	*Acacia auriculiformis* Benth.	72	22.93	402.21	104.57	506.78	367.42	183.71	672.38	0.672
101	*Acacia auriculiformis* Benth.	76	24.2	460.29	119.68	579.97	420.48	210.24	769.48	0.769
102	*Acacia auriculiformis* Benth.	103	32.8	959.04	249.35	1208.39	876.08	438.04	1603.23	1.603
103	*Acacia auriculiformis* Benth.	110	35.03	1118.37	290.78	1409.15	1021.63	510.82	1869.6	1.87
104	*Acacia auriculiformis* Benth.	116	36.94	1264.65	328.81	1593.46	1155.26	577.63	2114.13	2.114
105	*Acacia auriculiformis* Benth.	136	43.31	1818.01	472.68	2290.69	1660.75	830.38	3039.19	3.039
106	*Acacia mangium* Willd.	95	30.25	792	205.92	997.92	723.49	361.75	1324.01	1.324
107	*Acacia mangium* Willd.	120	38.22	1367.75	355.62	1723.37	1249.44	624.72	2286.48	2.286
108	*Alstonia scholaris* (L.) R.Br.	75	23.89	445.75	115.9	561.65	407.2	203.6	745.18	0.745
109	*Anacardium occidentale* L.	80	25.48	522.89	135.95	658.84	477.66	238.83	874.12	0.874
110	*Artocarpus heterophyllus* Lam.	85	27.07	606.31	157.64	763.95	553.86	276.93	1013.56	1.014
111	*Artocarpus heterophyllus* Lam.	120	38.22	1367.75	355.62	1723.37	1249.44	624.72	2286.48	2.286
112	*Artocarpus heterophyllus* Lam.	139	44.27	1910.15	496.64	2406.79	1744.92	872.46	3193.2	3.193
113	*Bridelia retusa* (L.) A. Juss.	65	20.7	309.91	80.58	390.49	283.11	141.56	518.11	0.518
114	*Caesalpinia sappan* L.	65	20.7	309.91	80.58	390.49	283.11	141.56	518.11	0.518
115	*Careya arborea* Roxb.	87	27.71	641.66	166.83	808.49	586.16	293.08	1072.67	1.073
116	*Cassia fistula* L.	72	22.93	402.21	104.57	506.78	367.42	183.71	672.38	0.672
117	*Cassia fistula* L.	82	26.11	555.19	144.35	699.54	507.17	253.59	928.14	0.928
118	*Cassia fistula* L.	85	27.07	606.31	157.64	763.95	553.86	276.93	1013.56	1.014
119	*Casuarina equisetifolia* L.	66	21.02	322.4	83.82	406.22	294.51	147.26	538.97	0.539
120	*Casuarina equisetifolia* L.	90	28.66	696.02	180.97	876.99	635.82	317.91	1163.55	1.164
121	*Casuarina equisetifolia* L.	91	28.98	714.83	185.86	900.69	653	326.5	1194.99	1.195
122	*Cocos nucifera* L.	72	22.93	402.21	104.57	506.78	367.42	183.71	672.38	0.672
123	*Cocos nucifera* L.	90	28.66	696.02	180.97	876.99	635.82	317.91	1163.55	1.164

124	*Dalbergia latifolia* Roxb.	69	21.97	360.96	93.85	454.81	329.74	164.87	603.42	0.603
125	*Dalbergia latifolia* Roxb.	70	22.29	374.46	97.36	471.82	342.07	171.04	626.01	0.626
126	*Delonyx regia* (Hook.) Raf.	110	35.03	1118.37	290.78	1409.15	1021.63	510.82	1869.6	1.87
127	*Delonyx regia* (Hook.) Raf.	121	38.54	1394.16	362.48	1756.64	1273.56	636.78	2330.61	2.331
128	*Ficus bengalensis* L.	68	21.66	348.13	90.51	438.64	318.01	159.01	581.98	0.582
129	*Ficus bengalensis* L.	125	39.81	1501.49	390.39	1891.88	1371.61	685.81	2510.06	2.51
130	*Garcinia andamanica* King	110	35.03	1118.37	290.78	1409.15	1021.63	510.82	1869.6	1.87
131	*Garcinia xanthochymus* Hook. f.	80	25.48	522.89	135.95	658.84	477.66	238.83	874.12	0.874
132	*Gliricidia sepium* (Jacq.) Walp.	75	23.89	445.75	115.9	561.65	407.2	203.6	745.18	0.745
133	*Hopea ponga* (Dennst.) Mabb.	75	23.89	445.75	115.9	561.65	407.2	203.6	745.18	0.745
134	*Hopea ponga* (Dennst.) Mabb.	89	28.34	677.46	176.14	853.6	618.86	309.43	1132.51	1.133
135	*Leucaena leucocephala* (Lam.) de Wit	75	23.89	445.75	115.9	561.65	407.2	203.6	745.18	0.745
136	*Melicope lunu-ankenda* (Gaertn.) T.G. Hartley	68	21.66	348.13	90.51	438.64	318.01	159.01	581.98	0.582
137	*Mitragyna parvifolia* (Roxb.) Korth.	68	21.66	348.13	90.51	438.64	318.01	159.01	581.98	0.582
138	*Morinda citrifolia* L., nom. Cons.	70	22.29	374.46	97.36	471.82	342.07	171.04	626.01	0.626
139	*Peltophorum pterocarpum* (DC.) K. Heyne	110	35.03	1118.37	290.78	1409.15	1021.63	510.82	1869.6	1.87
140	*Phyllanthus emblica* L.	75	23.89	445.75	115.9	561.65	407.2	203.6	745.18	0.745
141	*Polyalthia longifolia* (Sonn.) Thwaites	61	19.43	262.87	68.35	331.22	240.13	120.07	439.46	0.439
142	*Polyalthia longifolia* (Sonn.) Thwaites	67	21.34	335.14	87.14	422.28	306.15	153.08	560.27	0.56
143	*Polyalthia longifolia* (Sonn.) Thwaites	70	22.29	374.46	97.36	471.82	342.07	171.04	626.01	0.626
144	*Polyalthia longifolia* (Sonn.) Thwaites	70	22.29	374.46	97.36	471.82	342.07	171.04	626.01	0.626
145	*Polyalthia longifolia* (Sonn.) Thwaites	72	22.93	402.21	104.57	506.78	367.42	183.71	672.38	0.672
146	*Polyalthia longifolia* (Sonn.) Thwaites	77	24.52	475.56	123.65	599.21	434.43	217.22	795.03	0.795

147	*Polyalthia longifolia* (Sonn.) Thwaites	80	25.48	522.89	135.95	658.84	477.66	238.83	874.12	0.874
148	*Polyalthia longifolia* (Sonn.) Thwaites	91	28.98	714.83	185.86	900.69	653	326.5	1194.99	1.195
149	*Polyalthia longifolia* (Sonn.) Thwaites	91	28.98	714.83	185.86	900.69	653	326.5	1194.99	1.195
150	*Polyalthia longifolia* (Sonn.) Thwaites	99	31.53	873.83	227.2	1101.03	798.25	399.13	1460.82	1.461
151	*Polyalthia longifolia* (Sonn.) Thwaites	100	31.85	894.92	232.68	1127.6	817.51	408.76	1496.06	1.496
152	*Polyalthia longifolia* (Sonn.) Thwaites	119	37.9	1341.59	348.81	1690.4	1225.54	612.77	2242.74	2.243
153	*Polyalthia longifolia* (Sonn.) Thwaites	119	37.9	1341.59	348.81	1690.4	1225.54	612.77	2242.74	2.243
154	*Polyalthia longifolia* (Sonn.) Thwaites	119	37.9	1341.59	348.81	1690.4	1225.54	612.77	2242.74	2.243
155	*Polyalthia longifolia* (Sonn.) Thwaites	120	38.22	1367.75	355.62	1723.37	1249.44	624.72	2286.48	2.286
156	*Polyalthia longifolia* (Sonn.) Thwaites	120	38.22	1367.75	355.62	1723.37	1249.44	624.72	2286.48	2.286
157	*Polyalthia longifolia* (Sonn.) Thwaites	120	38.22	1367.75	355.62	1723.37	1249.44	624.72	2286.48	2.286
158	*Polyalthia longifolia* (Sonn.) Thwaites	120	38.22	1367.75	355.62	1723.37	1249.44	624.72	2286.48	2.286
159	*Polyalthia longifolia* (Sonn.) Thwaites	122	38.85	1419.99	369.2	1789.19	1297.16	648.58	2373.8	2.374
160	*Polyalthia longifolia* (Sonn.) Thwaites	122	38.85	1419.99	369.2	1789.19	1297.16	648.58	2373.8	2.374
161	*Polyalthia longifolia* (Sonn.) Thwaites	127	40.45	1557.09	404.84	1961.93	1422.4	711.2	2602.99	2.603
162	*Polyalthia longifolia* (Sonn.) Thwaites	127	40.45	1557.09	404.84	1961.93	1422.4	711.2	2602.99	2.603
163	*Polyalthia longifolia* (Sonn.) Thwaites	129	41.08	1612.82	419.33	2032.15	1473.31	736.66	2696.18	2.696
164	*Polyalthia longifolia* (Sonn.) Thwaites	129	41.08	1612.82	419.33	2032.15	1473.31	736.66	2696.18	2.696

165	*Polyalthia longifolia* (Sonn.) Thwaites	130	41.4	1641.51	426.79	2068.3	1499.52	749.76	2744.12	2.744
166	*Polyalthia longifolia* (Sonn.) Thwaites	137	43.63	1848.47	480.6	2329.07	1688.58	844.29	3090.1	3.09
167	*Pongamia pinnata* (L.) Pierre	105	33.44	1003.5	260.91	1264.41	916.7	458.35	1677.56	1.678
168	*Psidium guajava*	69	21.97	360.96	93.85	454.81	329.74	164.87	603.42	0.603
169	*Pterocarpus santalinus* L.f.	65	20.7	309.91	80.58	390.49	283.11	141.56	518.11	0.518
170	*Pterocarpus santalinus* L.f.	66	21.02	322.4	83.82	406.22	294.51	147.26	538.97	0.539
171	*Pterocarpus santalinus* L.f.	72	22.93	402.21	104.57	506.78	367.42	183.71	672.38	0.672
172	*Samanea saman* (Jacq.) Merr.	105	33.44	1003.5	260.91	1264.41	916.7	458.35	1677.56	1.678
173	*Samanea saman* (Jacq.) Merr.	190	60.51	3815.7	992.08	4807.78	3485.64	1742.82	6378.72	6.379
174	*Saraca asoca* (Roxb.) Willd.	95	30.25	792	205.92	997.92	723.49	361.75	1324.01	1.324
175	*Saraca asoca* (Roxb.) Willd.	110	35.03	1118.37	290.78	1409.15	1021.63	510.82	1869.6	1.87
176	*Simarouba glauca* DC.	65	20.7	309.91	80.58	390.49	283.11	141.56	518.11	0.518
177	*Syzygium cumini* (L.) Skeels	63	20.06	285.71	74.28	359.99	260.99	130.5	477.63	0.478
178	*Syzygium cumini* (L.) Skeels	64	20.38	297.68	77.4	375.08	271.93	135.97	497.65	0.498
179	*Syzygium cumini* (L.) Skeels	70	22.29	374.46	97.36	471.82	342.07	171.04	626.01	0.626
180	*Syzygium cumini* (L.) Skeels	75	23.89	445.75	115.9	561.65	407.2	203.6	745.18	0.745
181	*Syzygium cumini* (L.) Skeels	77	24.52	475.56	123.65	599.21	434.43	217.22	795.03	0.795
182	*Syzygium cumini* (L.) Skeels	78	24.84	491.08	127.68	618.76	448.6	224.3	820.94	0.821
183	*Syzygium cumini* (L.) Skeels	80	25.48	522.89	135.95	658.84	477.66	238.83	874.12	0.874
184	*Syzygium cumini* (L.) Skeels	86	27.39	623.86	162.2	786.06	569.89	284.95	1042.92	1.043
185	*Syzygium cumini* (L.) Skeels	87	27.71	641.66	166.83	808.49	586.16	293.08	1072.67	1.073
186	*Syzygium cumini* (L.) Skeels	90	28.66	696.02	180.97	876.99	635.82	317.91	1163.55	1.164
187	*Syzygium cumini* (L.) Skeels	104	33.12	981.15	255.1	1236.25	896.28	448.14	1640.19	1.64
188	*Syzygium cumini* (L.) Skeels	108	34.39	1071.38	278.56	1349.94	978.71	489.36	1791.06	1.791
189	*Tectona grandis* L.f.	91	28.98	714.83	185.86	900.69	653	326.5	1194.99	1.195
190	*Tectona grandis* L.f.	95	30.25	792	205.92	997.92	723.49	361.75	1324.01	1.324
191	*Terminalia arjuna* (Roxb.) Wight & Arn	65	20.7	309.91	80.58	390.49	283.11	141.56	518.11	0.518
192	*Terminalia chebula* Retz.	67	21.34	335.14	87.14	422.28	306.15	153.08	560.27	0.56

193	*Terminalia paniculata* Roth.	80	25.48	522.89	135.95	658.84	477.66	238.83	874.12	0.874
194	*Trema orientalis* (L.) Bl.	76	24.2	460.29	119.68	579.97	420.48	210.24	769.48	0.769
Total										**140.74**

AR – AMS0001/Version 04: Simplified baseline and monitoring methodologies of clean development mechanism: Afforestation and Reforestation Working Group of United Nations Framework Convention on Climate Changes is followed.

The Carbon audit at Sir Syed College has provided a comprehensive overview of the institution's carbon footprint. The audit identifies various sources of carbon emissions categorized into Scope 1 (direct emissions), Scope 2 (indirect emissions from purchased electricity), and Scope 3 (other indirect emissions). Understanding and addressing these emissions are crucial for the college's sustainability goals. LPG (liquefied petroleum gas) is widely used at the college for activities such as cooking in canteens and laboratories. The audit reveals that a total of 89 LPG cylinders, each with a volume of 14.2 kg, were used over the year. This usage results in a significant amount of carbon emissions. Specifically, the LPG consumption contributes 3728 kg of CO2e annually, which translates to 3.72 tons of CO2e per year. This highlights the need for exploring alternative energy sources or more efficient cooking methods to reduce the carbon footprint from LPG usage. One such solution could be the implementation of a hybrid kitchen system that combines solar energy with conventional cooking methods. This approach not only reduces reliance on LPG but also promotes the use of renewable energy, thereby significantly lowering carbon emissions. Diesel generators are often used as backup power sources, ensuring the college's operations continue during power outages. The audit indicates that the total annual diesel consumption for electricity generation is 75 liters. This diesel usage results in 198.75 kg of CO2e emissions per year, equivalent to 0.19 tons of CO2e annually. While this is a smaller component of the college's overall emissions, it still underscores the importance of optimizing generator usage. Purchased electricity represents a major portion of the college's carbon footprint. The total annual electricity consumption is 146,697 kWh, this translates to 118,824.57 kg of CO2e emissions annually, or 118.82 tons of CO2e. This substantial figure highlights the critical need for energy efficiency measures on campus. Steps such as improving lighting efficiency, optimizing HVAC systems, and reducing usage through awareness programs are needed to reduce these indirect emissions. Transportation is another significant source of carbon emissions at Sir Syed College. The audit data includes emissions from various modes of transport used by students and staff, including auto-rickshaws, four-wheelers, public transport, two-wheelers, and college buses. The transportation emissions add up to 49.39 tons of CO2e annually. This significant figure calls for the promotion of carpooling, use of public transport, and perhaps even the introduction of more eco-friendly transportation options like electric vehicles and bicycles.

The assessment of carbon stocks in trees provides valuable insights into their role in mitigating climate change. Using allometric equations, estimated the carbon stock for various tree species. The carbon stock values, derived from the equations and measurements, ranged from 0.02 to 0.35 tons of CO_2 equivalent per tree, depending on species and size. To enhance carbon sequestration and contribute effectively to climate mitigation, several key strategies should be adopted. Firstly, increasing tree planting initiatives with a focus on species known for high carbon storage potential. These species should be prioritized in afforestation and reforestation projects. Alongside planting, regular maintenance and monitoring are crucial to ensure optimal growth and carbon sequestration capabilities. Diversifying the range of tree species, including those with significant carbon stock will bolster ecosystem resilience and maximize carbon capture. Implementing sustainable forest management practices is vital to maintaining tree health and growth; this involves

controlling pests, diseases, and managing soil nutrients effectively. Establishing a robust system for continuous monitoring and reporting will facilitate timely adjustments to management practices, optimizing carbon storage. Participation in carbon credit programs should be encouraged, as these programs provide financial incentives for conservation and sustainable practices. Lastly, educating and engaging local communities about the importance of trees in carbon sequestration can amplify the impact of these efforts by fostering community involvement in tree planting and conservation activities. Adopting these strategies will enhance carbon management, support climate change mitigation, and promote overall ecosystem health.

Summarizing the carbon emissions profile for Sir Syed College, the total annual emissions amount to 190.06 tons of CO2e, highlighting the critical areas contributing to the college's carbon footprint and underscoring the need for targeted strategies to mitigate these emissions. To address this, it is essential to enhance documentation practices, optimize energy management, improve transportation protocols, and implement efficient waste management systems. In addition, integrating strategies to increase carbon sequestration is crucial. The assessment in this regard show that the carbon stock in various tree species ranges from 0.02 to 0.35 tons of CO2 equivalent per tree, depending on species and size. Prioritizing the planting of tree species with high carbon storage potential in afforestation and reforestation projects, along with regular maintenance and monitoring, will significantly contribute to climate mitigation. Diversifying tree species, implementing sustainable forest management practices, and establishing a robust monitoring system will further optimize carbon storage. Participation in carbon credit programs and engaging local communities in tree planting and conservation initiatives will enhance these efforts. By adopting these comprehensive strategies, Sir Syed College can significantly reduce its carbon footprint and advance its commitment to sustainability and environmental responsibility.

WATER QUALITY ASSESSMENT

Background

Water is basic forever. From the time that primeval species ventured from the oceans to live ashore. Chemically, it is transparent, colorless, tasteless compound of hydrogen and oxygen (H2O). Water is additionally found in strong state as ice and gaseous state as vapors (Popkin et al., 2010 and Linton, 2010). All living beings, including humans require water for their survival. Therefore, guaranteeing that sufficient supplies of water are accessible is fundamental for person. A typical clarification is that despite the fact that there is a considerable measure of water on earth, just around 2.5% is freshwater, and in light of the fact that the majority of water is put away as icy masses or profound ground water just a little measure of water is effortlessly available (Oki and Kanae, 2006).

Human activities consume and pollute a lot of water. At a global scale, most of the water use occurs in agricultural production, but there are also substantial water volumes consumed and polluted in the industrial and domestic sectors. Water consumption and pollution can be associated with specific activities, such as irrigation, bathing, washing, cleaning, cooling and processing. Total water consumption and pollution are generally regarded as the sum of a multitude of independent water demanding and polluting activities.

Water quality can be defined as the chemical, physical, biological, and radiological characteristics of water, and it is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose. It is most frequently used by reference to a set of standards against which compliance, generally achieved through treatment of the water, can be assessed. The most common standards used to assess water quality relate to health of ecosystems, safety of human contact, and drinking water. Bureau of Indian standard, World health organization (WHO) and Indian standards are the most commonly using standards of water.

The water quality analysis is mainly based on physical factor, chemical factor and biological factor.

- Physical Factors/physical parameter- including Temperature, pH, colour, conductivity, odour, taste, turbidity, suspended solids, dissolved solids etc
- Chemical Factors/ chemical parameters- including Hardness, fluoride, calcium, Alkalinity, magnesium, nitrate, chloride, phosphate, sulphate, BOD, COD, Nitrate
- Biological Factors /biological parameters- including Total Coliform, Faecal Coliform, MPN etc.

Methodology

The sample collection was carried out during the field visits. The water samples from Well water (Sir Syed College Campus), Water from Ladies Hostel, Water from Gents Hostel sources were taken from the campus. The sample collection, preservation, and analysis were done in the scientific manner as prescribed by the standard procedures.

Results

Water samples from three different locations were collected and analyzed for its quality parameters. The samples include Well water (Sir Syed College Campus), Water from Ladies Hostel, Water from Gents Hostel. The major parameters analyzedand results are presented in the Table. The results are comparable with the values of drinking water standards prescribed by different agencies.

Results of the physico, chemical and bacteriological parameters of Sir Syed Campus

Sl. No	Parameters	Well water (Campus)	Water from Ladies Hostel	Water from Gents Hostel
1.	pH	6.74	6.64	7.13
2.	Turbidity (NTU)	1.41	0.31	1.44
3.	Conductivity (µS/cm)	87.5	84.1	78.4
4.	Total Dissolved Solids (mg/L)	58	56	40
5.	Total Hardness as CaCO3 (mg/L)	22	14	24
6.	Total Alkalinity as CaCO3 (mg/L)	18.63	14.49	31.05
7.	Acidity	6	16	17
8.	Chloride (mg/L)	13.54	13.54	11.61
9.	Sulphate (mg/L)	2.28	BDL	1.13
10.	Calcium (mg/L)	5.61	3.2	4
11.	Magnesium (mg/L)	1.94	1.45	3.4
12.	Iron (mg/L)	0.08	0.03	0.05
13.	Nitrate - NO3 (mg/L)	1.08	1.52	0.57
14.	Total Coliform (CFU/100mL)	259	231	152
15.	Faecal Coliform (CFU/100mL)	122	30	75

pH

pH is one of the most important and frequently used test in water chemistry. It is a measure of intensity of acidity or alkalinity.pH is an important water quality parameter, which influences the biological, physical and chemical process within a water body. ThepH variations of three water sources are shown in table. In the present study, the pH values of three water sourcesare6.74, 6.64and7.13respectively. The results of the pH value are found to be within the acceptable limit as per IS10500-2012 drinking water specification.

Electrical Conductivity (EC)

Electrical conductivity is a measure of the concentration, dissociation as well as the migration of ions in the solution. It is directly proportional to dissolved mineral matter content and becomes an indicator of dissolved ions present in the water samples.TheECvariations of three water sources are shown in table. In the present study, the EC values of three water samples are 87.5 µS/cm, 84.1 µS/cm and 78.4 µS/cm respectively. In the present study, the values of electrical conductivity of various water sources were within the permissible limits for drinking water.

Total Dissolved Solids (TDS)

Total Dissolved Solids is a measure of the combined content of all inorganic and organic substances. Total Dissolved Solids were measured by using a digital TDS meter. In the present study, the TDS values of three water samples are 58 mg/l, 56mg/l and40mg/l respectively. In the present study, the values of TDS of various water sources were within the permissible limits for drinking water.

Total Hardness (TH)

The total hardness is an index of water quality with considerable significance in connection with the discharge of agricultural wastes. Hardness of water is not a specific constituent but is a variable and complex mixture of cations and anions. It is caused by dissolved polyvalent metallic ions.The results of the present study showed that the value of total hardness of three water samples are 22mg/L, 14mg/Land 24mg/L.The water samples of various water sources were within the permissible limits for drinking water as per IS10500-2012.

Alkalinity

The alkalinity of a water is a measure of its capacity to neutralize acids. The alkalinity of natural or treated water is due to the presence of bicarbonate, carbonate and hydroxide compounds of calcium magnesium, sodium and potassium, Borates Phosphates and silicate also contribute to alkalinity. The determination of alkalinity provides an idea of the nature of salts present. The alkalinity of three water samples are18.63mg/L,14.49mg/L and31.05mg/L respectively (Table). The alkalinity of Bore well and well water are found to be above the acceptable limit as per IS10500-2012.

Chloride (Cl-)

Chloride in the form of chlorine ions is one of the major inorganic ions in water. The presence of chloride in natural waters can be attributed to the dissolution of salt deposits, discharges of effluents from chemical industries, sewage discharges etc. Tableshows the concentrations of Chloride in various water sources of Sir Syed college. The Chloride of three water samples are13.54mg/L,13.54mg/L and 11.61mg/L respectively (Table)

Sulphate, Calcium and Magnesium

Sulphates occur naturally in water as a result of leaching from gypsum and other common minerals. In addition, sulphates may be added to water system in several treatment processes. Sulphate cause a problem of sealing in industrial water supplies and problem of odour and corrosion in waste water treatment due to its hydrogen sulphide. The sulphate concentration of three water samples are2.28 mg/L, BDL and 1.13 mg/L respectively. The calcium concentrations of three water samples are 5.61 mg/L, 3.2 mg/L and 4 mg/L respectively. The magnesium concentrations of three water samples are shown as 1.94 mg/L, 1.45 mg/L and 3.4mg/L respectively (Table).

Iron

Iron is the most abundant element in the earth's crust. In water it occurs mainly in the divalent and trivalent (ferrous and ferric) states. Iron is present in significant amounts in soils and rocks, principally in insoluble forms.The Fe concentration of the three water samples are0.08 mg/L, 0.03mg/Land 0.05 mg/L respectively (Table).

Nitrate

The presence of nitrate in water indicates organic pollution. Significant sources of nitrate are chemical fertilizers, domestic effluents, industrial discharge etc. Excessive concentration in drinking water is considered hazardous for infants because in their intestinal track nitrates are reduced to nitrites which may cause methemoglobinaemia.Nitrate is determined by cadmium-reduction techniques as well as phenol disulphonic acid method.Nitrate concentration in the water samples from 1.08mg/l, 1.52 mg/L and 0.57mg/lrespectively.

Bacteriological Analysis (Total coliform and Faecal coliform)

The tableshows that results of TC and FC of different water samples at Sir Syed College, Taliparamba. The TC and FC were present in all samples.

WASTE MANAGEMENT AUDIT

Introduction

Waste management refers to various schemes to manage and dispose of waste. It can be done by discarding, destroying, processing, recycling, reusing, or controlling wastes. The prime objective of waste management is to reduce the amount of unusable materials and to avert potential health and environmental hazards. A big part of waste management deals with municipal solid waste, which is created by industrial, commercial, and household activities.

The Waste management audit is a systematic review of waste generated on a campus. Identification of the existing waste management practices and the pros and cons associated with the waste management of the campus are systematically assessed in a detailed waste management audit. Following the Waste management audit, there will be recommendations for the firms to overcome or enhance the existing practices in a sustainable and eco-friendly manner by integrating the principles of green approaches or technologies.

Significance of Waste Management Audit

- Improper waste management practices can deteriorate the overall environmental status of the campus.
- Waste audit supports a firm in understanding the pros and cons of existing waste management systems in the organization.
- Waste auditing helps an organization adopt better waste management options.
- Enhancing reduction, reuse, and recycling practices.
- Overall improvement of the environment.

Objectives of waste audit:

- To investigate the current status of solid and liquid waste generated on campus.
- To examine the status of biodegradable and non-biodegradable waste
- To appraise the prevailing waste disposal methods and suggest measures to improve the existing waste management strategies.

Waste Management Audit at Sir Syed College:

The audit team observed the waste generation and management practices in the office, laboratories, canteen/Kitchen, the college's open areas, the playground, the auditorium, and construction sites. The team noticed that food waste and paper waste are the main components of the biodegradable waste in the college. Plastic waste constitutes the main nonbiodegradable waste. Construction activities on the campus generate construction waste also.

Existing waste management practices of the campus

The campus has adopted various positive practices of biodegradable and nonbiodegradable waste management, which include 1. Ring compost units were placed in 3 sites on the campus to collect food waste. 2. Reusing parts of electric and plumbing items, broken desk, and bench 3. Special bottle booth and waste bins for plastic waste collection 4. Pen dropping box for collecting used pens 5. Plastic wastes Handed over to Haritha Karma Sena 6. Biogas unit in college canteen 7. Burners for napkin disposal 8. E. waste and building wastes were handed over to recycling units after inviting tender. 9. Paper waste handed over to recycling units. 10. Students' attendance, assignments, mark entry, etc are in online mode to avoid paper waste 11. Notes and teaching materials are made available on an Online platform, thus reducing paper waste. 12. Sufficient number of waste bins for paper, food, and plastics on each floor 13. The compost produced is used for gardening purposes on the campus. 14. Restriction of single-use plastics on the campus 14. Cloth bag preparation unit by students of Bhoomithra Sena 15. Organizing awareness programs for waste management 16. Paper bags and paper cups are strictly banned on the campus 17. Regular use of steel glasses for campus programs 18. Imposing a fine for the use of disposable items on campus.

Table 1 shows the approximate quantity of waste generated per day in the campus and appendix 1 shows the responses to waste management survey questions by the campus fraternity.

Table 1:Approximate quantity of waste generated per day in the campus

	Bio-degradable	Non-biode-gradable	Hazardous	e-waste	Others
In kg	1 kg (food), 3 kg (papers)	0	0	0	0

Laboratories

	Bio-degradable	Non-biode-gradable	Hazardous	e-waste	Others
In kg	2 kg (plant and animal parts)	1 kg	25 gm	0	0

Canteen/Kitchen

	Bio-degradable	Non-biode-gradable	Hazardous	e-waste	Others
In kg	30 -40 kg	3 kg	0	0	0

College open areas, Play ground, Open auditorium, Construction sites

	Bio-degradable	Non-biode-gradable	Hazardous	e-waste	Others
In kg	0	1 kg	0	0	50 KG (construction)

Figures 1:- to 6 show the waste management practices adopted on the campus for sustainable waste management.

Fig 1: Biogas plant established in the campus , Fig 2: Hoardings with waste management message placed in the campus, Fig 3: Hoardings with sustainable life style message placed in the campus

Chemical waste management of the campus:

The campus has adopted diluting of the chemical wastes from the chemistry laboratory and disposing off it to the separate pits constructed for the purpose. Biological organisms are disposed after sterilization in autoclave by adopting bio-safety guidelines. Plant parts are dumped in compost pits.

Waste Water management:

Waste water from the campus premises is disposed to separate underground pits. Septic tanks are used to dispose toilet waste.

Glass wastes from laboratories:

Broken glass pieces were carried and dumped in a specific area and later hand over to recycling units.

Sanitary Napkin wastes

Separate napkin disposing burners arranged in toilets. Napkin burning incinerator also established in the campus. Due to heavy load, most of the time, the incinerators are not working properly. College has a plan to place more number of incinerators. Awareness, sessions on menstrual hygiene and promotion of the use of menstrual cups were conducted for the campus fraternity.

Fig4: Collection and transportation of Plastic wastes in the campus

Fig 5: Bhoomithra sena club members with cloth bags as part of an awarenesscamp

Fig 6: Campus cleaning drive by the college fraternity

Conclusion:
The audit team could observe that the college has implemented a number of green initiatives to ensure the sustainable management of both biodegradable and nonbiodegradable wastes in the campus. There were programs also conducted to make the students and teachers aware of the importance of sustainable waste management. The college Bhoomithrasena club is taking care to maintain the cleanliness of the campus by all its possible ways. The practices, findings, remarks, and recommendations emphasized in this waste management audit report will help to improve the waste management practices and resource usage at the college. This may help to guide the authorities in framing appropriate strategies for a green campus and sustainable environment.

Recommendations
1. Implementation of Green protocol in the campus
2. Hoardings/display boards with messages upholding environmental sustainability and waste management
3. Establishment of incinerators for the management of sanitary Napkins.
4. Constitution of a green protocol committee to monitor the waste management practices of the campus regularly

Appendix 1. The responses to waste management survey questions by the campus fraternity.

SL. No.	Questions	Response
1.	Does college generate any waste?	YES
	How is the waste generated in the campus managed? By • Composting • Recycling • Reusing • Others(specify)	Managing Waste 1. Composting – Ring compost of a pair placed in 3 sites to collect food waste. 2. Reusing parts of electric and plumbing items, broken desk and bench. 3. Special bottle booth and waste bins for waste collection. 4. Pen dropping box for collecting used pens. 5. Plastic waste Handed over to Haritha karma sena 6. Bio gas plant in canteen. 7. Burners for napkin disposal 8. Ewaste and building waste handed over to recycling units after inviting tender. 9. Paper waste handed over to recycling units . 10. Students attendance, assignments,mark entry etc are in online mode .Notes and teaching materials made available in Online platform- LMS.
3	How many separate boxes are placed in campus for different type of waste? (Specify the number of locations also)	3 boxes (Food, non bio degradable and paper) In each building, a set of 3 in all floor.
4.	Is there any waste wealth programme practiced in the campus?	Yes – Biogas, ring compost – manure produced used in garden.
5.	Is there any waste treatment system in the campus?	Yes
6.	Whether waste is polluting the ground/ surface/air of the college?	No
7.	Is there any treatment for toilet/sanitary napkin waste?	Yes- for napkin

8.	Which of the following are found near your college? Municipal dumpyard Garbage heap Public convenience Sewer line Stagnant water Open drainage Industry, Market/Shoppingcomplex Residency Bus/Railwaystation	 yes yes yes

Waste Generated in the college and their Disposal

Types of Waste	Particulars	Disposal Method
E-waste	Computers,Electrical and electronic parts	Handed over to recycling units after inviting tender. Collecting From sources and stored in a separate place.
Plastic waste	Pen, Refill, Plastic water bottles, Other plastic containers, Wrappers,etc.	1. Placed separate pen boxes to collect the used pen. Also every week students of Bhoomithrasena club collects pen from open groundand store in separate boxes. 2. Use of disposable plastic bottles strictly prohibited in the campus. If any will collect and dispose in bottle booth 3. All these collected waste were handed over to Haritha karma sena or other rag pickers for recycling. 4. In order to reduce the use of plastic packets, we are promoting cloth bags prepared by our students of Bhoomithrasena clubs. 5. Waste management classes and related flash mobs, quiz, street plays etc are regularly conducting with the support of Suchithwa mission and Haritha Kerala Mission.

Solid waste	Damaged furniture, Paper waste, Paper plates, Food waste	1. Collects and store in separate centres. 2. Damaged furniture parts reused to prepare new furnitures. 3. Paper plates and glasses are strictly banned in the campus. There are steel glasses and plates for using in all students and teacher related programmes. There is a monitoring committee to check this and also give fine if anybody using disposable items. 4. Food waste collected by separate bins from each building is carried over to the ring composting system. From Canteen also disposing all food waste to ring compost or in the compost pits.
Chemical waste	Lab waste	1. From chemistry lab, the chemicals after diluting with water disposed to separate pit constructed. 2. Biological organisms are disposed after sterilization in autoclave by adopting bio-safety guidelines. 3. Plant parts are dumped in compost pits.
Wastewater	Washing, Bathrooms	1. They were disposed to separate underground pits. 2. Septic tanks are used to dispose toilet waste.
Glass waste	Broken glass wares from the lab	1. Carried and stored in separate centres and handed over to recycling units.
Sanitary napkin		1. Separate napkin disposing burners arranged in toilet. 2. Napkin burning incinerator also using.But due to heavy load, usually not work properly. 3. Planning to place more number of incinerators, 4. Giving awareness classes to menstrual hygiene and also to promote the use of menstrual cups.

Food Waste		1. Collection from each building after lunch time and disposed to ring compost units. 2. From canteen , parts of chicken, beef etc collected regularly and given to animal farms(pig). Remaining waste dispose to ring compost and bio gas units. 3. In every building there is a system to collect food waste
Waste Paper	Answer sheets, assignments notes etc.	1. Methods adopted to reduce use of papers to write assignments. Some departments use note book system. From first semester to VI semester students will write in a single note book and that will return back. 2. If any note book left in the departments, after removing used pages, the book will store in the departments and handed over to needy students. 3. Answer sheets will return back and if any left will collect and store in boxes and given to recycling units.- 4. Students were encouraged to use our LMS, Moodle to upload assignments and teachers usually give notes through this mode or via Whattsapp, Telegram,E.mailetc

GREEN INITIATIVES AND OUTREACH PROGRAMMES

SIR SYED COLLEGE

Taliparamba, Karimbam P. O, Kannur
Affiliated to Kannur University
Accresited by NAAC (Cycle - 3) with A

GREEN ACTIVITIES REPORT
2023 - 2024

SWACHH BARATH SWACHH SIR SYED

CLEAN SIR SYED GREEN SIR SYED

1. Plastic free campus announcement

The College PTA, Green Protocol Monitoring Cell, and Clean the Campus Forum together have decided to initiate a project aimed at improving our college environment friendliness and making our campus a Zero Waste Campus. In the first phase, the Clean the Campus Forum, along with the College PTA and the Municipality, has successfully implemented a project for the collection and disposal of waste on campus on a monthly basis, which has been running successfully for the past two years.

In the second phase, starting from the week of August 14, 2023, all events and activities happening on campus, both big and small, and including yoga sessions, have been strictly prohibited from using paper/plastic glasses. For this purpose, the Green Protocol Monitoring Cell has already procured steel glasses as per the requirement of the PTA.

The distribution of steel glasses has been undertaken by the Botany Department. From now on, in all activities and events organized by departments, clubs, the Student Union, or associations, the usage of steel glasses alone will be allowed, as part of our college's efforts towards environmental friendliness and creating a Zero Waste Campus.

2. International Biodiversity Day Celebration

In connection with the International Biodiversity Day Celebration Dr. Sreeja P, Assistant Professor of Botany, Sir Syed College conducted an awareness class on mangrove restoration at Kavvayi lake, Kannur District on 22nd May 2023. The programme was inaugurated by Mrs. KV Lalitha, Chaiperson, Payyannur Municipality.

3. **<u>The Greenery Project Commences at Sir Syed College</u>**

Sir Syed College initiated the Greenery Project on World Environment Day. The project began by planting various trees in the main area of the college campus. The aim of the project, which included creating a bio-space for conducting eco-friendly activities for students, was to promote environmental consciousness. Trees were planted both in the botanical garden and in various locations across the college campus. The program concluded with the Environment Day celebration on June 5th. Dr. Khalil Chovva, a prominent environmental activist, inaugurated the event by planting a tree. The event was attended by E. M. Kareem Chelery, President of the Muslim League, Adv. P. Mahmood, President of C. D. M. I. A., and Mahmood

Allankulam, General Secretary of C. D. M. I. A. Additionally, Dr. Ismail Olaikkar, the college principal, and Olaikkar Ennulayikkar were also present, participating in the tree planting initiative.

4. **<u>Vithidal Utsavam</u>**

NCC Cadets of Sir Syed College participated in the sowing of seeds' Vithidal Utsavam' at Ezhome, Kappad along with farmers.

5. World Environment Day Celebration and Inauguration of Certificate course

Department of Zoology in association with Biodiversity club of Sir Syed College and MVR snakepark & Zoo Parassinikkadavu organized an awareness class on snake biodiversity at MVR snake park. Smt. Hemalatha M, I.P.S. Kannur District Rural SP inaugurated the programme. Dr. Vanaja T, North Zone Associate Director of Research, Kerala Agricultural University was the chief guest and Dr. Dileep Kumar R, Chief Scientific Officer, MVR Institute of Life science and Research studies handled the class. As a part of this programme a certificate course on Herpetology was launched specially for Zoology and Forestry students of Sir Syed college. Saplings of fruit trees were distributed to all the participants of the programme.

6. National Moth Week Celebration

A National Moth Week Celebration was conducted by the Department of Forestry from 22nd July to 30th July 2023.The keynote speaker of the programme was Sri. Unnikrishnan, MSc Zoology student at University of Madras. He is the author of a book entitled 'A beginners field guide to moths of Malabar'. He delivered a lecture on the topic 'Moths: Illuminating the Nocturnal Wonders of Nature'.

7. Kurumathoor Panchayat Biodiversity Register renovation

The inauguration of the second phase of the Kurumathoor Panchayat Biodiversity Register took place today at Karimban in the presidency of the panchayat president and Kerala State Biodiversity Board member, Mr. K.V. Govindan. The event, coordinated with the assistance of Sir Syed College Botanical Garden, Suvarajyam, and Forestry, is progressing smoothly. During the ceremony, CDMEA Secretary Mr. Mahmood Allankulam, Coordinator Mr. Joshy J, and Dr. Abdul Salam addressed the attendees. Forty students participated in the training program in the botanical division.

8. International mangrove forest Day Celebrated

The Kannur Candle Project, conducted under the leadership of the Wildlife Trust of India and the SBIF Foundation, organized the Candle Day celebration in collaboration with Sir Syed College. The celebration was inaugurated by Mr. Mahmood, the manager of Sir Syed College.

9. Plant Biodiversity Register Updation

Department of Botany, Sir Syed College in association with the Kerala Biodiversity Board conducted a Plant Biodiversity Register (PBR) updation survey at Velipara, Kurumathur Panchayath, Kannur on 01st July 2023. The program was inaugurated by KV Govindan, Member, Biodiversity Board, Kerala.

10. Awareness Program on MONSOON & HEALTH was conducted:

To promote health awareness during the monsoon season, the Zoology Department joined hands with the National Health Mission (NHM) and the National Ayush Mission (NAM) to organize a special awareness program on August 1, 2023. The event, which aimed to educate participants on the potential health risks associated with the monsoon, featured a lecture by Dr. Deepthi V Nair, a Specialist Medical Officer from NAM.

11. **<u>World Mosquito Day August 20, Mosquito born disease awareness program:</u>**

On August 21, 2023, an awareness program in commemoration of World Mosquito Day was organized in collaboration with the Kannur District Medical Office (Health). The event featured a quiz competition and exhibition aimed at raising awareness about mosquito-borne diseases. Smt. Murshida Kongay, Chairperson of Taliparamba Municipality, inaugurated the program, which was presided over by Nabeesa Beevi, Chairperson of Health in Taliparamba municipality. Several distinguished guests, including Dr. Shini, District VBDC Officer, and Dr. K T Rekha, District Deputy Medical Officer, graced the occasion. The event was a collaborative effort to educate the community about the importance of mosquito control and disease prevention.

12. <u>Sir Syed College Staff Association Hosts Khadi Exhibition:</u>

Sir Syed College Staff Association, in collaboration with the Payyannur Khadi Board, organized an exhibition of Khadi Products on 22nd August 2023. The event marked its inauguration with the first sale to Adv. P Mahamood, the Manager of Sir Syed College, by Mr. Balan, President of the Payyannur Khadi Board, in the presence of Mahamood Allamkulam, General Secretary of CDMEA, Dr. Ismail Olayikkara, Principal of Sir Syed College, Mr. Santhosh, Secretary of the Khadi Board Payyannur, and enthusiastic faculties and students. The exhibition provided students with a unique opportunity to explore and learn about various Khadi products, creating an enriching experience for all.

13. <u>SWACHATHA Action Plan with NSS Cell: 05/08/2023</u>

Under the auspices of the Kannur University NSS Cell, in collaboration with the Thaliparamba Municipality, cleanliness activities were carried out in the city and surrounding areas on Saturday, May 8, 2023. Around 200 NSS volunteers from various institutions such as Sir Syed College, Sir Syed Institute, and Kayi Saib Training College participated in the sanitation activities. Flash mobs and bus stands were organized by Don Bosco College volunteers in the surrounding areas. Sanitation activities were conducted in places such as Chiravakku, Bustan, News Corner, up to Nabras, Market, Taluk Office premises, Kappalam, Post Office premises, Pookkoth Nadu, Thrichambaram, and Seventh Mile.

The inauguration was done by Municipality Chairperson Mr. Murshid Kondhakkal. Mr. R. D. O. P. Merseys was the chief guest. Vice-Chairman of the Municipality, Mr. Kalingal Padmanabhan, and President of the Standing Committee, Mr. P. P. Mohammed Nisar, Councilors Mr. O. Saubhagyam, Mr. K. Rameshan, Mr. I. Kunniram, Mr. K. M. Latheef, Municipality Secretary Mr. K. P. Subair, Tahsildar Mr. P. Sajeevan, K. S. Riyas, K. V. Manoharan, Dr. K. Abdul Rahman, NSS officers, and officials of the NSS Program Office were also present. Dr. T. P. Nafees Bebe, Director of NSS Student Services at Kannur University, welcomed the gathering, and J. K. I. R. Fiyaz expressed gratitude.

14. Field Visit

Members of Biodiversity club, Sir Syed college visited the District Agriculture Farm at Karimbam on 16th September 2023.

15. Cleaning Drive

A Cleaning Drive Programme was conducted by NSS Unit (14 & 15) of Sir Syed College on 17th September 2023.

16. Let's Cultivate Agriculture with Nature

'കൃഷി ശീലമാക്കൂ പ്രകൃതിയോട് കൂട്ടുകൂടൂ'

In connection with Gandhi Jayanti, Sir Syed College's Zoology Department and the Biodiversity Club jointly organized an event titled "Let's Cultivate Agriculture with Nature" on October 5th. Mrs. Sreesha K., Agriculture Officer, conducted classes at the Thaliparamba campus. Mrs. Rahmat Begum distributed vegetable seeds to children as part of the event. Seed of vegetables and fruit plants are distributed during this programme.

17. Workshop on Biodiversity for Livelihood

A two-day workshop on Biodiversity for Livelihood was organized by the Biodiversity club and Zoology Department of Sir Syed college during 19th and 20th of October 2023. The workshop was financially assisted by Kerala Biodiversity Board, Govt. of Kerala and focused mainly on training the students in terrarium, aquarium and bonsai making. The resource persons were Dr. Byju Padiyur, Matsyafed Project Officer and Technician, Kannur and Mr. Sulaiman Kuppam, Bonsai Entrepreneur and Hobbyist.

18. World Wildlife Week Celebrations 2023-Invited Lecture

The Department of Forestry and Forestry Club of Sir Syed College organized an insightful session titled 'Battling Nipah' on 3rd October 2023 in connection with the Wildlife Week observation. This session was designed to educate students about the Nipah disease and the crucial role that bats play in its transmission. The function was presided over by Mrs. Sneha C, HOD of Forestry. The felicitations were given by Ms. Haritha M and Mr. Azhar Ali A, esteemed faculty members of the department. It was an informative and engaging session that shed light on the vital connection between bats and the spread of Nipah disease. The class was handled by Mr. Nithin Divakar, a PhD scholar and a prominent Bat researcher. Along with this an online caption writing competition was also conducted for the students.

19. World Wildlife Week Celebrations 2023- '*Big Cats'*

It's an initiative by the students of the Department of Forestry, Sir Syed College to introduce different wild animals and the importance of conserving them to the lower grade students. The initiative was started as part of the world wildlife Week Celebrations-2023. Mr. Sainath T (2nd Year BSc Forestry), a dedicated member of the Forestry Club, conducted an engaging session on "Big Cats" at the Mellontik Montessori House of Children in Taliparamba on 6th October 2023.

20. World Wildlife Week Celebrations 2023-Paper presentation competition

Biodiversity club in association with Zoology department organized various competitions to the students of various colleges in connection with the wild life week celebration on 7th October 2023. Competitions include an intercollegiate online quiz competition, a paper presentation session on the topic 'Partnership's for wildlife conservation' and an intercollegiate photography competition.

21. Malabar Manual; Paitalmala Environment - Cultural Exploration Journey

In collaboration with the Kerala Forest Department, under the leadership of the Sir Syed College Biodiversity Club and the Malayalam Department, a wilderness celebration was organized in connection with the World Wildlife Week. On October 14th, a nature study trek to Paitalmala in Malabar was conducted with the cooperation of the Kerala Forest Department. One hundred and fifty children from Malayalam, Zoology, and Forestry Departments participated in the event.

22. World Food Day

In connection with the World Food Day, NCC cadets distributed food to the homeless near Tailparamba on 16th October 2023.

23. SWACCH BARATH

In connection with Gandhi Jayanti, under the leadership of the Sir Syed College NCC Unit, the college premises, nearby areas, public spaces, and institutional surroundings were cleaned.

24. <u>Clean the Campus</u>

As a part of Clean the Campus activities, around 20 sacks of plastic wastes collected from the campus were handed over to Taliparamba Municipality on 19th October 2023.

25. <u>Talk on Indian Green Revolution</u>

A programme was organized by the Department of Zoology in association with Biodiversity Club on the topic 'Indian Green Revolution' on 24th November 2023. Session was handled by Prof. Dr. Vanaja T, Professor and North Zone Associate, Director of Research, Kerala Agricultural University. As a part of the session an exhibition cum sale of Malabar Kaipad products was also organized at Sir Syed College.

26. Workshop on orchid gardening

Through orchid farming, the Botany Department organized a one-day workshop on income generation in orchid farming on November 23, 2023. In a ceremony attended by Principal Dr. Ismayil Olaiyikkara, College Manager Adv. P. Mahmood inaugurated the event. Mr. Rajan Master, President of Kannur District Flowers Society, conducted the class. Dr. Shreej, the Head of the Botany Department, welcomed everyone, and Dr. Shakir, the convener of the program, expressed his gratitude. Dr. Tha Jo Abraham and Dr. Abdul Salam also extended their wishes and spoke. Various orchid species suitable for cultivation in Kannur district were introduced. Additionally, training was provided to children on planting techniques and fertilizer application.

27. Organized a cleanliness awareness class

Sir Syed College NSS, in collaboration with Clean Campus Forum, participated in the cleanliness drive of the local self-government and the Kannur district cleanliness mission, as part of the Navakerala project. They organized a cleanliness awareness class and flash mob. The current event was chaired by Principal Dr. Ismayil Olaiyikkara. The inauguration was done by Mr. Krishnan, the president of Thaliparamba block panchayat (29/11/2023). NSS Program Officer Ms. Bushra expressed vote of thanks.

28. <u>Synchronized Vulture survey records 121 sightings in Wayanad</u>

A synchronized vulture survey was conducted in the Wayanad landscape, including in the Wayanad Wildlife Sanctuary, South and North Wayanad forest divisions, which recently recorded 121 sightings of three species of vultures. As many as 65 participants representing various research institutes, including the Kerala Forest Research Institute, University of Calicut, Kerala Veterinary and Animal Sciences University, Sir Syed College, Taliparamba, and Malabar Christian College, Kozhikode participated in the survey. P. Muhammed Shabab, Chief Conservator of Forest, Palakkad, inaugurated the programme and Mr. Kumar presided.

29. <u>കണ്ടൽ വനവത്കരണം</u>

സർ സയ്യദ് കോളേജ് ബോട്ടണി വിഭാഗം, ഭൂമിത്ര സേന ക്ലബ്, WTI, NCC, NSS എന്നിവയുടെ ആഭിമുഖ്യത്തിൽ നാറാത്തു പഞ്ചായത്തിൽ കണ്ടൽ തൈകൾ വെച്ച് പിടിപ്പിച്ചു. നാറാത്തു ഗ്രാമപഞ്ചായത് പ്രസിഡന്റ് പരിപാടി ഉദ്ഘാടനം നിർവഹിച്ചു. കോർഡിനേറ്റർ ഡോ ശ്രീജ പി ആവശ്യമായ നിർദേശങ്ങൾ നൽകുകയും ചെയ്തു

30. <u>Synchronized Bird Survey Wayanad 2024</u>

Students and faculty of the Department of Forestry, Sir Syed College in association with the Forestry club participated in a synchronized bird survey at Wayanad wildlife sanctuary. The exercise records 228 species of birds. The three-day program was organized by Wayanad Wildlife Department on 26th January 2024.

31. <u>Power Quiz</u>

Students of Sir Syed College won the District level power quiz competition organized by the KSEB Officers association. Christy Jills (BSc Physics) and Muhammed Sabith (BSc Zoology) receiving the awards from the KSEB officers.

32. <u>NSS SNEHAARAMAM</u>

In the presence of the Principal Dr. Ismayil Olaiyikkara of Sir Syed College NSS Unit, Ward Councilor Mr. K Shabeeth inaugurated the Sneharaghavanam Park, constructed in front of the Thaliparamba Taluk Hospital.

33. **<u>Inauguration of Centre for Mangrove Studies and Satellite Nursery</u>** Dr. KV Sankaran, Former Director of KFRI and Coordinator of Asian Pacific Forest Invasive species Network (APFISN) inaugurated the Centre for Mangrove Studies and Satellite Nursery structured in the Botanical Garden of Sir Syed College on 7th February, 2024. Dr. Sujanapal P, Principal Scientist, Silviculture Division, KFRI delivered an invited lecture on the topic "Restoration of Mangrove Ecosystem". The programme was financially supported by Wildlife Trust of India, Kannur Kandal project, Payyannur and SBI foundation.

34. <u>Nutrimizala-Mushroom Harvesting Ceremony</u>

The Department of Botany, Sir Syed College started a new initiative on Mushroom Cultivation to upskill students as successful *entrepreneurs as part of the add on course. The first harvest of the mushroom was done by Prof. Ismail Olayikkara, Principal of Sir Syed College and was marketed in the name "Nutrimizala".*

35. <u>Malabar Manual - Journey 3</u>

As part of the environmental-cultural study trip, students of the Malayalam department visited locations such as Kanhagad Beach, Pallikara, and the seaside. They also participated as contributors in the Kanhagad Kavyotsavam, an excursion program conducted under the name "Saptabhasha Sangama Bhoomi".

36. Forestry Field Experience (FFE-2024)

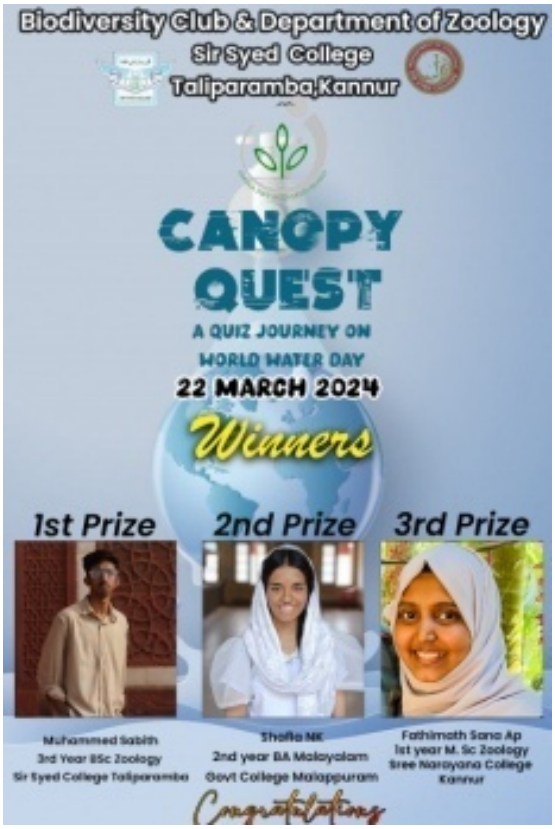
Venturing beyond Goa's famed beaches, forestry students embarked on a transformative journey in Mollem. Guided by Jiss K. Varkey IFS, they explored biodiversity at a vibrant park, witnessing the delicate balance of ecosystems firsthand. Immersed in the intricacies of conservation, they gained valuable insights into sustainable practices, from medicinal gardens to bamboo's versatile applications. The medical garden showcased plants' therapeutic properties, underscoring the vital link between biodiversity and human well-being. Meanwhile, the bambusetum served as a living classroom, highlighting bamboo's potential for sustainable forestry. From construction to artisanal crafts, students learned to appreciate the importance of eco-conscious choices in preserving Goa's natural heritage for generations to come.

37. Plastic waste management- awareness

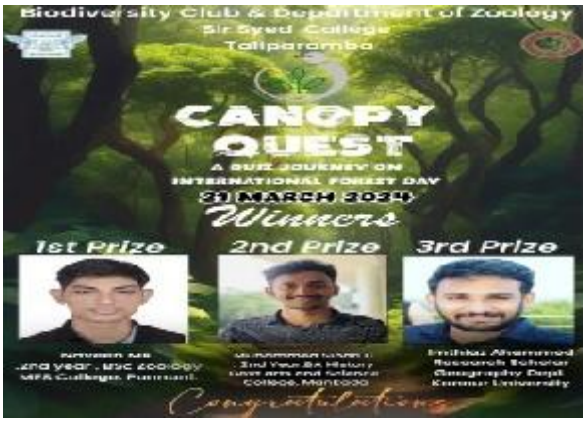
The inauguration of a year-long project aimed at collecting plastic waste dumped into the sea, as well as providing guidelines to reduce their usage, termed as plastic waste management and awareness, jointly organized by the Department of Botany of WWF Sir Syed College and the Earth Watch Club, was inaugurated. Mr. Shivakumar, the Chief Guest, is the Kerala Research Officer of WWF."

38. INTERNATIONAL WATER DAY

On International Water Day, the College Biodiversity Club, in collaboration with the Zoology Department, organized an online quiz competition for college students, under the joint leadership of the Club and the Department.



39. INTERNATIONAL FOREST DAY



On International Forest Day, the College Biodiversity Club, in collaboration with the Zoology Department, organized an online quiz competition for college students, under the joint leadership of the Club and the Department. Navin M. K. from Ponnani MES College, Muhammad Sinan from the Government Arts and Science College, Manakkadavu, and Imthiyas Ahmad from the Geography Department, Kannur University, secured the first three positions.

40. <u>Participated in Annual Bird Count at Aralam Wildlife sanctuary</u>

Department of Forestry in association with Forestry club of this college participated in Annual bird count at Aralam Wildlife sanctuary during 08-10, 2024. The survey was organized by the Sanctuary management and Aranyam Nature Foundation. The 19th edition of the bird survey in Aralam Wildlife Sanctuary spotted two new species of birds. The new species spotted were Woolly-necked stork and White-bellied drongo. Both are dry-land species, and with this the total number of species spotted in the protected area so far has touched 246.

41. **<u>Earth Hour Awareness Campaign</u>**

Department of Forestry, Sir Syed College in association with Nature Club organized an awareness campaign on the importance of observing Earth Hour raising the slogan "give an hour for earth". Faculties of the department along with Nature Club members took part in campaign and made awareness among students about the importance of switching off every electrical equipments for one hour for the revival of our mother nature. The campaign was initiated by World Wildlife Fund for nature, India.

42. <u>International Day of Forests Observation</u>

Department of Forestry, Sir Syed College organized different programs in connection with the observation of International Day of Forests, on 21st March 2024. Students from various colleges across Kerala participated in events such as Quizzes, poster making competition, cartoon competition and caption writing competition. All the competitions were based on theme related to Forest and it's conservation. Members of the nature club of this college also joined hand in organizing the events.

43. Observation of World Water Day and Unveiling of the Thematic Poster

Department of Forestry, Sir Syed College organized an informative session as part of the World Water Day Observations on 22nd March 2024. Ms. Senha C, Head of the Department, lead the session on the topic 'water for peace'. The poster showing the theme was also unveiled during the event.

44. World Sparrow Day Celebration

Department of Forestry in association with Forestry club of Sir Syed college took part in the world Sparrow Day Celebrations. 'I love sparrows' was the theme for World Sparrow Day 2024 emphasizing the special connection between humans and sparrows. As part of the event Water pots were placed at different corners of the college for the birds to thrive the summer heat.

45. Nutrifarm

Department of Botany, Sir Syed College has started a new initiative entitled "Nutrifarm" to raise the saplings of various medicinal, aromatic and crop plants with the help of students as part of the add on course. This year Mentha plants were propagated and the harvest ceremony was inaugurated by Prof. Ismail Olayikkara, Principal of Sir Syed College.


RESEARCH CENTRE IN BOTANY
KANNUR UNIVERSITY
RESEARCH GUIDES
WITH
SPECIALISATIONS

OUTREACH ACTIVITIES OF SIR SYED COLLEGE

"Sachh Bharath, Sacch Sir Syed: A Cleanliness Drive Transforming Sir Syed College"

In 2022, Sir Syed College embarked on a transformative journey towards cleanliness and environmental stewardship with the initiation of the "Sachh Bharath, Sacch Sir Syed" cleaning drive. This pioneering program was conceived with a multifaceted aim aimed at supporting the nationwide Swachhata (Cleanliness) movement, making a positive contribution to the environment, and fostering a culture of sustainable practices within the college community.

The primary objective of this initiative is to not only enhance the aesthetic appeal of the college premises but also to instill a sense of responsibility towards environmental preservation among students, faculty, and staff. By monitoring the environmental performance of the college, the program seeks to identify areas for improvement and implement effective strategies to mitigate pollution and waste generation.

At the heart of "Sachh Bharath, Sacch Sir Syed" lies the commitment to formulate and implement a comprehensive green protocol encompassing students, staff, and the entire campus. This protocol serves as a guiding framework for adopting eco-friendly practices in daily activities, waste management, energy conservation, and biodiversity preservation.

Central to the program's execution are regular cleaning drives and mass cleaning activities conducted both within the college premises and in surrounding areas. These initiatives extend beyond the campus boundaries, reaching out to bus stands, hospitals, schools, and other publically significant locations. By engaging with the broader community, the program aims to foster a culture of civic responsibility and collective action towards maintaining cleanliness and hygiene in shared spaces.

Through "Sachh Bharath, Sacch Sir Syed," Sir Syed College not only aims to create a clean and sustainable environment but also strives to nurture a generation of socially conscious individuals committed to the well-being of society and the planet. This initiative stands as a testament to the college's dedication to holistic education, emphasizing the importance of environmental stewardship alongside academic excellence.

OUTREACH ACTIVITIES

Expanding cleaning initiatives beyond the campus grounds to encompass outreach to various places is a fantastic way to extend the impact of these efforts and contribute positively to the broader community.

Community Service: Engaging in cleaning activities outside the campus demonstrates a commitment to community service. It allows students to give back to the surrounding neighborhoods and areas in need, fostering goodwill and strengthening community bonds.

Addressing Local Needs: By reaching out to various places such as parks, beaches, riversides, or urban areas, cleaning initiatives can address specific local needs. For example, cleaning up litter along water bodies helps prevent pollution and protects aquatic ecosystems, while tidying public spaces improves the quality of life for residents.

Educational Opportunities: Outreach cleaning programs offer valuable educational opportunities beyond the campus boundaries. Participants learn about the environmental challenges facing different communities and gain insights into how individual actions can make a difference. These experiences can inspire greater environmental consciousness and civic engagement.

Collaborative Partnerships: Collaborating with local authorities, nonprofit organizations, or community groups strengthens partnerships and enhances the effectiveness of cleaning initiatives. By pooling resources and expertise, stakeholders can work together to tackle larger-scale cleaning projects and address systemic issues related to waste management and environmental sustainability.

Promoting Environmental Stewardship: Outreach cleaning drives serve as powerful platforms for promoting environmental stewardship and raising awareness about pressing environmental issues. Through hands-on participation, volunteers become advocates for environmental conservation, inspiring others to adopt eco-friendly behaviors and practices.

Creating Lasting Impact: Beyond immediate cleanup efforts, outreach programs can create lasting impact by sparking ongoing community involvement and encouraging sustainable practices. By empowering residents to take ownership of their surroundings, these initiatives contribute to the long-term improvement of local environments and quality of life.

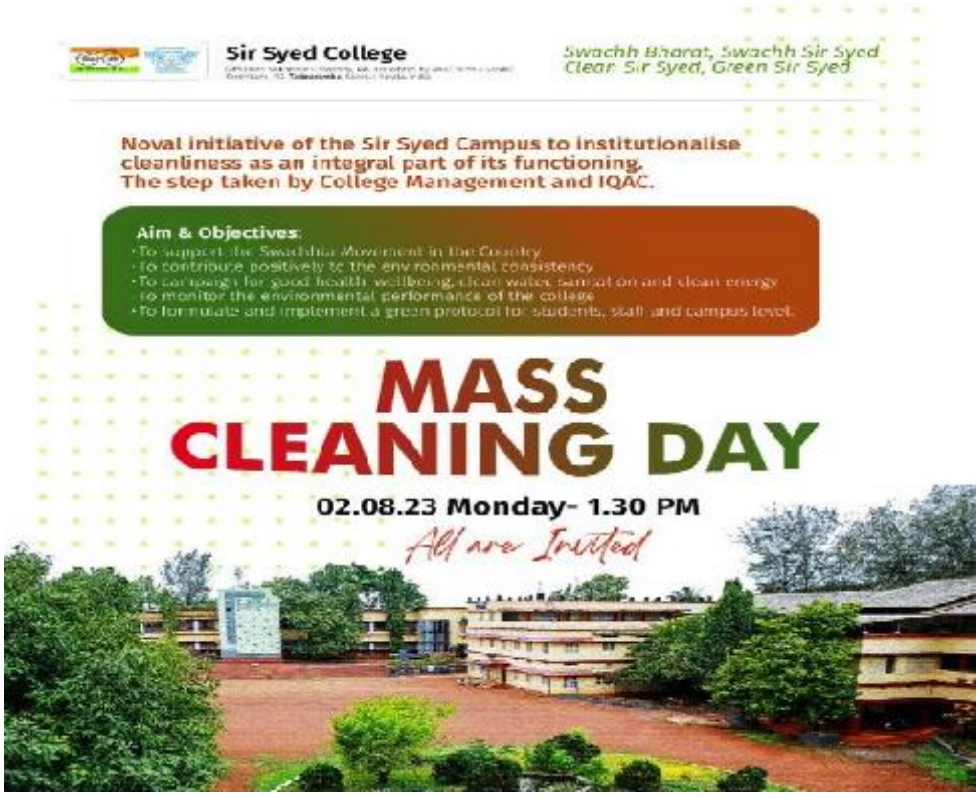
Regular cleaning activities have been conducted to maintain the cleanliness and hygiene of campus facilities. Through organized efforts, including campus-wide clean-up drives and routine classroom cleaning, the committee ensures that the campus remains a conducive environment for learning and recreation.

1. **<u>Mass campus cleaning on 28-02-2022</u>**

2. Cleaning statue of Mahathma Gandhi at Velapuram taliparamba on 30-09-2022

The cleaning of the Mahatma Gandhi statue at Velapuram, Taliparamba, on September 30, 2022, was likely a significant community initiative aimed at preserving and honoring the legacy of Mahatma Gandhi. Mahatma Gandhi's statue holds immense symbolic significance as a representation of his principles of truth, nonviolence, and social justice. Cleaning the statue serves as a gesture of respect and reverence for Gandhi's contributions to India's freedom struggle and his advocacy for peace and equality. Student volunteers worked side by side, fostering a sense of unity, pride, and shared responsibility for maintaining public monuments and spaces.

3. **<u>Mass campus cleaning on 18-11-2022</u>**



Mass cleaning drives at campuses are excellent initiatives for fostering a sense of community responsibility, promoting cleanliness, and instilling environmental awareness among students. These drives typically involve organizing large-scale efforts where students, faculty, and staff come together to clean up the campus premises.

4. **Mass campus cleaning on 02-08-2023**

5. **SWACHATHA Action Plan with NSS Cell: 05/08/2023**

Under the auspices of the Kannur University NSS Cell, in collaboration with the Thaliparamba Municipality, cleanliness activities were carried out in the city and surrounding areas on Saturday, May 8, 2023. Around 200 NSS volunteers from various institutions such as Sir Syed College, Sir Syed Institute, and Kayi Saib Training College participated in the sanitation activities. Flash mobs and bus stands were organized by Don Bosco College volunteers in the surrounding areas. Sanitation activities were conducted in places such as Chiravakku, Bustan, News Corner, up to Nabras, Market, Taluk Office premises, Kappalam, Post Office premises, Pookkoth Nadu, Thrichambaram, and Seventh Mile.

The inauguration was done by Municipality Chairperson Mr. Murshid Kondhakkal. Mr. R. D. O. P. Merseys was the chief guest. Vice-Chairman of the Municipality, Mr. Kalingal Padmanabhan, and President of the Standing Committee, Mr. P. P. Mohammed Nisar, Councilors Mr. O. Saubhagyam, Mr. K. Rameshan, Mr. I. Kunniram, Mr. K. M. Latheef, Municipality Secretary Mr. K. P. Subair, Tahsildar Mr. P. Sajeevan, K. S. Riyas, K. V. Manoharan, Dr. K. Abdul Rahman, NSS officers, and officials of the NSS Program Office were also present. Dr. T. P. Nafees Bebe, Director of NSS Student Services at Kannur University, welcomed the gathering, and J. K. I. R. Fiyaz expressed gratitude.

6. Karimbam bus stop cleaning 15-08-2023

The Karimbam bus stop cleaning event on August 15, 2023, as part of the Azadi Ka Amruth Mahotsav (Celebration of the 75th Anniversary of India's Independence), likely served as a symbolic gesture of community service and patriotism.

7. Cleaning of public places at Talipramba -02-10-2023

The participation of NCC cadets in a cleanliness drive in houses and public places near Sir Syed College demonstrates a proactive effort to promote cleanliness, hygiene, and community engagement. Volunteers would have divided into teams and dispersed to different locations to carry out cleaning activities. Tasks may have included sweeping streets and sidewalks, picking up litter, cleaning public amenities like benches and bus stops, and assisting with household cleaning if requested.

8. Organized a cleanliness awareness class.

Sir Syed College NSS, in collaboration with Clean Campus Forum, participated in the cleanliness drive of the local self-government and the Kannur district cleanliness mission, as part of the Navakerala project. They organized a cleanliness awareness class and flash mob. The current event was chaired by Principal Dr. Ismayil Olaiyikkara. The inauguration was done by Mr. Krishnan, the president of Thaliparamba block panchayat (29/11/2023). NSS Program Officer Ms. Bushra expressed vote of thanks.

9. College campus cleaning 22-12-2023

The college campus cleaning event on December 22, 2023, with the involvement of students NSS and NCC cadets, highlights a collaborative effort to maintain cleanliness and foster a sense of responsibility among the college community. The involvement of NSS and NCC cadets adds a structured and disciplined approach to the cleaning event. Cadets, trained in teamwork and leadership, would have played a crucial role in organizing volunteers, ensuring adherence to safety protocols, and maintaining discipline during the cleanup activities.

10. School cleaning at Kottakkanam AUP school.23-12-2023

The school cleaning event at Kottakkanam AUP School was likely a significant initiative aimed at improving the cleanliness and hygiene standards of the school premises.




11. Chapparapadavu health centre cleaning 26-12-2023

The cleaning event at the Chapparapadavu Health Centre on December 26, 2023, was indeed a significant initiative aimed at enhancing the cleanliness and hygiene standards of the healthcare facility.






12. Taliparamba –Karimbam Bustop cleaning 06-01-2024

The "Taliparamba – Karimbam Bus Stop Cleaning" event on January 6, 2024, organized by Sir Syed College students, showcases the proactive involvement of young individuals in community service and environmental stewardship. The volunteers, led by the student organizers, actively engaged in cleaning tasks such as picking up litter, sweeping sidewalks, and scrubbing surfaces. Working together, they transformed the bus stop area into a cleaner and more welcoming space for commuters and residents alike.

13. **<u>Cleaning and Gardening near Karimbam Bustop on 06-01-2024 in association with Taliparamba Municipality.</u>**

The cleaning and gardening initiative near Karimbam Bus Stop on January 6, 2024, in association with Taliparamba Municipality and led by students of Sir Syed College, exemplifies a commendable effort to enhance the aesthetics and cleanliness of a public space. The event would have engaged not only students but also members of the local community. Residents living near Karimbam Bus Stop may have joined the effort, contributing their time and energy to cleaning and beautifying the area they frequent daily. In addition to cleaning, students may have engaged in gardening activities to enhance the aesthetic appeal of the surroundings. This could involve planting flowers, shrubs, or small trees, as well as maintaining existing greenery to create a more vibrant and welcoming atmosphere.

14. **Mass campus cleaning on 18-11-2024**

Best practices followed on Green Campus initiatives in Sir Syed College, Kannur

Sir Syed College in Kerala has been at the forefront of adopting green campus initiatives to promote sustainability and environmental consciousness among its students, faculty, and staff. Through various innovative approaches, the college has successfully integrated eco-friendly practices into its daily operations. Below are some of the best practices followed in the green campus initiatives at Sir Syed College:

Native Plantation and Biodiversity Conservation:

Sir Syed College has undertaken extensive native plantation drives, replacing exotic species with indigenous ones to support local ecosystems.The college has designated green zones as Botanical garden, Aranyakam, Butterfly garden and other biodiversity hotspots, ensuring the protection and preservation of these areas.

Solar Power Generation:

The college has installed solar panels on rooftops and other suitable locations to harness solar energy for electricity generation.This sustainable energy source not only reduces the institution's carbon footprint but also serves as a practical learning opportunity for students in renewable energy technologies.

Waste Management and Recycling :

Sir Syed College has implemented a robust waste management system segregate in which they waste at source and promoting recycling.Students actively participate in waste collection and recycling drives, promoting a culture of waste reduction and sustainability.

Water Conservation :

The college has adopted water-saving measuresand water recycling for landscaping purposes.Awareness campaigns educate the campus community about responsible water usage.

Environmental Education and Outreach:

Sir Syed College integrates environmental education into its curriculum, ensuring that students gain a deep understanding of ecological principles and sustainable practices.Regular seminars, workshops, and awareness programs are conducted to engage the campus community and raise environmental consciousness.

Eco-friendly Infrastructure :

New infrastructure developments are designed with eco-friendly features, such as energy-efficient lighting, natural ventilation, and green building materials.These sustainable construction practices contribute to reduced energy consumption and environmental impact.

Student-Led Initiatives :

Student-led clubs and organizations actively promote green initiatives and encourage fellow students to participate.These initiatives empower students to take ownership of sustainability projects and develop leadership skills in environmental advocacy.

Research and Innovation :

Sir Syed College encourages faculty and students to conduct research related to environmental issues and sustainable solutions.This research contributes to the college's knowledge base and helps develop practical solutions for environmental challenges.

Community Engagement :

The college actively engages with the local community to share knowledge and collaborate on environmental projects.Outreach programs, tree planting drives, and awareness campaigns extend the college's green initiatives beyond campus boundaries.

Sir Syed College's commitment to green campus initiatives demonstrates its dedication to environmental sustainability and responsible citizenship. These best practices not only reduce the college's environmental impact but also inspire and educate future generations on the importance of ecological conservation. The institution serves as a model for other educational institutions seeking to implement green initiatives and foster a culture of sustainability.

RECOMMENDATIONS

GENERAL RECOMMENDATIONS

A comprehensive biodiversity management plan for colleges aims to systematically conserve and enhance the ecological diversity within campus environments. This involves conducting thorough biodiversity assessments to understand the current state of flora, fauna, and microbial life. Mapping biodiversity hotspots and identifying vulnerable areas helps prioritize conservation efforts. Implementing sustainable practices such as native plant gardens, wildlife habitats, and organic farming promotes biodiversity while reducing environmental impact. Integration of biodiversity education into curricula and hosting workshops cultivates awareness and active participation among students and faculty. Regular monitoring and evaluation programs track biodiversity indicators, ensuring adaptive management strategies. Collaboration with local communities, NGOs, and governmental bodies strengthens conservation initiatives and fosters broader environmental stewardship. Developing and enforcing biodiversity policies and governance frameworks ensures long-term commitment and effectiveness in preserving campus biodiversity, contributing to global conservation goals.

Biodiversity

The campus supports a rich biodiversity evidenced by thepresent study.The suggestions for conserving the biological diversity in the campus are;

Conduct a comprehensive survey to assess the biodiversity of the college campus, including flora, fauna, and microbial diversity and please ensure the data may be added to the concerned Panchayaths Peoples Biodiversity Register (PBR's).

Participatory Mode of Conservation: - To ensure the involvement of people in the campus for conserving biodiversity. The people include students, teachers, non-teaching staff and visitors of the college. Make awareness to the people about the importance of protection of biodiversity.

Organic Farming: Promote organic farming practices within the campus to reduce chemical inputs and support soil health.

Management of Invasive and Alien Species:-Managing invasive and alien species on cam-

pus is paramount to preserving native biodiversity and ecosystem health. The introduction and spread of non-native species can disrupt local ecosystems, outcompete native flora and fauna, and alter habitat dynamics. To effectively address this issue, proactive management strategies must be implemented. These strategies may include regular monitoring and early detection of invasive species, rapid response protocols for the removal or containment of new infestations, and ongoing control efforts for established populations. Implement Sustainable Development Practices:Ensure that any developmental activities on campus prioritize sustainability and minimize their impact on biodiversity. This could include using eco-friendly construction materials, adopting renewable energy sources, and incorporating green infrastructure into campus designs.

Promote Native Plant Species: Encourage the use of native plant species in landscaping and gardening efforts on campus. Native plants are better adapted to local conditions and support native wildlife populations, contributing to overall biodiversity conservation. Native trees are very less in number.Vegetables, fruits, and greens could be cultivated in the college campus through terrace garden, kitchen garden and indoor garden.

The name board with QR code may be kept in each Tree plant species in which the common name along with binomial name may be mentioned. The year of planting and economic importance with medicinal values if any may be mentioned in some plants so that the oldest as well as useful herbal plants may be identified in the campus.

Energy

- Enhance Energy Usage Documentation: Develop a thorough documentation system for tracking energy usage and associated costs. This system should include accurate meter reading processes and regular data verification checks. Additionally, staff should receive training on precise record-keeping to ensure the reliability of energy consumption data.
- Address Discrepancies in Energy Consumption: Conduct a detailed re-evaluation of the college's overall energy consumption, ensuring it aligns with the number of devices in use and their respective usage durations. It is also essential to identify and eliminate devices that consume power even when not in active use (phantom load), particularly following any renovation work.
- Centralized Solar Hybrid Kitchen: Consolidate the canteen and hostel kitchens into a single, centralized kitchen. This new kitchen should be equipped with a Solar Hybrid Kitchen system to significantly enhance energy efficiency and promote sustainability across campus dining facilities.
- Implementation and Enforcement of Energy Management Policy: Formulate and rigorously enforce a comprehensive energy management policy. This policy should clearly outline energy-saving practices, guidelines for equipment usage, and various energy conservation initiatives to ensure consistent application throughout the institution. (A draft policy prepared by KSBB is provided in the audit report for reference)
- Upgrade to Energy-Efficient Appliances: Replace outdated appliances with new, highly energy-efficient models rated 4-5 stars. These upgrades will help minimize energy

consumption, lower utility expenses, and support the college's sustainability goals.

- Effective E-Waste Management: Implement a robust e-waste disposal strategy. This includes establishing a designated storage area for e-waste with proper documentation until complete disposal. This measure ensures compliance with government regulations and promotes responsible e-waste management.Establish Student and Teacher Energy Management Group: Create a dedicated energy management group comprising students and teachers. This group will work to raise energy consciousness within the college, integrating energy management into the broader campus initiatives and aligning with ISO 50001 standards.
- Energy Conservation Awareness Program: Organize programs aimed at increasing awareness about energy conservation among all stakeholders. These programs will educate students and staff, fostering a culture of responsibility and proactive energy-saving behaviors.
- Enhance Natural Light and Airflow: Promote the use of natural lighting in key campus areas by installing skylights and ensuring efficient ventilation systems. This approach reduces reliance on artificial lighting, improves energy efficiency, and creates a healthier indoor environment

Transport

Promote Sustainable Transportation Options:

- Electric Vehicle Adoption: Install EV charging stations on campus and offer incentives such as discounts on campus services or priority parking for EV users. This will support the adoption of electric vehicles and contribute to a more sustainable campus.
- Cycling and Walking Infrastructure: Designate and construct bicycle lanes and well-maintained sidewalks with proper lighting to ensure safety. Create a cycling-friendly environment with well-marked lanes and crossings. Organize events like "Cycle to College Day" and walking challenges to foster a culture of active commuting.
- Bicycle Sharing Program: Implement a bike-sharing program to make bicycles readily available for short-distance commuting, reducing dependence on motorized vehicles and promoting physical activity.

Enhance Campus Transportation Services:

- Expand and Optimize Bus Services: Increase the bus fleet and service frequency to accommodate growing student numbers and reduce overcrowding. Implement an online reservation system and real-time tracking for better seat management and journey planning. Optimize bus routes to minimize travel distance and fuel consumption.
- Parking and Hostel Facilities: Construct additional parking facilities and increase hostel capacity by building new dormitories and optimizing existing spaces. Upgrade amenities within hostels to improve the living environment for students.

Safety and Compliance:

- Adherence to Safety Standards: Ensure strict adherence to safety and regulatory standards by evaluating vehicle safety, driver qualifications, and insurance coverage. Implement ongoing education for staff and students about these regulations to foster a culture of safety and responsibility.
- Traffic Safety and Collaboration: Collaborate with local authorities to implement traffic safety measures around the college, including speed limits, proper signage, and road maintenance. Monitor transportation patterns and conduct regular audits to assess the effectiveness of sustainability initiatives.
- Community Engagement and Awareness:
- Awareness Campaigns and Workshops: Organize campaigns and workshops to promote eco-friendly commuting options and raise awareness about sustainable mobility and responsible road behavior. Offer incentives and collaborate with behavioral psychologists to design programs that motivate individuals to adopt eco-friendly transportation modes.

Transportation Monitoring and Improvement:

- Establish a Transportation Monitoring Committee (TMCG): Form a committee with representatives from students, faculty, administration, and transport providers. Task the TMCG with collecting data on commuting patterns and satisfaction, and require them to present periodic reports with recommendations for continuous improvement in transportation services.

Carbon

- To address events and miscellaneous carbon emissions, Sir Syed College should adopt sustainable practices for campus events by focusing on waste reduction, optimizing energy usage, and encouraging virtual participation when feasible. Additionally, calculating the carbon emissions associated with major events and investing in carbon offset programs can help mitigate the environmental impact. These measures will not only contribute to the college's sustainability goals but also foster a culture of environmental responsibility among students and staff.
- Increase Tree Planting and Maintenance: Focus on planting species with high carbon sequestration potential in afforestation and reforestation projects. Regular maintenance and monitoring of these trees will ensure their optimal growth and carbon storage capabilities.
- Diversify Planting Species: Incorporate a diverse range of species in planting schemes to enhance ecosystem resilience and maximize carbon sequestration.
- Implement Sustainable Management Practices: Apply sustainable forest management practices to maintain tree health and growth. This includes controlling pests, diseases, and managing soil nutrients effectively to support tree growth and longevity.
- Promote Carbon Credit Programs: Encourage participation in carbon credit programs that recognize and reward carbon sequestration efforts. This can provide financial incentives for conservation and sustainable management practices.

- Educate and Engage Communities: Raise awareness among local communities about the importance of trees in carbon sequestration. Community engagement in tree planting and conservation activities can amplify the impact of carbon reduction efforts.

Waste Management

- Implementation of Green protocol in the campus
- Hoardings/display boards with messages upholding environmental sustainability and waste management
- Establishment of incinerators for the management of sanitary Napkins.
- Constitution of a green protocol committee to monitor the waste management practices of the campus regularly

Specific Recommendations

Creating a detailed and comprehensive biodiversity management plan for Sir Syed College in Taliparamba, Kannur, Kerala involves a structured approach encompassing assessment, conservation strategies, sustainable practices, education, monitoring, and governance. Here's a detailed plan tailored for the college:

1. Biodiversity Assessment and Mapping

- Baseline Survey: Conduct a comprehensive survey to assess the biodiversity of the college campus, including flora, fauna, and microbial diversity.
- Mapping: Create detailed maps indicating biodiversity hotspots, sensitive habitats, and areas of conservation concern.

2. Conservation Goals and Objectives

- Identify Threats: Assess potential threats to biodiversity such as habitat fragmentation, invasive species, pollution, and climate change impacts.
- Set Conservation Objectives: Define clear goals for biodiversity conservation, such as protecting endemic species, restoring degraded habitats, and enhancing ecosystem resilience.

3. Habitat Management and Restoration

- • Native Plant Gardens: Establish gardens with native plant species to support local biodiversity and provide habitats for pollinators and wildlife.
- • Wildlife Habitats: Designate and enhance wildlife habitats including ponds, birdhouses, and native vegetation corridors.
- • Habitat Restoration: Implement plans for restoring degraded ecosystems and enhancing biodiversity in those areas.

4. Sustainable Practices

- Water Management: Implement water conservation measures, such as rainwater har-

vesting and efficient irrigation systems, to support aquatic habitats.
- Energy Efficiency: Adopt renewable energy sources and energy-efficient technologies to minimize the college's ecological footprint.

5. Education, Awareness, and Community Engagement

- Curriculum Integration: Integrate biodiversity conservation topics into the college curriculum across disciplines.
- Workshops and Seminars: Conduct regular educational programs, workshops, and seminars focusing on biodiversity conservation and sustainable practices.
- Community Outreach: Engage students, staff, and local communities in biodiversity monitoring, conservation activities, and awareness campaigns.

6. Monitoring and Evaluation

- Biodiversity Monitoring: Establish a monitoring program to regularly assess biodiversity indicators, species populations, and habitat quality.
- Impact Assessment: Evaluate the effectiveness of conservation efforts and adapt management strategies based on monitoring results.
- Feedback Mechanisms: Solicit feedback from stakeholders and incorporate community input into biodiversity management decisions.

7. Policy Development and Governance

- Biodiversity Policy: Develop a college-wide biodiversity policy outlining goals, strategies, responsibilities, and timelines for biodiversity conservation.
- Partnerships and Collaboration: Collaborate with local authorities, NGOs, research institutions, and community groups to leverage expertise, funding, and resources for biodiversity conservation initiatives.

8. Research and Documentation

- Biodiversity Database: Maintain a comprehensive database documenting biodiversity records, species lists, and habitat characteristics.
- Research Initiatives: Support and facilitate research projects on campus biodiversity, providing opportunities for student involvement and academic collaboration.

9. Outreach and Networking

- Public Engagement: Use various communication channels (e.g., newsletters, social media) to raise awareness about biodiversity conservation and the college's initiatives.
- Networking: Participate in regional and national biodiversity networks to share knowledge, best practices, and collaborate on conservation projects.

10. Long-term Planning and Commitment

- Strategic Planning: Develop long-term strategies and action plans for biodiversity

conservation aligned with the college's sustainability goals.

- Continuous Improvement: Regularly review and update the biodiversity management plan based on new scientific findings, emerging threats, and institutional developments.

Implementation Timeline

- Short-term Goals (1-2 years): Focus on immediate actions such as habitat restoration and initial biodiversity surveys.
- Medium-term Goals (3-5 years): Expand conservation efforts, establish monitoring programs, and integrate biodiversity education across the curriculum.
- Long-term Goals (5+ years): Achieve sustainable management of biodiversity through ongoing monitoring, research, and community engagement.
- By following this comprehensive biodiversity management plan, Sir Syed College can effectively contribute to conserving local biodiversity, promoting environmental sustainability, and fostering a culture of stewardship among its students, staff, and surrounding communities.

SUMMARY AND CONCLUSION

The present green campus audit has evaluated the current environmental status in the campus.Biodiversity, Energy, Carbon storage, water quality, waste generationand environmental awareness programmes were assessed. The biodiversity audit highlights the importance of preserving and enhancing campus's ecological diversity, recommending initiatives such as green spaces development, native plant promotion, and conservation programs. The floristic analysis of revealed the presence Herbs (71 Nos), Shrubs (21 Nos), Trees (72 Nos), Aroids (10 Nos), Ferns (27 Nos) and Bamboos (15 Nos.). The number of Trees species in the campus has higher, followed by herbs and Shrubs. It also indicated that, the campus is rich in plant diversity with uniform distribution.

The faunal aspects covered in the assessment include selected groups of invertebrates and vertebrates. A total of 86 species of butterflies were noted during the assessment. They belong to five different families such as Hesperidae, Lycaenidae, Nymphalidae, Papilionidae, Pieridae. A total of 40 species of birds belong to 24 families were noted. The campus habitat harbours many species of reptiles, amphibians and mammals. 18 spiders were found belongs to 11 families.

Total energy use and equipment consumption were assessed to identify potential efficiency improvements. Data from different sectors were scrutinized based on criteria like energy-saving potential, costs, payback time, technical feasibility, and compatibility. This strategic framework established energy-saving measures by identifying consumption patterns. Overall, the analysis phase offered a holistic overview of the college's energy usage, guiding actionable recommendations for enhanced efficiency and sustainability.

In the present study, water quality assessment was also carried out. The physicochemical and bacteriological parameters of three water sources were assessed. From the results of the study showed that all the parameters were found within the permissible limit except bacteriological parameters. All the three water sources were contaminated with EC and FC (microbial contamination). Proper treatment methods ensure to the quality of water.

A carbon audit is a comprehensive assessment of an organization's carbon footprint, which is the total amount of greenhouse gases, primarily carbon dioxide, emitted directly or indirectly as a result of its activities. The audit involves quantifying the emissions associated with various aspects of an organization's operations, including energy consumption, transportation, waste management, and other relevant factors.

The audit provides valuable insights into commuting habits and their environmental impact. The limited use of personal vehicles and cycling, along with a high reliance on motorized transport—even for short distances—highlights the need for enhanced infrastructure and incentives to promote sustainable commuting, including the adoption of electric vehicles (EVs). By addressing these issues and encouraging eco-friendly transportation options, Sir Syed College can play a crucial role in reducing its carbon footprint, improving student health, and fostering a more sustainable campus environment.

The audit team could observe that the college has implemented a number of green initiatives to ensure the sustainable management of both biodegradable and nonbiodegradable wastes in the campus. There were programs also conducted to make the students and teachers aware of the importance of sustainable waste management. The college Bhoomithrasena club is taking care to maintain the cleanliness of the campus by all its possible ways. The practices, findings, remarks, and recommendations emphasized in this waste management audit report will help to improve the waste management practices and resource usage at the college. This may help to guide the authorities in framing appropriate strategies for a green campus and sustainable environment.

The college has launched distinctive and impactful green initiatives and outreach programs aimed at fostering environmental sustainability and enhancing human well-being, involving not only the student community but also staff and the general public. As part of the audit, these initiatives and outreach activities have been meticulously identified and documented, underscoring their significance as indicators of the college's dedication to environmental stewardship and societal responsibility.

Collectively, these audits serve as a holistic roadmap for transforming campus into a model of environmental responsibility and sustainability. By integrating the recommendations outlined in this report, we not only enhance the ecological integrity of the institution but also foster a culture of environmental awareness and responsibility among students, faculty, and staff. This comprehensive approach positions institution as a leader in the pursuit of a greener, more resilient future, aligning with global sustainable development goals (SDGs), Kunming-Montreal Global Biodiversity Framework and showcasing our dedication to creating a positive impact on both the local and global environment.

SIR SYED COLLEGE,
TALIPARAMBA, KANNUR, KERALA

KERALA STATE BIODIVERSITY BOARD