



ACS College of Engineering

Approved by AICTE New Delhi, Affiliated to VTU, Belagavi
(A Unit of RajaRajeswari Group of Institutions)
CET Code : E186 COMED-K : E003 PG CET : T918



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



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

7.1.6.1. The institutional environment and energy initiatives are confirmed through the following

1. Green audit
2. Energy audit
3. Environment audit
4. Clean and green campus recognitions/awards
5. Beyond the campus environmental promotional activities

Options:

A. Any 4 of the Above

5. Beyond the campus environmental promotion activities

ACSCE has an eco-friendly environment. It has a long legacy of healthy environmental practices including periodic plantation, their preservation and maintenance. Its land use is such that about 70 % of the total area is occupied by open land and plantation that generates a better and sustainable campus environment.

The campus environmental promotion activities are:

“SWACHHATA HI SEWA Campaign”

Unnat Bharat Abhiyan (UBA) is a flagship program of Ministry of Human Resource Development (MHRD), Government of India. Our Institution is one of the Participating Institutions (PI) under UBA. UBA emphasized on the implementation of ‘plastic free Campaign’ in the adopted villages. In this regard, our institution planned for the event in collaboration with NSS at our adopted villages. About 100 students of Aeronautical, Aerospace, Civil & Mechanical Engineering volunteered along with four faculty members namely Dr. Suresh P M, Mr. Srinidhi Acharya S R, Mr. Rakesh S of Mechanical Engineering and Mr. Shivashankar of Civil Engineering. Students and faculty members explained the ill effects of plastics and recommended not to use plastics. Instead of plastics, reusable bags can be used which saves the environment and animals. School children and the people of the villages responded and assured that they will say no to plastics and also welcomed the initiative. Students also collected the plastics from the houses and surrounding areas. The campaign was successful in imparting “SWACHHATA HI SEWA” and “Say no to Plastics”







Photos: Unnata Bharatha Abhiyan Activities on “SWACHHATA HI SEWA” Campaign

Swaccha Bharatha Abhiyana Program





Photos: Swaccha Bharatha Abhiyana activites

Bheemankuppe Lake Cleaning Campaign

Visit to Bheemanakuppe lake was scheduled on March 6th 2020 for swacch Baharath Abhiyaan.6th and 4th sem students along with faculties reached the lake with Gloves , Masks, Ginny bags, Dust pans, garbage baskets and brooms. We divided the lake Bank into 6 parts. Each part were assigned to group of 8 students. Bottles, Plastics and papers were picked from all the parts and completed the cleaning process. The waste sacks were dispatched to the nearby BBMP waste collection unit.



Photo: Bheemankuppe Lake Cleaning Campaign Photos

Swachha Bharat Mission and Environmental Awareness Event



Photos: Swachha Bharat Mission and Environmental Awareness Event

PLANTATION PROGRAM ON 29/3/2021

ACTIVITIES DONE: 9 saplings of Indian Beech tree (Honge) , Poppy (gasagase) and Neem● were planted. Medicinal importance of these plants were also indicated and explained.●





NATIONAL WORKSHOP ON OPPORTUNITES AND CHALLENGES ON RENEWABLE ENERGY CONVERSION TECHNOLOGIES

ACS College of Engineering, Kengeri, Bengaluru organized a two days National Workshop on Opportunities and Challenges on Renewable Energy Conversion Technologies was sponsored by Ministry of New and Renewable Energy, Government of India during 25th and 26th Feb. 2016. The various challenges and opportunities in renewable energy conversion technologies were discussed and interacted by the different academic research experts. About sixty participants both external and internal were attended and gained the technical knowledge in the renewable energy domain. The workshop was inaugurated with special address by Dr. H. Nagana Gouda, Director, National Centre for Solar Technology, Bengaluru. He stressed the tapping importance of renewable energy sources on the present energy conservation point of at state and national level. Dr. Nikil PG Senior Research Scientist (Solar), National Institute of Solar Energy, Gurgaon pointed out various opportunities and schemes for the development of renewable energy at national level by Ministry of New and Renewable Energy, Government of India. Dr.M.S.Murali, Principal of ACSCE has welcomed the gathering and pointed out the practicing of renewable energy in day to day life to reduce the dependence of conventional grid. Dr.M.Eswaramoorthy, Convenor of Workshop proposed vote of thanks.





Tree Plantation Activity 2016

The NSS Unit of ACSCE has conducted a Plantation Camp on 23/08/2016 in ACSCE College Road. The Camp was started at 10.00 AM in the morning. The Principal Dr. M.S. Murali inaugurated the camp by planting and watering a plant. After that he addressed all the volunteers about the importance and benefit of this type of camps. Mr. M.S. Shivakumar, NSS Programme Coordinator & HOD Dept. of Chemistry, motivated the students and volunteers. The faculty members like Dr. Pradeepa S.M, Mr. Venkatesh, Dept. of Chemistry, Mr. Raghavendra K, Dept. of Mathematics have very actively participated & involved in the Camp throughout the day. Senior faculty members such as Dr. Selvanandan, Dept. of Physics, Dr. Veena B.H, dept. of maths, Dr. C.S. Pillai, Dept. of CSE have also encouraged us during the camp. More importantly, more than 30 NSS volunteers from various branches of ACSCE have attended & carried the camp very enthusiastically with lot of interest. During the camp we have successfully planted around 75 plants. At the end of the day, Our management (RRGI), encouraged and appreciated our work. The NSS unit of ACSCE thanks the management for their continuous support and appreciation for all our activities. Finally, the above mentioned camp was also appreciated by the localities and the passengers who are travelling in that road during the camp.



“Say No to Crackers Awareness Program

Department of “Biomedical Engineering, ACSCE has conduct the following Events,
Name of the event:”Rally & awareness programme on “Say No to Crackers”

VENUE: Kengeri Upanagar

DATE:17th October 2017.



Photo: Say no to Crackers Campaign

Industrial Visit – Water Treatment Plant T K Halli

Date : 5th March 2020

Venue : T K Halli



Photo: Industrial Visit to T K Halli Water Treatment Plant

Industrial Visit to Solar Power Plant

The students of VI semester were taken to Solar Power Plant in Shivanasamudra, Mandya District for Industrial visit on 26.03.2019 that is on Tuesday as a part of Industry interaction to students along with two faculty members. The students assembled in the college at 8:30 am in their class. As the bus arrived at 9:00 am the students boarded the bus and started from college and reached Solar Power Plant in Mandya District at 12:30pm.

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Photo: Industrial Visit to Solar Power Plant



Hireal
Principal
A.C.S. College of Engineering
Kambipura, Mysore Road, Kengeri Hobli
Bangalore - 560 074



PRAKRUTHI

INSTITUTE OF ENVIRONMENTAL STUDIES

UNIT OF PRAKRUTHI FOUNDATION®

Ref: PIES/ACS/AUDIT/2021-22

Date: 22.11.2021

CERTIFICATE

This is to certify that **ACS College of Engineering KENGERI, BENGALURU - 560074** has successfully undergone **GREEN AUDIT**.

2. Energy Audit
3. Environmental Audit

The audit was conducted as per GRI indicators and other ISO standards as applicable with the moral support of the Principal, Teaching staff, non – teaching staff and Students.

The on-site audit was successfully conducted from 15-Oct-2021 to 20-Oct-2021 by Prakruthi Institute of Environmental Studies. Sustainability Assessor, Er. Ramesh Kumar BN, Er. Tushali Jagwani who are qualified personnel for carrying out green audit and did the site inspection.

Environmental GRI indicators considered in these auditing are water, air, noise, energy, waste, carbon footprint and biodiversity. The recommendations are put forth by the audit committee wherever there is scope of improvement.

We thank the college management for taking this proactive initiative for a sustainable journey.

Thanks and Regards
For Prakruthi Institute of Environmental Studies

Authorized Signatory

Associated concerns: ECO GREEN SOLUTION SYSTEMS PVT. LTD. & CONCEPT TECHNOLOGIES



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ENERGY AUDITING

ACS COLLEGE OF ENGINEERING

KENGERI, BENGALURU- 560 074

KARNATAKA



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Executive Summary

Sustainability is not only spoken in various levels but also practiced by industries, organizations and educational institutes to optimize their resource utilization and make them environment friendly. Hence sustainability is the need of the hour for our country to provide our future generation a clean and safe environment.

Educational institutions must play an active role in creating and modeling solution for such environmental problems. Green audit is one such concept or principle introduced to make the educational institutes environmentally sustainable.

Through green audit one gets a direction as how to improve the condition of environment within the system. Green audit can be a useful tool for a college to determine how and where they are consuming more of energy or water or resources; the college can then consider how to implement changes and make



savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan.

Green auditing and the implementation of mitigation measures is a win-win situation for the college, the learners and the planet. It can also create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of green impact on campus. Green auditing promotes financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility to the students and teachers.

In **ACS College of Engineering**, Bengaluru the audit process involved initial interviews with management to clarify policies, activities, records and the co-operation of staff and student in the implementation of mitigation measures. This was followed by

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staff and student interviews, collection of data through the questionnaire, review of records, observation of practices and observable outcomes. In addition, the approach ensured that the management and staff are active participants in the green auditing process in the college.

The baseline data prepared for the ACS College of Engineering will be a useful tool for campus greening, resource management, planning of future projects, and a document for implementation of sustainable development of the institution. Existing data will allow the college to compare its programmes and operations with those of peer institutions, identify areas in need of improvement, and prioritize the implementation of future projects. We expect that the management will be committed to implement the green audit recommendations.

CHAPTER - 1

INTRODUCTION

Green Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. It aims to analyze environmental practices within and outside of the concerned sites, which will have an impact on the eco-friendly ambience.

Green audit can be a useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of **Green** impact on campus. If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. Thus, it is imperative that the college evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

1.1. OBJECTIVES OF GREEN AUDIT

The Green Audit of an institution is becoming a paramount important these days for self-assessment of the institution, which reflects the role of the institution in mitigating the present environmental problems. The college has been putting efforts to keep the environment clean since its inception. But the auditing of this non-scholastic effort of the college has not been documented. Therefore, the purpose of the present green audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

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The main aim objectives of this green audit are to assess the environmental quality and the management strategies being implemented in **ACS College of Engineering**.

The specific objectives are:

1. To assess the source and quantity and of the water in the ACS College of Engineering campus
2. To know and monitor the energy consumption pattern in the campus
3. To quantify the liquid and solid waste generation and management plans in the campus.
4. To assess the carbon foot print of the Campus
5. To impart environment management plans to the campus and college

Benefits of Green Audit to an Educational Institute:

There are many advantages of green audit to an Educational Institute:

- It would help to protect the environment in and around the campus.
- Recognize the cost saving methods through waste minimization and energy conservation.
- Find out the prevailing and forthcoming complications.
- Empower the organization to frame a better environmental performance.
- It portrays good image of institution through its clean and green campus.

NAAC criteria VII Environmental Consciousness:

Universities are playing a key role in development of human resources worldwide. Higher education institutes campus run various activities with aim to percolate the knowledge along with practical dimension among the society. Likewise different technological problems higher education institutes also try to give solution for issues related to environment. Different types of evolutionary methods are used to assess the problem concerning environment. It includes Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Carbon Footprint Mapping, Green audit etc.

National Assessment and Accreditation Council (NAAC) which is a self-governing organization that declares the institutions as Grade according to the scores

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assigned at the time of accreditation of the institution. Green Audit has become mandatory procedure for educational institutes under Criterion VII of NAAC. The intention of green audit is to upgrade the environmental condition inside and around the institution. It is performed by considering environmental parameters like water and wastewater accounting, energy conservation, waste management, air, noise monitoring etc. for making the institution more eco-friendly.

Students are the major strength of any academic institution. Practicing green actions in any educational institution will inculcate the good habit of caring natural resources in students. Many environmental activities like plantation and nurturing saplings and trees, Cleanliness drives, Bird watching camps, No vehicle day, Rain water harvesting, etc. will make the students good citizen of the country. Through Green Audit, higher educational institutions can ensure that they contribute towards the reduction of Global warming through Carbon Footprint reduction measures.

CHAPTER – 2

ACS College of Engineering

2.1. ABOUT ACS College of Engineering

ACS College of Engineering, Kambipura, Mysore road, Bangalore, Karnataka is a self-financing co-education and regular college affiliated to Visvesvaraya Technological University, Belagavi, Karnataka. The college was established on 23-06-2009. The college received AICTE approval on 02-07-2021, VTU affiliation on 22-03-2021. The affiliating university act provides provision for availing autonomy.

The college is located in Bangalore urban with campus area of 5 acres and built-up area of 28,686 sq. mtrs. The college also has auditorium, playground, gymnasium, and other sports facilities. The college has swimming pool, boys & girls hostel, and quarters for faculties. The college provides cafeteria, health centre with fulltime qualified doctors and nurses. In addition the campus provides banking, transport, and generator facilities. The college offers the following undergraduate programs Aeronautical Engineering, Aerospace Engineering, Biomedical Engineering, Civil Engineering, Computer Science Engineering, Electronics and Communication Engineering and Mechanical Engineering and post-graduate program in Structural Engineering. The college also provides the excellent research facilities in Aeronautical, Biomedical, Civil, CSE, ECE, ME, Physics, Chemistry and Mathematics departments. The total student enrolled in the academic year 2020-2021 is 1254. The unit cost of education is Rs.86, 389 and Rs.44805 with salary and excluding salary component respectively. The college doesn't offer any programs in distant education mode and has teacher student ratio of 1:8. The college has been accredited by NAAC with A Grade in 1st cycle on 2016.

The ACS College of Engineering, since the time of its inception has been instrumental in revolutionizing the development of technical skills along with managerial propensity through latest innovative teaching methods and infusing a value system in order to create dynamic leaders of the future.

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Exposing the young and budding engineers to the world of latest technology, ACS College of Engineering provides the appropriate platform and the right kind of ambience to instill within the burgeoning engineers, the desired kind of professional attitude, traits and aspirations.

The intensive focus in the field of education has for sure created immense opportunities for the Engineering students, thus enabling them to seek propitious careers. The commitment towards personal concomitant students betterment has resulted in the provenience of ACS College of Engineering.

ACS College of Engineering provides highly innovative, skill based university affiliated courses which accredit the young generation to get the right career break in the desired fields. The institution not only provides quality education to the students but also groom them to face life with immense confidence. The Education imparted here not only focuses on academic enrichment but also nurtures complete development of personality of the individual who becomes an integral part of it.



Figure: Aerial view of ACSCE College

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INFRASTRUCTURAL FACILITIES

ACS college of Engineering has adequate infrastructural facilities as per the AICTE requirements. ACS College has adequate number of ventilated classrooms, Laboratories, Smart Classrooms (ICT enabled), Seminar halls, Computer Labs, Research Centers, HOD cabins, Staff cabins, Common rooms, Rest rooms, Central & Department Library and Convention hall. The management consistently interacts with the stake holders to improve the infrastructure facilities.

Infrastructure and Laboratories: The College is located in a beautiful lush green landscape, free from polluted environment and excellent atmosphere and ambience ideally suited for growth of the soul & mind.

It is located behind RRMCH on the Bengaluru-Mysore Highway 15 Km from the Bengaluru City Railway Station and 2km from Kengeri Railway Station. Campus Area is of 28,686 Square Meters.

Classrooms and Halls: ACS College of Engineering has 40 class rooms, 66 laboratories, smart class rooms, 05 seminar halls, 28 rest rooms and 12 common rooms.

Laboratories: The institution has laboratories as per AICTE norms. ACSCE has 66 laboratories with state of art laboratory equipment. The labs are well equipped with safety norms with list of experiments details. Labs are used by the students beyond the working hours for doing their projects. Also the college has established UC Berkeley and Intel intelligent System laboratory to bridge the gap between industry and academics.

Library: Apart from the books available in the library, students can also access online E-resources such as digital library to widen their knowledge and skills. The working time of library is from 9.00 am to 7.00 pm in working days and from 9.00 am to 4.00 pm in the holiday. Library has 16655 books, 70 Journals and 182 Project reports.

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2.2. UNDERGRADUATE PROGRAMS

- Civil Engineering
- Mechanical Engineering
- Computer Science and Engineering
- Electronics and Communication Engineering
- Aeronautical Engineering
- Aerospace Engineering
- Biomedical Engineering

2.3. POST GRADUATE PROGRAMES

- Product Design & Manufacturing (Mech)
- Structural Engineering (Civil)
- Aeronautical Engineering (AE)
- PhD Programs

2.4. VISION

Engineering the future of the nation by transforming the students to be technically skilled managers, innovative leaders and environmentally receptive citizens.

2.5. MISSION

To implement holistic approach in curriculum and pedagogy through Industry Integrated Interactions to meet the needs of Global Engineering Environment.

To develop students with knowledge, attitude and skill of employability, entrepreneurship (Be Job creators than job seekers), research potential and professionally ethical citizens.

2.6. GOALS

- Providing high quality medical graduates not only competent in their respective fields, but are also motivated to serve humanity at large.

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- Producing research papers in all fields of medical sciences, worthy of being published by National & International Journals.
- Providing all facilities for the pursuit of medical knowledge, relevant to the needs of contemporary society.
- Implementing public services beneficial to and relevant with the needs of the community at large, nationally and internationally.

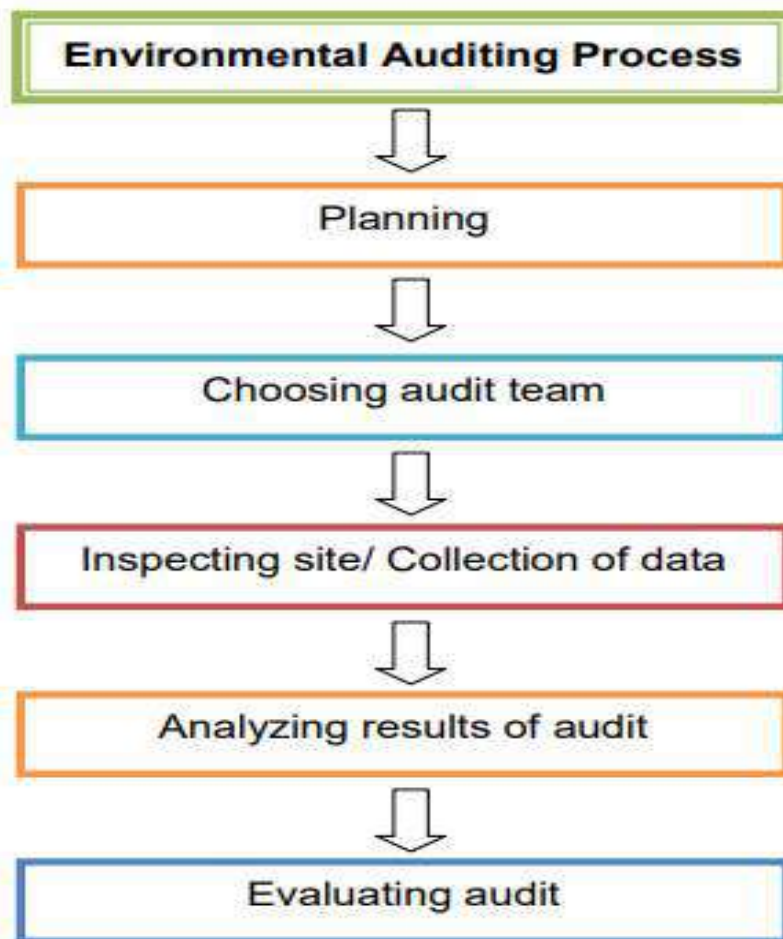
2.7. EDUCATIONAL OBJECTIVES

- To provide for instruction in training in such branches of learning as it may deem fit.
- To provide for research and for the advancement of and dissemination of knowledge.
- To undertake extra **moral** studies, extension programs and field outreach activities to contribute to the development of Society.
- To undertake the activities to strengthen the set objectives.

CHAPTER – 3

METHODOLOGY ADOPTED

The audit process was carried out in three phases. At first, all the secondary data required for the study was collected from various sources, like concerned departments as engineering, hostel, garden etc. A broad reference work was carried out to clear the idea of green auditing. Different case studies and methodologies were studied and the following methodology was adopted for present audit. The methodology of present study is based on onsite visits, the personal observations and questionnaires survey tool. Initially, based on data requirement, sets of questionnaires were prepared. The surveyors then visited all the departments of the university and the questionnaires were filled. The generated data is subsequently gathered and used for further analysis. From the outcome of the overall study, a final report is prepared.



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3.1. SURVEY BY QUESTIONNAIRE:

Baseline data for green audit report preparation was collected by questionnaire survey method. Questionnaires prepared to conduct the green audit in the university campus is based on the guidelines, rules, acts and formats prepared by Ministry of Environment, Forest and Climate Change, New Delhi, Central Pollution Control Board and other statutory organizations. Most of the guidelines and formats are based on broad aspects and some of the issues or formats were not applicable for University campus. Therefore, using these guidelines and formats, combinations, modifications and restructuring was done and sets of questionnaires were prepared as solid waste, energy, water, hazardous waste, and e-waste. All the questionnaires comprise of group of modules. The first module is related to the general information of the concerned department, which broadly includes name of the department, month and year, total number of students and employees, visitors of the department, average working days and office timings etc. The next module is related to the present consumption of resources like water, energy, or the handling of solid and hazardous waste. Maintaining records of the handling of solid and hazardous waste is much important in green audit. There are possibilities of loss of resources like water, energy due to improper maintenances and assessment of this kind of probability is necessary in green audit. One separate module is based on the questions related to this aspect. Another module is related to maintaining records, like records of disposal of solid waste, records of solid waste recovery etc. For better convenience of the surveyor, some statistics like, basic energy consumption characteristics for electrical equipment etc. was provided with the questionnaires itself.

Onsite visit and observations:

The ACS College of Engineering has vast built-up area comprising of various departments, administrative building, teachers and staff quarters, student hostels, guest house, sports complex and health center. All these amenities have different kind of infrastructure as per their requirement. All these buildings were visited by the surveyors and the present condition is checked with the help of the questionnaires. Personal observations were made during

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the onsite visit. All the amenities were clubbed in as per their similarities and differences, which makes the survey and further analysis easier.

Data analysis and final report preparation:

A proper analysis and presentation of data produced from work is a vital element. In case of green audit, the filled questionnaires of the survey from each group, were tabulated as per their modules, in Excel spreadsheets. The tabulated data is then used for further analysis. For better understanding of the results and to avoid complications, averages and percentages of the tables were calculated. Graphical representation of these results was made to give a quick idea of the status. Interpretation of the overall outcomes was made which incorporates all the primary and secondary data, references and interrelations within. Final report preparation was done using this interpretation.

- In order to meet its objectives, this audit combined physical inspection with a review of relevant documentation and interviews with various stakeholders.
- Review of the Documentation
- For the purpose of this audit the Green Policy of the institute was reviewed.
- Interviews
- Interviews were conducted with the Principal's, Registrar and also faculties and students.
- Physical Inspection
- **The audit team was in the college to inspect the campus.**

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3.2. LIST OF STUDENTS AND STAFF INVOLVED IN GREEN AUDITING

| Sl No | Name | Designation |
|--------------|----------------------|-------------------------------------|
| 1. | Dr. M.S. Murali | Principal |
| 2. | Mr. Sunilraj B.A | Asst. Professor. Dept. of Mech Engg |
| 3. | Dr. Selvanandan | Professor, Dept. of Physics |
| 4. | Mr. Athipathi | Estate Officer, ACSCE |
| 5. | Dr. Gayathri | Asst. Professor, Dept of Civil Engg |
| 6. | Mr. Srinidhi Acharya | Asst. Professor. Dept. of Mech Engg |
| 7. | Ms. Pooja | Student, Dept. of Mechanical |
| 8. | Mr. Jayaprakash | Student, Dept. of Civil Engg |
| 9. | Mr. Praveen Gowda | Student, Dept. of Civil Engg |
| 10. | Ms. Kruthika | Student, Dept. of Civil Engg |

CHAPTER – 4

GREEN AUDIT

ECO -FRIENDLY CAMPUS & GREEN PRACTICES IN ACS COLLEGE OF ENGINEERING

4.1. AREAS OF GREEN AUDITING

4.1.1. ENERGY AUDIT

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

4.1.2. WATER AUDIT

Water audit can be defined as a qualitative and quantitative analysis of water consumption to identify means of reducing, reusing and recycling of water. Water Audit is nothing but an effective measure for minimizing losses, optimizing various uses and thus, enabling considerable conservation of water in irrigation sector, domestic, power and industrial as well. A water audit is a technique or method which makes possible to identify ways of conserving water by determining any inefficiencies in the system of water distribution. The measurement of water losses due to different uses in the system or any utility is essential to implement water conservation measures in such an establishment.

This indicator addresses water consumption, water sources, irrigation, storm water, appliances and fixtures. Aquifer depletion and water contamination are taking place at unprecedented rates. It is therefore essential that any environmentally responsible institution should examine its water use practices.

It is observed that a number of factors like climate, culture, food habits, work and working conditions, level and type of development, and physiology to determine the requirement of water. The community which has a population between 20,000 to 1,00,000 requires 100 to 150 liters per person (capita) per day. The communities with a population can consume over 1, 00,000 requires

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150 to 200 liters person (capita) per day. As per the standards provided by WHO Regional office for South East Asia Schools require 10-15 liters per student if water-flushed toilets, Administration requires (Staff accommodation not included) 50 liters per person per day, Staff accommodation requires 30 liters per person per day and for sanitation purposes it depends on technology.

4.1.3. BIODIVERSITY AUDIT

All plant and animal species - including humans - are linked together in a complex web of life; we depend upon biodiversity for our survival. Biodiversity is the key to healthy ecosystems and ultimately a healthy planet. It keeps the air and water clean, regulates our climate and provides us food, shelter, clothing, medicine and other useful products. Each part within this complex web diminishes a little when one part weakens or disappears. The trees work hard to keep the air we breathe clean and healthy. Their leaves take in much of the poisonous unwanted carbon dioxide in the air, and replace it with the oxygen we need for healthy living. In this process, the plants with the help of sunlight, water, minerals and the green material called Chlorophyll within the leaves change the carbon-dioxide into food for themselves. When doing this they release oxygen into the air which is vital for all life on earth. The roots of trees dig deep into the earth and hold it together so that the rain and wind cannot wash or blow it away. This is very important as the earth has only a very thin layer (seldom more than one foot) of fertile soil covering it.

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4.1.4. BIODEGRADABLE AND HAZARDOUS WASTE AUDIT

This indicator addresses biodegradable waste from college and hostel canteen, paper waste to hazardous wastes of laboratories and worn-out electric & electronic goods, and plastic wastes. Hazardous materials represent significant risks to human health and ecological integrity. Hazardous wastes are also leached out through the e-waste generated in the campus. They often persist in the environment leaving a legacy of land and water contamination for generations. They also accumulate in the tissues of organisms and become concentrated within food chains, leading to cancer, endocrine disruption, birth defects, and other tragedies. The minimization, safe handling, and ultimate elimination of these materials are essential to the long-term health of the planet.

4.2. LAND AREA STATEMENT

The land under the project is designated for Educational activities as per Karnataka Government. No additional burden on land has been created which may adversely affect land use pattern in the area. No natural drain is being obstructed. The University land does not interfere with any forest, wetland, river, lake, mountain, national park & sanctuary etc.

The total area of campus – 20,234 Sq.mt.

| Building Area Abstract | | |
|-------------------------------|--------------------|------------------------|
| Sl.No | Floor wise | Area in Sq. Mtr |
| 1 | Lower Ground Floor | 2558.8 |
| 2 | Ground Floor | 3713.93 |
| 3 | First Floor | 3888.93 |
| 4 | Second Floor | 3789.07 |
| 5 | Third Floor | 3621.07 |
| 6 | Fourth Floor | 3705.07 |
| 7 | Fifth Floor | 3705 |
| 8 | Sixth Floor | 3705 |
| | Net Total | 28,686.87 |

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| Sl.No | Particulars | Area in Sq. Mtr |
|--------------|---------------------|------------------------|
| 1 | Instructional Area | 14959 |
| 2 | Administration Area | 4235 |
| 3 | Amenities Area | 1393 |
| 4 | Circulation Area | 8099.87 |
| | Net Total | 28,686.87 |

4.3. WATER REQUIREMENT:

The total water requirement for the University is 80 KLD. Water quality of ground water resources in the area has been studied for assessing the water environment. Borewell and rain water are being used in the campus. Rain Water Harvesting has been provided for recharging the aquifer to compensate withdrawal to some extent.

| Total requirement of water in KLD | |
|--|--|
| Fresh | 50 |
| Recycled | 30 |
| Total | 80 |
| Source of water | Bore well and Rainwater |
| 1.Whether canteen facility provided for day students etc | Yes |
| 2. Waste water generation in KLD | 300 KLD |
| STP capacity | 300 KLD |
| Technology employed for Treatment and mode of disposal of treated sewage | STP |
| Scheme of disposal of excess treated water if any | Gardening, Lawns, Toilet and Flush out |
| Any Treatment for lab water | - |
| No. of ponds, wells, taps, toilets, waterless urinals | 01 Pond 01 Open Wells 498 Taps 92 Toilets |
| No. and capacity of water tanks for storage | 40,000 litres |

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4.4. WASTE WATER GENERATION

About 300 m³/day of wastewater is being generated.

4.5. WASTE WATER MANAGEMENT

The Institution follows the systematic procedure for proper management and disposal of liquid waste. The wet waste from the college, hostels and canteen is given away to bio fertilizer plants for making eco-friendly fertilizers. A sewage treatment plant for the college is being conceived. This treated water is then used for the gardening and other purpose. Institution also conducts discussions with students to make them aware about the liquid waste management techniques.

- In order to treat the domestic and other waste waters, the sewage treatment plants (STPs - 1 no) have been installed and successfully operated within the premises. The STP capacities is 300 KLD respectively to handle the waste waters generated from College building, Hospital, Hostels, Canteens and recreational areas such as gymnasium etc.
- The waste water is first disinfected using bleaching disinfectants and then discharged into the under drainage system leading to STP.
- The sewage generated from other buildings is directly discharged into the STP and is treated along with other waste waters.
- The treatment scheme comprises of a biological treatment called ASP/SBR system wherein the aerobic bacteria stabilizes all the organic matter, neutralizes the microbial population
- The STPs have been performing smoothly and deliver effluents with BOD values below 10 mg/l. The aerobic treatment followed by disinfection results in microbe concentration below 100 units as stipulated in the consent. Likewise all other listed parameters are also complied with. Analysis reports are regularly forwarded to the KSPCB.

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Photo: Sewage Treatment Plant of 300 KLD in operation

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RECYCLE AND REUSE OF TREATED WASTE WATERS:

The institution installed sewage treatment plants for the treatment of waste waters originating from the Hospital, college, hostels, staff quarters and canteen areas. Whereas 250 KLD STP primarily treats the waste waters generating from Medical college, Hospital and club areas; the sewage from the ACS College, hostels and staff quarters is treated in 300 KLD STP near cricket ground. Generally the STPs are operated below 80% capacity levels and depending upon semester breaks the influent fluctuations are accordingly smoothened. On an average 200-250 KLD of treated waste water is available for its reuse. Biologically treated waste water is disinfected using liquid chlorine prior to its pumping for the uses. As per KSPCB stipulations, the treated waste waters are reused within the campus as out lined in the following paragraphs.

In general the STPs are operated at not more than 80% of the designed capacity and at much lower capacity during vacations, lock down etc. The treated waste waters from STP 1 and 2 is utilized for the following activities:

- i) Gardening and maintaining greenery within the campus. (70 %)
- ii) For construction and curing activities within the campus. (20%)
- iii) Secondary flushing in toilets in the hostel buildings. (5%)
- iv) Dust suppression as and when required. (1%)
- v) Buses and other vehicles washing within the campus. (4%)

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➤ **Treated water used for maintaining Grass Mat Cricket Ground:**



A cricket ground measuring as large as **14,500 sq m** is provided with grass mat that is maintained round the year on top priority. Since grass has small and shallow roots (as against large and deep roots of tall trees) the water demand is also high (Evaporation-transpiration) frequent watering is required to

ensure very survival of the grass. A sprinkler system has been provided for this purpose. In general a total of **140 KL** is required on any non monsoon day.

➤ **Bus/Car Washing:**



The institute operates a fleet of 6 Buses and other vehicles. Additionally the students staying in the premises also use the treated water to wash their cars and two wheelers. Provision of **5 KLD** has been made for the purpose.

Ongoing Construction Activities:

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For general maintenance works as well as other ongoing construction activities (Concreting and curing) in the premises also make use of treated water which is quite fluctuating in nature. Nevertheless a provision of **10-20 KLD** has been made.

Photo: Ongoing Construction Works

➤ Kitchen Gardening:



Few patches in the premises are used to grow vegetables (on Trial basis) which are often watered with treated water. The demand here could be approximated to **2 KLD** during non monsoon time.

Photo: Kitchen Gardening near Mess Area

Green Belt Development:

A Green zone has been developed with short, medium and tall trees along with other horticultural development and vacant areas in the campus. This also requires regular watering for the survival. Through the hydrant systems network, the treated water is pumped from both the STPs and a total of **110 KLD** is utilized for the purpose.

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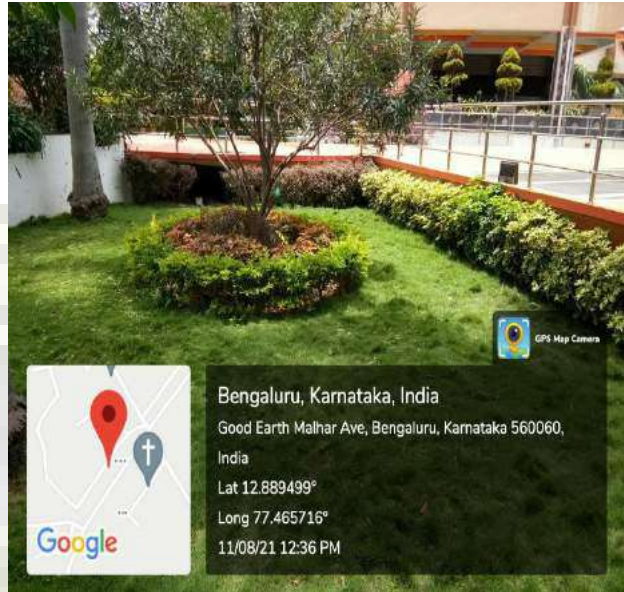


Photo: Green Belt Development at ACSCE

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4.6.1. EXISTING WATER MANAGEMENT METHODS INSTALLED IN THE CAMPUS

1. Rain water harvesting
2. Bore well /Open well recharge
3. Construction of tanks and bunds
4. Waste water recycling
5. Maintenance of water bodies and distribution system in the campus

1. Rain Water Harvesting:



Rainwater harvesting system, also called rainwater collection system or rainwater catchment system, technology that collects and stores rainwater for human use. The stored water is used for gardening and raw use. Besides natural percolation tanks, concrete storage tanks have also been built and rain water has been stored after proper filtration paving the open

places with concrete roads is avoided so that rain water can be percolated

- The rainwater harvested during rains not only helps to save water from conventional sources, but also to save energy and reduce expenses incurred on transportation and distribution of water. Awareness programmes on water conservation and rain water harvesting have been conducted regularly through various service of the college.
- In order to minimize the abstraction of ground waters, maintain the underground water table and control the hardness of the water supplied in the campus, the rain water potential has also been estimated for its tapping.

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➤ As per the scheme the roof top water shall be collected in the underground tanks/sumps, whereas the water collected from paved and unpaved areas shall pass through grease cum silt

trap and clean water shall be either directly used or shall be used for recharging the existing bore wells within the campus as per drawings. One such Rain water harvesting tank near Students mess is shown below. Similar structures shall be replicated at different locations within premises and other institutions. The institution has roof top rain water harvesting system which is installed on the roof of the institution.

2. Borewell and Open well (Pond) Recharge:

As the water crisis continues to become severe, there is a dire need of reform in water management system and revival of traditional systems. As a part of revival to traditional wisdom, in this institute we built a pond to collect and storage the rainwater for reuse on-site, rather than allowing it as run off.



Photo: Borewell Recharge System in the Campus



Photo: Open Well (Pond) Recharge

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3. Waste Water Recycling

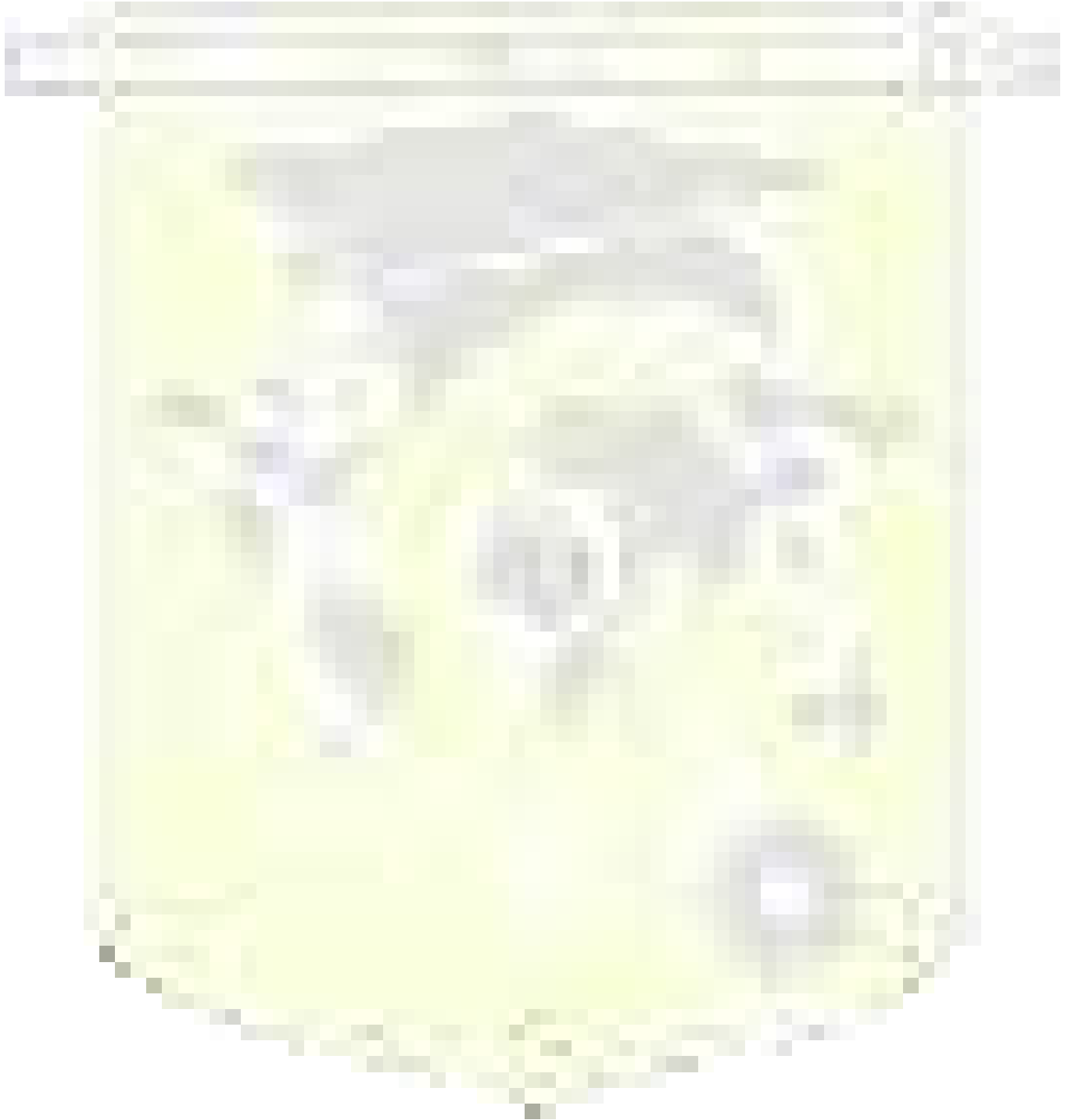
- In order to treat the domestic and other waste waters, the sewage treatment plants have been installed and successfully operated within the premises. The STP capacities are **300 KLD** respectively to handle the waste waters generated from College building, Hospital, Hostels, Canteens and recreational areas such as gymnasium etc.
- The waste water is first disinfected using bleaching disinfectants and then discharged into the under drainage system leading to STP.
- The sewage generated from other buildings is directly discharged into the STP and is treated along with other waste waters.
- The treatment scheme comprises of a biological treatment called ASP/SBR system where in the aerobic bacteria stabilizes all the organic matter, neutralizes the microbial population.
- The STPs have been performing smoothly and deliver effluents with BOD values below 10 mg/l. The aerobic treatment followed by disinfection results in microbe concentration below 100 units as stipulated in the consent. Likewise all other listed parameters are also complied with. Analysis reports are regularly forwarded to the KSPCB.

Recycle and Re-use of Treated Waste Waters:

In general the STPs are operated at not more than 80% of the designed capacity and at much lower capacity during vacations, lock down etc. The treated waste waters from STP 1 and 2 is utilized for the following activities;

- vi) Gardening and maintaining greenery within the campus. (70 %)
- vii) For construction and curing activities within the campus. (20%)
- viii) Secondary flushing in toilets in the hostel buildings. (5%)
- ix) Dust suppression as and when required. (1%)
- v) Buses and other vehicles washing within the campus. (4%)

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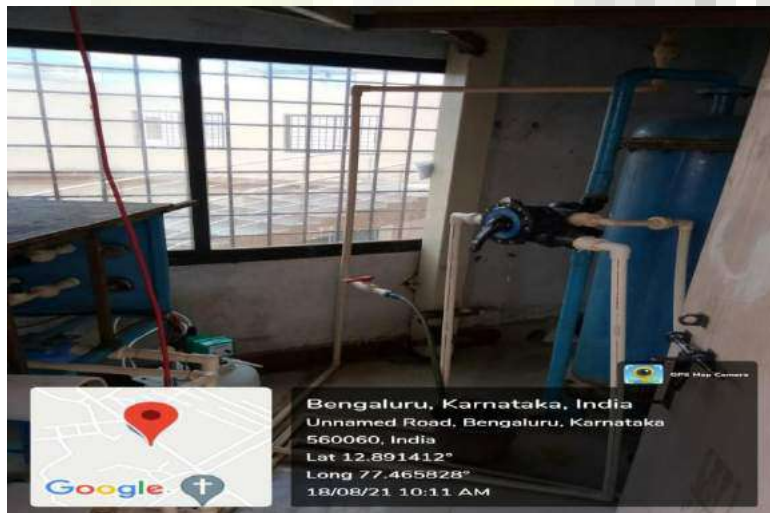
4. Construction of Tanks and Bunds:



As the water crisis continues to become severe, there is a dire need of reform in water management system and revival of traditional systems. As a part of revival to traditional wisdom, the institution built rain water storage tank, to collect the rainwater and can be used whenever it is required. The rainwater storage tank is build near to ACSCE campus, Faculty Quarters, Boys Hostel and Girls Hostel, ACSCE Convention Centre.

Photo: Tank to Store Rain Water

5. Maintenance of water bodies and distribution system in the campus



The ground water is pumped into storage tanks located at different places in the campus. There are few numbers of over head storage tanks. The water is distributed through well laid pipe network. Drinking water after treating in RO plant is supplied through a separate set of distribution pipes and

water for all other purpose is supplied through another set of distribution pipes. Entire distribution system is well supervised by Civil works people to ensure that there are no leakages and wastages of precious water through joints, valves etc. Waste usage of water is reduced using low pressure flushes. All the stakeholders of the college are well educated to use water economically and efficiently.

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Photo: Over Head Tank in the campus building



Photo: Underground water Storage Tank in the Campus



Photo: Water Bodies Distribution Line in the campus building

4.6. SOLID WASTE MANAGEMENT

The main producers of Solid waste in campus include, Canteen waste, hostel kitchen waste, Institutional waste, and staff quarters. Most of the Dry waste in campus is stored at a transfer station within the campus. The solid waste generated in the constituent colleges will be mostly waste papers, answer sheets and domestic waste like kitchen waste.

The University makes necessary arrangements for disposal of solid waste. Domestic waste is handed over to village panchayats. 5 kg of non-biodegradable waste is generated.

The Institution implements solid waste management by enforcing the waste segregation rules. Dustbins are placed in every classroom, laboratory, rest room, and mess at different locations in the campus. Sweepers are allotted to each floor who manages all the waste generated in the campus. All waste/garbage from college and hostel is segregated at source and disposed of in a proper manner. The wet waste from the hostels/ canteen is given away to bio fertilizer plants for making eco-friendly fertilizers. Wastes like newspapers and stationary is sold to proper recycling agencies/vendors. Through recycling the transport of large quantities of garbage to far-off dumps has been reduced. The institution has successfully completed and recently commissioned a BIO gas plant to handle 80 kg/day of solid waste. The Institution has organized Swach Bharat Mission. Under this banner the utility of recycling the solid waste has been elaborated. People from different aspects of life delivered their talks about the proper usage of waste. Moreover, the NSS volunteers have also demonstrated the proper procedure of disposing the waste.

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| Waste Management | |
|---|--|
| Quantity of biodegradable waste generation and mode of disposal as per norms | 52.5 kg/day to Bio gas plant |
| Quantity of non-biodegradable waste generation and mode of disposal as per norms | 22.5 kg/day of plastics and paper sold to vendors |
| Quantity of hazardous waste generation and mode of disposal as per norms | Waste oil: 20 litre/year sold to refine Waste Batteries: 5 Batteries/yr exchanges with new battery |
| Quantity of E-waste generation and mode of disposal as per norms | E-waste 40 kg/yr sold to recycling companies |

Biogas Plant:

The institution has successfully completed and recently commissioned a BIO gas plant to handle 80 kg/day of solid waste. This is an in-house design developed involving engineering students (from ACSCE) in the surveys for the estimation of solid waste generated on day today basis. The construction was also taken up by in-house civil team. The salient features of the Bio-gas systems are listed as below:

- The biogas plant receives the solid wastes from canteen (leftover cooked and uncooked foods), student mess, hostels, staff quarters and college buildings.
- The biogas plant comprises of a floating dome bio-digester, flame arresters, gas compressors, gas metering and gas stoves provided in the kitchen. The feeding line is also designed at two locations so as to simultaneously feed other waste for Research and enhancement of Bio-gas production
- A settling cum filtration unit has also been commissioned to separate

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digested solids from the liquid. The dried solids are to be further used as compost/soil conditioner. It is estimated that almost 70 kg of dry solids may be recovered per day.

- The filtrate is recycled back to the feeding tray of the crushing unit to dilute the solid food waste prior to its entry into the Bio Digester.
- The biogas recovered is directly used in the kitchen nearby, through the underground GI pipe line fitted with the flame arresters as fire safety.
- The segregation of wet waste and dry waste is under implementation within the campus so as to divert all the wet wastes to the bio-digester.
- The area around the biogas plant is paved with the concrete paver blocks to maintain cleanliness and hygienic.
- The plant design is in such manner as to expand conveniently in future and/or convert the existing system into a two reactor system for better efficiencies.



Photo: View of the new Biogas Plant at ACSCE

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E-waste management:



Photo : E- Waste Storage

The Institution has undertaken a number of E-waste Management initiatives with the objective of creating an eco-friendly environment in the campus. E-waste such as computers and its peripherals are upgraded regularly to continue usage and to avoid its wastage.

4.7. ENERGY MANAGEMENT

Energy conservation is an important aspect of campus sustainability which is also linked with carbon foot print of the campus. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices.

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| Energy & power details | |
|--|--|
| Electricity charges | Rs. 5,55,000 per month on an Average |
| Number of Gas cylinders used per month | 01 cylinder for lab for 3 month 01 cylinder /month 28 cylinder/month in the Mess |
| Number of Diesel Generators | 02 i.e 180 KVA, 125 KVA |
| Quantity of Diesel consumed Cost of generator fuel | 35 litre/hr for 180 KVA 22 litre/hr for 125 KVA Cost of Generator fuels i.e Diesel is Rs. 85/litre |
| Total number of CFL bulbs | - |
| Number of LED lights----- Incandescent bulbs----- fans----- AC's----- Tube lights----- electrical instruments----- computers----- photocopiers----- T.V's. etc.----- | 1347 Led bulbs 662 fans 22 AC's Tube lights 662, Computers - 547 Xerox machine -2 T.V. - 2 |

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4.8. SOLAR ENERGY

Solar Thermal Energy Harnessing:



In order to conserve the electrical energy in the boys and Girls Hostels, a total of 96 Solar Water Heating Panels and 12 tanks have been installed and operated on day today basis. This has eliminated the use of electrical geysers in the hostels as the hot water is required round the year in Bangalore climate

Photo: Solar Panels for water heating

b. Solar Street Light:



The Solar street lights are also installed in various part of the campus in order to reduce the conventional electricity usage

Photo: Solar Street Light

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AIR ENVIRONMENT

- In the University campus during construction in any stage water will be sprinkled on the soil to avoid dust generation.
- The debris and unused construction debris will be removed immediately for recycling, if any, or for designated land fill
- All vehicles for service activities at the University will be checked for vehicular emission. The agencies will be asked to keep them within prescribed limits. They will also be asked to maintain them properly.
- As discussed earlier there will be no other point source of Air pollution, which are noise free. Chimneys of suitable height have been provided to control the G.L.C. of PM 2.5, PM10, SO₂, & NO_x levels. Extensive tree plantations have been resorted to for further improving the air environment in general and minimize noise levels.

4.10.1. AIR EMISSIONS AND NOISE LEVELS

The University has installed noise free generators for power backup. No other point source of emissions like boiler, furnace etc. to run on fossil fuels, have been provided. So, the University does not generate Air & Noise Pollution.

4.10.2. TRAFFIC DENSITY

The students are not allowed to keep their own vehicles in the hostel. The University has its own buses for local students. The layout has been planned to provide adequate space for parking within the campus.

4.10.3. CARBON FOOTPRINT

Burning of fossil fuels (such as petrol) has an impact on the environment through the emission of greenhouse gases into the atmosphere. The most common greenhouse gases are carbon dioxide, water vapour, methane, nitrous oxide and ozone. Of all the greenhouse gases, carbon dioxide is the most

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prominent greenhouse gas, comprising 402 ppm of the Earth's atmosphere. The release of carbon dioxide gas into the Earth's atmosphere through human activities is commonly known as carbon emissions. Vehicular emission is the main source of carbon emission in the campus, hence to assess the method of transportation that is practiced in the college is important.

| Carbon footprint | |
|---|------|
| No of persons using bicycles (Approx.) | 03 |
| No of persons using cars (Approx.) | 21 |
| No of persons using two wheelers (Approx.) | 225 |
| No of persons using other transportations (Approx.) | 1091 |
| No of visitors per day (Approx.) | 85 |
| No of students staying in hostel | 150 |
| No of faculty and staff staying in staff quarters | 10 |
| Total Number of students | 1254 |
| Total No. of faculty and staff | 272 |

4.9. GREEN AUDIT (Ecology & Bio -Diversity)

FLORA

The campus has a rich collection of trees. About 50 tree species were identified. Most of the plants have important role in the maintenance of biodiversity and are the good carbon assimilators. Herbal garden and other ornamental gardens were maintained in the campus.

Apart from records of Forest department, field surveys were undertaken to study the vegetation and floral components in the campus. Apart from this Vanamahotsav (Tree Plantation) is celebrated every year in the campus in the way of conducting green gradation and green initiatives.



Figure: Flora at college campus

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4.11.1. FAUNA

Prolific wild life is not observed in the University campus, as there is no thick forest/ vegetation is noticed in the University Campus.

| FAUNAL GROUP | SCIENTIFIC NAMES |
|---------------------------|---|
| SPIDERS | Myrmachne orientalis (Family Salticidae); Nephilaplines (Family-Nephilidae); Heteropoda sp (Family-Sparassidae); Phintella vitatta (Family Salticidae) |
| MOTHS & BUTTERFLIES | Antheria assmensis; Bombyx mori; Philosamia ricini; Junonia atlites atlites ; Commander (Moduza procris procris); Ethope himachala ; Melanitis leda leda ; Paltoporia paraka paraka; Ypthima baldus ; Acraea terpsicore ; Elymnias, hypermnestra, undularis; Mycalesis perseus blasius; Tanaecialepidealepidae; Euploea core core |
| OTHER INSECTS | Scarlet dragonfly; Pantala flavescens (wandering glider), grasshoppers, microbes |
| REPTILES | squirrels, mouse, snake, lizard |
| BIRDS | Acridotheres tristis (Common myna); Streptopelia orientalis (Oriental Turtle Dove); Athene noctua (little owl); Pycnonotus cafer (Red-vented Bulbul), crows, sparrows, peacock |
| MAMMALS | Monkeys, Dogs, Cats |

Chapter 5

CONCLUSION AND RECOMMENDATIONS

ACS College of Engineering has always taken a green agenda for developing a green campus. Despite being primarily a technological institution, it has shown remarkable awareness in maintaining an eco-friendly campus. On visiting the Campus, one can experience the aesthetic and elegant buildings, splendid lawns, spacious sports grounds and lush green environment conducive for teaching-learning process.

1. The institutional initiatives for greening the campus are as follows:

- Restricted entry of automobiles
- Battery powered vehicles
- Pedestrian Friendly pathways
- Ban on use of Plastic
- Landscaping with trees and plants

1. RESTRICTED ENTRY OF AUTOMOBILES



The college operates a fleet of 6 buses covering each corner of Bengaluru to facilitate the students and staff. The institute encourages the staff and students to use the college transport instead of their own vehicles for safety, security, fuel conservation and to reduce environmental pollution. The college buses

are checked for pollution by the authorized agency.

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Photo: Two Wheeler Parking Zone

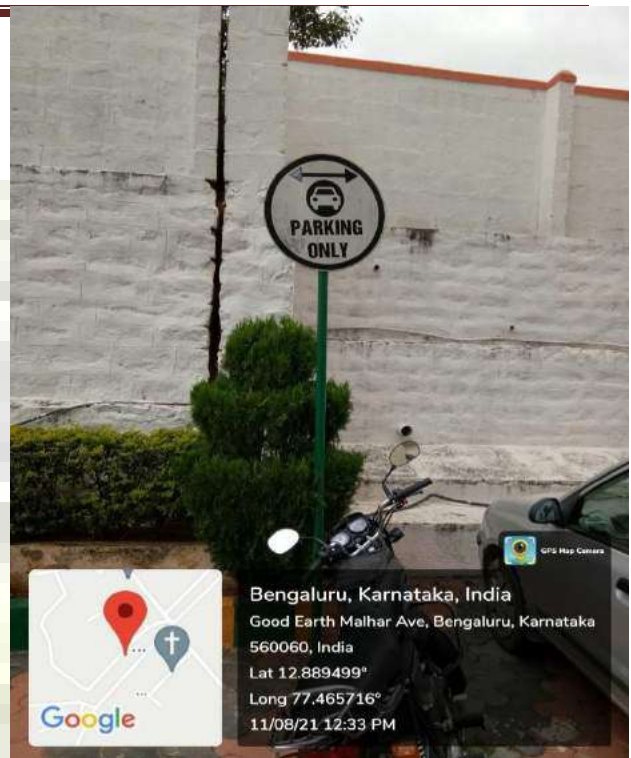


Photo: Four Wheeler Parking Zone

2. BATTERY POWERED VEHICLES

The Management has procured three battery operated carts for the use within the campus to minimize the movement and pollution arising due to fuel driven vehicles within the campus. Although, the steep slopes within the campus are not bicycle

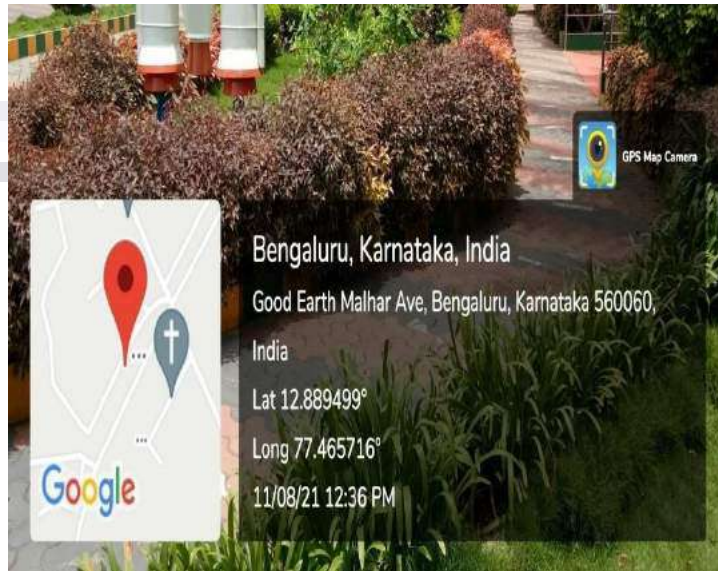


Photo: Battery Operated Vehicle in the Campus

friendly, yet majority of the students and staff prefer walking within the campus as the same is quite compact. The noise levels in the campus are kept to the minimum due to noise less battery operated carts and minimal movement of automobiles within the campus.

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3. PEDESTRIAN FRIENDLY PATHWAYS



Vehicle parking space is provided at the main entrance of the college campus. As the campus is vehicle free with some exceptions, students and staff experience comfort walking through the pedestrian friendly pathways. The internal roads are lined with trees and solar lights and they are properly maintained by the campus maintenance committee.

Photo: Pedestrian Path way in the campus

4. BAN ON USE OF PLASTIC



Single-use plastic items such as plastic bottles, bags, spoons, straws and cups are banned completely and awareness is created among staff and students through orientation and display boards in the premises. To restrict the use of plastic, measures have been taken to replace plastic tea cups and glasses with steel glasses in the

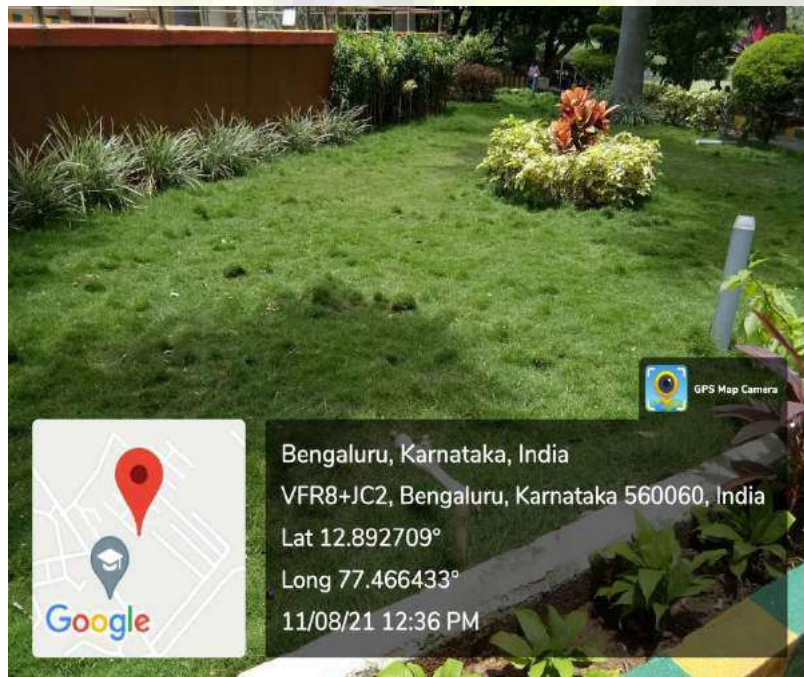
canteen. The staff and students are informed to use steel or copper water bottles instead of plastic bottles. The institution also conducted **Unnatha Bharatha**

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Abhiyan (UBA) activities on the Ban on use of plastics and created awareness to the faculties the localities in and around the campus.

UBA emphasized on the implementation of 'plastic free Campaign' in the adopted villages. Students and faculty members explained the ill effects of plastics and recommended not to use plastics. Instead of plastics, reusable bags can be used which saves the environment and animals. School children and the people of the villages responded and assured that they will say no to plastics and also welcomed the initiative. Students also collected the plastics from the houses and surrounding areas. The campaign was successful in imparting "SWACHHATA HI SEWA" and "Say no to Plastics".

5. LANDSCAPING WITH TREES AND PLANTS

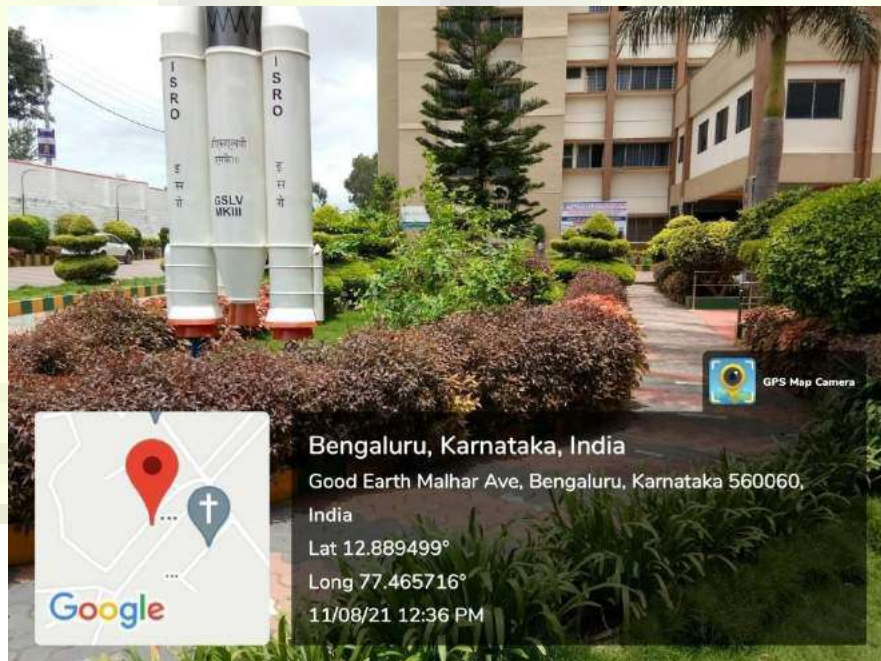
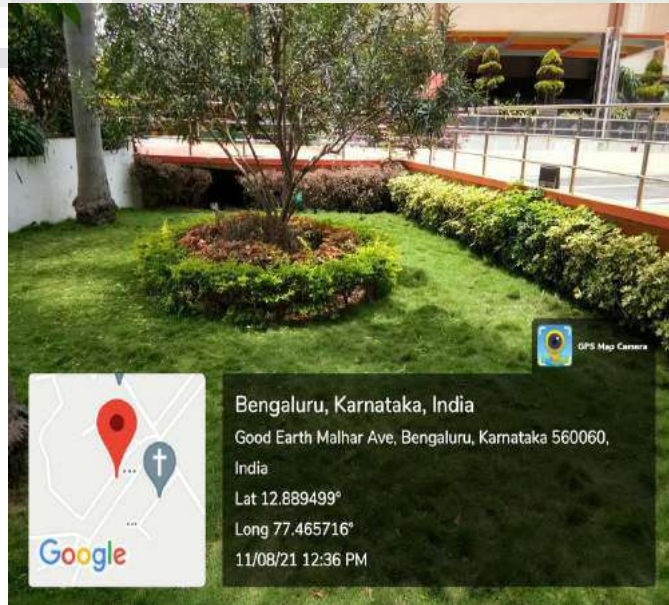


Landscaping of the college is worth seeing and reflects aesthetic sense. The institute has a canopy of trees and plants to make the environment pollution free to safeguard the health of all the inmates. The lawns and the trees provide shade and beautiful ambience. Utmost care is taken to develop and maintain green landscaping

by trained gardeners and supervisor. The construction, maintenance people in the college looks after the development and maintenance of the greenery in the campus. The institute authorities are taking initiatives to make the campus paperless. Internal communication in the campus, through e-mail or e-messages, is driving towards paperless office. Electronic notice boards are installed in the

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campus to display circulars and information for the students. Electronic gadgets are preferred to transfer and store the official data and information.



Photos: Landscaping with Tress and Plants

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Quality Audits On Environment And Energy Regularly Undertaken By The Institution

Quality audits on environment and energy regularly undertaken by the institution

The institutional environment and energy initiatives are confirmed through the following

1. Green audit
2. Energy audit
3. Environment audit
4. Clean and green campus recognitions/awards
5. Beyond the campus environmental promotional activities

Beyond The Campus Environmental Promotion Activities

ACSCE has an eco-friendly environment. It has a long legacy of healthy environmental practices including periodic plantation, their preservation and maintenance. Its land use is such that about 70 % of the total area is occupied by open land and plantation that generates a better and sustainable campus environment.

The campus environmental promotion activities are:

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SWACHHATA HI SEWA Campaign



Unnat Bharat Abhiyan (UBA) is a flagship program of Ministry of Human Resource Development (MHRD), Government of India. Our Institution is one of the Participating Institutions (PI) under UBA. UBA emphasized on the implementation of 'plastic free Campaign' in the adopted villages. In this regard, our institution planned for the event in

collaboration with NSS at our adopted villages. About 100 students of Aeronautical, Aerospace, Civil & Mechanical Engineering volunteered along with four faculty members namely Dr. Suresh P M, Mr. Srinidhi Acharya S R, Mr. Rakesh S of Mechanical Engineering and Mr. Shivashankar of Civil Engineering. Students and faculty members explained the ill effects of plastics and recommended not to use plastics. Instead of plastics, reusable bags can be used which saves the environment and animals. School children and the people of the villages responded and assured that they will say no to plastics and also welcomed the initiative. Students also collected the plastics from the houses and surrounding areas. The campaign was successful in imparting "SWACHHATA HI SEWA" and "Say no to Plastics"

Swaccha Bharatha Abhiyana Program



Photos: Swaccha Bharatha Abhiyana activities

Bheemankuppe Lake Cleaning Campaign



Visit to Bheemanakuppe lake was scheduled on March 6th 2020 for swacch Baharath Abhiyaan. 6th and 4th sem students along with faculties reached the lake with Gloves , Masks, Ginny bags, Dust pans, garbage baskets and brooms. We divided the lake Bank into 6 parts. Each part were assigned to

group of 8 students. Bottles, Plastics and papers were picked from all the parts and completed the cleaning process. The waste sacks were dispatched to the nearby BBMP waste collection unit.

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PLANTATION PROGRAM ON 29/3/2021

9 saplings of Indian Beech tree (Honge) , Poppy (gasagase) and Neem were planted.



Medicinal importance of these plants

were also indicated and explained.

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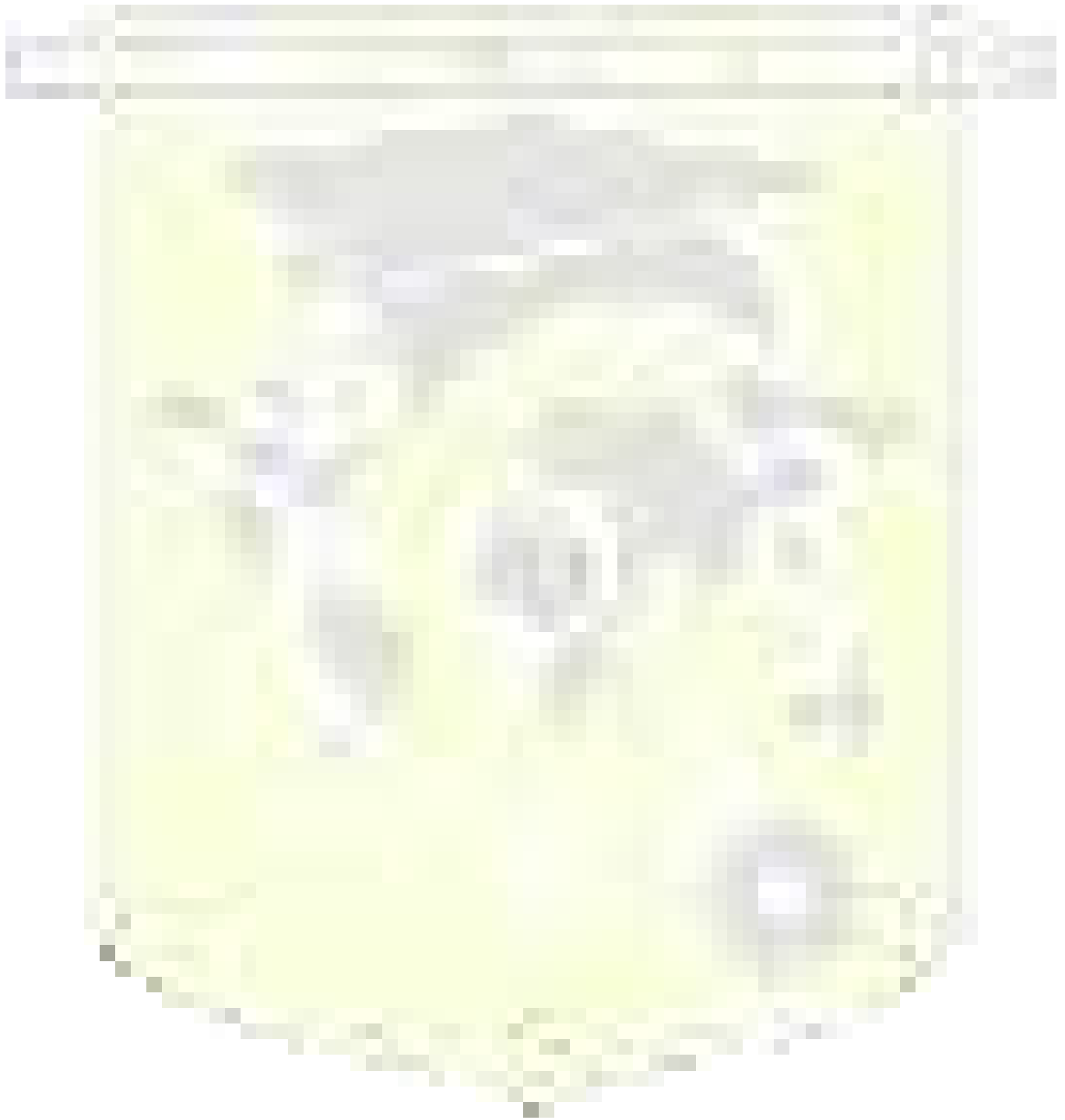
National Workshop On Opportunitites And Challenges On Renewable Energy Conversion Technologies



ACS College of Engineering, Kengeri, Bengaluru organized a two days National Workshop on Opportunities and Challenges on Renewable Energy Conversion Technologies was sponsored by Ministry of New and Renewable Energy,

Government of India during 25th and 26th Feb. 2016. The various challenges and opportunities in renewable energy conversion technologies were discussed and interacted by the different academic research experts. About sixty participants both external and internal were attended and gained the technical knowledge in the renewable energy domain. The workshop was inaugurated with special address by Dr. H. Nagana Gouda, Director, National Centre for Solar Technology, Bengaluru. He stressed the tapping importance of renewable energy sources on the present energy conservation point of at state and national level. Dr. Nikil PG Senior Research Scientist (Solar), National Institute of Solar Energy, Gurgaon pointed out various opportunities and schemes for the development of renewable energy at national level by Ministry of New and Renewable Energy, Government of India. Dr.M.S.Murali, Principal of ACSCE has welcomed the gathering and pointed out the practicing of renewable energy in day to day life to reduce the dependence of conventional grid. Dr.M.Eswaramoorthy, Convenor of Workshop proposed vote of thanks.

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Tree Plantation Activity 2016



The NSS Unit of ACSCE has conducted a Plantation Camp on 23/08/2016 in ACSCE College Road. The Camp was started at 10.00 AM in the morning. The Principal Dr. M.S. Murali inaugurated the camp by planting and watering a plant. After that he addressed all the

volunteers about the importance and benefit of this type of camps. Mr. M.S. Shivakumar, NSS Programme Coordinator & HOD Dept. of Chemistry, motivated the students and volunteers. The faculty members like Dr. Pradeepa S.M, Mr. Venkatesh, Dept. of Chemistry, Mr. Raghavendra K, Dept. of Mathematics have very actively participated & involved in the Camp throughout the day. Senior faculty members such as Dr. Selvanandan, Dept. of Physics, Dr. Veena B.H, dept. of maths, Dr. C.S. Pillai, Dept. of CSE have also encouraged us during the camp. More importantly, more than 30 NSS volunteers from various branches of ACSCE have attended & carried the camp very enthusiastically with lot of interest. During the camp 75 plants were successfully planted. At the end of the day, NSS unit of ACSCE thanks the management for their continuous support and appreciation for all our activities. Finally, the above mentioned camp was also appreciated by the localities and the passengers who are travelling in that road during the camp.

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Say No to Crackers Awareness Program

Department of “Biomedical Engineering, ACSCE has conduct the following Events,

Name of the event:”Rally & awareness programme on “Say No to Crackers”

VENUE: Kengeri Upanagar



DATE:17th October 2017.



Photo: Say no to Crackers Campaign

Industrial Visit to Solar Power Plant

The students of VI semester were taken to Solar Power Plant in Shivanasamudra, Mandya District for Industrial visit on 26.03.2019 that is on Tuesday as a part of Industry interaction to students along with two faculty members. The students assembled in the college at 8:30 am in their class. As the bus arrived at 9:00 am the students boarded the bus and started from college and reached Solar Power Plant in Mandya District at 12:30pm.

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Photo: Industrial Visit to Solar Power Plant

CONCLUSION AND RECOMMENDATIONS

Green Audit is the most efficient way to identify the strength and weakness of environmental sustainable practices and to find a way to solve problem. Green Audit is one kind of professional approach towards a responsible way in utilizing economic, financial, social and environmental resources. Green audits can “add value” to the management approaches being taken by the college and is a way of identifying, evaluating and managing environmental risks (known and unknown). There is scope for further improvement, particularly in relation to waste, energy and water management. The college in recent years consider the environmental impacts of most of its actions and makes a concerted effort to act in an environmentally responsible manner. Even though the college does perform fairly well, the recommendations in this report highlight many ways in which the college can work to improve its actions and become a more sustainable institution.

SUGGESTIONS

Some of the very important suggestions are :-

- Increase Awareness of Environmentally Sustainable Development- Use every opportunity to raise public, government, industry, foundation, and

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university awareness by openly addressing the urgent need to move toward an environmentally sustainable future.

- **Educate for Environmentally Responsible Citizenship-** Establish programs to produce expertise in environmental management, sustainable economic development, population, and related fields to ensure that all university graduates are environmentally literate and have the awareness and understanding to be ecologically responsible citizens.
- **Involve All Stakeholders-** Encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in environmentally sustainable development. Expand work with community and nongovernmental organizations to assist in finding solutions to environmental problems.
- **Collaborate for Interdisciplinary Approaches-** Convene university faculty and administrators with environmental practitioners to develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.
- **Adopt the proposed Environmentally Responsible Purchasing Policy,** and work towards creating and implementing a strategy to reduce the environmental impact of its purchasing decisions.
- **Increase reduce, reuse, and recycle education on campus.**
- **Name all the trees and plants with its common name and scientific name.**
- **Display boards of fauna diversity to generate enthusiasm for learners.**
- **Organize earn while learn eco-friendly programmes**
- **Conduct exhibitions for parents and public on environment and sustainable practices.**
- **Arrange training programmes on environmental management system and nature conservation.**
- **Ensure participation of students and teachers in local environmental**

issues.

CHAPTER 5

ASSESSMENT OF BASELINE ENVIRONMENTAL CONDITIONS AT SITE

5.1 WATER ENVIRONMENT

5.1.1 SAMPLING METHODOLOGY AND ANALYSIS

Borewell samples were collected and analysed.

Following procedures were used while sampling and & Methodologies adopted in assessing quality of water:

- Washing the bottles/cans with distilled water prior to the sampling;
- Before collection of water the bottles/cans are again washed 2-3 times with the same water
- For surface water, Bottles were lowered to a minimum depth of 30 cm below water surface.
- At each point, different sets of water samples were collected so as to cover all the parameters
- Sterilized bottles were used for the samples that are to be analyzed for bacteria
- Parameters like pH, TDS and temperature were analyzed in the field conditions. There are specific instruments for measuring TDS and pH in the field. These are portable. These instruments will be calibrated at laboratory before use. The results were reconfirmed after getting to the laboratory. DO is fixed and titrated in the field itself.
- Appropriate preservatives are added, depending upon the elements to be analyzed and marked accordingly (APHA / IS: 3025 (part I)).
- All the water samples collected in the ice box, were immediately transported to the laboratory and freezed at <5 °C for analysis.
- Field observations were noted in the field notebook.

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Sample Collection and Analysis of Water Sample

| Parameter | Frequency | Sampling Methodology | Preservation Method | Analysis Method | Prescribed Standard |
|--|---------------------------|-----------------------------|----------------------------|--|----------------------------|
| pH, TDS and Temperature | Once in a baseline period | IS: 3025 (Part I) | Not applicable | Onsite measurement | IS: 10500 specifications |
| Other physico-chemical and biological parameters | | | IS: 3025 (Part I) | 'Standard Methods for Examination of Water and Wastewater' Published by American Public Health Association (APHA) / IS: 3025 | |

5.1.2 WATER SAMPLE ANALYSIS

Samples and were analyzed for various parameters as per the procedures specified in “*Standard Methods for the Examination of Water and Wastewater*” published by American Public Health Association (APHA). Different physico-chemical parameters of ground water during study period were compared with standard at each monitoring stations and shown in the Table below.

Table: Primary Water Quality Criteria for Designated-Best-Use-Classes

| Designated-Best-Use | Category | Criteria Description |
|---|-----------------|---|
| Drinking Water Source without conventional treatment but after disinfection | A | <ul style="list-style-type: none"> • Total Coliforms Organism MPN/100ml shall be 50 or less • pH between 6.5 to 8.5 • Dissolved Oxygen 6mg/l or more • Biochemical Oxygen Demand (5 days 20°C) 2mg/l or less • TDS max. 500 mg/lit |

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| | | |
|---|---------|--|
| | | <ul style="list-style-type: none"> • Chlorides (as Cl⁻), 250 mg/L, Max |
| Outdoor bathing (Organized) | B | <ul style="list-style-type: none"> • Total Coliforms Organism MPN/100ml shall be 500 or less • pH between 6.5 and 8.5 • Dissolved Oxygen 5mg/l or more • Biochemical Oxygen Demand (5 days 20°C) 3mg/l or less |
| Drinking water source after conventional treatment and disinfection | C | <ul style="list-style-type: none"> • Total Coliforms Organism MPN/100ml shall be 5000 or less • pH between 6 to 9 • Dissolved Oxygen 4mg/l or more • Biochemical Oxygen Demand (5 days 20°C) 3mg/l or less • TDS max. 1500 mg/lit • Chlorides (as Cl⁻), 600 mg/L, Max |
| Propagation of Wild life and Fisheries | D | <ul style="list-style-type: none"> • pH between 6.5 to 8.5 • Dissolved Oxygen 4mg/l or more • Free Ammonia (as N) 1.2 mg/l or less |
| Irrigation, Industrial Cooling, Controlled Waste disposal | E | <ul style="list-style-type: none"> • pH between 6.0 to 8.5 • Electrical Conductivity at 25°C micro mhos/cm Max.2250 • Sodium absorption Ratio Max. 26 • Boron Max. 2mg/l • TDS max. 2100 mg/lit • Chlorides (as Cl⁻), 600 mg/L, Max |
| | Below-E | Not Meeting A, B, C, D & E Criteria |

Source: CPCB STANDARDS (CLASSIFICATION OF INLAND SURFACE WATER)

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Table: Groundwater Test Results

| S.No | Parameters | Borewell-1 | As Per IS 10500:2018) | |
|------|--|------------|---|---------------|
| | | | DL | PL |
| 1 | pH @24.6°C | 7.27 | 6.5-8.5 | No Relaxation |
| 2 | Total Dissolved Solids, mg/L | 85 | 500 | 2000 |
| 3 | Conductivity@25°C, µS/Cm | 169.7 | - | - |
| 4 | Temperature, °C | 24.7 | - | - |
| 5 | Turbidity as NTU | BDL | 1 | 5 |
| 6 | Chromium as Cr, mg/L | BDL | 0.05 | No Relaxation |
| 7 | Copper as Cu, mg/L | BDL | 0.05 | No Relaxation |
| 8 | Nickel as Ni, mg/L | BDL | 0.02 | No Relaxation |
| 9 | Iron as Fe, mg/L | BDL | 0.3 | No Relaxation |
| 10 | Zinc as Zn, mg/L | BDL | 5.0 | 15 |
| 11 | Lead as Pb, mg/L | BDL | 0.01 | No Relaxation |
| 12 | Cadmium as Cd, mg/L | BDL | 0.003 | No Relaxation |
| 13 | Sodium as Na, mg/L | 25.4 | - | - |
| 14 | Potassium as K, mg/L | 1.7 | - | - |
| 15 | Sulphates, mg/L | 4.0 | 200 | 400 |
| 16 | Calcium as Ca, mg/L | 7.2 | 75 | 200 |
| 17 | Total Hardness as CaCO ₃ , mg/L | 40 | 200 | 600 |
| 18 | Magnesium as Mg, mg/L | 5.3 | 30 | 100 |
| 19 | Chlorides as Cl, mg/L | 26.4 | 250 | 1000 |
| 20 | Total Alkalinity as CaCO ₃ ,mg/L | 18.8 | 200 | 600 |
| 21 | Dissolved Phosphates ,mg/L | 0.1 | - | - |
| 22 | Nitrate Nitrogen as (NO ₃ -N), mg/L | 1.0 | 45 | No Relaxation |
| 23 | Fecal Coliform, MPN/100ml | Absent | Shall not be detectable in 100ml Sample | |
| 24 | E.Coli, CFU/100ml | Absent | Shall not be detectable in 100ml Sample | |
| 25 | Fluorides as F, mg/L | BDL | 1.0 | 1.5 |

ND: Not Detected

BDL – Below Detection Limit

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5.1.3 GROUND WATER RESULT AND ITS INTERPRETATION

The analysis results indicate that pH of the groundwater samples was found to be 7.27. The TDS were found to be in the range of 80-85 mg/l. All the parameters found in the range prescribed limits. The water quality is potable in nature after giving necessary treatment (U.F + R.O) followed by disinfection process.

All of the parameters for Ground Water samples were found within the limit as per drinking water norms IS 10500:2012. They are not directly using this bore well water for drinking purpose. They have to compulsory to treat this water before use for domestic and drinking purpose. Based on above data, it is interpreted that the ground water quality meets with the drinking water norms. However, this water shall be used for drinking after conventional treatment.

5.2 STP Treated Water

300 KLD of wastewater is generated from various activities inside the campus. This wastewater is treated in 300 KLD STP inside the campus.

STP treated water was collected and tested for its quality which is discussed in table below:

Table: STP Treated Water

| S. No | Parameters | Results | Tolerance Limits | Test Method |
|--------------|--|----------------|-------------------------|---|
| 1 | pH@24.7°C | 7.60 | 6.5-8.5 | IS 3025:Part-11:1983 (Reaffirmed 2017) |
| 2 | Total Suspended Solids, mg/L | 15 | 10 | IS 3025:Part-17:1984 (Reaffirmed-2017) |
| 3 | Bio-Chemical Oxygen Demand (3Days at 27°C), mg/L | 5 | 10 | IS 3025:Part-44:1993 (Reaffirmed-2019) |
| 4 | Chemical Oxygen | 16 | 50 | IS 3025:Part-58:2006 |

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| | | | | |
|---|--|-----|------|--|
| | Demand, mg/L | | | (Reaffirmed-2017) |
| 5 | Ammonical nitrogen as NH ₃ -N, mg/L | 3.6 | 5 | APHA 23 rd Edition 4500,NH ₃ ,B,C:2017 |
| 6 | Total nitrogen, mg/L | 8.2 | 10 | IS 3025:Part-34:1988 (Reaffirmed-2019) |
| 7 | Fecal Coliform, MPN/100ml | 44 | <100 | APHA 23 rd Edition(9221B): 2017 |

Interpretation:

All the tested parameters are within the tolerance limits. The results indicate that the STP is working efficiently.

5.3 AIR ENVIRONMENT

The ambient air quality monitoring was carried out in accordance with guidelines of Central Pollution Control Board (CPCB) and National Ambient Air Quality Standards (NAAQS) of CPCB of November 2009.

Table: Ambient air quality Results

| S. No | PARAMETERS | UNIT | RESULTS | STANDARD LIMITS |
|-------|--|-------------------|-------------------|-----------------------|
| | | | Near Canteen Area | |
| 1 | Particulate Matter(PM ₁₀) | µg/m ³ | 36.2 | 100 µg/m ³ |
| 2 | Particulate Matter(PM _{2.5}) | µg/m ³ | 14.5 | 60 µg/m ³ |
| 3 | Sulphur Dioxide as SO ₂ | µg/m ³ | 10.2 | 80 µg/m ³ |
| 4 | Nitrogen Dioxide as NO ₂ | µg/m ³ | 16.7 | 80 µg/m ³ |
| 5 | Ammonia | µg/m ³ | BDL | 400 µg/m ³ |
| 6 | Benzene (C ₆ H ₆) | µg/m ³ | <1 | 5 µg/m ³ |
| 7 | Benzo(a) Pyrene | ng/m ³ | <0.5 | 1 ng/m ³ |
| 8 | Nickel (Ni) | ng/m ³ | <0.5 | 20 ng/m ³ |
| 9 | Arsenic (As) | ng/m ³ | <0.5 | 6 ng/m ³ |
| 10 | Lead (Pb) | µg/m ³ | <0.05 | 1 µg/m ³ |

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| | | | | |
|----|-------------------------|-------------------|-----|-----------------------|
| 11 | Carbon Monoxide | mg/m ³ | 0.2 | 4 mg/m ³ |
| 12 | Ozone (O ₃) | μg/m ³ | BDL | 100 μg/m ³ |

Interpretation of Results:

All the parameters are within the permissible values.

5.4 Noise Environment

Noise levels were monitored at the main gate area and the values are presented in the table below:

Table: Noise Monitoring Results

| S.No | Monitored Location | Results dB (A) Day | Tolerance Limits |
|----------------------|---------------------------|-------------------------------|-----------------------------------|
| 1 | North Side Area | 68.5 | IS 9989-1981 (Reaffirmed 2014) |
| 2 | South Side Area | 72.4 | |
| 3 | East Side Area | 73.1 | |
| 4 | West Side Area | 72.7 | |
| CPCB Standard | | 75 | |

Noise levels are within the prescribed tolerance limits.

CHAPTER-6

Energy Audit

6.1 Energy Audit

Energy cannot be seen, but we know it is there because we can see its effects in the forms of heat, light and power. This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances, and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment. An old incandescent bulb uses approximately 60W to 100W while an energy efficient light emitting diode (LED) uses only less than 10 W. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices.

6.2 Methodology

The purpose of the audit was to ensure that the practices followed in the campus with the criteria, methods and recommendations used in the audit were based on the identified risks. The methodology includes: preparation and filling up of questionnaire, physical inspection of the campus, observation and review of the document, interviewing responsible persons and data analysis, measurements and recommendations. The methodology adopted for this audit was a three step process comprising of:

1. Data Collection – In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, survey communicating with responsible persons and measurements. Following steps were taken for data collection: The team went to each department, centers, Library, canteen etc. Data about the general information was collected by observation and interview.

2. Data Analysis - Detailed analysis of data collected include: calculation of energy

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consumption, analysis of latest electricity bill of the campus, understanding the tariff plan.

3. Recommendation /Suggestions- On the basis of results of data analysis and observations, some steps for reducing power and water consumption were recommended. Proper treatments for waste were also suggested. Use of fossil fuels has to be reduced for the sake of community health.

The following are the major consumers of electricity in the facility

- Computers
- Lighting
- Air-Conditioning
- Fans
- Other Lab Equipment

6.3 Energy Observations:

Table: Energy Details

| | | |
|---|---|--|
| 1 | Total Power Requirement | 57000 KWH |
| 2 | Electricity charges | Rs. 5,55,000 per month on an Average |
| 3 | Number of Gas cylinders used per month | 01 cylinder for lab for 3 month 01 cylinder /month 28 cylinder/month in the Mess |
| 4 | Number of Diesel Generators | 02 i.e 180 KVA, 125 KVA |
| 5 | Quantity of Diesel consumed Cost of generator fuel | 35 litre/hr for 180 KVA 22 litre/hr for 125 KVA Cost of Generator fuels i.e Diesel is Rs. 85/litre |
| 6 | Total number of CFL bulbs | - |
| 7 | Number of LED lights----- ----- Incandescent bulbs----- ----- fans----- ----- AC's----- | 430 Led bulbs 480 fans 22 AC's Tube lights 130, Computers – 547 Xerox machine -2 |

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| | |
|-----------------------------|----------|
| --- | T.V. - 2 |
| Tube lights----- | |
| ----- | |
| electrical instruments----- | |
| ----- | |
| computers----- | |
| ----- | |
| photocopiers----- | |
| ----- | |
| T.V's. etc.----- | |
| ----- | |

6.4 Carbon Footprint

| Carbon Footprint | | | |
|-------------------------|--|--|------|
| a | Number of persons using cycles | | -- |
| b | Number of persons using cars | | 21 |
| c | Number of persons uses two wheelers | | 225 |
| d | Number of persons using other transportations like bus etc | | 1091 |

Measures For The Alternate Sources Of Energy And Energy Conservation:

1. Solar Energy:

a. Solar Thermal Energy Harnessing:

In order to conserve the electrical energy in the boys and Girls Hostels, a total



of 96 Solar Water Heating Panels and 12 tanks have been installed and

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operated on day today basis. This has eliminated the use of electrical geysers in the hostels as the hot water is required round the year in Bangalore climate.

Photo: Solar Panels for water heating

b. Solar Street Light:

The Solar street lights are also installed in various part of the campus in order to reduce the conventional electricity usage



Photo: Solar Street Light

2. Biogas Plant:

The institution has successfully completed and recently commissioned a BIO gas plant to handle 80 kg/day of solid waste. This is an in-house design developed involving engineering students (from ACSCE) in the surveys for the estimation of solid waste generated on day today basis. The construction was also taken up by in-house civil team. The salient features of the Bio-gas systems are listed as below:

[A] The biogas plant receives the solid wastes from canteen (leftover

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cooked and uncooked foods), student mess, hostels, staff quarters and college buildings.

- [B] The biogas plant comprises of a floating dome bio-digester, flame arresters, gas compressors, gas metering and gas stoves provided in the kitchen. The feeding line is also designed at two locations so as to simultaneously feed other waste for Research and enhancement of Bio-gas production
- [C] A settling cum filtration unit has also been commissioned to separate digested solids from the liquid. The dried solids are to be further used as compost/soil conditioner. It is estimated that almost 70 kg of dry solids may be recovered per day.
- [D] The filtrate is recycled back to the feeding tray of the crushing unit to dilute the solid food waste prior to its entry into the Bio Digester.
- [E] The biogas recovered is directly used in the kitchen nearby, through the underground GI pipe line fitted with the flame arresters as fire safety.
- [F] The segregation of wet waste and dry waste is under implementation within the campus so as to divert all the wet wastes to the bio-digester.
- [G] The area around the biogas plant is paved with the concrete paver blocks to maintain cleanliness and hygienic.

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[H] The plant design is in such manner as to expand conveniently in future and/or convert the existing system into a two reactor system for better efficiencies.

Photo: View of the new Biogas Plant at ACSCE

3. Use of LED bulbs:

The institution is regularly replacing tube lights (36 Watt) with 18 W LED Lights. The tube light which is not working is replaced with the LED bulbs.



Photo: Replacement of Conventional Tube lights with LED Tube



6.6 Recommendations:

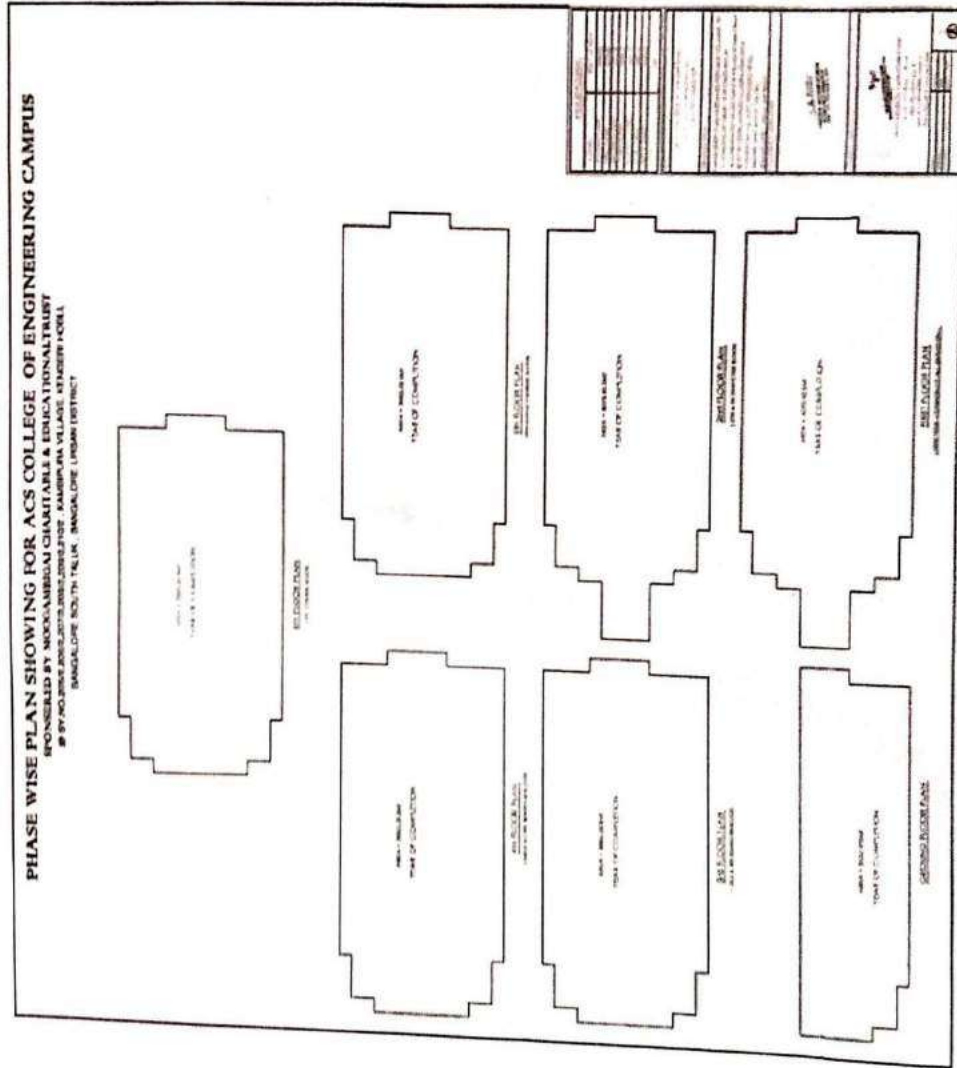
- To achieve energy saving gradually change CFL bulbs to LED, fix energy efficient equipments, appliances, increase renewable energy installations like solar PV cells, etc.
- Periodic electrical maintenance is to be done to optimise the power usage.
- To install more LED instead of CFL and tubes to reduce the power consumption.
- It is recommended to check the date of filling and date of inspection periodically in the fire extinguisher.

6.7 Conclusion

The energy inventory and energy audit found to have energy conservation and determined contribution to the climate change utilizing limited energy usage and lamps. The carbon foot print due to electricity also balanced from the green plantation to absorb CO₂ and reduction through bicycle usage within the campus. By incorporating solar power plant inside the campus of capacity 100 kW, helps the reduction of power consumption. The 10kWp Solar Photovoltaic (SPV) system at roof-top is estimated to afford an annual energy generation of 16,000 units (5units × 10kWp × 320days) for captive use under ideal conditions. The 20kWp Solar Photovoltaic (SPV) system at roof-top is estimated to afford an annual energy generation of 32,000 units (5units × 20kWp × 320days) for captive use under ideal conditions. The power is directly connected to the main grid. 100kWp solar plant generates approximately 400-500 kWh per day.

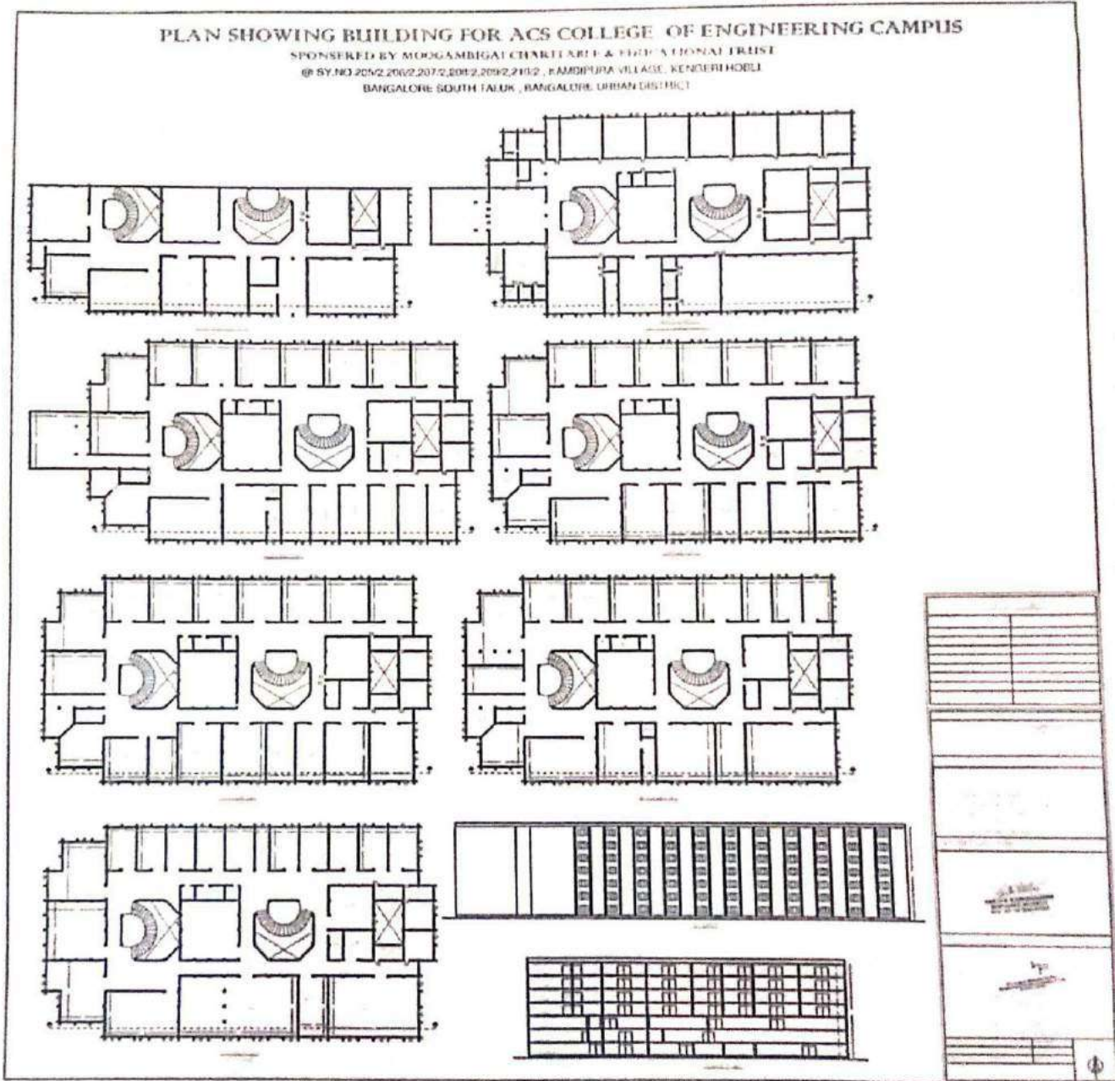
ANNEXURE 1

BUILDING PLAN OF A C S COLLEGE OF ENGINEERING



Principal
Principal
A.C.S. College of Engineering
Kambura, Mysore Road, Kengeri Hobli,
Bangalore - 560 072

Principal
A.C.S. College of Engineering
Kambipura, Mysore Road, Kengeri Hobli,
Bangalore, Karnataka, India



ANNEXURE - 2

Consent Issued by KSPCB

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Consent For Operation (CFO-Air,Water)

Karnataka State Pollution Control Board
Zonal Office, Bangalore South
Nisarga Bhavan, 601 Floor, Hanumanth Road, 7th Cross,
Shivanagar, Bangalore-560041
Tel: 080-2473886

Industry Colour: **ORANGE** Industry Scale: **LARGE**

(This document contains 6 pages including annexure & excluding additional conditions)

Combined Consent Order No: AW-304164 **PCB ID:** 34442 **Date:** 10/11/2017

Combined consent for discharge of effluents under the Water (Prevention and Control of Pollution) Act, 1974 and emission under Air (Prevention and Control of Pollution) Act, 1981

- Ref: 1. Application filed by the industry / organization on 16/09/2017
2. Inspection of the Industry/organization/by RO, - Bangalore South on 13/10/2017

Consent is hereby granted under Section 25(4) of the Water (Prevention & Control of Pollution) Act, 1974 (herein referred to as the Water Act) & Section 21 of Air (Prevention & Control of Pollution) Act, 1981, (here in referred to as the Air Act) and the Rules and Orders made there under and subject to the terms and conditions as detailed in the Schedule Annexed to this order.

The Occupier is authorized to operate /carryout industry/activity & to make discharge of the effluents & emissions conforming to the stipulated standards from the premises mentioned below:

Location:

Name of the Industry: Acs College Of Engineering
Address: Sy.No.205/2, 207/2, 208/2, 209/2 & 210/2, Kambipura Village, Bangalore South Taluk, Bangalore
Industrial Area: Not In I.A, Kambipura ,
Taluk: Not in BBMP Area, District: Bangalore Urban

Discharge of effluents under the Water Act:

| Sr | Water Code | WC(KLD) | WWG(KLD) | Remark |
|----|------------------|---------|----------|---|
| 1 | Domestic Purpose | 32.000 | 25.000 | treated in STP of capacity 300 KLD installed by RR Medical College. |

Discharge of Air emissions under the Air Act from the following stacks etc.

Sl. No. Description of chimney/outlet Limits specified refer schedule
The details of Sources, control equipments and its specification, type of fuel, rate of emissions, constituents to be controlled in emissions etc. are detailed in Annexure-I.

The consent for operation is granted considering the following activities/Products:

| Sr | Product Name | Applied Qty/Month | Unit |
|----|---------------------|-------------------|------|
| 1 | Engineering College | 0.000 | NOS |
| 2 | NA | 0.000 | NOS |

This consent is valid for the period from 13/10/2017 to 30/09/2022

For and on behalf of the
Karnataka State Pollution Control
Board

Page-1 e_outwardno7482-10/11/2017 e-signed(physical signature not require) Printed from XGN SENIOR ENVIRONMENTAL OFFICER

ANNEXURE - 3
Monitoring Reports

TEST REPORT

| | | | | | |
|---|----------------------------|---|----|-----------------------------|-------------|
| 1 | Customer Name & Address | M/S. ACS College Of Engineering Behind Rajarajeshwari Medical College, Kambipura, Kengeri, Mysore Road, Bangalore-560074 | 8 | Sample Collected On | 12.11.2021 |
| 2 | Sample Description | Borewell Water | 9 | Sample Receipt on | 12.11.2021 |
| 3 | Date of Analysis Start | 11.11.2021 | 10 | Sample RC No | 360 |
| 4 | Date of Analysis Completed | 16.11.2021 | 11 | Sample Code No | EGSSPL/1100 |
| 5 | Date Of Report/ Report No | 16.11.2021/EGSSPL/1100 | 12 | Quantity of Sample Received | 1Ltr |
| 6 | Sampling Methodology | IS 3025:PART-1:1987 (Reaffirmed 2019) | 13 | Environmental Conditions | Ambient |
| 7 | Appearance of Sample | Colorless Liquid | 14 | Sampling Time | 14:15 |

| S.No | Parameters | Results | As Per IS 10500:2018) | | Test Method |
|------|--|---------|---|---------------|---|
| | | | DL | PL | |
| 1 | pH @24.7°C | 7.27 | 6.5-8.5 | No Relaxation | IS 3025:Part-11:1983 (Reaffirmed-2017) |
| 2 | Total Dissolved Solids, mg/L | 85 | 500 | 2000 | IS 3025:Part-16:1984 (Reaffirmed-2017) |
| 3 | Conductivity@25°C, µS/Cm | 169.7 | - | - | IS 3025:Part-14:1985 (Reaffirmed-2019) |
| 4 | Temperature, °C | 24.7 | - | - | IS 3025:Part-09:1984 (Reaffirmed-2017) |
| 5 | Turbidity as NTU | BDL | 1 | 5 | IS 3025:Part-10:1984(Reaffirmed-2017) |
| 6 | Chromium as Cr, mg/L | BDL | 0.05 | No Relaxation | APHA 23 rd Edition:2017-3111 B |
| 7 | Copper as Cu, mg/L | BDL | 0.05 | No Relaxation | APHA 23 rd Edition:2017-3111 B |
| 8 | Nickel as Ni, mg/L | BDL | 0.02 | No Relaxation | APHA 23 rd Edition:2017-3111 B |
| 9 | Iron as Fe, mg/L | BDL | 0.3 | No Relaxation | APHA 23 rd Edition:2017-3111 B |
| 10 | Zinc as Zn, mg/L | BDL | 5.0 | 15 | APHA 23 rd Edition:2017-3111 B |
| 11 | Lead as Pb, mg/L | BDL | 0.01 | No Relaxation | APHA 23 rd Edition:2017-3111 B |
| 12 | Cadmium as Cd, mg/L | BDL | 0.003 | No Relaxation | APHA 23 rd Edition:2017-3111 B |
| 13 | Sodium as Na, mg/L | 25.4 | - | - | IS 3025:Part-45:1993 (Reaffirmed-2019) |
| 14 | Potassium as K, mg/L | 1.7 | - | - | IS 3025:Part-45:1993 (Reaffirmed-2019) |
| 15 | Sulphates, mg/L | 4 | 200 | 400 | APHA 23 rd Edition:2017 4500-SO ₄ ²⁻ E |
| 16 | Calcium as Ca, mg/L | 7.2 | 75 | 200 | IS 3025:Part-40:1991 (Reaffirmed-2019) |
| 17 | Total Hardness as CaCO ₃ , mg/L | 40 | 200 | 600 | IS 3025:Part-21: 2019 |
| 18 | Magnesium as Mg, mg/L | 5.3 | 30 | 100 | IS 3025:Part-46:1994 (Reaffirmed -2019) |
| 19 | Chlorides as Cl, mg/L | 26.4 | 250 | 1000 | IS 3025:Part-32:1988 (Reaffirmed-2019) |
| 20 | Total Alkalinity as CaCO ₃ , mg/L | 18.8 | 200 | 600 | IS 3025:Part-23:1986 (Reaffirmed -2019) |
| 21 | Dissolved Phosphates ,mg/L | 0.1 | - | - | IS 3025:Part-31:1988 (Reaffirmed-2019) |
| 22 | Nitrate Nitrogen as (NO ₃ -N), mg/L | 1 | 45 | No Relaxation | IS 3025:Part-34:1988 (Reaffirmed-2019) |
| 23 | Fecal Coliform, MPN/ 100ml | Absent | Shall not be detectable in 100ml Sample | | APHA 23 rd Edition:2017(9221B) |
| 24 | E.Coli, CFU/100ml | Absent | Shall not be detectable in 100ml Sample | | IS:15185 |
| 25 | Fluorides as F, mg/L | BDL | 1.0 | 1.5 | APHA 23 rd Edition:2017 4500-F D |

Note: Sample drawn by us

BDL:Below Detection Limit



TEST REPORT

| | | | | | |
|---|---|---|----|-----------------------------|--------------------------|
| 1 | Customer Name & Address | M/S. ACS College Of Engineering Behind Rajarajeshwari Medical College, Kambipura, Kengeri, Mysore Road, Bangalore-560074 | 7 | Sample Collected On | 12.11.2021 |
| 2 | Sample Description | STP-Treated Water | 8 | Sample Receipt On | 12.11.2021 |
| 3 | Date of Analysis Start | 12.11.2021 | 9 | Sample RC No | 361 |
| 4 | Date of Analysis Completed/Date Of Report | 16.11.2021/16.11.2021 | 10 | Sample Code No | EGSSPL/1101 |
| 5 | Report No | EGSSPL/1101 | 11 | Quantity of Sample Received | 1Ltrs |
| 6 | Appearance of Sample | Colorless Liquid | 12 | Sample Particulars | Sample received in a Can |

| S. No | PARAMETERS | RESULTS | TOLERANCE LIMIT | TEST METHOD |
|-------|--|---------|-----------------|--|
| 1 | pH @24.7°C | 7.60 | 6.5-9.0 | IS 3025:Part-11:1983 (Reaffirmed-2017) |
| 2 | Bio-Chemical Oxygen Demand, mg/L (3Days at 27°C) | 5 | 20 | IS 3025:Part-44:1993 (Reaffirmed-2019) |
| 3 | Total Suspended Solids, mg/L | 15 | 30 | IS 3025:Part-17:1984 (Reaffirmed-2017) |
| 4 | Chemical Oxygen Demand, mg/L | 16 | 50 | IS 3025:Part-58:2006 (Reaffirmed-2017) |
| 5 | Ammonical nitrogen as NH ₃ -N, mg/L | 3.6 | 5 | APHA 23 rd Edition 2017: 4500,NH ₃ , B,C |
| 6 | Total Nitrogen, mg/L | 8.2 | 10 | IS 3025:Part-34:1988 (Reaffirmed-2019) |
| 7 | Fecal Coliform, MPN/100ml | 44 | 100 | APHA 23 rd Edition(9221B):2017 |

Note: Sample Drawn by us



Ambient Air Quality Analysis Report

| | | | | | |
|---|--|---|----|---------------------|--------------------------------|
| 1 | Customer Name & Address | M/S. ACS College Of Engineering Behind Rajarajeshwari Medical College, Kambipura, Kengeri, Mysore Road, Bangalore-560074 | 6 | Samples Particulars | Ambient Air Quality Monitoring |
| 2 | Name of the Location | Near Canteen Area | 7 | Sample Code No | EGSSPL/AAQ/288 |
| 3 | Date of Sampling \ Date of Sample Received | 12.11.2021/12.11.2021 | 8 | Sample Collected By | Mr.Vijay Kumar |
| 4 | Date of Analysis Completed/Date Of Report | 16.11.2021/16.11.2021 | 9 | Monitoring Duration | 8hrs |
| 5 | Monitoring Done By | Eco Green Solution Systems Pvt.Ltd | 10 | Report No | EGSSPL/AAQ/288 |

| Instrument Details | PM _{2.5} (Fine Particulate Sampler) | PM ₁₀ (Respirable Dust Sampler) |
|---------------------------------|---|---|
| Make/Model No | Eco Green Instruments/ EGSS-007 | Eco Green Instruments/EGSS-NL-011 |
| S.No | 001 | 001 |
| Instrument Calibrated Date | 19.02.2021 | 19.02.2021 |
| Instrument Calibration Due Date | 18.02.2022 | 18.02.2022 |

| S. No | PARAMETERS | UNIT | RESULTS | STANDARD LIMITS | PROTOCOL |
|-------|--|-------------------|---------|-----------------------|-------------------------|
| 1 | Particulate Matter(PM ₁₀) | µg/m ³ | 36.2 | 100 µg/m ³ | IS 5182 (Part 23):2017 |
| 2 | Particulate Matter(PM _{2.5}) | µg/m ³ | 14.5 | 60 µg/m ³ | IS 5182 (Part 24): 2019 |
| 3 | Sulphur Dioxide as SO ₂ | µg/m ³ | 10.2 | 80 µg/m ³ | IS 5182 (Part 2): 2017 |
| 4 | Nitrogen Dioxide as NO ₂ | µg/m ³ | 16.7 | 80 µg/m ³ | IS 5182 (Part 6): 2017 |
| 5 | Ammonia | µg/m ³ | BDL | 400 µg/m ³ | IS 5182 (Part 25): 2018 |
| 6 | Benzene (C ₆ H ₆) | µg/m ³ | <1 | 5 µg/m ³ | IS 5182 (Part 11): 2017 |
| 7 | Benzo Pyrene | ng/m ³ | <0.5 | 1 ng/m ³ | IS 5182 (Part 12): 2017 |
| 8 | Nickel (Ni) | ng/m ³ | <0.5 | 20 ng/m ³ | EGSSPL/CPCB/SOP/AAQ/001 |
| 9 | Arsenic (As) | ng/m ³ | <0.5 | 6 ng/m ³ | EGSSPL/CPCB/SOP/AAQ/002 |
| 10 | Lead (Pb) | µg/m ³ | <0.05 | 1 µg/m ³ | EGSSPL/CPCB/SOP/AAQ/003 |
| 11 | Carbon Monoxide | mg/m ³ | 0.2 | 4 mg/m ³ | IS 5182 (Part 10): 2019 |
| 12 | Ozone (O ₃) | µg/m ³ | BDL | 100 µg/m ³ | EGSSPL/CPCB/SOP/AAQ/004 |

BDL:Below Detection Limit



Ambient Air Quality Analysis Report

| | | | | | |
|---|--|--|----|---------------------|--------------------------------|
| 1 | Customer Name & Address | M/S. ACS College Of Engineering Behind Rajarajeshwari Medical College, Kambipura, Kengeri, Mysore Road, Bangalore-560074 | 6 | Samples Particulars | Ambient Air Quality Monitoring |
| 2 | Name of the Location | Near Main Gate Area | 7 | Sample Code No | EGSSPL/AAQ/289 |
| 3 | Date of Sampling \ Date of Sample Received | 12.11.2021/12.11.2021 | 8 | Sample Collected By | Mr. Vijay Kumar |
| 4 | Date of Analysis Completed/Date Of Report | 16.11.2021/16.11.2021 | 9 | Monitoring Duration | 8hrs |
| 5 | Monitoring Done By | Eco Green Solution Systems Pvt.Ltd | 10 | Report No | EGSSPL/AAQ/289 |

| Instrument Details | PM _{2.5} (Fine Particulate Sampler) | PM ₁₀ (Respirable Dust Sampler) |
|---------------------------------|---|---|
| Make/Model No | Eco Green Instruments/ EGSS-007 | Eco Green Instruments/EGSS-NL-011 |
| S.No | 002 | 002 |
| Instrument Calibrated Date | 19.02.2021 | 19.02.2021 |
| Instrument Calibration Due Date | 18.02.2022 | 18.02.2022 |

| S. No | PARAMETERS | UNIT | RESULTS | STANDARD LIMITS | PROTOCOL |
|-------|--|-------------------|---------|-----------------------|-------------------------|
| 1 | Particulate Matter(PM ₁₀) | µg/m ³ | 56.7 | 100 µg/m ³ | IS 5182 (Part 23):2017 |
| 2 | Particulate Matter(PM _{2.5}) | µg/m ³ | 34.2 | 60 µg/m ³ | IS 5182 (Part 24): 2019 |
| 3 | Sulphur Dioxide as SO ₂ | µg/m ³ | 18.5 | 80 µg/m ³ | IS 5182 (Part 2): 2017 |
| 4 | Nitrogen Dioxide as NO ₂ | µg/m ³ | 26.2 | 80 µg/m ³ | IS 5182 (Part 6): 2017 |
| 5 | Ammonia | µg/m ³ | BDL | 400 µg/m ³ | IS 5182 (Part 25): 2018 |
| 6 | Benzene (C ₆ H ₆) | µg/m ³ | <1 | 5 µg/m ³ | IS 5182 (Part 11): 2017 |
| 7 | Benzo Pyrene | ng/m ³ | <0.5 | 1 ng/m ³ | IS 5182 (Part 12): 2017 |
| 8 | Nickel (Ni) | ng/m ³ | <0.5 | 20 ng/m ³ | EGSSPL/CPCB/SOP/AAQ/001 |
| 9 | Arsenic (As) | ng/m ³ | <0.5 | 6 ng/m ³ | EGSSPL/CPCB/SOP/AAQ/002 |
| 10 | Lead (Pb) | µg/m ³ | <0.05 | 1 µg/m ³ | EGSSPL/CPCB/SOP/AAQ/003 |
| 11 | Carbon Monoxide | mg/m ³ | 1.7 | 4 mg/m ³ | IS 5182 (Part 10): 2019 |
| 12 | Ozone (O ₃) | µg/m ³ | BDL | 100 µg/m ³ | EGSSPL/CPCB/SOP/AAQ/004 |

BDL:Below Detection Limit



AMBIENT NOISE LEVEL MONITORING REPORT

| | | | | | |
|---|------------------------------------|--|----|--------------------------|---------------------------|
| 1 | Customer Name & Address | M/S.ACS College Of Engineering Behind Rajarajeshwari Medical College, Kambipura, Kengeri, Mysore Road, Bangalore-560074 | 6 | Sample Collected On | 12.11.2021 |
| 2 | Date of Data Downloaded | 13.11.2021 | 7 | Sample Receipt On | 12.11.2021 |
| 3 | Report No | EGSSPL/EN-073/21-22 | 8 | Sampling Methodology | IS 9989-1981 (RA-2014) |
| 4 | Sample Collected By | M/S. Eco Green Solution Systems Pvt.Ltd 48/A-4, KIADB Industrial Area, Veerapura Post, Doddaballapur, Bengaluru-561203 | 9 | Sample Code No | EN-073/21-22 |
| 5 | Particulars of the Instrument Used | Sound Level Meter (Baseline Technologies/2511) S.No: A0118-1679 | 10 | Environmental Conditions | Normal |

Results

| S.No | Monitored Location | Result (dBA) Day | Protocol |
|----------------------|---------------------------|-------------------------|-----------------------------------|
| 1 | North Side Area | 68.5 | IS 9989-1981 (Reaffirmed 2014) |
| 2 | South Side Area | 72.4 | |
| 3 | East Side Area | 73.1 | |
| 4 | West Side Area | 72.7 | |
| CPCB Standard | | 75 | |



ENVIRONMENTAL AUDITING

ACS COLLEGE OF ENGINEERING

KENGERI, BENGALURU- 560 074

KARNATAKA



Prepared by

**Prakruthi Institute of
Environmental Studies**
2nd Floor, No. 93, 7th Cross, Lower
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560003



Submitted by:

**ACS College of Engineering,
(Unit of Rajarajeswari Group of Institution)
#207, Kambipura, Next to RajaRajeswari Medical
College & Hospital,
Mysore Road, Kengeri, Bengaluru-560074**



Environmental Audit Report-2020-21

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Executive Summary

Sustainability is not only spoken in various levels but also practiced by industries, organizations and educational institutes to optimize their resource utilization and make them environment friendly. Hence sustainability is the need of the hour for our country to provide our future generation a clean and safe environment. Educational institutions must play an active role in creating and modeling solution for such environmental problems. Green audit is one such concept or principle introduced to make the educational institutes environmentally sustainable. Through green audit one gets a direction as how to improve the condition of environment within the system. Green audit can be a useful tool for a college to determine how and where they are consuming more of energy or water or resources; the college can then consider how to implement changes and make



savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan.

Green auditing and the implementation of mitigation measures is a win-win situation for the college, the learners and the planet. It can also create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of green impact on campus. Green auditing promotes financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility to the students and teachers.

In **ACS College of Engineering**, Bengaluru the audit process involved initial interviews with management to clarify policies, activities, records and the co-operation of staff and student in the implementation of mitigation measures.

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This was followed by staff and student interviews, collection of data through the questionnaire, review of records, observation of practices and observable outcomes. In addition, the approach ensured that the management and staff are active participants in the green auditing process in the college.

The baseline data prepared for the ACS College of Engineering will be a useful tool for campus greening, resource management, planning of future projects, and a document for implementation of sustainable development of the institution. Existing data will allow the college to compare its programmes and operations with those of peer institutions, identify areas in need of improvement, and prioritize the implementation of future projects. We expect that the management will be committed to implement the green audit recommendations.

CHAPTER - 1

INTRODUCTION

Green Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. It aims to analyze environmental practices within and outside of the concerned sites, which will have an impact on the eco-friendly ambience.

Green audit can be a useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of Green impact on campus. If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. Thus, it is imperative that the college evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

1.1. OBJECTIVES OF GREEN AUDIT

The Green Audit of an institution is becoming a paramount important these days for self-assessment of the institution, which reflects the role of the institution in mitigating the present environmental problems. The college has been putting efforts to keep the environment clean since its inception. But the auditing of this non-scholastic effort of the college has not been documented. Therefore, the purpose of the present green audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

Environmental Audit Report-2020-21

The main aim objectives of this green audit are to assess the environmental quality and the management strategies being implemented in **ACS College of Engineering**.

The specific objectives are:

1. To assess the source and quantity and of the water in the ACS College of Engineering campus
2. To know and monitor the energy consumption pattern in the campus
3. To quantify the liquid and solid waste generation and management plans in the campus.
4. To assess the carbon foot print of the Campus
5. To impart environment management plans to the campus and college

Benefits of Green Audit to an Educational Institute:

There are many advantages of green audit to an Educational Institute:

- It would help to protect the environment in and around the campus.
- Recognize the cost saving methods through waste minimization and energy conservation.
- Find out the prevailing and forthcoming complications.
- Empower the organization to frame a better environmental performance.
- It portrays good image of institution through its clean and green campus.

NAAC criteria VII Environmental Consciousness:

Universities are playing a key role in development of human resources worldwide. Higher education institutes campus run various activities with aim to percolate the knowledge along with practical dimension among the society. Likewise different technological problems higher education institutes also try to give solution for issues related to environment. Different types of evolutionary methods are used to assess the problem concerning environment. It includes Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Carbon Footprint Mapping, Green audit etc.

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National Assessment and Accreditation Council (NAAC) which is a self-governing organization that declares the institutions as Grade according to the scores assigned at the time of accreditation of the institution. Green Audit has become mandatory procedure for educational institutes under Criterion VII of NAAC. The intention of green audit is to upgrade the environmental condition inside and around the institution. It is performed by considering environmental parameters like water and wastewater accounting, energy conservation, waste management, air, noise monitoring etc. for making the institution more eco-friendly.

Students are the major strength of any academic institution. Practicing green actions in any educational institution will inculcate the good habit of caring natural resources in students. Many environmental activities like plantation and nurturing saplings and trees, Cleanliness drives, Bird watching camps, No vehicle day, Rain water harvesting, etc. will make the students good citizen of the country. Through Green Audit, higher educational institutions can ensure that they contribute towards the reduction of Global warming through Carbon Footprint reduction measures.

CHAPTER – 2

ACS College of Engineering

2.1. ABOUT ACS College of Engineering

ACS College of Engineering, Kambipura, Mysore Road, Bangalore, Karnataka is a self-financing co-education and regular college affiliated to Visvesvaraya Technological University, Belagavi, Karnataka. The college was established on 23-06-2009. The college received AICTE approval on 02-07-2021, VTU affiliation on 22-03-2021. The affiliating university act provides provision for availing autonomy.

The college is located in Bangalore urban with campus area of 5 acres and built-up area of 28,686 sq. mtrs. The college also has auditorium, playground, gymnasium, and other sports facilities. The college has swimming pool, boys & girls hostel, and quarters for faculties. The college provides cafeteria, health centre with fulltime qualified doctors and nurses. In addition the campus provides banking, transport, and generator facilities. The college offers the following undergraduate programs Aeronautical Engineering, Aerospace Engineering, Biomedical Engineering, Civil Engineering, Computer Science Engineering, Electronics and Communication Engineering and Mechanical Engineering and post-graduate program in Structural Engineering. The college also provides the excellent research facilities in Aeronautical, Biomedical, Civil, CSE, ECE, ME, Physics, Chemistry and Mathematics departments. The total student enrolled in the academic year 2020-2021 is 1254. The unit cost of education is Rs.86, 389 and Rs.44805 with salary and excluding salary component respectively. The college doesn't offer any programs in distant education mode and has teacher student ratio of 1:8. The college has been accredited by NAAC with A Grade in 1st cycle on 2016.

The ACS College of Engineering, since the time of its inception has been instrumental in revolutionizing the development of technical skills along with managerial propensity through latest innovative teaching methods and infusing a value system in order to create dynamic leaders of the future.

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Exposing the young and budding engineers to the world of latest technology, ACS College of Engineering provides the appropriate platform and the right kind of ambience to instill within the burgeoning engineers, the desired kind of professional attitude, traits and aspirations.

The intensive focus in the field of education has for sure created immense opportunities for the Engineering students, thus enabling them to seek propitious careers. The commitment towards personal concomitant students betterment has resulted in the provenience of ACS College of Engineering.

ACS College of Engineering provides highly innovative, skill based university affiliated courses which accredit the young generation to get the right career break in the desired fields. The institution not only provides quality education to the students but also groom them to face life with immense confidence. The Education imparted here not only focuses on academic enrichment but also nurtures complete development of personality of the individual who becomes an integral part of it.



Figure: Aerial view of ACSCE College

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INFRASTRUCTURAL FACILITIES

ACS college of Engineering has adequate infrastructural facilities as per the AICTE requirements. ACS College has adequate number of ventilated classrooms, Laboratories, Smart Classrooms (ICT enabled), Seminar halls, Computer Labs, Research Centers, HOD cabins, Staff cabins, Common rooms, Rest rooms, Central & Department Library and Convention hall. The management consistently interacts with the stake holders to improve the infrastructure facilities.

Infrastructure and Laboratories: The College is located in a beautiful lush green landscape, free from polluted environment and excellent atmosphere and ambience ideally suited for growth of the soul & mind.

It is located behind RRMCH on the Bengaluru-Mysore Highway 15 Km from the Bengaluru City Railway Station and 2km from Kengeri Railway Station. Campus Area is of 28,686 Square Meters.

Classrooms and Halls: ACS College of Engineering has 40 class rooms, 66 laboratories, smart class rooms, 05 seminar halls, 28 rest rooms and 12 common rooms.

Laboratories: The institution has laboratories as per AICTE norms. ACSCE has 66 laboratories with state of art laboratory equipment. The labs are well equipped with safety norms with list of experiments details. Labs are used by the students beyond the working hours for doing their projects. Also the college has established UC Berkeley and Intel intelligent System laboratory to bridge the gap between industry and academics.

Library: Apart from the books available in the library, students can also access online E-resources such as digital library to widen their knowledge and skills. The working time of library is from 9.00 am to 7.00 pm in working days and from 9.00 am to 4.00 pm in the holiday. Library has 16655 books, 70 Journals and 182 Project reports.

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2.2. UNDERGRADUATE PROGRAMS

- Civil Engineering
- Mechanical Engineering
- Computer Science and Engineering
- Electronics and Communication Engineering
- Aeronautical Engineering
- Aerospace Engineering
- Biomedical Engineering

2.3. POST GRADUATE PROGRAMES

- Product Design & Manufacturing (Mech)
- Structural Engineering (Civil)
- Aeronautical Engineering (AE)
- PhD Programs

2.4. VISION

Engineering the future of the nation by transforming the students to be technically skilled managers, innovative leaders and environmentally receptive citizens.

2.5. MISSION

To implement holistic approach in curriculum and pedagogy through Industry Integrated Interactions to meet the needs of Global Engineering Environment.

To develop students with knowledge, attitude and skill of employability, entrepreneurship (Be Job creators than job seekers), research potential and professionally ethical citizens.

2.6. GOALS

- Providing high quality medical graduates not only competent in their respective fields, but are also motivated to serve humanity at large.

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- Producing research papers in all fields of medical sciences, worthy of being published by National & International Journals.
- Providing all facilities for the pursuit of medical knowledge, relevant to the needs of contemporary society.
- Implementing public services beneficial to and relevant with the needs of the community at large, nationally and internationally.

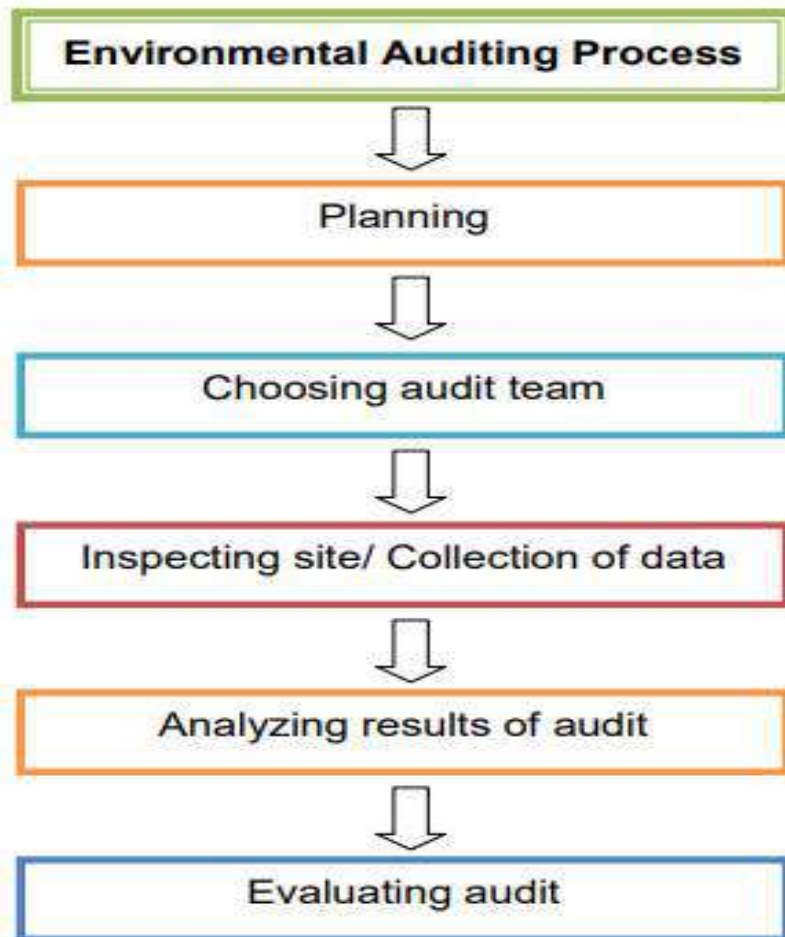
2.7. EDUCATIONAL OBJECTIVES

- To provide for instruction in training in such branches of learning as it may deem fit.
- To provide for research and for the advancement of and dissemination of knowledge.
- To undertake extra moral studies, extension programs and field outreach activities to contribute to the development of Society.
- To undertake the activities to strengthen the set objectives.

CHAPTER – 3

METHODOLOGY ADOPTED

The audit process was carried out in three phases. At first, all the secondary data required for the study was collected from various sources, like concerned departments as engineering, hostel, garden etc. A broad reference work was carried out to clear the idea of green auditing. Different case studies and methodologies were studied and the following methodology was adopted for present audit. The methodology of present study is based on onsite visits, the personal observations and questionnaires survey tool. Initially, based on data requirement, sets of questionnaires were prepared. The surveyors then visited all the departments of the university and the questionnaires were filled. The generated data is subsequently gathered and used for further analysis. From the outcome of the overall study, a final report is prepared.



3.1. SURVEY BY QUESTIONNAIRE:

Baseline data for green audit report preparation was collected by questionnaire survey method. Questionnaires prepared to conduct the green

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audit in the university campus is based on the guidelines, rules, acts and formats prepared by Ministry of Environment, Forest and Climate Change, New Delhi, Central Pollution Control Board and other statutory organizations. Most of the guidelines and formats are based on broad aspects and some of the issues or formats were not applicable for University campus. Therefore, using these guidelines and formats, combinations, modifications and restructuring was done and sets of questionnaires were prepared as solid waste, energy, water, hazardous waste, and e-waste. All the questionnaires comprise of group of modules. The first module is related to the general information of the concerned department, which broadly includes name of the department, month and year, total number of students and employees, visitors of the department, average working days and office timings etc. The next module is related to the present consumption of resources like water, energy, or the handling of solid and hazardous waste. Maintaining records of the handling of solid and hazardous waste is much important in green audit. There are possibilities of loss of resources like water, energy due to improper maintenances and assessment of this kind of probability is necessary in green audit. One separate module is based on the questions related to this aspect. Another module is related to maintaining records, like records of disposal of solid waste, records of solid waste recovery etc. For better convenience of the surveyor, some statistics like, basic energy consumption characteristics for electrical equipment etc. was provided with the questionnaires itself.

Onsite visit and observations:

The ACS College of Engineering has vast built-up area comprising of various departments, administrative building, teachers and staff quarters, student hostels, guest house, sports complex and health center. All these amenities have different kind of infrastructure as per their requirement. All these buildings were visited by the surveyors and the present condition is checked with the help of the questionnaires. Personal observations were made during the onsite visit. All the amenities were clubbed in as per their similarities and differences, which makes the survey and further analysis easier.

Data analysis and final report preparation:

A proper analysis and presentation of data produced from work is a vital element. In case of green audit, the filled questionnaires of the survey from each group, were tabulated as per their modules, in Excel spreadsheets. The tabulated data is then used for further analysis. For better understanding of the results and to avoid complications, averages and percentages of the tables were calculated. Graphical representation of these results was made to give a quick idea of the status. Interpretation of the overall outcomes was made which incorporates all the primary and secondary data, references and interrelations within. Final report preparation was done using this interpretation.

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- In order to meet its objectives, this audit combined physical inspection with a review of relevant documentation and interviews with various stakeholders.
- Review of the Documentation
- For the purpose of this audit the Green Policy of the institute was reviewed.
- Interviews
- Interviews were conducted with the Principal's, Registrar and also faculties and students.
- Physical Inspection
- **The audit team was in the college to inspect the campus.**

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3.2. LIST OF STUDENTS AND STAFF INVOLVED IN GREEN AUDITING

| Sl No | Name | Designation |
|--------------|----------------------|-------------------------------------|
| 1. | Dr. M.S. Murali | Principal |
| 2. | Mr. Sunilraj B.A | Asst. Professor. Dept. of Mech Engg |
| 3. | Dr. Selvanandan | Professor, Dept. of Physics |
| 4. | Mr. Athipathi | Estate Officer, ACSCE |
| 5. | Dr. Gayathri | Asst. Professor, Dept of Civil Engg |
| 6. | Mr. Srinidhi Acharya | Asst. Professor. Dept. of Mech Engg |
| 7. | Ms. Pooja | Student, Dept. of Mechanical |
| 8. | Mr. Jayaprakash | Student, Dept. of Civil Engg |
| 9. | Mr. Praveen Gowda | Student, Dept. of Civil Engg |
| 10. | Ms. Kruthika | Student, Dept. of Civil Engg |

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CHAPTER – 4

GREEN AUDIT

ECO -FRIENDLY CAMPUS & GREEN PRACTICES IN ACS COLLEGE OF ENGINEERING

4.1. AREAS OF GREEN AUDITING

4.1.1. ENERGY AUDIT

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

4.1.2. WATER AUDIT

Water audit can be defined as a qualitative and quantitative analysis of water consumption to identify means of reducing, reusing and recycling of water. Water Audit is nothing but an effective measure for minimizing losses, optimizing various uses and thus, enabling considerable conservation of water in irrigation sector, domestic, power and industrial as well. A water audit is a technique or method which makes possible to identify ways of conserving water by determining any inefficiencies in the system of water distribution. The measurement of water losses due to different uses in the system or any utility is essential to implement water conservation measures in such an establishment.

This indicator addresses water consumption, water sources, irrigation, storm water, appliances and fixtures. Aquifer depletion and water contamination are taking place at unprecedented rates. It is therefore essential that any environmentally responsible institution should examine its water use practices.

It is observed that a number of factors like climate, culture, food habits, work and working conditions, level and type of development, and physiology to determine the requirement of water. The community which has a population between 20,000 to 1,00,000 requires 100 to 150 liters per person (capita) per day. The communities with a population can consume over 1, 00,000 requires

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150 to 200 liters person (capita) per day. As per the standards provided by WHO Regional office for South East Asia Schools require; 10-15 liters per student if water-flushed toilets, Administration requires (Staff accommodation not included) 50 liters per person per day, Staff accommodation requires 30 liters per person per day and for sanitation purposes it depends on technology.

4.1.3. BIODIVERSITY AUDIT

All plant and animal species - including humans - are linked together in a complex web of life; we depend upon biodiversity for our survival. Biodiversity is the key to healthy ecosystems and ultimately a healthy planet. It keeps the air and water clean, regulates our climate and provides us food, shelter, clothing, medicine and other useful products. Each part within this complex web diminishes a little when one part weakens or disappears. The trees work hard to keep the air we breathe clean and healthy. Their leaves take in much of the poisonous unwanted carbon dioxide in the air, and replace it with the oxygen we need for healthy living. In this process, the plants with the help of sunlight, water, minerals and the green material called Chlorophyll within the leaves change the carbon-dioxide into food for themselves. When doing this they release oxygen into the air which is vital for all life on earth. The roots of trees dig deep into the earth and hold it together so that the rain and wind cannot wash or blow it away. This is very important as the earth has only a very thin layer (seldom more than one foot) of fertile soil covering it.

4.1.4. BIODEGRADABLE AND HAZARDOUS WASTE AUDIT

This indicator addresses biodegradable waste from college and hostel canteen, paper waste to hazardous wastes of laboratories and worn-out electric & electronic goods, and plastic wastes. Hazardous materials represent significant risks to human health and ecological integrity. Hazardous wastes are also leached out through the e-waste generated in the campus. They often persist in the environment leaving a legacy of land and water contamination for generations. They also accumulate in

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the tissues of organisms and become concentrated within food chains, leading to cancer, endocrine disruption, birth defects, and other tragedies. The minimization, safe handling, and ultimate elimination of these materials are essential to the long-term health of the planet.

4.2. LAND AREA STATEMENT

The land under the project is designated for Educational activities as per Karnataka Government. No additional burden on land has been created which may adversely affect land use pattern in the area. No natural drain is being obstructed. The University land does not interfere with any forest, wetland, river, lake, mountain, national park & sanctuary etc.

The total area of campus – 20,234 Sq.mt.

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4.3. WATER REQUIREMENT:

The total water requirement for the University is 80 KLD. Water quality of ground water resources in the area has been studied for assessing the water environment. Borewell and rain water are being used in the campus. Rain Water Harvesting has been provided for recharging the aquifer to compensate withdrawal to some extent.

| Building Area Abstract | | |
|-------------------------------|--------------------|------------------------|
| Sl.No | Floor wise | Area in Sq. Mtr |
| 1 | Lower Ground Floor | 2558.8 |
| 2 | Ground Floor | 3713.93 |
| 3 | First Floor | 3888.93 |
| 4 | Second Floor | 3789.07 |
| 5 | Third Floor | 3621.07 |
| 6 | Fourth Floor | 3705.07 |
| 7 | Fifth Floor | 3705 |
| 8 | Sixth Floor | 3705 |
| | Net Total | 28,686.87 |

| Sl.No | Particulars | Area in Sq. Mtr |
|--------------|---------------------|------------------------|
| 1 | Instructional Area | 14959 |
| 2 | Administration Area | 4235 |
| 3 | Amenities Area | 1393 |
| 4 | Circulation Area | 8099.87 |
| | Net Total | 28,686.87 |

| Total requirement of water in KLD | |
|---|-------------------------|
| Fresh | 50 |
| Recycled | 30 |
| Total | 80 |
| Source of water | Bore well and Rainwater |
| 1. Whether canteen facility provided for day students etc | Yes |

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| | |
|--|--|
| 2. Waste water generation in KLD | 300 KLD |
| STP capacity | 300 KLD |
| Technology employed for Treatment and mode of disposal of treated sewage | STP |
| Scheme of disposal of excess treated water if any | Gardening, Lawns, Toilet and Flush out |
| Any Treatment for lab water | - |
| No. of ponds, wells, taps, toilets, waterless urinals | 01 Pond 01 Open Wells 498 Taps 92 Toilets |
| No. and capacity of water tanks for storage | 40,000 litres |

4.4. WASTE WATER GENERATION

About 300 m³/day of wastewater is being generated.

4.5 Waste Water Management

The Institution follows the systematic procedure for proper management and disposal of liquid waste. The wet waste from the college, hostels and canteen is given away to bio fertilizer plants for making eco-friendly fertilizers. A sewage treatment plant for the college is being conceived. This treated water is then used for the gardening and other purpose. Institution also conducts discussions with students to make them aware about the liquid waste management techniques.

- In order to treat the domestic and other waste waters, the sewage treatment plants (STPs - 1 no) have been installed and successfully operated within the premises. The STP capacities is 300 KLD respectively to handle the waste waters generated from College building, Hospital, Hostels, Canteens and recreational areas such as gymnasium etc.
- The waste water is first disinfected using bleaching disinfectants and then

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discharged into the under drainage system leading to STP.

- The sewage generated from other buildings is directly discharged into the STP and is treated along with other waste waters.
- The treatment scheme comprises of a biological treatment called ASP/SBR system wherein the aerobic bacteria stabilizes all the organic matter, neutralizes the microbial population
- The STPs have been performing smoothly and deliver effluents with BOD values below 10 mg/l. The aerobic treatment followed by disinfection results in microbe concentration below 100 units as stipulated in the consent. Likewise all other listed parameters are also complied with. Analysis reports are regularly forwarded to the KSPCB.





Photo: Sewage Treatment Plant of 300 KLD in operation

RECYCLE AND REUSE OF TREATED WASTE WATERS:

The institution installed a sewage treatment plants for the treatment of waste waters originating from the Hospital, college, hostels, staff quarters and canteen areas. Whereas 250 KLD STP primarily treats the waste waters generating from Medical college, Hospital and club areas; the sewage from the ACS College, hostels and staff quarters is treated in 300 KLD STP near cricket ground. Generally the STPs are operated below 80% capacity levels and depending upon semester breaks the influent fluctuations are accordingly smoothened. On an average 200-250 KLD of treated waste water is available for its reuse. Biologically treated waste water is disinfected using liquid chlorine prior to its pumping for the uses. As per KSPCB stipulations, the treated waste waters are reused within the campus as out lined in the following paragraphs.

In general the STPs are operated at not more than 80% of the designed capacity and at much lower capacity during vacations, lock down etc. The treated waste waters from STP 1 and 2 is utilized for the following activities:

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- i) Gardening and maintaining greenery within the campus. (70 %)
- ii) For construction and curing activities within the campus. (20%)
- iii) Secondary flushing in toilets in the hostel buildings. (5%)
- iv) Dust suppression as and when required. (1%)
- v) Buses and other vehicles washing within the campus. (4%)

➤ **Treated water used for maintaining Grass Mat Cricket Ground:**



A cricket ground measuring as large as **14,500 sq m** is provided with grass mat that is maintained round the year on top priority. Since grass has small and shallow roots (as against large and deep roots of tall trees) the water demand is also high (Evaporation-transpiration) frequent watering is required to ensure very survival of the grass. A sprinkler system has been

provided for this purpose. In general a total of **140 KL** is required on any non monsoon day.

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➤ **Bus/Car Washing:**



The institute operates a fleet of 6 Buses and other vehicles. Additionally the students staying in the premises also use the treated water to wash their cars and two wheelers. Provision of **5 KLD** has been made for the purpose.

Ongoing Construction Activities:



For general maintenance works as well as other ongoing construction activities (Concreting and curing) in the premises also make use of treated water which is quite fluctuating in nature. Nevertheless a provision of **10-20 KLD** has

been made.

Photo: Ongoing Construction Works

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➤ Kitchen Gardening:

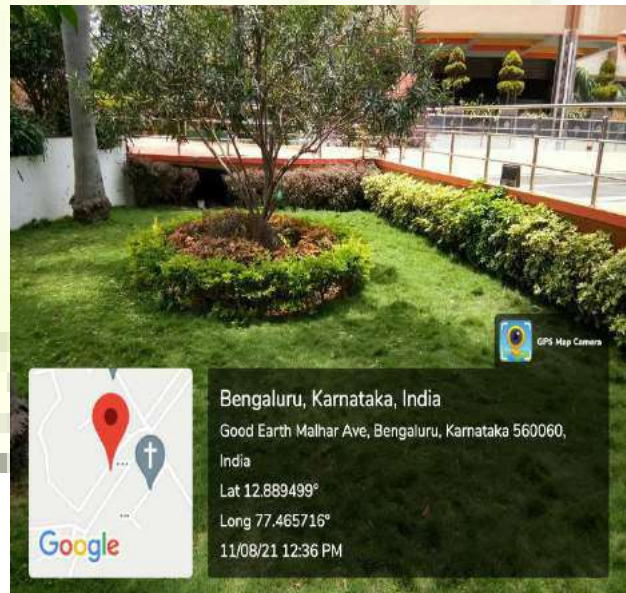
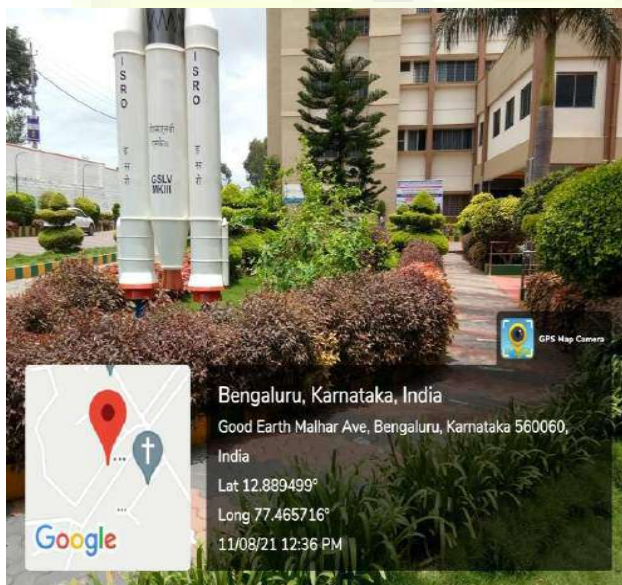


Few patches in the premises are used to grow vegetables (on Trial basis) which are often watered with treated water. The demand here could be approximated to **2 KLD** during non monsoon time.

Photo: Kitchen Gardening near Mess Area

Green Belt Development:

A Green zone has been developed with short, medium and tall trees along with other horticultural development and vacant areas in the campus. This also requires regular watering for the survival. Through the hydrant systems network, the treated water is pumped from both the STPs and a total of **110 KLD** is utilized for the purpose.



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Photo: Green Belt Development at ACSCE

4.6.1. EXISTING WATER MANAGEMENT METHODS INSTALLED IN THE CAMPUS

1. Rain water harvesting
2. Bore well /Open well recharge
3. Construction of tanks and bunds
4. Waste water recycling
5. Maintenance of water bodies and distribution system in the campus

1. Rain Water Harvesting:



Rainwater harvesting system, also called rainwater collection system or rainwater catchment system, technology that collects and stores rainwater for human use. The stored water is used for gardening and raw use. Besides natural percolation tanks, concrete storage tanks have also been built and rain water has been stored after proper filtration paving the open

places with concrete roads is avoided so that rain water can be percolated

- The rainwater harvested during rains not only helps to save water from conventional sources, but also to save energy and reduce expenses incurred on transportation and distribution of water. Awareness programmes on water

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conservation and rain water harvesting have been conducted regularly through various service of the college.

- In order to minimize the abstraction of ground waters, maintain the underground water table and control the hardness of the water supplied in the campus, the rain water potential has also been estimated for its tapping.



- As per the scheme the roof top water shall be collected in the underground tanks/sumps, whereas the water collected from paved and unpaved areas shall pass through grease cum silt

trap and clean water shall be either directly used or shall be used for recharging the existing bore wells within the campus as per drawings. One such Rain water harvesting tank near Students mess is shown below. Similar structures shall be replicated at different locations within premises and other institutions. The institution has roof top rain water harvesting system which is installed on the roof of the institution.

2. Borewell and Open well (Pond) Recharge:

As the water crisis continues to become severe, there is a dire need of reform in water management system and revival of traditional systems. As a part of revival to traditional wisdom, in this institute we built a pond to collect and storage the rainwater for reuse on-site, rather than allowing it as run off.

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Photo: Borewell Recharge System in the Campus
Photo: Open Well (Pond) Recharge

3. Waste Water Recycling

- In order to treat the domestic and other waste waters, the sewage treatment plants have been installed and successfully operated within the premises. The STP capacities are **300 KLD** respectively to handle the waste waters generated from College building, Hospital, Hostels, Canteens and recreational areas such as gymnasium etc.
- The waste water is first disinfected using bleaching disinfectants and then discharged into the under drainage system leading to STP.
- The sewage generated from other buildings is directly discharged into the STP and is treated along with other waste waters.
- The treatment scheme comprises of a biological treatment called

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ASP/SBR system where in the aerobic bacteria stabilizes all the organic matter, neutralizes the microbial population.

- The STPs have been performing smoothly and deliver effluents with BOD values below 10 mg/l. The aerobic treatment followed by disinfection results in microbe concentration below 100 units as stipulated in the consent. Likewise all other listed parameters are also complied with. Analysis reports are regularly forwarded to the KSPCB.

Recycle and Re-use of Treated Waste Waters:

In general the STPs are operated at not more than 80% of the designed capacity and at much lower capacity during vacations, lock down etc. The treated waste waters from STP 1 and 2 is utilized for the following activities;

- Gardening and maintaining greenery within the campus. (70 %)
- For construction and curing activities within the campus. (20%)
- Secondary flushing in toilets in the hostel buildings. (5%)
- Dust suppression as and when required. (1%)
- Buses and other vehicles washing within the campus. (4%)

4. Construction of Tanks and Bunds:



As the water crisis continues to become severe, there is a dire need of reform in water management system and revival of traditional systems. As a part of revival to traditional wisdom, the institution built rain water storage tank, to collect the rainwater and can be used whenever it is required. The rainwater storage tank is build near to ACSCE campus, Faculty Quarters, Boys Hostel and Girls Hostel, ACSCE Convention Centre.

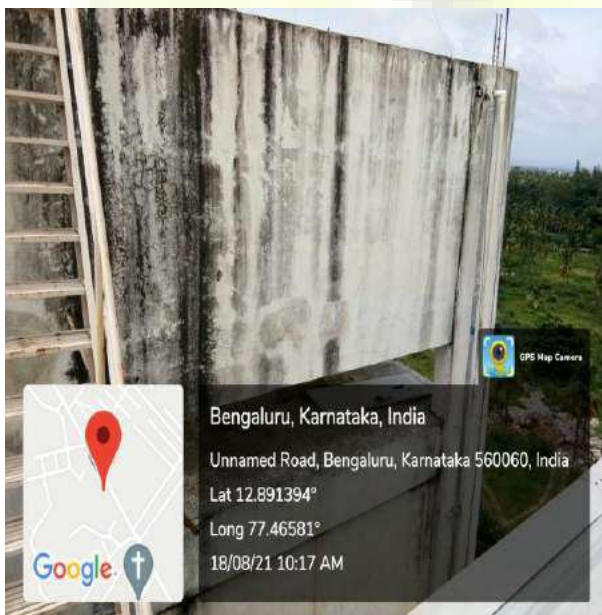
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5. Maintenance of water bodies and distribution system in the campus



The ground water is pumped into storage tanks located at different places in the campus. There are few numbers of over head storage tanks. The water is distributed through well laid pipe network. Drinking water after treating in RO plant is supplied through a separate set of distribution pipes and

water for all other purpose is supplied through another set of distribution pipes. Entire distribution system is well supervised by Civil works people to ensure that there are no leakages and wastages of precious water through joints, valves etc. Waste usage of water is reduced using low pressure flushes. All the stakeholders of the college are well educated to use water economically and efficiently.



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Photo: Over Head Tank in the campus building

Photo: Underground water Storage Tank in the Campus



Photo: Water Bodies Distribution Line in the campus building

4.5. SOLID WASTE MANAGEMENT

The main producers of Solid waste in campus include, Canteen waste, hostel kitchen waste, Institutional waste, and staff quarters. Most of the Dry waste in campus is stored at a transfer station within the campus. The solid waste generated in the constituent colleges will be mostly waste papers, answer sheets and domestic waste like kitchen waste.

The University makes necessary arrangements for disposal of solid waste. Domestic waste is handed over to village panchayats. 5 kg of non-biodegradable waste is generated.

The Institution implements solid waste management by enforcing the waste segregation rules. Dustbins are placed in every classroom, laboratory, rest room, and mess at different locations in the campus. Sweepers are allotted to each floor who manages all the waste generated in the campus. All waste/garbage from college and hostel is segregated at source and disposed of in a proper manner. The wet waste from the hostels/ canteen is given away to bio fertilizer plants for making eco-friendly fertilizers. Wastes like newspapers and stationary is sold to proper recycling agencies/vendors. Through recycling the transport of large quantities of garbage to far-off dumps has been reduced. The institution has successfully completed and recently commissioned a BIO gas plant to handle 80 kg/day of solid waste. The Institution has organized Swach Bharat Mission. Under this banner the utility of recycling the solid waste has been elaborated. People from different aspects of life delivered their talks about the proper usage of waste. Moreover, the NSS volunteers have also demonstrated the proper procedure of disposing the waste.

| Waste Management | |
|---|--|
| Quantity of biodegradable waste generation and mode of disposal as per norms | 52.5 kg/day to Bio gas plant |
| Quantity of non-biodegradable waste generation and mode of disposal as per norms | 22.5 kg/day of plastics and paper sold to vendors |
| Quantity of hazardous waste generation and mode of disposal as per norms | Waste oil: 20 litre/year sold to refine Waste Batteries: 5 Batteries/yr exchanges with new battery |
| Quantity of E-waste generation and mode of disposal as per norms | E-waste 40 kg/yr sold to recycling companies |

Biogas Plant:

The institution has successfully completed and recently commissioned a BIO gas plant to handle 80 kg/day of solid waste. This is an in-house design developed involving engineering students (from ACSCE) in the surveys for the estimation of solid waste generated on day today basis. The construction was also taken up by in-house civil team. The salient features of the Bio-gas systems are listed as below:

- The biogas plant receives the solid wastes from canteen (leftover cooked and uncooked foods), student mess, hostels, staff quarters and college buildings.
- The biogas plant comprises of a floating dome bio-digester, flame arresters, gas compressors, gas metering and gas stoves provided in the kitchen. The feeding line is also designed at two locations so as to simultaneously feed other waste for Research and enhancement of Bio-gas production
- A settling cum filtration unit has also been commissioned to separate digested solids from the liquid. The dried solids are to be further used as compost/soil conditioner. It is estimated that almost 70 kg of dry solids may be recovered per day.
- The filtrate is recycled back to the feeding tray of the crushing unit to dilute the solid food waste prior to its entry into the Bio Digester.
- The biogas recovered is directly used in the kitchen nearby, through the

underground GI pipe line fitted with the flame arresters as fire safety.

- The segregation of wet waste and dry waste is under implementation within the campus so as to divert all the wet wastes to the bio-digester.
- The area around the biogas plant is paved with the concrete paver blocks to maintain cleanliness and hygienic.
- The plant design is in such manner as to expand conveniently in future and/or convert the existing system into a two reactor system for better efficiencies.



Photo: View of the new Biogas Plant at ACSCE

E-waste management:



Photo: E- Waste Storage

The Institution has undertaken a number of E-waste Management initiatives with the objective of creating an eco-friendly environment in the campus. E-waste such as computers and its peripherals are upgraded regularly to continue usage and to avoid its wastage.

4.6. ENERGY MANAGEMENT

Energy conservation is an important aspect of campus sustainability which is also linked with carbon foot print of the campus. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices.

| Energy & power details | |
|--|--|
| Electricity charges | Rs. 5,55,000 per month on an Average |
| Number of Gas cylinders used per month | 01 cylinder for lab for 3 month 01 cylinder /month 28 cylinder/month in the Mess |
| Number of Diesel Generators | 02 i.e 180 KVA, 125 KVA |
| Quantity of Diesel consumed Cost of generator fuel | 35 litre/hr for 180 KVA 22 litre/hr for 125 KVA Cost of Generator fuels i.e Diesel is Rs. 85/litre |
| Total number of CFL bulbs | - |
| Number of LED lights----- Incandescent bulbs----- fans----- AC's----- Tube lights----- electrical instruments----- computers----- photocopiers----- T.V's. etc.----- | 1347 Led bulbs 662 fans 22 AC's Tube lights 662, Computers – 547 Xerox machine -2 T.V. - 2 |

4.7. SOLAR ENERGY

Solar Thermal Energy Harnessing:



In order to conserve the electrical energy in the boys and Girls Hostels, a total of 96 Solar Water Heating Panels and 12 tanks have been installed and operated on day today basis. This has eliminated the use of electrical geysers in the hostels as the hot

water is required round theyear in Bangalore climate

Photo: Solar Panels for water heating

b. Solar Street Light:



The Solar street lights are also installed in various part of the campus in order to reduce the conventional electricity usage

Photo: Solar Street Light

AIR ENVIRONMENT

- In the University campus during construction in any stage water will be sprinkled on the soil to avoid dust generation.
- The debris and unused construction debris will be removed immediately for recycling, if any, or for designated land fill
- All vehicles for service activities at the University will be checked for vehicular emission. The agencies will be asked to keep them within prescribed limits. They will also be asked to maintain them properly.
- As discussed earlier there will be no other point source of Air pollution, which are noise free. Chimneys of suitable height have been provided to control the G.L.C. of PM 2.5, PM10, SO₂, & NO_x levels. Extensive tree plantations have been resorted to for further improving the air environment in general and minimize noise levels.

4.10.1. AIR EMISSIONS AND NOISE LEVELS

The University has installed noise free generators for power backup. No other point source of emissions like boiler, furnace etc. to run on fossil fuels, have been provided. So, the University does not generate Air & Noise Pollution.

4.10.2. TRAFFIC DENSITY

The students are not allowed to keep their own vehicles in the hostel. The University has its own buses for local students. The layout has been planned to provide adequate space for parking within the campus.

4.10.3. CARBON FOOTPRINT

Burning of fossil fuels (such as petrol) has an impact on the environment through the emission of greenhouse gases into the atmosphere. The most common greenhouse gases are carbon dioxide, water vapour, methane, nitrous oxide and ozone. Of all the greenhouse gases, carbon dioxide is the most prominent greenhouse gas, comprising 402 ppm of the Earth's atmosphere. The release of carbon dioxide gas into the Earth's atmosphere through human activities is commonly known as carbon emissions. Vehicular emission is the main source of carbon emission in the campus, hence to assess the method of transportation that is practiced in the college is important.

| Carbon footprint | |
|---|------|
| No of persons using bicycles (Approx.) | 03 |
| No of persons using cars (Approx.) | 21 |
| No of persons using two wheelers (Approx.) | 225 |
| No of persons using other transportations (Approx.) | 1091 |
| No of visitors per day (Approx.) | 85 |
| No of students staying in hostel | 150 |
| No of faculty and staff staying in staff quarters | 10 |
| Total Number of students | 1254 |
| Total No. of faculty and staff | 272 |

4.8. GREEN AUDIT (Ecology & Bio -Diversity)

FLORA

The campus has a rich collection of trees. About 50 tree species were identified. Most of the plants have important role in the maintenance of biodiversity and are the good carbon assimilators. Herbal garden and other ornamental gardens were maintained in the campus.

Apart from records of Forest department, field surveys were undertaken to study the vegetation and floral components in the campus. Apart from this Vana Mahotsav (Tree Plantation) is celebrated every year in the campus in the way of

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conducting green gradation and green initiatives.



Figure: Flora at college campus

4.11.1. FAUNA

Prolific wild life is not observed in the University campus, as there is no thick forest/ vegetation is noticed in the University Campus.

| FAUNAL GROUP | SCIENTIFIC NAMES |
|---------------------------|--|
| SPIDERS | Myrmachne orientalis (Family Salticidae); Nephilaplipes (Family-Nephilidae); Heteropoda sp (Family-Sparassidae); Phintella vitatta (FamilySalticidae) |
| MOTHS & BUTTERFLIES | Antheria assmensis; Bombyx mori; Philosamia ricini; Junonia atlites atlites ; Commander (Moduza procris procris); Ethope himachala ; Melanitis leda leda ; Paltoporia paraka paraka; Ypthima baldus ; Acraea terpsicore ; Elymnias, hypermnestra, undularis; Mycalesis perseus blasi us; Tanaecialepidealepidae; Euploea core core |
| OTHER INSECTS | Scarlet dragonfly; Pantala flavescens (wandering glider), |

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| | |
|----------|--|
| | grasshoppers, microbes |
| REPTILES | squirrels, mouse, snake, lizard |
| BIRDS | Acridotheres tristis (Common myna); Streptopelia orientalis (Oriental Turtle Dove); Athene noctua (little owl); Pycnonotus cafer (Red-vented Bulbul), crows, sparrows, peacock |
| MAMMALS | Monkeys, Dogs, Cats |

Chapter 5

CONCLUSION AND RECOMMENDATIONS

ACS College of Engineering has always taken a green agenda for developing a green campus. Despite being primarily a technological institution, it has shown remarkable awareness in maintaining an eco-friendly campus. On visiting the Campus, one can experience the aesthetic and elegant buildings, splendid lawns, spacious sports grounds and lush green environment conducive for teaching-learning process.

1. The institutional initiatives for greening the campus are as follows:

- Restricted entry of automobiles
- Battery powered vehicles
- Pedestrian Friendly pathways
- Ban on use of Plastic
- Landscaping with trees and plants

1. RESTRICTED ENTRY OF AUTOMOBILES



The college operates a fleet of 6 buses covering each corner of Bengaluru to facilitate the students and staff. The institute encourages the staff and students to use the college transport instead of their own vehicles for safety, security, fuel conservation and to reduce environmental pollution. The college buses are checked for pollution by the

authorized agency.

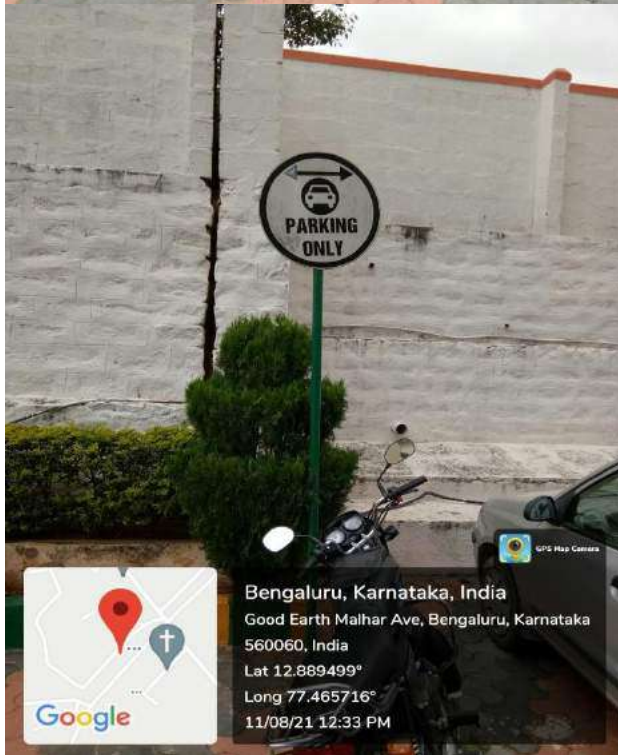


Photo: Two Wheeler Parking Zone

Photo: Four Wheeler Parking Zone

2. BATTERY POWERED VEHICLES

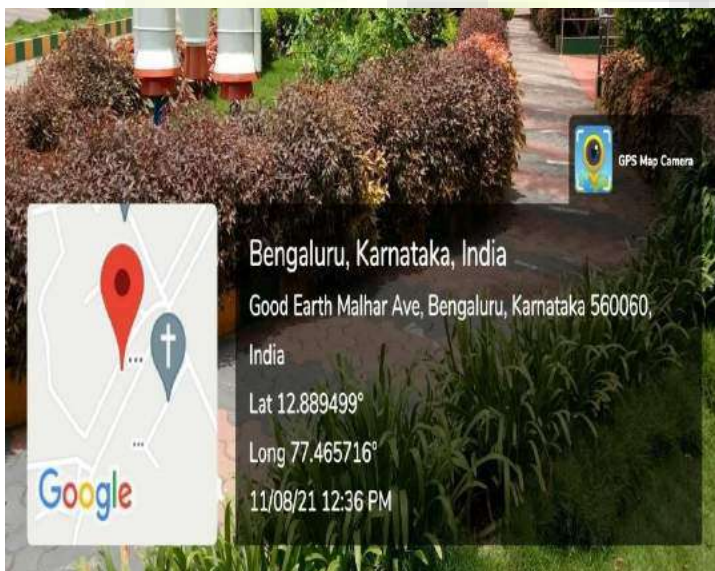


The Management has procured three battery operated carts for the use within the campus to minimize the movement and pollution arising due to fuel driven vehicles with in the campus. Although, the steep slopes within the campus are not bicycle friendly, yet majority of the students and staff prefer walking within the campus as the same is quite compact. The noise levels in the campus are kept to the minimum due to noise less

battery operated carts and minimal movement of automobiles within the campus.

Photo: Battery Operated Vehicle in the Campus

3. PEDESTRIAN FRIENDLY PATHWAYS



Vehicle parking space is provided at the main entrance of the college campus. As the campus is vehicle free with some exceptions, students and staff experience comfort walking through the pedestrian friendly pathways. The internal roads are lined with trees and solar lights and they are properly maintained by the campus maintenance committee.

Photo: Pedestrian Path way in the campus

4. BAN ON USE OF PLASTIC

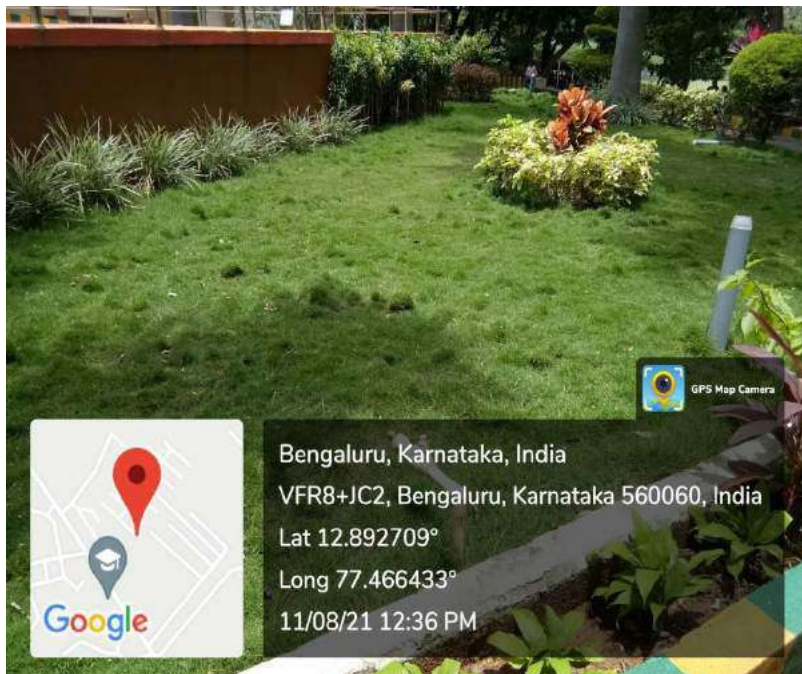


Single-use plastic items such as plastic bottles, bags, spoons, straws and cups are banned completely and awareness is created among staff and students through orientation and display boards in the premises. To restrict the use of plastic, measures have been taken to replace plastic tea cups and glasses with steel glasses in the canteen. The staff and students are informed to use

steel or copper water bottles instead of plastic bottles. The institution also conducted **Unnatha Bharatha Abhiyan (UBA)** activities on the Ban on use of plastics and created awareness to the faculties the localities in and around the campus.

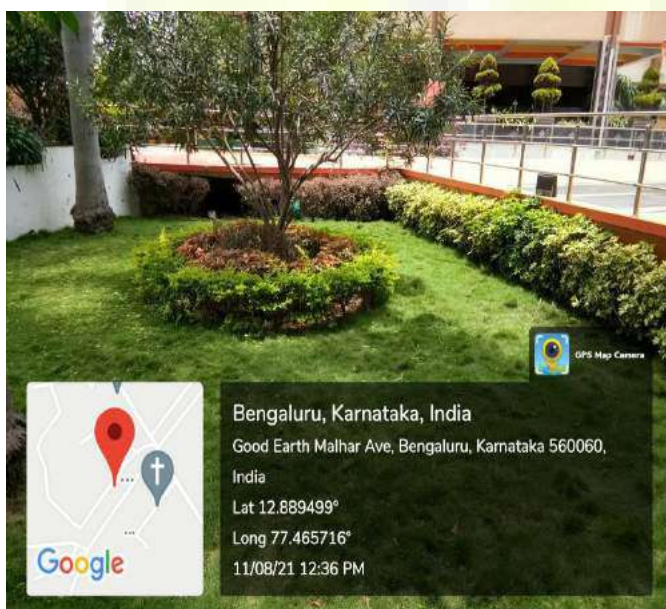
UBA emphasized on the implementation of 'plastic free Campaign' in the adopted villages. Students and faculty members explained the ill effects of plastics and recommended not to use plastics. Instead of plastics, reusable bags can be used which saves the environment and animals. School children and the people of the villages responded and assured that they will say no to plastics and also welcomed the initiative. Students also collected the plastics from the houses and surrounding areas. The campaign was successful in imparting "SWACHHATA HI SEWA" and "Say no to Plastics".

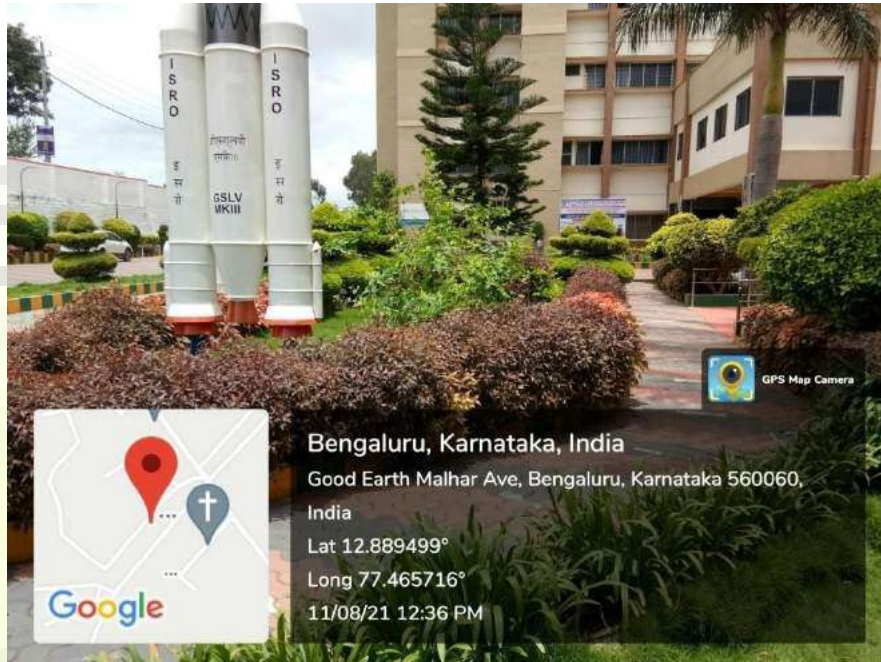
5. LANDSCAPING WITH TREES AND PLANTS



Landscaping of the college is worth seeing and reflects aesthetic sense. The institute has a canopy of trees and plants to make the environment pollution free to safeguard the health of all the inmates. The lawns and the trees provide shade and beautiful ambience. Utmost care is taken to develop and maintain green landscaping by trained gardeners and supervisor. The construction,

maintenance people in the college looks after the development and maintenance of the greenery in the campus. The institute authorities are taking initiatives to make the campus paperless. Internal communication in the campus, through e-mail or e-messages, is driving towards paperless office. Electronic notice boards are installed in the campus to display circulars and information for the students. Electronic gadgets are preferred to transfer and store the official data and information.





Photos: Landscaping with Tress and Plants

Quality Audits On Environment And Energy Regularly Undertaken By The Institution

Quality audits on environment and energy regularly undertaken by the institution

The institutional environment and energy initiatives are confirmed through the following

1. Green audit
2. Energy audit
3. Environment audit
4. Clean and green campus recognitions/awards
5. Beyond the campus environmental promotional activities

Beyond The Campus Environmental Promotion Activities

ACSCE has an eco-friendly environment. It has a long legacy of healthy environmental practices including periodic plantation, their preservation and maintenance. Its land use is such that about 70 % of the total area is occupied by open land and plantation that generates a better and sustainable campus environment.

The campus environmental promotion activities are:

SWACHHATA HI SEWA Campaign



Unnat Bharat Abhiyan (UBA) is a flagship program of Ministry of Human Resource Development (MHRD), Government of India. Our Institution is one of the Participating Institutions (PI) under UBA. UBA emphasized on the implementation of 'plastic free Campaign' in the adopted villages. In this regard, our institution planned for the event in collaboration with NSS at our adopted villages. About 100

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students of Aeronautical, Aerospace, Civil & Mechanical Engineering volunteered along with four faculty members namely Dr. Suresh P M, Mr. Srinidhi Acharya S R, Mr. Rakesh S of Mechanical Engineering and Mr. Shivashankar of Civil Engineering. Students and faculty members explained the ill effects of plastics and recommended not to use plastics. Instead of plastics, reusable bags can be used which saves the environment

and animals. School children and the people of the villages responded and assured that they will say no to plastics and also welcomed the initiative. Students also collected the plastics from the houses and surrounding areas. The campaign was successful in imparting “SWACHHATA HI SEWA” and “Say no to Plastics”

Swaccha Bharatha Abhiyana Program



Photos: Swaccha Bharatha Abhiyana activities

Bheemankuppe Lake Cleaning Campaign



Visit to Bheemanakuppe lake was scheduled on March 6th 2020 for swacch Baharath Abhiyaan. 6th and 4th sem students along with faculties reached the lake with Gloves , Masks, Ginny bags, Dust pans, garbage baskets and brooms. We divided the lake Bank into 6 parts. Each part were assigned to group of 8 students. Bottles, Plastics and papers were picked from all the parts and completed the cleaning process. The waste sacks were dispatched to the nearby BBMP waste collection unit.

PLANTATION PROGRAM ON 29/3/2021

9 saplings of Indian Beech tree (Honge) , Poppy (gasagase) and Neem were planted. Medicinal importance of these plants were also indicated and explained.



National Workshop On Opportunitites And Challenges On Renewable Energy Conversion Technologies



ACS College of Engineering, Kengeri, Bengaluru organized a two days National Workshop on Opportunities and Challenges on Renewable Energy Conversion Technologies was sponsored by Ministry of New and Renewable Energy, Government of India during 25th and 26th Feb. 2016.

The various challenges and opportunities in renewable energy conversion technologies were discussed and interacted by the different academic research experts. About sixty participants both external and internal were attended and gained the technical knowledge in the renewable energy domain. The workshop was inaugurated with special address by Dr. H. Nagana Gouda, Director, National Centre for Solar Technology, Bengaluru. He stressed the tapping importance of renewable energy sources on the present energy conservation point of at state and national level. Dr. Nikil PG Senior Research Scientist (Solar), National Institute of Solar Energy, Gurgaon pointed out various opportunities and schemes for the development of renewable energy at national level by Ministry of New and Renewable Energy, Government of India. Dr.M.S.Murali, Principal of ACSCE has welcomed the gathering and pointed out the practicing of renewable energy in day to day life to reduce the dependence of conventional grid. Dr.M.Eswaramoorthy, Convenor of Workshop proposed vote of thanks.

Tree Plantation Activity 2016

The NSS Unit of ACSCE has conducted a Plantation Camp on 23/08/2016 in ACSCE College Road. The Camp was started at 10.00 AM in the morning. The Principal Dr. M.S. Murali inaugurated the camp by planting and watering a plant. After that he addressed all the volunteers about the importance and benefit of this type of camps. Mr. M.S. Shivakumar, NSS Programme Coordinator & HOD Dept. of Chemistry, motivated the students and volunteers. The faculty members like Dr.

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Pradeepa S.M, Mr. Venkatesh, Dept. of Chemistry, Mr. Raghavendra K, Dept. of Mathematics have very actively participated & involved in the Camp throughout the day. Senior faculty members such as Dr. Selvanandan, Dept. of Physics, Dr. Veena B.H, dept. of maths, Dr. C.S. Pillai, Dept. of CSE have also encouraged us during the camp. More importantly, more than 30 NSS volunteers from various branches of ACSCE have attended & carried the camp very

enthusiastically with lot of interest. During the camp 75 plants were successfully planted. At the end of the day, NSS unit of ACSCE thanks the management for their continuous support and appreciation for all our activities. Finally, the above mentioned camp was also appreciated by the localities and the passengers who are travelling in that road during the camp.

Say No to Crackers Awareness Program

Department of “Biomedical Engineering, ACSCE has conduct the following Events,
Name of the event:”Rally & awareness programme on “Say No to Crackers”

VENUE: Kengeri Upanagar

DATE:17th October 2017.



Photo: Say no to Crackers Campaign

Industrial Visit to Solar Power Plant

The students of VI semester were taken to Solar Power Plant in Shivanasamudra, Mandya District for Industrial visit on 26.03.2019 that is on Tuesday as a part of Industry interaction to students along with two faculty members. The students assembled in the college at 8:30 am in their class. As the bus arrived at 9:00 am the students boarded the bus and started from college and reached Solar Power Plant in Mandya District at 12:30pm.



Photo: Industrial Visit to Solar Power Plant

CONCLUSION AND RECOMMENDATIONS

Green Audit is the most efficient way to identify the strength and weakness of environmental sustainable practices and to find a way to solve problem. Green Audit is one kind of professional approach towards a responsible way in utilizing economic, financial, social and environmental resources. Green audits can “add value” to the management approaches being taken by the college and is a way of identifying, evaluating and managing environmental risks (known and unknown). There is scope for further improvement, particularly in relation to waste, energy and water management. The college in recent years consider the environmental impacts of most of its actions and makes a concerted effort to act in an environmentally responsible manner. Even though the college does perform fairly well, the recommendations in this report highlight many ways in which the college can work to improve its actions and become a more sustainable institution.

SUGGESTIONS

Some of the very important suggestions are: -

- Increase Awareness of Environmentally Sustainable Development- Use every opportunity to raise public, government, industry, foundation, and university awareness by openly addressing the urgent need to move toward an environmentally sustainable future.

- Educate for Environmentally Responsible Citizenship- Establish programs to produce expertise in environmental management, sustainable economic development, population, and related fields to ensure that all university graduates are environmentally literate and have the awareness and understanding to be ecologically responsible citizens.
- Involve All Stakeholders- Encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in environmentally sustainable development. Expand work with community and nongovernmental organizations to assist in finding solutions to environmental problems.
- Collaborate for Interdisciplinary Approaches- Convene university faculty and administrators with environmental practitioners to develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.
- Adopt the proposed Environmentally Responsible Purchasing Policy, and work towards creating and implementing a strategy to reduce the environmental impact of its purchasing decisions.
- Increase reduce, reuse, and recycle education on campus.
- Name all the trees and plants with its common name and scientific name.
- Display boards of fauna diversity to generate enthusiasm for learners.
- Organize earn while learn eco-friendly programmes
- Conduct exhibitions for parents and public on environment and sustainable practices.
- Arrange training programmes on environmental management system and nature conservation.
- Ensure participation of students and teachers in local environmental issues.

Chapter 5

ASSESSMENT OF BASELINE ENVIRONMENTAL CONDITIONS
AT SITE

5.1 WATER ENVIRONMENT

5.1.1 SAMPLING METHODOLOGY AND ANALYSIS

Borewell samples were collected and analysed.

Following procedures were used while sampling and Methodologies adopted in assessing quality of water:

- Washing the bottles/cans with distilled water prior to the sampling;
- Before collection of water the bottles/cans are again washed 2-3 times with the same water
- For surface water, Bottles were lowered to a minimum depth of 30 cm below water surface.
- At each point, different sets of water samples were collected so as to cover all the parameters
- Sterilized bottles were used for the samples that are to be analyzed for bacteria
- Parameters like pH, TDS and temperature were analyzed in the field conditions. There are specific instruments for measuring TDS and pH in the field. These are portable. These instruments will be calibrated at laboratory before use. The results were reconfirmed after getting to the laboratory. DO is fixed and titrated in the field itself.
- Appropriate preservatives are added, depending upon the elements to be analyzed and marked accordingly (APHA / IS: 3025 (part I)).
- All the water samples collected in the ice box, were immediately transported to the laboratory and freezed at <5 °C for analysis.
- Field observations were noted in the field notebook.

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Sample Collection and Analysis of Water Sample

| Parameter | Frequency | Sampling Methodology | Preservation Method | Analysis Method | Prescribed Standard |
|--|---------------------------|----------------------|---------------------|--|--------------------------|
| pH, TDS and Temperature | Once in a baseline period | IS: 3025 (Part I) | Not applicable | Onsite measurement | IS: 10500 specifications |
| Other physico chemical and biological parameters | | | IS: 3025 (Part I) | 'Standard Methods for Examination of Water and Wastewater' Published by American Public Health Association (APHA) / IS: 3025 | |

5.1.2 WATER SAMPLE ANALYSIS

Samples were analyzed for various parameters as per the procedures specified in “*Standard Methods for the Examination of Water and Wastewater*” published by American Public Health Association (APHA). Different physico-chemical parameters of ground water during study period were compared with standard at each monitoring stations and shown in the Table below.

Table: Primary Water Quality Criteria for Designated-Best-Use-Classes

| Designated-Best-Use | Category | Criteria Description |
|---|----------|---|
| Drinking Water Source without conventional treatment but after disinfection | A | <ul style="list-style-type: none"> • Total Coliforms Organism MPN/ 100ml shall be 50 or less • pH between 6.5 to 8.5 • Dissolved Oxygen 6mg/l or more • Biochemical Oxygen Demand (5 days 20°C) 2mg/l or less • TDS max. 500 mg/lit • Chlorides (as Cl-), 250 mg/L, Max |
| Outdoor bathing (Organized) | B | <ul style="list-style-type: none"> • Total Coliforms Organism MPN/ 100ml shall be 500 or less |

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| | | |
|---|---------|--|
| | | <ul style="list-style-type: none"> • pH between 6.5 and 8.5 • Dissolved Oxygen 5mg/l or more • Biochemical Oxygen Demand (5 days 20°C) 3mg/l or less |
| Drinking water source after conventional treatment and disinfection | C | <ul style="list-style-type: none"> • Total Coliforms Organism MPN/100ml shall be 5000 or less • pH between 6 to 9 • Dissolved Oxygen 4mg/l or more • Biochemical Oxygen Demand (5 days 20°C) 3mg/l or less • TDS max. 1500 mg/lit • Chlorides (as Cl⁻), 600 mg/L, Max |
| Propagation of Wild life and Fisheries | D | <ul style="list-style-type: none"> • pH between 6.5 to 8.5 • Dissolved Oxygen 4mg/l or more • Free Ammonia (as N) 1.2 mg/l or less |
| Irrigation, Industrial Cooling, Controlled Waste disposal | E | <ul style="list-style-type: none"> • pH between 6.0 to 8.5 • Electrical Conductivity at 25°C micro mhos/cm Max.2250 • Sodium absorption Ratio Max. 26 • Boron Max. 2mg/l • TDS max. 2100 mg/lit • Chlorides (as Cl⁻), 600 mg/L, Max |
| | Below-E | Not Meeting A, B, C, D & E Criteria |

Source: CPCB STANDARDS (CLASSIFICATION OF INLAND SURFACE WATER)

Table: Groundwater Test Results

| S.No | Parameters | Borewell-1 | As Per IS 10500:2018) | |
|------|------------------------------|------------|-----------------------|---------------|
| | | | DL | PL |
| 1 | pH@24.6°C | 7.27 | 6.5-8.5 | No Relaxation |
| 2 | Total Dissolved Solids, mg/L | 85 | 500 | 2000 |
| 3 | Conductivity@25°C, μS/Cm | 169.7 | - | - |
| 4 | Temperature, °C | 24.7 | - | - |
| 5 | Turbidity as NTU | BDL | 1 | 5 |
| 6 | Chromium as Cr, mg/L | BDL | 0.05 | No Relaxation |
| 7 | Copper as Cu, mg/L | BDL | 0.05 | No Relaxation |
| 8 | Nickel as Ni, mg/L | BDL | 0.02 | No Relaxation |

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| | | | | |
|----|--|--------|---|---------------|
| 9 | Iron as Fe, mg/L | BDL | 0.3 | No Relaxation |
| 10 | Zinc as Zn, mg/L | BDL | 5.0 | 15 |
| 11 | Lead as Pb, mg/L | BDL | 0.01 | No Relaxation |
| 12 | Cadmium as Cd, mg/L | BDL | 0.003 | No Relaxation |
| 13 | Sodium as Na, mg/L | 25.4 | - | - |
| 14 | Potassium as K, mg/L | 1.7 | - | - |
| 15 | Sulphates, mg/L | 4.0 | 200 | 400 |
| 16 | Calcium as Ca, mg/L | 7.2 | 75 | 200 |
| 17 | Total Hardness as CaCO ₃ , mg/L | 40 | 200 | 600 |
| 18 | Magnesium as Mg, mg/L | 5.3 | 30 | 100 |
| 19 | Chlorides as Cl, mg/L | 26.4 | 250 | 1000 |
| 20 | Total Alkalinity as CaCO ₃ , mg/L | 18.8 | 200 | 600 |
| 21 | Dissolved Phosphates, mg/L | 0.1 | - | - |
| 22 | Nitrate Nitrogen as (NO ₃ -N), mg/L | 1.0 | 45 | No Relaxation |
| 23 | Fecal Coliform, MPN/100ml | Absent | Shall not be detectable in 100ml Sample | |
| 24 | E.Coli, CFU/100ml | Absent | Shall not be detectable in 100ml Sample | |
| 25 | Fluorides as F, mg/L | BDL | 1.0 | 1.5 |

ND: Not Detected

BDL – Below Detection Limit

5.1.3 GROUND WATER RESULT AND ITS INTERPRETATION

The analysis results indicate that pH of the groundwater samples was found to be 7.27. The TDS were found to be in the range of 80-85 mg/l. All the parameters found in the range prescribed limits. The water quality is potable in nature after giving necessary treatment (U.F + R.O) followed by disinfection process.

All of the parameters for Ground Water samples were found within the limit as per drinking water norms IS 10500:2012. They are not directly using this bore well water for drinking purpose. They have to compulsory to treat this water before use for domestic and drinking purpose. Based on above data, it is interpreted that the ground water quality meets with the drinking water norms. However, this water shall be used for drinking after conventional treatment.

5.2 STP Treated Water

300 KLD of wastewater is generated from various activities inside the campus. This wastewater is treated in 300 KLD STP inside the campus.

STP treated water was collected and tested for its quality which is discussed in table below:

Table: STP Treated Water

| S. No | Parameters | Results | Tolerance Limits | Test Method |
|-------|--|---------|------------------|--|
| 1 | pH@24.7°C | 7.60 | 6.5-8.5 | IS 3025:Part-11:1983 (Reaffirmed 2017) |
| 2 | Total Suspended Solids, mg/L | 15 | 10 | IS 3025:Part-17:1984 (Reaffirmed-2017) |
| 3 | Bio-Chemical Oxygen Demand (3Days at 27°C), mg/L | 5 | 10 | IS 3025:Part-44:1993 (Reaffirmed-2019) |
| 4 | Chemical Oxygen Demand, mg/L | 16 | 50 | IS 3025:Part-58:2006 (Reaffirmed-2017) |
| 5 | Ammonical nitrogen as NH ₃ -N, mg/L | 3.6 | 5 | APHA 23 rd Edition 4500,NH ₃ ,B,C:2017 |
| 6 | Total nitrogen, mg/L | 8.2 | 10 | IS 3025:Part-34:1988 (Reaffirmed-2019) |
| 7 | Fecal Coliform, MPN/100ml | 44 | <100 | APHA 23 rd Edition(9221B): 2017 |

Interpretation:

All the tested parameters are within the tolerance limits. The results indicate that the STP is working efficiently.

5.3 AIR ENVIRONMENT

The ambient air quality monitoring was carried out in accordance with guidelines of Central Pollution Control Board (CPCB) and National Ambient Air Quality Standards (NAAQS) of CPCB of November 2009.

Table: Ambient air quality Results

| S. No | PARAMETERS | UNIT | RESULTS | STANDARD LIMITS |
|-------|--|-------------------|-------------------|-----------------------|
| | | | Near Canteen Area | |
| 1 | Particulate Matter(PM ₁₀) | µg/m ³ | 36.2 | 100 µg/m ³ |
| 2 | Particulate Matter(PM _{2.5}) | µg/m ³ | 14.5 | 60 µg/m ³ |
| 3 | Sulphur Dioxide as SO ₂ | µg/m ³ | 10.2 | 80 µg/m ³ |
| 4 | Nitrogen Dioxide as NO ₂ | µg/m ³ | 16.7 | 80 µg/m ³ |
| 5 | Ammonia | µg/m ³ | BDL | 400 µg/m ³ |
| 6 | Benzene (C ₆ H ₆) | µg/m ³ | <1 | 5 µg/m ³ |
| 7 | Benzo(a) Pyrene | ng/m ³ | <0.5 | 1 ng/m ³ |
| 8 | Nickel (Ni) | ng/m ³ | <0.5 | 20 ng/m ³ |
| 9 | Arsenic (As) | ng/m ³ | <0.5 | 6 ng/m ³ |
| 10 | Lead (Pb) | µg/m ³ | <0.05 | 1 µg/m ³ |
| 11 | Carbon Monoxide | mg/m ³ | 0.2 | 4 mg/m ³ |
| 12 | Ozone (O ₃) | µg/m ³ | BDL | 100 µg/m ³ |

Interpretation of Results:

All the parameters are within the permissible values.

5.4 Noise Environment

Noise levels were monitored at the main gate area and the values are presented in the table below:

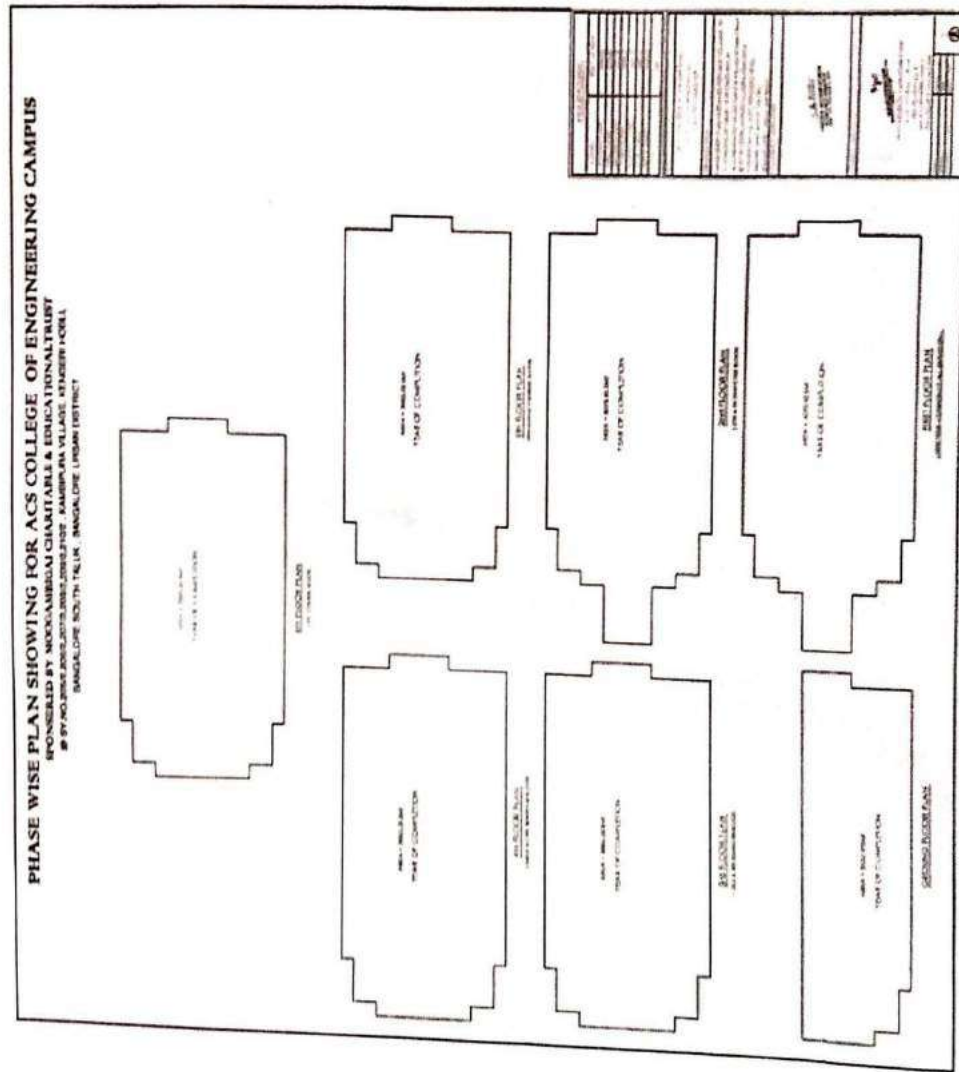
Table: Noise Monitoring Results

| S.No | Monitored Location | Results dB (A) Day | Tolerance Limits |
|----------------------|---------------------------|-------------------------------|-----------------------------------|
| 1 | North Side Area | 68.5 | IS 9989-1981 (Reaffirmed 2014) |
| 2 | South Side Area | 72.4 | |
| 3 | East Side Area | 73.1 | |
| 4 | West Side Area | 72.7 | |
| CPCB Standard | | 75 | |

Noise levels are within the prescribed tolerance limits.

ANNEXURE 1

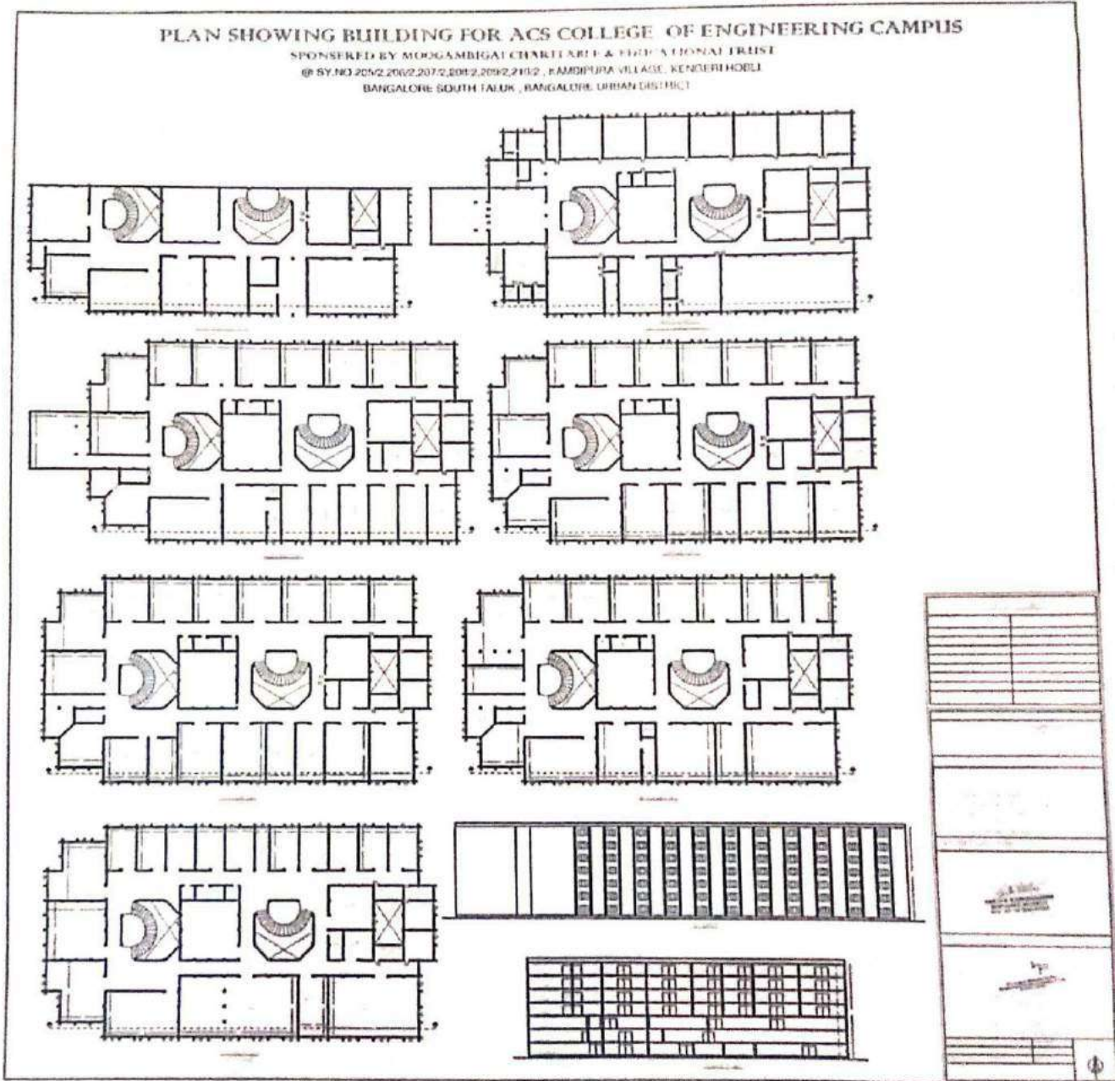
BUILDING PLAN OF A C S COLLEGE OF ENGINEERING

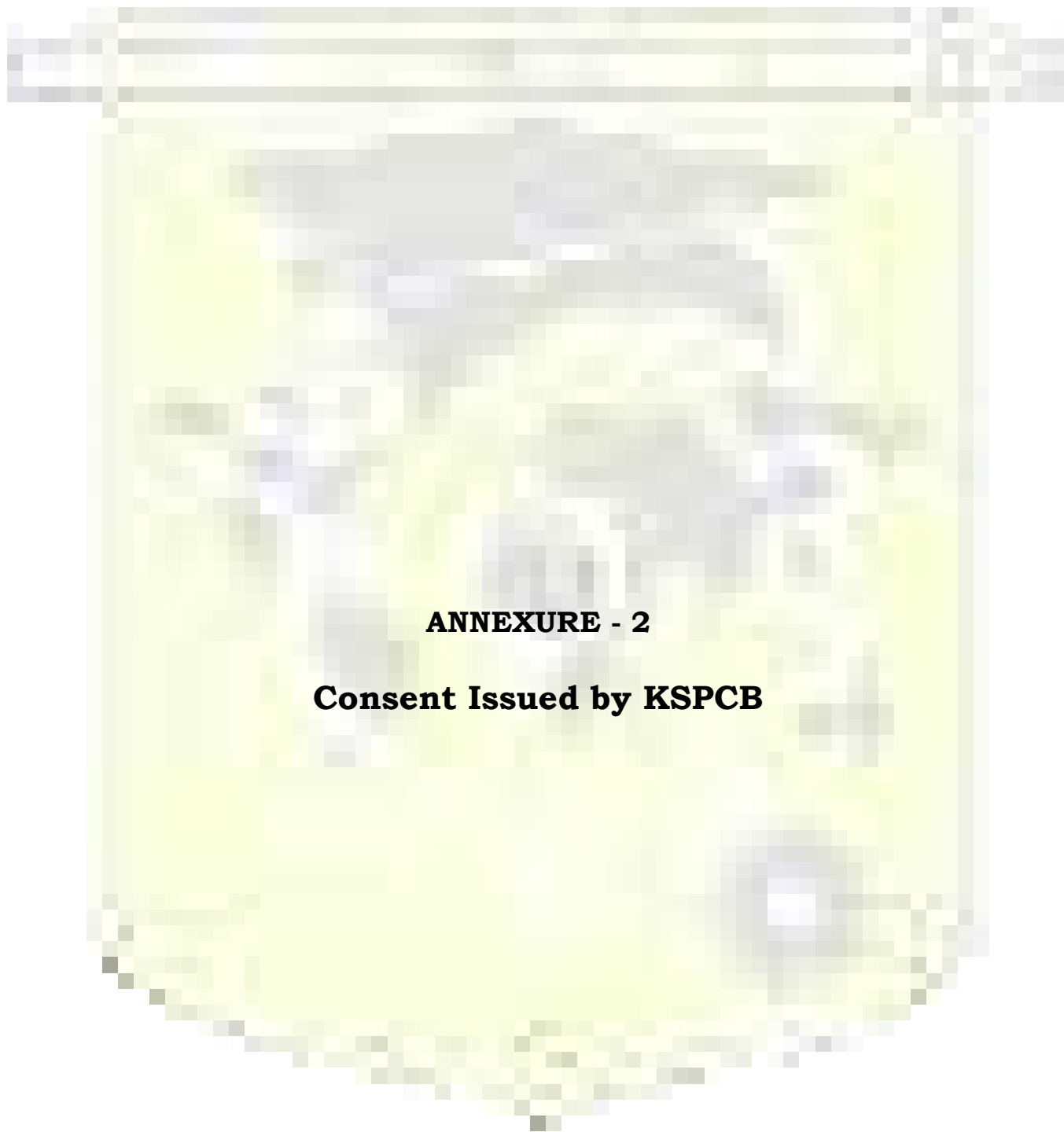


Principal
Principal
A.C.S. College of Engineering
Kambipura, Mysore Road, Kengeri Hobli,
Bangalore - 560 072

Environmental Audit Report-2020-21

Principal
A.C.S. College of Engineering
Kambipura, Mysore Road, Kengeri Hobli,
Bangalore, Karnataka, India





ANNEXURE - 2

Consent Issued by KSPCB

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Consent For Operation
(CFO-Air,Water)

Karnataka State Pollution Control Board
Zonal Office, Bangalore South
Nisarga Bhavan, 6th Floor, Hanumanth Road, 7th Cross,
Shivanagar, Bangalore-560041
Tel: 080-2473886

Industry Colour: **ORANGE** Industry Scale: **LARGE**

(This document contains 6 pages including annexure & excluding additional conditions)

Combined Consent Order No: AW-304164 **PCB ID:** 34442 **Date:** 10/11/2017

Combined consent for discharge of effluents under the Water (Prevention and Control of Pollution) Act, 1974 and emission under Air (Prevention and Control of Pollution) Act, 1981

- Ref: 1. Application filed by the industry / organization on 16/09/2017
2. Inspection of the Industry/organization/by RO, - Bangalore South on 13/10/2017

Consent is hereby granted under Section 25(4) of the Water (Prevention & Control of Pollution) Act, 1974 (herein referred to as the Water Act) & Section 21 of Air (Prevention & Control of Pollution) Act, 1981, (here in referred to as the Air Act) and the Rules and Orders made there under and subject to the terms and conditions as detailed in the Schedule Annexed to this order.

The Occupier is authorized to operate /carryout industry/activity & to make discharge of the effluents & emissions conforming to the stipulated standards from the premises mentioned below:

Location:

Name of the Industry: Acs College Of Engineering
Address: Sy.No.205/2, 207/2, 208/2, 209/2 & 210/2, Kambipura Village, Bangalore South Taluk, Bangalore
Industrial Area: Not In I.A, Kambipura ,
Taluk: Not in BBMP Area, District: Bangalore Urban

Discharge of effluents under the Water Act:

| Sr | Water Code | WC(KLD) | WWG(KLD) | Remark |
|----|------------------|---------|----------|---|
| 1 | Domestic Purpose | 32.000 | 25.000 | treated in STP of capacity 300 KLD installed by RR Medical College. |

Discharge of Air emissions under the Air Act from the following stacks etc.

Sl. No. Description of chimney/outlet Limits specified refer schedule

The details of Sources, control equipments and its specification, type of fuel, rate of emissions, constituents to be controlled in emissions etc. are detailed in Annexure-I.

The consent for operation is granted considering the following activities/Products:

| Sr | Product Name | Applied Qty/Month | Unit |
|----|---------------------|-------------------|------|
| 1 | Engineering College | 0.000 | NOS |
| 2 | NA | 0.000 | NOS |

This consent is valid for the period from 13/10/2017 to 30/09/2022

For and on behalf of the
Karnataka State Pollution Control
Board

Page-1 e_outwardno7482-10/11/2017 e-signed(physical signature not require) Printed from XGN SENIOR ENVIRONMENTAL OFFICER



ANNEXURE - 3
Monitoring Reports

TEST REPORT

| | | | | | |
|---|----------------------------|---|----|-----------------------------|-------------|
| 1 | Customer Name & Address | M/S. ACS College Of Engineering Behind Rajarajeshwari Medical College, Kambipura, Kengeri, Mysore Road, Bangalore-560074 | 8 | Sample Collected On | 12.11.2021 |
| 2 | Sample Description | Borewell Water | 9 | Sample Receipt on | 12.11.2021 |
| 3 | Date of Analysis Start | 11.11.2021 | 10 | Sample RC No | 360 |
| 4 | Date of Analysis Completed | 16.11.2021 | 11 | Sample Code No | EGSSPL/1100 |
| 5 | Date Of Report/ Report No | 16.11.2021/EGSSPL/1100 | 12 | Quantity of Sample Received | 1Ltr |
| 6 | Sampling Methodology | IS 3025:PART-1:1987 (Reaffirmed 2019) | 13 | Environmental Conditions | Ambient |
| 7 | Appearance of Sample | Colorless Liquid | 14 | Sampling Time | 14:15 |

| S.No | Parameters | Results | As Per IS 10500:2018) | | Test Method |
|------|--|---------|---|---------------|---|
| | | | DL | PL | |
| 1 | pH @24.7°C | 7.27 | 6.5-8.5 | No Relaxation | IS 3025:Part-11:1983 (Reaffirmed-2017) |
| 2 | Total Dissolved Solids, mg/L | 85 | 500 | 2000 | IS 3025:Part-16:1984 (Reaffirmed-2017) |
| 3 | Conductivity@25°C, µS/Cm | 169.7 | - | - | IS 3025:Part-14:1985 (Reaffirmed-2019) |
| 4 | Temperature, °C | 24.7 | - | - | IS 3025:Part-09:1984 (Reaffirmed-2017) |
| 5 | Turbidity as NTU | BDL | 1 | 5 | IS 3025:Part-10:1984(Reaffirmed-2017) |
| 6 | Chromium as Cr, mg/L | BDL | 0.05 | No Relaxation | APHA 23 rd Edition:2017-3111 B |
| 7 | Copper as Cu, mg/L | BDL | 0.05 | No Relaxation | APHA 23 rd Edition:2017-3111 B |
| 8 | Nickel as Ni, mg/L | BDL | 0.02 | No Relaxation | APHA 23 rd Edition:2017-3111 B |
| 9 | Iron as Fe, mg/L | BDL | 0.3 | No Relaxation | APHA 23 rd Edition:2017-3111 B |
| 10 | Zinc as Zn, mg/L | BDL | 5.0 | 15 | APHA 23 rd Edition:2017-3111 B |
| 11 | Lead as Pb, mg/L | BDL | 0.01 | No Relaxation | APHA 23 rd Edition:2017-3111 B |
| 12 | Cadmium as Cd, mg/L | BDL | 0.003 | No Relaxation | APHA 23 rd Edition:2017-3111 B |
| 13 | Sodium as Na, mg/L | 25.4 | - | - | IS 3025:Part-45:1993 (Reaffirmed-2019) |
| 14 | Potassium as K, mg/L | 1.7 | - | - | IS 3025:Part-45:1993 (Reaffirmed-2019) |
| 15 | Sulphates, mg/L | 4 | 200 | 400 | APHA 23 rd Edition:2017 4500-SO ₄ ²⁻ E |
| 16 | Calcium as Ca, mg/L | 7.2 | 75 | 200 | IS 3025:Part-40:1991 (Reaffirmed-2019) |
| 17 | Total Hardness as CaCO ₃ , mg/L | 40 | 200 | 600 | IS 3025:Part-21: 2019 |
| 18 | Magnesium as Mg, mg/L | 5.3 | 30 | 100 | IS 3025:Part-46:1994 (Reaffirmed -2019) |
| 19 | Chlorides as Cl, mg/L | 26.4 | 250 | 1000 | IS 3025:Part-32:1988 (Reaffirmed-2019) |
| 20 | Total Alkalinity as CaCO ₃ , mg/L | 18.8 | 200 | 600 | IS 3025:Part-23:1986 (Reaffirmed -2019) |
| 21 | Dissolved Phosphates ,mg/L | 0.1 | - | - | IS 3025:Part-31:1988 (Reaffirmed-2019) |
| 22 | Nitrate Nitrogen as (NO ₃ -N), mg/L | 1 | 45 | No Relaxation | IS 3025:Part-34:1988 (Reaffirmed-2019) |
| 23 | Fecal Coliform, MPN/ 100ml | Absent | Shall not be detectable in 100ml Sample | | APHA 23 rd Edition:2017(9221B) |
| 24 | E.Coli, CFU/100ml | Absent | Shall not be detectable in 100ml Sample | | IS:15185 |
| 25 | Fluorides as F, mg/L | BDL | 1.0 | 1.5 | APHA 23 rd Edition:2017 4500-F D |

Note: Sample drawn by us

BDL:Below Detection Limit



TEST REPORT

| | | | | | |
|---|---|--|----|-----------------------------|--------------------------|
| 1 | Customer Name & Address | M/S. ACS College Of Engineering Behind Rajarajeshwari Medical College, Kambipura, Kengeri, Mysore Road, Bangalore-560074 | 7 | Sample Collected On | 12.11.2021 |
| 2 | Sample Description | STP-Treated Water | 8 | Sample Receipt On | 12.11.2021 |
| 3 | Date of Analysis Start | 12.11.2021 | 9 | Sample RC No | 361 |
| 4 | Date of Analysis Completed/Date Of Report | 16.11.2021/16.11.2021 | 10 | Sample Code No | EGSSPL/1101 |
| 5 | Report No | EGSSPL/1101 | 11 | Quantity of Sample Received | 1Ltrs |
| 6 | Appearance of Sample | Colorless Liquid | 12 | Sample Particulars | Sample received in a Can |

| S. No | PARAMETERS | RESULTS | TOLERANCE LIMIT | TEST METHOD |
|-------|--|---------|-----------------|--|
| 1 | pH @24.7°C | 7.60 | 6.5-9.0 | IS 3025:Part-11:1983 (Reaffirmed-2017) |
| 2 | Bio-Chemical Oxygen Demand, mg/L (3Days at 27°C) | 5 | 20 | IS 3025:Part-44:1993 (Reaffirmed-2019) |
| 3 | Total Suspended Solids, mg/L | 15 | 30 | IS 3025:Part-17:1984 (Reaffirmed-2017) |
| 4 | Chemical Oxygen Demand, mg/L | 16 | 50 | IS 3025:Part-58:2006 (Reaffirmed-2017) |
| 5 | Ammonical nitrogen as NH ₃ -N, mg/L | 3.6 | 5 | APHA 23 rd Edition 2017: 4500,NH ₃ , B,C |
| 6 | Total Nitrogen, mg/L | 8.2 | 10 | IS 3025:Part-34:1988 (Reaffirmed-2019) |
| 7 | Fecal Coliform, MPN/100ml | 44 | 100 | APHA 23 rd Edition(9221B):2017 |

Note: Sample Drawn by us



Ambient Air Quality Analysis Report

| | | | | | |
|---|--|---|----|---------------------|--------------------------------|
| 1 | Customer Name & Address | M/S. ACS College Of Engineering Behind Rajarajeshwari Medical College, Kambipura, Kengeri, Mysore Road, Bangalore-560074 | 6 | Samples Particulars | Ambient Air Quality Monitoring |
| 2 | Name of the Location | Near Canteen Area | 7 | Sample Code No | EGSSPL/AAQ/288 |
| 3 | Date of Sampling \ Date of Sample Received | 12.11.2021/12.11.2021 | 8 | Sample Collected By | Mr.Vijay Kumar |
| 4 | Date of Analysis Completed/Date Of Report | 16.11.2021/16.11.2021 | 9 | Monitoring Duration | 8hrs |
| 5 | Monitoring Done By | Eco Green Solution Systems Pvt.Ltd | 10 | Report No | EGSSPL/AAQ/288 |

| Instrument Details | PM _{2.5} (Fine Particulate Sampler) | PM ₁₀ (Respirable Dust Sampler) |
|---------------------------------|---|---|
| Make/Model No | Eco Green Instruments/ EGSS-007 | Eco Green Instruments/EGSS-NL-011 |
| S.No | 001 | 001 |
| Instrument Calibrated Date | 19.02.2021 | 19.02.2021 |
| Instrument Calibration Due Date | 18.02.2022 | 18.02.2022 |

| S. No | PARAMETERS | UNIT | RESULTS | STANDARD LIMITS | PROTOCOL |
|-------|--|-------------------|---------|-----------------------|-------------------------|
| 1 | Particulate Matter(PM ₁₀) | µg/m ³ | 36.2 | 100 µg/m ³ | IS 5182 (Part 23):2017 |
| 2 | Particulate Matter(PM _{2.5}) | µg/m ³ | 14.5 | 60 µg/m ³ | IS 5182 (Part 24): 2019 |
| 3 | Sulphur Dioxide as SO ₂ | µg/m ³ | 10.2 | 80 µg/m ³ | IS 5182 (Part 2): 2017 |
| 4 | Nitrogen Dioxide as NO ₂ | µg/m ³ | 16.7 | 80 µg/m ³ | IS 5182 (Part 6): 2017 |
| 5 | Ammonia | µg/m ³ | BDL | 400 µg/m ³ | IS 5182 (Part 25): 2018 |
| 6 | Benzene (C ₆ H ₆) | µg/m ³ | <1 | 5 µg/m ³ | IS 5182 (Part 11): 2017 |
| 7 | Benzo Pyrene | ng/m ³ | <0.5 | 1 ng/m ³ | IS 5182 (Part 12): 2017 |
| 8 | Nickel (Ni) | ng/m ³ | <0.5 | 20 ng/m ³ | EGSSPL/CPCB/SOP/AAQ/001 |
| 9 | Arsenic (As) | ng/m ³ | <0.5 | 6 ng/m ³ | EGSSPL/CPCB/SOP/AAQ/002 |
| 10 | Lead (Pb) | µg/m ³ | <0.05 | 1 µg/m ³ | EGSSPL/CPCB/SOP/AAQ/003 |
| 11 | Carbon Monoxide | mg/m ³ | 0.2 | 4 mg/m ³ | IS 5182 (Part 10): 2019 |
| 12 | Ozone (O ₃) | µg/m ³ | BDL | 100 µg/m ³ | EGSSPL/CPCB/SOP/AAQ/004 |

BDL:Below Detection Limit



Ambient Air Quality Analysis Report

| | | | | | |
|---|--|--|----|---------------------|--------------------------------|
| 1 | Customer Name & Address | M/S. ACS College Of Engineering Behind Rajarajeshwari Medical College, Kambipura, Kengeri, Mysore Road, Bangalore-560074 | 6 | Samples Particulars | Ambient Air Quality Monitoring |
| 2 | Name of the Location | Near Main Gate Area | 7 | Sample Code No | EGSSPL/AAQ/289 |
| 3 | Date of Sampling \ Date of Sample Received | 12.11.2021/12.11.2021 | 8 | Sample Collected By | Mr. Vijay Kumar |
| 4 | Date of Analysis Completed/Date Of Report | 16.11.2021/16.11.2021 | 9 | Monitoring Duration | 8hrs |
| 5 | Monitoring Done By | Eco Green Solution Systems Pvt.Ltd | 10 | Report No | EGSSPL/AAQ/289 |

| Instrument Details | PM _{2.5} (Fine Particulate Sampler) | PM ₁₀ (Respirable Dust Sampler) |
|---------------------------------|---|---|
| Make/Model No | Eco Green Instruments/ EGSS-007 | Eco Green Instruments/EGSS-NL-011 |
| S.No | 002 | 002 |
| Instrument Calibrated Date | 19.02.2021 | 19.02.2021 |
| Instrument Calibration Due Date | 18.02.2022 | 18.02.2022 |

| S. No | PARAMETERS | UNIT | RESULTS | STANDARD LIMITS | PROTOCOL |
|-------|--|-------------------|---------|-----------------------|-------------------------|
| 1 | Particulate Matter(PM ₁₀) | µg/m ³ | 56.7 | 100 µg/m ³ | IS 5182 (Part 23):2017 |
| 2 | Particulate Matter(PM _{2.5}) | µg/m ³ | 34.2 | 60 µg/m ³ | IS 5182 (Part 24): 2019 |
| 3 | Sulphur Dioxide as SO ₂ | µg/m ³ | 18.5 | 80 µg/m ³ | IS 5182 (Part 2): 2017 |
| 4 | Nitrogen Dioxide as NO ₂ | µg/m ³ | 26.2 | 80 µg/m ³ | IS 5182 (Part 6): 2017 |
| 5 | Ammonia | µg/m ³ | BDL | 400 µg/m ³ | IS 5182 (Part 25): 2018 |
| 6 | Benzene (C ₆ H ₆) | µg/m ³ | <1 | 5 µg/m ³ | IS 5182 (Part 11): 2017 |
| 7 | Benzo Pyrene | ng/m ³ | <0.5 | 1 ng/m ³ | IS 5182 (Part 12): 2017 |
| 8 | Nickel (Ni) | ng/m ³ | <0.5 | 20 ng/m ³ | EGSSPL/CPCB/SOP/AAQ/001 |
| 9 | Arsenic (As) | ng/m ³ | <0.5 | 6 ng/m ³ | EGSSPL/CPCB/SOP/AAQ/002 |
| 10 | Lead (Pb) | µg/m ³ | <0.05 | 1 µg/m ³ | EGSSPL/CPCB/SOP/AAQ/003 |
| 11 | Carbon Monoxide | mg/m ³ | 1.7 | 4 mg/m ³ | IS 5182 (Part 10): 2019 |
| 12 | Ozone (O ₃) | µg/m ³ | BDL | 100 µg/m ³ | EGSSPL/CPCB/SOP/AAQ/004 |

BDL:Below Detection Limit



AMBIENT NOISE LEVEL MONITORING REPORT

| | | | | | |
|---|------------------------------------|--|----|--------------------------|------------------------|
| 1 | Customer Name & Address | M/S.ACS College Of Engineering Behind Rajarajeshwari Medical College, Kambipura, Kengeri, Mysore Road, Bangalore-560074 | 6 | Sample Collected On | 12.11.2021 |
| 2 | Date of Data Downloaded | 13.11.2021 | 7 | Sample Receipt On | 12.11.2021 |
| 3 | Report No | EGSSPL/EN-073/21-22 | 8 | Sampling Methodology | IS 9989-1981 (RA-2014) |
| 4 | Sample Collected By | M/S. Eco Green Solution Systems Pvt.Ltd 48/A-4, KIADB Industrial Area, Veerapura Post, Doddaballapur, Bengaluru-561203 | 9 | Sample Code No | EN-073/21-22 |
| 5 | Particulars of the Instrument Used | Sound Level Meter (Baseline Technologies/2511) S.No: A0118-1679 | 10 | Environmental Conditions | Normal |

Results

| S.No | Monitored Location | Result (dBA) Day | Protocol |
|----------------------|---------------------------|-------------------------|-----------------------------------|
| 1 | North Side Area | 68.5 | IS 9989-1981 (Reaffirmed 2014) |
| 2 | South Side Area | 72.4 | |
| 3 | East Side Area | 73.1 | |
| 4 | West Side Area | 72.7 | |
| CPCB Standard | | 75 | |



GREEN AUDITING

ACS COLLEGE OF ENGINEERING

KENGERI, BENGALURU- 560 074

KARNATAKA



Prepared by

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2nd Floor, No. 93, 7th Cross, Lower
Palace Orchards, Bengaluru – 560003



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Submitted by:

**ACS College of Engineering,
(Unit of Rajarajeswari Group of Institution)
#207, Kambipura, Next to RajaRajeswari Medical
College & Hospital,
Mysore Road, Kengeri, Bengaluru-560074**



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Executive Summary

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Sustainability is not only spoken in various levels but also practiced by industries, organizations and educational institutes to optimize their resource utilization and make them environment friendly. Hence sustainability is the need of the hour for our country to provide our future generation a clean and safe environment. Educational institutions must play an active role in creating and modeling solution for such environmental problems. Green audit is one such concept or principle introduced to make the educational institutes environmentally sustainable. Through green audit one gets a direction as how to improve the condition of environment within the system. Green audit can be a useful tool for a college to determine how and where they are consuming more of energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of



waste, which can be used for a recycling project or to improve waste minimization plan.

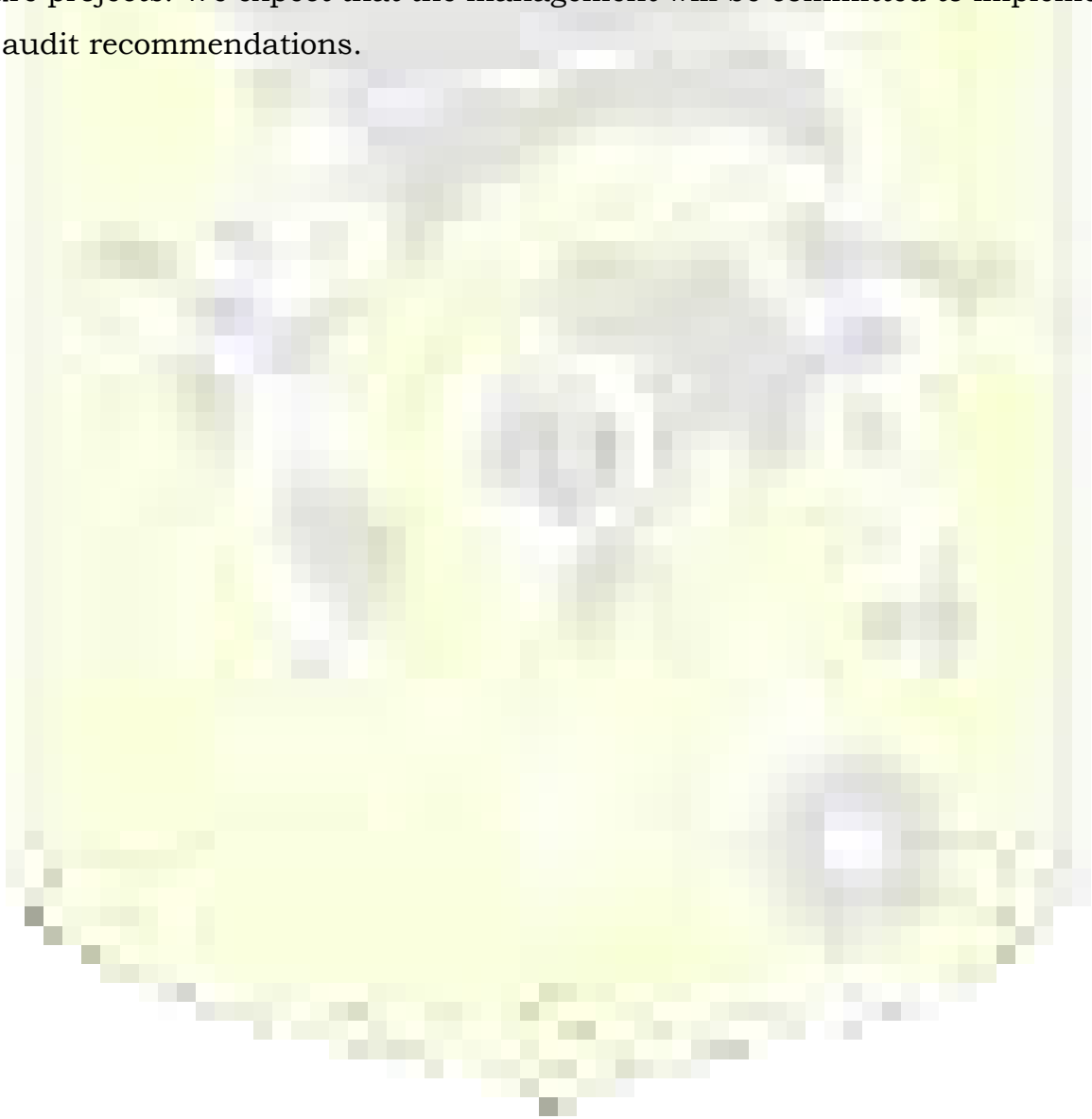
Green auditing and the implementation of mitigation measures is a win-win situation for the college, the learners and the planet. It

can also create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of green impact on campus. Green auditing promotes financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility to the students and teachers.

In **ACS College of Engineering**, Bengaluru the audit process involved initial interviews with management to clarify policies, activities, records and the co-operation of staff and student in the implementation of mitigation measures. This was followed by staff and student interviews, collection of data through the questionnaire, review of records, observation of practices and observable outcomes. In addition, the approach ensured

that the management and staff are active participants in the green auditing process in the college.

The baseline data prepared for the ACS College of Engineering will be a useful tool for campus greening, resource management, planning of future projects, and a document for implementation of sustainable development of the institution. Existing data will allow the college to compare its programmes and operations with those of peer institutions, identify areas in need of improvement, and prioritize the implementation of future projects. We expect that the management will be committed to implement the green audit recommendations.



CHAPTER 1

INTRODUCTION

Green Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. It aims to analyze environmental practices within and outside of the concerned sites, which will have an impact on the eco-friendly ambience.

Green audit can be a useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of **Green** impact on campus. If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. Thus, it is imperative that the college evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

1.1. OBJECTIVES OF GREEN AUDIT

The Green Audit of an institution is becoming a paramount important these days for self-assessment of the institution, which reflects the role of the institution in mitigating the present environmental problems. The college has been putting efforts to keep the environment clean since its inception. But the auditing of this non-scholastic effort of the college has not been documented. Therefore, the purpose of the present green audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards. The main aim objectives of this green audit are to assess the environmental quality and the management strategies being implemented in **ACS College of Engineering**.

The specific objectives are:

1. To assess the source and quantity and of the water in the ACS College of Engineering campus
2. To know and monitor the energy consumption pattern in the campus
3. To quantify the liquid and solid waste generation and management plans in the campus.
4. To assess the carbon foot print of the Campus
5. To impart environment management plans to the campus and college

Benefits of Green Audit to an Educational Institute:

There are many advantages of green audit to an Educational Institute:

- It would help to protect the environment in and around the campus.
- Recognize the cost saving methods through waste minimization and energy conservation.
- Find out the prevailing and forthcoming complications.
- Empower the organization to frame a better environmental performance.
- It portrays good image of institution through its clean and green campus.

NAAC criteria VII Environmental Consciousness:

Universities are playing a key role in development of human resources worldwide. Higher education institutes campus run various activities with aim to percolate the knowledge along with practical dimension among the society. Likewise different technological problems higher education institutes also try to give solution for issues related to environment. Different types of evolutionary methods are used to assess the problem concerning environment. It includes Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Carbon Footprint Mapping, Green audit etc.

National Assessment and Accreditation Council (NAAC) which is a self-governing organization that declares the institutions as Grade according to the scores assigned at the time of accreditation of the institution. Green Audit has become mandatory procedure for educational institutes under Criterion VII of NAAC. The intention of green audit is to upgrade the environmental condition inside and around the institution. It is performed by considering environmental parameters like water and wastewater

accounting, energy conservation, waste management, air, noise monitoring etc. for making the institution more eco-friendly.

Students are the major strength of any academic institution. Practicing green actions in any educational institution will inculcate the good habit of caring natural resources in students. Many environmental activities like plantation and nurturing saplings and trees, Cleanliness drives, Bird watching camps, No vehicle day, Rain water harvesting, etc. will make the students good citizen of the country. Through Green Audit, higher educational institutions can ensure that they contribute towards the reduction of Global warming through Carbon Footprint reduction measures.



CHAPTER – 2

ACS College of Engineering

2.1. ABOUT ACS College of Engineering

ACS College of Engineering, Kambipura, Mysore road, Bangalore, Karnataka is a self-financing co-education and regular college affiliated to Visvesvaraya Technological University, Belagavi, Karnataka. The college was established on 23-06-2009. The college received AICTE approval on 02-07-2021, VTU affiliation on 22-03-2021. The affiliating university act provides provision for availing autonomy.

The college is located in Bangalore urban with campus area of 5 acres and built-up area of 28,686 sq. mtrs. The college also has auditorium, playground, gymnasium, and other sports facilities. The college has swimming pool, boys & girls' hostel, and quarters for faculties. The college provides cafeteria, health center with fulltime qualified doctors and nurses. In addition the campus provides banking, transport, and generator facilities. The college offers the undergraduate programs viz; Aeronautical Engineering, Aerospace Engineering, Biomedical Engineering, Civil Engineering, Computer Science Engineering, Electronics and Communication Engineering and Mechanical Engineering and post-graduate program in Structural Engineering. The college also provides the excellent research facilities in Aeronautical, Biomedical, Civil, CSE, ECE, ME, Physics, Chemistry and Mathematics departments. The total student enrolled in the academic year 2020-2021 is 1254. The unit cost of education is Rs.86,389 and Rs.44,805 with salary and excluding salary component respectively. The college doesn't offer any programs in distant education mode and has teacher student ratio of 1:8. The college has been accredited by NAAC with A Grade in 1st cycle on 2016.

The ACS College of Engineering, since the time of its inception has been instrumental in revolutionizing the development of technical skills along with managerial propensity through latest innovative teaching methods and infusing a value system in order to create dynamic leaders of the future.

Exposing the young and budding engineers to the world of latest technology, ACS

Green Audit Report-2020-21

College of Engineering provides the appropriate platform and the right kind of ambience to instill within the burgeoning engineers, the desired kind of professional attitude, traits and aspirations.

The intensive focus in the field of education has for sure created immense opportunities for the Engineering students, thus enabling them to seek propitious careers. The commitment towards personal concomitant students' betterment has resulted in the provenience of ACS College of Engineering.

ACS College of Engineering provides highly innovative, skill based university affiliated courses which accredit the young generation to get the right career break in the desired fields. The institution not only provides quality education to the students but also groom them to face life with immense confidence. The Education imparted here not only focuses on academic enrichment but also nurtures complete development of personality of the individual who becomes an integral part of it.



Figure: Aerial view of ACSCE College

INFRASTRUCTURAL FACILITIES

ACS college of Engineering has adequate infrastructural facilities as per the AICTE requirements. ACS College has adequate number of ventilated classrooms, Laboratories, Smart Classrooms (ICT enabled), Seminar halls, Computer Labs, Research Centers, HOD cabins, Staff cabins, Common rooms, Rest rooms, Central & Department Library and Convention hall. The management consistently interacts with the stake holders to improve the infrastructure facilities.

Infrastructure and Laboratories: The College is located in a beautiful lush green landscape, free from polluted environment and excellent atmosphere and ambience ideally suited for growth of the soul & mind.

It is located behind RRMCH on the Bengaluru-Mysore Highway 15 Km from the Bengaluru City Railway Station and 2 km from Kengeri Railway Station. Campus Area is of 28,686 Square Meters.

Classrooms and Halls: ACS College of Engineering has 40 class rooms, 66 laboratories, smart class rooms, 05 seminar halls, 28 rest rooms and 12 common rooms.

Laboratories: The institution has laboratories as per AICTE norms. ACSCE has 66 laboratories with state of art laboratory equipments. The labs are well equipped with safety norms with list of experiments details. Labs are used by the students beyond the working hours for doing their projects. Also the college has established UC Berkeley and Intel intelligent System laboratory to bridge the gap between industry and academics.

Library: Apart from the books available in the library, students can also access online E-resources such as digital library to widen their knowledge and skills. The working time of library is from 9.00 am to 7.00 pm in working days and from 9.00 am to 4.00 pm in the holiday. Library has 16655 books, 70 Journals and 182 Project reports.

2.2. UNDERGRADUATE PROGRAMS

- Civil Engineering
- Mechanical Engineering
- Computer Science and Engineering
- Electronics and Communication Engineering
- Aeronautical Engineering
- Aerospace Engineering
- Biomedical Engineering

2.3. POST GRADUATE PROGRAMES

- Product Design & Manufacturing (Mech)
- Structural Engineering (Civil)
- Aeronautical Engineering (AE)
- PhD Programs

2.4. VISION

Engineering the future of the nation by transforming the students to be technically skilled managers, innovative leaders and environmentally receptive citizens.

2.5. MISSION

To implement holistic approach in curriculum and pedagogy through Industry Integrated Interactions to meet the needs of Global Engineering Environment.

To develop students with knowledge, attitude and skill of employability, entrepreneurship (Be Job creators than job seekers), research potential and professionally ethical citizens.

2.6. GOALS

- Providing high quality medical graduates not only competent in their respective fields, but are also motivated to serve humanity at large.
- Producing research papers in all fields of medical sciences, worthy of being published by National & International Journals.
- Providing all facilities for the pursuit of medical knowledge, relevant to the needs of contemporary society.
- Implementing public services beneficial to and relevant with the needs of the community at large, nationally and internationally.

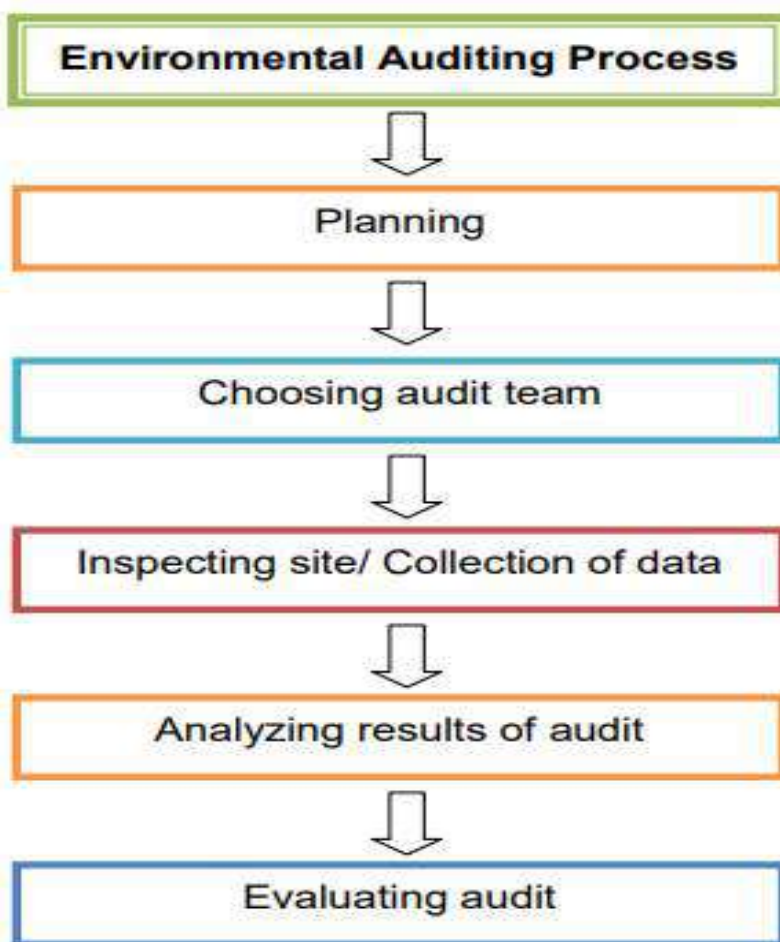
2.7. EDUCATIONAL OBJECTIVES

- To provide for instruction in training in such branches of learning as it may deem fit.
- To provide for research and for the advancement of and dissemination of knowledge.
- To undertake extra moral studies, extension programs and field outreach activities to contribute to the development of Society.
- To undertake the activities to strengthen the set objectives.

CHAPTER – 3

METHODOLOGY ADOPTED

The audit process was carried out in three phases. At first, all the secondary data required for the study was collected from various sources, like concerned departments as engineering, hostel, garden etc. A broad reference work was carried out to clear the idea of green auditing. Different case studies and methodologies were studied and the following methodology was adopted for present audit. The methodology of present study is based on onsite visits, the personal observations and questionnaires survey tool. Initially, based on data requirement, sets of questionnaires were prepared. The surveyors then visited all the departments of the university and the questionnaires were filled. The generated data is subsequently gathered and used for further analysis. From the outcome of the overall study, a final report is prepared.



3.1. SURVEY BY QUESTIONNAIRE:

Baseline data for green audit report preparation was collected by questionnaire survey

method. Questionnaires prepared to conduct the green audit in the university campus is based on the guidelines, rules, acts and formats prepared by Ministry of Environment, Forest and Climate Change, New Delhi, Central Pollution Control Board and other statutory organizations. Most of the guidelines and formats are based on broad aspects and some of the issues or formats were not applicable for University campus. Therefore, using these guidelines and formats, combinations, modifications and restructuring was done and sets of questionnaires were prepared as solid waste, energy, water, hazardous waste, and e-waste. All the questionnaires comprise of group of modules. The first module is related to the general information of the concerned department, which broadly includes name of the department, month and year, total number of students and employees, visitors of the department, average working days and office timings etc. The next module is related to the present consumption of resources like water, energy, or the handling of solid and hazardous waste. Maintaining records of the handling of solid and hazardous waste is much important in green audit.

There are possibilities of loss of resources like water, energy due to improper maintenances and assessment of this kind of probability is necessary in green audit. One separate module is based on the questions related to this aspect. Another module is related to maintaining records, like records of disposal of solid waste, records of solid waste recovery etc. For better convenience of the surveyor, some statistics like, basic energy consumption characteristics for electrical equipment etc. was provided with the questionnaires itself.

Onsite visit and observations:

The ACS College of Engineering has vast built-up area comprising of various departments, administrative building, teachers and staff quarters, student hostels, guest house, sports complex and health center. All these amenities have different kind of infrastructure as per their requirement. All these buildings were visited by the surveyors and the present condition is checked with the help of the questionnaires. Personal observations were made during the onsite visit. All the amenities were clubbed in as per their similarities and differences, which makes the survey and further analysis easier.

Data analysis and final report preparation:

A proper analysis and presentation of data produced from work is a vital element. In case of green audit, the filled questionnaires of the survey from each group, were tabulated as per their modules, in Excel spreadsheets. The tabulated data is then used for further analysis. For better understanding of the results and to avoid complications, averages and percentages of the tables were calculated. Graphical representation of these results was made to give a quick idea of the status. Interpretation of the overall outcomes was made which incorporates all the primary and secondary data, references and interrelations within. Final report preparation was done using this interpretation.

- In order to meet its objectives, this audit combined physical inspection with a review of relevant documentation and interviews with various stakeholders.
- Review of the Documentation
- For the purpose of this audit the Green Policy of the institute was reviewed.
- Interviews
- Interviews were conducted with the Principal's, Registrar and also faculties and students.
- Physical Inspection
- The audit team was in the college to inspect the campus.

3.2. LIST OF STUDENTS AND STAFF INVOLVED IN GREEN AUDITING

| Sl No | Name | Designation |
|--------------|----------------------|-------------------------------------|
| 1. | Dr. M.S. Murali | Principal |
| 2. | Mr. Sunilraj B.A | Asst. Professor. Dept. of Mech Engg |
| 3. | Dr. Selvanandan | Professor, Dept. of Physics |
| 4. | Mr. Athipathi | Estate Officer, ACSCE |
| 5. | Dr. Gayathri | Asst. Professor, Dept of Civil Engg |
| 6. | Mr. Srinidhi Acharya | Asst. Professor. Dept. of Mech Engg |
| 7. | Ms. Pooja | Student, Dept. of Mech Engg |
| 8. | Mr. Jayaprakash | Student, Dept. of Civil Engg |
| 9. | Mr. Praveen Gowda | Student, Dept. of Civil Engg |
| 10. | Ms. Kruthika | Student, Dept. of Civil Engg |

CHAPTER – 4

GREEN AUDIT

**ECO -FRIENDLY CAMPUS & GREEN PRACTICES IN ACS COLLEGE OF
ENGINEERING**

4.1. AREAS OF GREEN AUDITING

4.1.1. ENERGY AUDIT

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

4.1.2. WATER AUDIT

Water audit can be defined as a qualitative and quantitative analysis of water consumption to identify means of reducing, reusing and recycling of water. Water Audit is nothing but an effective measure for minimizing losses, optimizing various uses and thus, enabling considerable conservation of water in irrigation sector, domestic, power and industrial as well. A water audit is a technique or method which makes possible to identify ways of conserving water by determining any inefficiencies in the system of water distribution. The measurement of water losses due to different uses in the system or any utility is essential to implement water conservation measures in such an establishment.

This indicator addresses water consumption, water sources, irrigation, storm water, appliances and fixtures. Aquifer depletion and water contamination are taking place at unprecedented rates. It is therefore essential that any environmentally responsible institution should examine its water use practices.

It is observed that a number of factors like climate, culture, food habits, work and working conditions, level and type of development, and physiology to determine the requirement of water. The community which has a population between 20,000 to 1,00,000 requires 100 to 150 liters per person (capita) per day. The communities with a population can consume over 1, 00,000 requires 150 to 200 liters person (capita) per day. As per the standards provided by WHO Regional office for South East Asia 10-15 liters per student if water-flushed toilets, Administration requires (Staff accommodation

not included) 50 liters per person per day, Staff accommodation requires 30 liters per person per day and for sanitation purposes it depends on technology.

4.1.3. BIODIVERSITY AUDIT

All plant and animal species - including humans - are linked together in a complex web of life; we depend upon biodiversity for our survival. Biodiversity is the key to healthy ecosystems and ultimately a healthy planet. It keeps the air and water clean, regulates our climate and provides us food, shelter, clothing, medicine and other useful products. Each part within this complex web diminishes a little when one part weakens or disappears. The trees work hard to keep the air we breathe clean and healthy. Their leaves take in much of the poisonous unwanted carbon dioxide in the air, and replace it with the oxygen we need for healthy living. In this process, the plants with the help of sunlight, water, minerals and the green material called Chlorophyll within the leaves change the carbon-dioxide into food for themselves. When doing this they release oxygen into the air which is vital for all life on earth. The roots of trees dig deep into the earth and hold it together so that the rain and wind cannot wash or blow it away. This is very important as the earth has only a very thin layer (seldom more than one foot) of fertile soil covering it.

4.1.4. BIODEGRADABLE AND HAZARDOUS WASTE AUDIT

This indicator addresses biodegradable waste from college and hostel canteen, paper waste to hazardous wastes of laboratories and worn-out electric & electronic goods, and plastic wastes. Hazardous materials represent significant risks to human health and ecological integrity. Hazardous wastes are also leached out through the e-waste generated in the campus. They often persist in the environment leaving a legacy of land and water contamination for generations. They also accumulate in the tissues of organisms and become concentrated within food chains, leading to cancer, endocrine disruption, birth defects, and other tragedies. The minimization, safe handling, and ultimate elimination of these materials are essential to the long-term health of the planet.

4.2. LAND AREA STATEMENT

The land under the project is designated for educational activities as per Karnataka Government. No additional burden on land has been created which may adversely affect land use pattern in the area. No natural drain is being obstructed. The University land does not interfere with any forest, wetland, river, lake, mountain, national park & sanctuary etc.

The total area of campus – **20,234 Sq.mt.**

| Building Area Abstract | | |
|-------------------------------|--------------------|------------------------|
| Sl.No | Floor wise | Area in Sq. Mtr |
| 1 | Lower Ground Floor | 2558.8 |
| 2 | Ground Floor | 3713.93 |
| 3 | First Floor | 3888.93 |
| 4 | Second Floor | 3789.07 |
| 5 | Third Floor | 3621.07 |
| 6 | Fourth Floor | 3705.07 |
| 7 | Fifth Floor | 3705 |
| 8 | Sixth Floor | 3705 |
| | Net Total | 28,686.87 |

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| Sl.No | Particulars | Area in Sq. Mtr |
|-------|---------------------|------------------|
| 1 | Instructional Area | 14959 |
| 2 | Administration Area | 4235 |
| 3 | Amenities Area | 1393 |
| 4 | Circulation Area | 8099.87 |
| | Net Total | 28,686.87 |

4.3. WATER REQUIREMENT:

The total water requirement for the University is 80 KLD. Water quality of ground water resources in the area has been studied for assessing the water environment. Borewell and rain water are being used in the campus. Rain Water Harvesting has been provided for recharging the aquifer to compensate withdrawal to some extent.

| Total requirement of water in KLD | |
|--|--|
| Fresh | 50 |
| Recycled | 30 |
| Total | 80 |
| Source of water | Bore well and Rainwater |
| 1. Whether canteen facility provided for day students etc | Yes |
| 2. Waste water generation in KLD | 300 KLD |
| STP capacity | 300 KLD |
| Technology employed for Treatment and mode of disposal of treated sewage | STP |
| Scheme of disposal of excess treated water if any | Gardening, Lawns, Toilet and Flush out |
| Any Treatment for lab water | - |
| No. of ponds, wells, taps, toilets, waterless urinals | 01 Pond 01 Open Wells 498 Taps 92 Toilets |
| No. and capacity of water tanks for storage | 40,000 litres |

4.4. WASTE WATER GENERATION

About 300 m³/day of wastewater is being generated.

4.5. WASTE WATER MANAGEMENT

The Institution follows the systematic procedure for proper management and disposal of liquid waste. The wet waste from the college, hostels and canteen is given away to bio fertilizer plants for making eco-friendly fertilizers. A sewage treatment plant for the college is being conceived. This treated water is then used for the gardening and other purpose. Institution also conducts discussions with students to make them aware about the liquid waste management techniques.

- To treat the domestic and other waste waters, the sewage treatment plant (STP - 1 no) has been installed and successfully operated within the premises. The STP capacity is 300 KLD to handle the waste waters generated from College building, Hostels, Canteens and recreational areas such as gymnasium etc.
- The sewage generated from the buildings is directly discharged into the STP and is treated.
- The treatment scheme comprises of a biological treatment called ASP/SBR system wherein the aerobic bacteria stabilizes all the organic matter, neutralizes the microbial population
- The STPs have been performing smoothly and deliver effluents with BOD values below 10 mg/l. The aerobic treatment followed by disinfection results in microbe concentration below 100 units as stipulated in the consent. Likewise all other listed parameters are also complied with. Analysis reports are regularly forwarded to the KSPCB.

RECYCLE AND REUSE OF TREATED WASTE WATERS:

The institution installed a sewage treatment plant for the treatment of waste waters originating from the college, hostels, staff quarters and canteen areas. The sewage from the ACS College, hostels and staff quarters is treated in 300 KLD STP near cricket



ground. Generally, the STPs are operated below 80% capacity levels and depending upon semester breaks the influent fluctuations are accordingly smoothened. On an average 200-250 KLD of treated waste water is available for its reuse. Biologically treated waste water is disinfected using liquid chlorine prior to its pumping for the uses. As per KSPCB stipulations, the treated waste waters are reused within the campus as out lined in the following paragraphs.

In general, the STP is operated at not more than 80 % of the designed capacity and at much lower capacity during vacations, lock down etc. The treated waste waters from STP is utilized for the following activities:

- Gardening and maintaining greenery within the campus. (70 %)
- For construction and curing activities within the campus (20%)
- Secondary flushing in toilets in the hostel buildings. (5%)
- Dust suppression as and when required. (1%)
- Buses and other vehicles washing within the campus. (4%)

➤ Treated water used for maintaining Grass Mat Cricket Ground:

A cricket ground measuring as large as **14,500 sq m** is provided with grass mat that is maintained round the year on top priority. Since grass has small and shallow roots (as against large and deep roots of tall trees) the water demand is also high (Evaporation-transpiration) frequent watering is required to ensure very survival of the grass. A sprinkler system has been provided for this purpose. In general a total of **140 KL** is required on any non-monsoon day.

➤ Bus/Car Washing:



The institute operates a fleet of 6 Buses and other vehicles. Additionally the students staying in the premises also use the treated water to wash their cars and two wheelers. Provision of **5 KLD** has been made for the purpose.

Activities:

➤ Ongoing Construction



For general maintenance works as well as other ongoing construction activities (Concreting and curing) in the premises also make use of treated water which is quite fluctuating in nature. Nevertheless, a provision of **10-20 KLD** has been made.

Photo: Ongoing Construction Works

➤ Kitchen Gardening:



Few patches in the premises are used to grow vegetables (on Trial basis) which are often watered with treated water. The demand here could be approximated to **2 KLD** during non-monsoon time.

Photo: Kitchen Gardening near Mess Area

➤ Green Belt Development:

A Green zone has been developed with short, medium and tall trees along with other horticultural development and vacant areas in the campus. This also requires regular watering for the survival. Through the hydrant systems network, the treated water is pumped from the STP and a total of **110 KLD** is utilized for the purpose.

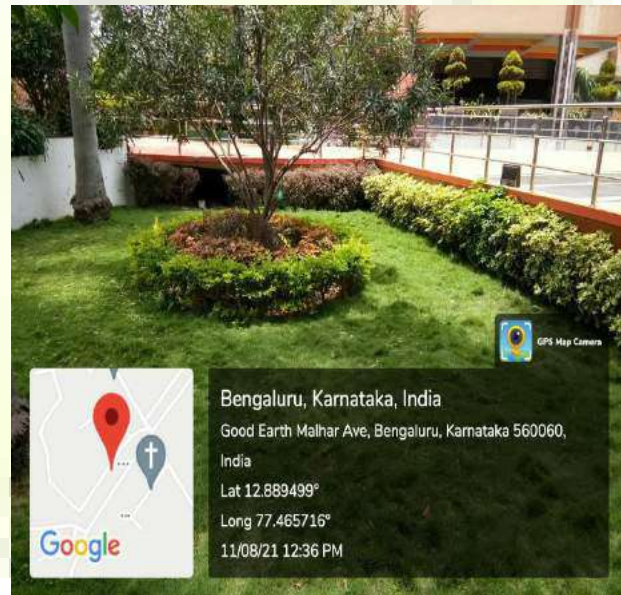
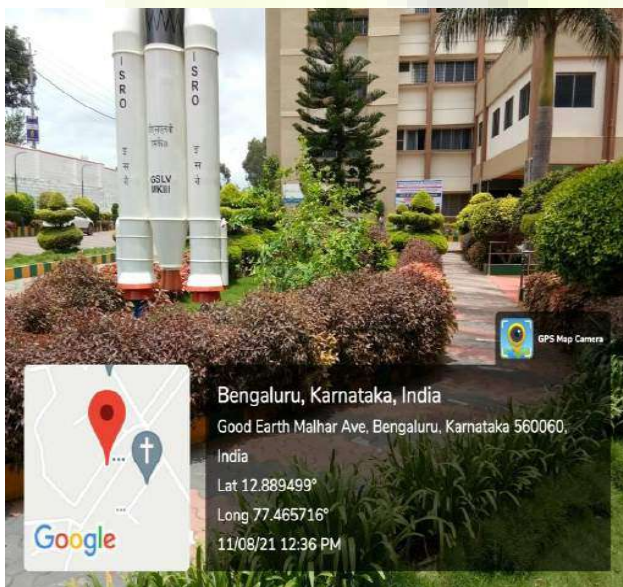


Photo: Green Belt Development at ACSCE

4.6.1. EXISTING WATER MANAGEMENT METHODS INSTALLED IN THE CAMPUS

1. Rain water harvesting
2. Bore well /Open well recharge
3. Construction of tanks and bunds
4. Waste water recycling
5. Maintenance of water bodies and distribution system in the campus

1. Rain Water Harvesting:

Rainwater harvesting system, also called rainwater collection system or rainwater catchment system, technology that collects and stores rainwater for human use. The stored water is used for gardening and raw use. Besides natural percolation tanks, concrete storage tanks have also been built and rain water has been stored after proper filtration paving the open places with concrete roads is avoided so that rain water can be percolated



➤ The rainwater harvested during rains not only helps to save water from conventional sources, but also to save energy and reduce expenses incurred on transportation and distribution of water. Awareness programmes on water conservation and rain water harvesting have been conducted regularly through various service of the college.

➤ In order to minimize the abstraction of ground waters, maintain the underground water table and control the hardness of the water supplied in the campus, the rain water potential has also been estimated for its tapping.

- As per the scheme the roof top water shall be collected in the underground tanks/ sumps, whereas the water collected from paved and unpaved areas shall pass through grease cum silt trap and clean water shall be either directly used or shall be used for recharging the existing bore wells within the campus as per drawings. One such Rain water harvesting tank near Students mess is shown below. Similar structures shall be replicated at different locations within premises and other institutions. The institution has roof top rain water harvesting system which is installed on the roof of the institution.

2. Borewell and Open well (Pond) Recharge:

As the water crisis continues to become severe, there is a dire need of reform in water management system and revival of traditional systems. As a part of revival to traditional wisdom, in this institute we built a pond to collect and storage the rainwater for reuse on-site, rather than allowing it as run off.





Photo: Borewell Recharge System in the Campus Photo: Open Well (Pond) Recharge

3. Waste Water Recycling

- In order to treat the domestic and other waste waters, the sewage treatment plant has been installed and successfully operated within the premises. The STP capacity is **300 KLD** to handle the waste waters generated from College building, Hostels, Canteens and recreational areas such as gymnasium etc.
- The sewage generated from the buildings is directly discharged into the STP and is treated along with other waste waters.
- The treatment scheme comprises of a biological treatment called ASP/SBR system where in the aerobic bacteria stabilizes all the organic matter, neutralizes the microbial population.
- The STPs have been performing smoothly and deliver effluents with BOD values below 10 mg/l. The aerobic treatment followed by disinfection results in microbe concentration below 100 units as stipulated in the consent. Likewise all other listed parameters are also complied with. Analysis reports are regularly forwarded to the KSPCB.



Photo: Sewage Treatment Plant in operation

Recycle and Re-use of Treated Waste Waters:

In general, the STP is operated at not more than 80% of the designed capacity and at much lower capacity during vacations, lock down etc. The treated waste water from STP is utilized for the following activities;

- i) Gardening and maintaining greenery within the campus. (70 %)
- ii) For construction and curing activities within the campus. (20%)
- iii) Secondary flushing in toilets in the hostel buildings. (5%)
- iv) Dust suppression as and when required. (1%)
- v) Buses and other vehicles washing within the campus. (4%)

4. Construction of Tanks and Bunds:

As the water crisis continues to become severe, there is a dire need of reform in water management system and revival of traditional systems. As a part of revival to



traditional wisdom, the institution built rain water storage tank, to collect the rainwater and can be used whenever it is required. The rainwater storage tank is build near to ACSCE campus, Faculty Quarters, Boys Hostel and Girls Hostel, ACSCE Convention Centre.

Photo: Tank to Store Rain Water

5. Maintenance of water bodies and distribution system in the campus

The ground water is pumped into storage tanks located at different places in the campus. There are few numbers of over head storage tanks. The water is distributed through well laid pipe network. Drinking water after treating in RO plant is supplied through a separate set of distribution pipes and water for all other purpose is supplied through another set of distribution pipes. Entire distribution system is well supervised by Civil works people to ensure that there are no leakages and wastages of precious water through joints, valves etc. Waste usage of water is reduced using low pressure flushes. All the stakeholders of the college are well educated to use water economically and efficiently.



Photo: Over Head Tank in the campus building



Photo: Underground water Storage Tank in the Campus



Photo: Water Bodies Distribution Line in the campus building
4.6. SOLID WASTE MANAGEMENT

The main producers of Solid waste in campus include, Canteen waste, hostel kitchen waste, Institutional waste, and staff quarters. Most of the Dry waste in campus is stored at a transfer station within the campus. The solid waste generated in the constituent colleges will be mostly waste papers, answer sheets and domestic waste like kitchen waste.

The college makes necessary arrangements for disposal of solid waste. Domestic waste is handed over to village panchayats. 5 kg of non-biodegradable waste is generated.

The Institution implements solid waste management by enforcing the waste segregation rules. Dustbins are placed in every classroom, laboratory, rest room, and mess at different locations in the campus. Sweepers are allotted to each floor who manages all the waste generated in the campus. All waste/garbage from college and hostel is segregated at source and disposed of in a proper manner. The wet waste from the hostels/ canteen is given away to bio fertilizer plants for making eco-friendly fertilizers. Wastes like newspapers and stationary is sold to proper recycling agencies/vendors. Through recycling the transport of large quantities of garbage to far-off dumps has been reduced. The institution has successfully completed and recently commissioned a BIO gas plant to handle 80 kg/day of solid waste. The Institution has organized Swachh Bharat Mission. Under this banner the utility of recycling the solid waste has been elaborated. People from different aspects of life delivered their talks about the proper usage of waste. Moreover, the NSS volunteers have also demonstrated the proper procedure of disposing the waste.

| Waste Management | |
|--|---|
| Quantity of biodegradable waste generation and mode of disposal as per norms | 52.5 kg/day to Bio gas plant |
| Quantity of non-biodegradable waste generation and mode of disposal as per norms | 22.5 kg/day of plastics and paper sold to vendors |
| Quantity of hazardous waste generation and mode of disposal as per norms | Waste oil: 20 litre/year sold to refine Waste Batteries: 5 Batteries/yr exchanges with new battery |
| Quantity of E-waste generation and mode of disposal as per norms | E-waste 40 kg/yr sold to recycling companies |

Biogas Plant:

The institution has successfully completed and recently commissioned a BIO gas plant to handle 80 kg/day of solid waste. This is an in-house design developed involving engineering students (from ACSCE) in the surveys for the estimation of solid waste generated on day today basis. The construction was also taken up by in-house civil team.

The salient features of the Bio-gas systems are listed as below:

- The biogas plant receives the solid wastes from canteen (leftover cooked and uncooked foods), student mess, hostels, staff quarters and college buildings.
- The biogas plant comprises of a floating dome bio-digester, flame arresters, gas compressors, gas metering and gas stoves provided in the kitchen. The feeding line is also designed at two locations so as to simultaneously feed other waste for Research and enhancement of Bio-gas production
- A settling cum filtration unit has also been commissioned to separate digested solids from the liquid. The dried solids are to be further used as compost/soil conditioner. It is estimated that almost 70 kg of dry solids may be recovered per day.
- The filtrate is recycled back to the feeding tray of the crushing unit to dilute the solid food waste prior to its entry into the Bio Digester.
- The biogas recovered is directly used in the kitchen nearby, through the underground GI pipe line fitted with the flame arresters as fire safety.

- The segregation of wet waste and dry waste is under implementation within the campus so as to divert all the wet wastes to the bio-digester.
- The area around the biogas plant is paved with the concrete paver blocks to maintain cleanliness and hygienic.
- The plant design is in such manner as to expand conveniently in future and/or convert the existing system into a two reactor system for better efficiencies.



Photo: View of the new Biogas Plant at ACSCE

E-waste management:



Photo : E- Waste Storage

The Institution has undertaken a number of E-waste Management initiatives with the objective of creating an eco-friendly environment in the campus. E-waste such as computers and its peripherals are upgraded regularly to continue usage and to avoid its wastage.

4.7. ENERGY MANAGEMENT

Energy conservation is an important aspect of campus sustainability which is also linked with carbon foot print of the campus. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices.

| Energy & power details | |
|--|--|
| Electricity charges | Rs. 5,55,000 per month on an Average |
| Number of Gas cylinders used per month | 01 cylinder for lab for 3 months 01 cylinder /month 28 cylinder/month in the Mess |
| Number of Diesel Generators | 02 i.e 180 KVA, 125 KVA |
| Quantity of Diesel consumed Cost of generator fuel | 35 litre/hr for 180 KVA 22 litre/hr for 125 KVA Cost of Generator fuels i.e Diesel is Rs. 85/litre |
| Total number of CFL bulbs | - |
| Number of LED lights----- Incandescent bulbs----- fans----- AC's----- Tube lights----- electrical instruments----- computers----- photocopiers----- T.V's. etc.----- | 1347 Led bulbs 662 fans 22 AC's Tube lights 662, Computers - 547 Xerox machine -2 T.V. - 2 |

4.8. SOLAR ENERGY

Solar Thermal Energy Harnessing:



In order to conserve the electrical energy in the boys and Girls Hostels, a total of 96 Solar Water Heating Panels and 12 tanks have been installed and operated on day today basis. This has eliminated the use of electrical geysers in the hostels as the hot water is required round the year in Bangalore climate

Photo: Solar Panels for water heating

b. Solar Street Light:



The Solar street lights are also installed in various part of the campus in order to reduce the conventional electricity usage

Photo: Solar Street Light

AIR ENVIRONMENT

- In the University campus during construction in any stage water will be sprinkled on the soil to avoid dust generation.
- The debris and unused construction debris will be removed immediately for recycling, if any, or for designated land fill
- All vehicles for service activities at the University will be checked for vehicular emission. The agencies will be asked to keep them within prescribed limits. They will also be asked to maintain them properly.
- As discussed earlier there will be no other point source of Air pollution, which are noise free. Chimneys of suitable height have been provided to control the G.L.C. of PM 2.5, PM10, SO₂, & NO_x levels. Extensive tree plantations have been resorted to for further improving the air environment in general and minimize noise levels.

4.10.1. AIR EMISSIONS AND NOISE LEVELS

The University has installed noise free generators for power backup. No other point source of emissions like boiler, furnace etc. to run on fossil fuels, have been provided. So, the University does not generate Air & Noise Pollution.

4.10.2. TRAFFIC DENSITY

The students are not allowed to keep their own vehicles in the hostel. The University has its own buses for local students. The layout has been planned to provide adequate space for parking within the campus.

4.10.3. CARBON FOOTPRINT

Burning of fossil fuels (such as petrol) has an impact on the environment through the emission of greenhouse gases into the atmosphere. The most common greenhouse gases are carbon dioxide, water vapour, methane, nitrous oxide and ozone. Of all the greenhouse gases, carbon dioxide is the most prominent greenhouse gas, comprising 402 ppm of the Earth's atmosphere. The release of carbon dioxide gas into the Earth's atmosphere through human activities is commonly known as carbon emissions. Vehicular emission is the main source of carbon emission in the campus, hence to assess the method of transportation that is practiced in the college is important.

| Carbon footprint | |
|---|------|
| No of persons using bicycles (Approx.) | 03 |
| No of persons using cars (Approx.) | 21 |
| No of persons using two wheelers (Approx.) | 225 |
| No of persons using other transportations (Approx.) | 1091 |
| No of visitors per day (Approx.) | 85 |
| No of students staying in hostel | 150 |
| No of faculty and staff staying in staff quarters | 10 |
| Total Number of students | 1254 |
| Total No. of faculty and staff | 272 |

4.9. GREEN AUDIT (Ecology & Bio -Diversity)

FLORA

The campus has a rich collection of trees. About 50 tree species were identified. Most of the plants have important role in the maintenance of biodiversity and are the good carbon assimilators. Herbal garden and other ornamental gardens were maintained in the campus.

Apart from records of Forest department, field surveys were undertaken to study the vegetation and floral components in the campus. Apart from this Vanamahotsav (Tree Plantation) is celebrated every year in the campus in the way of conducting green gradation and green initiatives.



Figure: Flora at college campus

4.11.1. FAUNA

Prolific wild life is not observed in the University campus, as there is no thick forest/ vegetation is noticed in the University Campus.

| FAUNAL GROUP | SCIENTIFIC NAMES |
|---------------------------|---|
| SPIDERS | Myrmachne orientalis (Family Salticidae); Nephilapipes (Family-Nephilidae); Heteropoda sp (Family-Sparassidae); Phintella vitatta (FamilySalticidae) |
| MOTHS & BUTTERFLIES | Antheria assmensis; Bombyx mori; Philosamia ricini; Junonia atlites atlites ; Commander (Moduza procris procris); Ethope himachala ; Melanitis leda leda ; Paltoporia paraka paraka; Ypthima baldus ; Acraea terpsicore ; Elymnias, hypermnestra, undularis; Mycalesis perseus blasius; Tanaecialepidealepidae; Euploea core core |
| OTHER INSECTS | Scarlet dragonfly; Pantala flavescens (wandering glider), grasshoppers, microbes |
| REPTILES | squirrels, mouse, snake, lizard |
| BIRDS | Acridotheres tristis (Common myna); Streptopelia orientalis (Oriental Turtle Dove); Athene noctua (little owl); Pycnonotus cafer (Red-vented Bulbul), crows, sparrows, peacock |
| MAMMALS | Monkeys, Dogs, Cats |

CONCLUSION AND RECOMMENDATIONS

ACS College of Engineering has always taken a green agenda for developing a green campus. Despite being primarily a technological institution, it has shown remarkable awareness in maintaining an eco-friendly campus. On visiting the Campus, one can experience the aesthetic and elegant buildings, splendid lawns, spacious sports grounds and lush green environment conducive for teaching-learning process.

1. The institutional initiatives for greening the campus are as follows:

- Restricted entry of automobiles
- Battery powered vehicles
- Pedestrian Friendly pathways
- Ban on use of Plastic
- Landscaping with trees and plants

1. RESTRICTED ENTRY OF AUTOMOBILES



The college operates a fleet of 6 buses covering each corner of Bengaluru to facilitate the students and staff. The institute encourages the staff and students to use the college transport instead of their own vehicles for safety, security, fuel conservation and to reduce environmental pollution. The college buses are checked for pollution by the

authorized agency.



Photo: Two Wheeler Parking Zone

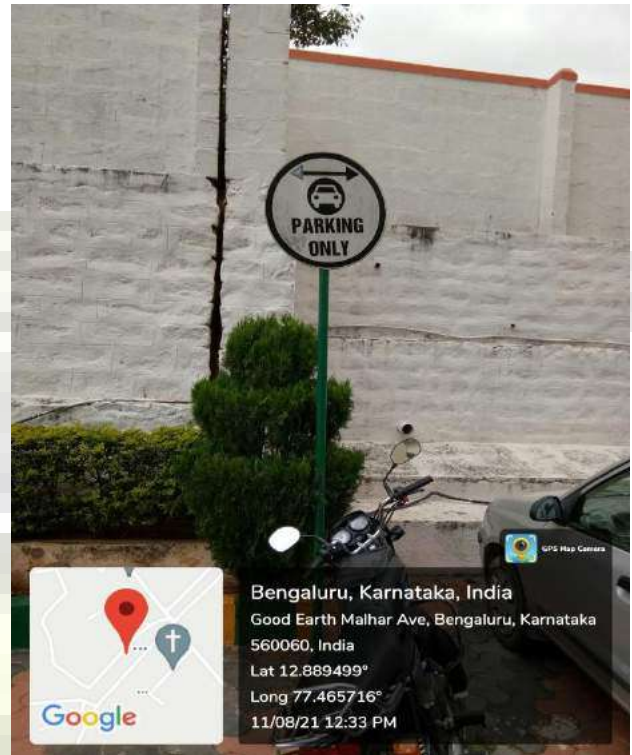


Photo: Four Wheeler Parking Zone

2. BATTERY POWERED VEHICLES

The Management has procured three battery operated carts for the use within the campus to minimize the movement and pollution arising due to fuel driven vehicles with



in the campus. Although, the steep slopes within the campus are not bicycle friendly, yet majority of the students and staff prefer walking within the campus as the same is quite compact. The noise levels in the campus are kept to the minimum due to noise less battery operated carts and minimal movement of automobiles within the campus.

Photo: Battery Operated Vehicle in the Campus

3. PEDESTRIAN FRIENDLY PATHWAYS

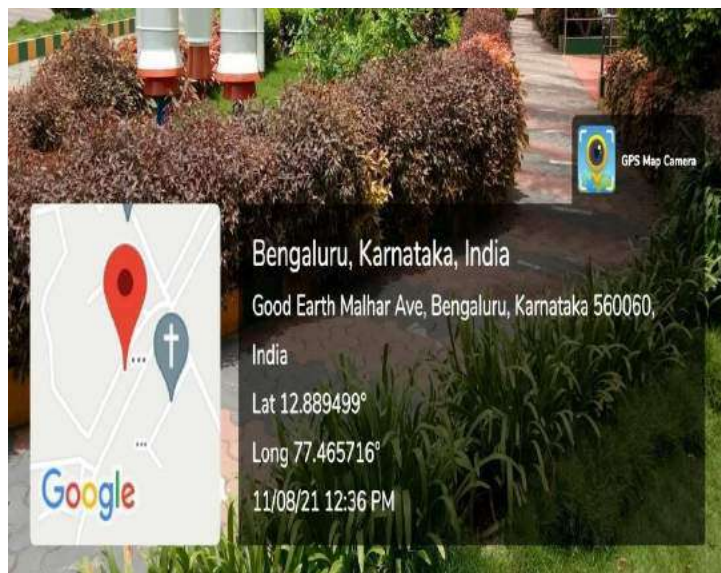


Photo: Pedestrian Path way in the campus

Vehicle parking space is provided at the main entrance of the college campus. As the campus is vehicle free with some exceptions, students and staff experience comfort walking through the pedestrian friendly pathways. The internal roads are lined with trees and solar lights and they are properly maintained by the campus maintenance committee.

4. BAN ON USE OF PLASTIC

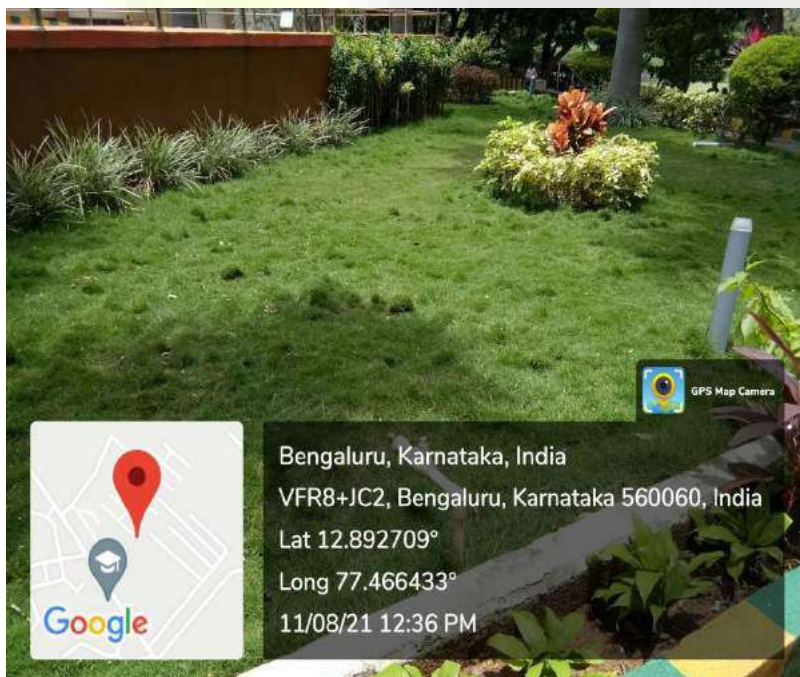


Single-use plastic items such as plastic bottles, bags, spoons, straws and cups are banned completely and awareness is created among staff and students through orientation and display boards in the premises. To restrict the use of plastic, measures have been taken to replace plastic tea cups and glasses with steel glasses in the canteen. The staff and students are informed to use

steel or copper water bottles instead of plastic bottles. The institution also conducted **Unnatha Bharatha Abhiyan (UBA)** activities on the Ban on use of plastics and created awareness to the faculties the localities in and around the campus.

UBA emphasized on the implementation of 'plastic free Campaign' in the adopted villages. Students and faculty members explained the ill effects of plastics and recommended not to use plastics. Instead of plastics, reusable bags can be used which saves the environment and animals. School children and the people of the villages responded and assured that they will say no to plastics and also welcomed the initiative. Students also collected the plastics from the houses and surrounding areas. The campaign was successful in imparting "SWACHHATA HI SEWA" and "Say no to Plastics".

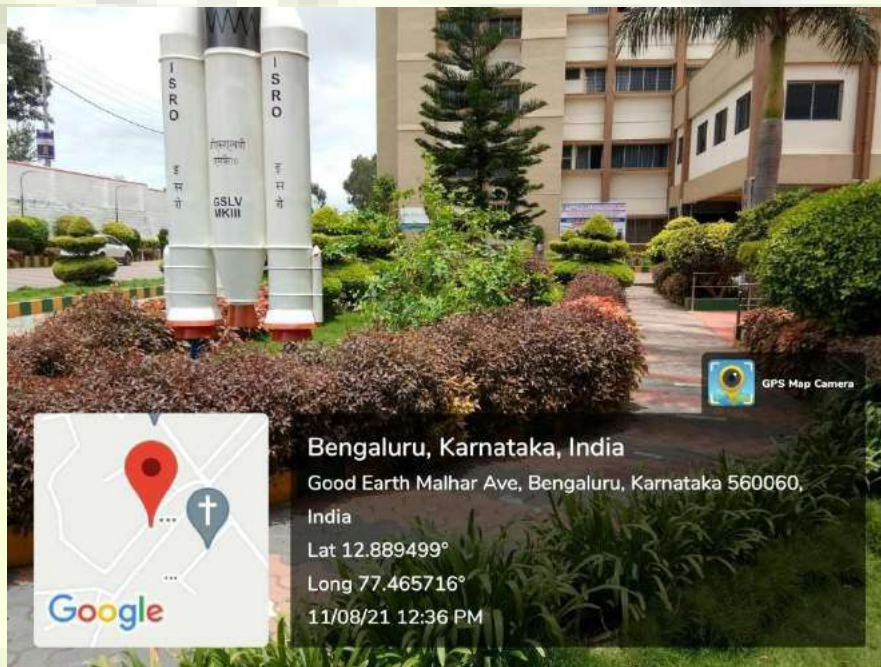
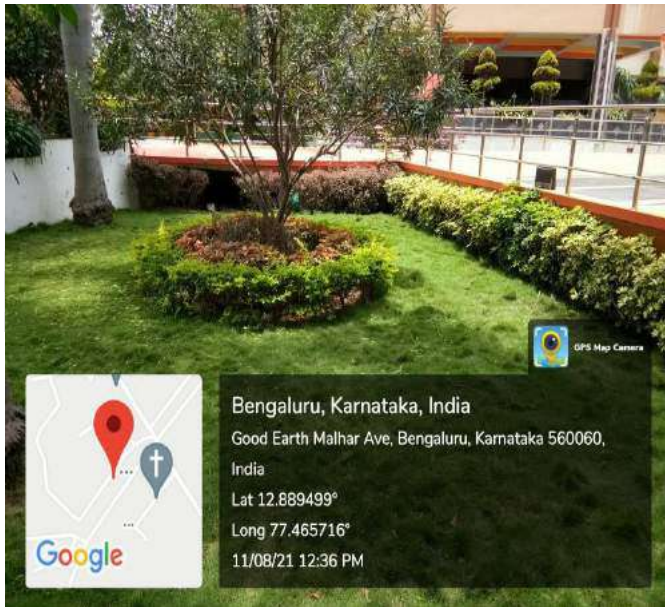
5. LANDSCAPING WITH TREES AND PLANTS



Landscaping of the college is worth seeing and reflects aesthetic sense. The institute has a canopy of trees and plants to make the environment pollution free to safeguard the health of all the inmates. The lawns and the trees provide shade and beautiful ambience. Utmost care is taken to develop and maintain green landscaping by trained gardeners and supervisor. The construction, maintenance people in the college

looks after the development and maintenance of the greenery in the campus. The institute authorities are taking initiatives to make the campus paperless. Internal communication in the campus, through e-mail or e-messages, is driving towards paperless office. Electronic notice boards are installed in the campus to display circulars and information for the students. Electronic gadgets are preferred to transfer and store the official data and information.

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Photos: Landscaping with Tress and Plants

Quality Audits On Environment And Energy Regularly Undertaken By The Institution

Quality audits on environment and energy regularly undertaken by the institution

The institutional environment and energy initiatives are confirmed through the following

1. Green audit
2. Energy audit
3. Environment audit
4. Clean and green campus recognitions/awards
5. Beyond the campus environmental promotional activities

Beyond The Campus Environmental Promotion Activities

ACSCE has an eco-friendly environment. It has a long legacy of healthy environmental practices including periodic plantation, their preservation and maintenance. Its land use is such that about 70 % of the total area is occupied by open land and plantation that generates a better and sustainable campus environment.

The campus environmental promotion activities are:



SWACHHATA HI SEWA Campaign

Unnat Bharat Abhiyan (UBA) is a flagship program of Ministry of Human Resource Development (MHRD), Government of India. Our Institution is one of the Participating Institutions (PI) under UBA. UBA emphasized on the implementation of 'plastic free Campaign' in the adopted villages. In this regard, our institution planned for the event in collaboration with NSS at our adopted villages. About

Green Audit Report-2020-21



100 students of Aeronautical, Aerospace, Civil & Mechanical Engineering volunteered along with four faculty members namely Dr. Suresh P M, Mr. Srinidhi Acharya S R, Mr. Rakesh S of Mechanical Engineering and Mr. Shivashankar of Civil Engineering. Students and faculty members explained the ill effects of plastics and recommended not to use plastics. Instead of plastics, reusable bags can be used which saves the environment and animals. School children and the people of the villages responded and assured that they will say no to plastics and also welcomed the initiative. Students also collected the plastics from the houses and surrounding areas. The campaign was successful in imparting “SWACHHATA HI SEWA” and “Say no to Plastics”

Swaccha Bharatha Abhiyana Program



Photos: Swaccha Bharatha Abhiyana activities

Bheemankuppe Lake Cleaning Campaign



Visit to Bheemanakuppe lake was scheduled on March 6th 2020 for swacch Baharath Abhiyaan. 6th and 4th sem students along with faculties reached the lake with Gloves, Masks, Ginny bags, Dust pans, garbage baskets and brooms. We divided the lake Bank into 6 parts. Each part were assigned to group of 8 students. Bottles, Plastics and papers

were picked from all the parts and completed the cleaning process. The waste sacks were dispatched to the nearby BBMP waste collection unit.

PLANTATION PROGRAM ON 29/3/2021

9 saplings of Indian Beech tree (Honge), Poppy (gasagase) and Neem were planted. Medicinal importance of these plants were also indicated and explained.



National Workshop On Opportunites And Challenges On Renewable Energy Conversion Technologies



ACS College of Engineering, Kengeri, Bengaluru organized a two days National Workshop on Opportunities and Challenges on Renewable Energy Conversion Technologies was sponsored by Ministry of New and Renewable Energy, Government of India during 25th and 26th Feb. 2016.

The various challenges and opportunities in renewable energy conversion technologies were discussed and interacted by the different academic research experts. About sixty participants both external and internal were attended and gained the technical knowledge in the renewable energy domain. The workshop was inaugurated with special address by Dr. H. Nagana Gouda, Director, National Centre for Solar Technology, Bengaluru. He stressed the tapping importance of renewable energy sources on the present energy conservation point of at state and national level. Dr. Nikil PG Senior Research Scientist (Solar), National Institute of Solar Energy, Gurgaon pointed out various opportunities and schemes for the development of renewable energy at national level by Ministry of New and Renewable Energy, Government of India. Dr.M.S.Murali, Principal of ACSCE has welcomed the gathering and pointed out the practicing of renewable energy in day to day life to reduce the dependence of conventional grid. Dr.M.Eswaramoorthy, Convenor of Workshop proposed vote of thanks.

Tree Plantation Activity 2016

The NSS Unit of ACSCE has conducted a Plantation Camp on 23/08/2016 in ACSCE College Road. The Camp was started at 10.00 AM in the morning. The Principal Dr. M.S. Murali inaugurated the camp by planting and watering a plant. After that he addressed all the volunteers about the importance and benefit of this type of camps. Mr. M.S. Shivakumar, NSS Programme Coordinator & HOD Dept. of Chemistry,



motivated the students and volunteers. The faculty members like Dr. Pradeepa S.M, Mr. Venkatesh, Dept. of Chemistry, Mr. Raghavendra K, Dept. of Mathematics have very actively participated & involved in the Camp throughout the day. Senior faculty members such as Dr. Selvanandan, Dept. of Physics, Dr. Veena B.H, dept. of maths, Dr. C.S. Pillai, Dept.

of CSE have also encouraged us during the camp. More importantly, more than 30 NSS volunteers from various branches of ACSCE have attended & carried the camp very enthusiastically with lot of interest. During the camp 75 plants were successfully planted. At the end of the day, NSS unit of ACSCE thanks the management for their continuous support and appreciation for all our activities. Finally, the above mentioned camp was also appreciated by the localities and the passengers who are travelling in that road during the camp.

Say No to Crackers Awareness Program

Department of "Biomedical Engineering, ACSCE has conduct the following Events,

Name of the event:"Rally & awareness programme on "Say No to Crackers"

VENUE: Kengeri Upanagar

DATE:17th October 2017.



Photo: Say no to Crackers Campaign

Industrial Visit to Solar Power Plant

The students of VI semester were taken to Solar Power Plant in Shivanasamudra, Mandya District for Industrial visit on 26.03.2019 that is on Tuesday as a part of Industry interaction to students along with two faculty members. The students assembled in the college at 8:30 am in their class. As the bus arrived at 9:00 am the students boarded the bus and started from college and reached Solar Power Plant in Mandya District at 12:30pm.



Photo: Industrial Visit to Solar Power Plant

CONCLUSION AND RECOMMENDATIONS

Green Audit is the most efficient way to identify the strength and weakness of environmental sustainable practices and to find a way to solve problem. Green Audit is one kind of professional approach towards a responsible way in utilizing economic, financial, social and environmental resources. Green audits can “add value” to the management approaches being taken by the college and is a way of identifying, evaluating and managing environmental risks (known and unknown). There is scope for further improvement, particularly in relation to waste, energy and water management. The college in recent years consider the environmental impacts of most of its actions and makes a concerted effort to act in an environmentally responsible manner. Even though the college does perform fairly well, the recommendations in this report highlight many ways in which the college can work to improve its actions and become a more sustainable institution.

SUGGESTIONS

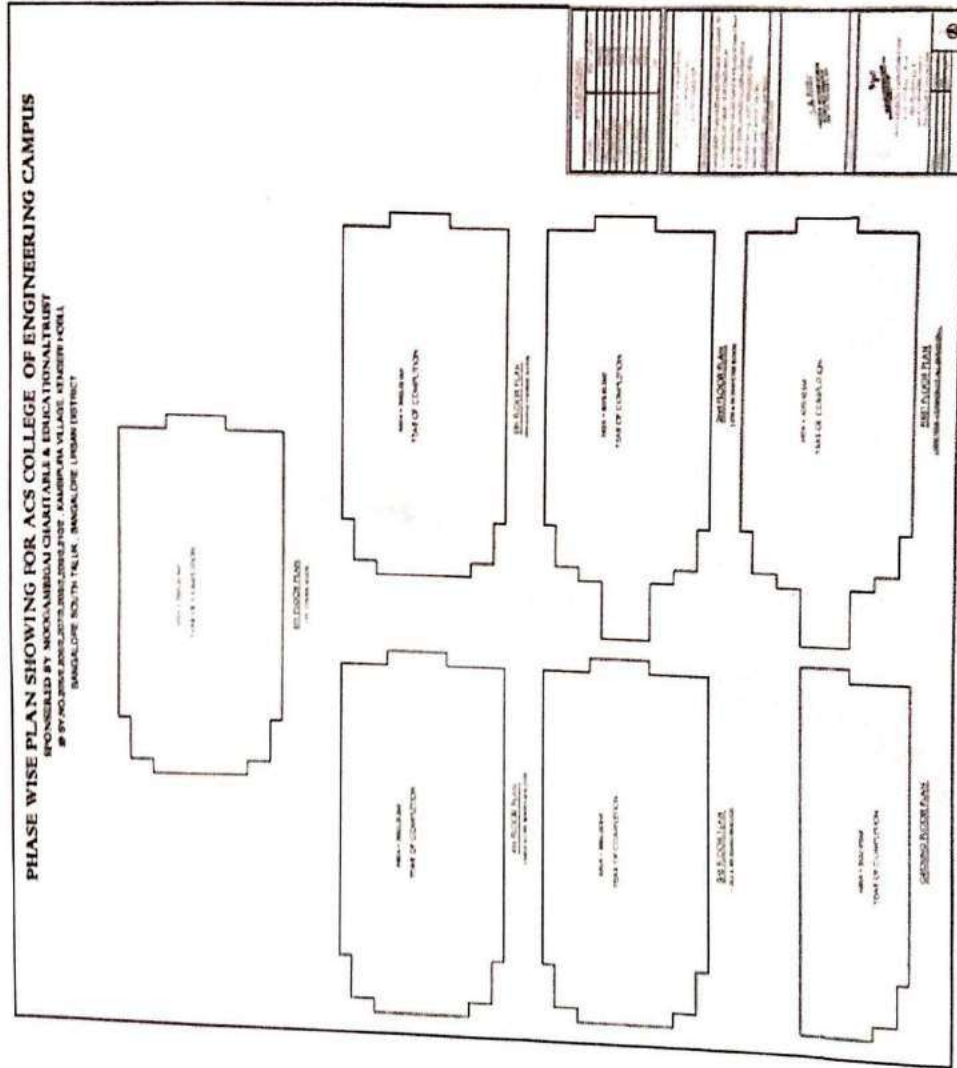
Some of the very important suggestions are :-

- Increase Awareness of Environmentally Sustainable Development- Use every opportunity to raise public, government, industry, foundation, and university awareness by openly addressing the urgent need to move toward an environmentally sustainable future.
- Educate for Environmentally Responsible Citizenship- Establish programs to produce expertise in environmental management, sustainable economic development, population, and related fields to ensure that all university graduates are environmentally literate and have the awareness and understanding to be ecologically responsible citizens.
- Involve All Stakeholders- Encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in environmentally sustainable development. Expand work with community and nongovernmental organizations to assist in finding solutions to environmental problems.

- Collaborate for Interdisciplinary Approaches- Convene university faculty and administrators with environmental practitioners to develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.
- Adopt the proposed Environmentally Responsible Purchasing Policy, and work towards creating and implementing a strategy to reduce the environmental impact of its purchasing decisions.
- Increase reduce, reuse, and recycle education on campus.
- Name all the trees and plants with its common name and scientific name.
- Display boards of fauna diversity to generate enthusiasm for learners.
- Organize earn while learn eco-friendly programmes
- Conduct exhibitions for parents and public on environment and sustainable practices.
- Arrange training programmes on environmental management system and nature conservation.
- Ensure participation of students and teachers in local environmental issues.

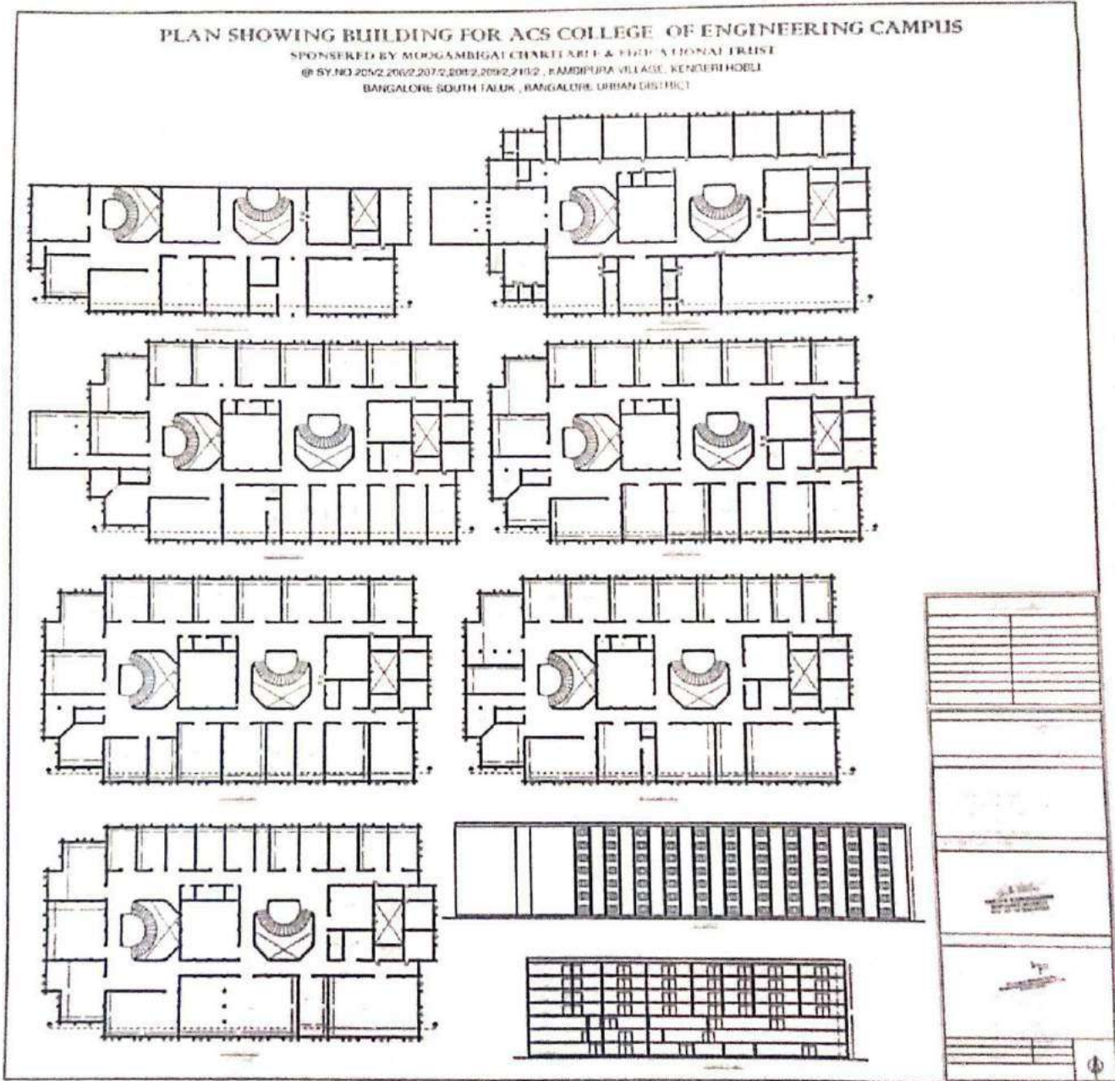
ANNEXURE 1

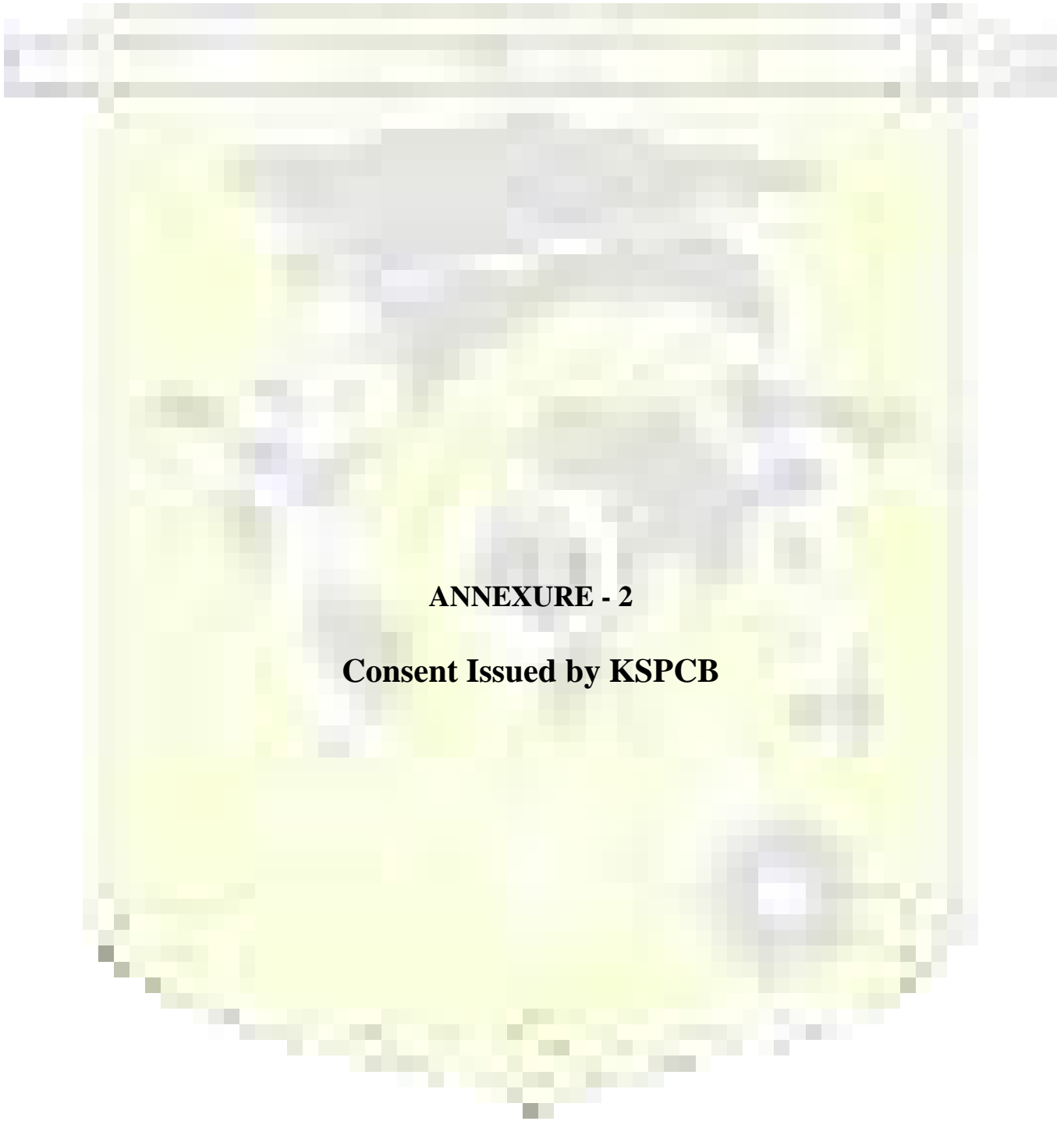
BUILDING PLAN OF A C S COLLEGE OF ENGINEERING



Principal
Principal
A.C.S. College of Engineering
Kambupura, Mysore Road, Keneng Hobli,
Bangalore - 560 072

Principal
A.C.S. College of Engineering
Kambipura, Mysore Road, Kengeri Hobli,
Bangalore, Karnataka, India





ANNEXURE - 2

Consent Issued by KSPCB

Green Audit Report-2020-21

Consent For Operation (CFO-Air,Water)

Karnataka State Pollution Control Board
Zonal Office, Bangalore South
Nisarga Bhavan, 6th Floor, Hanumanth Road, 7th Cross,
Shivanagar, Bangalore-560041
Tel: 080-2473886

Industry Colour: **ORANGE** Industry Scale: **LARGE**

(This document contains 6 pages including annexure & excluding additional conditions)

Combined Consent Order No: AW-304164 **PCB ID:** 34442 **Date:** 10/11/2017

Combined consent for discharge of effluents under the Water (Prevention and Control of Pollution) Act, 1974 and emission under Air (Prevention and Control of Pollution) Act, 1981

- Ref: 1. Application filed by the industry / organization on 16/09/2017
2. Inspection of the Industry/organization/by RO, - Bangalore South on 13/10/2017

Consent is hereby granted under Section 25(4) of the Water (Prevention & Control of Pollution) Act, 1974 (herein referred to as the Water Act) & Section 21 of Air (Prevention & Control of Pollution) Act, 1981, (here in referred to as the Air Act) and the Rules and Orders made there under and subject to the terms and conditions as detailed in the Schedule Annexed to this order.

The Occupier is authorized to operate /carryout industry/activity & to make discharge of the effluents & emissions conforming to the stipulated standards from the premises mentioned below:

Location:

Name of the Industry: Acs College Of Engineering
Address: Sy.No.205/2, 207/2, 208/2, 209/2 & 210/2, Kambipura Village, Bangalore South Taluk, Bangalore
Industrial Area: Not In I.A, Kambipura ,
Taluk: Not in BBMP Area, District: Bangalore Urban

Discharge of effluents under the Water Act:

| Sr | Water Code | WC(KLD) | WWG(KLD) | Remark |
|----|------------------|---------|----------|---|
| 1 | Domestic Purpose | 32.000 | 25.000 | treated in STP of capacity 300 KLD installed by RR Medical College. |

Discharge of Air emissions under the Air Act from the following stacks etc.

Sl. No. Description of chimney/outlet Limits specified refer schedule
The details of Sources, control equipments and its specification, type of fuel, rate of emissions, constituents to be controlled in emissions etc. are detailed in Annexure-I.

The consent for operation is granted considering the following activities/Products:

| Sr | Product Name | Applied Qty/Month | Unit |
|----|---------------------|-------------------|------|
| 1 | Engineering College | 0.000 | NOS |
| 2 | NA | 0.000 | NOS |

This consent is valid for the period from 13/10/2017 to 30/09/2022

For and on behalf of the
Karnataka State Pollution Control
Board

Page-1 e_outwardno7482-10/11/2017 e-signed(physical signature not require) Printed from XGN SENIOR ENVIRONMENTAL OFFICER