



# PRAKRUTHI

## INSTITUTE OF ENVIRONMENTAL STUDIES

### UNIT OF PRAKRUTHI FOUNDATION®

Ref: PIES/NCET/AUDIT/2021-22

Date: 02.03.2022

## CERTIFICATE

### SUB.: “ENERGY AUDIT REPORT”

This is to certify that **M/s. RajaRajeswari Medical College & Hospital, # 202, Kambipura, Mysore Road, Bangalore-560 074, Karnataka, India.** has successfully undergone **ENERGY 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 06-Jan-2022 to 01-Mar-2022 by Prakruthi Institute of Environmental Studies. Sustainability Assessor, Er.Ramesh Kumar BN, Er. Tushali Jagwani who are qualified personnel have carryout out Energy auditing.

Environmental GRI indicators considered in these auditing are Water, Air, Noise, Energy, Wastes, 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**

# ENERGY AUDIT REPORT



**RAJARAJESWARI**  
MEDICAL COLLEGE & HOSPITAL

**RajaRajeswari Medical College & Hospital**

**# 202, Kambipura, Mysore Road,**

**Bangalore-560 074, Karnataka, India.**



Audited by

**Er. Ramesh Kumar B N**

**Chief Environmental officer (R)**

**Karnataka State Pollution Control Board**

**Chairman**

**Prakruthi Institute of Environmental Studies**

**2nd Floor, No.93, 7th Cross, Lower Palace**

**Orchards, Bengaluru – 560003**



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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.

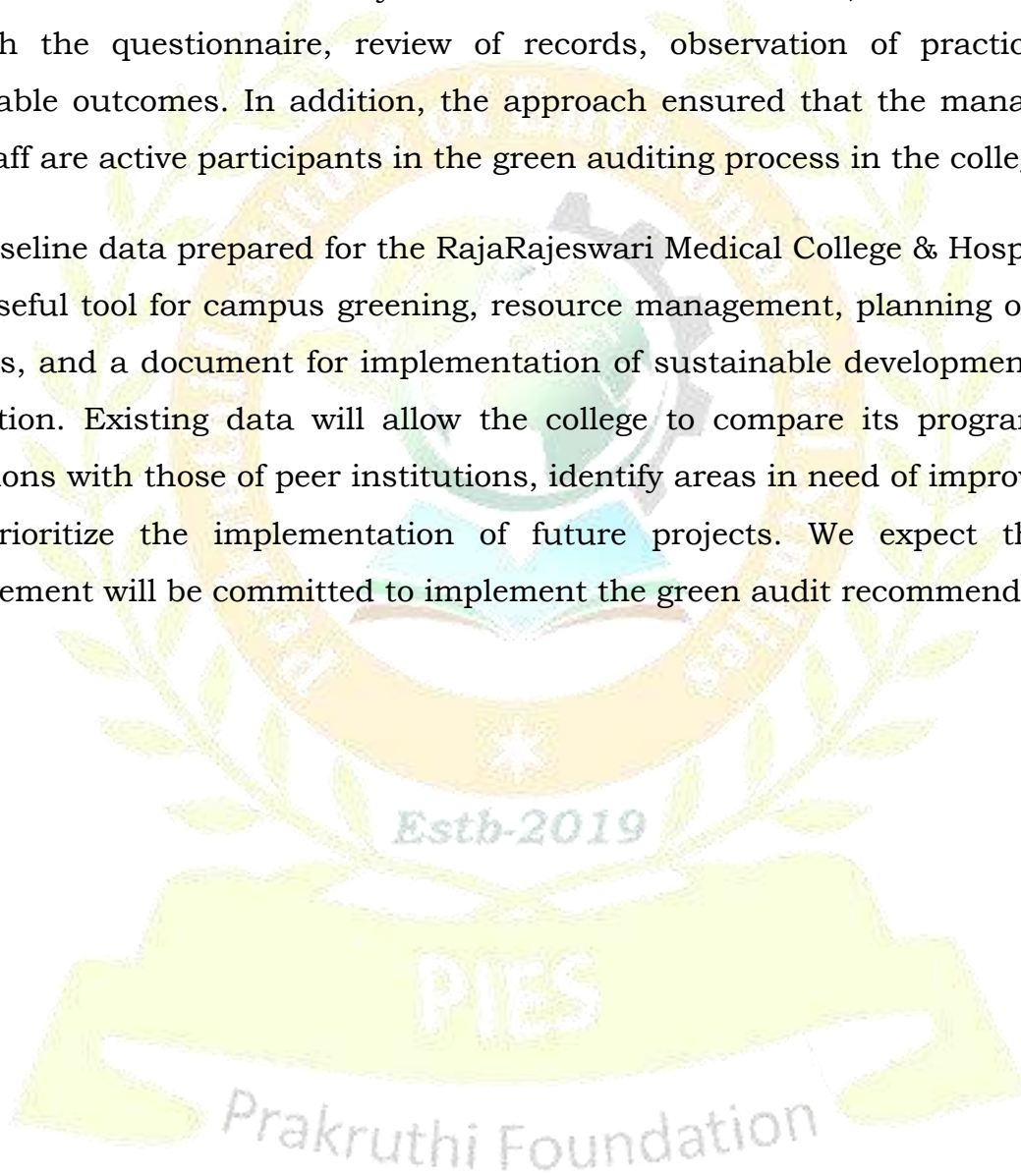
Green auditing and the implementation of mitigation measures is a win-win situation for the college, the learners and the planet. It can also create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of green impact on campus.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

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and social responsibility to the students and teachers.

In **RajaRajeswari Medical College & Hospital**, 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 RajaRajeswari Medical College & Hospital 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 programs 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 RajaRajeswari Medical College & Hospital.

### **The specific objectives are:**

1. To assess the source and quantity and of the water in the RajaRajeswari Medical College & Hospital 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:**

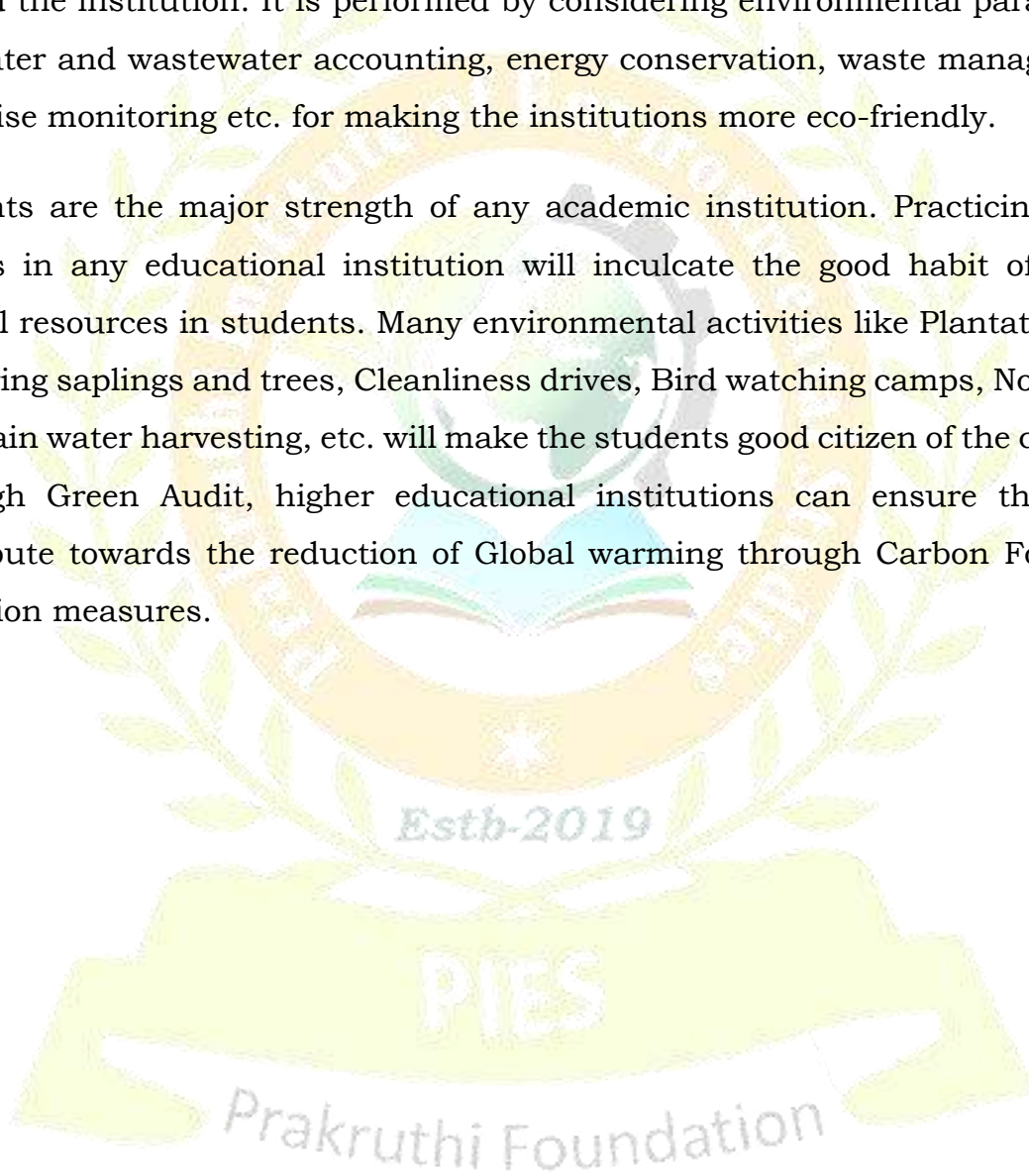
Universities are playing a key role in development of human resources worldwide. Higher education institutes campus run various activities with aim to percolate the knowledge along with practical dimension among the society. Likewise different technological problems higher education institutes also try 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 institutions 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. RAJARAJESWARI MEDICAL COLLEGE & HOSPITAL**

### **2.1. ABOUT RAJARAJESWARI MEDICAL COLLEGE & HOSPITAL**

Rajarajeshwari Medical College and Hospital (RRMCH) is an educational institution that imparts Medical education to the aspiring students to strengthen the Health sector in the country. Needless to reiterate that in the time of Covid pandemic, these qualified students with the desired knowledge of the subject have been playing a major role in handling the grave situation.

In collaboration with Government of Karnataka, RRMCH has been functioning as a Covid Center and handling patients on one hand and rendering services of Vaccination on the other. The institute was established in the year 2005 and since then has been implementing the provisions under various Acts and Rules as laid by Ministry of Environment and Forest, New Delhi as well as by the Karnataka Pollution Control Board. The Institution has obtained Consent under water and air acts and also the Authorization under Bio Medical waste Management Rules 2016 as promulgated by MOEF. These consents and Authorizations are renewed from time to time implementing the provisions of consent conditions.

#### **Mission**

- Learner centered health care education
- Patient centered service
- Community oriented research
- Strong community relationship
- Serve the under served
- Meet the regional, national and global health care educational needs
- Inter organizational linkage
- Strategic future oriented planning
- Professionalism in management

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- Open organizational climate
- Excellence in knowledge skills and service

### **Vision**

- Single window delivery of total human health care service & education needs
- Total quality management
- Unique work culture in alleviating human sufferings
- To train general, specialized, & allied professionals to meet the regional national and global health care services
- Be efficient, effective, community acceptable, and excel in service, education & research
- To impart knowledge & interact with organizations of similar interest
- Fostering global competencies, inculcating value system among learners
- Promote use of technology of relevance
- To induce paradigm shift in community that many diseases are preventable, curable & affordable
- Reach the unreachable with awareness, education & service
- Serve the under served

### **INFRASTRUCTURAL FACILITIES**

**RajaRajeswari Medical College & Hospital** has adequate infrastructural facilities as per the AICTE requirements. RajaRajeswari Medical College & Hospital 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, Hostels, Central & Department Library and Auditorium and also 1250 bedded hospital with 8 labs, 20 OTs and 5 ICU facilities. The management consistently interacts with the stake holders to improve the infrastructure facilities.

### **AUDITORIUM / SEMINAR HALL**

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A well-equipped auditorium with seating for over 500 people serves as the venue for the regular conferences, workshops and seminars that are part of the learning process at RajaRajeswari Medical College & Hospital. A Medical Education



Department setup with the objective of enhancing quality of education, dedicates itself to implementing continuous improvement in standards.

The 5000 seater ACS Convention Hall at RajaRajeswari Medical College & Hospital is a vast space that transforms itself to meet varied needs. It is a venue for large conferences and seminars. It

hosts a range of cultural activities. It serves as an examination center for large groups. Last but not the least, it is also designed to accommodate sporting activity and games.

The seminar hall is spacious, well ventilated and furnished halls. It also offers facilities such as LCD and OHP projectors, screens, white-boards for delivering lectures.

### SMART CLASS ROOM

A Smart Classroom is a traditional lecture style teaching space that has available technological equipment that can be used to aid and enhance instruction of a course. The smart class room is equipped with the basic technology that will enable to connect laptop to the projector.

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Features a smart podium with a touch panel control system, PC and laptop connection, document camera, DVD/VCR Player, projector, and screen and also have an overhead transparency projector.

### SKILL LAB at RRMCH



A well-equipped clinical skill lab supports the acquisition, maintenance and enhancement of clinical skills of students in health care profession.

Within this non-threatening environment, patient volunteers, simulated patients. Mannequins and Information technology are employed

to provide hands on learning experiences for practice of essential clinical skills.

Prakruthi Foundation

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### LIBRARY AND INFORMATION SERVICE



The Central Library is spread over a floor space of about 1200 sq. mtrs.

The Central Library stocks more than 22,000 books of various subjects in medical and allied health sciences. Reputed journals, both Indian and foreign are available in departmental libraries. The total number of books

in the central and departmental library runs over 22,000 titles.

Computerized catalogues of the library holdings as well as a card index are available for the students. Further, there is provision of modern bar code and Online Public Access Catalogue (OPAC) technology to facilitate for user friendly, quick and easy search facility for the students and faculty.

Students are encouraged to avail other facilities like e-mail, internet, CD-ROM browsing & photocopying. Ample and separate reading space has been provided to both the students and faculty along with comfortable seating arrangements. Besides the Central Library all the departments, pre-clinical and clinical have been provided with departmental libraries which are well stocked with standard text books and other works of reference.

To supplement the knowledge acquisition process, RajaRajeswari Medical College & Hospital has a large central library independent of the departmental libraries. This central facility is well-stocked with books spanning the gamut of healthcare subjects. The library also subscribes to a range of specialized journals to help

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students keep pace with the advances in medicine. The library also has a digital section that stores medical information in the form of CDs / DVDs and offers access to online medical literature through the HELINET. Open from 9 am to 9 pm on all working days, the library offers students quiet reading rooms and facilities for photo copying of material.

### CRICKET GROUND



RajaRajeswari Medical College and Hospital has a sprawling cricket ground which is at par with any cricket ground where national cricket matches are played. The management of RajaRajeswari Medical College and Hospital has entered into a Memorandum of Understanding with KSCA

(Karnataka State Cricket Association) to host zonal under 16 and 18 matches as well as club tournaments. Various matches are played round the year thus giving an opportunity for the aspiring sports players and the enthusiasts. Work is in full progress to build a pavilion to accommodate the spectators.

Many International Cricket teams like **Australian Cricket Team under 19 and Sri Lankan Cricket Team representing under 14** have played in the cricket grounds adding feather to the cap.

A club House is being built to complete the set up thus making the cricket ground at RajaRajeswari medical College and Hospital one of the best cricket grounds in the country.

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### 2.2. Courses Offered

- **MBBS**
- **MD**
  - MD – Anatomy
  - MD – Anaesthesia
  - MD – Biochemistry
  - MD – Community Medicine
  - MD – DVL
  - MD – Forensic Medicine
  - MD – General Medicine
  - MD – Microbiology
  - MD – Pathology
  - MD – Paediatrics
  - MD – Pharmacology
  - MD – Physiology
  - MD – Psychiatry
  - MD – Radio Diagnosis
  - MD – TB & Respiratory Medicine
- **MS**
  - MS – ENT
  - MS – General Surgery
  - MS – OBG
  - MS – Ophthalmology
  - MS – Orthopaedics
- **Super Specialty**
  - DM – Cardiology
  - M.Ch. – Urology
  - M.Ch. – Plastic Surgery
  - M.Ch. – Pediatric Surgery
- **Paramedical**



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- Dip. in Medical Laboratory Technology
- Dip. in Operation Theatre Anesthesia Technology
- Dip. in Medical Imaging Technology
- Dip. in Health Inspector
- Dip. in Ophthalmic Technology
- Dip. in Medical Record Technology

- **Research Programs**

- **Fellowship Program**

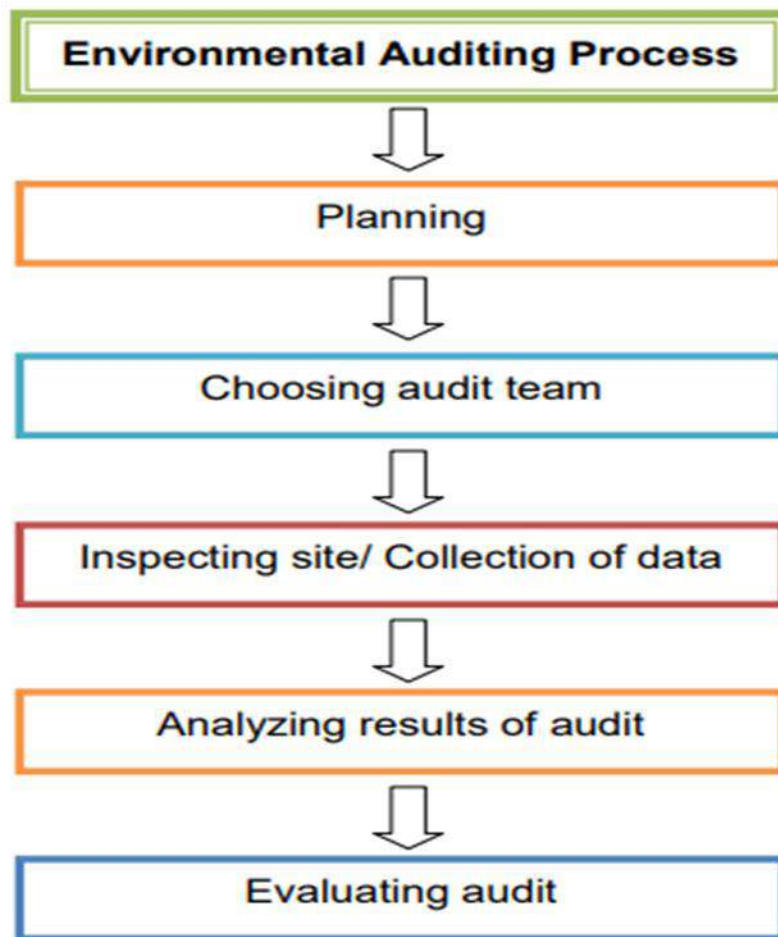
- Head & Neck Oncology, Department of ENT
- Perinatal Medicine, Department of Pediatrics
- Dermato Surgery, Department of DVL

- **Allied Health Sciences**

- B.Sc Cardiac Care Technology
- B.Sc Perfusion Technology
- B.Sc Renal Dialysis Technology
- B.Sc Respiratory Care Technology
- B.Sc Anesthesia Technology
- BSc. Optometry Technology
- B.Sc Imaging Technology

**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 RajaRajeswari Medical College & Hospital 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

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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**

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Sl No	Name	Designation	Role
1.	Dr. Satya Moorti B	Dean	Chairman
2.	Dr. D C Sharma	Professor	Member
3.	Mr. Prasanna N	Estate Officer	Member
4.	Dr. Supriya	Asst Professor. Anatomy	Member
5.	Dr. Vidhusha	Asst Professor. Community Medicine	Member
6.	Dr. Shilpa	Asst Professor. Microbiology	Member
7.	Dr. Sindura	PG Student	Member
8.	Dr.Naines Maheshwari	PG Student	Member
9.	Ms. Deepika P	UG Student	Member
10.	Mr. Nitish Kumar	UG Student	Member
11.	Dr. Balasubramanian P	Principal Physiotherapy	Member Convener

### CHAPTER 4. GREEN AUDIT

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# **ECO -FRIENDLY CAMPUS & GREEN PRACTICES IN RAJARAJESWARI MEDICAL COLLEGE & HOSPITAL**

### **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. 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

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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.

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### 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 – 25 acres.

Sl. No.	PARTICULARS	AREA	
1	<b>Total area</b>	25 acres	
2	College area	39118 sq. mtrs.	
3	Hospital (including OPD)	50552 sq. mtrs.	
4	Hostel & residential Complex	30236 sq. mtrs.	
5	Total Built up area	169572.89 sq. mtrs.	
6	Road/Parking	15173.03 sq. mtrs.	
7	Green belt area	7586.51 sq. mtrs.	
8	Vacant area for future development	9,064.81 sq. mtrs.	
9	Building Configuration [Number of Blocks / Towers / Wings etc., with Numbers of Basements and Upper Floors, canteen, seminar halls, playground, auditorium, hostels, Labs]	Number of blocks/towers/wings:	3
		Number of basements:	3
		Number of upper floors College:	5
		Hospital:	6
		CCL:	3
		Canteen:	1
		Number of seminar halls/ Demo rooms:	56
		Playground number:	1
		Number of Auditorium: (Kadamba, ACS Convention hall)	2
		Number of Hostels: (Boys hostel, girls hostel, Interns, Nurses, NRI,	7



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		PG, Staff Quarters)	
		Number of labs.:	11

### 4.3. WATER REQUIREMENT:

The total water requirement for the University is **180 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

Total requirement of water in KLD	
Fresh	<b>180</b>
Recycled	447
Total	<b>627</b>
Source of water	Bore wells and Rainwater
1. Whether canteen facility provided for day students etc	Yes
2. Waste water generation in KLD	<b>550</b> KLD
STP capacity	300 KLD +250 KLD
Technology employed for Treatment and mode of disposal of treated sewage	STP (ASP AND SBR)
Scheme of disposal of excess treated water if any	Gardening, Lawns, Secondary purposes such as Bus/Car Washing, Toilet and Flush out. The treated water is also used for Ongoing Construction Activities
Any Treatment for lab water	The lab waters are collected in 200 l tanks and dosed with the 10% bleaching solution for disinfecting. The primarily treated/disinfected

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	water is then diverted to the STP for further treatment.
No. of ponds, wells	01 Pond 00 Open Wells

### 4.4. WASTE WATER GENERATION

About 550 m<sup>3</sup>/day of wastewater is being generated.

### 4.5. WASTE WATER MANAGEMENT

RajaRajeswari Medical College and Hospital (RRMCH) located at Mysore Road, Bangalore, has installed two sewage treatment plants for the treatment of waste waters originating from the Hospital, college, hostels, staff quarters and canteen areas.

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 smoothed. On an average 440 - 450 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 outlined in the following paragraphs.



**Figure: Waste Water Treatment Systems-250KLD**

#### **4.6. WATER REUSE PLAN**

The entire premises measures nearly 25 acres, out of which only 20% is covered with buildings and the rest is open areas where the treated water is applied for various purposes listed as below.

##### **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-

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monsoon day.

### GREEN BELT:



A total of 18,463 sq m 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.

### SECONDARY FLUSHING:



Dual plumbing system has been provided in Boys Hostel, NRI Hostel and the Studio Apartments; in general a sum total of **90 KLD** is required for the flushing purpose.

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### BUS/CAR WASHING



The institute operates a fleet of Buses, cars (  $32 + 30 = 62$ ) 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.

### DUST SUPPRESSION:



The sports ground (area 12,000 sq m) and other unpaved areas often need to be sprayed water for the suppression of dust specifically during non monsoon months, the requirement could be approximated up to 10 KLD.

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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.

### CLEANING OF PAVED SURFACES:



Occasionally whenever cleaning of paved concrete surfaces (84,548 sq m) is required; the treated water is used for the purpose, though not quantifiable, yet could be approximated to 60 KLD.

### CLEANING OF THERMAL SOLAR PANELS:



Frequent cleaning of solar thermal panels (100 No) and 12 no storage tanks; is also carried out by treated water and this consumption though fluctuating is of the order of 15 KLD

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### HVAC COOLING SYSTEMS:

The centralized air conditioning systems are also supplied with treated water which has an average consumption up to 5 KLD.

### SUMMARY:

In the light of ample land area availability with minimal building construction, entire treated water is being reused within the campus, although during peak summer months the demand exceeds the supply and vice versa during the rainy season. The reuse of the treated water can be summarized in the following table:

Sl No	ITEM	AREA/Nos	Quantity, KLD
1.	Grass Mat Cricket Ground:	14,500 sq m	140
2.	Green Belt	18,463 sq m	110
3.	Secondary Flushing	Three Blocks	90
4.	Bus and Car Washing	62 vehicles	5
5.	Ongoing Construction Activities	Two sites + Maintenance	10
6.	Dust Suppression	14,500 sq m	10
7.	Kitchen Gardening	500 sq m	2
8.	Cleaning of Paved Surfaces	84,584 sq m	60
9.	Cleaning of Solar Panels	100 No + 12 tanks	15
10.	HVAC cooling systems:	One No	5
		<b>TOTAL</b>	<b>447 KLD</b>

With the recent commissioning of Biogas plant in the college premises, it would now be possible to divert a large fraction of organic matter directly for Biomethanation into this plant and as such the organic loading in the existing STPs shall considerably reduce. This shall help to further divert few non polluting streams such as RO reject streams and softening plant regenerations etc. from the STPs and reduce hydraulic load on the STPs.

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### 4.6.1. RECYCLE AND REUSE OF TREATED WASTE WATER

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 utilised for the following activities;

- Gardening and maintaining greenery within the campus. (60 %)
- For construction and curing activities within the campus. (10%)
- Secondary flushing in toilets in the hostel buildings. (20%)
- Dust suppression as and when required. (1%)
- Buses and other vehicles washing within the campus. (9%)

### 4.7. SOLID WASTE MANAGEMENT



The institution has successfully completed and recently commissioned a BIO gas plant to handle 500 kg/day of solid waste. This is an in-house design developed involving engineering students (from RRCE) 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



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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 150 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

### **4.8. Bio-Medical Waste Management:**

The institution has obtained the Authorization from KSPCB under BMW Rules 2016 and has been operating under the provisions of the Rules. The salient features of compliance are listed as below:

- The institute has implemented the colour coding system (Yellow, Red, Blue and white) in each ward to collect the different varieties of waste based on their infection potential,
- recyclability and safety from injury during handling.
- A collection room has also been functioning to temporarily store the waste bags prior to
- their lifting by the Common Bio Medical waste handling facility.
- An agreement has been signed with M/S Maridi Eco Industries Pvt. Ltd, a common
- facility that collects the Bio-Medical waste from the hospital premises on

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routine basis.

- The quantum of Bio-medical waste disposed by the common facility is submitted to
- KSPCB through the Annual report periodically.
- All the liquid wastes from wards, operation Theaters, pathological labs and from
- washrooms are initially disinfected individually and then diverted to the STP for further treatment and further disposal.

### 4.9. 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.

#### REPLACEMENT OF CFL TUBE LIGHTS WITH LED LIGHTS



- During April 2017 – March 2019, a Total of 3750 tube lights (36 Watt) were replaced with 18 W LED Lights, which resulted in Total savings of 197100 units.

- Similarly in above duration a total of 7515 Tube lights (40 Watt) were also replaced by 18 W LED

lights resulting in savings of 482763 units.

- Thus, altogether Total saving of 679,863 Units could be achieved in two years' time.

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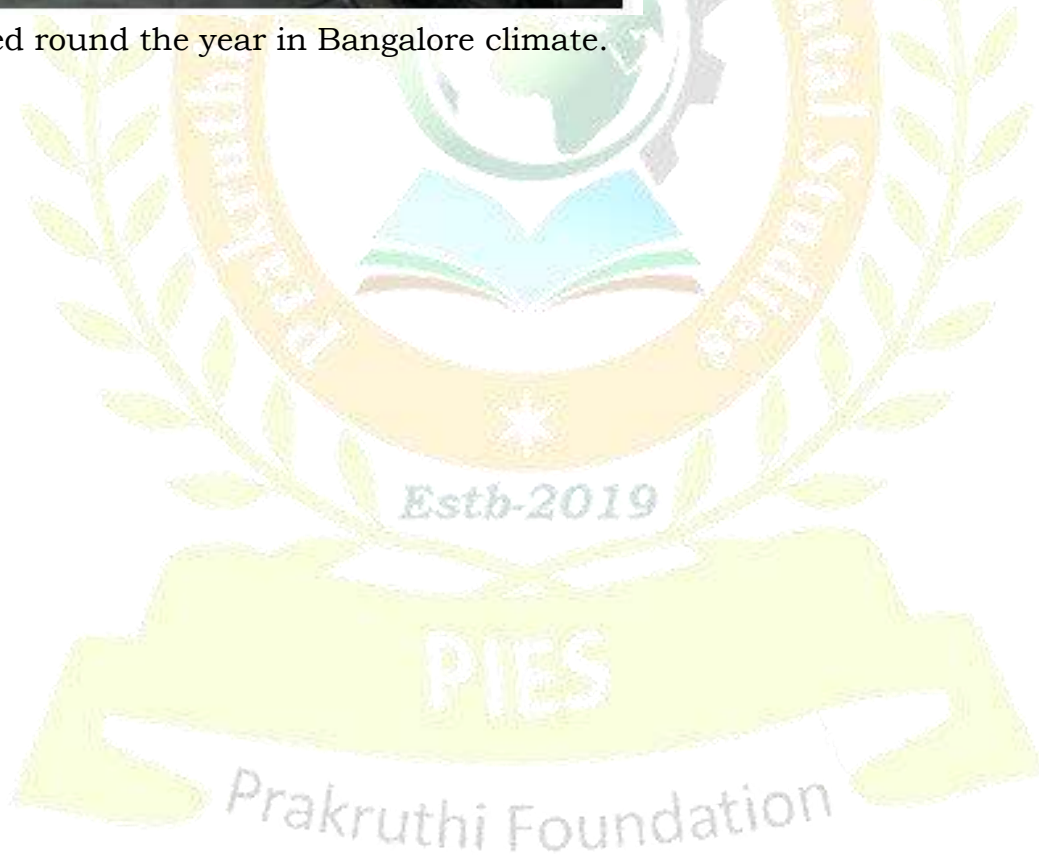
- On the expenditure front, a total of 10,965 LED lights costs Rs 4506000.

### 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-to-day basis. This has eliminated the use of electrical geysers in the hostels as the hot water is

required round the year in Bangalore climate.



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### SOLAR PHOTOVOLTAIC ENERGY HARNESSING:

In order to conserve the use of electrical energy in day-to-day functioning of the Medical College and the Hospital, harnessing of solar energy to the tune of 900 KW using solar panels has been conceived that shall meet almost 40% of power requirement. The project is still in the pipe line and the vendors are being consulted to finalize the design

<b>Energy &amp; power details</b>			
Electricity charges in Rs.	2018	2019	2020
	3,18,07,092	3,23,77,488	3,32,11,212
No. of Units Consumed year wise in Watts	2018	2019	2020
	3361200	3276600	3367200
No.of Gas cylinders used per month	-		
No.of Diesel Generators	3		
Quantity of Diesel consumed	52,040 LITERS/YR		
Cost of Generator fuel	Rs. 44,23,400/-		
Number of LED lights-----	Total number of CFL bulbs	100	
Incandescent bulbs-----	Number of Lead Lights	10,000	
fans-----	No. of Incandescent bulbs	300	
AC's-----	No. of Fans	5,000	
Tube lights-----	No.of A.C's	300	
electrical instruments-----	No. of Tube lights	8,000	
computers-----	No. of Computers	102	
photocopiers-----	No. of TV's	50	
T.V's. etc.-----			

#### 4.10. 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.

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- 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, SO<sub>2</sub>, & NO<sub>x</sub> 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 low noise 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, etc) 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.

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### 4.11. ECOLOGY & BIO -DIVERSITY

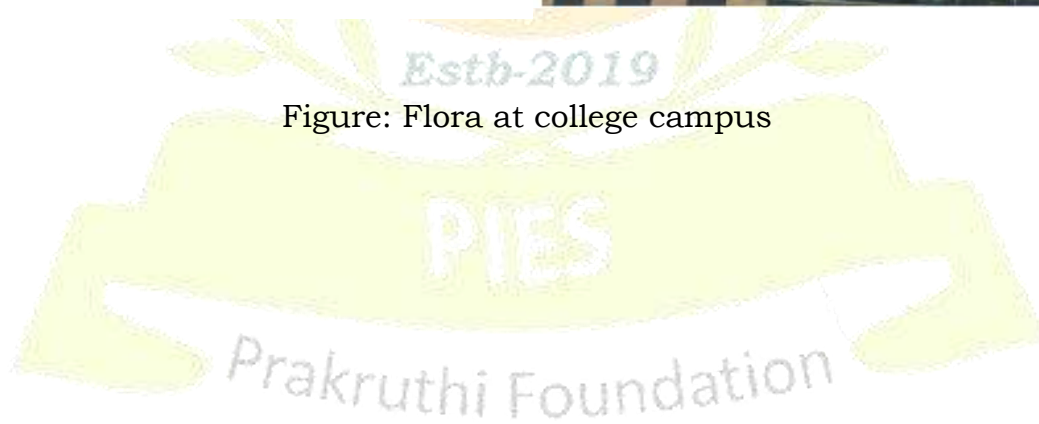
#### 4.11.1. FLORA

The campus has a rich collection of trees. 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.



Estb-2019  
Figure: Flora at college campus



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### 4.11.2. 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);Nephilaplices (Family-Nephilidae); Heteropoda sp (Family-Sparassidae); Phintella vitatta (FamilySalticidae)
MOTHS & BUTTERFLIE S	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;Mycalesisperseusblasi us;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

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### 4.11.3. FLORA

Number of Trees with Species	
Royal Palm tree	100
Pink Trumpet Tabebuia Avalanda	50
White Tabebuia Avalanda	50
Tabebuia	30
Badami tree	40
Champaka	20

### 4.12. GREEN CAMPUS INITIATIVES

#### USE OF BATTERY OPERATED CARTS



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

#### GREEN BELT DEVELOPMENT

- The premises has created plant nursery that is responsible to create and maintain greenery within the campus.
- The large sized cricket ground along with other green belt is helpful in creating significant lung space within the campus and thus, improved air quality.
- The STP sludge is used as soil conditioner cum manure for maintaining the



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entire greenery in the campus. Also the treated sewage imparts Nitrates and Phosphates to the plants and hence a healthy growth.

### RAIN WATER HARVESTING



- 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

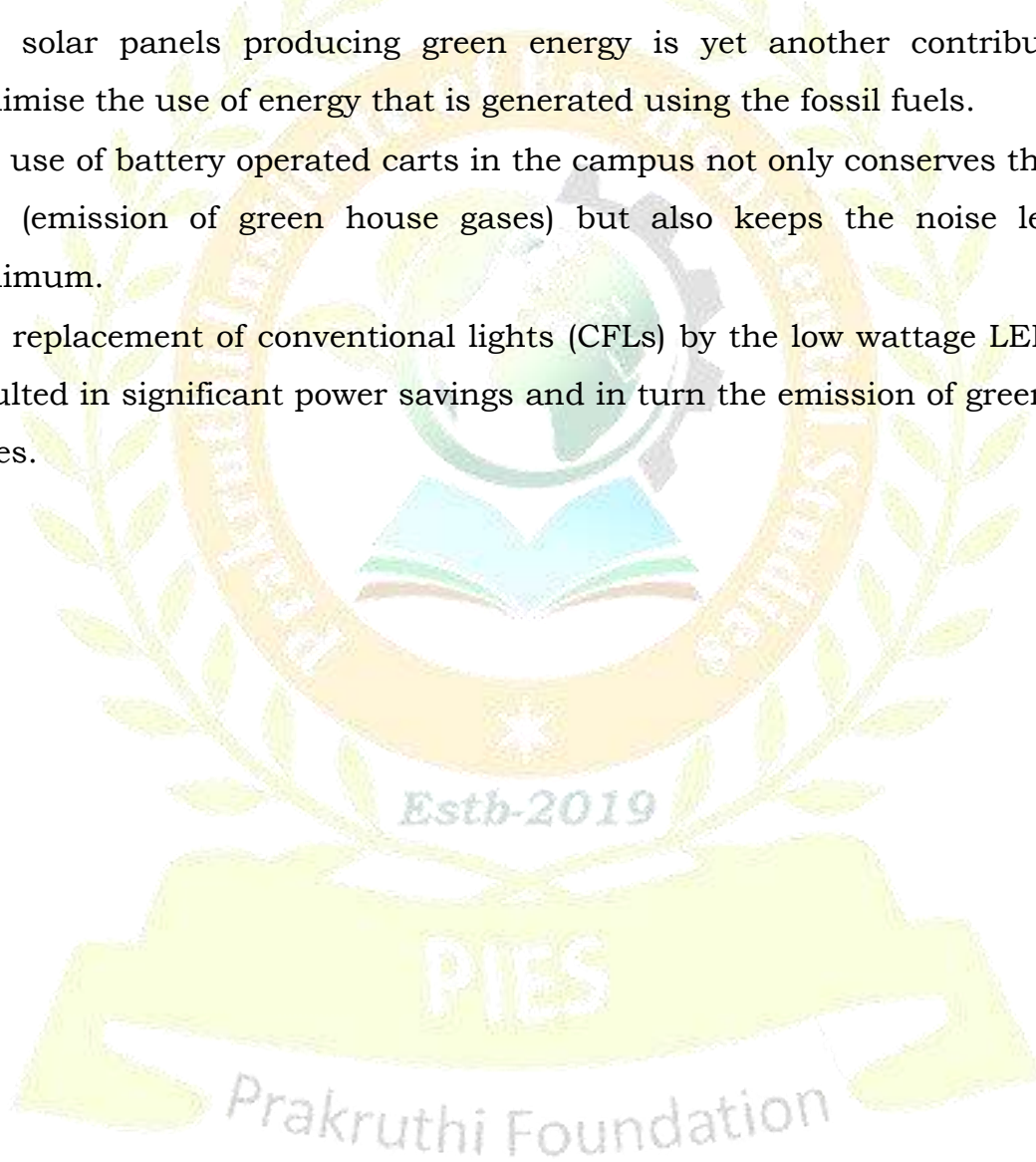
tanks/ sumps, whereas the water collected from paved and unpaved areas shall pass through grease cum silt trap and clean water shall be either directly used or shall be used for recharging the existing bore wells within the campus as per drawings.

- 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.
- A Sump tank of capacity 300 cum and Ground water recharging well -2 Nos. have been provided for rainwater harvesting and reused for green belt development.
- Storm water from roofs and open spaces is collected and taken through silt settling tanks followed by sand filters and then into the recharging bore well.
- The storm water that could not be collected is discharged into the SWD systems leading to public drainage system.
- A large portion of rain water is diverted into the existing pond to maintain the levels.

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### **COMBAT AGAINST GLOBAL WARMING**

- The installation of Biogas digester and use of biogas (2 commercial cylinders / day) shall be a land mark in reducing the green house gases (CO<sub>2</sub>, CH<sub>4</sub>) release into the atmosphere.
- The green zones shall be fixing CO<sub>2</sub> from the atmosphere and releasing O<sub>2</sub> in the atmosphere shall help in slowing down the global warming.
- The solar panels producing green energy is yet another contribution to minimise the use of energy that is generated using the fossil fuels.
- The use of battery operated carts in the campus not only conserves the liquid fuel (emission of green house gases) but also keeps the noise levels at minimum.
- The replacement of conventional lights (CFLs) by the low wattage LED lights resulted in significant power savings and in turn the emission of green house gases.



## **CHAPTER 5. CONCLUSION AND RECOMMENDATIONS**

RajaRajeswari Medical College & Hospital has always taken a green agenda for developing a green campus. Despite being primarily a healthcare 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
- Pedestrian Friendly pathways
- Ban on use of Plastic
- Landscaping with trees and plants

### **2. RESTRICTED ENTRY OF AUTOMOBILES**

The college operates a fleet of 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.

### **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 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

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plastic, measures have been taken to replace plastic tea cups and glasses with steel glasses in the canteen.

### **5. LANDSCAPING WITH TREES AND PLANTS**

The college operates a fleet of 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.

### **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 considered 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.

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### **SUGGESTIONS:**

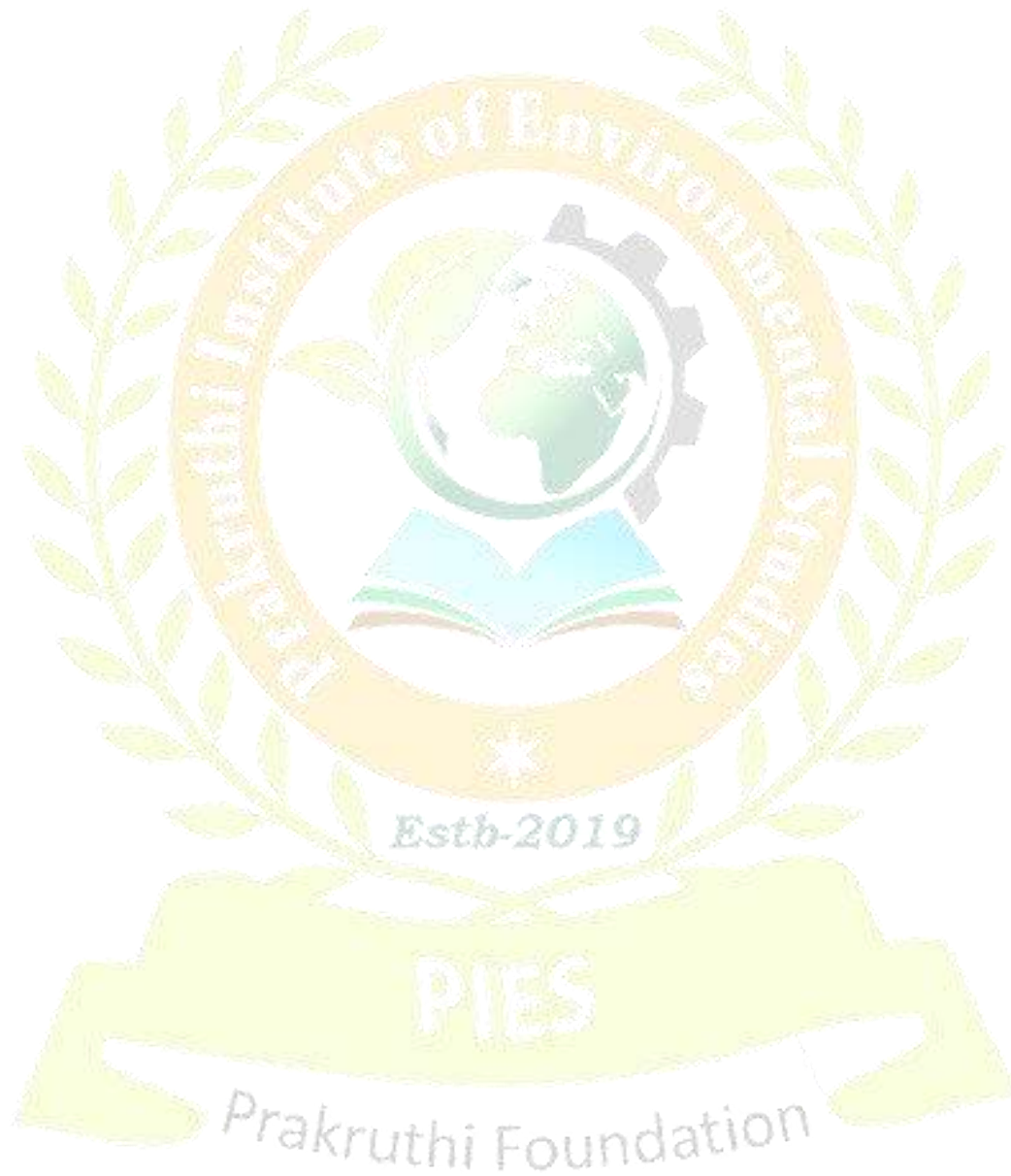
#### **SOME OF THE VERY IMPORTANT SUGGESTIONS ARE: -**

- 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 programs.
- Conduct exhibitions for parents and public on environment and sustainable practices.
- Arrange training programs on environmental management system and nature

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conservation.

- Ensure participation of students and teachers in local environmental issues.



**CHAPTER 6. ASSESSMENT OF BASELINE**

**ENVIRONMENTAL CONDITIONS AT SITE**

**6.1. WATER ENVIRONMENT**

**6.1.1. 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 frozen at <5 0C 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	

#### 6.1.2. 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.



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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"> <li>➤ Total Coliforms Organism MPN/100ml shall be 50 or less</li> <li>➤ pH between 6.5 to 8.5</li> <li>➤ Dissolved Oxygen 6mg/l or more</li> <li>➤ Biochemical Oxygen Demand (5 days 200C) 2mg/l or less</li> <li>➤ TDS max. 500 mg/lit</li> <li>➤ Chlorides (as Cl-), 250 mg/L, Max</li> </ul>
Outdoor bathing (Organized)	B	<ul style="list-style-type: none"> <li>➤ Total Coliforms Organism MPN/100ml shall be 500 or less</li> <li>➤ pH between 6.5 and 8.5</li> <li>➤ Dissolved Oxygen 5mg/l or more</li> <li>➤ Biochemical Oxygen Demand (5 days 200C) 3mg/l or less</li> </ul>
Drinking water source after conventional treatment and disinfection	C	<ul style="list-style-type: none"> <li>➤ Total Coliforms Organism MPN/100ml shall be 5000 or less</li> <li>➤ pH between 6 to 9</li> <li>➤ Dissolved Oxygen 4mg/l or more</li> <li>➤ Biochemical Oxygen Demand (5 days 200C) 3mg/l or less</li> <li>➤ TDS max. 1500 mg/lit</li> <li>➤ Chlorides (as Cl-), 600 mg/L, Max</li> </ul>
Propagation of Wild life and Fisheries	D	<ul style="list-style-type: none"> <li>➤ pH between 6.5 to 8.5</li> <li>➤ Dissolved Oxygen 4mg/l or more</li> <li>➤ Free Ammonia (as N) 1.2 mg/l or less</li> </ul>
Irrigation, Industrial Cooling, Controlled Waste disposal	E	<ul style="list-style-type: none"> <li>➤ pH between 6.0 to 8.5</li> <li>➤ Electrical Conductivity at 250C micro mhos/cm Max.2250</li> <li>➤ Sodium absorption Ratio Max. 26</li> <li>➤ Boron Max. 2mg/l</li> <li>➤ TDS max. 2100 mg/lit</li> <li>➤ Chlorides (as Cl-), 600 mg/L, Max</li> </ul>
	Below-E	<ul style="list-style-type: none"> <li>➤ Not Meeting A, B, C, D &amp; E Criteria</li> </ul>

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 <sup>0</sup> C	7.48	6.5-8.5	No Relaxation
2.	Total Dissolved Solids, mg/L	760	500	2000
3.	Conductivity@25 <sup>0</sup> C, $\mu$ S/Cm	1515 .4	-	-
4.	Temperature, <sup>0</sup> C	24.8	-	-
5.	Turbidity as NTU	0.2	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	132. 5	-	-
14.	Potassium as K, mg/L	7.5	-	-
15.	Sulphates, mg/L	81.6	200	400
16.	Calcium as Ca, mg/L	123. 4	75	200
17.	Total Hardness as CaCO <sub>3</sub> , mg/L	480	200	600
18.	Magnesium as Mg, mg/L	41.7	30	100
19.	Chlorides as Cl, mg/L	210	250	1000
20.	Total Alkalinity as CaCO <sub>3</sub> ,mg/L	260	200	600
21.	Dissolved Phosphates ,mg/L	0.4	-	-
22.	Nitrate Nitrogen as (NO <sub>3</sub> -N), mg/L	1.2	45	No Relaxation
23.	Fecal Coliform, MPN/100ml	Abse nt	Shall not be detectable in 100ml Sample	
24.	E.Coli, CFU/100ml	Abse nt	Shall not be detectable in 100ml Sample	
25.	Fluorides as F, mg/L	0.8	1.0	1.5

ND: Not Detected

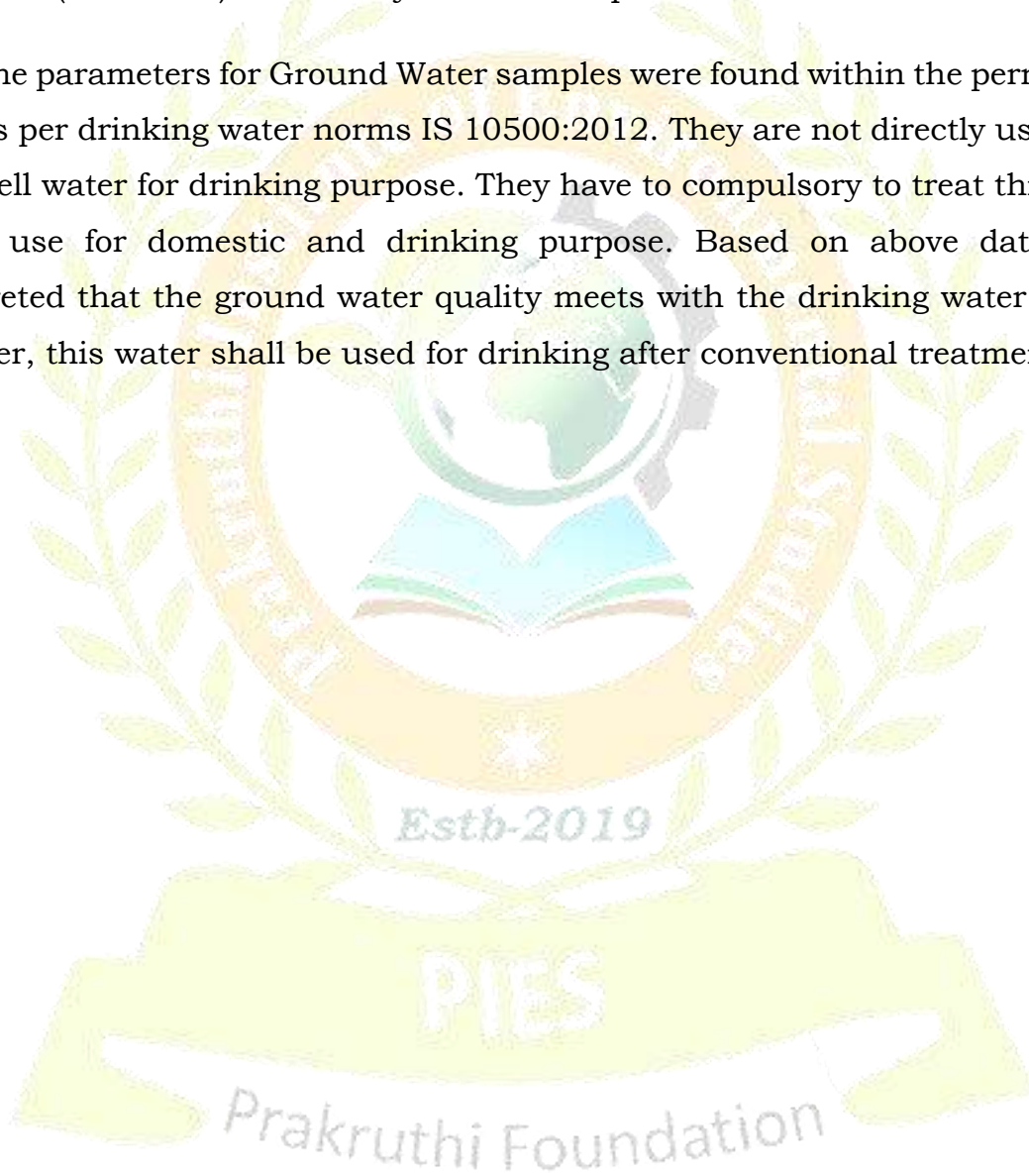
BDL – Below Detection Limit

## Energy Audit Report – 2021- 22

### 6.1.3. GROUND WATER RESULT AND ITS INTERPRETATION

The analysis results indicate that pH of the groundwater samples was found to be 7.48. The TDS was found to be 760 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 permissible 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.



## Energy Audit Report – 2021- 22

### 6.2. STP TREATED WATER

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	<a href="#">pH@24.7<sup>0</sup>C</a>	7.72	6.5-8.5	IS 3025:Part-11:1983 (Reaffirmed 2017)
2	Total Suspended Solids, mg/L	8	20	IS 3025:Part-17:1984 (Reaffirmed-2017)
3	Bio-Chemical Oxygen Demand (3Days at 27 <sup>0</sup> C), mg/L	6	10	IS 3025:Part-44:1993 (Reaffirmed-2019)
4	Chemical Oxygen Demand, mg/L	24	50	IS 3025:Part-58:2006 (Reaffirmed-2017)
5	Ammonical nitrogen as NH <sub>3</sub> -N, mg/L	1.1	5	APHA 23 <sup>rd</sup> Edition 4500,NH <sub>3</sub> ,B,C:2017
6	Total nitrogen, mg/L	2.8	10	IS 3025:Part-34:1988 (Reaffirmed-2019)
7	Fecal Coliform, MPN/100ml	44	<100	APHA 23 <sup>rd</sup> Edition(9221B): 2017

#### **INTERPRETATION:**

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

## Energy Audit Report – 2021- 22

### 6.3. 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 Back Gate Area	Near Main Gate Area	
1	Particulate Matter(PM10)	$\mu\text{g}/\text{m}^3$	43.7	62.6	$100 \mu\text{g}/\text{m}^3$
2	Particulate Matter(PM2.5)	$\mu\text{g}/\text{m}^3$	18.6	25.4	$60 \mu\text{g}/\text{m}^3$
3	Sulphur Dioxide as SO <sub>2</sub>	$\mu\text{g}/\text{m}^3$	12.6	16.2	$80 \mu\text{g}/\text{m}^3$
4	Nitrogen Dioxide as NO <sub>2</sub>	$\mu\text{g}/\text{m}^3$	15.4	25.7	$80 \mu\text{g}/\text{m}^3$
5	Ammonia	$\mu\text{g}/\text{m}^3$	BDL	BDL	$400 \mu\text{g}/\text{m}^3$
6	Benzene (C <sub>6</sub> H <sub>6</sub> )	$\mu\text{g}/\text{m}^3$	<1	<1	$5 \mu\text{g}/\text{m}^3$
7	Benzo(a) Pyrene	$\text{ng}/\text{m}^3$	<0.5	<0.5	$1 \text{ng}/\text{m}^3$
8	Nickel (Ni)	$\text{ng}/\text{m}^3$	<0.5	<0.5	$20 \text{ng}/\text{m}^3$
9	Arsenic (As)	$\text{ng}/\text{m}^3$	<0.5	<0.5	$6 \text{ng}/\text{m}^3$
10	Lead (Pb)	$\mu\text{g}/\text{m}^3$	<0.05	<0.05	$1 \mu\text{g}/\text{m}^3$
11	Carbon Monoxide	$\text{mg}/\text{m}^3$	0.9	1.4	$4 \text{mg}/\text{m}^3$
12	Ozone (O <sub>3</sub> )	$\mu\text{g}/\text{m}^3$	BDL	BDL	$100 \mu\text{g}/\text{m}^3$

#### **INTERPRETATION OF RESULTS:**

All the parameters are within the permissible values.

## Energy Audit Report – 2021- 22

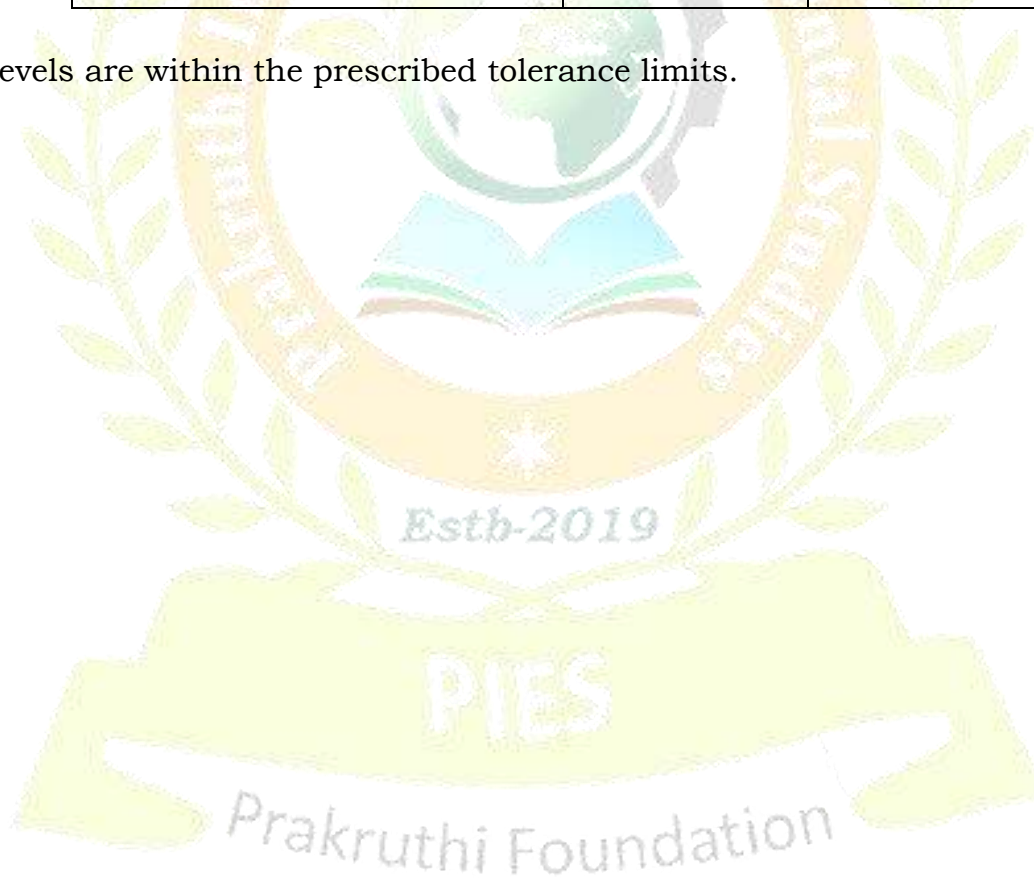
### 6.4. NOISE ENVIRONMENT

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	Near Back Gate Area	53.7	IS 9989-1981 (Reaffirmed 2014)
2	Near Main Gate Area	56.7	
3	Near Cricket Ground Area	52.4	
4	Near DG Area	53.9	
<b>CPCB Standard</b>		<b>50</b>	

Noise levels are within the prescribed tolerance limits.



**CHAPTER 7. ENERGY AUDIT**

**7.1 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.

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

## Energy Audit Report – 2021- 22

### 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

### 7.3 ENERGY OBSERVATIONS

**TABLE: ENERGY DETAILS**

<b>Energy &amp; power details</b>			
Electricity charges in Rs.	2018	2019	2020
	3,18,07,092	3,23,77,488	3,32,11,212
No. of Units Consumed year wise in Watts	2018	2019	2020
	3361200	3276600	3367200
No. of Gas cylinders used per month	-		
No. of Diesel Generators	3		
Quantity of Diesel consumed	52,040 LITERS/YR		
Cost of Generator fuel	Rs. 44,23,400/-		



## Energy Audit Report – 2021- 22

Number of LED lights-----	Total number of CFL bulbs	100
Incandescent bulbs-----	Number of Lead Lights	10,000
fans-----	No. of Incandescent bulbs	300
AC's-----	No. of Fans	5,000
Tube lights-----	No. of A.C's	300
electrical instruments-----	No. of Tube lights	8,000
computers-----	No. of Electrical instruments	-
photocopiers-----	No. of Computers	102
T.V's. etc.-----	No. of Photocopier's	-
	No. of TV's	50

### 7.4 MEASURES FOR THE ALTERNATE SOURCES OF ENERGY AND ENERGY CONSERVATION

#### 1. SOLAR ENERGY:

##### a. SOLAR THERMAL ENERGY HARNESSING:



In order to conserve the use of electrical energy in day today functioning of the Medical College and the Hospital, harnessing of solar energy to the tune of 900 Kw using solar panels has been conceived that shall meet almost 40% of power requirement. The project is still in the pipe line and the vendors are being consulted to finalise the design.

##### b. 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

## Energy Audit Report – 2021- 22

the hot water is required round the year in Bangalore climate.

**The following table shows the existing solar water heating systems at RRMCH campus.**

Sl. No	Blocks	No. of Water Tanks & Capacity	No. of solar Panels
1	Medical Boys Hostel	6 no of 800 l each = 4800 l	48
2	Medical Girls Hostel	6 no of 800 l each = 4800 l	48
3	<b>TOTAL</b>	<b>9600 l</b>	<b>96 No</b>

- Presuming 300 days of sun shine in a year, 100 l/day of water heated from 25 ° C to 55 ° C using a single panel results into the savings of 1000 Kwh (units)/year.
- Hence 9600 l/day of water heating results into the savings of  $(9600 \times 1000)/100 = 96,000$  Kwh /yr or 96,000 units/yr
- Energy savings per yr = 96,000 units
- At the rate of Rs 7.75 per unit, total Annual savings =  $96,000 \times 7.75 = \text{Rs } 744,000.00$  (Rs seven Lakh Forty Four Thousand only)

**Thus, the installation of 96 no. solar panels for water heating results into 96,000 (Ninety Six Thousand) units per year and savings of Rs 744,000 (Rs seven lakh Forty four Thousand) per year.**

## Energy Audit Report – 2021- 22

### 2. BIOGAS PLANT:

The institution has successfully completed and recently commissioned a BIO gas plant to handle 500 kg/day of solid waste. This is an in-house design developed involving engineering students (from RRCE) 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 150 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.

## Energy Audit Report – 2021- 22

- 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



Figure: Biogas Plant



## Energy Audit Report – 2021- 22

### 3. USE OF LED BULBS:

The institution is regularly replacing tube lights (40 Watt) with 18 W LED Lights. The tube light which is not working is replaced with the LED bulbs.

#### Replacement of CFL Tube lights with LED Lights

S.NO	Types of the Tube lights	April2017 to March 2018 change the No of Tubes	Total No of Tube light changed per year	Total watt	Total saving in KW	Total saving in Kwh (8 hours)	Total Units saving per year	Total amount Saved per Year (1unit=Rs7.65)
1	CONVENTIONAL 40Watt Tube	3810 No	3810 No	152400W (152.4KW)	83.82KW	670.56kwh/day	244754 units	18,72,368.00
2	LED 18 Watt Tube	3810 No		68580W (68.58KW)				

S.NO	Types of the Tube lights	April2018 to March 2019 change the No of Tubes	Total No of Tube light changed per year	Total watt	Total saving in KW	Total saving in Kwh (8 hours)	Total Units saving per year	Total amount Saved per Year (1unit=Rs7.65)
1	CONVENTIONAL 40Watt Tube	3705 No	3705 No	148200W (148.2KW)	81.51KW	652.08kwh	238009 units	18,20,768.00
2	LED 18 Watt Tube	3705 No		66690W (66.69KW)				

- Total saving in 2years in terms of units – **4,82,763 units**
- Total savings in 2years in terms of Rupees – **Rs.36,93,136.00**

- **Grand Total Saving in 2 years in terms of units – 6,79,863 units**

## Energy Audit Report – 2021- 22

### 7.5 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.

### 7.6 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 CO<sub>2</sub> 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.

# **ANNEXURE-I**



# ECO GREEN SOLUTION SYSTEMS PVT LTD

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E-mail: lab@egsspl.in, ecogreen@egsspl.in



Pg 1 Of 2

CIN NO: U74140KA2005PTC036991  
EGSSPL/TF/09/01

## TEST REPORT

1	Customer Name & Address	M/S.Raja Rajeswari Medical College & Hospital #202,Kambipura,Mysore Road, Bangalore-560074	9	Sample Collected On	27.12.2021
2	Sample Description	Borewell Water	10	Sample Receipt on	27.12.2021
3	Date of Analysis Start	27.12.2021	11	Sample RC No	480
4	Date of Analysis Completed	06.01.2022	12	Sample Code No	EGSSPL/1373
5	Date Of Report/ Report No	06.01.2022/EGSSPL/1373	13	Quantity of Sample Received	2Ltrs
6	Sampling Methodology	IS 3025:PART-1:1987-RA 2019	14	Environmental Conditions	Ambient
7	Appearance of Sample	Colorless Liquid	15	Sampling Time	14:21
8	Latitude	12.89517555°	16	Longitude	77.46089734°

S.No	Parameters	Results	As Per IS 10500:2018)		Test Method
			DL	PL	
1	pH @24.8°C	7.48	6.5-8.5	No Relaxation	IS 3025:Part-11:1983 (Reaffirmed-2017)
2	Total Dissolved Solids, mg/L	760	500	2000	IS 3025:Part-16:1984 (Reaffirmed-2017)
3	Conductivity@25°C, µS/Cm	1515.4	-	-	IS 3025:Part-14:1985 (Reaffirmed-2019)
4	Temperature, °C	24.8	-	-	IS 3025:Part-09:1984 (Reaffirmed-2017)
5	Turbidity as NTU	0.2	1	5	IS 3025:Part-10:1984 (Reaffirmed-2017)
6	Chromium as Cr, mg/L	BDL	0.05	No Relaxation	APHA 23 <sup>rd</sup> Edition:2017-3111 B
7	Copper as Cu, mg/L	BDL	0.05	No Relaxation	APHA 23 <sup>rd</sup> Edition:2017-3111 B
8	Nickel as Ni, mg/L	BDL	0.02	No Relaxation	APHA 23 <sup>rd</sup> Edition:2017-3111 B
9	Iron as Fe, mg/L	BDL	0.3	No Relaxation	APHA 23 <sup>rd</sup> Edition:2017-3111 B
10	Zinc as Zn, mg/L	BDL	5.0	15	APHA 23 <sup>rd</sup> Edition:2017-3111 B
11	Lead as Pb, mg/L	BDL	0.01	No Relaxation	APHA 23 <sup>rd</sup> Edition:2017-3111 B
12	Cadmium as Cd, mg/L	BDL	0.003	No Relaxation	APHA 23 <sup>rd</sup> Edition:2017-3111 B
13	Sodium as Na, mg/L	132.5	-	-	IS 3025:Part-45:1993 (Reaffirmed-2019)
14	Potassium as K, mg/L	7.5	-	-	IS 3025:Part-45:1993 (Reaffirmed-2019)
15	Sulphates, mg/L	81.6	200	400	APHA 23 <sup>rd</sup> Edition:2017 4500-SO <sub>4</sub> <sup>2-</sup> E
16	Calcium as Ca, mg/L	123.4	75	200	IS 3025:Part-40:1991 (Reaffirmed-2019)
17	Total Hardness as CaCO <sub>3</sub> , mg/L	480	200	600	IS 3025:Part-21 (Reaffirmed-2019)
18	Magnesium as Mg, mg/L	41.7	30	100	IS 3025:Part-46:1994 (Reaffirmed-2019)
19	Chlorides as Cl, mg/L	210	250	1000	IS 3025:Part-32:1988 (Reaffirmed-2019)
20	Total Alkalinity as CaCO <sub>3</sub> , mg/L	260	200	600	IS 3025:Part-23:1986 (Reaffirmed-2019)
21	Dissolved Phosphates, mg/L	0.4	-	-	IS 3025:Part-31:1988 (Reaffirmed-2019)
22	Nitrate Nitrogen as (NO <sub>3</sub> -N), mg/L	1.2	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 <sup>rd</sup> Edition:2017(9221B)
24	E.Coli, CFU/100ml	Absent	Shall not be detectable in 100ml Sample		IS:15185
25	Fluorides as F, mg/L	0.8	1.0	1.5	APHA 23 <sup>rd</sup> Edition:2017 4500-F- D

Note: Sample drawn by us

BDL:Below Detection Limit

\*\* End of Report\*\*

  
Authorized Signatory  
(P.Hanumanthaiyah)  
Government Analyst





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E-mail: lab@egsspl.in, ecogreen@egsspl.in



Pg 2 Of 2



GPS Map  
Camera Lite

Kengeri, Bengaluru, Karnataka 560060, India

Latitude

12.89517555°

Local 02:21:02 PM

GMT 08:51:02 AM

Longitude

77.46089734°

Altitude 677.68 meters

Monday, 27-12-2021



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E-mail: lab@egsspl.in, ecogreen@egsspl.in

Pg 1 Of 2

CIN NO: U74140KA2005PTC036991

EGSSPL/TF/09/01

## TEST REPORT

1	Customer Name & Address	M/S. Raja Rajeswari Medical College & Hospital #202,Kambipura,Mysore Road, Bangalore-560074	8	Sample Collected On	27.12.2021
2	Sample Source/Type	STP-Treated Water	9	Sample Receipt On	27.12.2021
3	Date of Analysis Start	27.12.2021	10	Sample RC No	481
4	Date of Analysis Completed/Date Of Report	06.01.2022/06.01.2022	11	Sample Code No	EGSSPL/1374
5	Report No	EGSSPL/1374	12	Quantity of Sample Received	1Ltr
6	Appearance of Sample	Colorless Liquid	13	Sample Particulars	Sample received in a Can
7	Latitude	12.8956376 <sup>0</sup>	14	Longitude	77.46253029 <sup>0</sup>

S. No	Parameter	Results	Tolerance Limits	Test Method
1	pH @24.9°C	7.72	6.5-9.0	IS 3025:Part-11:1983 (Reaffirmed-2017)
2	Total Suspended Solids, mg/L	8	20	IS 3025:Part-17:1984 (Reaffirmed-2017)
3	Bio-Chemical Oxygen Demand, (3Days at 27°C), mg/L	6	10	IS 3025:Part-44:1993 (Reaffirmed-2019)
4	Chemical Oxygen Demand, mg/L	24	50	IS 3025:Part-58:2006 (Reaffirmed-2017)
5	Ammonical nitrogen as NH <sub>3</sub> -N, mg/L	1.1	5	APHA 23 <sup>rd</sup> Edition 2017: 4500,NH <sub>3</sub> , B,C
6	Total Nitrogen, mg/L	2.8	10	IS 3025:Part-34:1988 (Reaffirmed-2019)
7	Fecal Coliform, MPN/100ml	44	100	APHA 23 <sup>rd</sup> Edition(9221B):2017

Note: Sample Drawn by us

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(P.Hanumanthaiah)  
Government Analyst



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E-mail: lab@egsspl.in, ecogreen@egsspl.in

Pg 2 Of 2



202, Mysore Rd, Harsha Layout, Kengeri Satellite Town,  
Bengaluru, Karnataka 560060, India

Latitude  
12.8956376°

Local 02:58:28 PM  
GMT 09:28:28 AM

Longitude  
77.46253029°

Altitude 673.81 meters  
Monday, 27-12-2021



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E-mail: lab@egsspl.in, ecogreen@egsspl.in

Pg 1 Of 2

CIN NO: U74140KA2005PTC036991  
EGSSPL/A/TF/01/00

## Analysis Report Of Stack Emission

1	Customer Name & Address	M/S. Raja Rajeswari Medical College & Hospital #202,Kambipura,Mysore Road, Bangalore-560074	9	Sample Collected On	28.12.2021
2	Stack Location	DG Set (380-KVA)	10	Sample Receipt On	28.12.2021
3	Date of Analysis Start/Date Of Analysis Completed	28.12.2021/31.12.2021	11	Sampling Methodology	IS 11255 PART-3:2008 (RA 2018)
4	Date Of Report/ Report No	31.12.2021/SE-2033/21-22	12	Sample Code No	SE-2033/21-22
5	Sample Collected By	Mr.Manohara	13	Environmental Conditions	Ambient
6	Particulars of the Instrument Used	Stack Monitoring Kit & Flue Gas Analyser	14	Instrument S.No/Model	08-DTI-2015/ EGSS-009 & FGA-53X
7	Instruments Calibrated Date	22.02.2021 & 31.08.2021	15	Instruments Calibration Due Date	21.02.2022 & 30.08.2022
8	Latitude	12.89509085 <sup>o</sup>	16	Longitude	77.46030939 <sup>o</sup>

## DATA COLLECTED DETAILS

1	Date of Monitoring	28.12.2021
2	Manometer Reading (H)	8.3
3	Stack Gas Temperature (°C)	92
4	Ambient Temperature (°C)	30
5	Stack Gas Velocity (m/s)	11.2
6	Rate of Sampling	35
7	Nozzle Used	1/4" Dia = 6.35 X 10 <sup>-5</sup>
8	Pitot Tube Constant	0.8890
9	Period of Sampling in Minutes	28

S. No	Parameters	Unit	Results	Protocol	Standard Limits
1	Particulate Matter as PM	mg/Nm <sup>3</sup>	31.8	IS:11255 (Part-1) 1985 (Reaffirmed 2019)	150
2	Sulphur dioxide as SO <sub>2</sub>	PPM	3	EGSSPL/SOP/FGA/001	Not Stipulated
3	Oxides of Nitrogen as NO <sub>x</sub> -NO <sub>2</sub>	PPM	21	EGSSPL/SOP/FGA/002	Not Stipulated

**Note:** 1. The Furnished results pertain only to the tested samples & applicable parameters

\*\*End Of Report\*\*

  
**Authorized Signatory**  
(P.Hanumanthaiah)  
Government Analyst



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E-mail: lab@egsspl.in, ecogreen@egsspl.in

Pg 2 Of 2



VFW6+6F3 RAJARAJESHWARI MEDICAL COLLEGE AND  
HOSPITAL, Kambipura, Karnataka 560060, India

Latitude  
12.89509085°

Longitude  
77.46030939°

Local 12:25:55 PM  
GMT 06:55:55 AM

Altitude 673.48 meters  
Monday, 27-12-2021



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An ISO 9001:2015 & ISO 45001:2018 Certified Company

48/A-4, KIADB Industrial Area, Doddaballapur, Bengaluru-561203  
E-mail: lab@egsspl.in, ecogreen@egsspl.in



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CIN: U74140KA2005PTC036991  
EGSSPL/A/TF/01/00

## Ambient Air Quality Analysis Report

1	Customer Name & Address	M/S.Raja Rajeswari Medical College & Hospital #202,Kambipura,Mysore Road, Bangalore-560074	7	Samples Particulars	Ambient Air Quality Monitoring
2	Name of the Location	Near Back Gate Area	8	Sample Code No	EGSSPL/AAQ/368
3	Date of Sampling/Date of Sample Received	27.12.2021/27.12.2021	9	Sample Collected By	Mr.Manohara
4	Date of Analysis Completed/Date Of Report	31.12.2021/31.12.2021	10	Monitoring Duration	8hrs
5	Monitoring Done By	Eco Green Solution Systems Pvt.Ltd	11	Report No	EGSSPL/AAQ/368
6	Latitude	12.89469461°	12	Longitude	77.46152986°

Instrument Details	PM <sub>2.5</sub> (Fine Particulate Sampler)	PM <sub>10</sub> (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 <sub>10</sub> )	µg/m <sup>3</sup>	43.7	100 µg/m <sup>3</sup>	IS 5182 (Part 23):2017
2	Particulate Matter(PM <sub>2.5</sub> )	µg/m <sup>3</sup>	18.6	60 µg/m <sup>3</sup>	IS 5182 (Part 24): 2019
3	Sulphur Dioxide as SO <sub>2</sub>	µg/m <sup>3</sup>	12.6	80 µg/m <sup>3</sup>	IS 5182 (Part 2): 2017
4	Nitrogen Dioxide as NO <sub>2</sub>	µg/m <sup>3</sup>	15.4	80 µg/m <sup>3</sup>	IS 5182 (Part 6): 2017
5	Ammonia	µg/m <sup>3</sup>	BDL	400 µg/m <sup>3</sup>	IS 5182 (Part 25): 2018
6	Benzene (C <sub>6</sub> H <sub>6</sub> )	µg/m <sup>3</sup>	<1	5 µg/m <sup>3</sup>	IS 5182 (Part 11): 2017
7	Benzo Pyrene	ng/m <sup>3</sup>	<0.5	1 ng/m <sup>3</sup>	IS 5182 (Part 12): 2017
8	Nickel (Ni)	ng/m <sup>3</sup>	<0.5	20 ng/m <sup>3</sup>	EGSSPL/CPCB/SOP/AAQ/001
9	Arsenic (As)	ng/m <sup>3</sup>	<0.5	6 ng/m <sup>3</sup>	EGSSPL/CPCB/SOP/AAQ/002
10	Lead (Pb)	µg/m <sup>3</sup>	<0.05	1 µg/m <sup>3</sup>	EGSSPL/CPCB/SOP/AAQ/003
11	Carbon Monoxide	mg/m <sup>3</sup>	0.9	4 mg/m <sup>3</sup>	IS 5182 (Part 10): 2019
12	Ozone (O <sub>3</sub> )	µg/m <sup>3</sup>	BDL	100 µg/m <sup>3</sup>	EGSSPL/CPCB/SOP/AAQ/004

BDL:Below Detection Limit

\*\*End Of Report\*\*

  
Authorized Signatory  
(P.Hanumanthaiah)  
Government Analyst



# ECO GREEN SOLUTION SYSTEMS PVT LTD



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GPS Map  
Camera Lite

VFW6+2GX, Kambipura, Karnataka 560060, India

Latitude

12.89469461°

Local 11:46:24 AM

GMT 06:16:24 AM

Longitude

77.46152986°

Altitude 713.63 meters

Tuesday, 28-12-2021



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EGSSPL/A/TF/01/00

## Ambient Air Quality Analysis Report

1	Customer Name & Address	M/S. Raja Rajeswari Medical College & Hospital #202,Kambipura,Mysore Road, Bangalore-560074	7	Samples Particulars	Ambient Air Quality Monitoring
2	Name of the Location	Near Main Gate Area	8	Sample Code No	EGSSPL/AAQ/369
3	Date of Sampling/Date of Sample Received	27.12.2021/27.12.2021	9	Sample Collected By	Mr.Manohara
4	Date of Analysis Completed/Date Of Report	31.12.2021/31.12.2021	10	Monitoring Duration	8hrs
5	Monitoring Done By	Eco Green Solution Systems Pvt.Ltd	11	Report No	EGSSPL/AAQ/369
6	Latitude	12.89683764°	12	Longitude	77.46159525°

Instrument Details	PM <sub>2.5</sub> (Fine Particulate Sampler)	PM <sub>10</sub> (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 <sub>10</sub> )	µg/m <sup>3</sup>	62.6	100 µg/m <sup>3</sup>	IS 5182 (Part 23):2017
2	Particulate Matter(PM <sub>2.5</sub> )	µg/m <sup>3</sup>	25.4	60 µg/m <sup>3</sup>	IS 5182 (Part 24): 2019
3	Sulphur Dioxide as SO <sub>2</sub>	µg/m <sup>3</sup>	16.2	80 µg/m <sup>3</sup>	IS 5182 (Part 2): 2017
4	Nitrogen Dioxide as NO <sub>2</sub>	µg/m <sup>3</sup>	25.7	80 µg/m <sup>3</sup>	IS 5182 (Part 6): 2017
5	Ammonia	µg/m <sup>3</sup>	BDL	400 µg/m <sup>3</sup>	IS 5182 (Part 25): 2018
6	Benzene (C <sub>6</sub> H <sub>6</sub> )	µg/m <sup>3</sup>	<1	5 µg/m <sup>3</sup>	IS 5182 (Part 11): 2017
7	Benzo Pyrene	ng/m <sup>3</sup>	<0.5	1 ng/m <sup>3</sup>	IS 5182 (Part 12): 2017
8	Nickel (Ni)	ng/m <sup>3</sup>	<0.5	20 ng/m <sup>3</sup>	EGSSPL/CPCB/SOP/AAQ/001
9	Arsenic (As)	ng/m <sup>3</sup>	<0.5	6 ng/m <sup>3</sup>	EGSSPL/CPCB/SOP/AAQ/002
10	Lead (Pb)	µg/m <sup>3</sup>	<0.05	1 µg/m <sup>3</sup>	EGSSPL/CPCB/SOP/AAQ/003
11	Carbon Monoxide	mg/m <sup>3</sup>	1.4	4 mg/m <sup>3</sup>	IS 5182 (Part 10): 2019
12	Ozone (O <sub>3</sub> )	µg/m <sup>3</sup>	BDL	100 µg/m <sup>3</sup>	EGSSPL/CPCB/SOP/AAQ/004

BDL:Below Detection Limit

\*\*End Of Report\*\*

  
Authorized Signatory  
(P.Hanumanthaiah)  
Government Analyst





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Kengeri, Bengaluru, Karnataka 560060, India

Latitude  
12.89683764°

Local 10:06:07 AM  
GMT 04:36:07 AM

Longitude  
77.46159525°

Altitude 672.39 meters  
Tuesday, 28-12-2021

GPS Map  
Camera Lite



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CIN NO: U74140KA2005PTC036991

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## REPORT

1	Customer Name & Address	M/S. Raja Rajeswari Medical College & Hospital #202,Kambipura,Mysore Road, Bangalore-560074	6	Sample Collected On	27.12.2021
2	Date of Data Downloaded	28.12.2021	7	Sample Receipt On	27.12.2021
3	Report No	EGSSPL/EN-096/21-22	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-096/21-22
5	Particulars of the Instrument Used	Sound Level Meter	10	Environmental Conditions	Normal

Instrument Details	Sound Level Meter
Make/ Model No	Baseline Technologies/2511
S.No	A0118-1679
Instrument Calibrated Date	10.08.2021
Instrument Calibration Due Date	09.08.2022

## (Day Time)

S.No	Monitored Location	Result (dBA) Day	Protocol
1	Near Back Gate Area	53.7	IS 9989-1981 (Reaffirmed 2014)
2	Near Main Gate Area	56.7	
3	Near Cricket Ground Area	52.4	
4	Near DG Area	53.9	
<b>CPCB Standard</b>		<b>50</b>	

**Note:** 1.All readings are taken at a distance of 1mtr from the location

\*End Of Report\*\*

**Authorized Signatory**  
(P.Hanumanthaiah)  
Government Analyst



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