CERTIFICATE FOR GREEN AUDIT

Certificate Number: PSQC129

This is to certify that, we have conducted a **GREEN AUDIT** in **TAGORE MEDICAL COLLEGE AND HOSPITAL, Rathinamangalam, Chennai-600127, Tamilnadu** during 18/03/2021 – 19/03/2021. The Audit investigates the following activities.

1. Coverage of matured trees (nearly 1516 trees available in the college campus)
2. Implemented many flowers, shrubs and indoor plants
3. Assessment of RO plant and water distribution network
4. Analysis of waste water treatment in STP and treated water utilization
5. Evaluation of solid and E-waste management system
6. Future expansion of Solar PV & Thermal energy systems for regular activities
7. Plan for implementing solar water heating system in hostel area to pre-heat the water
8. Identification of expansion of green coverage for planting more trees
9. Survey on Bio-diversity and plan for improvement of Birds, Reptile and Amphibian

The detailed campus Greenery Coverage and initiatives are presented in the Audit Report.

Authorized Auditor

G. ARIVARASAN
BEE Certified Energy Auditor (EA-21875)
Lead Auditor – ISO 14001, EMS

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(Consultancy – Accreditation & Certification) Auditing & Training
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Web Site: www.psqualitycertifications.com
CIN: U74999TN2020PTC138625

CERTIFICATE FOR ENERGY AUDIT

Certificate Number: PSQC130

This is to certify that, we have conducted an **ENERGY AUDIT** in **TAGORE MEDICAL COLLEGE AND HOSPITAL, Rathinamangalam, Chennai-600127, Tamilnadu** during 18/03/2021 – 19/03/2021. The Audit team has identified 07 Energy Conservation Proposals (ENCONs) and summary of the energy audit is given below.

Description/Year	2020-2021		
Annual Electricity Consumption (kWh)	1604661 kWh		
Annual LPG consumption (kg)	38,016 kg		
Summary of Energy Conservation (ENCON) Proposals			
Description	**Parameters**		
	Present	**After**	**Savings**
Annual Energy Consumption	20,73,168 kWh + 42,731 Kg of LPG	16,04,661 kWh + 38,016 kg of LPG	4,68,507 kWh + 4715 kg of LPG
Annual Energy Cost	223.85 lakhs	185.57 lakhs	38.28 lakhs
Simple Payback Period	-	-	1.5 years

Equipment's/Systems Audited

Electrical System	**Thermal System**
All major electrical equipment's	Inverter, UPS and battery system
Electrical Distribution system	Diesel, generators, pumps and motors
Lightings, Fans and Air conditioning system	LPG for cooking application
Rooftop solar PV system	

The detailed Energy Conservation Proposals are presented in the Audit Report.

Authorized Auditor

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CERTIFICATE FOR ENVIRONMENTAL AUDIT

Certificate Number: PSQC131

This is to certify that, we have conducted an **ENVIRONMENTAL AUDIT** in **TAGORE MEDICAL COLLEGE AND HOSPITAL, Rathinamangalam, Chennai-600127, Tamilnadu** during 18/03/2021 – 19/03/2021. This Audit highlights the energy balance sheet indicating various energy carriers associated with the regular activities of the institution and their CO2 mapping.

Environmental system: CO2 Balance sheet (2020-2021)

S.No	Energy Consumption & CO_2 Emission			CO_2 Neutralization		
	Description	Annual Usage	CO_2 Emission (Tons/Annum)	Description	Annual Usage	CO_2 Emission (Tons/Annum)
1	Electrical Energy	16,04,661 kwh	1315.82	Matured Trees	1516 Nos	33.05
2	Diesel	93055 Liters	245.66			
3	LPG Consumption	38,016 kg	114.05			
4	**Total Emission**		**1,675.53**	**Total Neutralized**		**33.05**
Balance CO_2 to be Neutralized				1642.48 Tons/Annum[1]		
CO_2 Accountability for TMCH Campus				1994.32 Tons/Annum[1]		
(Calculated based on the weighted average of total strength of students, teaching and technical staff = 1552)						

System Audited

Electricity Consumption	Usage of Chemicals, Salts, Acids & Cleaning Agents
Diesel Consumption (Transport + DG)	Biogas Plants
LPG Consumption	RO Plant and Water distribution system
Solid and E-waste Handling & Management	STP and waste water utilization

The detailed environmental aspects & impacts are presented in the Audit Report.

Authorized Auditor

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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

DETAILS OF THE CLIENT

TAGORE MEDICAL COLLEGE & HOSPITAL

Rathinamangalam, Melakottaiyur Post, Chennai-600127

Affiliated to the Tamil Nadu Dr.MGR Medical University, Chennai

TAGORE MEDICAL COLLEGE & HOSPITAL

Rathinamangalam, Melakkottaiyur Post, Chennai - 600127.
Phone : 044-30101111, Fax : 044-222 5555, Email: tagoremch@gmail.com

(Affiliated to the Tamil Nadu Dr.MGR Medical University & Recognized by the Ministry of Health & Family welfare. Govt. of India New Delhi)

DATE OF AUDIT

18/03/2021 to 19/03/2021

(Audited and Accounted for the period of 2020-21)

DEAN
TAGORE MEDICAL COLLEGE & HOSPITAL
RATHINAMANGALAM, MELAKOTTAIYUR POST,
CHENNAI-600 127.

AUDIT CONDUCTED AND SUBMITTED BY

P S QUALITY CERTIFICATION PVT LTD

No.415, F4, Ist Floor, Asha Vignesh Apartment, Ambattur, Tamil Nadu 600 053.

Mobile: +91- 81240 88335, 044 - 4959 1335

GREEN AUDIT REPORT

DETAILS OF THE CLIENT

TAGORE MEDICAL COLLEGE & HOSPITAL

Rathinamangalam, Melakottaiyur Post, Chennai-600127

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Our earth, our habitat, our home

Acknowledgements

P S QUALITY CERTIFICATION PVT LTD, No. 415, F4, I Floor, Asha Vignesh Apartment, Ambattur, Tamil Nadu 600 053 is thankful to the Management and Technical team members of **TAGORE MEDICAL COLLEGE & HOSPITAL,** Tamil Nadu, India for providing an opportunity to conduct a detailed Energy, Environment and Green Audit process for the college premises.

It is our great pleasure, which must be recorded here that the management of **TAGORE MEDICAL COLLEGE & HOSPITAL** extended all possible support and assistance resulting in expeditious completion of the audit process. The audit team appreciates the cooperation and guidance extended during course of site visit and measurements. We are also thankful to all those who gave us the necessary inputs and information to carry out this very vital exercise of green audit. Finally, we offer our sincere thanks to all the members in the Institution.

Audit Team Members	
Mr. G. ARIVARASAN	BEE Certified Energy Auditor (EA-21875) Lead Auditor-ISO-14001:2015 (EMS).

Audit Conducted, Complied and Verified by,

(Mr. G. ARIVARASAN)

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TAGORE MEDICAL COLLEGE & HOSPITAL
RATHINAMANGALAM, MELAKOTTAIYUR POST,
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Contents

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Executive Summary

This section presents a brief summary of the results of the detailed green audit carried out at TMCH, Rathinamangalam during Mar 2021.

The audit was mainly targeted at identifying practical, sustainable and economically viable Resource saving opportunities in all sections of the facility, resulting from a detailed study and analyses of technical parameters. The audit involved using a wide range of sophisticated, portable, diagnostic and measuring instruments to generate refined data and facilitate complex analyses to give a more reliable basis for evaluation of energy saving potential and economic viability.

TMCH has its building located at Rethinamangalam, Chennai. The building occupies an area of 29360 Sq.m. The major resources used are energy and water. In addition, the ecosystem of the campus including the biodiversity and sustainability have been assessed.
The study has identified opportunities for saving resources, improving compliance and maximising eco friendliness of the campus.

A summary list of recommendations is given at the end of the report.

SAY NO TO POLLUTION & YES TO RECYCLE

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Tagore Educational Trust was formed in 1997 by the chairperson Professor M. Mala, M.A., M.Phil. An educationist and philanthropist. Trust is pledged to the noble task of offering state of the art higher education in the field of Medicine, Engineering and Humanities. The Trust has already earned year of enviable reputation by establishing institutions offering quality education. In keeping with this objective, the Trust started Tagore Medical College and Hospital in the year 2010-2011 to train young men and women as dedicated, high skilled medical professional committed with the noble task of serving community.

Provisional Affiliation for starting for first year PG degree courses from the academic year 2020-2021 was approved by the Tamil Nadu Medical University in their letter proc. no. Affln.IV(1)/68378/2019, Dt:26.09.2020 for the following departments, M.D Community Medicine, M.D. General Medicine, M.D General Surgery, M.D Pathology, M.D Ophthalmology, M.S Orthopaedics, M.S Obstetrics and Gynaecology

The lush green surroundings of buildings

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Tagore Medical College and Hospital contemplates to achieve eminence in teaching-learning through establishment of state-of-art infrastructure facilities for the execution of curricular, co-curricular and extra-curricular activities effectively. Housed in a lush green campus of 26.25 acres, the infrastructure of the institution is spread over three blocks and the teaching-learning facilities fulfil the requirements of the statutory bodies. There are four well ventilated, air-

conditioned ICT-enabled, classrooms equipped with 150 seating capa smart boards. The Wi-Fi enabled campus facilitates technology methods like, video-demonstrations, online quiz activities and game based learning. The institute also has two well-furnished examination halls, each with a seating capacity of 150 students for examinations. Each department of college has adequate number of well-equipped, ICT-enabled demonstration halls, seminar halls and a departmental library as stipulated. Totally there are 37 demonstration rooms and seminar halls, 20 departmental libraries and one central library.

Each department of college also has adequate number of well-designed laboratories viz. practical, specialised and research laboratories. In addition, the institute also has 5 well developed museums, a skill lab and a dissection hall of the anatomy department to facilitate self-directed and participatory learning. The central research laboratory of the institution houses sophisticated instruments to facilitate and promote research acumen of the faculty and students.

The 818 bedded, NABH accredited teaching hospital of the institution consists of 13 operation theatres (10 major, super specialties, and 03 minor OT), six specific intensive care units, 36 wards, NABL accredited central clinical laboratory, blood bank and the casualty. Each clinical department has out-patient and in-patient services with attached clinics. The bed occupancy rate is adequate as per the MCI/NMC norms and serve as a rich source for the teaching and learning of clinical skills. Institution also provides the super specialty facilities such as Oncology, Neurosurgery, Cardiology, Neurology, Nephrology, Surgical oncology, Plastic surgery and cardiothoracic surgery which creates opportunities for the students to enhance their knowledge in specialised clinical fields. The family visits, school visits, visits to different organizations, postings in UHC and RHC of the institution are the resources for students for community based learning. The field visits, medical camps, health education and awareness programs conducted regularly by the community medicine department provide scope for experiential learning in students. Institution has video teleconferencing facility in a conference hall well equipped with LCD television displays, cameras, microphones, and VGA connections to enable interactive learning through distant resources.

AYUSH-related learning facilities are also established in the hospital through an actively running AYUSH outpatient department. The herbal garden maintained in the campus, is helpful for creating knowledge and awareness on the use of medicinal plants.

The institution periodically reviews, modifies and updates the existing infrastructure based on the demands and the challenges for the efficient conduct of teaching-learning and research.

This is evidently demonstrated by the institution's efforts in as accessing online teaching-learning platforms for regular academic operations during the COVID crisis.

The central library of the institution is fully air conditioned and spread over an area of 2631 sq. m. The reference and text books of various subjects are arranged subject wise in open shelves for ease of access and retrieval of books. There is a separate room for journals and the archives. Newly purchased books and journals are separately displayed in two separate racks at the entrance. The library has an Audio- Visual room with 50 seats.

The library has a well-lighted and ventilated reading room for undergraduate students with a seating facility for 170 students. Also, there are reading halls for students and staff with a seating capacity of 170 and 50 respectively that allow for the usage of own study material. The journal section has 35 seats capacity. There is a separate reading section for post graduate students with 50 seats. CCTV cameras are installed in the library for strict surveillance. The library also has a Reprographic room, facilities for scanning and printing. There are rooms available separately for the library staff.

There is an internet enabled computer room with 50 computers. The students can utilize the e resources, CD/DVD of various books and use various search engines for the purpose of learning and research. Wi-Fi facilities are available for students and faculties in the library.

There is a virtual library which has online journals that can be accessed from PROQUEST medical database, MEDLINE database and the Tamil Nadu Dr. MGR medical university database. The various e-resources available are e- Journals, e-books, Magazines, Newspapers, Reports, Research Dissertations, Skill building reviews.

The library also has a collection of undergraduate and postgraduate university examination question papers, NEET, AIIMS and PGIMER entrance exam preparation books and post graduate dissertations for reference. Every department has its own departmental library in addition to central library. The department library has many good collection of books for instant reference and accessible at department levels. The institution has also subscribed for more than 100 national and international journals. The e-resources can be assessed from anywhere and at any time by the students and faculties where they are provided with own user id and password for references on request by the user.

Library committee is responsible for collection of new arrival of books, journals and to maintain the regulation of library. It collects requests for books and journals from HODs of all

departments, places orders for procurement of books. After the arrival of books, they are catalogued and database entries are done after which they are placed in the rack of new arrival of books. The overall resources of the library include books comprising of 4673 titles, 13301 volumes and 1210 reference books; 129 journals of which 76 are national and 53 are international; non-book materials or e-resources (Medline) comprising of 1869 scholarly journals, 146 trade journals, 69 e-books, 39 magazines, 23 reports, a collection of rare books and copies of Thesis and University Question papers Special reports or any other knowledge resources. As evident from its repertoire TMCH has grown significantly since its inception in 2010 and continues to strive to provide the highest quality of education and research in diverse fields while at the same time supporting the poor community through grants and employment opportunities.

With the objective of improving, it is environmental in the campus TMCH requested P S Quality Certifications to carry out an environmental audit of its campus at TMCH, Rethinamangalam. The objective of 'Environmental Audit' is to optimize the use of all forms of resources such as energy, water, materials and surroundings. It would also help to reduce/eliminate the adverse impact of their use. More importantly, the recommendations from the audit would result in significant cost benefits for TMCH. Accordingly, the audit team conducted the audit with an intensive field study. This report is based on field study and subsequent analyses of data.

1.2 SCOPE OF THE STUDY

The green audit was conducted with the following scope of work to cover the impact of resources used in various areas of the campus.

- Conducted 'Awareness Programme on 'green audit '
- Assess the inputs, outputs and wastage for each resource usage area
- Asses water management practises
- Asses the solid waste management practices
- Evaluate the compliance with regulatory and other re
- Analyse the air and noise pollution in the campus
- Assess the green cover and plant diversity.
- Evaluate the performance of sewage treatment system
- Identify measures for improving the campus environment

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1.3 AUDIT APPROACH

Green Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. It aims to analyse 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.

Goals of Green Audit

- The objective of carrying out Green Audit is securing the environment and cut down the threats posed to human health.
- To make sure that rules and regulations are taken care of
- To avoid the interruptions in environment that are more difficult to handle and their correction requires high cost.
- To suggest the best protocols for adding to sustainable development

Benefits of Green Audit

- It would help to prepare plan to protect the environment.
- Recognize the cost saving methods through waste minimization and management.
- Point out the prevailing and forthcoming impacts on environment.
- Ensures conformity with the applicable laws.
- Empower the organizations to frame a better environmental performance.
- It portrays a good image of an institute, which helps building better relationships with the group of interested parties.

The audit was carried out by undertaking a field visit to the site during Mar 2020. During the field visit, a number of on-site measurements were taken and observations made for various

equipment in the campus along with collection of resource consumption, equipment and operational data from the administration and technical departments. Discussions were held with concerned Technical / Managerial staff to fully understand the working requirements to arrive at practically reliable solutions. The audit team collected relevant data and made key measurements.

The following areas were covered as part of the study:

- Bio diversity and ecology
- Carbon footprint
- Health and hygiene
- Flora and fauna
- Water use, distribution and management
- Solid waste generation and disposal
- Air and noise pollution assessment
- Assessment of compliance requirements
- Waste water disposal
- E- waste management
- Medical waste management

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After carrying out the measurement & field study, the preliminary observations of the study were discussed with the management. The report presents the field measurements, operational data, data analysis, key observations made, and recommendations for achieving optimum use of resources and for mitigating adverse impact on environment. The recommendations are followed by cost-benefit analysis. Major emphasis is laid on short and medium term measures. The ultimate aim of this exercise is to enable the management to understand and prioritize environmental improvement measures identified through the study.

1.4 CAMPUS DESCRIPTION

Tagore Medical College & Hospital (TMCH) has its campus at Rethinamangalam, Chennai and The Tamil Nadu Dr. MGR Medical University Chennai, in the letter no. Preceding Affln III (3) /32878/2009 Date: 29.07.2010 had granted provisional affiliation for starting MBBS degree course from the academic year 2010-2011.

1.5 SOURCES OF ENVIRONMENTAL IMPACTS

The major sources of environmental impact are water use, energy use, solid wastes, effluents, air pollution and noise.

Campus Environment System

2.1BIO DIVERSITY

Biodiversity is the amount of variety of life on Earth. It is the number of different species of plants, animals, and microorganisms. It includes organisms from Earth's vastly different ecosystems, including deserts, rainforests, coral reefs, grasslands, tundra, and polar ice caps. Biodiversity contributes to ecosystem as follows:

- Increase ecosystem productivity; each species in an ecosystem has a specific niche a role to play.
- Support a larger number of plant species and, therefore, a greater variety of crops.
- Protect freshwater resources.
- Promote soils formation and protection.
- Provide for nutrient storage and recycling.
- Aid in breaking down pollutants.
- Contribute to climate stability.
- Speed recovery from natural disasters.
- Provide more food resources.
- Provide more medicinal resources and pharmaceutical drugs.
- Offer environments for recreation and tourism.

Despite being in the thick of the city, TMCH boasts of wide bio diversity due to its vast greenery and the water body nearby.

2.2IMPORTANT PLANT SPECIES IN THE CAMPUS

Trees play a critical role for people and the planet. Numerous studies have demonstrated that the presence of trees and urban nature can improve people's mental and physical health, children's attention and test scores, the property values in a neighborhood, and beyond. Trees cool our urban centers. Trees are essential for healthy communities and people. The benefits

that trees provide can help cities and countries meet 15 of the 17 internationally supported United Nations Sustainable Development Goals.

The TMCH campus has a good species diversity. Species diversity is a measurement of an ecosystems species richness and species evenness. Species richness refers to number of different species in an eco-system. Species evenness is the variation in the abundance of individuals per species within the community.

DESCRIPTION- FLORA	**QTY**
Neem Tree	163
Bullet Wood Tree	73
Lebek Tree	19
Pongam Tree	149
Portia Tree	102
Jamun Tree	57
Illuppai Tree	60
Fig Tree	19
Peepal Tree	19
Kondni Tree	15
Rusty Shield Tree	53
Thomy Bamboo	24
Thingam	12
Arjun	7
Nunna	14
Rain Tree	45
Gulumur	24
Neam	15
Bhadam Tree	62
Thankani Tree	14
Deek Tree	30
Pathari Tree	24
Ashoka Tree	13
Rosea Tree	24
Mango Tree	8

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White Rose Tree	25
Hors Deng	30
Kumthal Pannas	78
Kundumani	13
Pamni Tree	58
Elephant Tree	12
Mandari Tree	13
Puliyen Tree	1
Kadambha Tree	14
Puvum Kali	25
Kuruvi Allan	29
Ink Tree	5
Champagam Tree	10
Seetha Fruit Tree	10
Vishnu Tree	25
Rosewood Tree	6
Parueu	6
Veseri Valai	16
Stone Bangal Tree	85
Coconut Tree	10
Total	**1516**

By increasing the species diversity in its ecosystem, TMCH has increased both the efficiency and productivity, thus making more resources available for other species within the ecosystem.

2.3NAMING OF PLANT SPECIES

Binomial Nomenclature is a widely used, formal system of naming a species. The nomenclature consists of two names, both of which are derived from Latin. However, it can be derived from other languages too. Such a name is called a binomial name or a scientific name.

The generic name or the initial part of the name highlights the genus to which an organism belongs. The second part, or the specific name, identifies the exact species to which the organism falls under, within the genus. The botanical names of various plant species in TMCH campus are given in the following table.

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Sl.No	Common Name	Botanical Name	trees available
1	Neem Tree	Azadirachta indica	163
2	Bullet Wood Tree	Mimusops elengi	73
3	Lebbeck Tree	Albizia lebbeck	19
4	Pongam Tree	Pongamia pinnata	149
5	Portia Tree	Thespesia populnea	102
6	Jamun Tree	Syzygium cumini	57
7	Iluppai Tree	Madhuca longifolia	60
8	Fig Tree	Ficus Rellussa	19
9	Peepal Tree	Ficus religiosa	19
10	Kondni Tree	Cassia Siamea	15
11	Rusty Shield Tree	Peltophorum pterocarpum	53
12	Thorny Bamboo	Bambusa Velgarius	24
13	Thingam	Lannea coromandelica	12
14	Arjun	Terminalia arjuna	7
15	Nuna	Morinda Tinetoria	14
16	Rain Tree	Samanea saman	45
17	Gulumur	Delonux Regiya	24
18	Neam	Mali Neem	15
19	Badam Tree	Bhdham(Rosaceae)	62
20	Thankani Tree	Casuea Fislula	14
21	Deek Tree	Deek	30
22	Pathari Tree	Spothida companilata	24
23	Ashoka Tree	Poliyanthea lanehpolia	13
24	Rosea Tree	Tabebuia rosea	24
25	Mango Tree	Mangifera indica	8
26	White Rose Tree	Aaulieasea	25
27	Hors Deng	Umbrala Tree	30
28	Kumthal Pannas	Royalfarms	78
29	Kundumani	Adintharanna Povinica	13

30	Pamni Tree	Pulmeria	58
31	Elephant Tree	Kigeliea pennata	12
32	Mandari Tree	Buhuniea	13
33	Puliyen Tree	Tamarina indica	1
34	Kadambha Tree	Kadambha	14
35	Puvum Kali	Pulmeria	25
36	Kuruvi Allan	Ficus Ponda	29
37	Ink Tree	Jakaranda	5
38	Champagam Tree	Michkelea Champaka	10
39	Seetha Fruit Tree	Annuna	10
40	Vishnu Tree	Mahaganni	25
41	Rosewood Tree	Rosewood	6
42	Parueu	Cyeus	6
43	Visiri Vazai	Ravenala form	16
44	Stone Bangal Tree	Fieus Blackanna	85
45	Coconut Tree	Cocos nucifera	10
	Total		**1516**

2.4 LISTING OF AMPHIBIANS, REPTILES, MAMMALS ETC..

Amphibians play a pivotal role in ecosystem as secondary consumers in many food chains. Tadpoles have significant impact in nutritional cycling. They are herbivorous to omnivorous and are the prey items for both invertebrates and vertebrates. Adult amphibians are the best biological pest controllers. Invertebrates and vertebrates also predate them. Because of their importance in ecosystem, decline or extinction of their population has significant impact on other organisms along with them.

From the ecological perspective, amphibians are regarded as good ecological indicators. Due to high degree of sensitivity, either during tadpole stage or as adults, they respond to very slight change in the environment. Such responses have been used to indicate habitat fragmentation, ecosystem stress, impact of pesticides, and various anthropogenic activities.

Mammals always play a vital role for whichever ecosystem they live in. Mammals are typically important for maintaining services and functions associated with sust ecosystem, such as playing the prey-predator role in the environment, seed

Reptiles play an important role in the balance of an Ecosystem. In most ecosystems, reptiles are the vital part of food chains and they play a huge role as both the prey species and the predators in ecosystems. They also play the role of a pollinator. The reptiles eliminated many serious agricultural pests.

The list of various amphibians. Mammals and reptiles spotted in TMCH campus is given in the following table.

Species	**Zoological name**	**Picture**
Monkey	Cercopithecidae	
Cow	Bos indicus	
Rat snake	Ptyas mucosa	
Squirrels	Sciuridae	
Rat	Rattus	
Garden Lizard	Calotes versicolor	
Stray dogs	Canis lupus familiaris	

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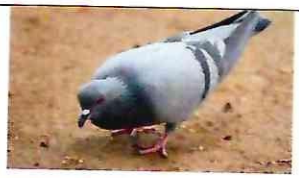
2.5 LIST OF BIRD DIVERSITY

Birds occupy many levels of trophic webs, from mid-level consumers to top predators. As with other native organisms, birds help maintain sustainable population levels of their prey and predator species and, after death, provide food for scavengers and decomposers. Many birds are important in plant reproduction through their services as pollinators or seed dispersers. Birds also provide critical resources for their many host-specific parasites, including lice that eat only feathers, flies adapted for living on birds, and mites that hitchhike on birds from plant to plant and even between countries.

Bird's name	Zoological name	Picture
Woodpecker	Picidae	
Indian cuckoo	Cuculus micropterus	
Indian sparrow	Passer domesticus	
Common myna	Acridotheres tristis	
Pigeon	Columba livia	
Parrot	Psittacula eupatria	
Peacock	Pavo cristatus	

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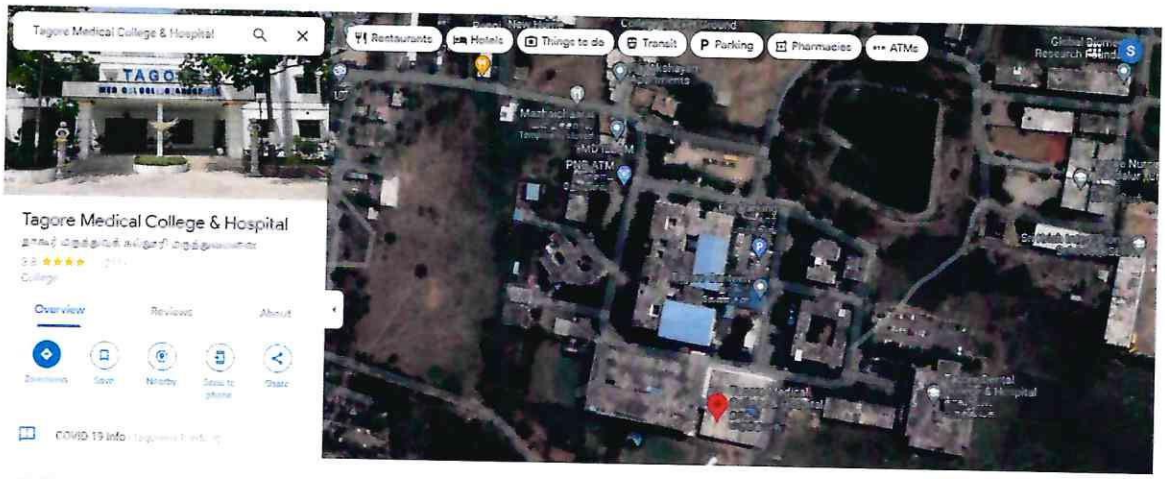
GREEN COVER

TMCH maintains a variety of trees and botanical gardens containing several plants and shrubs. About 20% of the total area is under green cover. The dense green cover of the campus is visible in the satellite image shown below.



Tagore Medical College & Hospital, Rethinamangalam located in pollution free area with adequate natural vegetation.

It is also an active participant of Swachh Bharat Mission (SBM). Swachh Bharat Abhiyaan or Clean India Mission is a countrywide campaign initiated by the Government of India in 2014 to eliminate open defecation and improve solid waste management. The mission is aimed at progressing towards target 6.2 of the Sustainable Development Goals Number 6 established by the United Nations in 2015. Some of the plants developed in TMCH campus under this mission are depicted in the following pictures.

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To nurture the growth of the plants and to dispose the garden waste. TMCH has created a system for composting. Compost is a type of organic matter that can be added to soil to help plants grow.

Composting involves decomposition of flowers, leaves, grass scrapings and yard trimmings over time to create a nutrient-rich organic material that can be added to the soil. The practice decreases the waste generated in the campus. The advantages of composting include

- **Waste reduction.** Composting allows recycle of natural wastes helps minimize the environmental impact. Otherwise, these wastes were being burnt resulting in air pollution and degradation in aesthetic environment.
- **Soil enrichment.** Compost helps soil retain more moisture and nutrients. It also prevents erosion by breaking up compacted soil.
- **Lower need for synthetic fertilizers.** Unlike many synthetic fertilizers, compost is free of harmful chemicals and adds organic material to the soil

2.6 CAMPUS HYGIENE

Ensuring that the college is well maintained is not only conducive to productivity; it also increases the likelihood of attracting more students. Though everyone aims to keep themselves personally very clean, not much importance is given for keeping the surroundings clean. The sources of water are constantly being polluted. Unhygienic surrounding invites mosquitoes and flies. Environmental hygiene or sanitation thus helps to reduce the incidences of those diseases, which are commonly acquired or transmitted through contaminated water, food and drinks. These include gastrointestinal diseases like diarrhoea, dysentery, cholera etc. and insect-borne infections like malaria, dengue, plague, filariasis, etc. Because of its universal use, water can be the channel for spreading various diseases like typhoid, cholera, dysentery etc.

TMCH has a campus-cleaning schedule in place, which enables it to maintain highest standards of hygiene and sanitation. The following picture shows the effect of maintaining hygiene in toilets and bathrooms.

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2.7 CARBON FOOT PRINT AUDITING

According to World Health Organization (WHO), a carbon footprint is a measure of the impact and organization's activities have on the amount of carbon dioxide (CO2) produced through the burning of fossil fuels and is expressed as a weight of CO2 emissions produced in tonnes per year. The emissions can be direct or indirect. Direct emissions include the use of energy and transport. The use of electrical energy in the premises is also taken into account as its generation at the source emits carbon di oxide. Indirect emissions for example, pertains to energy consumed in the manufacture of various materials used in the campus and also transport emissions of the students/staff using public transport, visitors and other service providers visiting the campus.

The main source of energy used in the campus is electricity from Tamilnadu Generation and Distribution Corporation Ltd (TANGEDCO). In times of power shutdown, the Diesel Generators are operated which use HSD as a fuel. Diesel is also used for cars used by TMCH. The annual energy consumption for the plant during the year 2021 is given below in the table.

Energy source	**Annual Quantity**	**Annual Cost**	**CO_2 emissions (Tonnes/year)**
Electricity	1604661 kWh	Rs.15,558,239	145
Diesel for cars (5 Nos.)	5265 litres	Rs. 3,63,062	12.2
Diesel for DG sets	87790 litres	Rs. 8,490,658	9.1
Total		**Rs. 24,411,959**	**166.3**

Thus, the TMCH campus emits 166 Tonnes of CO2 per year only through its energy use.

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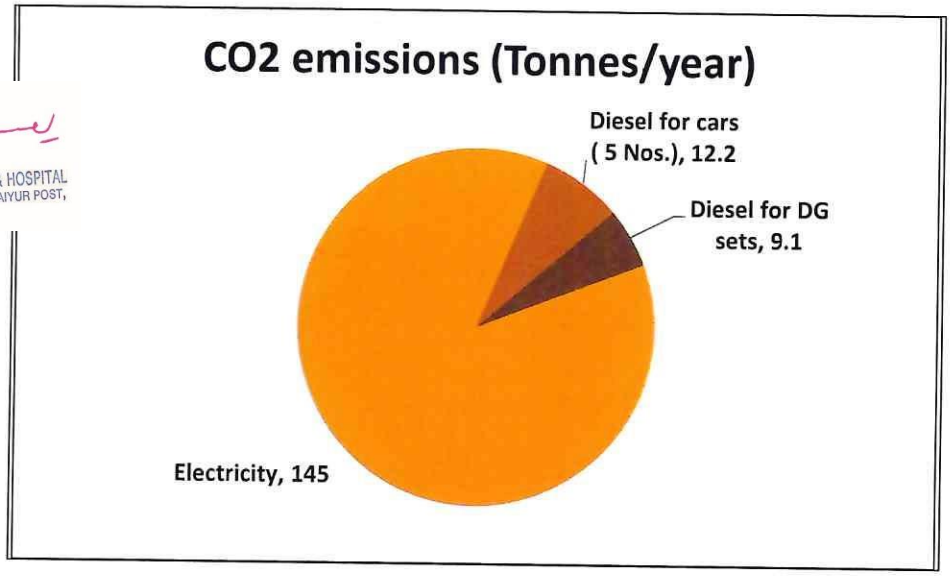
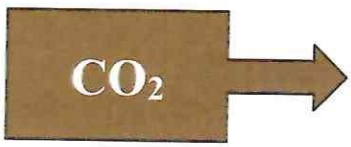


CO2 sequestration

S.No	Common Name	CO2 sequestered kg per year	Total Number of trees available	Total CO2 sequestered
Trees				
1.	Banana	*55*	5	275
2.	Jack	*37*	4	148
3.	Mango	*44*	6	264
4.	Amla	*13*	1	13
5.	Moringa	*17*	1	17
6.	Papaya	*7*	4	28
7.	Custard Apple	*8*	1	8
8.	Guava	**14**	2	28
9.	Pomegranate	*8*	5	40
10.	Golmohar tree	*21*	1	21
11.	Coconut	*42*	8	336
12.	Ashoka tree	*23*	20	460
13.	kapok silk cotton tree	*16*	1	16
14.	Tree lettuce	*8*	8	64
15.	Golden shower	*17*	30	510
16.	Indian Almond tree	*32*	1	32

17.	Pungam	*34*	6	204
18.	Poo arasan	*26*	5	130
19.	Subabul	*8*	3	24
20.	Teak	*34*	1	34
21.	Pupal tree	*17*	1	17
Shrubs				
22.	Curry leaf	*12*	5	60
Ornamental Plants				
23.	Golden Duranta	*0.5*	500	250
24.	Clerodendran	*0.3*	100	30
25.	Clerodendran	*0.3*	300	90
26.	Crotons	***0.2***	30	6
27.	Idlly poo	*0.2*	50	10
28.	Pedulanthus	*0.3*	300	90
29.	Thuja plant	*0.2*	10	2
30.	Thulasi	*0.3*	2	0.6
31.	Chembaruthi	*2.1*	1	2.1
32.	Mini Nanthiyavettai	*1.3*	20	26
33.	Jasmine	*0.4*	1	0.4
34.	Green Acalypha	*0.3*	50	15
35.	Red Acalypha	*0.3*	50	15
36.	Difenbachiya	*0.2*	5	1
Palm trees				
37.	Fan palm	*3.1*	2	6.2
38.	Areca palm	*2.9*	20	58
Total CO2 sequestered in the campus per year				**3331**



The Matured Trees contributes for reduction of **3.3** Tons of CO2 emission/Annum

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CO_2 absorption by trees and plants has been calculated as per the methodology given in Annexure – 1.

The total CO_2 emissions from the campus is 166.3 Tonnes per year. Due to the greening activities, the CO_2 absorption in the campus is 3.3 Tonnes per year.

2.8 HEALTH HAZARDS AND RISK/SAFETY ASSESMENT

Students, staff, and faculties are involved in activities that exposed them to a range of minor to severe or even fatal accidents in academic settings. Managing work environment risks is crucial to any safety and health prevention program. Working activities in academic sites, such as laboratory, may be accompanied by a variety of hazardous risks. While students, staff, and faculties need to stay alert and aware at all times to avoid accidents, the administration needs to know the most common causes for college accidents and be able to identify in advance the risk factors to prevent them

2.9 REDUCTION IN PAPER USE

TMCH has been using paperless office concept through its electronic documentation management environment, which provides an alternative to the workflow and storage issues associated with paper files. This helps in combating deforestation by cutting down the demand on paper, which is mostly made available through deforestation. The effects of deforestation on the global environment have been adverse and consequently affected the survival of humans and other organisms on the planet. Reducing the demand for paper enhances the greening and is a practical action towards reversing the climate change effects with far reaching impacts on the survival of various species. The following screenshots evidence the use of software that seek to displace paper.

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Best practices and recommendations

3.1 Best Practices

Restricted entry of automobiles

The University does not allow entry to all vehicles inside the campus. Only the fraternity of university can enter with their vehicles. In the university campus, only restricted automobiles can enter and most of them park in the parking area. This results in safety as well as reduction in air pollution. The measure also does not disturb the species thronging the campus.

Landscaping

Every year during rainy season, college takes the initiative of plantation inside the college campus. It has nursery and promote different NGO and institute for plantation. College takes the advantage of free plant from nursery and plantation takes place every year inside the campus.

Effective waste segregation

Due to persistent awareness and creation of a system, methodical waste segregation is in practice.

Recommendations

- Promote reuse of one-side used paper
- Reuse envelopes that are received by the university

- Encourage planting of fruit bearing trees which can be used by campus residents
- Educate students on the health and environmental benefits of cycling and encourage them to use them
- Adopt Environmentally Responsible Purchasing Policy, and work towards creating and implementing a strategy to reduce the environmental impact of its purchasing decisions. For example, star rated appliances can be purchased for reducing energy consumption.
- Celebrate World Environment day to sensitise student community
- Conduct and take part in competitions concerning environment preservation
- Provide posters in the campus to create awareness among the students
- Encourage students to participate in community development activities
- Adopt 'Green Chemistry' that reduces or eliminates the use or generation of hazardous substances in the use of chemicals in the laboratory.
- Conduct exhibitions for parents and public on environment and sustainable practices.
- Declare the campus plastic free and implement it thoroughly
- Formulate an environment policy for the college
- Establish a system for safe disposal of an E-waste

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Annexure-1

How to calculate the amount of CO2 sequestered in a tree per year

It is estimated that our agroforestry trees, planted in tropical climates, will sequester atmospheric carbon dioxide at an average of 50 pounds of carbon dioxide per tree per year. The rate of carbon sequestration depends on the growth characteristics of the tree species, the conditions for growth where the tree is planted, and the density of the tree's wood. It is greatest in the younger stages of tree growth, between 20 to 50 years.

The methodology is explained below

1. Determine the total (green) weight of the tree.
2. Determine the dry weight of the tree.
3. Determine the weight of carbon in the tree.
4. Determine the weight of carbon dioxide sequestered in the tree
5. Determine the weight of CO2 sequestered in the tree per year

Determine the total (green) weight of the tree

The algorithm to calculate the weight of a tree is:

W = Above-ground weight of the tree in pounds

D = Diameter of the trunk in inches

H = Height of the tree in feet

For trees with D < 11:

W = 0.25D2H

For trees with D >= 11:

W = 0.15D2H

Depending on the species, the coefficient (e.g. 0.25) could change, and the variables D2 and H could be raised to exponents just above or below 1. However, these two equations could be seen as an "average" of all the species' equations.

The root system weighs about 20% as much as the aboveground weight of the tree.

Therefore, to determine the total green weight of the tree, multiply the aboveground weight of the tree by 120%.

Determine the dry weight of the tree

This is based on an extension publication from the University of Nebraska.

This publication has a table with average weights for one cord of wood for different temperate tree species. Taking all species in the table into account, the average tree is 72.5% dry matter and 27.5% moisture.

Therefore, to determine the dry weight of the tree, multiply the weight of the tree by 72.5%.

Determine the weight of carbon in the tree

The average carbon content is generally 50% of the tree's total volume.

Therefore, to determine the weight of carbon in the tree, multiply the dry weight of the tree by 50%.

Determine the weight of carbon dioxide sequestered in the tree

CO2 is composed of one molecule of Carbon and 2 molecules of Oxygen.

The atomic weight of Carbon is 12.001115.

The atomic weight of Oxygen is 15.9994.

The weight of CO2 is C+2*O=43.999915.

The ratio of CO2 to C is 43.999915/12.001115=3.6663.

Therefore, to determine the weight of carbon dioxide sequestered in the tree, multiply the weight of carbon in the tree by 3.6663.

Determine the weight of CO2 sequestered in the tree per year

Divide the weight of carbon dioxide sequestered in the tree by the age of the tree.

ENERGY AUDIT REPORT

DETAILS OF THE CLIENT

TAGORE MEDICAL COLLEGE & HOSPITAL

Rethinamangalam, Melakottaiyur Post, Chennai-600127

Affiliated to the Tamil Nadu Dr.MGR Medical

TAGORE MEDICAL COLLEGE & HOSPITAL

Rathinamangalam, Melakkottaiyur Post, Chennai - 600127.
Phone : 044-30101111, Fax : 044-222 5555, Email: tagoremch@gmail.com

(Affiliated to the Tamil Nadu Dr.MGR Medical University & Recognized by the Ministry of Health & Family welfare. Govt. of India New Delhi)

DATE OF AUDIT

18/03/2021 to 19/03/2021

(Audited and Accounted for the period of 2020-21)

AUDIT CONDUCTED AND SUBMITTED BY

P S QUALITY CERTIFICATION PVT LTD

No.415, F4, Ist Floor, Asha Vignesh Apartment, Ambattur, Tamil Nadu 600 053.

Mobile: +91- 81240 88335, 044 - 4959 1335

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Leaks make your future bleak...

EXECUTIVE SUMMARY

Electrical and Thermal Energy Process

A detailed was conducted in **Tagore Medical College and Hospital.** The audit team has identified ***12 Energy Conservation Proposals (ENCONs)*** and summary of the Energy Audit Process is given below.

Description/Year	19-20	2020-21
Annual Electricity Consumption (kWh)	20,73,168	16,04,661
Annual LPG Consumption (kg)	42,731	38,016

Summary of Energy Conversion (ENCON) Proposals		
Description	**Parameters**	
	Present	**After**
Annual Energy Consumption	20,73,168 kWh + 42,731 Kg of LPG	16,04,661 kWh + 38,016 kg of LPG
Annual Energy Cost	Rs. 2,23,83,573	Rs. 1,85,57,279

Equipment's/Systems Audited:

Electrical System	Thermal System
• All major electrical equipment's	• Inverter, UPS and Battery System
• Electrical distribution system	• Diesel generators, Pumps and motors
• Lightings, Fans & Air Conditioning	• Roof top solar PV system
	• LPG for cooking application

The detailed Energy Conservation Proposals are presented in the Audit Report.

Audit Conducted, Complied and Verified by,

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RATHINAMANGALAM, MELAKOTTAIYUR POST,
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(Mr. G. ARIVARASAN)

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Executive Summary

This section presents a brief summary of the results of the detailed energy audit carried out at TMCH, Rethinamangalam during Mar 2021.

The audit was mainly targeted at identifying practical, sustainable and economically viable Resource saving opportunities in all sections of the facility, resulting from a detailed study and analyses of technical parameters. The audit involved using a wide range of sophisticated, portable, diagnostic and measuring instruments to generate refined data and facilitate complex analyses to give a more reliable basis for evaluation of energy saving potential and economic viability.

TMCH has its building located at Rethinamangalam, Chennai. The building occupies an area of 29360 Sq.m. The main energy source to the facility is electricity, which is obtained from TANGEDCO. The plant has two DG set for back-up power of 500 kVA each. The following table gives total cost of energy sources of the last three years i.e., 2017, 2018, and 2019.
The study has identified an annual energy saving potential of 3, 75,762 kWh (amounting to Rs.31.94 lakhs and 21 % of the total bill) of electricity with involvement of technology change.
The total cost of implementation for the proposals is estimated to be Rs. 123.58 lakhs.
A summary list of recommendations, the saving potential and implementation cost is given In the next page. The details of various proposals are given in detail in this report:

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Summary of recommendations

S.No	Particulars	Energy Savings, kWh/year	Cost Savings, Rs. Lakh(s)/year	Investment Rs. Lakh(s)	Payback Period, months
1	Increase temperature setting of air conditioners to 25^0C	157104	13.35	nil	nil
2	Replace 40 W Fluorescent tube lights by 26 w led tube lights	3198	0.27	0.28	12
3	Replace existing ceiling fans by energy efficient BLDC FANS.	152100	12.93	87.30	108
4	Install a 60 kw solar power plant in the terrace of the building	63,360	5.39	36.00	91

Annual Monetary savings – Rs. 31.94 Lakhs

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CHAPTER 1

Introduction

1.1 BACKGROUND

Tagore Educational Trust was formed in 1997 by the chairperson Professor M. Mala, M.A., M.Phil. An educationist and philanthropist. Trust is pledged to the noble task of offering state of the art higher education in the field of Medicine, Engineering and Humanities. The Trust has already earned year of enviable reputation by establishing institutions offering quality education. In keeping with this objective, the Trust started Tagore Medical College and Hospital in the year 2010-2011 to train young men and women as dedicated, high skilled medical professional committed with the noble task of serving community.

Provisional Affiliation for starting for first year PG degree courses from the academic year 2020-2021 was approved by the Tamil Nadu Medical University in their letter proc. No. Affln.IV(1)/68378/2019, Dt:26.09.2020 for the following departments, M.D Community Medicine, M.D. General Medicine, M.D General Surgery, M.D Pathology, M.D Ophthalmology, M.S Orthopaedics, M.S Obstetrics and Gynaecology

Tagore Medical College and Hospital contemplates to achieve eminence in teaching-learning through establishment of state-of-art infrastructure facilities for the execution of curricular, co-curricular and extra-curricular activities effectively. Housed in a lush green campus of 26.25 acres, the infrastructure of the institution is spread over three blocks and the teaching-learning facilities fulfil the requirements of the statutory bodies. There are four well ventilated, air-conditioned ICT-enabled, classrooms equipped with 150 seating capacity, LCD projectors and smart boards. The Wi-Fi enabled campus facilitates technology driven teaching-learning methods like, video-demonstrations, online quiz activities and game based learning. The institute also has two well-furnished examination halls, each with a seating capacity of 150 students for examinations. Each department of college has adequate number of well-equipped, ICT-enabled demonstration halls, seminar halls and a departmental library as stipulated. Totally there are 37 demonstration rooms and seminar halls, 20 departmental libraries and one central library.

Each department of college also has adequate number of well-designed laboratories viz. practical, specialised and research laboratories. In addition, the institute also has 5 well

developed museums, a skill lab and a dissection hall of the anatomy department to facilitate self-directed and participatory learning. The central research laboratory of the institution houses sophisticated instruments to facilitate and promote research acumen of the faculty and students.

The 818 bedded, NABH accredited teaching hospital of the institution consists of 13 operation theatres (10 major, super specialties, and 03 minor OT), six specific intensive care units, 36 wards, NABL accredited central clinical laboratory, blood bank and the casualty. Each clinical department has out-patient and in-patient services with attached clinics. The bed occupancy rate is adequate as per the MCI/NMC norms and serve as a rich source for the teaching and learning of clinical skills. Institution also provides the super specialty facilities such as Oncology, Neurosurgery, Cardiology, Neurology, Nephrology, Surgical oncology, Plastic surgery and cardiothoracic surgery which creates opportunities for the students to enhance their knowledge in specialised clinical fields. The family visits, school visits, visits to different organizations, postings in UHC and RHC of the institution are the resources for students for community based learning. The field visits, medical camps, health education and awareness programs conducted regularly by the community medicine department provide scope for experiential learning in students. Institution has video teleconferencing facility in a conference hall well equipped with LCD television displays, cameras, microphones, and VGA connections to enable interactive learning through distant resources.

AYUSH-related learning facilities are also established in the hospital through an actively running AYUSH outpatient department. The herbal garden maintained in the campus, is helpful for creating knowledge and awareness on the use of medicinal plants.

The institution periodically reviews, modifies and updates the existing infrastructure based on the demands and the challenges for the efficient conduct of teaching-learning and research. This is evidently demonstrated by the institution's efforts in as accessing online teaching-learning platforms for regular academic operations during the COVID crisis.

The central library of the institution is fully air conditioned and spread over an area of 2631 sq. m. The reference and text books of various subjects are arranged subject wise in open shelves for ease of access and retrieval of books. There is a separate room for journals and the archives. Newly purchased books and journals are separately displayed in two separate racks at the entrance. The library has an Audio- Visual room with 50 seats.

The library has a well-lighted and ventilated reading room for undergraduate students with a seating facility for 170 students. Also, there are reading halls for students and staff with a

seating capacity of 170 and 50 respectively that allow for the usage of own study material. The journal section has 35 seats capacity. There is a separate reading section for post graduate students with 50 seats. CCTV cameras are installed in the library for strict surveillance. The library also has a Reprographic room, facilities for scanning and printing. There are rooms available separately for the library staff.

There is an internet enabled computer room with 50 computers. The students can utilize the e resources, CD/DVD of various books and use various search engines for the purpose of learning and research. Wi-Fi facilities are available for students and faculties in the library.

There is a virtual library which has online journals that can be accessed from PROQUEST medical database, MEDLINE database and the Tamil Nadu Dr. MGR medical university database. The various e-resources available are e- Journals, e-books, Magazines, Newspapers, Reports, Research Dissertations, Skill building reviews.

The library also has a collection of undergraduate and postgraduate university examination question papers, NEET, AIIMS and PGIMER entrance exam preparation books and post graduate dissertations for reference. Every department has its own departmental library in addition to central library. The department library has many good collection of books for instant reference and accessible at department levels. The institution has also subscribed for more than 100 national and international journals. The e-resources can be assessed from anywhere and at any time by the students and faculties where they are provided with own user id and password for references on request by the user.

Library committee is responsible for collection of new arrival of books, journals and to maintain the regulation of library. It collects requests for books and journals from HODs of all departments, places orders for procurement of books. After the arrival of books, they are catalogued and database entries are done after which they are placed in the rack of new arrival of books. The overall resources of the library include books comprising of 4673 titles, 13301 volumes and 1210 reference books; 129 journals of which 76 are national and 53 are international; non-book materials or e-resources (Medline) comprising of 1869 scholarly journals, 146 trade journals, 69 e-books, 39 magazines, 23 reports, a collection of rare books and copies of Thesis and University Question papers Special reports or any other knowledge resources. As evident from its repertoire TMCH has grown significantly since its inception in 2010 and continues to strive to provide the highest quality of education and research in diverse

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fields while at the same time supporting the poor community through grants and employment opportunities.

With the objective of reducing its energy intensity in its campuses, TMCH requested P S Quality Certifications to carry out an energy audit of its campus at TMCH, The objective of 'Energy Audit' is to optimize the use of all forms of energy such as electricity, Diesel, petrol, LPG etc. and reduce/eliminate the adverse impact of their use. More importantly, the recommendations from the audit would result in significant cost benefits for TMCH. Accordingly, the audit team conducted the audit with an intensive field study. This report is based on field study and subsequent analyses of data.

1.2 SCOPE OF THE STUDY

The energy audit was conducted with the following scope of work to cover the energy utilisation in various areas of the campus.

- Conducted 'Awareness Programme on 'Energy Conservation '
- Assess the inputs, outputs and wastage for each usage area
- Develop benchmarks for energy consumption
- Evaluate the tariff and optimisation of tariff
- Assess potential for renewable energy sources
- Evaluate the carbon footprint
- Identify energy saving measures
- Discussion and brainstorming of the measures evolved
- Cost benefit analysis of the evolved measures.

1.3 AUDIT APPROACH

As per the Energy Conservation Act, 2001 "Energy audit" means the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption. The audit was carried out by undertaking a field visit to the site during Mar 2021. During the field visit, a number of on-site measurements were taken for various equipment in the campus along with collection of energy consumption, equipment and operational data from the administration and technical departments. Personnel Discussions were held with concerned Technical / Managerial staff to fully understand the working

requirements to arrive at practically realizable solutions. The audit team collected relevant data and made key measurements.

The following areas were covered as part of the study:

- Tariff
- Electrical Systems : Distribution and management
- Air conditioners
- Lighting
- Ceiling and pedestal fans
- UPS
- Servo stabilisers
- Computers
- CCTV system
- DG sets

After carrying out the measurement & field study, the preliminary observations of the study were discussed with the management. The report presents the field measurements, operational data, data analysis, key observations made, and recommendations for achieving energy use efficiency for each of the above-mentioned equipment/area. The recommendations are followed by cost-benefit analysis. Major emphasis is laid on short and medium term measures. The ultimate aim of this exercise is to enable the management to understand and prioritize energy efficiency measures identified through the study.

1.4 CAMPUS DESCRIPTION

Tagore Medical College & Hospital (TMCH) has its campus at Rethinamangalam, Chennai and The Tamil Nadu Dr. MGR Medical University Chennai, in the letter no. Preceding Affln III (3) /32878/2009 Date: 29.07.2010 had granted provisional affiliation for starting MBBS degree course from the academic year 2010-2011.

1.5 ENERGY SOURCES

The main source of energy used in the campus is electricity from Tamilnadu Generation and Distribution Corporation Ltd (TANGEDCO). In times of power shutdown, the Diesel Generators are operated which use HSD as a fuel. Diesel is also used for cars used by TMCH.

1.6 ENERGY CONSUMPTION & ENERGY COST

Annual energy consumption for the plant during the year 2021 is given below in the table.

Energy source	Annual Quantity	Annual Cost
Electricity	1604661 kWh	Rs.15,558,239
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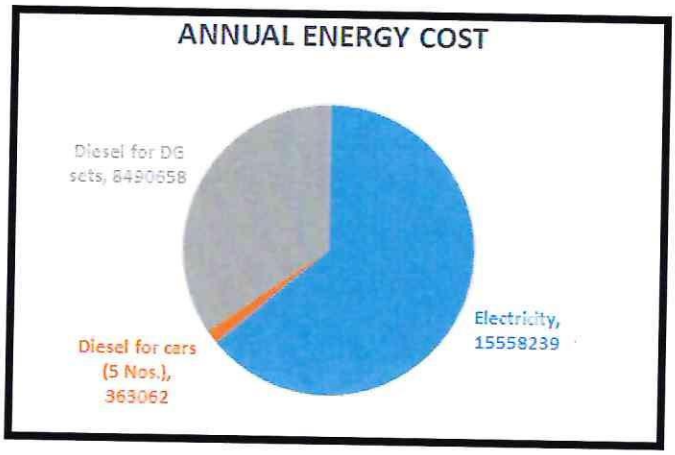

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Electricity forms the major energy cost accounting for 64% of the total energy expenditure.

The electricity tariff of TANGEDCO applicable for TMCH is HT-III-B (Private Educational Institutions & Hostels). Accounting to the tariff one unit or kWh is charged at Rs. Day = Rs.8.93; Peak = Rs.11.16; Night = Rs.8.50. In addition, a fixed charge of Rs. Demand Charges = Rs.297000 + Meter Rent = Rs.4366 is also charged. The connected load for TMCH is 1888 kW. The cost of diesel is Rs 69 per litre.

Campus Energy System

2.1 ELECTRICAL SYSTEM

TMCH has an HT connection with a connected load of 11KV / 433V 630KVA Transformer with Tamil Nadu Generation and Distribution Corporation (TANGEDCO). The service details are given below.

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TamilNadu Generation and Distribution Corporation Ltd.

High Tension Bill (Provisional) for the Month of April 2020

TANGEDCO CIN No:U40109TN2009SGC073746

GST No:33AADCT4784E1ZC

HSN . 27160000

SAC : 996912

**** Electrical Energy & Distribution Services are exempted under GST ****

To TAGORE MEDICAL COLLAGE & HOSPITAL

Rathinamangalam,Melakottaiyur, Chengalpattu Taluk,

RATHINAMANGALAM
Chengalpattu
Kancheepuram - 600127

Service No. 099094111102
Bill No. 9094111102052001
Date of Bill 06-May-20
Due Date 12-May-20
Tariff App. / Bld. HT III / HT III
GST No :

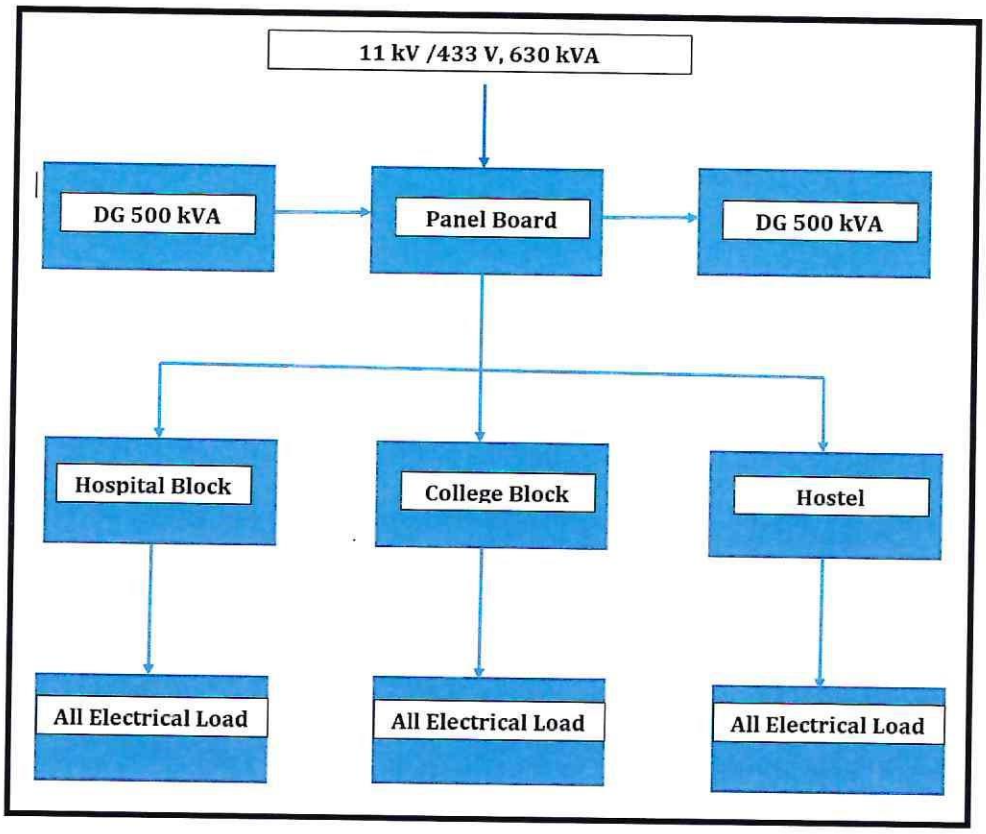
Permitted MD . 500 KVA Transformer Loss : 0units/0KVA Tr. CAP. 0 KVA

DETAILS	RATE	CONSUMPTION	AMOUNT (Rs.)
1. Industrial Consumption	8 per unit	142162	11,37,296.00
2. Peak Hour Consumption	1.6 per unit	0	0.00
3. Night Hour Consumption (5% Rebate)	0.4 per unit	0 (-)	0.00(-)
4. Quarters Consumption	0 per unit	0	0.00
5. Commercial Consumption	0 per unit	0	0.00
6. Temp. Supply Consumption	0 per unit	0	0.00
7. Total Energy Charges			11,37,296.00
8. Demand Charges	350 per KVA	450	1,57,500.00
9. Total Demand and Energy Charges			12,94,796.00

Tariff	Category of Consumer	Unit charges (Rs./kWh)	Fixed charges (Rs./kW)
HT-III	Private Educational Institutions & Hostels	Day = Rs.8.00; Peak = Rs.11.16; Night = Rs.8.50	Demand Charges = Rs.297000 + Meter Rent = Rs.4366

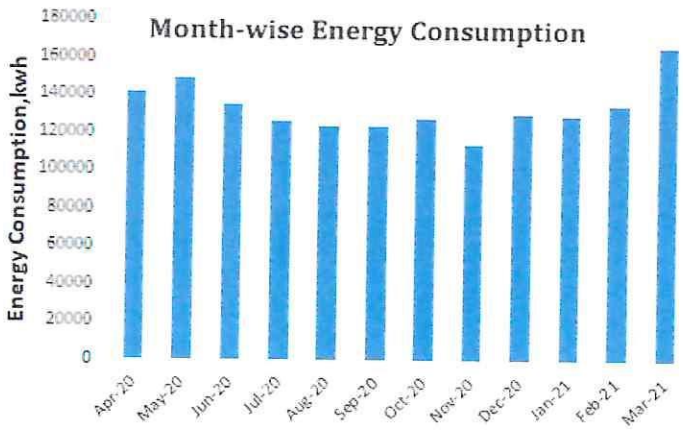
However, the supply is 3 phase most of the loads in use are of single phase. The premises has two DG set of 500 kVA, which acts a standby and is operated during power failure period from grid. The single line diagram of the electricity system is given below.

From the main panel board the incoming 3 phase 433 V supply three separate feeders supply power to College block and Hospital block. The two 500-kVA DG set is connected to the panel board through a bus coupler.



2.2 ELECTRICAL ENERGY USE PATTERN

The electrical energy consumption for various months is given in the following graph.



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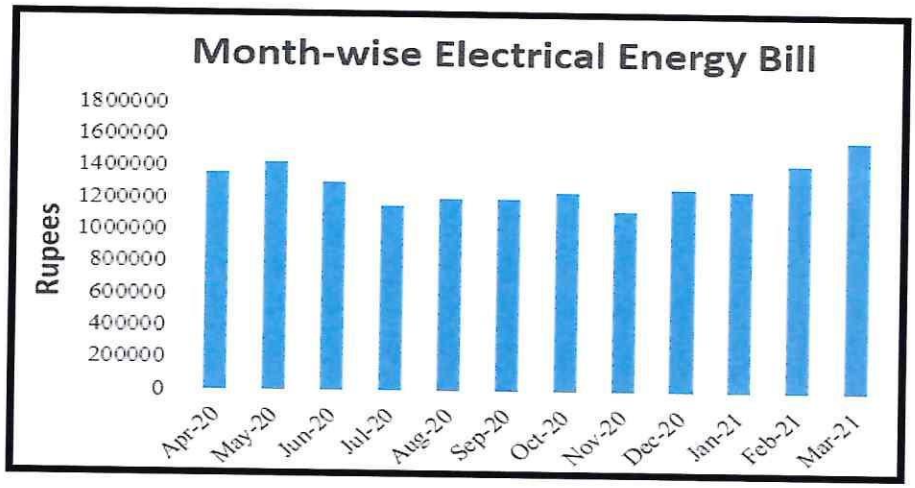
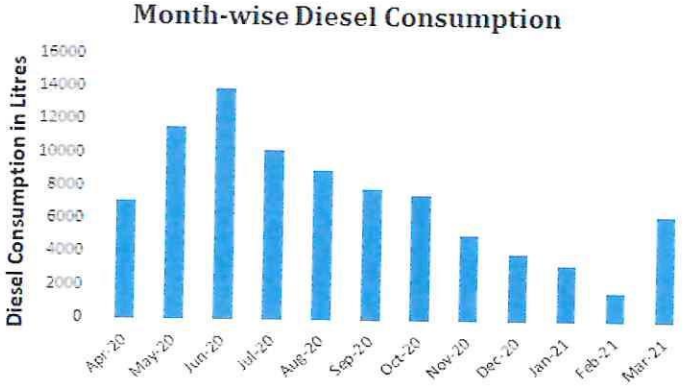
Energy consumption is found to be lower during the month of November, which could be due to lower energy requirements for air conditioners. The peak energy consumption is during the month of March in which 166373 kWh was consumed.

The energy cost varies directly in proportion to energy consumed. The energy bill consists of two components. The variable component, which depends on the energy consumed, determines the energy cost. The fixed component is to be paid at the rate of Demand Charges = Rs.297000 + Meter Rent = Rs.4366 for a connected load of 110 kW. This to be paid every month as fixed charges.



2.3 DIESEL GENERATING (DG) SETS

The plant is equipped with two DG set of 500 kVA. It is used in times of power cuts and power shortage. There is no metering and monitoring of electrical energy generated from DG set. However, the diesel consumption is monitored and the annual consumption is around 87790 litres amounting to Rs. 84.90 lakhs. The month wise diesel consumption is given in the figure below.



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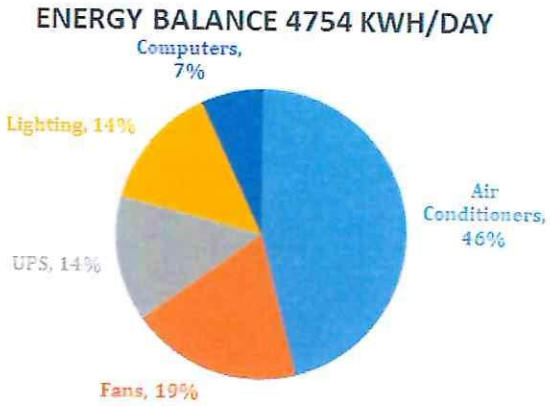
2.4 ENERGY BALANCE

Energy balance entails analysis of the site's energy use, identifying the sources of energy, determining the amount of the energy supplied and detailing what the energy is used for. The power measurements have been taken for various loads and based on this an energy balance has been made. The energy balance details are shown in the following figure.

Sl.No	Equipment's	Watts	Numbers	Approx. Operating Hours	Load Factor	Watts	Kwh/day
1	**Air Conditioners**						
	Split AC	1 ton	44	12hrs/day	0.4	1500	316.80
		1.5 ton	138	12hrs/day	0.4	1500	993.60
		2 ton	72	12hrs/day	0.4	1500	518.40
		3 ton	2	12hrs/day	0.4	1500	14.40
	cassette AC	2 ton	11	12hrs/day	0.4	1500	79.20
		4 ton	16	12hrs/day	0.4	1500	115.20
	Ductable AC	4 ton	4	12hrs/day	0.4	1500	28.80
		8 ton	1	12hrs/day	0.4	1500	7.20
		8.5 ton	10	12hrs/day	0.4	1500	72.00
		11 ton	3	12hrs/day	0.4	1500	21.60
		16 ton	1	12hrs/day	0.4	1500	7.20
	Window AC	1.5 ton	1	12hrs/day	0.4	1500	7.20
2	Ceiling Fan	60	2909	12hrs/day	0.4	60	837.79
3	Exhaust Fan	60	141	12hrs/day	0.4	60	40.61
4	Table / Pedestal Fan	60	37	12hrs/day	0.4	60	10.66
5	Tube light	36	222	12hrs/day	0.4	36	38.36
6	LED Bulb	25	4224	12hrs/day	0.4	25	506.88
7	Incandescent Bulb	9	146	12hrs/day	0.4	9	6.31
8	**Any other loads Computers, printers, projector, laptop, Scanner, CCTV, Biometry machine, Xerox machine, Router, LED TV, Amplifier etc.,**						
	UPS	400 kVA	28	24hrs/day	1	1000	672.00
	Printers	250	8	12hrs/day	0.05	250	1.20
	Stabilizers	195 kVA	2	12hrs/day	1	700	16.80
	Computers	95	238	12hrs/day	1	95	271.32
	CCTV	2	260	24hrs/day	0.2	2	2.50
	Copier	100	5	12hrs/day	0.2	100	1.20
	Router	6	96	24hrs/day	0.2	6	2.76
	LED TV	41	30	12hrs/day	0.6	41	8.86
	Lift		3	12hrs/day	1	1000	36.00
	PA Systems	200	13	8hrs/day	0.1	200	2.08
	Entrance Name Board	300	1	12hrs/day	1	300	3.60
	Security Cabin-1 Light	36	2	12hrs/day	0.4	36	0.35
	Spot Light	30	6	12hrs/day	0.4	30	0.86
	Ceiling Fan	75	1	12hrs/day	0.4	75	0.36
	Security Cabin-2 Light	36	2	12hrs/day	0.4	36	0.35
	TMCH Name Board	1500	1	12hrs/day	0.4	1500	7.20
	Double Arm Street Light	75	22	12hrs/day	0.4	75	7.92
	Single Arm Street Light	75	68	12hrs/day	0.4	75	24.48
	Flood Light	200	26	12hrs/day	0.4	200	24.96
	bollard Light 7ft	20	15	12hrs/day	0.4	20	1.44
	bollard Light 3ft	9	6	12hrs/day	0.4	9	0.26
	Spike Light	9	7	12hrs/day	0.4	9	0.30
	Himast Fitting-1	150	4	12hrs/day	0.4	150	2.88
	Double Arm Focus Light	150	8	12hrs/day	0.4	150	5.76
	Motor	1119	4	8hrs/day	1	1119	35.81
	LED Light	12	6	12hrs/day	0.4	12	0.35
	Multicolor Light	20	4	12hrs/day	0.4	20	0.38
	Total Average Energy Consumption per day						**4754.18**

The energy balance shows the dominance of Air conditioners which turns out to be energy guzzlers. They consume 46% of the total energy consumption. Lighting and fans also account for a significant portion of the energy consumed. The summary of the energy balance is shown in the following figure.



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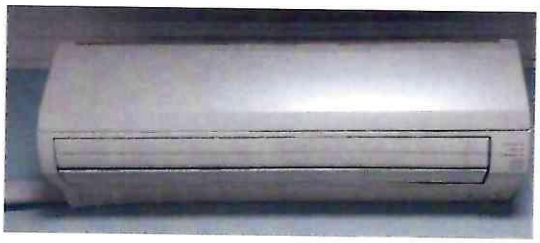
Energy Conservation Opportunities

3.1 INCREASE TEMPERATURE SETTING OF AIR CONDITIONERS TO 25^{0}C

Maximum energy is consumed by the air conditioners in the campus. The energy consumption of the AC's is very sensitive to the set temperature. Increasing the air-conditioner temperature setting by just 1^{0}C can save about 6 per cent of electricity consumption, according to the Bureau of Energy Efficiency. A temperature of 25^{0}C is sufficient to satisfy human comfort as per International stands. An increase from 21^{0}C to 25^{0}C will result in 24% saving in energy consumption. Hence, it is suggested to maintain a set temperature of 25^{0}C in all the air conditioners throughout the campus.

High energy guzzling window air conditioners.



Split air conditioners without any star rating.

Energy consumption for Air conditioners per day	2182 kWh
Percentage energy savings by raise in the set temperature from 21^{0}C to 25^{0}C	24%
Annual energy savings	24% x 2182 x 25 days x 12 months

	1,57,104 kWh/year
Annual monetary savings	1,57,104 x 8.50
	Rs. 13,35,384

3.2 REPLACE 40 W FLOURESCENT TUBELIGHTS BY 26 W LED TUBELIGHTS

TMCH has already installed a number of LED tube-lights in an effort to save energy. However, there are still 222 nos. of 36 W tube-lights, which consumes twice the energy needed for conventional tube-lights. It is suggested to replace these lamps by 26 W LED tube-lights as and when the existing tube fails.

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Energy consumption for 40 W FTL lamps	38.36 kWh
Energy consumption by replacing existing lamps with 26 W LED.	38.36 x 26/36
	27.70 kWh
Energy savings per day	38.36 – 27.70 = 10.65 kWh
Annual energy savings	10.65 kWh x 25 days x 12 months
	3198 kWh/year
Annual monetary savings	3198 x 8.50
	Rs. 27,183
Investment	Rs. 27,750
Payback period	12 months

3.3 REPLACE EXISTING CEILING FANS BY ENERGY EFFICIENT BLDC FANS

TMCH has 2910 nos. of ceiling fans each of 60 W capacity. The energy consumption of ceiling fans is 104 kWh/day. It is suggested to replace the existing fans by more efficient Brush Less Direct Current (BLDC) fans which will consume only 26 W. Since the payback period is very high, only selected fans, which are continuously in operation, may be replaced initially.

Energy consumption for existing fans	889 kWh

Energy consumption by replacing existing fans with 26 W BLDC fans	889 x 26/60
	382 kWh
Energy savings per day	889 – 382 = 507 kWh
Annual energy savings	507 kWh x 25 days x 12 months
	1,52,100 kWh/year
Annual monetary savings	1,52,100 x 8.50
	Rs. 12,92,850
Investment @ Rs.3000 per fan	Rs. 87,30,000
Payback period	108 months

3.4 INSTALL A 60 KW SOLAR POWER PLANT IN THE TERRACE OF THE BUILDING

In order to promote the use of green energy, many establishments have installed solar PV systems. TMCH campus has adequate roof space to accommodate a 60 kW solar power plant. The system can be online with net metering or it can be connected to the LT side of the campus electrical network.

Average energy generation per kW of solar PV	4 kWh per day
Potential for energy generation with a 60 kW power plant.	60 x 4 = 240 kWh/day
Annual energy savings	240 kWh x 22 days x 12 months
	63,360 kWh/year
Annual monetary savings	63,360 x 8.50
	Rs. 5,38,560
Investment @ Rs.60,000 per kW	Rs. 36,00,000
Payback period	91 months

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Annexure – 1

Electricity Bill Details April 2020 - March 2021							
Reading taken Date	Reading	Used Unit *800 MF = 800	CC Charges	Other Charges	Bill Amount	Total Amount	Bill Paid
30.04.2020	1936.4 - 2114.103	142162.4	1137296	224825	1362121	1362121	1362121
31.05.2020	2114.103 - 2301.0479	149555.92	1196448	230470	1426918	1426918	1426918
30.06.2020	2301.0479 - 2470.257	135367.28	1082936	221883	1304819	1304819	1304819
31.07.2020	2470.257 - 2627.941	126147.2	1009176	147232	1156408	1156408	1156408
31.08.2020	2627.941 - 2782.31	123495	987960	216210	1204170	1204170	1204170
30.09.2020	2782.31 - 2937.21	123920	991360	214100	1205460	1205460	1205460
31.10.2020	2937.21 - 3097.36	128120	1024960	218144	1243104	1243104	1243104
30.11.2020	3097.36 - 3240.237	114301.6	914416	213625	1128041	1128041	1128041
31.12.2020	3240.237 - 3403.1272	130312	1042496	223520	1266016	1266016	1266016
31.01.2021	3403.1272 - 3565.538	129928.64	1039432	221129	1260561	1260561	1260561

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28.02.2021	3565.538 - 3734.2605	134978	1079824	349676	1429500	1429500	1429500
31.03.2021	3734.2605 - 3942.2266	166372.88	1330984	240137	1571121	1571121	1571121

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ENVIRONMENT AUDIT REPORT

DETAILS OF THE CLIENT

TAGORE MEDICAL COLLEGE & HOSPITAL

Rethinamangalam, Melakottaiyur Post, Chennai-600127

Affiliated to the Tamil Nadu Dr.MGR Medical

TAGORE MEDICAL COLLEGE & HOSPITAL

Rathinamangalam, Melakkottaiyur Post, Chennai - 600127.
Phone : 044-30101111, Fax : 044-222 5555, Email: tagoremch@gmail.com

(Affiliated to the Tamil Nadu Dr MGR Medical University & Recognized by the Ministry of Health & Family welfare. Govt. of India New Delhi)

DATE OF AUDIT

18/03/2021 to 19/03/2021

(Audited and Accounted for the period of 2020-21)

DEAN
TAGORE MEDICAL COLLEGE & HOSPITAL
RATHINAMANGALAM, MELAKOTTAIYUR POST,
CHENNAI-600 127.

AUDIT CONDUCTED AND SUBMITTED BY

P S QUALITY CERTIFICATION PVT LTD

No.415, F4, Ist Floor, Asha Vignesh Apartment, Ambattur, Tamil Nadu 600 053.

Mobile: +91- 81240 88335, 044 - 4959 1335

REDUCE, REUSE, RECYCLE

Acknowledgements

P S QUALITY CERTIFICATION PVT LTD, No. 415, F4, I Floor, Asha Vignesh Apartment, Ambattur, Tamil Nadu 600 053 is thankful to the Management and Technical team members of **TAGORE MEDICAL COLLEGE AND HOSPITAL,** Tamil Nadu, India for providing an opportunity to conduct a detailed Energy, Environment and Green Audit process for the college premises.

It is our great pleasure, which must be recorded here that the management of **TAGORE MEDICAL COLLEGE AND HOSPITAL** extended all possible support and assistance resulting in expeditious completion of the audit process. The audit team appreciates the cooperation and guidance extended during course of site visit and measurements. We are also thankful to all those who gave us the necessary inputs and information to carry out this very vital exercise of green audit.

Finally, we offer our sincere thanks to all the members in the Institution.

Audit Team Members	
Mr. G. ARIVARASAN	BEE Certified Energy Auditor (EA-21875) Lead Auditor-ISO-14001:2015 (EMS),

Audit Conducted, Complied and Verified by,

(Mr. G. ARIVARASAN)

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Contents

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Executive Summary

This section presents a brief summary of the results of the detailed environment audit carried out at TMCH, Rethinamangalam during Mar 2021.

The audit was mainly targeted at identifying practical, sustainable and economically viable Resource saving opportunities in all sections of the facility, resulting from a detailed study and analyses of technical parameters. The audit involved using a wide range of sophisticated, portable, diagnostic and measuring instruments to generate refined data and facilitate complex analyses to give a more reliable basis for evaluation of energy saving potential and economic viability.

TMCH has its building located at Rethinamangalam, Chennai. The building occupies an area of 29360 Sq.m. The major resources used are energy and water.

The study has identified opportunities for saving resources, improving compliance and minimizing the environmental impact.

A summary list of recommendations is given at the end of the report.

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Introduction

1.1 BACKGROUND

Tagore Educational Trust was formed in 1997 by the chairperson Professor M. Mala, M.A., M.Phil. An educationist and philanthropist. Trust is pledged to the noble task of offering state of the art higher education in the field of Medicine, Engineering and Humanities. The Trust has already earned year of enviable reputation by establishing institutions offering quality education. In keeping with this objective, the Trust started Tagore Medical College and Hospital in the year 2010-2011 to train young men and women as dedicated, high skilled medical professional committed with the noble task of serving community.

Provisional Affiliation for starting for first year PG degree courses from the academic year 2020-2021 was approved by the Tamil Nadu Medical University in their letter proc. No. Affln.IV(1)/68378/2019, Dt:26.09.2020 for the following departments, M.D Community Medicine, M.D. General Medicine, M.D General Surgery, M.D Pathology, M.D Ophthalmology, M.S Orthopaedics, M.S Obstetrics and Gynaecology

Tagore Medical College and Hospital contemplates to achieve eminence in teaching-learning through establishment of state-of-art infrastructure facilities for the execution of curricular, co-curricular and extra-curricular activities effectively. Housed in a lush green campus of 26.25 acres, the infrastructure of the institution is spread over three blocks and the teaching-learning facilities fulfil the requirements of the statutory bodies. There are four well ventilated, air-conditioned ICT-enabled, classrooms equipped with 150 seating capacity, LCD projectors and smart boards. The Wi-Fi enabled campus facilitates technology driven teaching-learning methods like, video-demonstrations, online quiz activities and game based learning. The institute also has two well-furnished examination halls, each with a seating capacity of 150 students for examinations. Each department of college has adequate number of well-equipped, ICT-enabled demonstration halls, seminar halls and a departmental library as stipulated. Totally there are 37 demonstration rooms and seminar halls, 20 departmental libraries and one central library.

Each department of college also has adequate number of well-designed laboratories viz. practical, specialised and research laboratories. In addition, the institute also has 5 well developed museums, a skill lab and a dissection hall of the anatomy department to facilitate

self-directed and participatory learning. The central research laboratory of the institution houses sophisticated instruments to facilitate and promote research acumen of the faculty and students.

The 818 bedded, NABH accredited teaching hospital of the institution consists of 13 operation theatres (10 major, super specialties, and 03 minor OT), six specific intensive care units, 36 wards, NABL accredited central clinical laboratory, blood bank and the casualty. Each clinical department has out-patient and in-patient services with attached clinics. The bed occupancy rate is adequate as per the MCI/NMC norms and serve as a rich source for the teaching and learning of clinical skills. Institution also provides the super specialty facilities such as Oncology, Neurosurgery, Cardiology, Neurology, Nephrology, Surgical oncology, Plastic surgery and cardiothoracic surgery which creates opportunities for the students to enhance their knowledge in specialised clinical fields. The family visits, school visits, visits to different organizations, postings in UHC and RHC of the institution are the resources for students for community based learning. The field visits, medical camps, health education and awareness programs conducted regularly by the community medicine department provide scope for experiential learning in students. Institution has video teleconferencing facility in a conference hall well equipped with LCD television displays, cameras, microphones, and VGA connections to enable interactive learning through distant resources.

AYUSH-related learning facilities are also established in the hospital through an actively running AYUSH outpatient department. The herbal garden maintained in the campus, is helpful for creating knowledge and awareness on the use of medicinal plants.

The institution periodically reviews, modifies and updates the existing infrastructure based on the demands and the challenges for the efficient conduct of teaching-learning and research. This is evidently demonstrated by the institution's efforts in as accessing online teaching-learning platforms for regular academic operations during the COVID crisis.

The central library of the institution is fully air conditioned and spread over an area of 2631 sq. m. The reference and text books of various subjects are arranged subject wise in open shelves for ease of access and retrieval of books. There is a separate room for journals and the archives. Newly purchased books and journals are separately displayed in two separate racks at the entrance. The library has an Audio- Visual room with 50 seats.

The library has a well-lighted and ventilated reading room for undergraduate students with a seating facility for 170 students. Also, there are reading halls for students and staff with a seating capacity of 170 and 50 respectively that allow for the usage of own study material. The

journal section has 35 seats capacity. There is a separate reading section for post graduate students with 50 seats. CCTV cameras are installed in the library for strict surveillance. The library also has a Reprographic room, facilities for scanning and printing. There are rooms available separately for the library staff.

There is an internet enabled computer room with 50 computers. The students can utilize the e resources, CD/DVD of various books and use various search engines for the purpose of learning and research. Wi-Fi facilities are available for students and faculties in the library.

There is a virtual library which has online journals that can be accessed from PROQUEST medical database, MEDLINE database and the Tamil Nadu Dr. MGR medical university database. The various e-resources available are e- Journals, e-books, Magazines, Newspapers, Reports, Research Dissertations, Skill building reviews.

The library also has a collection of undergraduate and postgraduate university examination question papers, NEET, AIIMS and PGIMER entrance exam preparation books and post graduate dissertations for reference. Every department has its own departmental library in addition to central library. The department library has many good collection of books for instant reference and accessible at department levels. The institution has also subscribed for more than 100 national and international journals. The e-resources can be assessed from anywhere and at any time by the students and faculties where they are provided with own user id and password for references on request by the user.

Library committee is responsible for collection of new arrival of books, journals and to maintain the regulation of library. It collects requests for books and journals from HODs of all departments, places orders for procurement of books. After the arrival of books, they are catalogued and database entries are done after which they are placed in the rack of new arrival of books. The overall resources of the library include books comprising of 4673 titles, 13301 volumes and 1210 reference books; 129 journals of which 76 are national and 53 are international; non-book materials or e-resources (Medline) comprising of 1869 scholarly journals, 146 trade journals, 69 e-books, 39 magazines, 23 reports, a collection of rare books and copies of Thesis and University Question papers Special reports or any other knowledge resources. As evident from its repertoire TMCH has grown significantly since its inception in 2010 and continues to strive to provide the highest quality of education and research in diverse fields while at the same time supporting the poor community through grants and employment opportunities.

With the objective of improving it's environmental in the campus TMCH requested P S Quality Certifications to carry out an environmental audit of its campus at TMCH, Rethinamangalam. The objective of 'Environmental Audit' is to optimize the use of all forms of resources such as energy, water, materials and surroundings. It would also help to reduce/eliminate the adverse impact of their use. More importantly, the recommendations from the audit would result in significant cost benefits for TMCH. Accordingly, the audit team conducted the audit with an intensive field study. This report is based on field study and subsequent analyses of data.

1.2 SCOPE OF THE STUDY

The environmental audit was conducted with the following scope of work to cover the impact of resources used in various areas of the campus.

- Conduct Half day 'Awareness Programme on 'Environment '
- Assess the inputs, outputs and wastage for each resource usage area
- Asses water management practises
- Asses the solid waste management practices
- Evaluate the compliance with regulatory and other requireme
- Analyse the air and noise pollution in the campus
- Evaluate the performance of sewage treatment system
- Identify measures for improving the campus environment

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1.3 AUDIT APPROACH

Environmental auditing is essentially an environmental management tool for measuring the effects of certain activities on the environment against set criteria or standards. TMCH recognises the importance of environmental matters and accepts that its environmental performance will be scrutinised by a wide range of interested parties. Environmental auditing is used to investigate understand and identify environmental aspects and impacts. These are used to help improve existing human activities, with the aim of reducing the adverse effects of these activities on the environment.

An environment audit can be defined as a management tool comprising systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing with the aim of helping to safeguard the environment by facilitating management control of practices and assessing compliance with company policies, which would include regulatory requirements and standards applicable.

The audit was carried out by undertaking a field visit to the site during Mar 2021. During the field visit, a number of on-site measurements were taken and observations made for various

equipment in the campus along with collection of resource consumption, equipment and operational data from the administration and technical departments. Discussions were held with concerned Technical / Managerial staff to fully understand the working requirements to arrive at practically reliable solutions. The audit team collected relevant data and made key measurements.

The following areas were covered as part of the study:

- Water use, distribution and management
- Solid waste generation and disposal
- Air and noise pollution assessment
- Assessment of compliance requirements
- Carbon footprint
- Bio diversity and ecology
- Waste water disposal
- E- waste management
- Medical waste management

After carrying out the measurement & field study, the preliminary observations of the study were discussed with the management. The report presents the field measurements, operational data, data analysis, key observations made, and recommendations for achieving optimum use of resources and for mitigating adverse impact on environment. The recommendations are followed by cost-benefit analysis. Major emphasis is laid on short and medium term measures. The ultimate aim of this exercise is to enable the management to understand and prioritize environmental improvement measures identified through the study.

1.4 CAMPUS DESCRIPTION

Tagore Medical College & Hospital (TMCH) has its campus at Rethinamangalam, Chennai and The Tamil Nadu Dr. MGR Medical University Chennai, in the letter No. Preceding Affln III (3) /32878/2009 Date: 29.07.2010 had granted provisional affiliation for starting MBBS degree course from the academic year 2010-2011.

1.5 SOURCES OF ENVIRONMENTAL IMPACTS

The major sources of environmental impact are water use, energy use, solid wastes, effluents, air pollution and noise.

CHAPTER 2

Campus Environment System

2.1 WATER AUDIT

Water auditing is a systematic & scientific examination of water accounts of the facility. It provides a rational, scientific framework that categorizes all water use in the system. It is a tool to overcome shortage, leakage and losses in the system. Water audit, helps to identify steps that need to be taken to reduce water use and losses. Comprehensive Water Audit can give a detailed profile of distribution system and water users thereby facilitating easier & effective management of resources and improved reliability. It may also prove as an effective tool for realistic understanding & assessment of present performance level of the service for future expansion.

Water auditing process involves checking of sector-wise water use against project planning and losses actually realized on the projects. Elements of water audit include a record of the amount of water produced (total water supply), water delivered to metered users, water delivered to unmetered users, water loss and suggest measures to address water loss (through leakages and other unaccounted for water losses).

Water audit leads to-

(a) Reduced water losses,

(b) Improved financial performance,

(c) Improved reliability of supply system,

(d) Enhanced knowledge of the distribution system,

(e) Efficient use of existing supplies,

(f) Better safeguard to public health and property,

(g) Improved public relations,

(h) Reduced legal liability, and

(i) Reduced disruption, thereby improving level of service to customers.

Water supply and distribution

The source of water for the campus is 7 numbers with 25 ft. open well. The average daily water drawn from the well is about 150000 litres. The water is pumped from the well is two sumps (sump 1 and sump 2) with capacities of 1 lakh litres and 1.5 lakh litres each. During summer

months when the well goes, dry there is a bore well from where a 5 hp pump pumps it to the sumps. From the Borewell 1 a submersible 7.5 hp pump pumps it to overhead tank of 50,000 litres in the Hospital building and to 30,000 litres tank in the guest house. From Bore well 2 another submersible pump of 7.5 hp pumps it to overhead tanks of 30,000 litres in the college building.

Water supply well

The total number of students,faculty and staff in the campus is 1552. For an average consumption of 1,50,000 litres per day, the per capita water consumption is 67 litres. This is in line with the accepted norms. Assuming 1 litre per sq foot the water requirement for garden area of 3421 sq ft is about 3 Kl per day.

Drinking water is purchased in cans and the consumption is about 12,500 litres per day.

Rainwater harvesting:

The premises has provided arrangements for rain water harvesting. The rainwater harvesting system comprises components of various stages - transporting rainwater through pipes or drains, filtration, and for recharge. The catchment of a water harvesting system i.e the terrace in the various blocks of TMCH is the surface, which directly receives the rainfall and provides water to the system. Coarse mesh has been provided at the roof to prevent the passage of debris appropriate conduits are provided that carry rainwater from the catchment or rooftop area to

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the harvesting system. Conduits in TMCH are of polyvinyl chloride (PVC) pipes, The Water collected goes through a filter bed, which is used to remove suspended pollutants from rainwater collected over roof. The filter unit has a chamber filled with filtering media such as fibre, coarse sand and gravel layers to remove debris and dirt from water before it enters the recharge structure. The premises has provided effective arrangements for rain water harvesting. The rainwater collected from the roof of university building are collected through pipes and delivered into 5 Nos. of rainwater harvesting pits, from where it percolates into the ground. Similar arrangement has been provided for collecting rainwater from the terrace of arts and science college building.

2.2 AIR POLLUTION MANAGEMENT

Air pollution consists of chemicals or particles in the air that can harm the health of humans, animals, and plants. It also damages buildings. Pollutants in the air take many forms. They can be gases, solid particles, or liquid droplets. People experience a wide range of health effects from being exposed to air pollution. Effects can be broken down into short-term effects and long-term effects.

Short-term effects, which are temporary, include illnesses such as pneumonia or bronchitis. They also include discomfort such as irritation to the nose, throat, eyes, or skin. Air pollution can also cause headaches, dizziness, and nausea. Bad smells made by toilets, bathrooms, garbage, or sewer systems are considered air pollution, too. These odors are less serious but still unpleasant.

Long-term effects of air pollution can last for years or for an entire lifetime. They can even lead to a person's death. Long-term health effects from air pollution include heart disease, lung cancer, and respiratory diseases such as emphysema. Air pollution can also cause long-term damage to people's nerves, brain, kidneys, liver, and other organs.

In TMCH campus the sources of air pollution are ambient sources and DG set stack when it is in operation. The results of the ambient air monitoring and DG set stack emissions are given in the annexure. Fugitive emissions i.e uncontrolled air pollution created by blowing of dust by wind has been kept under control by well tarred roads. Also sprinkling of water on the soil also arrests air pollution. Since the DG sets are operated only during the power cuts, air pollution is not an area of concern for TMCH.

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2.3 NOISE POLLUTION MANAGEMENT

Noise pollution can be defined as any disturbing or unwanted noise that interferes or harms humans or wildlife. Although noise constantly surrounds us, noise pollution generally receives less attention than water quality and air quality issues because it cannot be seen, tasted, or smelled. Noise pollution has a negative impact on wildlife species by reducing habitat quality, increasing stress levels, and masking other sounds. Excessive noise pollution in working areas can influence psychological health. Noise pollution can cause headaches, high blood pressure, respiratory agitation, racing pulse, and, in exposure to extremely loud, constant noise, gastritis, colitis and even heart attacks may occur. Noise affects brain responses and people's ability to focus, which can lead to low-performance levels over time. Like other sound waves, too much noise when it goes to the brain leads to lower response rates as well as making the mind dull. It is also poor for memory, making it hard to study. The studies have shown that students living near railway stations or airports have problems in learning. Studies show that the occurrence of aggressive behaviour, disturbance of sleep, constant stress, fatigue, depression, anxiety, hysteria and hypertension in humans as well as animals can be linked to excessive noise levels. The level of irritation increases with increased noise, and people tend to become less and less patient. These, in turn, can cause more severe and chronic health issues later in life.

Since TMCH is an academic institution noise pollution is much less than the allowable limits. Whenever the DG set is in operation some noise pollution is created. However the DG set is containerised due to which the noise pollution is contained. The results of the noise pollution are given in the annexure.

2.4 ENERGY USE AND ENVIRONMENTAL IMPACT

The electricity use in campus appears to be a clean source of energy. However this electricity is produced in power plants which burns fossil fuels such as coal. The burning of coal in the power plant causes local pollution in the form of suspended particulate matter and also releases Carbon dioxide, oxides of nitrogen and oxides of sulphur. Carbon dioxide is responsible for global warming. Oxides of sulphur and nitrogen result in acid rain.

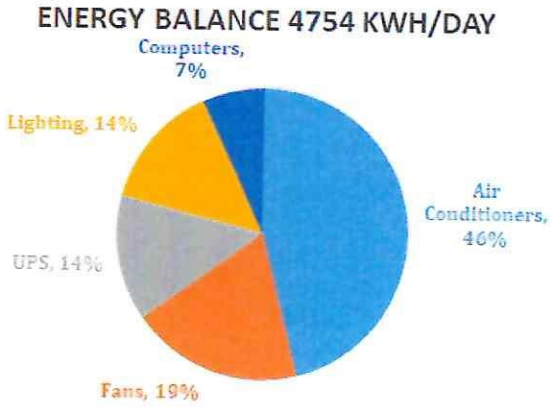
The main source of energy used in the campus is electricity from Tamilnadu Generation and Distribution Corporation Ltd (TANGEDCO). In times of power shutdown the Diesel Generators are operated which use HSD as a fuel. Diesel is also used for cars used by TMCH.

The annual energy consumption for the plant during the year 2021 is given below in the table.

Energy source	Annual Quantity	Annual Cost	CO_2 emissions (Tonnes/year)
Electricity	1604661 kWh	Rs.15,558,239	145
Diesel for cars (5 Nos.)	5265 litres	Rs. 3,63,062	12.2
Diesel for DG sets	87790 litres	Rs. 8,490,658	9.1
Total annual energy cost		**Rs. 24,411,959**	

Thus the TMCH campus emits 166 Tonnes of CO2 per year only through its energy use. Electricity forms the major energy cost accounting for 71% of the total energy expenditure. The electricity tariff of TANGEDCO applicable for TMCH is HT-III (Private Educational Institutions & Hostels). Accounting to the tariff one unit or kWh is charged at Rs. Day = Rs.8.93; Peak = Rs.11.16; Night = Rs.8.50. In addition, a fixed charge of Rs. Demand Charges = Rs.297000 + Meter Rent = Rs.4366 is also charged. The connected load for TMCH is 1888 kW. The cost of diesel is Rs 69 per litre

The energy balance shows the dominance of Air conditioners which turns out to be energy guzzlers. They consume 46% of the total energy consumption. Lighting and fans also account for a significant portion of the energy consumed. The summary of the energy balance is shown in the following figure.



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The study has identified an annual energy saving potential of 3, 75,762 kWh (amounting to Rs.31.94 lakhs and 21 % of the total bill) of electricity with involvement of technology change. The total cost of implementation for the proposals is estimated to be Rs. 123.58 lakhs.

A summary list of recommendations, the saving potential and implementation cost is given Below.

S.No	Particulars	Energy Savings, kWh/year	Cost Savings, Rs. Lakh(s)/year	Investment Rs. Lakh(s)
1	Increase temperature setting of air conditioners to 25^{0}C	157104	13.35	nil
2	Replace 40 W Fluorescent tube lights by 26 w led tube lights	3198	0.27	0.28
3	Replace existing ceiling fans by energy efficient BLDC FANS.	152100	12.93	87.30
4	Install a 60 kw solar power plant in the terrace of the building	63,360	5.39	36.00

2.5 SOLID WASTE MANAGEMENT

Solid waste management systems cover all actions that seek to reduce the negative impacts on health, environment and economy. Solid waste consists mainly of several recyclable materials such as paper and cardboard. Inside the educational institutes, especially universities, e-waste arising out of electrical and electronic gadgets used in the campus such as used Printer cartridges, Bulbs, tube lights etc.. Withering of leaves from the garden and garden trimmings are also contributors to solid waste. Without an effective management program, solid waste can have detrimental impacts on the environment. An inefficient municipal solid waste management system may create serious negative environmental impacts like infectious diseases, land and water pollution, obstruction of drains and loss of biodiversity.

Considerable solid waste is generated in the campus. The waste mostly consists of paper and other biodegradable wastes. All these wastes are collected through individual bins and disposed through the corporation waste collection system. The solid wastes are segregated and disposed through recyclers.

2.6 ENVIRONMENTAL AWARNESS INITIATIVE

Awareness has been created to avoid use of plastics in the campus. Students, faculty and staff have been sensitized to switch off electrical gadgets whenever not in use.

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CHAPTER 3

Overall recommendations

1) Water meter may be provided to measure the water pumped from well and bore well.
2) Record of water-consumed everyday may be maintained in a register.
3) Periodic cleaning of overhead tanks may be carried out and the date of cleaning / due date of cleaning may be marked near the overhead tanks.
4) All leaking taps should be identified through daily walkthroughs and repair/ replacement should be done.
5) As a water conservation, measure the water dripping from the air conditioners may be collected and used as distilled water for applications in lab and topping for batteries.
6) In washbasins, the existing taps may be replaced with spring-loaded taps to save water.
7) For gardening, sprinkler system can be used to minimize water use.
8) Students should be sensitized on water savings
9) Posters may be prominently displayed for saving water.
10) More trees may be planted along the compound wall to minimize air pollution
11) Pollution under Control (PUC) certificate may be periodically obtained through monitoring.
12) Awareness posters are required to be displayed for energy savings.
13) Energy metres may be provided for each block and monitored on daily basis.\
14) Activities involving students may be carried out on special occasions such as World environment day, etc...

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COMPLETION OF THE REPORT

This synopsis report is prepared as a part of the Energy, Environment and Green Audit process conducted at **TAGORE MEDICAL COLLEGE & HOSPITAL**, Tamil Nadu, India by **P S QUALITY CERTIFICATION PVT LTD,** No.415, F4, I Floor, Asha Vignesh Apartment, Ambattur, Tamil Nadu 600 053.

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