रयत शिक्षण संस्था, सातारा

Rayat Shikshan Sanstha's

ARTS, SCIENCE AND COMMERCE COLLEGE, MOKHADA

Dist.- Palghar (M.S.) 401 604

GREEN AUDIT REPORT

2020-2021

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1. INTRODUCTION

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

Green Audit helps colleges to assess uses or over usage different kinds of environmental resources such as water, energy etc. It also helps to quantify the impact made by college on various environmental elements. Green audit promotes health consciousness and also promotes environmental awareness. The aim of the green audit is to provide better understandings of green impacts on college campus and promote sustainable use of available resources. If self-assessment is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-assessment 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.

Recently it was observed that people are not caring much about nature. Human activities are directly or indirectly damaging the environment and having different environment issues. Change in the eco system is mostly due to the increase in world population, enormous advancement in science and: technology and globalization. The problems arise due to this are: global warming, depletion of ozone layers, air

pollution, water pollution etc. 'Green Audit' is also called as Environmental Audit It is the most efficient ecological way to solve environmental problems.

Further, clean and healthy environment is one of the desired pre-requisites in any educational institution. To fulfill this, our institution emphasizes on adopting green practices and creates environment awareness amongst all its stakeholders. Active participation of stakeholders facilitates this process of making the campus eco-friendly. The strategies used to make campus eco-friendly are adopting energy conservation practices, effective waste management, waste water treatment and tree plantation for making the campus clean, green and healthy. Further, various green practices like rain water harvesting, solar street lamps, solid and liquid waste, Greening the campus and no vehicle day. Further, college has an active Eco club which conducts various activities to increase awareness amongst students, such as awareness rallies, different competitions. Further, academic activities such as study tours/visits. Cleaning of campus and the nearby villages on different occasion and projects are also arranged in accordance to Green policy.

2. PROFILE OF THE INSTITUTE:

A. About Rayat Shikshan Sanshta:

A premier institution of education like the Rayat Shikshan Sanstha, known and honored far and wide, not only at the national level, but at the global level too, needs no introduction. The institution itself is regarded as a noble mission, a noble cause, so earnestly and so endearingly pursued by its founder- father Karmaveer Bhaurao Patil, the educator of the educators and his legendary wife Sou. Laxmibai Patil with her exemplary sacrifices made to turn the mission into a reality.

The Rayat Shikshan Sanstha is one of the leading educational institutions in Asia. The value of its contribution to education in general is enormously great as it has, from the very beginning, tried all its best to lay emphasis on the education of the down-trodden, the poor and the ignorant who really form the major bulk of society. The founder of the institution, late Dr. Karamaveer Bhaurao Patil, was a man of the masses who devoted all his mind and heart to the cause of their education. He had an incisive understanding of the social ills that beset his times and fully realized the dire need of the spread of education. He believed that education alone could correct the social ills such as caste-hierarchy, money-lending, illiteracy, untouchability, superstitions and social and economic inequality. Throughout his life he tried to translate this belief into reality. He was the champion of the poor, the weak, the dispossessed and left no stone unturned for their upliftment. He was a great humanitarian who endeavored hard to educate the masses to bring a kindly light of hope in their lives of misery and ignorance. He realised that the social ills could be remedied through the education of the masses alone and laid the foundation of the Rayat Shikshan Sanstha by opening a Boarding House at Kale (Tal-Karad, Dist-Satara) in 1919. Soon, however, in 1924 he shifted the head-quarters of his educational institution to Satara.

B. About College:

Arts, Science and Commerce College, Mokhada is a leading College in Mokhada Tahasil, Palghar District. Mokhada Tahasil falls under the remote and tribal area of Palghar District of Maharashtra. Among total population of Mokhada Tashil 99 % of population is tribal. Our college is the leading higher educational institute available in Mokhada Tahasil rendering quality education in Arts, Commerce & Science faculties. It is established by Rayat Shikshan Sanstha, Satara in 1984 with 47 students. It is affiliated to Mumbai University, Mumbai. The college is established with the prime objective to educate the students from tribal area and downtrodden strata of the society. It was renamed as Arts, Science and Commerce College, Mokhada in 2013 with the commencement of science faculty in the college. It is a multifaculty college providing education from UG to PG courses. The college is accredited with 'B' grade (CGPA 2.21) by NAAC, Banglore.

3. ENVIRONMENT CONSERVATION COMMITTEE

Sr. No.	Name of Member	Designation	Title in Committee
1.	Prin. Dr. J. G. Jadhav	Principal	Chairman
2.	Dr. A. B. Mamlayya	HOD, Dept. of Zoology	Coordinator

4. FUNCTION OF ENVIRONMENT CONSERVATION COMMITTEE:

The college has constituted an Environmental Cell to make the student teachers aware about the environmental issues and challenges and inspire them to disseminate the information and sensitize the school children and the society at large about these challenges.

- To sensitize the student teachers about the Institute and Environment related problems.
- To inculcate the sense of responsibility towards the development of planet Earth and appreciation of its beauty.
- To providing opportunities to acquire knowledge, skills, attitude, commitment to preserve the environment.
- To make them understand the interdependence of economic, social and ecological factors.
- To train the student teachers to impart environmental education to school children through curricular and co-curricular activities.
- To improve the environment of the college campus.
- To make students aware of society about the environment conservation.
- To manage solid waste, liquid waste and e-waste of the college campus.

5. STEPS OF GREEN AUDIT

Pre-Audit

1. Plan the audit
2. Select the audit team
3. Schedule the audit facility
4. Acquire the background information
5. Visit the site

On-site

1. Understand the scope of audit
2. Analyse the strengths and weaknesses of the internal controls
3. Conduct the audit
4. Evaluate the observations of audit program
5. Prepare a report of the observations side by side

Post-Audit

1. Produce a draft report of the data collected
2. Produce a final report of the observations and the inference with accuracy
3. Distribute the final report to the management
4. Prepare an action plan to overcome the flaws
5. Keep a watch on the action plan

6. BACKGROUND

This is one of the leading higher educational institute in the tribal area of Mokhada Tehsil, District Palghar. It was established by Rayat Shikshan Sanstha, Satara in 1984 with the name Arts and Commerce College, Mokhada. The college is established with the prime objective to educate the students from tribal area and downtrodden strata of the society. It was renamed as Arts, Science and Commerce College, Mokhada in 2013 with the commencement of science faculty in the college.

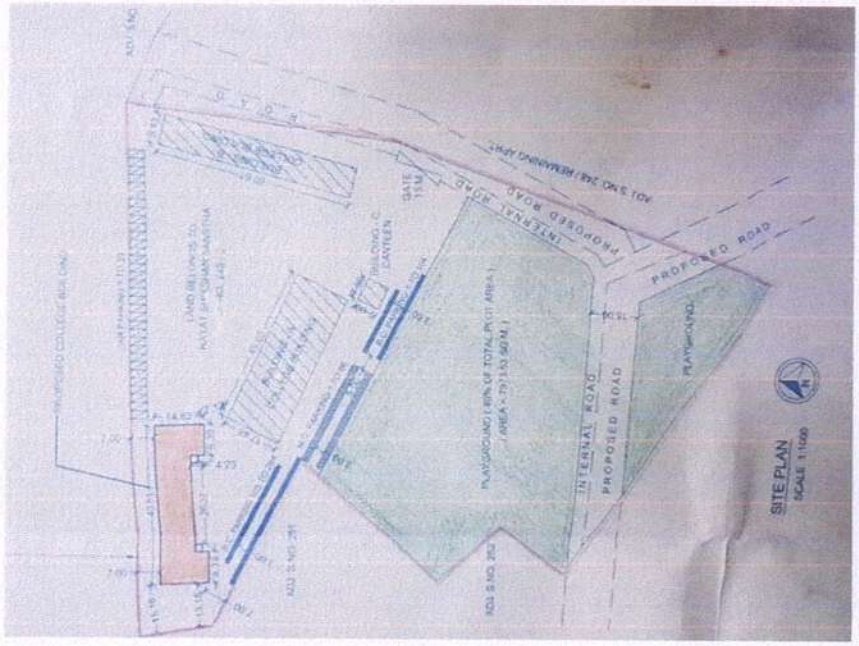
The college imparts UG level education in various subjects such as Botany, Zoology, Physics, Chemistry and Mathematics as Science subjects. The college offers three years Bachelor of Commerce degree program and Marathi History and Economics as part of Bachelor of Arts Program.

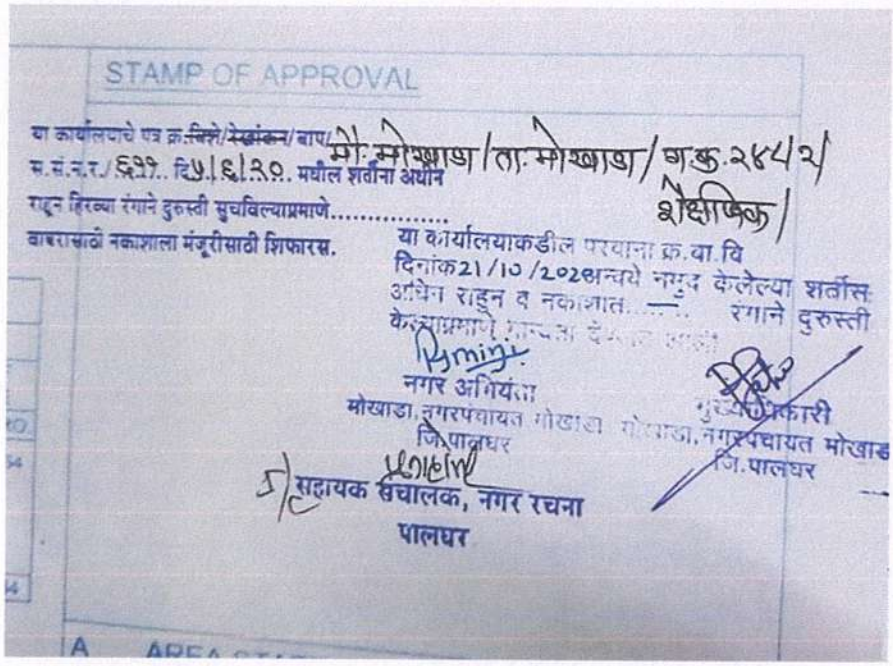
The college located outside of the Mokhada town near to the town lake. Its magnificent campus is spread over on 8.6 acres with total built up area of 1430/- sq. mtrs.

With keen interest and initiative from Prin. Dr. J.G. Jadhav (Principal) of the College to undertake the Green & Environmental Audit of the campus, the audit was undertaken.

Figure 1 Campus Google Map:

Figure 2 Campus Map:





- Courses offered by College

Sr. No.	Name of Faculty	Name of Program	Name of Subject
1.	Faculty of Arts	BA	Economics
2.			History
3.			Marathi
4.	Faculty of Commerce	B.Com	Commerce
5.	Faculty of Science	B.Sc.	Botany
6.			Zoology
7.			Chemistry
8.			Physics
9.			Mathematics

7. SCOPE OF WORK

The following Environmental Issues were studied for the above mentioned campus area.

- Water Environment including rain water harvesting potential of the campus.
- Plant diversity.
- Noise Environment.
- Solid Waste Management Practices.
- Air Environment.

Based on the available data, sampling and information provided by the Arts, Commerce and Science College, Mokhada officials this report has been prepared and recommendations for betterment of campus environment are provided.

8. BASELINE DATA

The most of the baseline data relating population, water supply, has been collected from the college management. The data / samples for drinking water, noise, floral diversity, and solid waste generation were collected by visiting the campus area by the expert teams.

❖ Total Population of The Campus

Sr. No.	Particulars	Total population of institute (incl. Students, Permanent, Temporary staff & visitors)
1.	College Staff (Teaching and Non-Teaching)	36
2.	College Students (Girls and Boys)	591
3.	Residential Students	-
4.	Residential Staff	18
5.	Floating Population	08
	Total	653

9. WATER AUDIT

Water is a key driver and is vital to development of Biodiversity, Agriculture, Humans as well as the Economy. With recent experiences across the world and in India, the water scarcity and security is emerging issues. The state of Maharashtra has also faced severe impact of the water scarcity in the recent past. Therefore water management is a crucial step of sustainable development and it also has been made an integral part of the Sustainable Development Goals (SDGs).

Unplanned urban growth and economic development has placed unprecedented pressures on natural resources especially on water. Increasing demand for the water in areas such as Mokhada highlights the necessity of the overall water management. As per the standard guidelines given in National Water Mission the service level benchmark is to provide 150 lpcd water supply for metro cities, 135 lpcd for other cities/towns with sewage system and 70 lpcd without sewage system city/town.

a) Water Requirement calculations:

There are about 02 water storage tanks within the campus, the total water required on the campus is shown below:

Sr. No.	Particulars	Total population	Required Water Supply (lpcd)	Water Requirement (M^3/Day)
1.	College Staff (Teaching and Non-Teaching	36	15	540
2.	College Students (Girls and Boys)	591	15	8865
3.	Residential Students	-	135	-
4.	Residential Staff	18	135	2430
5.	Floating Population	08	10	80
	Total	653	310	11,915

Note: The water requirement is calculated as per National Building Code 2005 and requirement is inclusive of drinking water

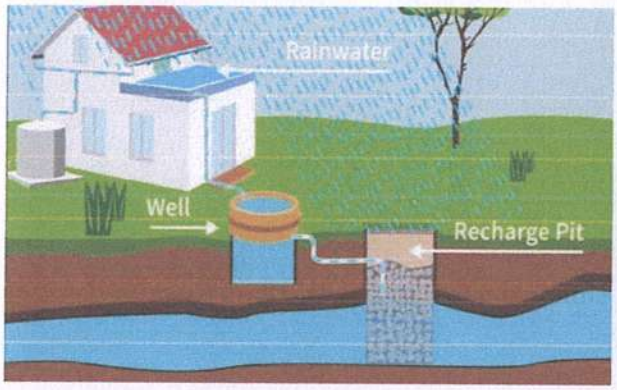
b) Quality of water :

Sr. No.	Parameters	Result	Acceptable Limit as per IS 10500 : 2012	Units
1	Color	1.2	5	Hazen unit
2	Odour	Agreeable	Agreeable	-
3	pH	7.27	6.5-8.5	-
4	Turbidity	0.8	1	N.T.U
5	Total Dissolved Solids	173	500	mg/lit
6	Calcium	12	75	mg/lit
7	Chloride	16	250	mg/lit
9	Iron	< 0.05	0.3	mg/lit
10	Magnesium	10	30	mg/lit
11	Nitrate	4	45	mg/lit
12	Sulphate	25	200	mg/lit
13	Alkalinity	51	200	mg/lit
14	Total Hardness	79	200	mg/lit
15	E. Coli	Absent	Should be Absent	/ 100 ml
16	Total Coliform	Absent	Should be Absent	/ 100 ml

It is informed that water supply is taken from the well present in college campus. Water is directly used for various domestic purposes, irrigation of plants etc. To maintain the quality of Drinking Water College uses two RO systems, one at staff room and other at student's water supply coolers. The RO systems is maintained by annual maintenance contact.

c) Rain Water Harvesting Potential of College Campus

The campus buildings possess large terrace areas and non-paved. Currently, none of the buildings have Rain Water Harvesting (RWH) System implemented. The campus has huge potential for RWH. The college campus is situated on barren land. Towards the south west side slope there is a well in



the college premises. The well the main source of water on the college campus. Rain water fall on the college campus buildings may be harvested by using well injection system.

Sr. No.	Building Name	Roof Top Area (Sq.m.)	Runoff Coefficient	Rain water Harvested (m3)
1.	Main Building	848.45	0.8	1634
2.	Class room Building	555	0.8	1026
3.	College Canteen	25	0.8	36
4.	Staff Quarters	400	0.8	721
5	Principal's Quarter	72	0.8	96

d) Management of Generated Wastewater:

Based on the water consumption data and considering about 80% of the water supplied is converted in to the waste water either through the washrooms, chemical laboratories, etc. the campus generated about 11254 m^3 of waste water every day.

It was observed that there is no separate drainage system for collecting and transporting sewage and liquids from laboratories. Currently, a combined drainage systems is placed which carries all the liquid effluent to a sewerage system. There is necessity of collection of grey and black water. The grey water with minor treatment must be used for irrigation of vegetation and black water must be treated properly using simple septic system and soak pits.

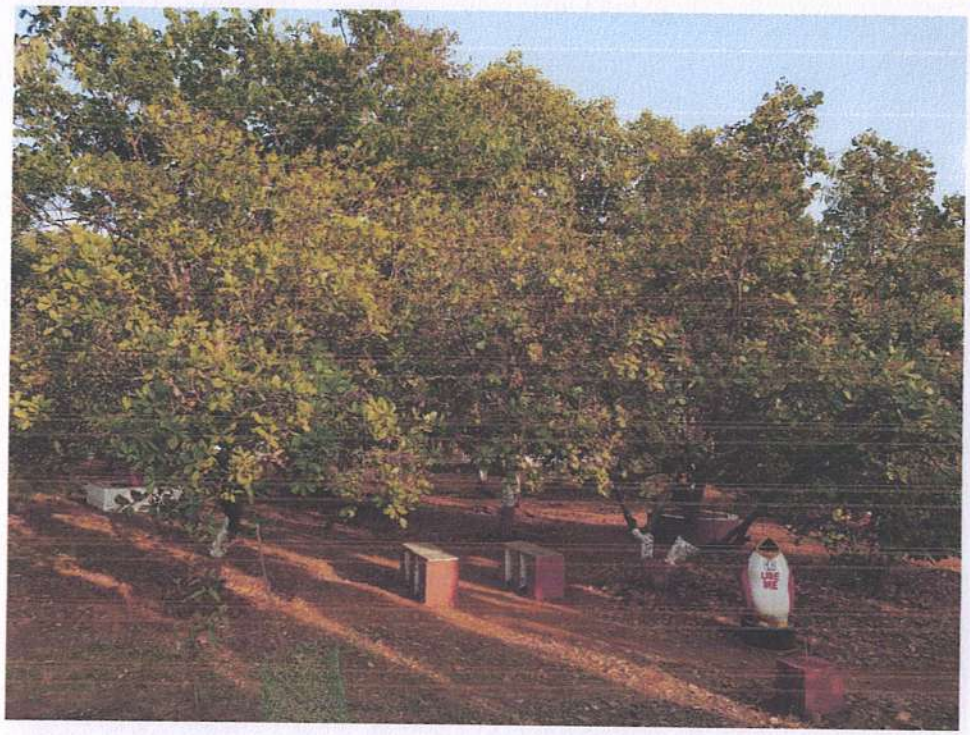
10. LAND MANAGEMENT AND TREE PLANTATION

The college of Campus is eco-friendly because of many planted trees the campus. The soil erosion is controlled by levelling the college land and dump the soil on the necessary places. Also the college prefers organic fertilizers and pesticides instead of chemical fertilizers and pesticides to maintain soil properly. This makes the college campus look very green. The college tree cover is more than 35%, So the college environment is extremely fresh.

Our college has green campus, which comprises of following floras:

Sr. no.	Common name	Scientific name	Family name	Number Trees	Girth at 4ft height from ground In cm	Height of the plant In Ft.
1	Ashok	*Polyalthia longifolia*	Annonaceae	68	50.4 cm	28.61
2	Cashew	*Anacardium occidentale*	Anacardiaceae	58	50.1	19.74
3	Mango	*Mangifera indica*	Anacardiaceae	78	63.7	33.19
4	Black Plum	*Syzygium cumini*	Myrtaceae	24	63.6	32.84
5	Manila Tamarind	*Pithacolobium dulc*	Fabaceae	04	35.56	32.80
6	River Tamarind	*Leucaena leucocephala*	Fabaceae	06	50.9	39.42
7	Teak	*Tectona grandis*	Lamiaceae	43	58. 42	41.01
8	Red Date	*Ziziphus jujuba*	Rhamnaceae	08	58	45.05

9	Lebbek Tree	*Albizia lebbeck*	Fabaceae	05	96.52	42.65
10	Sacred fig	*Ficus religiosa*	Moraceae	01	563.88	90.1
11	Karanj	*Pongamia pinnata*	Fabaceae	05	50.08	41.01
12	Eucalyptus	*Eucalyptus sp.*	Myrtaceae	16	27.94	22.63
13	Cluster Fig	*Ficus racemosa*	Moraceae	2	30.48	14.76
14	Tamarind	*Tamarindus indica*	Fabaceae	04	50.8	14.7
15	Flame of the forest	*Delonix regia*	Fabaceae	03	58.42	40.2
16	Earpod Wattle	*Acacia auriculiformes*	Fabaceae	10	50	32.84
17	Bidi Leaf Tree	*Bauhinia sp.*	Fabaceae	04	50.8	21.32
18	Hibiscus	*Hibiscus rosasinensis*	Malvaceae	06	40.71	16.5
19	Indian Gooseberry	*Phyllanthus emblica*	Phyllanthaceae	04	58.44	40.27
20	African Mahogany	*Khaya senegalensis*	Mellaceae	07	144.81	49.26
21	Wild sweetsop	*Annona reticulata*	Annonaceae	01	45.72	19
22	Australian Acacia	*Acacia auriculiformis*	Fabaceae	08	45.72	22.96
23	Nirgudi	*Vitex negundo*	Lamiaceae	03	43.18	26
24	Indian Wild Cherry	*Muntingia calabura*	Muntingiaceae	01	16	9
25	Indian screw tree	*Helicteres isora*	Malvaceae	01	16.1	9.17
26	Flame of the Forest	*Butea monosperma*	Fabaceae	02	58.42	19



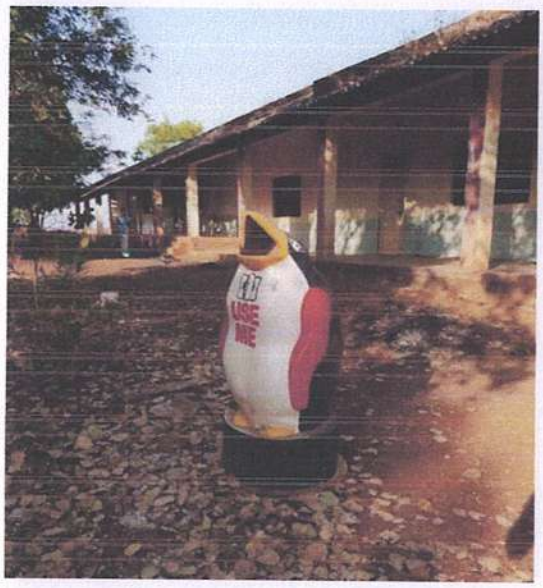
11. WASTE QUANTIFICATION AND MANAGEMENT

a) Segregation of waste - Solid Waste Management

Nearly everything humans do leave behind some kind of waste. Arts, Commerce and Science College, Mokhada also generate a variety of wastes such as electronic wastes, institutional waste. The college does a good job of ensuring that hazardous materials are disposed of properly. So the college has given its top priority to dispose of the waste material.

First the solid waste generated in college campus is separated into two parts 1) Decomposable solid waste and 2) Non decomposable solid waste. Non-decomposable solid waste is further separated in to two parts Polythene bags and other non-decomposable material is separated and sold to vendors before disposing the organic wastes. Broken glass, and plastic, rubber and other materials are disposed into *Nagar Panchayat* dump bins to be recycled. The organic waste is dumped in to decomposing pit for organic decomposition.

The garbage management always tries to make the college campus Eco-friendly. Vermicomposts is prepared with the help of mulch of tree leaves and waste paper that occurs around the college campus. These vermicomposts are again utilized to cultivate the plant of college. For this purpose Waste bins have been kept in the college. To maintain college campus clean, the waste materials are collected from containers and stored in tanks to produce Vermicomposts.



b) Compost Fertilizer Unit:

Compost fertilizer is prepared form plant litter of the college campus. This compost is used as fertilizer for plants of college garden. Compost is a key ingredient in organic farming. At the simplest level, the process of composting simply requires making a heap of wet organic matter and waiting for the materials to break down into humus after a period of three months. Compost is rich in nutrients. The compost itself is beneficial for the land in many ways, including as a soil conditioner, a fertilizer, addition of vital humus or humic acids, and as a natural pesticide for soil. In ecosystem, compost is useful for erosion control, land and stream reclamation, wetland construction, and as landfill cover. The decomposition process is done by shredding the plant matter, adding water and ensuring proper aeration by regularly turning the mixture. Worms and fungi further break up the material. Aerobic bacteria manage the chemical process by converting the inputs into heat, carbon dioxide and ammonium. The ammonium is further converted by bacteria into plant-nourishing nitrites and nitrates through the process of nitrification.

c) Use of Organic Fertilizers / Pesticides:

Organic Fertilizers and Pesticides are used instead of using chemical fertilizers and insecticides.

d) E-Waste Quantification and Management:

- E-Waste materials are kept in a separate store-room with a dead stock register.
- Drives, Monitors, Keyboards, Cartridges, etc. is disposed through outside agencies as a scrap.
- UPS batteries are recharged / repaired / exchanged by the suppliers.
- The cartridge of laser printers is refilled outside the college campus.

12. HEALTH AUDIT

MANAGEMENT OF HUMAN HEALTH AND SAFETY:

The college has given special priority for human health and safety. The following various factors help to manage human health and safety.

a) Regular Health Check-up:

Every year, the college organizes over all body checkup camp. The students take active part in this event.

b) Separate Toilet facility:

Separate toilets are available for students and staff in the college.

c) First-Aid Box:

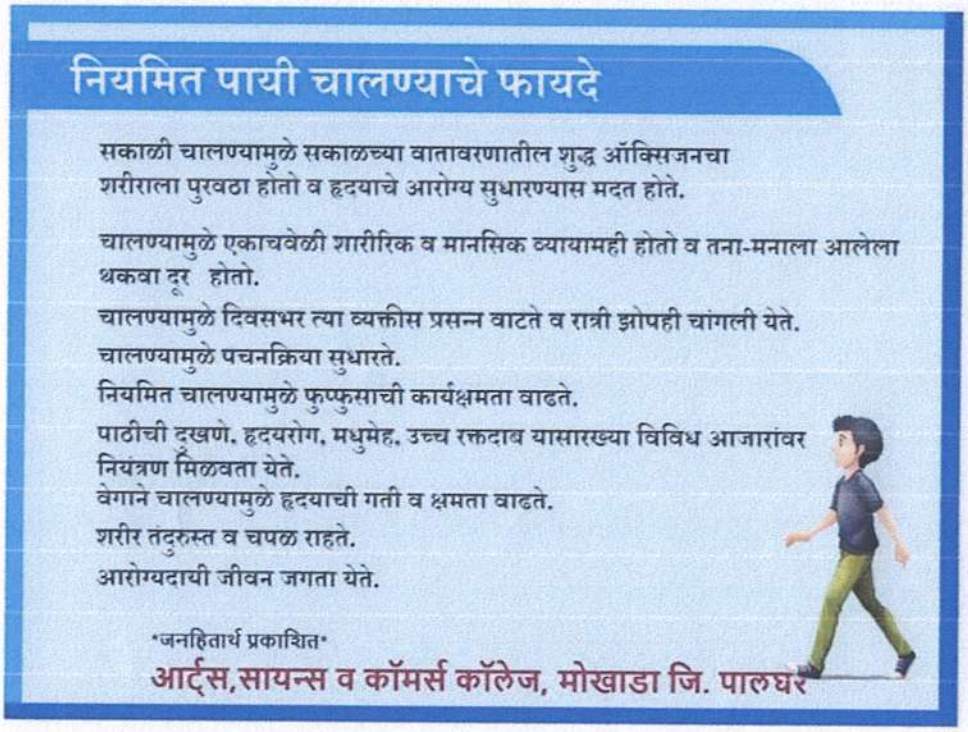
In case of any accidental injury, first aid boxes are available in the college.

d) Fire Extinguisher:

Fire Extinguishers have been set up in various places in the college so as not to cause the loss of life and financial loss through fire.

e) Flexes of Health Awareness:

In order to create health awareness among students and society, The College has setup flex boards / banners to spread awareness about the health related information in the college campus.



13. ENVIRONMENTAL QUALITY AUDIT

a) Public Awareness about Environmental Conservation:

Environment will not prevail if public awareness is not spread, keeping this thing in mind, the college has tried to aware students towards environmental conservation.

The college campus has put up banners / flexes boards to create awareness about environmental conservation. Through this, the college tried its best to create awareness about environmental conservation.

i) Individual Role Related To Environmental Conservation.

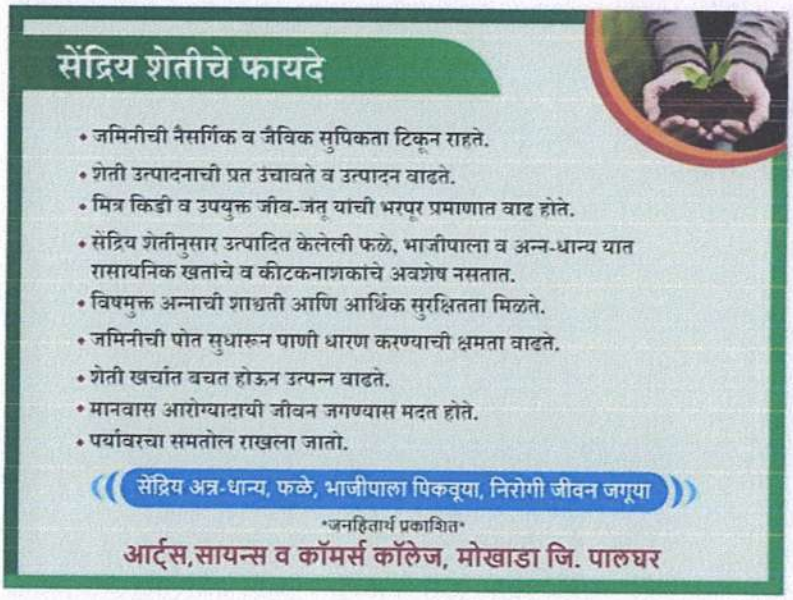
The college campus has put flex for he conservation of Environment.

ii) Importance of Trees:

With the objective of Conservation of Environment the College has taken initiative to conserve the trees also.

iii) Benefits of Organic Farming

All the Decomposable waste is used to prepare the vermicomposting and the fertilizer is used for farming, thus the college promotes organic farming in their campus.



b) Air Pollution Management

The college has made positive efforts through various means to reduce the problems related to air pollution in the college campus. Flex/Boards are displayed in the college campus.

c) Noise Level & Noise Environment

Noise pollution is one of the major environmental issues in India today and most of us are unaware of the hazards it can cause. In India, we all are subjected to some form of loud noises for a considerable amount of time on daily basis as well across the year based on the festive season such as Ganesh Festival, Diwali and others.

Unwarranted sounds such as honking, other vehicular noise, the loudspeakers and not to forget about household noise such as television and music system sounds on daily basis are inevitable. In our country it's a major perception that happiness can only be expressed by creating loud noises.

Sr. No.	Location	Min Noise Level dB (A)	Max Noise Level dB (A)	Noise Standards dB (A)*
1.	Main Building	43	56	50
2.	Building Under Construction	60	68	50
3.	College Canteen	51	59	50
4.	Lecture Hall Building	36	48	50
5.	Principal Quarters	40	51	50
6.	Staff Quarters	41	54	50

*Note: Ambient Air Quality Standards in respect of Noise dB (A), in accordance with Noise Pollution Regulation and Control) amendment rules, 2000 Silent Zone

In order to avoid sound pollution in the college campus, or to avoid causing noise, the college has tried various means to prevent sound pollution. The campus has been declared as Silent Zone and the students have been instructed with the help of boards of silence zone. An instruction has been given to students to operate mobile phones in silent mode, especially at the library and auditorium hall. Suggestion boards of no honking are setup in the campus so

sound pollution could be reduced. Most of trees have been planted in the college campus to reduce the intensity of noise pollution so in future the intensity of sound pollution will be reduced in the campus

d) Environment related programs - Organization of Tree Plantation Programme:

Environmental conservation committee, NSS, Department of Life-Long learning and extension arranges tree plantation programme every year. All trees in the campus are cultivated through these departments. Thus air pollution in college campus is not known.

e) No Smoking, No Tobacco in the Campus Area:

Smoking and chewing of tobacco is strictly prohibited in the college campus.

f) Paperless Office

Deliberate efforts are made to use least amount of paper in administrative work, and academic work. The college prefers information technology like the website, email, WhatsApp, phone instead of the paperwork. E-sources are available for Faculty as teaching aids. Wi-Fi facility enables to create paperless activities.

g) Plastic Free Campus

The Government of Maharashtra has banned uses of plastic material. An initiative is taken to ban plastic bags in the college premises and promote to use paper bags.


Don't Throw
Plastic in
Premises

14. OVERALL RECOMMENDATIONS

i) Chemistry lab should have proper ventilation system.

ii) More number of Tree plantations should be done to maintain biodiversity.

iii) The premises should be free from garbage for more eco- friendly environment.

iv) Awareness for energy and water conservation among students and staff by displaying boards.

v) Energy conservative measures should be planned

vi) Water usage reduction techniques to be used

vii) Awareness among students and staff about green environment shall be done use tools like display boards.

रयत शिक्षण संस्था, सातारा

Rayat Shikshan Sanstha's

ARTS, SCIENCE AND COMMERCE COLLEGE, MOKHADA

DISTRICT PALGHAR (M.S.) 401 604

GREEN AUDIT REPORT

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1. INTRODUCTION

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

Green Audit helps colleges to assess uses or over usage different kinds of environmental resources such as water, energy etc. It also helps to quantify the impact made by college on various environmental elements. Green audit promotes health consciousness and also promotes environmental awareness. The aim of the green audit is to provide better understandings of green impacts on college campus and promote sustainable use of available resources. If self-assessment is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-assessment 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.

Recently it was observed that people are not caring much about nature. Human activities are directly or indirectly damaging the environment and having different environment issues. Change in the eco system is mostly due to the increase in world population, enormous advancement in science and: technology and globalization. The problems arise due to this are: global warming, depletion of ozone layers, air

pollution, water pollution etc. 'Green Audit' is also called as Environmental Audit It is the most efficient ecological way to solve environmental problems.

Further, clean and healthy environment is one of the desired pre-requisites in any educational institution. To fulfill this, our institution emphasizes on adopting green practices and creates environment awareness amongst all its stakeholders. Active participation of stakeholders facilitates this process of making the campus eco-friendly. The strategies used to make campus eco-friendly are adopting energy conservation practices, effective waste management, waste water treatment and tree plantation for making the campus clean, green and healthy. Further, various green practices like rain water harvesting, solar street lamps, solid and liquid waste, Greening the campus and no vehicle day. Further, college has an active Eco club which conducts various activities to increase awareness amongst students, such as awareness rallies, different competitions. Further, academic activities such as study tours/visits. Cleaning of campus and the nearby villages on different occasion and projects are also arranged in accordance to Green policy.

2. PROFILE OF THE INSTITUTE

A. About Rayat Shikshan Sanshta:

A premier institution of education like the Rayat Shikshan Sanstha, known and honored far and wide, not only at the national level, but at the global level too, needs no introduction. The institution itself is regarded as a noble mission, a noble cause, so earnestly and so endearingly pursued by its founder- father Karmaveer Bhaurao Patil, the educator of the educators and his legendary wife Sou. Laxmibai Patil with her exemplary sacrifices made to turn the mission into a reality.

The Rayat Shikshan Sanstha is one of the leading educational institutions in Asia. The value of its contribution to education in general is enormously great as it has, from the very beginning, tried all its best to lay emphasis on the education of the down-trodden, the poor and the ignorant who really form the major bulk of society. The founder of the institution, late Dr. Karamaveer Bhaurao Patil, was a man of the masses who devoted all his mind and heart to the cause of their education. He had an incisive understanding of the social ills that beset his times and fully realized the dire need of the spread of education. He believed that education alone could correct the social ills such as caste-hierarchy, money-lending, illiteracy, untouchability, superstitions and social and economic inequality. Throughout his life he tried to translate this belief into reality. He was the champion of the poor, the weak, the dispossessed and left no stone unturned for their upliftment. He was a great humanitarian who endeavored hard to educate the masses to bring a kindly light of hope in their lives of misery and ignorance. He realised that the social ills could be remedied through the education of the masses alone and laid the foundation of the Rayat Shikshan Sanstha by opening a Boarding House at Kale (Tal-Karad, Dist-Satara) in 1919. Soon, however, in 1924 he shifted the head-quarters of his educational institution to Satara.

B. About College:

Arts, Science and Commerce College, Mokhada is a leading College in Mokhada Tahasil, Palghar District. Mokhada Tahasil falls under the remote and tribal area of Palghar District of Maharashtra. Among total population of Mokhada Tashil 99 % of population is tribal. Our college is the leading higher educational institute available in Mokhada Tahasil rendering quality education in Arts, Commerce & Science faculties. It is established by Rayat Shikshan Sanstha, Satara in 1984 with 47 students. It is affiliated to Mumbai University, Mumbai. The college is established with the prime objective to educate the students from tribal area and downtrodden strata of the society. It was renamed as Arts, Science and Commerce College, Mokhada in 2013 with the commencement of science faculty in the college. It is a multifaculty college providing education from UG to PG courses. The college is accredited with 'B' grade (CGPA 2.21) by NAAC, Banglore.

3. ENVIRONMENT CONSERVATION COMMITTEE

Sr. No.	Name of Member	Designation	Title in Committee
1.	Prin. Dr. L. D. Bhor	Principal	Chairman
2.	Dr. A. N. Chandore	HOD, Dept. of Botany	Coordinator

4. FUNCTION OF ENVIRONMENT CONSERVATION COMMITTEE:

The college has constituted an Environmental Cell to make the student teachers aware about the environmental issues and challenges and inspire them to disseminate the information and sensitize the school children and the society at large about these challenges.

- To sensitize the student teachers about the Institute and Environment related problems.
- To inculcate the sense of responsibility towards the development of planet Earth and appreciation of its beauty.
- To providing opportunities to acquire knowledge, skills, attitude, commitment to preserve the environment.
- To make them understand the interdependence of economic, social and ecological factors.
- To train the student teachers to impart environmental education to school children through curricular and co-curricular activities.
- To improve the environment of the college campus.
- To make students aware of society about the environment conservation.
- To manage solid waste, liquid waste and e-waste of the college campus.

5. STEPS OF GREEN AUDIT

Pre-Audit

1. Plan the audit
2. Select the audit team
3. Schedule the audit facility
4. Acquire the background information
5. Visit the site

On-site

1. Understand the scope of audit
2. Analyse the strengths and weaknesses of the internal controls
3. Conduct the audit
4. Evaluate the observations of audit program
5. Prepare a report of the observations side by side

Post-Audit

1. Produce a draft report of the data collected
2. Produce a final report of the observations and the inference with accuracy
3. Distribute the final report to the management
4. Prepare an action plan to overcome the flaws
5. Keep a watch on the action plan

6. BACKGROUND

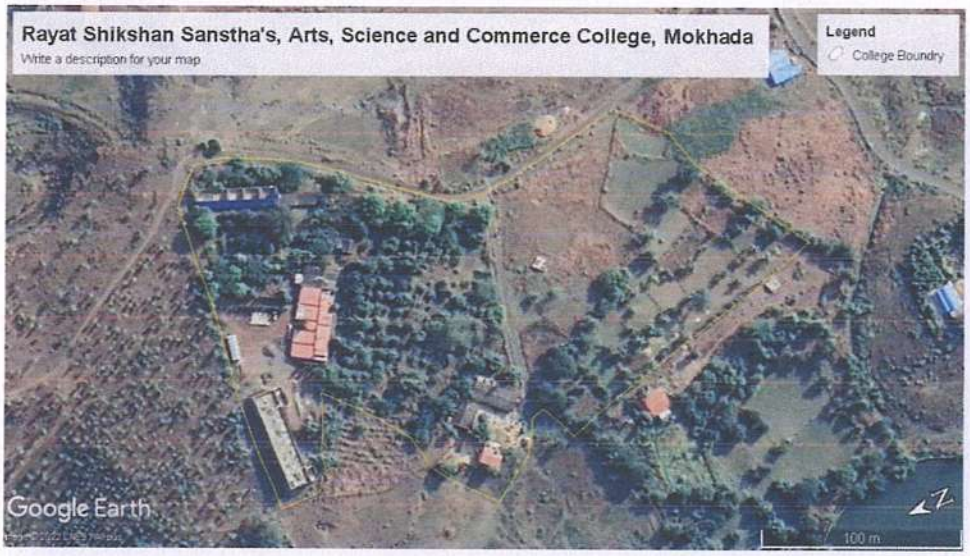
This is one of the leading higher educational institute in the tribal area of Mokhada Tehsil, District Palghar. It was established by Rayat Shikshan Sanstha, Satara in 1984 with the name Arts and Commerce College, Mokhada. The college is established with the prime objective to educate the students from tribal area and downtrodden strata of the society. It was renamed as Arts, Science and Commerce College, Mokhada in 2013 with the commencement of science faculty in the college.

The college imparts UG level education in various subjects such as Botany, Zoology, Physics, Chemistry and Mathematics as Science subjects. The college offers three years Bachelor of Commerce degree program and Marathi History and Economics as part of Bachelor of Arts Program.

The college located outside of the Mokhada town near to the town lake. Its magnificent campus is spread over on 8.6 acres with total built up area of 1430/- sq. mtrs.

With keen interest and initiative from Prin. Dr. L.D. Bhor (Principal) of the College to undertake the Green & Environmental Audit of the campus, the audit was undertaken.

Figure 1 Campus Map:



Google Maps

Imagery ©2022 CNES / Airbus, Map data ©2022 20 m

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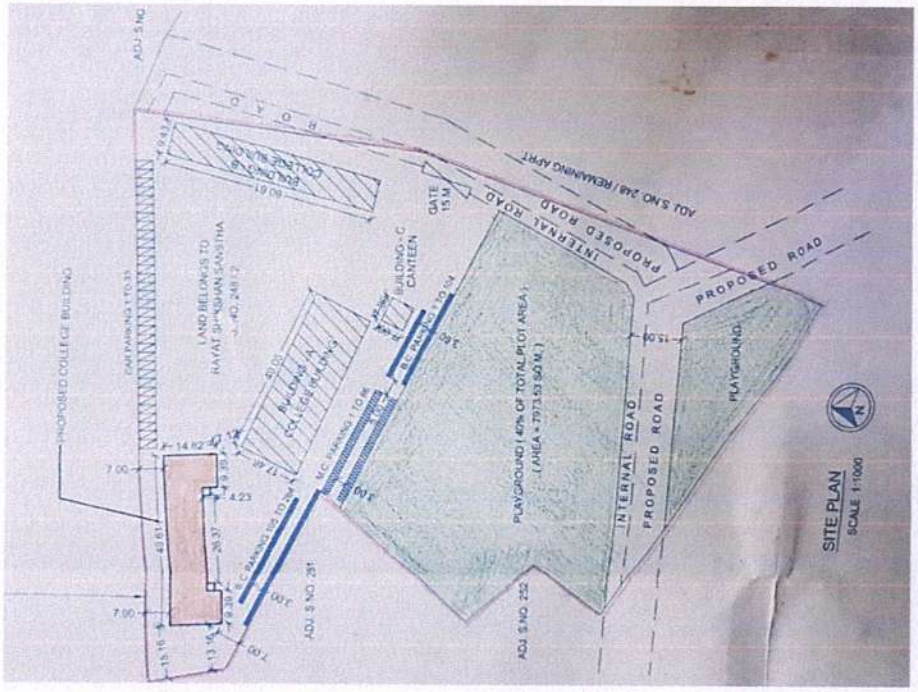
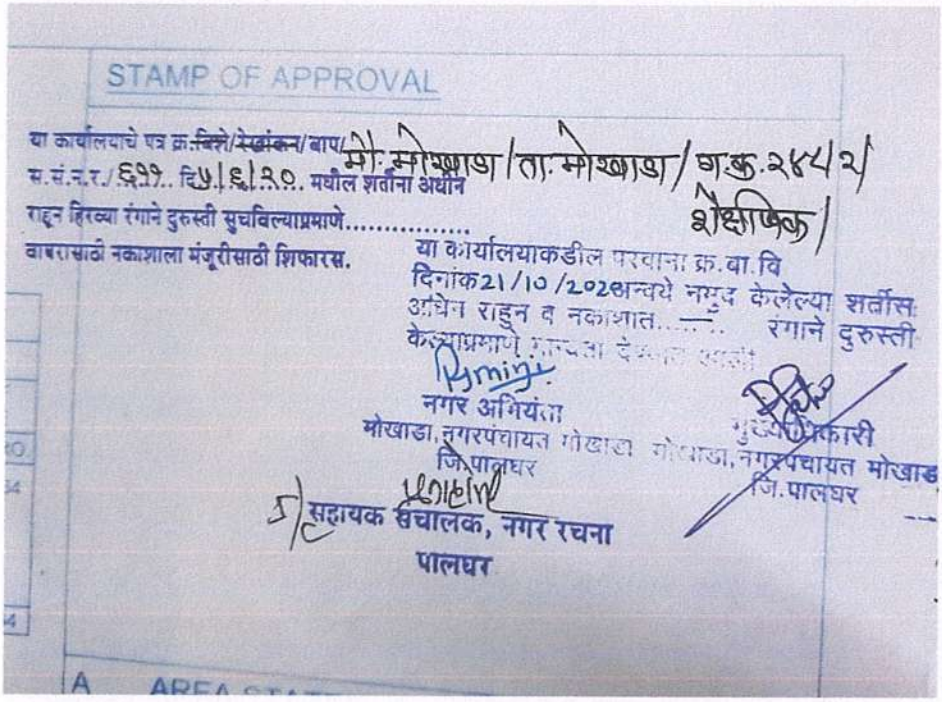
Figure 2 Campus Map:





- Courses offered by College

Sr. No.	Name of Faculty	Name of Program	Name of Subject
1.	Faculty of Arts	BA	Economics
2.			History
3.			Marathi
4.	Faculty of Commerce	B.Com	Commerce
5.	Faculty of Science	B.Sc.	Botany
6.			Zoology
7.			Chemistry
8.			Physics
9.			Mathematics

7. SCOPE OF WORK

The following Environmental Issues were studied for the above mentioned campus area.

- Water Environment including rain water harvesting potential of the campus.
- Plant diversity.
- Noise Environment.
- Solid Waste Management Practices.
- Air Environment.

Based on the available data, sampling and information provided by the Arts, Commerce and Science College, Mokhada officials this report has been prepared and recommendations for betterment of campus environment are provided.

8. Baseline Data

The most of the baseline data relating population, water supply, has been collected from the college management. The data / samples for drinking water, noise, floral diversity, and solid waste generation were collected by visiting the campus area by the expert teams.

❖ Total Population of The Campus

Sr. No.	Particulars	Total population of institute (incl. Students, Permanent, Temporary staff & visitors)
1.	College Staff (Teaching and Non-Teaching)	38
2.	College Students (Girls and Boys)	540
3.	Residential Students	-
4.	Residential Staff	19
5.	Floating Population	10
	Total	597

9. WATER AUDIT

Water is a key driver and is vital to development of Biodiversity, Agriculture, Humans as well as the Economy. With recent experiences across the world and in India, the water scarcity and security is emerging issues. The state of Maharashtra has also faced severe impact of the water scarcity in the recent past. Therefore water management is a crucial step of sustainable development and it also has been made an integral part of the Sustainable Development Goals (SDGs).

Unplanned urban growth and economic development has placed unprecedented pressures on natural resources especially on water. Increasing demand for the water in areas such as Mokhada highlights the necessity of the overall water management. As per the standard guidelines given in National Water Mission the service level benchmark is to provide 150 lpcd water supply for metro cities, 135 lpcd for other cities/towns with sewage system and 70 lpcd without sewage system city/town.

a) Water Requirement calculations:

There are about 02 water storage tanks within the campus, the total water required on the campus is shown below:

Sr. No.	Particulars	Total population	Required Water Supply (lpcd)	Water Requirement (M^3/Day)
1.	College Staff (Teaching and Non-Teaching	38	15	570
2.	College Students (Girls and Boys)	540	15	8100
3.	Residential Students	-	135	-
4.	Residential Staff	19	135	2565
5.	Floating Population	10	10	100
	Total	597	310	11,335

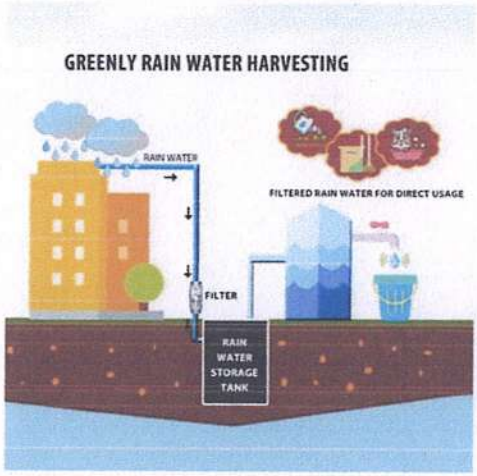
Note: The water requirement is calculated as per National Building Code 2005 and requirement is inclusive of drinking water

b) Quality of water:

Sr. No.	Parameters	Result	Acceptable Limit as per IS 10500 : 2012	Units
1	Color	1.4	5	Hazen unit
2	Odour	Agreeable	Agreeable	-
3	pH	7.38	6.5-8.5	-
4	Turbidity	0.7	1	N.T.U
5	Total Dissolved Solids	164	500	mg/lit
6	Calcium	16	75	mg/lit
7	Chloride	14	250	mg/lit
9	Iron	< 0.05	0.3	mg/lit
10	Magnesium	11.6	30	mg/lit
11	Nitrate	4.90	45	mg/lit
12	Sulphate	24.43	200	mg/lit
13	Alkalinity	50	200	mg/lit
14	Total Hardness	81	200	mg/lit
15	E. Coli	Absent	Should be Absent	/ 100 ml
16	Total Coliform	Absent	Should be Absent	/ 100 ml

It is informed that water supply is taken from the well present in college campus. Water is directly used for various domestic purposes, irrigation of plants etc. To maintain the quality of Drinking Water College uses two RO systems, one at staff room and other at student's water supply coolers. The RO system is maintained by annual maintenance contact.

c) Rain Water Harvesting Potential of College Campus:



The campus buildings possess large terrace areas and non-paved. Currently, none of the buildings have Rain Water Harvesting (RWH) System implemented. The campus has huge potential for RWH. The college campus is situated on barren land. Towards the

south west side slope there is a well in the college premises. The well the main source of water on the college campus. Rain water fall on the college campus buildings may be harvested by using well injection system.

Sr. No.	Building Name	Roof Top Area (Sq.m.)	Runoff Coefficient	Rain water Harvested (m3)
1.	Main Building	848.45	0.8	1702
2.	Class room Building	555	0.8	1123
3.	College Canteen	25	0.8	47
4.	Staff Quarters	400	0.8	804
5	Principal's Quarter	72	0.8	125

d) Management of Generated Wastewater:

Based on the water consumption data and considering about 80% of the water supplied is converted in to the waste water either through the washrooms, chemical laboratories, etc. the campus generated about 10872 m^3 of waste water every day.

It was observed that there is no separate drainage system for collecting and transporting sewage and liquids from laboratories. Currently, a combined drainage systems is placed which carries all the liquid effluent to a sewerage system. There is necessity of collection of grey and black water. The grey water with minor treatment must be used for irrigation of vegetation and black water must be treated properly using simple septic system and soak pits.

10. LAND MANAGEMENT AND TREE PLANTATION

The college of Campus is eco-friendly because of many planted trees the campus. The soil erosion is controlled by levelling the college land and dump the soil on the necessary places. Also the college prefers organic fertilizers and pesticides instead of chemical fertilizers and pesticides to maintain soil properly. This makes the college campus look very green. The college tree cover is more than 35%, So the college environment is extremely fresh.

Our college has green campus, which comprises of following floras:

Sr. no.	Common name	Scientific name	Family name	Number Trees	Girth at 4ft height from ground In cm	Height of the plant In Ft.
1	Ashok	Polyalthia longifolia	Annonaceae	68	50.4 cm	28.69
2	Cashew	Anacardium occidentale	Anacardiaceae	66	50.16	19.85
3	Mango	Mangifera indica	Anacardiaceae	80	63.8	33.26
4	Black Plum	Syzygium cumini	Myrtaceae	24	63.6	32.90
5	Manila Tamarind	Pithacolobium dulc	Fabaceae	04	35.56	32.84
6	River Tamarind	Leucaena leucocephala	Fabaceae	06	50.9	39.42
7	Teak	Tectona grandis	Lamiaceae	44	58. 42	41.01
8	Red Date	Ziziphus jujuba	Rhamnaceae	08	58.07	45.13
9	Lebbek Tree	Albizia lebbeck	Fabaceae	05	96.52	42.65

10	Sacred fig	Ficus religiosa	Moraceae	01	563.90	90.18
11	Karanj	Pongamia pinnata	Fabaceae	05	50.08	41.01
12	Eucalyptus	Eucalyptus sp.	Myrtaceae	16	27.94	22.63
13	Cluster Fig	Ficus racemosa	Moraceae	2	30.48	14.76
14	Tamarind	Tamarindus indica	Fabaceae	04	50.8	14.7
15	Flame of the forest	Delonix regia	Fabaceae	03	58.42	40.2
16	Earpod Wattle	Acacia auriculiformes	Fabaceae	10	50	32.84
17	Bidi Leaf Tree	Bauhinia sp.	Fabaceae	04	50.8	21.32
18	Hibiscus	Hibiscus rosasinensis	Malvaceae	07	40.71	16.6
19	Indian Gooseberry	Phyllanthus emblica	Phyllanthaceae	04	58.44	40.27
20	African Mahogany	Khaya senegalensis	Mellaceae	07	144.81	49.26
21	Wild sweetsop	Annona reticulata	Annonaceae	01	45.72	19.14
22	Australian Acacia	Acacia auriculiformis	Fabaceae	08	45.72	22.96
23	Nirgudi	Vitex negundo	Lamiaceae	03	43.18	26
24	Indian Wild Cherry	Muntingia calabura	Muntingiaceae	01	16	9
25	Indian screw tree	Helicteres isora	Malvaceae	01	16.1	9.17
26	Flame of the Forest	Butea monosperma	Fabaceae	02	58.42	19.1
27	Guava	Psidium guajava	Myrtaceae	15	36.71	7.6

11. WASTE QUANTIFICATION AND MANAGEMENT

a) Segregation of waste - Solid Waste Management

Nearly everything humans do leave behind some kind of waste. Arts, Commerce and Science College, Mokhada also generate a variety of wastes such as electronic wastes, institutional waste. The college does a good job of ensuring that hazardous materials are disposed of properly. So the college has given its top priority to dispose of the waste material.

First the solid waste generated in college campus is separated into two parts 1) Decomposable solid waste and 2) Non decomposable solid waste. Non-decomposable solid waste is further separated in to two parts Polythene bags and other non-decomposable material is separated and sold to vendors before disposing the organic wastes. Broken glass, and plastic, rubber and other materials are disposed into *Nagar Panchayat* dump bins to be recycled. The organic waste is dumped in to decomposing pit for organic decomposition.

The garbage management always tries to make the college campus Eco-friendly. Vermicomposts is prepared with the help of mulch of tree leaves and waste paper that occurs around the college campus. These vermicomposts are again utilized to cultivate the plant of college. For this purpose Waste bins have been kept in the college. To maintain college campus clean, the waste materials are collected from containers and stored in tanks to produce Vermicomposts.

b) Compost Fertilizer Unit:

Compost fertilizer is prepared form plant litter of the college campus. This compost is used as fertilizer for plants of college garden. Compost is a key ingredient in organic farming. At the simplest level, the process of composting simply requires making a heap of wet organic matter and waiting for the materials to break down into humus after a period of three months. Compost is rich in nutrients. The compost itself is beneficial for the land in many ways,

including as a soil conditioner, a fertilizer, addition of vital humus or humic acids, and as a natural pesticide for soil. In ecosystem, compost is useful for erosion control, land and stream reclamation, wetland construction, and as landfill cover. The decomposition process is done by shredding the plant matter, adding water and ensuring proper aeration by regularly turning the mixture. Worms and fungi further break up the material. Aerobic bacteria manage the chemical process by converting the inputs into heat, carbon dioxide and ammonium. The ammonium is further converted by bacteria into plant-nourishing nitrites and nitrates through the process of nitrification.

c) Use of Organic Fertilizers / Pesticides:

Organic Fertilizers and Pesticides are used instead of using chemical fertilizers and insecticides.

d) E-Waste Quantification and Management:

- E-Waste materials are kept in a separate store-room with a dead stock register.
- Drives, Monitors, Keyboards, Cartridges, etc. is disposed through outside agencies as a scrap.
- UPS batteries are recharged / repaired / exchanged by the suppliers.
- The cartridge of laser printers is refilled outside the college campus.

12. HEALTH AUDIT

MANAGEMENT OF HUMAN HEALTH AND SAFETY:

The college has given special priority for human health and safety. The following various factors help to manage human health and safety.

a) Regular Health Check-up:

Every year, the college organizes over all body checkup camp. The students take active part in this event.

b) Separate Toilet facility:

Separate toilets are available for students and staff in the college.

c) First-Aid Box:

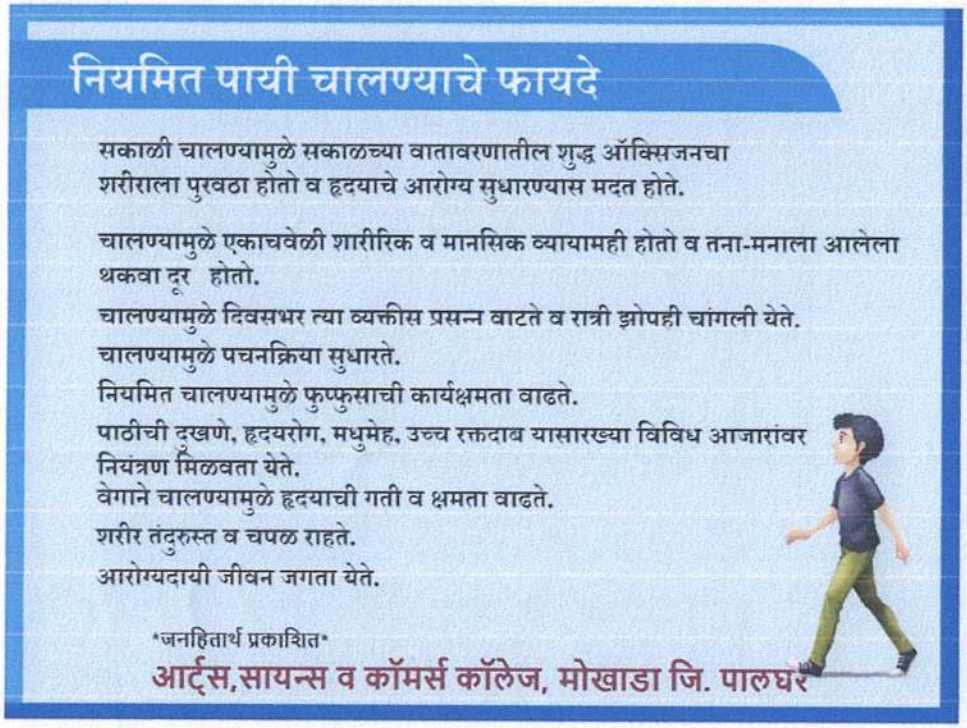
In case of any accidental injury, first aid boxes are available in the college.

d) Fire Extinguisher:

Fire Extinguishers have been set up in various places in the college so as not to cause the loss of life and financial loss through fire.

e) Flexes of Health Awareness:

In order to create health awareness among students and society, The College has setup flex boards / banners to spread awareness about the health related information in the college campus.



13. ENVIRONMENTAL QUALITY AUDIT

a) Public Awareness about Environmental Conservation:

Environment will not prevail if public awareness is not spread, keeping this thing in mind, the college has tried to aware students towards environmental conservation.

The college campus has put up banners / flexes boards to create awareness about environmental conservation. Through this, the college tried its best to create awareness about environmental conservation.

i) Individual Role Related To Environmental Conservation.

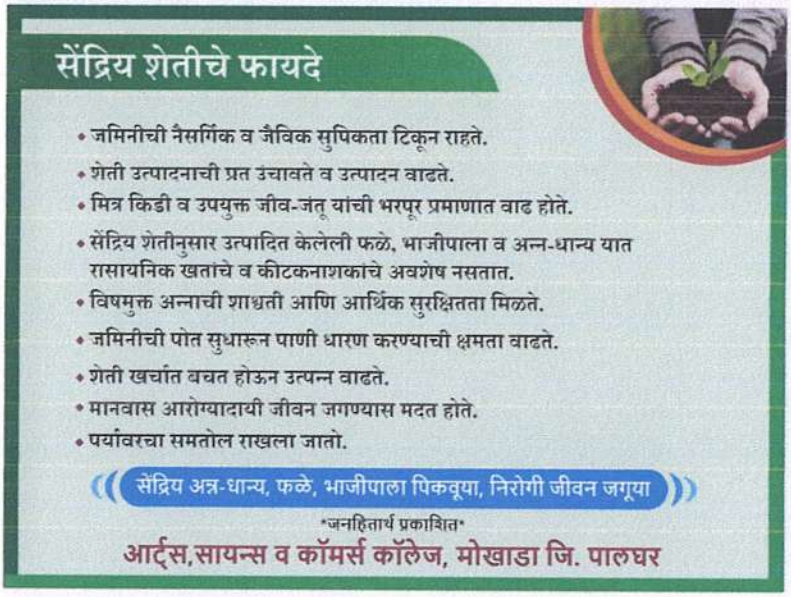
The college campus has put flex for he conservation of Environment.

ii) Importance of Trees:

With the objective of Conservation of Environment the College has taken initiative to conserve the trees also.

iii) Benefits of Organic Farming

All the Decomposable waste is used to prepare the vermicomposting and the fertilizer is used for farming, thus the college promotes organic farming in their campus.



b) Air Pollution Management

The college has made positive efforts through various means reduce the problems related to air pollution in the college campus.

c) Noise Level & Noise Environment

Noise pollution is one of the major environmental issues in India today and most of us are unaware of the hazards it can cause. In India, we all are subjected to some form of loud noises for a considerable amount of time on daily basis as well across the year based on the festive season such as Ganesh Festival, Diwali and others.

Unwarranted sounds such as honking, other vehicular noise, the loudspeakers and not to forget about household noise such as television and music system sounds on daily basis are inevitable. In our country it's a major perception that happiness can only be expressed by creating loud noises.

Sr. No.	Location	Min Noise Level dB (A)	Max Noise Level dB (A)	Noise Standards dB (A)*
1.	Main Building	41	53	50
2.	Building Under Construction	55	71	50
3.	College Canteen	52	59	50
4.	Lecture Hall Building	34	47	50
5.	Principal Quarters	44	55	50
6.	Staff Quarters	45	57	50

*Note: Ambient Air Quality Standards in respect of Noise dB (A), in accordance with Noise Pollution Regulation and Control) amendment rules, 2000 Silent Zone

In order to avoid sound pollution in the college campus, or to avoid causing noise, the college has tried various means to prevent sound pollution. The campus has been declared as Silent Zone and the students have been instructed with the help of boards of silence zone. An instruction has been given to students to operate mobile phones in silent mode, especially at the library and auditorium hall. Suggestion boards of no honking are setup in the campus so sound pollution could be reduced. Most of trees have been planted in the college

campus to reduce the intensity of noise pollution so in future the intensity of sound pollution will be reduced in the campus

d) Environment related programs - Organization of Tree Plantation Programme:

Environmental conservation committee, NSS, Department of Life-Long learning and extension arranges tree plantation programme every year. All trees in the campus are cultivated through these departments. Thus air pollution in college campus is not known.

e) No Smoking, No Tobacco in the Campus Area:

Smoking and chewing of tobacco is strictly prohibited in the college campus.

f) Paperless Office

Deliberate efforts are made to use least amount of paper in administrative work, and academic work. The college prefers information technology like the website, email, WhatsApp, phone instead of the paperwork. E-sources are available for Faculty as teaching aids. Wi-Fi facility enables to create paperless activities.

g) Plastic Free Campus

The Government of Maharashtra has banned uses of plastic material. An initiative is taken to ban plastic bags in the college premises and promote to use paper bags.


SAY NO
to Single Use
Plastic Bags

14. OVERALL RECOMMENDATIONS

i) Lab waste water should be drained to proper drainage system.

ii) Planning of chemical consumption and purchase to be ensured

iii) There must be proper channel to dispose degradable & non-degradable wastes.

iv) Composting of bio degradable waste to be scientifically done

v) The number of water supply resource should be more.

vi) Rain water Harvesting must be done technically

vii) Water bodies should be maintained by cleaning & repairing whenever require.

viii) There is a need of Septic tank to store more water.

ix) Solar Panel should be installed as alternate source of energy.

x) Tree plantation shall be done to maintain biodiversity and steps to be taken for conservation of birds by creating artificial nesting.

ENERGY AUDIT REPORT

RAYAT SHIKSHAN SANSTHA'S ARTS, SCIENCE & COMMERCE COLLEGE MOKHADA, DISTRICT- PALGHAR- 401604

ENERGY AUDITED DURING DT-11-08-2022 TO DT-11-08-2022

AUDITED BY

ADITI ENGINEERING SERVICES NASHIK

Acknowledgement

Energy Audit of system is key instrument in knowing the present level of efficiency of various components and establishing the areas of shortfall for improvement.

We are very thankful for Hon. Principal Dr. Laxman Bhor (M.Com, B.Ed, M.Phil, PHD) **Rayat Shikshan Sanstha's Arts, Science& Commerce College Mokhada, District- Palghar- 401604** for having given opportunity to conduct Energy audit of various facilities in college campus. We are also thankful for Hon. Shri- Subhash Saindanshiv Associate Professor Botany, various respected HOD & their respective subordinate staffs have given their valuable contribution for guiding & supporting us during campus round for data collection,network study & measurement for accomplishing successful Energy audit. We also appreciate & thanks for hospitality given to us during audit period.

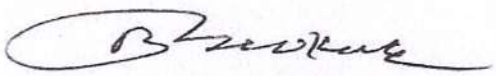
This report made with sincere efforts gives details of the relevant data collected during energy audit study, observation, analysis & recommendations made pertaining to different facilities in campus.

Several Energy Conservation Opportunities(Measures) have been identified & proposed in course of our study & theseoptions when implemented , are expected to bring in lasting benefits(saving) in term of energy as well as cost saving to the management.

We are pleased to submit this Detailed Energy Audit Report to **Hon. Principal Dr. Laxman Bhor (M.Com, B.Ed, M.Phil, PHD) Rayat Shikshan Sanstha's Arts, Science& Commerce College Mokhada, District- Palghar- 401604** representing on behalf of management of Rayat Shikshan sanstha Satara and wish him all the best for implementation of identified Energy Conservation Opportunity as well as recommendations after sincere study & observations.

Aditi Engineering services Nashik is willing to support management technically toward implementation of Energy Saving Measures for deriving energy conservation & cost effective benefits.

For Aditi Engineering services Nashik



Mr. B.L. Deokar

BEE Certified Energy Auditor & Team

ENERGY AUDIT TEAM

Name	Company	Designation
Shri Saidanshiv Subhash	Rayat Shikshan Sanstha's Arts, Science & Commerce College Mokhada, District- Palghar	Associate Professor Botany
Shri- Sangharatna Tayade	Rayat Shikshan Sanstha's Arts, Science & Commerce College Mokhada, District- Palghar	Assistant Professor Botany
Er. Deokar Bhausaheb &Team	Aditi Engineering Services Nashik	Certified Energy Auditor

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	1) Replacement Of Existing FTL & CFL Fitting With	
	3) Bogus billing correction	
	2) Correction In Applied Tariff Category	
	4) Permanent Disconnection Of Service Connection From MSEDCL	
5	Installation Of Turbo Ventilator	
6	Solar Water Heater	
7	Single Phase 10 KVA Rating UPS Load Study	
8	Electric loading study of DG set	
9	Awareness Program & Sign Board Display Near Switch Board.	
10	Electrical Safety Audit	
11	Illumination Study	
12	Necessity Of Solar Power System Installation In Campus	
13	List Of Instrument Used For Measurement In Energy Audit	

1) INTRODUCTION

Rayat Shikshan Sanstha's Arts, Science& Commerce College Mokhada, District- Palghar-401604 is situated at established in 1984 by Rayat Shikshan Sanstha Satara, premier educational institution founded By Hon .Late Padmvibhushan Dr. Shri- Karmveer Bhaurao Patil veteran social activist which has been imparting higher education up to degree level in science , Art & commerce faculty. In addition to this college also provides education in M.C.V.C. Stream.

College campus consists of buildings in which administrative office , various HOD cabins ,staff rooms , classrooms , various laboratory like Physics, chemistry, botany, biology as well as MCVC laboratory various faculty departments are functioning with basic motto to impart quality , employment, entrepreneur and Agro oriented higher education to mostly rural as well as marginal urban student. There is also beautiful library where student studying in various branches have facility to refer books. The college developed garden in campus.

A) Scope of Energy Audit-

The task of energy audit undertaken by Aditi Engineering Services Nasik has objective to identify energy saving & conservation opportunity with electrical network & equipment load study with measurement & to recommend action plan with saving & financial calculation for implementation to materialize energy saving & conservation opportunity to save input energy cost. The energy audit was conducted during 11-08-2022 to 11-08-2022.

1) Review of total Inventory of various electrical load
2) MSEDCL bill study & working out average cost of power & identify cost saving opportunity.
3) Identification of various energy conservation measures & saving opportunity.
4) Review of Awareness program if any for optimum use of electricity & water as well as its saving.
5) Review of implemented non–conventional energy installation & their performance evaluation in input power mix in college campus.(Solar power, Solar heater, Turbo ventilator)
6) UPS Loading study
7) Motor loading study to identify energy saving opportunity.
8) Exploration of scope to solar power introduction in campus.
9) Preparation & submission of technical Energy Audit Report.

B) ENERGY AUDIT METHODOLOGY:-

The audit involves visiting physical position of load & carry out inventory of load. Due measurement of electrical load of equipment & circuit is carried out. Energy bill received

from MSEDCL is audited & studied for KWH requirement & how efficiently energy is used. Various positions are interacted, familiarized with energy audit & involved for successful & result oriented energy audit. Energy conservation & saving opportunities are identified during round & measurement for implementation

C) SYSTEMS STUDIED DURING ENERGY AUDIT:-

1) Review of total Inventory of various electrical load
2) MSEDCL bill study & working out average cost of power & identify cost saving opportunity.
3) Identification of various energy conservation measures & saving opportunity.
4) Review of Awareness program if any for optimum use of electricity & water as well as its saving.
5) Review of implemented non–conventional energy installation & their performance evaluation in input power mix in college campus.(Solar power, Solar heater, Turbo ventilator)
6) UPS Loading study
7) Motor loading study to identify energy saving opportunity.
8) Exploration of scope to solar power introduction in campus.

It is reviewed about Awareness program if any for optimum use of electricity & water as well as its saving undertaken at college level. There is tremendous scope to create awareness among user about efficient & optimum use of energy & water to save. Instruction cum Request Sign board shall be displayed near each switch-board & toilet block, bathrooms to influence & guide to user to arrest misuse & wastage of power & water.

2) EXECUTIVE SUMMARY

The College uses majorly electricity as input energy source for application of various college activities. The electricity is procured from MSEDCL by various LT connection (single phase & three phase) located in various college building. MSEDCL serves monthly electricity bill for payment & on receipt of monthly electricity bill it is paid. Standby power source DG set of 25 KVA & 15 KVA is available to use during power failure from MSEDCL.

A) Average Cost of Power-

There are various type of electricity connection being power supplied by MSEDCL. Monthly electricity bill is served by MSEDCL against electricity used & is paid by college. Average cost of power is worked out by summing up total KWH of all connections & their amount. By dividing total amount by total KWH works out average cost of power per KWH. **It is major observation from billing information that MSEDCL is not**

reading regularly the meters which is making college pay bill at higher tariff & higher cost unnecessary. This misdeed of MSEDCL must be brought to notice of subdivision & section office of MSEDCL in written & monitor it.

BILLING ANALYSIS AS BELOW ----

Category		Connection No			Purpose-		
LT-I (B) Residential		9510009581			Gymkhana		
Months	KWH	Billed Amount in Rs					
		Fixed charges in Rs	Rs/ KWH	Wheeling charge Rs/KWH	Electricity duty	Tax on sale Rs/KWH	Total Bill in Rs
		102	3.44	1.38	16%	0	
Jun-21	30	102	103.2	41.4	39.5	0	286.1
Jul-21	30	102	103.2	42.0	39.6	0	286.8
Aug-21	30	102	103.2	42.0	39.6	0	286.8
Sep-21	30	102	103.2	42.0	39.6	0	286.8
Oct-21	360	102	2433.6	504.0	486.3	0	3525.9
Nov-21	0	102	0	0.0	16.3	0	118.3
Dec-21	0	102	0	0.0	16.3	0	118.3
Jan-22	0	102	0	0.0	16.3	0	118.3
Total	**480**	**816**	**2846.4**	**671.4**	**693.4**	**0**	**5027.2**

Category		Connection No			Purpose-		
LT-II Com		9510006337			Office		
Months	KWH	Billed Amount in Rs					
		Fixed charges in Rs	Rs/ KWH	Wheeling charge Rs/KWH	Electricity duty	Tax on sale Rs/KWH	Total Bill in Rs
		415	7.18	1.38	21%	0.18	
Jun-21	770	415.0	5528.6	1062.6	1471.3	138.6	8616.1
Jul-21	770	415.0	5528.6	1062.6	1471.3	138.6	8616.1
Aug-21	770	415.0	5528.6	1062.6	1471.3	138.6	8616.1
Sep-21	3254	415.0	23363.7	4490.5	5936.5	585.7	34791.5
Oct-21	495	415.0	3554.1	683.1	977.0	89.1	5718.3
Nov-21	474	415.0	3403.3	654.1	939.2	85.3	5497.0
Dec-21	1004	415.0	7208.7	1385.5	1891.9	180.7	11081.9
Jan-22	500	415.0	3590.0	690.0	986.0	90.0	5771.0

Feb-22	559	415.0	4013.6	771.4	1092.0	100.6	6392.7
Total	**8596**	**3735.0**	**61719.3**	**11862.5**	**16236.5**	**1547.3**	**95100.6**

Category		Sanctioned Load-	Connection No		Purpose-		
LT-VII (B) Public Service		6K W	9513004891		Water Works(Motor pump set)		
Months	KWH	Billed Amount in Rs					
		Fixed charges in Rs	Rs/ KWH	Wheeling charge Rs/KWH	Electricity duty	Tax on sale Rs/KWH	Total Bill in Rs
		373	4.68	1.38	21%	0.18	
Jun-21	30	373	140.4	41.4	116.5	5.4	676.7
Jul-21	30	373	140.4	41.4	116.5	5.4	676.7
Aug-21	30	373	140.4	41.4	116.5	5.4	676.7
Sep-21	77	373	360.4	106.3	176.3	13.9	1029.8
Oct-21	7	373	32.8	9.7	87.2	1.3	503.9
Nov-21	10	373	46.8	13.8	91.1	1.8	526.5
Dec-21	93	373	435.2	128.3	196.7	16.7	1150.0
Jan-22	33	373	154.4	45.5	120.3	5.9	699.2
Total	310	2984	1450.8	427.8	1021.1	55.8	5939.5

Category		Connection No				Purpose-	
LT-I (B) Residential		9510009506				Principal quarter	
Months	KWH	Billed Amount in Rs					
		Fixed charges in Rs	Rs/ KWH	Wheeling charge Rs/KWH	Electricity duty	Tax on sale Rs/KWH	Total Bill in Rs
		102	3.44	1.38	16%	0	
Jun-21	140	102	481.6	193.2	124.3	0	901.1
Jul-21	113	102	388.72	155.9	103.5	0	750.1
Aug-21	20	102	68.8	27.6	31.7	0	230.1
Sep-21	4	102	13.76	5.5	19.4	0	140.7
Oct-21	39	102	134.16	53.8	46.4	0	336.4
Nov-21	56	102	192.64	77.3	59.5	0	431.4
Dec-21	57	102	196.08	78.7	60.3	0	437.0
Jan-22	34	102	116.96	46.9	42.5	0	308.4
Total	463	816	1592.72	638.9	487.6	0	3535.3

Months	Connection No		Connection No		Connection No		Connection No		Total		Average cost of power
	9510009581		9510006337		9510009506		9513004891				
	KWH	Amount in Rs	KWH	Amount in Rs	KWH	Amount in Rs	KWH	Amount in Rs	KWH	Amount in Rs	Rs/KWH
Jun-21	30	286.1	770	8616.1	140	901.1	30	676.7	970	10480.0	10.80
Jul-21	30	286.8	770	8616.1	113	750.1	30	676.7	943	10329.7	10.95
Aug-21	30	286.8	770	8616.1	20	230.1	30	676.7	850	9809.7	11.54
Sep-21	30	286.8	3254	34791.5	4	140.7	77	1029.8	3365	36248.8	10.77
Oct-21	360	3525.9	495	5718.3	39	336.4	7	503.9	901	10084.5	11.19
Nov-21	0	118.3	474	5497	56	431.4	10	526.5	540	6573.2	12.17
Dec-21	0	118.3	1004	11081.9	57	437	93	1150	1154	12787.2	11.08
Jan-22	0	118.3	500	5771	34	308.4	33	699.2	567	6896.9	12.16
Total	480	5027.2	8037	88708	463	3535.2	310	5939.5	9290	103209.9	11.11

Average cost of power per KWH works out to be Rs- 11.11 /KWH

B) Total percentage of LED lighting load in total lighting load-

Type of Load	Quantity in No	Total Load in Watt	Percentage of load with total	Presumed Working Hours per year	Assessed Energy consumption per year in KWH	Percentage Energy consumption on total KWH
LED Tube light	52	1040	52.2	2040	2121.6	66
FTL Tube light	9	350	17.6	2040	714.0	22
LED Bulb	14	167	8.4	2040	340.7	11
Incandescent Lamp	7	375	18.8	76.5	28.7	1
CFL Bulb	4	62	3.1	76.5	4.7	0
Total	86	1994	100		3209.7	100

Particulars	Total Lighting Requirement	Lighting met through LED bulb	Lighting through other type lamp
A) Load in KW	1.99	1.207	0.787
Percentage	100	60.6	39.4
B) Assessed Energy consumption per year in KWH	3210	2462	748
Percentage	100	76.7	23.3

C) Identified energy & cost saving opportunity

Sr No	Energy saving & conservation opportunity identified	Annual saving	
		KWH	Amount in Rs
1	Correction in applied tariff category	0	26460
2	Permanent Disconnection of service connection from MSEDCL	0	5004
3	Bogus Reading correction	0	3060
4	Replacement of FTL with LED Tube Light	1350	14999

5	Equivalent electricity saving from installed turbo ventilator for ventilation	3254	35041
6	Equivalent electricity saving from installed solar water heater	2228	24755
	Total	6832	109319

D) Annual Power Mix Of College Met By Renewable & Non-Renewable Energy Sources

Sr No	Input Energy Mix	Unit	Quantity	% share on Total	Type of energy	Estimated CO2 Green House Gas Emission reduction per year in Ton
1	Total Electrical Energy requirement from MSEDCL in KWH (June 21 to Jan 22)	KWH	9290	Total No of 8 month KWH		0
	Total assessed annual Electrical Energy requirement from MSEDCL in KWH (June 21 to May 22)	KWH	13935	81	Conventional	
2	Metered added Annual solar power generation	KWH	0	0		0

3	Assessed Annual Electrical Equivalent Solar energy used for heating water through solar heater	KWH	0	0		0
4	Annual Solar energy used for LED Solar Street Light	KWH	0	0		0
5	Annual Saving of electrical energy from turbo ventilator	KWH	3254	19	Non-conventional	2766
6	Total annual Energy requirement	KWH	17189	100		

There is also conventional energy source diesel consumption for DG set besides above during year. Data receipt of same is awaited. Heat energy is converted into electrical energy.

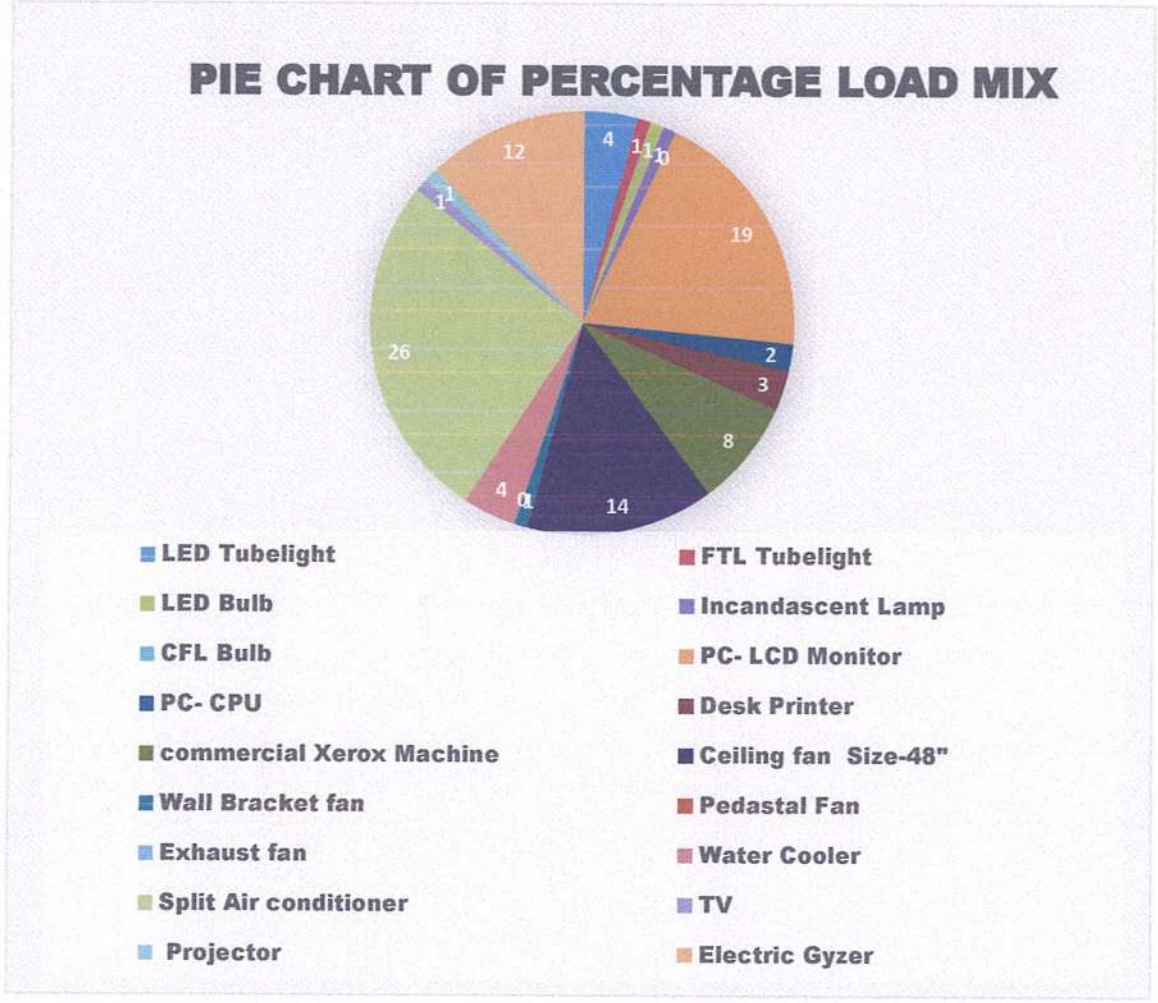
Green Energy application per year & CO2 emission reduction

Total annual Energy requirement KWH	17189
Total application of green Energy in KWH	3254
% share of green energy on total requirement	19 %
Estimated CO2 Green House Gas Emission reduction per year in Ton	2766

3) ANALYSIS OF CONNECTED LOAD IN CAMPUS OTHER THAN MOTIVE POWER –

As Viewed from below table, analysis of inventoried various type of load is done & it understands that Split Air conditioner load has dominance in total load mix & shares more electrical consumption. College has been taking initiative in energy conservation & energy saving work. As part of this college has replaced FTL with LED light & LED Tube light during year 2021-2022.

Type of Load	Quantity in No	Total Load in Watt	Percentage of load with total
LED Tube light	52	1040	4
FTL Tube light	9	350	1
LED Bulb	14	167	1
Incandescent Lamp	7	375	1
CFL Bulb	4	62	0
PC- LCD Monitor	80	4890	19
PC- CPU	31	465	2
Desk Printer	16	800	3
commercial Xerox Machine	2	2000	8
Ceiling fan Size-48"	48	3600	14
Wall Bracket fan	7	315	1
Pedestal Fan	1	45	0
Exhaust fan	4	120	0
Water Cooler	4	1110	4
Split Air conditioner	4	6755	26
TV	2	180	1
Projector	3	270	1
Electric Geyser	1	3000	12
Total	289	25544	100


PIE CHART OF PERCENTAGE LOAD MIX
4
1
1
0
19
2
3
8
14
0
1
4
26
1
12
LED Tubelight
FTL Tubelight
LED Bulb
Incandascent Lamp
CFL Bulb
PC- LCD Monitor
PC- CPU
Desk Printer
commercial Xerox Machine
Ceiling fan Size-48"
Wall Bracket fan
Pedastal Fan
Exhaust fan
Water Cooler
Split Air conditioner
TV
Projector
Electric Gyzer

4) IDENTIFIED ENERGY & COST SAVING OPPORTUNITY

1) Replacement of existing FTL & CFL fitting with energy efficient LED Lamp

There is load of lighting & fan in college campus. Hence it is focused for identification of energy saving opportunity. Energy saving & conservation opportunities are identified which are mentioned below with cost benefit analysis based on revised average cost of power. Lowest pay back option shall be implemented on priority.

Existing equipment details			Proposed replacement with				Saving in watt	Annual Working hours	Saving in KWH per year	Saving in cost Rs	Capital investment in Rs	Payback period in years
Equipment	No	Total Watts	Equipment	No	Watt/No	Total Watts						
Incandescent Lamp	7	375	LED Lamp	7	5	35	340	2040	694	7706	595	0.1
FTL	9	350	LED Tube Light	9	18	162	188	2040	384	4261	2700	1
CFL Lamp	4	62	LED Lamp	4	5	20	42	2040	86	952	340	0.4
Electric Geyser	1	3000	Solar Water Heater 125 LPD	1	–	–	3000	450	1350	14999	20500	1
Total	**21**			**21**			**3570**		**2514**	**27918**	**24135**	

Average cost of power Rs/KWH - 11.11, Operation hours per day- 8 No, Operation day per year- 255

Electric Geyser Operation hours per day- 1.5 Operation day per year-300

2) CORRECTION IN APPLIED TARIFF CATEGORY BY MSEDCL-

The connection No 9510006337 tariff category has been applied wrong by MSEDCL. So you have to pay the electricity Bill with higher rate of tariff unnecessary making it financial loss of college. So it is necessary to get changed from MSEDCL tariff Category as suggested to enable to pay bill with applicable tariff. You can claim refund the amount for preceding two years which has been recovered by MSEDCL on account of wrong tariff category.

1) Existing billing with wrong tariff category

Category		Connection No			Purpose-		
LT-II Com		9510006337			Office		
Months	KWH	Billed Amount in Rs					
		Fixed charges in Rs	Rs/ KWH	Wheeling charge Rs/KWH	Electricity duty	Tax on sale Rs/KWH	Total Bill in Rs
		415	7.18	1.38	21%	0.18	
Jun-21	770	415.0	5528.6	1062.6	1471.3	138.6	8616.1
Jul-21	770	415.0	5528.6	1062.6	1471.3	138.6	8616.1
Aug-21	770	415.0	5528.6	1062.6	1471.3	138.6	8616.1
Sep-21	3254	415.0	23363.7	4490.5	5936.5	585.7	34791.5
Oct-21	495	415.0	3554.1	683.1	977.0	89.1	5718.3
Nov-21	474	415.0	3403.3	654.1	939.2	85.3	5497.0
Dec-21	1004	415.0	7208.7	1385.5	1891.9	180.7	11081.9
Jan-22	500	415.0	3590.0	690.0	986.0	90.0	5771.0
Feb-22	559	415.0	4013.6	771.4	1092.0	100.6	6392.7
Total	**8596**	**3735.0**	**61719.3**	**11862.5**	**16236.5**	**1547.3**	**95100.6**

2) Proposed billing with correct tariff category

Proposed Category		Connection No			Purpose-		
LT-VII (B) Public Service		9510006337			Office		
Months	KWH	Billed Amount in Rs					
		Fixed charges in Rs	Rs/ KWH	Wheeling charge Rs/KWH	Electricity duty %	Tax on sale Rs/KWH	Total Bill in Rs
		373	4.68	1.38	21%	0.18	
Jun-21	770	373	3603.6	1062.6	1058.2	138.6	1058.2
Jul-21	770	373	3603.6	1062.6	1058.2	138.6	1058.2
Aug-21	770	373	3603.6	1062.6	1058.2	138.6	1058.2
Sep-21	3254	373	15228.7	4490.5	4219.4	585.7	4219.4
Oct-21	495	373	2316.6	683.1	708.3	89.1	708.3
Nov-21	474	373	2218.3	654.1	681.5	85.3	681.5
Dec-21	1004	373	4698.7	1385.5	1356.0	180.7	1356.0
Jan-22	500	373	2340.0	690.0	714.6	90.0	714.6
Feb-22	559	373	2616.1	771.4	789.7	100.6	789.7
Total	**8596**	**3357**	**40229.3**	**11862.5**	**11644.2**	**1547.3**	**68640.3**

3) Saving in Billing Cost after changing tariff category for nine month-

Particulars	Billed Amount in Rs						
	KWH	Fixed charges in Rs	Energy charges in Rs	Wheeling charge Rs	Electricity duty Rs	Tax on sale Rs	Total Bill in Rs
Existing billing with wrong tariff category	8596	3735	61719	11862	16236	1547	95100
Proposed billing with correct tariff category	8596	3357	40229	11862	11644	1547	68640
Saving in Billing Cost Rs		378	21490	0	4592	0	26460

3) PERMANENT DISCONNECTION OF SERVICE CONNECTION FROM MSEDCL-

College is holding many service connection of MSEDCL to procure power for various activity in college. However following connection has been identified which is making pay fixed charges though potential saving opportunity is available. This can be saved by diverting load of this connection to LT-I (B) Residential Connection No - 9510009581 & get the connection No-9510006337 permanently disconnected from MSEDL to save cost.

Months	Connection No9510006337
	Fixed charges in Rs
Jun-21	415
Jul-21	415
Aug-21	415
Sep-21	415
Oct-21	415
Nov-21	415
Dec-21	415
Jan-22	415
Feb-22	415
March -22	415
April-22	427
May-22	427
Total saving Potential	**5004**

4) Bogus Reading- **It is major observation from billing information that MSEDCL is not reading regularly the meters which is making college pay bill at higher tariff & higher cost unnecessary. This misdeed of MSEDCL must be brought to notice of subdivision & section office of MSEDCL in written & monitor it.**

1) Accumulated KWH unit billing-

Category		Connection No			Purpose-		
LT-I (B) Residential		9510009581			Gymkhana		
Months	KWH	Billed Amount in Rs					
		Fixed charges in Rs	Rs/ KWH	Wheeling charge Rs/KWH	Electricity duty	Tax on sale Rs/KWH	Total Bill in Rs
		102	3.44	1.4	16%	#REF!	
21-Oct	360	102	2433.6	140.8	428.2	0	3104.6
21-Nov	0	102	0	140.8	38.8	0	281.6
21-Dec	0	102	0	140.8	38.8	0	281.6
22-Jan	0	102	0	140.8	38.8	0	281.6
Total	**360**	**816**	**2846.4**	**1126.1**	**766.2**	**0**	**5554.6**

2) Correct KWH unit billing-

Category		Connection No			Purpose-		
LT-I (B) Residential		9510009581			Gymkhana		
Months	KWH	Billed Amount in Rs					
		Fixed charges in Rs	Rs/ KWH	Wheeling charge Rs/KWH	Electricity duty	Tax on sale Rs/KWH	Total Bill in Rs
		102	3.44	1.4	16%	#REF!	
Oct-21	90	102	309.6	126.0	86.0	0	623.6
Nov-21	90	102	309.6	126.0	86.0	0	623.6
Dec-21	90	102	309.6	126.0	86.0	0	623.6
Jan-22	90	102	309.6	126.0	86.0	0	623.6
Total	**360**	**408**	**1238.4**	**504.0**	**344.1**	**0**	**2494.5**

Saving in billing amount Rs 3060

5).INSTALLATION OF TURBO VENTILATOR -

College management has installed turbo ventilator for ventilation of various halls in college campus. These tub ventilators absorb pressure energy from blowing natural air & convert into velocity of buckets of turbo ventilator to rotate it about axis. In this way green energy is used .If college management had installed electrical exhaust fan in halls, operational cost of these fans would have been spent by management. So this requiring energy & operational cost is saved as well as CO2 emission resulting from this energy use is also avoided to protect environment. This is illustrated as below.

No of turbo ventilator installed	Turbo ventilator Working hours	If expulsion of air from hall would have done with electrical exhaust fan						
	No of Hrs	No of fan	Wattage of each fan	Total watt	Total working hrs per year	Total KWH required per year	Cost of power Rs/KWH	Amount per year in Rs
2	24	4	90	360	8760	3154	11.11	35041

Assessed Annual energy saving potential in KWH 3154

Total Assessed Annual Energy cost saving potential in Rs 35230

6).SOLAR WATER HEATER-

It is proposed to replace electric geyser with solar water heater in Principal quarter to harness cost free solar green energy for heating water requiring for bath. This reduces demand of conventional commercial energy. This will also help to reduce greenhouse gas emission mitigating environmental damage. Application of this solar water heater is cost effective in which solar heat is gained without input energy cost.

Quantification of heat gained & equivalent electrical KWH harnessed by solar heater

Solar System Details	Purpose	Average Water Temperature in oC		Specific heat of water	Density of water	Total Solar heat gained by water per day in	Equivalent Electricity saving in KWH per year	Average Electricity Cost in	Electricity Cost saving in Rs per year	Estimated CO2 Green House Gas Emission reduction
Capacity in LPD		Hot(Out)	Cold (In)	Kcal/Kg/oC	Kg/Ltr	Kcal	KWH	Rs/KWH	Rs	per year in Kg
125	Hot water supply	60	18	1	1	5250	2228	11.11	24755	1872

7). SINGLE PHASE UPS LOAD STUDY

UPS & inverter is installed for standby source of power for college load during supply failure from MSEDCL end. UPS & Inverter capacity is more than requirement. So when batteries are fully charged during availability of MSEDCL supply trickle charging of batteries is continuously going on due to internal battery resistance. This requires power for charging from MSEDCL or DG set. The college has to pay cost of power unnecessary. Hence capacity of UPS & inverter is necessary to be optimized in Circuit & redundant capacity shall be shut down. It is advised to extend UPS supply to various user end from single point central UPS room for optimum utilization of capacity of UPS & inverter. UPS found very under loaded i.e. below 50%. It is recommended to load it up to 80% so that power pollution by it will reduce & operating cost will reduce. Lighting load of respective premise can be diverted on UPS to supply stable rated voltage to lamps. This will prolong life of lamps & save the cost.

Sr No	Location	Equipment Details						Battery details			Remark
		Type	Make	Capacity in VA	Phase	Rated Voltage in Volt	DC Bus Volt	No	Volt	Capacity in AH	
1	Digital Literacy Programme Library	UPS	Luminus	2500	1	220	36	3	12	150	Batteries shall be kept free & not in box for better cooling. Material kept in UPS room

											shall be shifted elsewhere.
2		UPS	Luminus	3500	1	220	48	4	12	150	as above
3		UPS	Luminus	3500	1	220	48	4	12	150	as above
4	Administrative office	UPS	Luminus	3500	1	220	48	4	12	150	
5	Department Room	Inverter	_	1500	1	220	24	2	12	150	
6	Electrical Lab MCVC	Inverter	_	1500	1	220	24	2	12	150	
7	Botany Lab	UPS		600	1	220			Inbuilt		
8		UPS		600	1	220			Inbuilt		
9	Examination Department	Inverter	_	1500	1	220	24	2	12	150	

UPS more than 1 KVA capacity		UPS less than 1 KVA capacity		Inverter		Total Batteries			
No	Total VA Capacity	No	Total VA Capacity	No	Total VA Capacity	No	Volt	AH	Total WH capacity
4	13000	2	1200	3	4500	21	12	150	37800

8).ELECTRICAL LOADING STUDY OF DG SET

DG is installed for standby source of power for college load during supply failure from MSEDCL end. Loading of DG is measured with power analyzer to assess % loading of DG. But DG was found operating at no-load wasting diesel. Revamping work of electrical network was going on. Necessary care for economical operation of DG is necessary. DG capacity is sufficient for existing connected load.

Sr No	DG Set Details						Load Reading			Remark
	Make	Phase	KVA	Hz	RPM	PF	Volt	Amp	Hz	
1	KOEL	1	10	50	1500	0.8	230	0	50	As MSEDCL supply failed, DG found on without load wasting diesel. This was observed at 13.10 hrs on 4-1-2023
2	POWERICA	1	25	50	1500	0.8	off	off	off	DG found off

9.AWARENESS PROGRAM & SIGN BOARD DISPLAY NEAR SWITCH BOARD

It is reviewed about Awareness program if any undertaken at college level for optimum use of electricity & water as well as its saving. There is still tremendous scope to create awareness among user about efficient & optimum use of energy & water to save. Instruction cum Request Sign board shall be displayed near each switch-board, toilet block & bathrooms to influence & guide to user to arrest misuse & wastage of power & water.

10).ELECTRICAL SAFETY AUDIT

Considering huge human occupancy in building Electrical Safety Audit is recommended to identify unsafe location & condition to comply to ensure electrical safety with human being, property & equipment. This is very serious thing & is priority issue.

11).ILLUMINATION STUDY

Illumination study is necessary to be conducted to comply reference standard IS 3646(Part1): 1992. Illumination level is almost found deviated & less as compare to requirement quoted in standard; The by & large artificial lighting shall have to add or modify adequately to attain illumination level requiring for human eye comfort prescribed in IS 3646(Part1): 1992 standard. It is recommended to use energy efficient lighting & luminaire wherever it is not installed so far to distribute light uniformly on working plane to maintain eye comfort level & quality of work.

12).NECESSITY OF SOLAR POWER SYSTEM INSTALLATION IN CAMPUS-

As moved around in energy audit, there has been identified immense potential in campus to introduce solar power in total power mix. There is lot of useful roof top available in campus for installation of solar panel.

As college exists in tribal area, the almost non-availability of electrical power from MSEDCL is unfortunate & acute problem being faced by college for its various routine activity. College has to run DG set for standby source of power to meet its power requirement. Power generated from DG set is very costly & not affordable to use frequently. But college is dependent on it almost inevitably. In this situation solar electric power application is the

best & cheapest as well as green energy source of power & is most preferable. So it is advised to go for solar electric power route to terminate dependency of source of power. In view of this, as MSEDCL power is frequently interrupted, Off Grid Solar Power Model is recommended to adopt for college to meet its power requirement. Merits of systems are elaborated below.

1) **Generation & utilization of power will be irrespective of availability of MSEDCL power.**
2) **Only single connection of MSEDCL shall be had as standby source of power.**
3) **It is recommended to add inverter capacity in existing available capacity at single station. The batteries of inverter will recharge in day time & inverter capacity will work in night hours or if load demands power in day time it will feed to meet entire requirement of power.**
4) **Solar power is free & green power. So there is significant saving in cost & environment damage from pollution. However college has to invest initially more to install solar power system to harness solar power & convert in electricity.**
5) **The dependency on MSEDCL or DG set power source will be overcome.**

The installation of solar power generation has following benefits to college-

1) This is generating green power mitigating greenhouse gas emission for protection of environment as well as it is conserving conventional energy resources.
2) This mode of power generation saves energy cost for costly purchasing power from MSEDCL & overcome dependency on utility power supply.
3) This also helps to student as demonstrative model for studying to imbibe technical Knowledge.

13) LIST OF INSTRUMENT USED FOR MEASUREMENT IN ENERGY AUDIT

Sr No	Instrument Name
1	3- Phase Electric Power Analyzer
2	Lux Meter
3	Thermometer & Hygrometer
4	Measuring steel tape
5	IR Thermometer