7.1.6.001

No. 2/2019

Office of the Principal,
Brijlal Biyani Science College,
Amravati.
Date: 29.7.2019

To,

1. Dr. G.D. Agrahari,
Associate Professor,
Department of Electronics,

2. Dr. S.J. Ishwarkar
Associate Professor,
Department of Botany,

Subject: Green Audit & Energy Audit.

Dear Sir,

I am please to appoint following committee for carrying Green Audit & Energy Audit of the College Campus.

1. Dr. G.D. Agrahari - Convener

2. Dr. S.J. Ishwarkar - Member

Your are requested to identify the expert person and / or organization / Agency to carry Green Audit and Energy Audit alongwith the cost for the same.

Submit the report to the undersigned regarding the same after both audit's is over.

PRINCIPAL

Brijlal Biyani Science College Amravati

PRINCIPAL
Brijlal Biyani Science College,
Amravati.

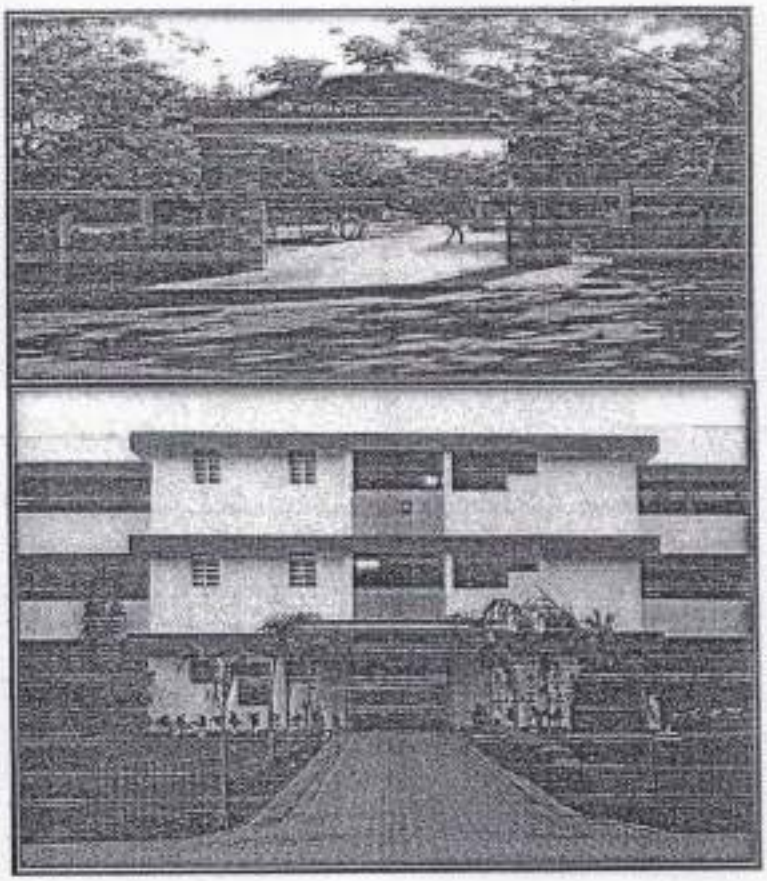
Dr. G.D. Agrawal

Brijlal Biyani Shiksha Samiti Amavati's

BRIJLAL BIYANI SCIENCE COLLEGE, AMRAVATI

GREEN AUDIT AND ENERGY AUDIT

AUGUST 2019



-Principal-

Dr D. S. Dhote

-Audit Team Members -

Mr Swapnil Thanekar, Ms Bhakti Thanekar, Mr Ashish Soni, Mr Masood Ahmed Raza, Ms S. Rokde

Brijlal Biyani Science College Amravati

PRINCIPAL
Brijlal Biyani Science College,
Amravati.

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Message from Principal



Brijlal Biyani Science College, Amravati has responsibility to become role model for society. We endeavor to set benchmarks for quality education; our Management envisioned itself with responsibility towards making this world a better place. We therefore took cognizance of the perilous topic of "Climate Change" and its impact on the human beings and the habitat. We have therefore integrated energy assessment and green audit. Our green campus team is consistently brainstormed to reduce the energy consumption by mitigating the losses/wastage, introduction of green energy etc. We understand completely that Global warming is fuelling the bulk mean temperature of our earth, causing rise in sea levels, catalyzing extreme weather conditions, acidic rains and an eminent catastrophe is in the making. The cascading effects of climate change are jeopardizing the livelihood of larger sections as food and water are becoming scarce.

We therefore decided to take up directed actions which are in-line with the United Nations Sustainability Development Goal, precisely UNSDG-13. We have contributed towards the development of new concepts, technologies, patents and various innovative ways to conserve energy. We are constantly taking action to align ourselves towards the UNFCCC's goal of limiting global temperature rise to well below 2°C and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.

We sought the help of Green Audit Team (Mr. Swapnil Thanekar, Mrs. Bhakti Thanekar and Mr. Ashish Soni) who played key role in this achievement. We have purchased carbon credits to offset our emissions. The "Additional Projects" which cause real, measurable and additional emission reductions certified by Designated Operational Entities and endorsed by GHG programs. We endeavor to set an example for our Peers so that they can also adopt sustainable practices.

Dr. Deepak Dhote
Principal

PRINCIPAL
Brijlal Biyani Science College,
Amravati.

Brijlal Biyani Science College Amravati

Acknowledgement

Green Audit Assessment Team thanks the management of Brijlal Biyani Science College, Amravati for assigning this important work of Green Audit. We appreciate the cooperation of our Team for completion of study. Our special thanks to:

1. President and Executive Committee Shri Brijlal Biyani Shiksha Samiti, Amravati-

Mr. Ashok Tulsidasji Rathi, Adv.	President
Mr. Omprakash Shrinivasji Laddha	Vice-President
Mr. Deodatta Ramnarayanji Sharma	Vice-President
Mr. Rajendrakumar Harnarayanji Nawandar	Secretary
Mr. Sunilkumar Jugalkishorji Goyenka	Joint Secretary
Mr. Vinodkumar Bhawarilalji Samra	Treasurer
Mr. Prakalpa Murlidharji Rathi	Executive Member
Mr. Rajesh Prakashchandraji Rathi, Adv.	Executive Member
Mr. Ashok Jagdishprasadji Agrawal	Executive Member
Mr. Sunil Rambilasji Laddha	Executive Member
Mr. Vijaykumar Narayandasji Karwa	Executive Member
Mr. Sanjaykumar Ashokkumarji Kakraniya	Executive Member
Mr. Deepak Vijaykumarji Kasat	Executive Member

Mr. Adityaraj Rajendrakumarji Goglani	Executive Member
Mr. Prashant Ghanshyamdasji Agrawal	Executive Member
Mr. Omprakash Ramratanji Nawandar	Executive Member
Mr. Prashant Thakurdasji Rathi	Executive Member

2. All the members of College Development Committee, Brijlal Biyani Science College, Amravati.

3. Green Audit Committee

4. Principal - Dr. Deepak Dhote

5. IQAC Coordinator – Dr. A. D. Rangari

6. Faculty Member – Dr. G.D. Agrahari, Dr. S.J. Ishwarkar, Dr. S.R. Katke

Team of colleagues as stated under Annexure-I

For giving us necessary inputs to carry out this very vital exercise of Green Audit. We are also thankful to other staff members who were actively involved while collecting the data and conducting field measurements.

Profile of Audit Team Members and Independent Reviewers

Mr. Swapnil Thanekar Certified Energy Auditor, M.Tech (Heat & Power Engineering), Expert Global Reporting Initiative
Ms. Bhakti Thanekar Certified Energy Auditor, B.Tech (Chemical Engineering), Principal Consultant - Energy and Safety
Mr. Ashish Soni, Diploma Graduate with 16 years' experience in electrical systems
Mr . Masood Ahmed Raza Mechanical Engineer, Assessment Team Member
Ms. S.Rokde, **Independent Reviewer** Astt. Professor, Deptt. of Mathematics

DISCLAIMER

Green Audit Team has prepared this report for *Brijlal Biyani Science College, Amravati* based on input data submitted by the representatives of College and after having complemented with the best judgment capacity of the expert team.

While all reasonable care has been taken in its preparation, details contained in this report have been compiled in good faith based on information gathered.

It is further informed that the calculations are arrived following best estimates and no representation, warranty or undertaking, express or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report.

Prepared by: (Bhakti Thanekar)

Technical Review by: (Swapnil Thanekar)

Scope of Work

Topics to be covered as part of the assessment are

✓ Solar Passive Architecture

- How the buildings are constructed to utilize the solar energy efficiently. This includes use of day light as lighting source and avoidance of GHG intensive technology example AC as source of cooling due to solar heat gains.

✓ Implementation of measures to reduce wastage of energy

- This includes effective and objective evidences to create awareness towards wastage of electric energy. Hoardings, placards, messages, posters etc planted at key locations in college, hostels and cafeterias. PCRA (Petroleum Conservation Research Association, Govt of India) and BEE (Bureau of Energy Efficiency) posters are exhibited.
- It can also be extended to include papers presented by the students on avoidance of electricity at college or day to day life.
- Appointment of joint committees of teachers and students to save electricity
- Controlling of Power Factor by installation of APFC and getting rebate (up to 5% or MSEDCL norms) from MSEDCL for maintaining unity Power factor

✓ Energy Efficient Procurement

- This includes evaluation of energy efficient procurement practices. This does not exactly mean that you need to buy the most efficient, but you need to buy the most efficient which is financially viable. Example AC with efficiency star ratings, Transformer etc.
- Replacement of lighting sources to CFL or LED
- Replacement of Copper Ballast with Electronic Ballast
- Centralized controls of lighting, auditorium etc. to avoid any mis-use of electricity
- Procurement of LED monitors to phase-out CRT Monitors
- Shift to paperless regime wherever not required, example attendance muster replaced by biometrics, DG logbook replaced by computerized logbook, daily reports converted from paper to paperless, HoD meetings converted to paperless formats, and all such examples
- Installation of Solar panels, Power Purchase Agreements with Solar Power Plant owners to buy Environmentally friendly energy Source etc
- Documentary evidences as feasible to calculate the above impacts and finally into the value of value of avoidance of tCO_2 emitted to atmosphere.

✓ Rain Water Harvesting

This includes Calculation of Catchment Area (Terrace and ground) and evaluating rough amount of water that is recharged into the water recharge pits if applicable.

✓ Hazardous Waste Management and e-Waste Management

There are various wastes that are generated within the organization. The report will give the list of the procedures for waste handling.

✓ Duration of the Green Audit

The Green audit field observations data collection was carried from 29th July to 30th July 2019 for the session 2018-19. The submitted data was monitored by the college throughout the year and assessed by Assessment Team during the visit.

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Abbreviations

AHU	Air Handling Unit
CFL	Compact Fluorescent Lamp
COP	Coefficient Of Performance
DG	Diesel Generator
ECRM	Energy Consumption Reduction Method .
HVAC	Heating, Ventilation, And Air Conditioning
ISO	International StandardisationOrganisation
ITHD	Current Voltage Total Harmonic Distortion
Km	Kilometer
kV	kilo Volt
kW	kilo Watts
Lab	Laboratory
LED	Light-Emitting Diode
MNRE	Ministry of New and Renewable Energy
MSEDCL	Maharashtra State Electricity Distribution Co. Ltd.
TR	Tons of Refrigeration
VTHD	Voltage Total Harmonic Distortion

Reference list of Websites

Sr. No.	Websites
1	IEEE 519 - http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=2227
2	http://mnre.gov.in/solar-energy/ch2.pdf
3	BEE - http://www.beeindia.in/
4	ECBC - http://beeindia.in/content.php?page=schemes/schemes.php?id=3
5	http://www.energymanagertraining.com/new_index.php
6	http://www.usailighting.com/stuff/contentmgr/files/1/92ffeb328de0f4878257999e7d46d6e4/misc/lighting_comparison_chart.pdf
7	https://www.bijlibachao.com/lights/use-energy-efficient-lights.html
8	http://www.imd.gov.in/section/climate/climateimp.pdf
9	http://www.bijlibachao.com/air-conditioners/air-conditioner-selection-understand-tonnage-ser-cop-and-star-rating.html
10	http://www.thehindubusinessline.com/opinion/time-to-focus-on-more-crop-per-drop/article9776971.ece
11	http://cgwb.gov.in/district_profile/maha-ashtra/nashik.pdf
12	http://www.indiawaterportal.org/sites/indiawaterportal.org/files/Roof%20Top%20Rainwater%20Harvesting_Presentation_2006.pdf
13	http://www.imd.gov.in/section/climate/climateimp.pdf
14	https://vcsregistry2.apx.com/myModule/rpt/myrpt.asp?r=206&h=18325
15	http://www.cea.nic.in/tpeandce.html
16	http://cdm.unfccc.int/
17	http://database.v-c-s.org/
18	http://bbscamt.com/
19	http://www.cea.nic.in/tpeandce.html
20	https://timesofindia.indiatimes.com/india/power-ministry-may-make-24-degree-celsius-as-default-setting-for-air-conditioners/articleshow/64701707.cms

Introduction of the Institute[1]

Shri Brijlal Biyani Shiksha Samiti has been founded in the year 1969 in cherished memory of Vidarbha Kesari Late Brijlalji Biyani, the great political and social awakener of Vidarbha. His services in the field of Art, Literature and Education were also great and outstanding.

This Shiksha Samiti, to commemorate his memory, was registered under the Societies Registration Act and the Bombay Public Trust Act also. The society is at present, running a full-fledged Science College with Postgraduate (Botany & Electronics) Degree courses, Bachelor of Science, Bachelor of Business Administration, Bachelor of Computer Application, Bachelor of Commerce and Junior College classes. The College has today become one of the premier institutions of the town. On account of the teamwork of highly qualified and devoted lecturers, well equipped laboratories, libraries and scientifically planned periodical internal assessment system and extra special coaching scheme, the performance of this College during last years has shown remarkable progress and won lures in academic field.

The institution aims at giving their students a sound education which while training them for academic career, will also make self-reliant, keen cooperative and incorruptible citizens.

* MSc. maths, msc chemistry msc comp to be added

[1]Reference: http://bbscamt.com/ and College Management

Objective of Green Audit

The Green Audit Team focused on Material[2] issues pertaining to college which have the highest influence on the Green Attributes of the College. To evaluate steps taken by college management towards green campus below material issues are discussed chapter wise:

1. Organization Level Efforts
2. Creation of Awareness
3. Lighting
4. Cooling and Ventilation
5. Operation of Electronic Equipments
6. Water Management
7. Water Quality
8. Renewable Energy
9. Transportation
10. Purchasing Practices
11. Energy Assessment and Carbon Footprint
12. Waste Management
13. Plantation Details

Checklist approach is adopted for transparent evaluation of the topics and increase readability for independent reader.

[2] Definition: as per Global Reporting Initiative GRI 101: FOUNDATION2016
An organization is faced with a wide range of topics on which it can report. Relevant topics, which potentially merit inclusion in the report, are those that can reasonably be considered important for reflecting the organization's economic, environmental, and social impacts, or influencing the decisions of stakeholders. In this context, 'impact' refers to the effect an organization has on the economy, the environment, and/or society (positive or negative). A topic can be relevant – and so potentially material – based on only one of these dimensions.

1. Organizational Level Efforts

Is the college having campus green team?	Yes, the Green Campus Committee will be uploaded on the college website: http://bbscgmt.com/
If yes, who are the stakeholders?	The below stakeholders are reconfirmed during the surveillance audit. The stakeholders include o Administration o Teaching Faculty o Students o Facility manager (from Accounts Department) o Canteen manager o Volunteers However, Green Campus Team is shared with the Audit Team. Refer Annexure III.
Does it meet regularly?	Based on the review of submitted records, it is confirmed that the Team meets once in a semester.
Can the Green Campus Team suggest new environmental initiatives to College Management?	Suggestions of improvement of environmental performance are always welcomed by Management. Installation of evaporative cooling, faucets to reduce the water wastage in wash basins, discussion on the carbon neutrality of college, water management were prominent topics of discussion.
Have you established an environmental mission/vision for your campus?	The Environmental mission/ vision is integrated part of the philosophy of Management of College. The Green Campus Committee is driven by the visionary thoughts of the Honorable Principal. He is persistent and resolved to make the campus eco-friendlier. Already implementation of solar panels, application of efficient technologies to save energy is implemented. Measures to implement the scope of improvements are also assessed in the relevant chapters of this report.
Is the college encouraging sustainable behaviour via: o education campaigns? o Posters, placards, messages o incentives? o contests? o awards?	College conducts various activities to create awareness amongst the students and society on environment safety and protection. Tree plantation was carried out in college premises and university campus with active participation of students, faculties and management. Biyani Forest Club took the initiative under the guidance of Dr. S. R. Katke to prepare a nursery in the college itself. The small saplings which grew below the old neem trees were collected. The plastic bags were collected and in them saplings were planted. The teaching staff, non-teaching staff and students contributed to collect the polythene bags thus reducing the plastic waste disposed. The forest club filled the plastic bags with soil and planted small saplings in them. The forest club wishes to achieve the target of 500 samplings so that they can nurse them and provide them during the coming year for plantation.

Seed Bank was formed at college and students of B.Sc II and III (Biology group) were entrusted the assignment of collecting seeds of various fruits and plants during the summer vacation. Seed collection was also explained to the local students of Uttamnagar and in turn they also contributed to the Seed Bank. Seeds of mango, jamun, neem, arjun, palas , karanj, karwand, sitafal, dates, dharoli, babool, biba ,fanas were collected.

Brijlal Biyani Science College, Amravati's Biyani Forest Club in continuation with the earlier seed ball preparation workshop arranged seed sowing activity on 20/07/19. Lt. Dr. S. R. Kolke, HOD, Zoology arranged the visit to Wadali forest land, forest plantation section no.2 area for sowing of seed balls. Forester Mr. Fartode guided students for the planed seed ball sowing so that maximum germination is assured. Seed balls of mango, jamun, arjun, neem and sitafal were sowed in protected area of the forest. 25 - 50 students were participated in the activity.

Department of Zoology extended its services to the Women of Self Help Group in guiding them to compost the kitchen and garden waste by using the earthworm i.e. vermicomposting thus reducing the waste disposal. The women of SHG participated very keenly and assured to assort the waste and convert kitchen and garden waste into vermicompost.

No vehicle day was observed in the college. Blood Donation camps were arranged on 16/01/2019 in the college. Various activities were carried out under NSS scheme which includes Cleanliness drives, tree plantation. College has observed clean week from 01 august to 15 august in 2018. Around 150 students participated in this.

Please refer Annexure IV and XIV for details.

Our college alumni Mr. Prafulla Vadaskar in Collaboration with Brijlal Biyani Science College, Amravati developed the SMART-SWITCH technology which is very useful as far as power crisis & power conservation is concerned. He under the guidance of Principal Dr. D.S. Dhote designed & developed this technology named as SL-BUS technology system & also submitted Ph.D. thesis to the University on the topic "DESIGN & DEVELOPMENT of SMART EMBEDDED CONTROL SYSTEM FOR POWER CONSERVATION" in the month of July-2019.

Mr. Prafulla Vadaskar has also setup START-UP named as VADACTRO i.e. Vidarbha Advanced Computer Technology & Research Organization & Started the manufacturing & business of smart living which is right now internationally recognized. Also with the help of this technology College is going to adopt smart switch systems with a novel concept "One College One Switch."

Is the college staff modelling sustainable behaviour for students, peers, and community?	It is confirmed that the below good practices 'as observed during the last Assessment' are still practiced. • The Staff of the college utilize the private vehicles for commuting. • The HoD's are car pulling. • Please refer above assessments for additional details.
Do students model sustainable behaviour for staff, peers, and community?	It is confirmed that the below good practices 'as observed during the last Assessment' are still practiced • The students of the college utilize the state transport for commuting.
Is the college sharing learning internally via: oPosters, placards, messages? o assemblies? o classroom presentations? o training/professional development? o posters/bulletin boards? o newsletter? o website?	Data is shared via posters, placards and messages. The topics include minimization of energy usage by avoiding wastage, improvements on energy efficiency, minimization of water wastages, proper disposal of wastes. Please refer Annexure XIV for details. In addition, College is interacting with the Students, Teachers and Society. Please refer above assessments pertaining to sharing of learning's.
Does the college offer energy conservation lessons?	It is confirmed based on the review of various publications and interaction with students and college faculties.
Is the college sharing its learning externally via o Paper presentations? o newsletter? o website?	The students are encouraged to present projects on topic related to environmental aspects. The college is also sharing the Green Audit Report to its peers (upon request) so that learning's of college are shared.

Scope of Improvement :

At organization level, the college needs to Establish long term improvement objectives to further reduce energy consumption and water consumption and reflect the same in form of dedicated Environment Policy.

Conclusion:

- **Active involvement of Organization is observed.**
- **Adequate awareness amongst the students and other stakeholders (faculty, other staffs, service providers, etc.) is observed and reflected from their behavior.**
- **Responsible Step taken by offsetting Green Gases by purchase of credits**

2. Creation of Awareness

Are there posters/guidance displayed to remind students and staff of good practices?	Yes.
Are the students aware of energy sources?	The major source of energy is electricity followed by usage of LPG in canteen, lab and hostel. Students are aware of these sources of energy which are utilized by the college.
Is college tracking its electrical energy usage?	There are dedicated meters (for college, library and hostel) which measures the electricity imported by the college. The reading of annual electricity consumptions are included as part of this report under chapter 11.
Is college offering energy conservation lessons and programs?	• College has created awareness among the faculty and students to reduce energy wastage. • The college has appropriately disabled the screen savers and programmed the computers for sleep mode operations. Please refer Annexure VI and VII for details.
Do students and staff know where their water comes from?	The main sources of water are borewell water. Borewell water is utilized for drinking, wash rooms and cleaning.
Is college encouraging responsible water use via: o posters, placards? o incentives? o contests? o awards?	Yes, by posters, placards, contests and awards to winner of contest.
How is trash managed outside the campus?	The canteen waste is sent to Municipal Corporation disposal site. **Recommendation:** Please refer chapter 12 for details on recommendations of waste management
Conclusion: • Visible communication on environmental issues. • Effective use of notice boards and signs.	
Recommendation: • The usage policy of photocopiers, fax machines and other equipment users is "POWER ON" when in use and "POWER OFF" when not in use. There is no idle power consumption. • Please refer chapter 12 for details on recommendations of waste management	

3. Lighting

Is college utilizing any incandescent lights? Can they be replaced with compact fluorescents (energy saving bulbs)?	The college timings are from 8 am to 5 PM. Thus, requirement of daytime lighting is limited. Energy efficient lighting system is followed. The contemporary best practices with recommendations on lighting by Bureau of Energy Efficiency, Book-3, Chapter 8, table 8.1

Table 8.1 Luminous Performance Characteristics of Commonly Used Lamps

Type of Lamp	Lumens / Watt		Colour Rendering Index	Typical Application
	Range	Avg.		
Incandescent	8-18	14	Excellent (100)	Homes, restaurants, general lighting, emergency lighting
Fluorescent lamps	46-60	50	Good w.r.t. cooling (60-77)	Offices, shops, hospitals, homes
Compact fluorescent lamps (CFL)	40-70	60	Very good (85)	Hotels, shops, homes, offices
High pressure mercury (HPMV)	44-57	50	Fair (45)	General lighting in factories, garages, car parking, flood lighting
LED lamps	30-50	40	Good (70)	Reading lights, desk lamps, night lights, spotlights, security lights, signage lighting, etc.

The term reading light[3] normally refers to lamps or lights which focus light dedicated for readings, thus LEDs were not considered for class room lightings. Fluorescent lamps were utilized for class rooms (as the same are stated to be suitable for office illumination level requirements).LEDs are installed in Principal Office, Administrative Office, Chemistry Lab, Computer Lab, Botany Lab, Zoology Lab, Mathematics Lab, Physics Lab, Staff room and Electronics lab as a measure towards energy conservation during this year. LED lighting survey was also undertaken by the Audit Team. Please refer below assessments in details.

During the onsite visit the Audit Team visited each department and physically counted the installed lights by their types (Fluorescent tube lamp, CFL and LED). It is confirmed that there is no incandescent light installed for lighting purpose.

As per the published article: http://www.usailighting.com/stuff/contentmgr/files/1/92ffeb328de0f4878257999e7d46d6e4/misc/lighting_comparison_chart.pdf

LED light has lumen/ watt in the range of 80-100 whereas CFL has lumen/ watt in the range of 70-90

[3]https://www.collinsdictionary.com/dictionary/english/reading-light

	Recommendation: *As per the replacement policy the college should install LED lights in the class rooms in place of conventional tube lights. The CFL lamps[4] should be replaced by the LED lamps.*
Has the college evaluated existing lighting for opportunities to reduce lighting in over-lit areas?	The lighting arrangements are well balanced with arrangements to switch ON and OFF lights independently. There are therefore practically no over lit areas.
Are the light switched duly labelled to make more obvious which switches relate to which appliances?	Switch arrangements are lucid. The fan switches are adjacent to fan speed regulators. Light switches are arranged in order of lighting.
Are the lights switched off to make use of daylight? (e.g. lights parallel to windows or in corridors)	There is minimum or practically negligible use of lights during day time as the building structure has possibility of daylight usage.
Is the college utilizing natural lighting when possible?	Yes, natural lighting is first preference.
For the spaces like store rooms, toilets, kitchen areas, copying rooms, corridors etc is there scope for automatic lighting controls?	The policy of college is to switch off the lights and other electrical equipment when they are not in use. The appropriate usage of the resources and control on its avoidance is one of core responsibilities of the respective HoD. Since, the culture of useful gain is practiced over the years, there is a responsible and natural tendency amongst staff and students to avoid wastage. Every Lab in-charge is responsible for the lab electrical utilities, every faculty including the HoD is responsible for switching off the un-necessary lightings and AC in his / her cabin.
Can main lighting ever be switched off and dedicated lighting be used?	As such there are no dedicated lamps which can replace overhead lighting. However, redundant lighting can be switched off when it is not required. Lights above desk can be operated and other overheads lights can be switched off.
Are the light fittings clean?	Cleanliness is well maintained. In-house light fittings are cleaned regularly. The light fitting in the veranda needs cleaning. The College team clarified that the excess dust due to the metro construction has caused the dusting of the light fitting and same will be attended soon.
Do windows and skylights need cleaning to allow in more natural light?	The window and skylight are clean. Cleaning is with utmost care and regular cleaning schedules were observed by the Audit Team during the course of Audit.
Has the college installed lighting occupancy sensors?	No, lights are negligibly operated during day time. The lights are operated manually.
Is there mechanism in place to immediately report inoperable occupancy light sensors?	NA as no light sensor is installed.

[4] The CFL lamps have problem as they contain mercury. Mercury is very toxic to human health and the environment.

What is the % contribution of the LED lighting?	The value is determined and presented under Annexure V.

Further Scope of Improvement:

As per the replacement policy the college should install LED lights in the class rooms in place of conventional tube lights. The CFL lamps[5] should be replaced by the LED lamps.

A dedicated stabilizer can be installed and the lighting load can be transferred. With the help of voltage regulation, further energy savings are possible from the fluorescent lamps. Please refer below table which provides impact of energy savings from voltage regulations (reference Bureau of Energy Efficiency, Book 3, Chapter 8).

Particular	10 % lower Voltage	10% higher voltage
Fluorescent Lamp Light Output	Decreases by 9%	Increases by 8 %
Fluorescent Lamp power consumption	Decreases by 15 %	Increases by 8.1 %

Conclusion:

- **During this Assessment it is verified and is confirmed that Brijlal Biyani Science College, Amravati is excellent with respect to the usage of day lighting. Sufficient lux levels close to 200 are common on the work-stations and classes. Survey was undertaken with students and employees with respect to lighting efficacy and no complain was identified within respect to the sufficiency of lighting measures.**
- **Minimal lighting load is observed during day time as college makes good use of daylight.**
- **Replacement policy to further improve lighting efficiency (as stated above) is implemented.**

[5] The CFL lamps have problem as they contain mercury. Mercury is very toxic to human health and the environment.

4. Cooling and Ventilation

How are the Air Conditioning Controls? For the local controls, how it is ensured that AC is working only ON when necessary. What is temperature setting of the AC?	The AC usage is very high as the temperature in Amravati is comparatively higher (Max temperature is above 42°C[6] hottest day in Amravati was registered with temperature of 47°[7].
What is the mechanism of reducing heat in-grace? Are the closing blinds or fitting reflective film to windows installed to reduce solar gain?	The building is designed to make best use of day light and avoid the heat in-grace. Blinds are available to control unnecessary heat in-grace. In addition, it is confirmed that there is no unnecessary operation of the equipment which add up the heat.
Are all external doors and windows closed when air conditioning is on?	Based on interviews, it is confirmed that this practice is maintained.
Is there a scenario where air conditioning is wasted in unused spaces, such as cupboards, corridors?	There are no such instances observed. Arrangements are duly implemented to avoid losses.
Are Efficient and energy labelled AC's utilized for cooling purposes?	Following the sustainability practices, the college has procured 03 number of ACs which have 5 star ratings by Bureau of Energy Efficiency. These AC run for average 3-4 hours in the summer and rainy season. • The newly installed 03 number of ACs are 5 star rated installed one in botany lab and two in computer lab. These AC's run for 4-5 hours during summer and rainy season. • 01 number of old AC without rating is installed in the Principal's Office and it runs for 6 hours. • 01 number of AC without rating is installed in microbiology lab and it runs for 3 hours • 05 number of AC without rating are installed in computer lab **Recommendation:** ***As evaporative cooling is proved technology in and allows high number of air changes, it is recommended to replace the existing***

[6]https://www.accuweather.com/en/in/amravati/189309/may-weather/189309
[7]https://www.accuweather.com/en/in/amravati/189309/may-weather/189309

	underrated AC's by evaporative cooling. This will reduce 60-80 % electricity consumption. *The AC temperature should set above 24°C which is consistent with the guidelines of Ministry of Power[8] for HVAC applications.* Still, is scope for the use of evaporative based cooling which is energy effective compared to the reversed Bryan cycle i.e. Vapor Compression Cycle. The basic reason for the same installed system has COP of 1.5 kW/TR of refrigeration compared to evaporative cycle which draws 0.3-0.5 kW based on the size of installation.

Recommendation

- ✓ **College must replace the existing old AC's in the college. AC in the Principal's cabin needs to be replaced on priority.**
- ✓ **The AC temperature should set above 24 °C which is consistent with the guidelines of Ministry of Power[9] for HVAC applications.**
- ✓ **As evaporative cooling is proved technology in and allows high number of air changes, it is recommended to replace the existing underrated AC's by evaporative cooling. This will reduce 60-80 % electricity consumption.**

Conclusion:

- **PROCUREMENT[10] and installation of 5 and 3 STAR AC is observed as one of energy conservation measure. The selection of AC follows the publicly traceable selection methodology which is mix of feasibility and performance.**
- **Majority of AC's are not rated. Recommendation is already raised. Please refer the same.**

[8]https://timesofindia.indiatimes.com/india/power-ministry-may-make-24-degree-celsius-as-default-setting-for-air-conditioners/articleshow/64701707.cms
[9]https://timesofindia.indiatimes.com/india/power-ministry-may-make-24-degree-celsius-as-default-setting-for-air-conditioners/articleshow/64701707.cms
[10]http://www.bijlibachao.com/air-conditioners/air-conditioner-selection-understand-tonnage-eer-cop-and-star-rating.html

5. Operation of Electronic Equipment

Are computers, printers, photocopiers and other equipment switched off at the end of the day?	Yes
Is there any mechanism by which the screens and other equipment be controlled during the day?	The college has appropriately disabled the screen savers and programmed the computers for sleep mode operations. Please refer to Annexure VI.
Are the screen savers disabled?	Yes please refer above assessment.
Are computers programmed to 'power down' mode?	Computers are programmed for the sleep operation.
Is the user entrusted with the rights to modify standby settings? (e.g. TVs, LCD projectors, printers etc.)	No, the college has the administrative rights. Such changes cannot be initiated by users.
What is status of the photocopiers, fax machines and other equipment? Are they programmed on 'Energy Saver' mode during the day?	**Recommendation:** • **The usage policy of photocopiers, fax machines and other equipment users is "POWER ON" when in use and "POWER OFF" when not in use. There is no idle power consumption.**
Are the power management settings enabled on all the computers/ monitors/ all-in-one machines?	All machines are governed by the college. All are equipped by power management settings as already described above.
Recommendation: • **The usage policy of photocopiers, fax machines and other equipment users is "POWER ON" when in use and "POWER OFF" when not in use. There is no idle power consumption.**	

6. Water Management

Are any water leaks identified?	The urinals are flushed periodically and manually. Simple taps are installed during 2018-19. The urinals are equipped with push button taps. Please refer below recommendation.
Are taps left running? Are there any dripping taps? Do taps need maintenance?	No such instance was observed.
Are push button taps utilized?	*The toilet washrooms are equipped with the push buttons.*
Is water escaping from overflows either inside or outside buildings?	No such instance was identified during onsite audit.
Has the college installed low-flow faucets, automatic faucets, and/or faucet aerators?	**Recommendation:** **College can install the low-flow faucets, automatic faucets, and/or faucet aerators.**
Has the college installed low-flow shower heads at Hostel?	Please refer above recommendation.
Has the college collected rainwater for onsite watering needs?	**Recommendation** **College is utilising the groundwater for drinking, washroom and cleaning, However, there is no rainwater harvesting system installed. The college is in process of installing the rainwater harvesting system to utilize the rainwater harvesting potential. The actual quantity of harvested water will be reported in next annual assessment.**
Is the college collecting the condensation from A/C units for onsite watering needs?	No. It is advised to collect the condensed water from A/C units.
Has the college optimized its irrigation system for gardening to: o operate at night or early morning hours to minimize evaporation? o water the minimum time and frequency necessary for the applicable vegetation?	As per the latest publication from "The Hindu" drip irrigation is one of the most important measures to achieve "more crop per drop". Share of Agriculture consumption is approximately 83 per cent of India's water resources, thus approximately 17 per cent water resources are available for domestic and industrial use (https://www.thehindubusinessline.com/opinion/time-to-focus-on-more-crop-per-drop/article9778971.ece). The Assessment Team noted that college is utilizing the RO reject water for watering nearby plants. For rest of gardening area of college. It is noted that there is no drip or sprinkler system implemented by college, however the plants are watered by mug

	and bucket by dedicated resource.
What is amount of rain water harvested?	No rain water harvesting system is installed. Recommendation is already issued. The college administration needs to expedite the installation of water harvesting system and recharge the ground water table.
Are there any community-based projects implemented by the college?	• Awareness programme on vermiculture was undertaken for community. • Compost manure (though in small quantity) is also given to needy free of cost or utilized in house. • Cleanliness drives under "Swatch Bharat" is undertaken by college NSS unit. • Blood donation camps are organized by college
Recommendation: • **The college Management needs to consider the low-flow faucets, automatic faucets, and/or faucet aerators as the replacement for the existing conventional taps.** • **College needs to install the metering arrangement to measure the water drawn from bore well.** • **College needs to install meters to measure the water drawn from the borewell.**	
Conclusion: • **The toilet washrooms are equipped with the push buttons.** • **Practically efficient measures are implemented for gardening.** • **RO reject water is supplied to plants.** • **College installed rainwater harvesting**	

7. Water Quality

Is the college campus maintained clean to minimize litter polluting water table?	The college premise is kept clean. Thus the chances of litter polluting water table are negligible. However, please refer below "Scope for Improvement". **Scope for Improvement:** The disposal of chemicals from the chemical lab should be captured in a dedicated pit (isolated from ground) and further steps of handling chemicals should follow best practices.
Is the college monitoring drinking water quality regularly? If yes, what is the frequency?	The Chemical Lab is undertaking water testing. In case of any deviant parameters are observed, the water will be tested in a third-party laboratory. Water Quality Test are included as part of Annexure VII to this Report.

	Recommendation: College should appoint independent third party for drinking water testing at least once in a semester.

Recommendation:

College should appoint independent third party for drinking water testing at least once in a semester.

Conclusion:

The students, staff members and guests have access to clean, safe and potable water.

8. Renewable Energy

Is the college having solar, wind, or other forms of renewable energy?	College Management has introduced solar PV generation. The share of renewable energy comes to 11.53 %[1]. Of electrical energy.
Is the college purchasing renewable power from third party or renewable energy certificates for its electricity use?	Only Grid electricity is purchased. This is verified from the submitted bills.
Is the college offering renewable energy lessons / programs?	Yes. Students are also encouraged to present papers and make assignments of renewable energy.

Conclusion:

The contribution of the renewable energy needs to be improved from the present value of 11.53%. College Management needs to develop long term action plan in this regard.

It is noted that emissions offset are purchased to compensate GHG emissions.

9. Transportation

Is the college providing eco-friendly or less GHG intensive transportation matching services? (Example carpools, college buses etc)	The Staff and students of the college utilize the public transport (State transport) for commuting. The HoD's are car pulling.
What are the good practices pertaining to Transport?	There is no college owned or contracted transport. The students utilize state transport and cycle as means of commutation. The use of cycle is encouraged as parking lot allows only parking of cycles. No fossil fuel based vehicle are allowed other than staff members who are using two wheelers as mode of transport

[1] = {58,806 (college electricity) + 21,759 (hostel) + 8,060 (library)}/(11,762) solar energy
= 11.53 %

Conclusion:

The college management, its employees and the students observe good practices of transportation/ commutation.

10. Purchasing Practices

Describe the purchasing that confirms the better environmental performance?	Lastly the college has purchased the ACs with 5-starlabelling. Printers with duplex printing facility is installed at the office. There is culture of the two sided printing. Paper is not wasted.
How does the college limit the purchase of single-serve bottles and containers?	The college has RO system; guests are served with water from RO system. Single serve bottles are not utilized unless requested by the guest.
Is the college having water fountains/stations to promote easy filling of reusable water bottles?	Yes, the water dispensers are connected to output of RO system. Clean and potable water is available to staff, student and guests.

Conclusion:

The GHG intensive technologies are well managed.

Focus on the replacement of lighting as per above stated recommendation needs to be considered

Focus of the recommendation pertaining to the replacement of AC with evaporative cooling needs to be considered.

One sided paper is utilized by college to avoid use of fresh papers

Policy for the disposal of Archived paper Records needs to be formed by college

7.1.6.029

11. Energy Assessment and Carbon Footprint

Has the college undertaken energy audit?	Yes, the energy audit was undertaken and electrical measurements were undertaken at the college. Please refer the Annexure –XVII of this report. Energy audit is an effective tool in identifying and perusing a comprehensive energy management program. Energy Audit highlights the areas of energy savings, thereby reducing the energy costs. The following are the major consumers of electricity in the facility ✓ Computers ✓ Lighting ✓ Air-Conditioning ✓ Fans ✓ Pumps ✓ Other Lab Equipment
What are the steps undertaken during the energy audit?	The Assessment Team undertook the analysis of the college premise: ✓ To study electricity bills ✓ Study of lighting system and its measurement. ✓ Air conditioner ✓ Study of loads in particular at the IT labs ✓ Usage of Renewable energy systems ✓ Identification of energy saving opportunity and energy conservation.
What methodology was adopted?	The energy assessment involved desk review and onsite measurements. Review of energy bill received from MSEDCL was undertaken. Review of lighting, HVAC, fuel usage, pumping systems etc. was undertaken. Energy conservation and saving opportunities are identified and included below.
What are the suggested energy conservation measures?	Below energy conservation measures are suggested ✓ The one switch for college concept should be implemented in the college. This will avoid unwanted operation and wastage of electricity. ✓ There are 40 W tube lights with copper chokes. As per replacement policy the LED tube-light should be installed. The T8 LED tube has wattage of 16 W, thus the energy saved is 40-16 = 24 watt. As per study there are 243 tubes of 40 W in college, library and hostel. After the replacement based on failure the energy savings will be approximately 20000 kWh. With average electricity cost of INR 6/kWh, the annual savings will be approximately INR 1,20,000 per year. ✓ Air conditioner shall be operated between temperature range of 24-28°C to maintain lower cooling load on compressor to save energy. ✓ The existing non-star labelled AC's should be replaced by the 3-star(daily usage of 2-4 hour) or 5-star AC's (daily usage above 4 hours). The energy savings will

7.1.6.030

	be approximately (7500[12] X 8[13]) /2[14] = 30000 INR per year. ✓ Application of evaporative cooling should be promoted in place of AC's. The basic reason for the same installed system has COP of 1.5 kW/TR of refrigeration compared to evaporative cycle which draws 0.3-0.5 kW based on the size of installation. If even the 5 non labelled AC are replaced, then the savings will be (1-0.5)*300 days*4 hours per day*5 (number of AC)= 3000 kWh. With cost of INR 6/kWh, the savings will be INR 18,000 per year. ✓ Solar energy application is recommended for battery charging of UPS. Solar panels can be installed on the remaining terrace area. ✓ All Class Rooms and labs must sensitize students regarding optimum use of electrical appliances in the room like, lights, fans, computers ✓ During onsite audit, it is observed that most of the tube lights in a class room are kept ON, even though, there is sufficient light level near the window opening. In such cases, the light row near the window may be kept OFF. ✓ There is no policy on the use and operation of electronic Equipments. ✓ All computers to have power saving settings to turn off monitors and hard discs, say after 10 minutes/30 minutes. The electronic equipment like copy machines must be operated in ON/ OFF mode. ✓ The comfort air conditioning temperature to be set between 24°C to 26°C. ✓ Lights in toilet area may be kept OFF during day time
Has the college calculated its carbon footprint?	The college has calculated the carbon footprint. The data applicable to Scope-2 emission (electricity purchase from grid) is available.
How is college promoting zero emission transportation options?	Not applicable. There is no internal transportation within the college.
What are special energy saving measures undertaken?	✓ Printers are shared, ✓ Renewable energy is utilized, ✓ LED lights are installed ✓ New procurement includes 5-star AC's ✓ Installation of electronic fan regulators ✓ Installation of submersible pumps
Are all the applicable emission sources calculated?	The emission source pertaining to grid based electricity source is calculated. Scope-01 emission source data pertaining to LPG consumption are calculated, for Scope-02 electricity bills are considered **Scope-01 Emissions:**

[12]Conservatively accounting savings for 1 ton. https://www.mylloyd.com/customer-service/ac-energy-saving-chart

[13]Non labelled AC

[14]Considering conservatively average 4 hours a day operation

LPG Consumption in Chemistry Lab	LPG consumption in Girls Hostel and Generator
Kg	kg
2800	57

Equivalent Scope-01 Emissions are as below:

Thus, Scope 01 emissions are 9.45/0.9 = 11 tCO_2

Scope -2 Emissions are tabulated as follows:

Month	Main building	Hostel meter	Library meter
	kWh	kWh	kWh
Apr-18	2915	1789	653
May-18	0	0	0
Jun-18	956	296	239
Jul-18	3908	1617	672
Aug-18	4079	1907	694
Sep-18	3435	1482	690
Oct-18	4653	521	189
Nov-18	891	2152	748
Dec-18	2531	1182	434
Jan-19	2767	1149	472
Feb-19	3869	1569	502
Mar-19	3048	1249	367
Total (kWh)	**33052**	**14913**	**5660**
Grid Emission Factor as per CEA Version 14	**0.91 tCO_2/MWh**		
Scope 2 Emissions are(tCO2)			**55**

Scope-02 emissions = 48.79/0.9 = ~ 55 tCO_2

Total CO2 emissions for financial year 2018-19

= Scope-01 + Scope-02 émission

= (11 + 55) tCO_2

= 66 tCO_2

Carbon Credits Purchased

66/0.99 uncertainty factor = 73.33 = 74 tCO_2

Weblink of purchase of carbon credits:

7.1.6.032

https://vcsregistry2.apx.com/myModule/rpt/myrpt.asp?r=206&h=26359

Snapshot (Edited)

VCU Serial Numbers	Quantity of VCUs	Registry ID	Project Database ID	Project Name	Originative Program	Beneficial Owner	Retirement Reason Details	Date of Retirement
5482-238831401-238831474-VCU-008-APX-IN-1-1563-14122011-22032012-0	74	VCSR1212	VCSPD1563	Adani Enterprises Limited Solar PV Power Project in Gujarat, India	Verified Carbon Standard	Brijlal Biyani Science College, Amravati	GHG emissions Offsetting	03/10/2019

12. Waste Management

How the college reduces its paper waste via: o encouraging digital reading, note-taking, and activities? o setting printers and computers to default to duplex (double-sided) printing? o reducing margins and white space on documents that must be printed? o printing multiple pages per sheet? o minimizing paper correspondence with families? o opting out of unwanted mail?	• The class room and labs are well ventilated and spacious. This minimizes suffocation to students by improving air changes and hence the air quality. • The college has adopted the duplex printers, which enables the complete usage of the paper areas • The internal correspondences and various fonctionalities are taken care by the electronic means like emails, sms and whatsapp. The recycling/ disposal system adopted by the college is as below.
Is the college undertaking recycling collection for additional recyclable materials—like plastic bags, CFL (spiral) light bulbs, batteries, drink pouches, candy wrappers, and electronics?	Different types are generated within campus which include • **Canteen Waste:** Municipal Corporation handles the canteen waste. It is authorized government functionality for waste disposal. • **E-Waste:** The E-waste generally includes the tube-lights, CFL, LED, electronic waste etc.

	During the site visit it is observed that the e-wastes are retained at various labs and in fragmented manner. There is no dedicated mechanism to identify, dispose and store the e-waste. College has yet not signed any MoU with authorized agencies for e-waste handling or purchase of electronic scrap. **Recommendation: College must design dedicated mechanism of e-waste disposal to collect, segregate and dispose the e-waste.** • **Bio-Medical Waste Handling:** The bio-medical wastes are incinerated and landfilled inside campus. **Recommendation: College must sign MoU for the bio-hazardous wastes. College can also install incinerators at girls' common room for disposal of sanitary waste. This will allow disposal without any foul smell.** • **Recycling of RO Waste Water:** The waste water from RO is recycled for garden use. • **Chemical Waste: The chemical lab is discharging the waste to ground.** **Recommendation: College must initiate appropriate measures (Cement pit, non-permeable type) for disposal of chemical wastes to avoid soil contamination.** Please refer Annexure XII and XVI for details.

Conclusion:

Waste Management needs improvements.

Recommendations:

- ✓ **College must design dedicated mechanism of e-waste disposal to collect, segregate and dispose the e-waste.**
- ✓ **College must sign MoU for the bio-hazardous wastes. College can also install incinerators at girls' common room for disposal of sanitary waste. This will allow disposal without any foul smell.**
- ✓ **College must initiate appropriate measures (Cement pit, non-permeable type) for disposal of chemical wastes to avoid soil contamination.**

7.1.6.034

13. Plantation by College

S. N.	Botanical Name	Vernacular Name	Family	Total
01.	*Azadirachta indica*	Kadu neem	Meliaceae	35
02.	*Acacia arabica*	Subabhul	Mimosaceae	06
03.	*Auracharia sp*	X mas tree	Cupressaceae	05
04	*Acacia sp*	Babhul	Mimosaceae	13
05.	*Amaryllis sp*	Lily	Amaryllidinae	07
06.	*Aloe vera*	Korfad	Liliaceae	12
07.	*Arum sp*	Chamkora	Araceae	04
08.	*Asparagus racemosus*	Shatawari	Liliaceae	12
09.	*Aegle marmelos*	Bael	Rutaceae	02
10.	*Bougainvillea spectabilis*	Bougainvillea	Nyctaginaceae	17
11.	*Barleria prattensis*	Kata koranti	Acanthaceae	07
12.	*Borassus flabellifer*	Fan palm	Aracaceae	15
13.	*Bauhinia purpurea*	Kachnar	Ceasalpinaceae	03
14.	*Cassia siamea*	Kassod	Ceasalpiniaceae	07
15.	*Cassia occidentalis*	Kandhan	Ceasalpiniaceae	10
16.	*Cassia fistula*	Amaltas	Ceasalpiniaceae	14
17.	*Canna indica*	Keddhedi	Cannaceae	02
18.	*Cycas circinalis*	Green sago	Cycadaceae	07
19.	*Cycas revolute*	Sago palm	Cycadaceae	09
20.	*Croton sp*	Croton	Euphorbiaceae	04
21.	*Clerodendrum phlomidis*	Khanduchakka	Verbenaceae	10
22.	*Clerodendrum serratum*	Bharangi	Verbenaceae	09
23.	*Cymbopogon martini*	Tikhadi	Poaceae	04
24.	*Clitoria ternatea*	Gokarna	Fabaceae	07
25.	*Catharanthus roseus*	Sadafuly	Apocynaceae	10
26.	*Ceasalpinia pulcherrima*	Pride of brooms	Ceasalpiniaceae	05
27.	*Delonix regia*	Gulmohar	Ceasalpiniaceae	11
28.	*Duranta repens*	Duranta	Verbenaceae	56
29.	*Dalbergia sissoo*	Shisham	Papilionaceae	02
30.	*Eucalyptus globulus*	Nilgiri	Myrtaceae	06
31.	*Erythrina phlobaides*	Panjra	Papilionaceae	01
32.	*Erythrina variegate*	Indian coral tree	Papilionaceae	01
33.	*Ficus religiosa*	Pimpal	Moraceae	10
34.	*Ficus glomerata*	Umber	Moraceae	05
35.	*Haemalia patens*	Fire brush	Rubiaceae	02
36.	*Hibiscus populneus*	Paras pipal	Malvaceae	01
37.	*Hibiscus rosasinensis*	Jaswand	Malvaceae	06
38.	*Ixora parviflora*	Torch tree	Rubiaceae	02
39.	*Jatropa curcas*	Physic nut	Euphorbiaceae	04
40.	*Jasminum sambac*	Mogra	Oleaceae	09
41.	*Juniperus sambac*	Juniper	Cupressaceae	16
42.	*Kigelia pinnata*	Karanj	Bignoniaceae	04
43.	*Kigelia sp*		Bignoniaceae	01
44.	*Livistona rotundifolia*	Table palm	Arecaceae	14
45.	*Lagerstraemia speciose*	Jarul	Lythraceae	01
46.	*Michelia champaca*	Sonchapha	Magnoliaceae	01

47.	*Magnifera indica*	Mango(Amba)	Anacardiaceae	02
48.	*Murraya paniculata*	Madhumalti	Rutaceae	02
49.	*Melia azadirach*	Bakain (Endanger)	Meliaceae	01
50.	*Mimosa pudica*	Lajwanti	Mimosaceae	10
51.	*Mimusop selengi*	Bakul	Sapotaceae	07
52.	*Nepralepis Sp.*	Fern	Filicaceae	04
53.	*Prosopis cineraria*	Shami (Endanger)	Mimosaceae	01
54.	*Polyalthia longifolia*	Ashoka	Annonaceae	20
55.	*Psidium guajava*	Jam	Myrtaceae	02
56.	*Phyllanthus niruri*	BhuiAawala	Euphorbiaceae	17
57.	*Putranjiva roxburghii*	Jivanputra	Putranjivaceae	02
58.	*Prunus dulcis*	Badam	Rosaceae	02
59.	*Pinus roxburgi*	Pine	Pinaceae	04
60.	*Peltophorum Sp.*	Yellow flame tree	Ceasalpinaceae	03
61.	*Punica granatum*	Anar	Punicaceae	01
62.	*Plumbago zeylanica*	Doctor bush	Plumbaginaceae	04
63.	*Rosa indica*	Gulab	Rosaceae	04
64.	*Ruellia simplex*	Blue bell	Acanthaceae	12
65.	*Thevetia peruviana*	Bittee	Apocynaceae	05
66.	*Tabernaemontana divaricata*	Swastik	Apocynaceae	04
67.	*Thunbergia erecta*	Bush clockvine	Acanthaceae	01
68.	*Tridax procumbence*	Kambarmodi`	Asteraceae	25
69.	*Thuja plicata*	Vidya	Cupressaceae	06
70.	*Tinospora cordifolia*	Gulwel	Menispermaceae	08
71.	*Tecoma stans*	Yellow bell	Bignoniaceae	10
72.	*Syzygium aromaticum*	Lawang	Myrtaceae	04
73.	*Saraca indica*	Ashoka	Mimosaceae	10
74.	*Sida alba*	Sida	Malvaceae	15
75.	*Vitis quadrangularis*	Hadjod	Vitaceae	05

Annexures

Annexure – I: List of Interviewed College / Students

Sr. No	Name	Designation
1	Dr. Deepak S. Dhote	Principal, Chairman
2	Mr. Saurabh Rathi	Management Representative
3	Dr. A. D. Rangari	IQAC Coordinator
4	Dr. P. B. Raghuvanshi	Head of Department, Chemistry
5	Dr. D. T. Deshmukh	Head of Department, Statistics
6	Dr. S. R. Katake	Head of Department, Zoology
7	Dr. N. H. Shahare	Head of Department, Botany
8	Dr. G. D. Agrahari	Head of Department, Electronics
9	Dr. A. D. Rangari	Head of Department, Physics
10	Mrs. P. R. Agrawal	Head of Department, Mathematics
11	Dr. V. S. Tondre	Head of Department, Computer Science
12	Dr. S. G. Ishwarkar	EVS In charge (Senior College)
13	Ms. K. V. Bhopale	EVS In charge (Junior College)
14	Mr. Dinesh Maniyar	Canteen Manager
15	Mr. M. D. Mahajan	Administrative Head
16	Dr. A. U Pachkhade	Regular Campus Users (Morning Walk Representative)
	Post Graduate Students Representative	
17	Mr. A. R. Ugale	**M.Sc. II Botany**
18	Ms. Mansi Sharma	**M.Sc. II Chemistry**
19	Ms. Tilottama Umbarkar	**M.Sc. II Electronics**
20	Ms. Shradhha Bhavner	**M.Sc. II Computer Science**
21	Ms. Avantika Mankar	**M.Sc. II Mathematics**
22	Mr. Shubham R. Pahalajani	**M.Com. II**
	Undergraduate Student Representative	
23	Ms. Nikita A. Jain	**B.Com III**
24	Mr. Saurabh S. Mushade	**BBA III**
25	Mr. Aniktet B. Guhe	**B.Sc. III**
26	Mr. Shubham S. Vyavhare	**BCA III**
27	Mr. Amansingh Chavan	**B.Voc. II**

Annexure –II: Reference Documents / Surveys

Sr. No	Reference Documents / Surveys pertaining to
1.	Functionality of RO water plant
2.	Utilization of RO reject water for gardening
3.	Roof top area by College
4.	Setup for Water Harvesting
5.	Information regarding Canteen Compost Management
6.	Information regarding Garden Waste Management
7.	Information regarding Liquid Waste Management
8.	Measures for maintaining Cleanliness in Campus.
9.	Measures for Garbage Collection and disposal
10.	Plantation Measures
11.	Electricity Bills for duration of April 2018 to March 2019
12.	Green Campus Committee composition
13.	Declaration on Operational Controls Of System Department With Respect To IT Management & Other Electronic Equipments
14.	Roll Of Staff, Students & Management to Save Electricity in Campus.
15.	Lighting Survey undertaken by the Green Audit Team
16.	AC Survey undertaken by the Green Audit Team
17.	Water Harvesting Survey undertaken by the Green Audit Team
18.	Waste Water Management Survey undertaken by the Green Audit Team

Annexure –III: Green Campus Committee

Sr. No	Name	Designation
1	Dr. Deepak S. Dhote	Principal, Chairman
2	Mr. Saurabh Rathi	Management Representative
3	Dr. A. D. Rangari	IQAC Coordinator
4	Dr. P. B. Raghuvanshi	Head of Department, Chemistry
5	Dr. D. T. Deshmukh	Head of Department, Statistics
6	Dr. S. R. Katake	Head of Department, Zoology
7	Dr. N. H. Shahare	Head of Department, Botany
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17	Mr. A. R. Ugale	**M.Sc. II Botany**
18	Ms. Mansi Sharma	**M.Sc. II Chemistry**
19	Ms. Tilottama Umbarkar	**M.Sc. II Electronics**
20	Ms. Shradhha Bhavner	**M.Sc. II Computer Science**
21	Ms. Avantika Mankar	**M.Sc. II Mathematics**
22	Mr. Shubham R. Pahalajani	**M.Com. II**
	Undergraduate Student Representative	
23	Ms. Nikita A. Jain	**B.Com III**
24	Mr. Saurabh S. Muahade	**BBA III**
25	Mr. Aniktet B. Guhe	**B.Sc. III**
26	Mr. Shubham S. Vyavhare	**BCA III**
27	Mr. Amansingh Chavan	**B.Voc. II**

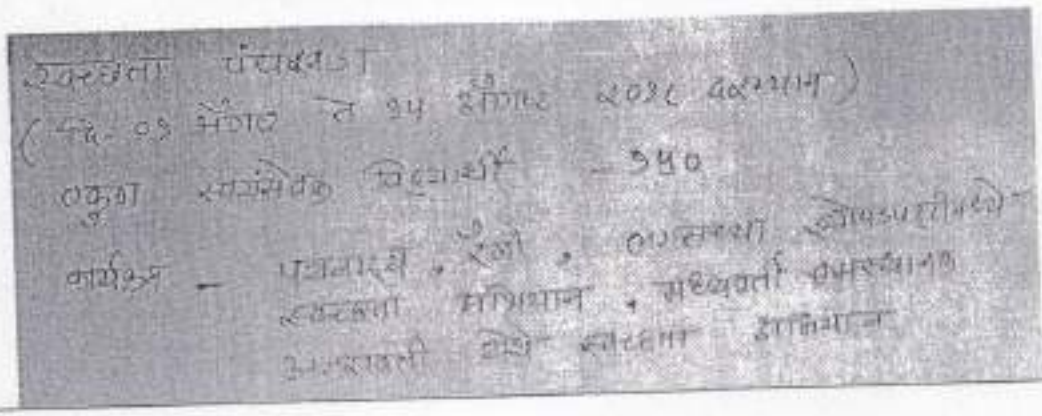
Annexure –IV: List Awareness Programs undertaken by College



Students participated in cleanliness drive



Cleanliness Drive by Students under NSS Scheme



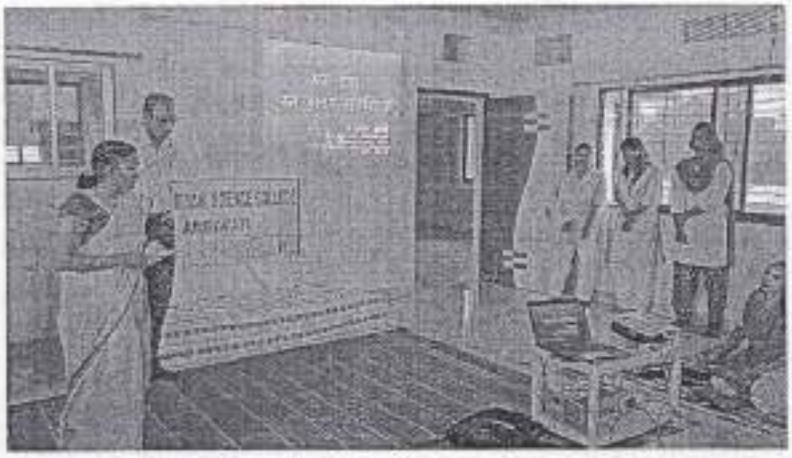
वृक्षारोपण

ब्रिजलाल बियाणी विज्ञान महाविद्यालयातील राष्ट्रीय सेवा योजना पथकाद्वारे वलगाव ग्राम कचुर्णा येथे दि. 08 जुलै 2015 रोजी हिंदू स्मशानभूमी मध्ये एकूण 25 वृक्षांचे लागवड करण्यात आली. यावेळी गावचे सरपंच श्री. निलेश वरहाडे, पोलीस पाटील श्री संजय वरहाडे, श्री उद्धवराव वरहाडे तसेच गावकरी, राष्ट्रीय कार्यक्रम अधिकारी प्रा. एस. एन. पठाण व राष्ट्रीय स्वयंसेवक उपस्थित होते.



Tree Plantation





Rainwater Harvesting workshop



Seed ball preparation activity



Seed Ball sowing activity



Workshop Photo



Students participation in Blood Donation



Blood Donation Camp

Annexure –V: Lighting Survey

List of Assumptions:

- During the survey specific hours for each class room was assessed and accordingly average daily hours is calculating under column "Hrs Of Use"
- The W ratings of the installed lights is taken from the College data
- The calculations cover the two approaches
  - Note: The Lumen/Watt for 28 W tube light is up to 110; which is almost same as LED is: 110-120[1]
  - The Green Audit Team acknowledges the criteria for introduction of LED lights as LED lights do not have disposal problems. Tube lights face problem of mercury contamination.
  - Conversely the college also faces the same problem of disposal of existing tube lights. The sudden disposal of tube lights on large scale and within their service life will lead to huge amount of e-waste which has critical impact on environment. The college management is thus looking for the replacement policy and lighting (tube light, CFL) will be upgraded to eco-friendly LED after failure of existing lighting system.

Place	Tube Lights	Watt	Hrs Of Use	Wh	CFL	Watt	Hrs Of Use	Wh	LED	Watt	Hrs Of Use	Wh
Office	-	-	-	-	-	-	-	-	7	25	7	1225
Staff Room	2	40	7	560	-	-	-	-	-	-	-	-
Guest Room	3	40	7	840	-	-	-	-	12	20	7	1680
Principal Office		40		0	-	-	-	-	10	10	6	600
Conference Hall	9	40	3	1080	1	20	5	100	1	50	5	250
Physical Training Room	3	40	3	360				0	-	-	-	-
Chemistry Lab	13	40	3	1560				0	9	20	7	1260

[1] https://www.google.co.in/amp/s/www.bijlibachao.com/lights/comparing-led-lights-with-fluorescent-lights.html%3fisamp=1

Computer Lab	-	-	-	-	11	16	7	1232	15	10	7	1050
	-	-	-	-	-	-	-	-	14	15	7	1470
	-	-	-	-	-	-	-	-	5	16	7	560
Botany Lab	31	40	4	4960	-	-	-	-	-	-	-	-
Zoology Lab	-	-	-	-	-	-	-	-	1	10	7	70
Zoology Lab	-	-	-	-	-	-	-	-	13	20	7	1820
Physics Lab	3	40	5	600	-	-	-	-	6	20	7	840
Maths Department	4	40	5	800	-	-	-	-	3	20	7	420
Canteen	7	40	3	840	-	-	-	-	2	10	3	60
Library	-	-	-	-	-	-	-	-	48	20	7	6720
Classroom 1	4	40	3	480	-	-	-	-	-	-	-	-
Classroom 2	3	40	3	360	-	-	-	-	-	-	-	-
Classroom 3	3	40	3	360	-	-	-	-	-	-	-	-
Classroom 4	4	40	3	480	-	-	-	-	-	-	-	-
Classroom 5	4	40	3	480	-	-	-	-	-	-	-	-
Classroom 6	4	40	3	480	-	-	-	-	-	-	-	-
Classroom 7	3	40	4	480	-	-	-	-	-	-	-	-

7.1.6.046

Classroom 8	3	40	3	360	-	-	-	-	-	-	-	-
Classroom 9	4	40	3	480	-	-	-	-	-	-	-	-
Classroom 10	3	40	3	360	-	-	-	-	-	-	-	-
Classroom 11	3	40	3	360	-	-	-	-	-	-	-	-
Classroom 12	4	40	3	480	-	-	-	-	-	-	-	-
Classroom 13	4	40	3	480	-	-	-	-	-	-	-	-
Classroom 14	3	40	3	360	-	-	-	-	-	-	-	-
Corridor GF	9	40	3	1080	-	-	-	-	4	15	3	180
Corridor FF	6	40	3	720	-	-	-	-	-	-	-	-
Corridor SF	10	40	3	1200	-	-	-	-	-	-	-	-
Microbiology and Technology	-	-	-	-	24	20	7	3360	23	10	7	1610
Urinals	-	-	-	-	-	-	-	-	2	20	1	40
Electronis lab	10	40	5	2000	-	-	-	-	1	20	7	140
Electronis lab	5	40	5	1000	14	20	7	1960	-	-	-	-
Staff room ground floor	-	-	-	-	7	20	7	980	1	16	7	112
Staff room ground floor	-	-	-	-	-	-	-	-	3	20	7	420
Staff room ground floor	-	-	-	-	4	16	7	448	3	30	7	630

7.1.6 0 4 7

Staff room first floor	2	40	1	80	-	-	-	-	-	-	-	-
Staff room second floor	8	40	5	1600	-	-	-	-	-	-	-	-
Statistics Department	5	40	3	600	-	-	-	-	1	20	7	140
				Hostel								
Room 1 to room 22	44	40	8	14080	-	-	-	-	-	-	-	-
Dining room	3	40	40	4800	-	-	-	-	-	-	-	-
Kitchen	1	40	8	320	-	-	-	-	1	10	4	40
Office	1	40	4	160	-	-	-	-	-	-	-	-
Corridor GF	8	40	5	1600	-	-	-	-	-	-	-	-
Corridor FF	6	40	5	1200	-	-	-	-	-	-	-	-
Recreation Room	1	40	4	160	-	-	-	-	1	10	4	40
Total	243		185	48200	61		40	8080	186		145	21377
% LED Lightings		27.5%										

7.1.6. 048

Annexure –VI: Undertaking by the System Department regarding control of Electronic Equipments

As per recommendation, the college agreed to establish the usage policy inline with below recommendation

- The usage policy of photocopiers, fax machines and other equipment users is "POWER ON" when in use and "POWER OFF" when not in use. There is no idle power consumption.

7.1.6.050

Annexure –VII: Water Quality Reports

DRINKING WATER ANALYSIS

DELUXE WATER & SOIL ANALYSIS KIT MODEL - 111 E

Figure 1: Front Panel Diagram of Digital Water and Soil Analysis kit

7.1.6051

Table 1. Technical Specifications

Temperature measurement	
Range	0 to 60°C
Resolution	0.1°C
Accuracy	± 0.5°C
Sensor	Semi Conductor Type
pH measurements	
Range	0 to 14.00 pH
Resolution	0.01 pH
Accuracy	± 0.01 pH
Temperature Compensation	0 to 100°C
Conductivity measurements	
Range	0 to 19.99 mS/cm 0 to 20,000 µS/cm
Resolution	0.01 mS/cm
Accuracy	0.5% of range ± 1digit
TDS measurements	
Range	0 to 19.00 ppt (0-20,000 ppm)
Accuracy	0.5% of range ± 1 digit
Oscillator	1 KHz Built-in
Salinity measurements	
Range	0 to 49.99 ppt (0-30,000 ppm)
Accuracy	0.5% of range ± 1 digit
Oscillator	1 KHz Built-in
Turbidity measurements	
Detector	Photocell /Photo diode
Light Source	6V, 0.3 Amps Tungsten Lamp
Calibration	With Formazine Solution
O.D (Optical Density) measurements	
filters	**Wave length**
Violet	420
Blue	480

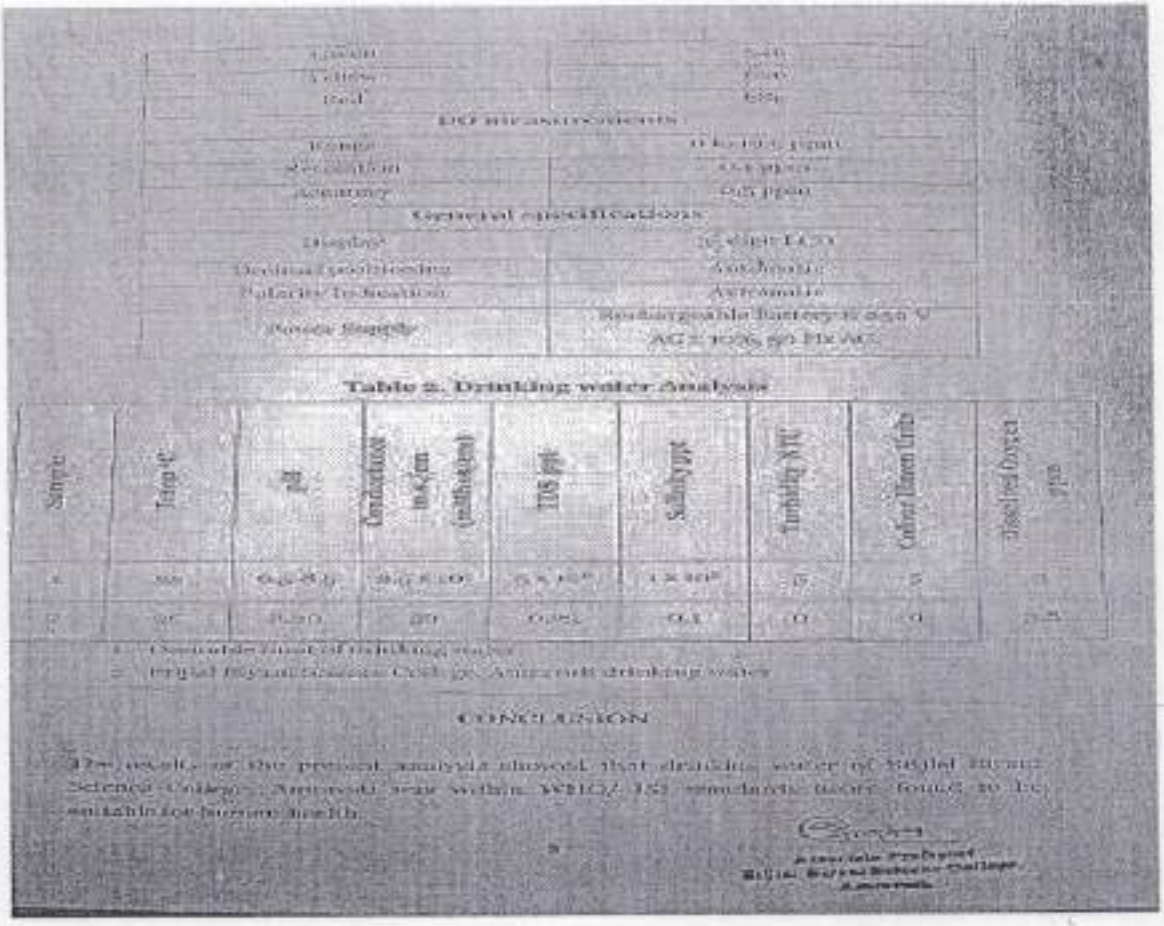


Table 2. Drinking water Analysis

Sample	Temp °C	pH	Conductance mS/cm (millisiemens)	TDS ppm	Salinity ppt	Turbidity NTU	Odour Threshold Units	Dissolved Oxygen ppm
A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0
B	27	7.20	20	0.05	0.1	0	0	7.8

1. Desirable limit of drinking water
2. Brijlal Biyani Science College, Amravati drinking water

CONCLUSION

The results of the present analysis showed that drinking water of Brijlal Biyani Science College, Amravati was within WHO/ ISI standards hence found to be suitable for human health.

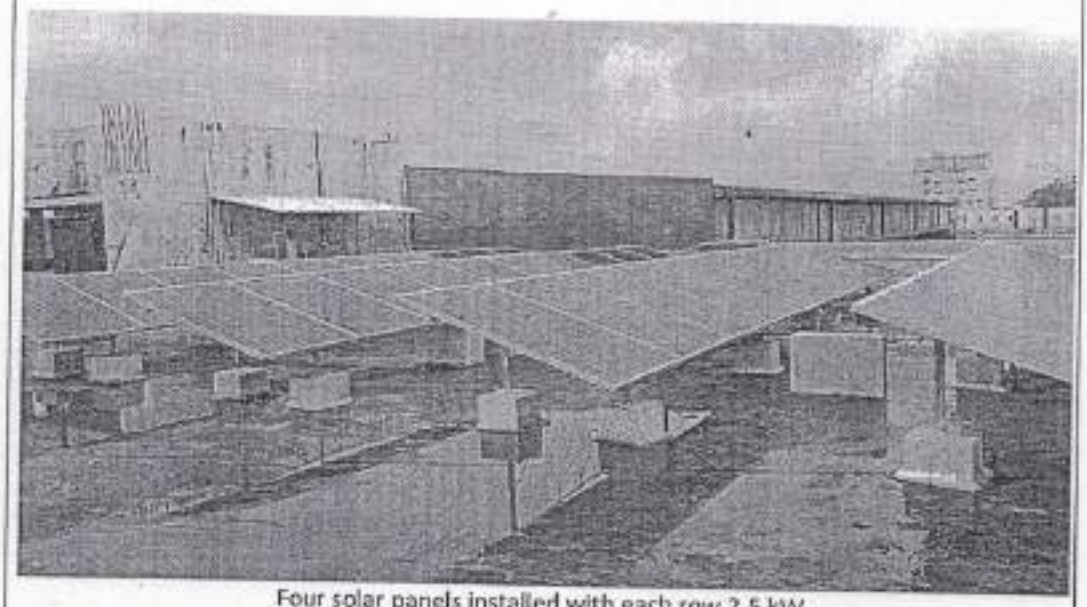
Associate Professor
Brijlal Biyani Science College,
Amravati

Annexure –VIII: List of Major Electronic Equipments in College

Computer Science Department quotation notice annual maintenance list of equipment as below.

Sr. No	Department	No. of Comp	Lab top	Rack Switch/Switch	Printer /Scanner	All in one Printer	Projector
1	Main Lab	29	03	01	07	03	01
2	BCA	41	01	01	02	02	01
3	Lab 2nd this class	46		02	02		
4	Physics	02			01	01	02
5	Chemistry	02		01	01		
6	Office	14	01	02	06	01	
7	Zoology	03		01	01		01
8	Exam Jr.	01			01		
9	CCC Class	05					
10	Stat.	01	01		01		
11	Botany	02	02	01	01	01	
12	Electronics	09	02		02		02
13	BBA	04		01	01		01
14	Exam PET, PMT	01	01				
15	Library	07		01	01		
16	Maths	01	01				
17	Biotech		01	01	01		
18	Server	02					
		163	13	11	28	08	08

Annexure –IX: Solar Panel Installations



Four solar panels installed with each row 2.5 kW





Annexure –X: Water Distribution Data

The water is drawn from borewell. The water drawn is not measured. Recommendation to monitor the water drawn is raised under chapter 6 of this report.

Annexure –XI: Solar Passive Structure

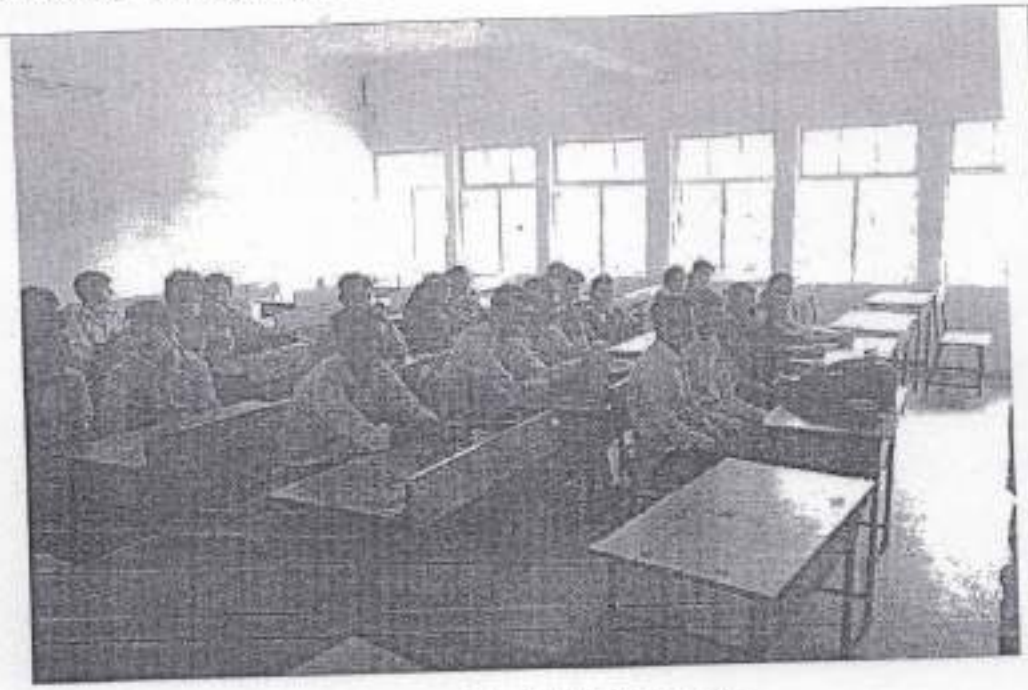


Efficient use of daylight in labs

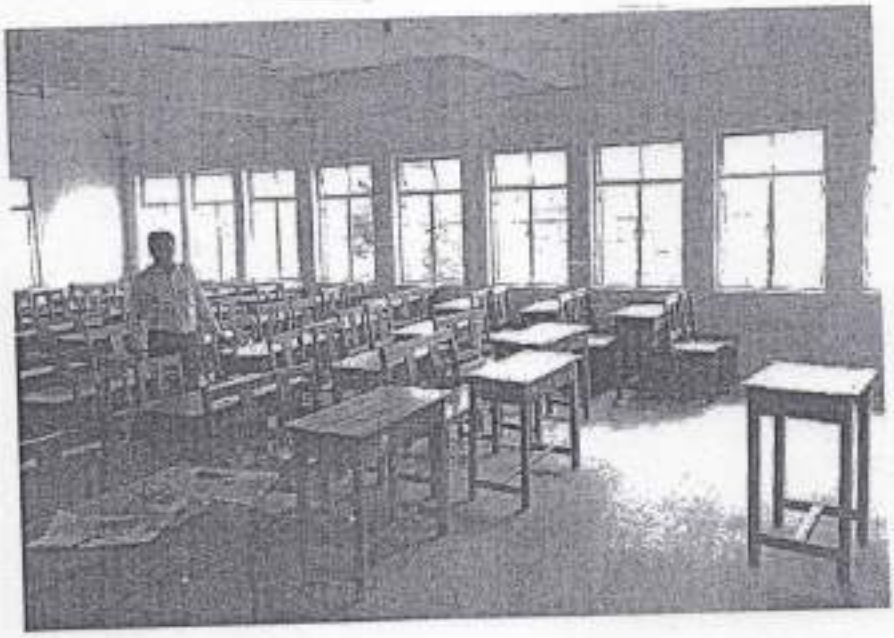


Efficient use of daylight in Labs

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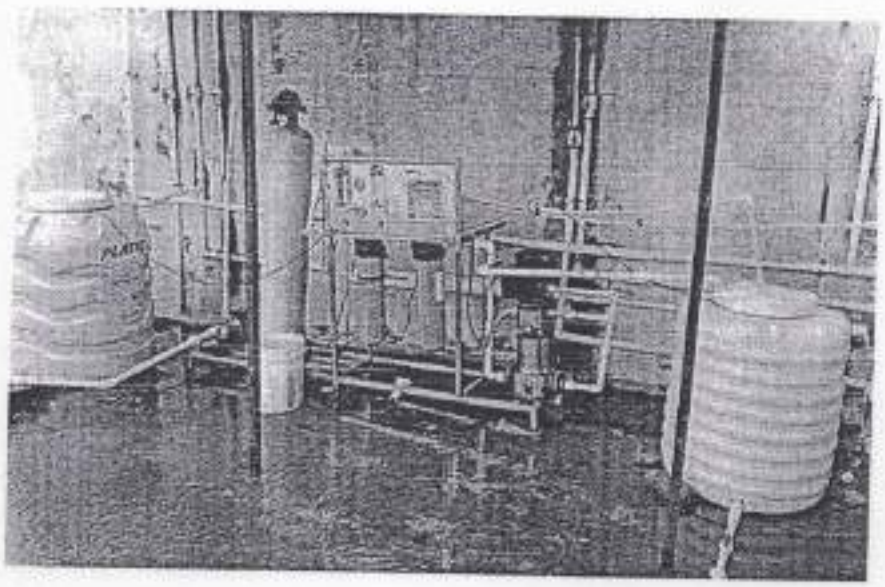


Efficient use of daylight in Class rooms

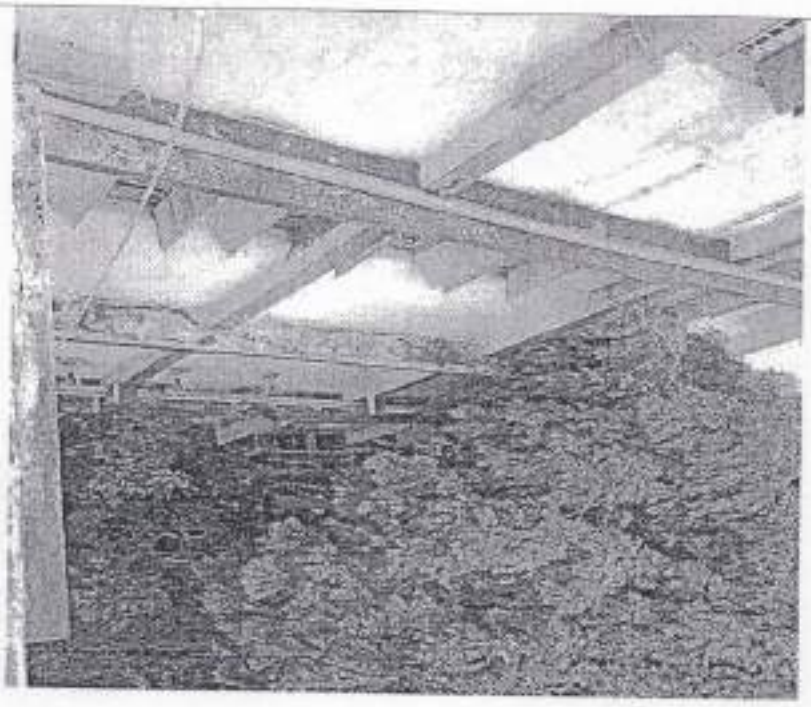


Efficient use of daylight in classrooms

Annexure –XII: Water Management



RO Water Plant



RO water rejection to garden area-

Annexure –XIII: Waste Management



vermicomposting pit



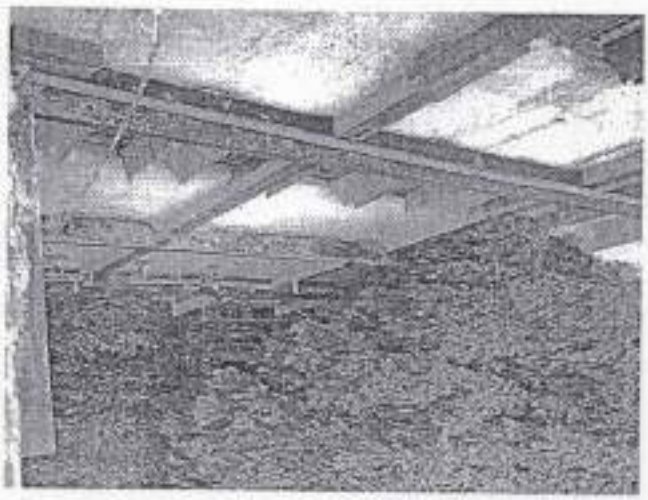
E waste Collector



Waste collection

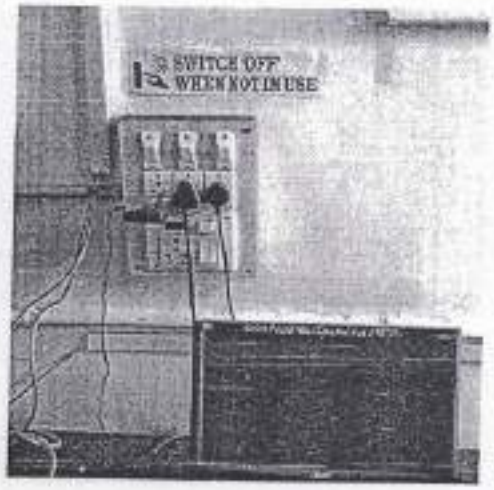


Incinerator for pretreatment of biohazardous waste

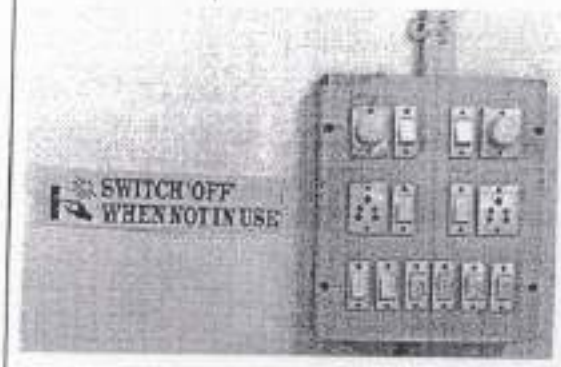


RO water rejection to garden are

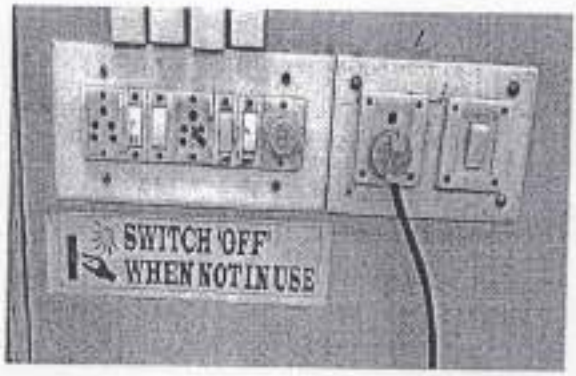
Annexure –XIV: Awareness



Save Electricity Awareness



Save Electricity Awareness



Save Electricity Awareness

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Annexure –XV: Snapshot of annual rainfall data, Grid Emission Factor

Talukawise Rainy Days & Total Rainfall

Report : Yearly

District : Amravati

Reporting Year : 2011-12

	Average		In year 2011-12		
Taluka	Number of Rainy Days	Rainfall	Number of Rainy Days	Rainfall	Percentage of Rainfall in the year in comparision with Average Rainfall
1	2	3	4	5	6
Dhamni	48	1172.70	48	1043.90	89.0
Chikhaldara	54600	1926.77	62	1577.70	102.3
Anjangaon Surji	38	616.30	36	646.20	104.9
Achalpur	37	697.50	40	741.00	106.2
Chandurbazar	42	668.30	44	654.80	91.1
Morshi	35	758.40	37	611.40	80.6
Warud	32	862.40	48	788.10	91.2
Teosa	30	727.80	44	718.80	98.4
Amravati	34	765.80	40	899.90	117.4
Bhatkuli	38	766.34	3590	736.30	95.9
Daryapur	37	697.40	42	678.60	106.1

Source :
'Agricultural Development Officer, Zilla Parishad,Commissionerate Of Agriculture'

Reference: http://data.maharashtra.gov.in/SDB_Reports/Amravati/PDF/2011-12_Amravati_DSA_5_7.pdf

CEA Database Version-14

CENTRAL ELECTRICITY AUTHORITY: CO2 BASELINE DATABASE

VERSION	14.0
DATE	Dec 18
BASELINE METHODOLOGY	ACM0002 / Ver 17.0 and "Tool to Calculate the Emission Factor for an Electricity System", Version 6.0

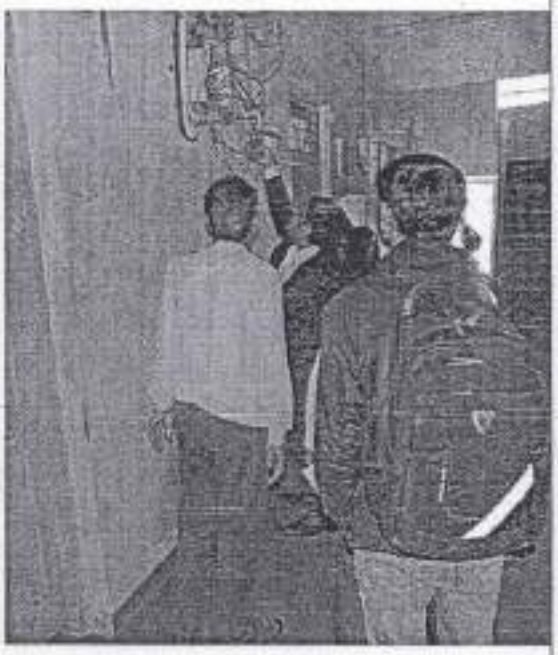
Emission Factors (tCO2/MWh) (incl. Imports)	2017-18
Weighted Average Emission Rate (2)	0.82

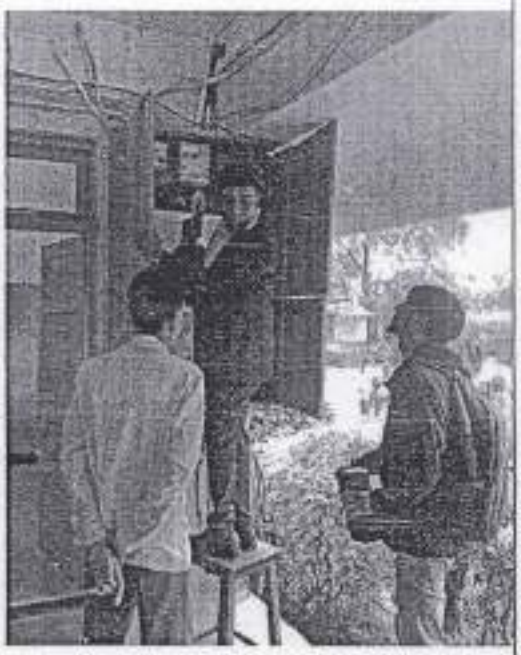
Annexure -XVI: Waste Handling

Please refer recommendation raised under Chapter 12 of this report.

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Annexure –XVII: Onsite Measurements (Sample Pics)









Notes:

Coordinates of Sustainability Solutions :

Swapnil Thanekar

Sustainability |Energy |Water

(Certified Energy Auditor – EA4416)

Plot Number 08, Shivaji Nagar,

Opposite LAD college Ground,

North Ambazari Road,

Pin- 440010, Nagpur

Phone - 0091- 8149130608, 8975664570

Email: swapnil_thanekar@yahoo.co.in

A-3, Flat 305, Sneha Vihar,

Dangat Patil Nagar, Shivne,

Off- NDA Road,

Pin 411023- Pune

ENERGY AUDIT REPORT

of

Brijlal Biyani Science College, Amravati

Year: 2019-20

Prepared by:

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: enrichcons@gmail.com

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(A Government of Maharashtra undertaking)
2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006
Ph No: 020-26614393/26614403
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2018-19/CR-05/4174 19th September , 2018

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with ***MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)*** under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm	:	**Enrich Consultants** Yashashree, Plot No. 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune - 411009.
Registration Category	:	Empanelled *Consultant for Energy Conservation Programme*
Registration Number	:	***MEDA/ECN/CR-05/2018-19/EA-03***

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **31st March 2021** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

19/9/18

(Smita Kudarikar)
General Manager (EC)

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/BBSC/19-20/01 Date: 12/7/2020

CERTIFICATE

This is to certify that we have conducted Energy Audit at, Brijlal Biyani Science College, Amaravati, in the Academic year 2019-20

.The College has adopted following Energy Efficient practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Maximum usage of Day Lighting
- Installation of 10 kWp Roof Top Solar PV Plant

We appreciate the support of Management, involvement of faculty members and students in the process of making the Campus Energy Efficient.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

INDEX

Sr. No	Particulars	Page No
I	Acknowledgement	5
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2	Study of Connected Load	9
3	Study of Present Energy Consumption	10
4	Carbon Foot Printing	12
5	Study of Usage of Alternate Energy	14
6	Study of LED Lighting	15

ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Brijlal Biyani Science College, Amaravati, for awarding us the assignment of Energy Audit of their Amaravati Campus for the Year: 2019-20.

We are thankful to:

- Dr. D. S. Dhote, Principal

We are also thankful to other Staff members for helping us during the field study.

EXECUTIVE SUMMARY

1. Brijlal Biyani Science College, Amaravati consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

1. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	8292	7.46
2	Maximum	1165	1.05
3	Minimum	115	0.10
4	Average	691.00	0.62

2. Energy Conservation projects already installed:

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated Equipment
- Maximum Usage of Day Lighting

3. Usage of Alternate Energy:

- The College has installed Roof Top Solar PV Plant of Capacity **10 kWp.**
- Energy purchased from MSEDCL is **8292 kWh.**
- Energy generated by Roof Top Solar PV Plant is **12000 kWh.**
- The percentage of Usage of Alternate Energy to Annual Energy Demand is **59 %.**

4. Usage of LED Lighting:

- The Total Annual Lighting Load of the College is **18.256 kW.**
- The Total Annual LED Lighting Demand is **9.136 kWh.**
- The percentage of Annual LED Lighting to Annual Lighting Demand is **50.04 %.**

5. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg** of **CO_2** into atmosphere

6. References:

- For CO_2 Emissions: www.tatapower.com
- For Roof Top Solar PV Plant Energy generation: www.solarrooftop.gov,in

ABBREVIATIONS

LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
IQAC	:	Internal Quality Assurance Cell
BEE	:	Bureau of Energy Efficiency
FTL	:	Fluorescent Tube Light
CFL	:	Compact Fluorescent Light
PV	:	Photo Voltaic
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO_2	:	Carbon Di Oxide
MT	:	Metric Ton

CHAPTER-I
INTRODUCTION

1.1 Objectives:

1. To study present Energy Consumption
2. To Study the present CO_2 emissions
3. To study usage of Alternate Energy
4. To study usage of LED Lighting

1.2 Table No 1: General Details of the College:

No	Head	Particulars
1	Name of Institution	Brijlal Biyani Science College
2	Address	Amaravati
3	Affiliation	Sant Gadge Baba Amaravati University

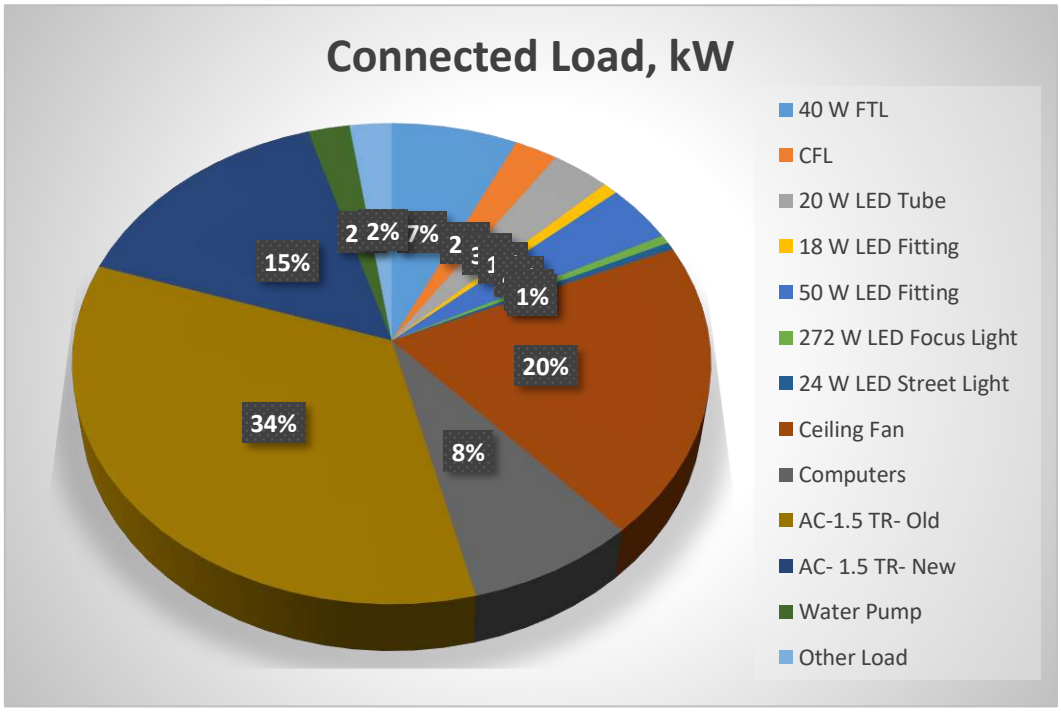
CHAPTER-II
STUDY OF CONNECTED LOAD

The major contributors to the connected load of the College include:

Table No 2: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W FTL	170	40	6.8
2	CFL	116	20	2.32
3	20 W LED Tube	176	18	3.168
4	18 W LED Fitting	44	18	0.792
5	50 W LED Fitting	76	50	3.8
6	272 W LED Focus Light	2	272	0.544
7	24 W LED Street Light	20	24	0.48
8	Ceiling Fan	295	65	19.175
9	Computers	109	70	7.63
10	AC-1.5 TR- Old	15	2200	33
11	AC- 1.5 TR- New	8	1838	14.704
12	Water Pump	1	2238	2.238
13	Other Load	15	150	2.25
14	**Total**			**97**

Chart No 1: Study of Connected Load:



CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of last year Electricity Bills

Table No 3: Electrical Bill Analysis- 2019-20:

No	Month	Energy Consumed, kWh
1	Apr-19	865
2	May-19	166
3	Jun-19	546
4	Jul-19	1165
5	Aug-19	981
6	Sep-19	838
7	Oct-19	761
8	Nov-19	720
9	Dec-19	847
10	Jan-20	115
11	Feb-20	796
12	Mar-20	492
13	Total	8292
14	Maximum	1165
15	Minimum	115
16	Average	691.00

Chart No 2: Variation in Monthly Energy Consumption:

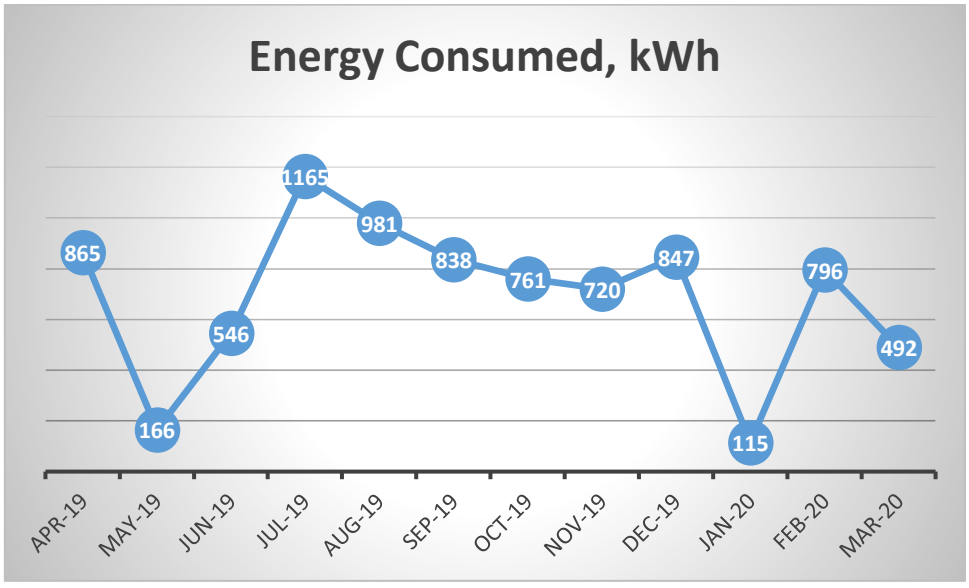


Table No 4: Variation in Important Parameters:

No	Parameter/ Variation	Energy Consumed, kWh
1	Total	8292
2	Maximum	1165
3	Minimum	115
4	Average	691.00

CHAPTER-IV
CARBON FOOTPRINTING

A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities.

In this we compute the emissions of Carbon-Di-Oxide, by usage of the various forms of Energy used by the College for performing its day to day activities

The College uses Electrical Energy for various Electrical gadgets.

Basis for computation of CO_2 Emissions:

- 1 kWh of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations

Table No 5: Month wise CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO_2 Emissions, MT
1	Apr-19	865	0.78
2	May-19	166	0.15
3	Jun-19	546	0.49
4	Jul-19	1165	1.05
5	Aug-19	981	0.88
6	Sep-19	838	0.75
7	Oct-19	761	0.68
8	Nov-19	720	0.65
9	Dec-19	847	0.76
10	Jan-20	115	0.10
11	Feb-20	796	0.72
12	Mar-20	492	0.44
13	Total	8292	7.46
14	Maximum	1165	1.05
15	Minimum	115	0.10
16	Average	691.00	0.62

Chart No 3: Month wise CO_2 Emissions:

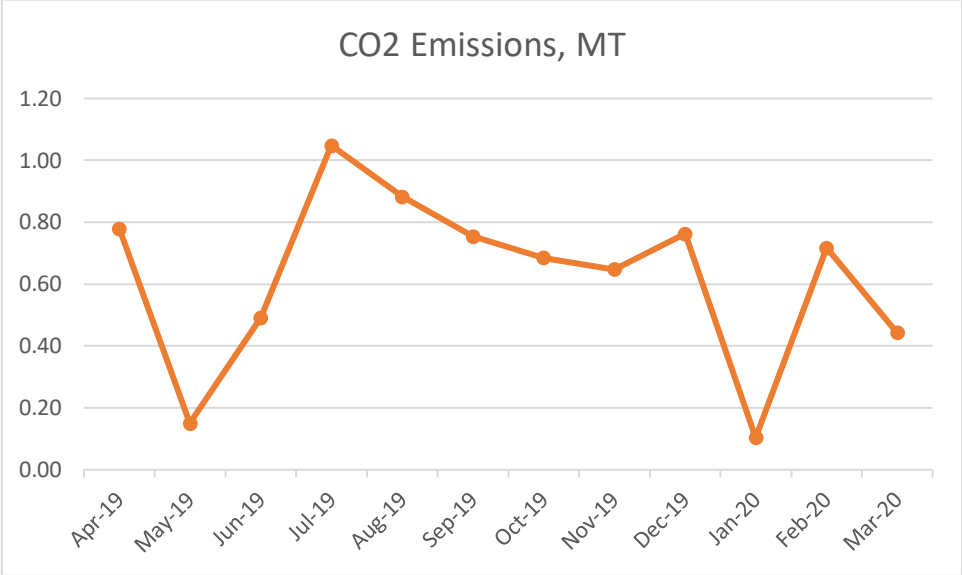


Table No 6: Important Parameters:

No	Parameter/ Variation	Energy Consumed, kWh	CO2 Emissions, MT
1	Total	8292	7.46
2	Maximum	1165	1.05
3	Minimum	115	0.10
4	Average	691.00	0.62

CHAPTER-V
STUDY OF USAGE OF ALTERNATE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **10 kWp**.

In the following Table, we compute the percentage of Usage of Alternate Energy to Annual Energy Demand of the College.

Table No 7: Computation of % Annual Energy Demand met by Alternate Energy:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant	10	LPD
2	Electrical Energy generated by Solar PV Plant	4	kWh/kWp
3	Annual Energy Generation Days	300	Nos/Annum
4	Total Energy Generated in 20-21= 1 * 2 * 3	12000	kWh/Annum
5	Energy purchased from MSEDCL	8292	kWh
6	Total Energy Requirement = 4+5	20292	kWh
7	**% of Usage of Alternate Energy = 4*100/6**	**59**	**%**

Photograph of Solar Thermal Water Heating System:



CHAPTER VI
STUDY OF USAGE OF LED LIGHTING

In this chapter, we compute the percentage of usage of LED Lighting to Annual Lighting power requirement.

Table No 8: Percentage of Usage of LED Lighting to Annual Lighting Load:

No	Particulars	Value	Unit
1	Qty of 40 W FTL Light Fittings	170	Nos
2	Load per Fitting	40	W/Unit
3	Total Load of 40 W FTL Fitting	**6.8**	kW
4	Qty of 20 W CFL Light Fittings	116	Nos
5	Load per Fitting	20	W/Unit
6	Total Load of 20 W CFL Fitting	**2.32**	kW
7	Qty of 18 W LED Light Fittings	44	Nos
8	Load per Fitting	18	W/Unit
9	Total Load of 18 W LED Fitting	**0.792**	kW
10	Qty of 20 W LED Light Fittings	176	Nos
11	Load per Fitting	20	W/Unit
12	Total Load of 20 W LED Fitting	**3.52**	kW
13	Qty of 24 W LED Light Fittings	20	Nos
14	Load per Fitting	24	W/Unit
15	Total Load of 24 W LED Fitting	**0.48**	kW
16	Qty of 50 W LED Light Fittings	76	Nos
17	Load per Fitting	50	W/Unit
18	Total Load of 50 W LED Fitting	**3.8**	kW
19	Qty of 272 W LED Light Fittings	2	Nos
20	Load per Fitting	272	W/Unit
21	Total Load of 272 W LED Fitting	**0.544**	kW
22	Total Lighting Load=3+6+9+12+15+18+21	**18.256**	kW
23	Total LED Lighting Load=9+12+15+18+21	**9.136**	kW
28	% of Total Lighting Demand met by LED Lighting=27*100/26	**50.04**	%

ENERGY AUDIT REPORT

of

Brijlal Biyani Science College, Amravati

Year: 2020-21

Prepared by:

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: enrichcons@gmail.com

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

An ISO 9001 : 2000 Reg. no. : RQ 91 / 2462

Maharashtra Energy Development Agency
(Government of Maharashtra Institution)
Aundh Road, Opposite Spicer College Road, Near Commissionerate of Animal Husbandary,
Aundh, Pune, Maharashtra 411067
Ph No: 020-35000450
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2021-22/CR-14/1577 22nd April, 2021

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with *MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)* under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : **M/s Enrich Consultants**
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Muktangan English School, Parvati,
Pune - 411009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme for Class 'A'*

Registration Number : ***MEDA/ECN/2021-22/Class A/EA-03***

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **21st April, 2023** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (EC)

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/BBSC/20-21/01 Date: 12/5/2021

CERTIFICATE

This is to certify that we have conducted Energy Audit at, Brijlal Biyani Science College, Amaravati, in the Academic year 2020-21

.The College has adopted following Energy Efficient practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Maximum usage of Day Lighting
- Installation of 10 kWp Roof Top Solar PV Plant

We appreciate the support of Management, involvement of faculty members and students in the process of making the Campus Energy Efficient.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

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ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Brijlal Biyani Science College, Amaravati, for awarding us the assignment of Energy Audit of their Amaravati Campus for the Year: 2020-21.

We are thankful to:

- Dr. D. S. Dhote, Principal

We are also thankful to other Staff members for helping us during the field study.

EXECUTIVE SUMMARY

1. Brijlal Biyani Science College, Amaravati consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

1. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	4669	4.20
2	Maximum	1260	1.13
3	Minimum	149	0.13
4	Average	389.08	0.35

2. Energy Conservation projects already installed:

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated Equipment
- Maximum Usage of Day Lighting

3. Usage of Alternate Energy:

- The College has installed Roof Top Solar PV Plant of Capacity **10 kWp.**
- Energy purchased from MSEDCL is **4669 kWh.**
- Energy generated by Roof Top Solar PV Plant is **12000 kWh.**
- The percentage of Usage of Alternate Energy to Annual Energy Demand is **72 %.**

4. Usage of LED Lighting:

- The Total Annual Lighting Demand of the College is **2190.72 kWh.**
- The Total Annual LED Lighting Demand is **1096.32 kWh.**
- The percentage of Annual LED Lighting to Annual Lighting Demand is **50.04 %.**

5. Assumptions:

1. 1 kWh of Electrical Energy releases **0.9 Kg** of **CO_2** into atmosphere
2. Daily working hours-**2 Nos** (For Lighting Calculations)
3. Annual working Days-**60 Nos** (For Lighting Calculations)

6. Recommendation:

It is recommended to replace the old Light Fittings by LEDs.

7. References:

- For CO_2 Emissions: www.tatapower.com
- For Roof Top Solar PV Plant Energy generation: www.solarrooftop.gov,in

ABBREVIATIONS

LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
IQAC	:	Internal Quality Assurance Cell
BEE	:	Bureau of Energy Efficiency
FTL	:	Fluorescent Tube Light
CFL	:	Compact Fluorescent Light
PV	:	Photo Voltaic
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO_2	:	Carbon Di Oxide
MT	:	Metric Ton

CHAPTER-I
INTRODUCTION

1.1 Objectives:

1. To study present Energy Consumption
2. To Study the present CO_2 emissions
3. To study usage of Alternate Energy
4. To study usage of LED Lighting

1.2 Table No 1: General Details of the College:

No	Head	Particulars
1	Name of Institution	Brijlal Biyani Science College
2	Address	Amaravati
3	Affiliation	Sant Gadge Baba Amaravati University

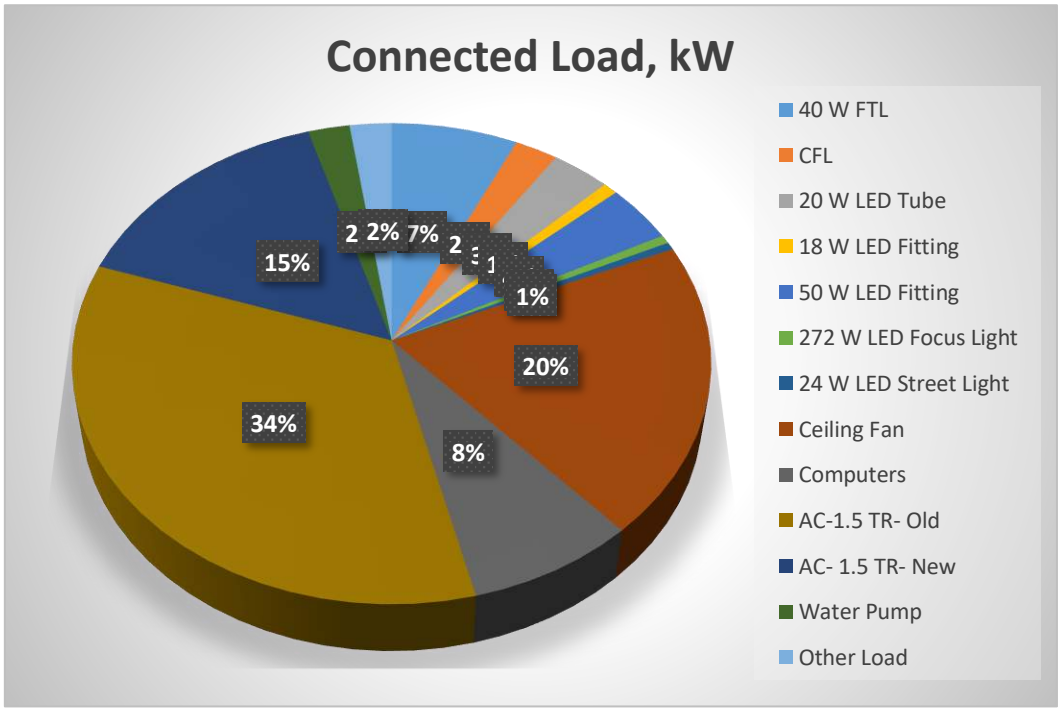
CHAPTER-II
STUDY OF CONNECTED LOAD

The major contributors to the connected load of the College include:

Table No 2: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W FTL	170	40	6.8
2	CFL	116	20	2.32
3	20 W LED Tube	176	18	3.168
4	18 W LED Fitting	44	18	0.792
5	50 W LED Fitting	76	50	3.8
6	272 W LED Focus Light	2	272	0.544
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8	Ceiling Fan	295	65	19.175
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11	AC- 1.5 TR- New	8	1838	14.704
12	Water Pump	1	2238	2.238
13	Other Load	15	150	2.25
14	**Total**			**97**

Chart No 1: Study of Connected Load:



CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of last year Electricity Bills

Table No 3: Electrical Bill Analysis- 2020-21:

No	Month	Energy Consumed, kWh
1	Apr-20	492
2	May-20	475
3	Jun-20	475
4	Jul-20	475
5	Aug-20	149
6	Sep-20	149
7	Oct-20	149
8	Nov-20	149
9	Dec-20	1260
10	Jan-21	375
11	Feb-21	307
12	Mar-21	214
13	Total	4669
14	Maximum	1260
15	Minimum	149
16	Average	389.08

Chart No 2: Variation in Monthly Energy Consumption:

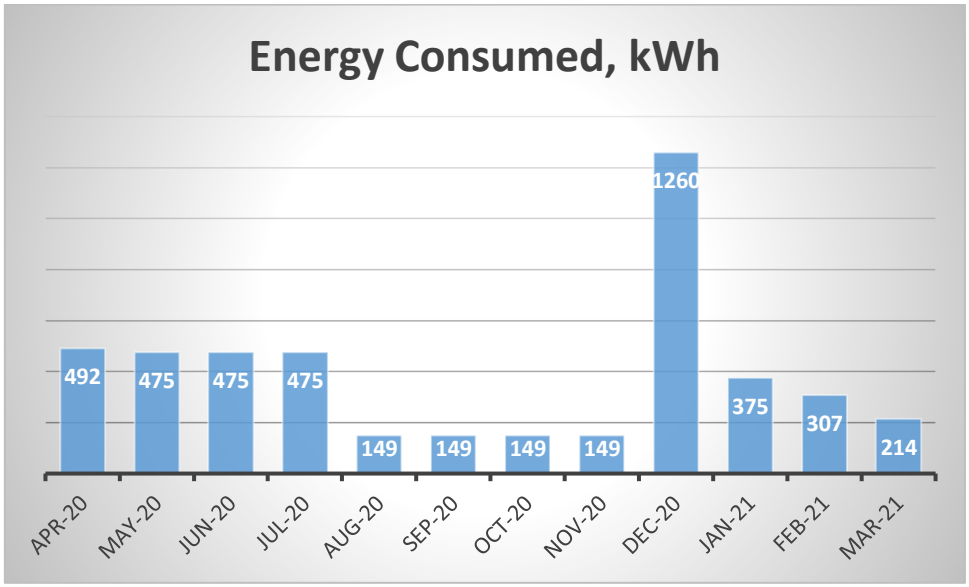


Table No 4: Variation in Important Parameters:

No	Parameter/ Variation	Energy Consumed, kWh
1	Total	4669
2	Maximum	1260
3	Minimum	149
4	Average	389.08

CHAPTER-IV
CARBON FOOTPRINTING

A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities.

In this we compute the emissions of Carbon-Di-Oxide, by usage of the various forms of Energy used by the College for performing its day to day activities

The College uses Electrical Energy for various Electrical gadgets.

Basis for computation of CO_2 Emissions:

- 1 kWh of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations

Table No 5: Month wise CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO_2 Emissions, MT
1	Apr-20	492	0.44
2	May-20	475	0.43
3	Jun-20	475	0.43
4	Jul-20	475	0.43
5	Aug-20	149	0.13
6	Sep-20	149	0.13
7	Oct-20	149	0.13
8	Nov-20	149	0.13
9	Dec-20	1260	1.13
10	Jan-21	375	0.34
11	Feb-21	307	0.28
12	Mar-21	214	0.19
13	Total	4669	4.20
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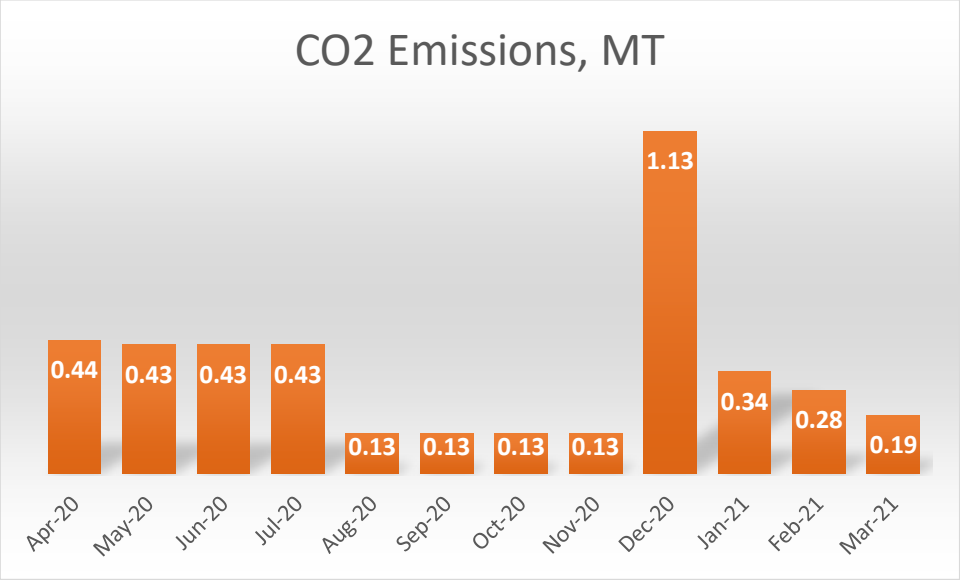


Table No 6: Important Parameters:

No	Parameter/ Variation	Energy Consumed, kWh	CO2 Emissions, MT
1	Total	4669	4.20
2	Maximum	1260	1.13
3	Minimum	149	0.13
4	Average	389.08	0.35

CHAPTER-V
STUDY OF USAGE OF ALTERNATE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **10 kWp**.

In the following Table, we compute the percentage of Usage of Alternate Energy to Annual Energy Demand of the College.

Table No 7: Computation of % Annual Energy Demand met by Alternate Energy:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant	10	LPD
2	Electrical Energy generated by Solar PV Plant	4	kWh/kWp
3	Annual Energy Generation Days	300	Nos/Annum
4	Total Energy Generated in 20-21= 1 * 2 * 3	12000	kWh/Annum
5	Energy purchased from MSEDCL	4669	kWh
6	Total Energy Requirement = 4+5	16669	kWh
7	**% of Usage of Alternate Energy = 4*100/6**	**72**	**%**

Photograph of Solar Thermal Water Heating System:



CHAPTER VI
STUDY OF USAGE OF LED LIGHTING

In this chapter, we compute the percentage of usage of LED Lighting to Annual Lighting power requirement.

Table No 8: Percentage of Usage of LED Lighting to Annual Lighting Load:

No	Particulars	Value	Unit
1	Qty of 40 W FTL Light Fittings	170	Nos
2	Load per Fitting	40	W/Unit
3	Total Load of 40 W FTL Fitting	**6.8**	kW
4	Qty of 20 W CFL Light Fittings	116	Nos
5	Load per Fitting	20	W/Unit
6	Total Load of 20 W CFL Fitting	**2.32**	kW
7	Qty of 18 W LED Light Fittings	44	Nos
8	Load per Fitting	18	W/Unit
9	Total Load of 18 W LED Fitting	**0.792**	kW
10	Qty of 20 W LED Light Fittings	176	Nos
11	Load per Fitting	20	W/Unit
12	Total Load of 20 W LED Fitting	**3.52**	kW
13	Qty of 24 W LED Light Fittings	20	Nos
14	Load per Fitting	24	W/Unit
15	Total Load of 24 W LED Fitting	**0.48**	kW
16	Qty of 50 W LED Light Fittings	76	Nos
17	Load per Fitting	50	W/Unit
18	Total Load of 50 W LED Fitting	**3.8**	kW
19	Qty of 272 W LED Light Fittings	2	Nos
20	Load per Fitting	272	W/Unit
21	Total Load of 272 W LED Fitting	**0.544**	kW

22	Total Lighting Load=3+6+9+12+15+18+21	18.256	kW
23	Total LED Lighting Load=9+12+15+18+21	9.136	kW
24	Daily Usage Period	2	Hrs
25	Annual Working Days	60	Nos
26	Annual Total Lighting Load=22*24*25	**2190.72**	kWh
27	Annual LED Lighting Load=23*24*25	**1096.32**	kWh
28	% of Total Lighting Demand met by LED Lighting=27*100/26	**50.04**	%

CHAPTER VII
EECOMMENDATION

It is recommended to replace the Old Light Fittings by LED fittings.

ENVIRONMENTAL AUDIT REPORT

of

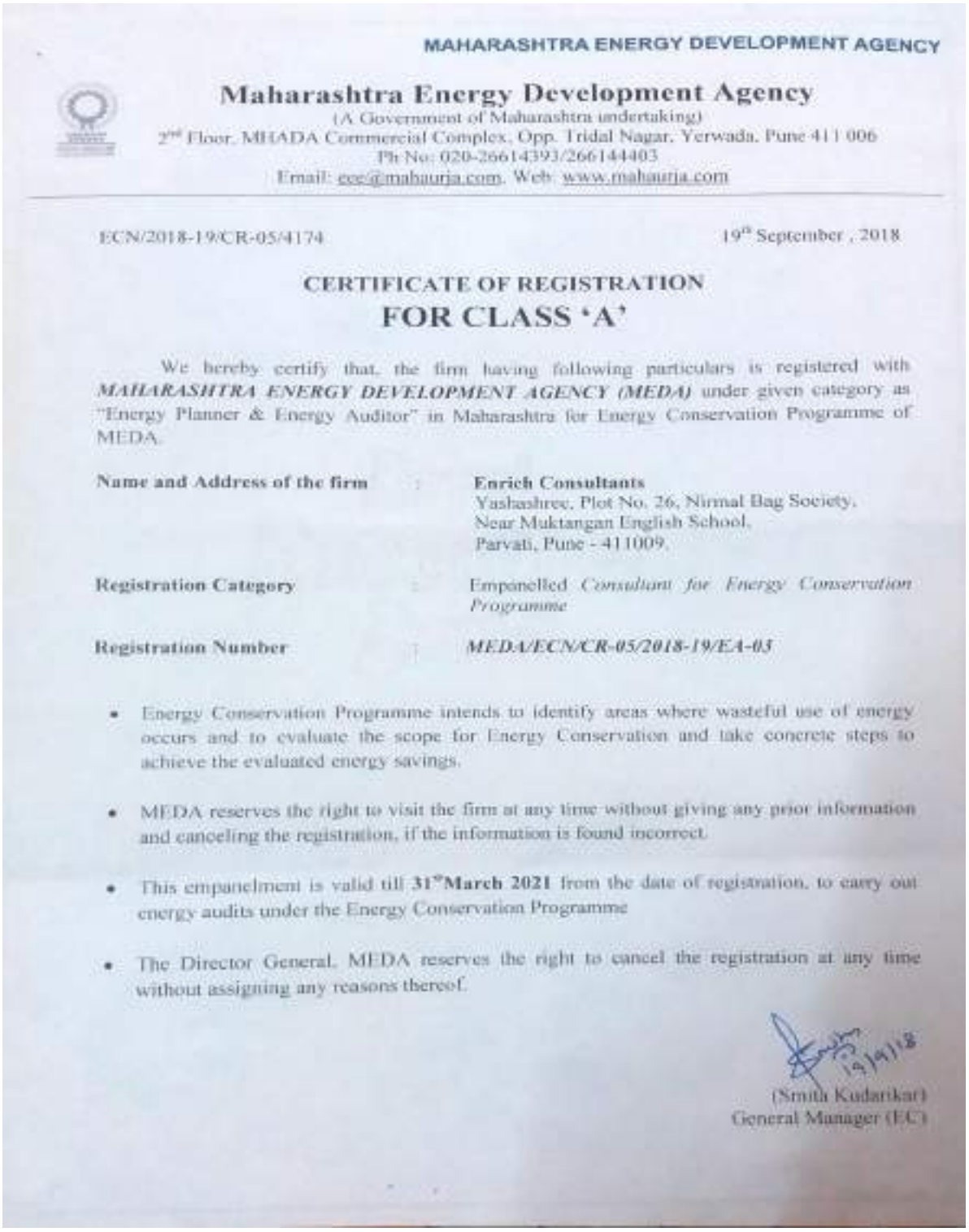
Brijlal Biyani Science College, Amravati

Year: 2020-21

Prepared by:

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: enrichcons@gmail.com



MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(A Government of Maharashtra undertaking)
2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006
Ph No: 020-26614393/266144403
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2018-19/CR-05/4174 19th September , 2018

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with ***MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)*** under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm	:	**Enrich Consultants** Yashashree, Plot No. 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune - 411009.
Registration Category	:	Empanelled *Consultant for Energy Conservation Programme*
Registration Number	:	***MEDA/ECN/CR-05/2018-19/EA-03***

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **31st March 2021** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

19/9/18
(Smita Kudarikar)
General Manager (EC)

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/BBSC/19-20/03 Date: 19/7/2020

CERTIFICATE

This is to certify that we have conducted Green Audit at Brijlal Biyani Science College, Amaravati in the Academic year 2019-20.

The College has adopted following Green Initiatives:

- Usage of Energy Efficient LED Light Fitting
- Usage of BEE STAR Rated Energy Efficient Equipment
- Maximum Usage of Day Lighting
- Installation of Roof Top Solar PV Plant of Capacity 10 kWp
- Provision of Separate bins for Dry & Wet Waste
- Installation of Vermi Composting Plant
- Tree Plantation in the campus
- Provision of Sanitary Waste Incinerator

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

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ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Brijlal Biyani Science College, Amaravati, for awarding us the assignment of Environmental Audit of their Amaravati Campus for the Year: 2019-20.

We are thankful to:

- Dr. D. S. Dhote, Principal

We are also thankful to other Staff members for helping us during the field study.

EXECUTIVE SUMMARY

1. Brijlal Biyani Science College, Amaravati consumes Energy in the form of **Electrical Energy** used for various gadgets, office & other facilities

2. Various Pollution due to College Activities:

- **Air pollution:** Mainly CO_2 on account of Electricity Consumption
- **Solid Waste:** Bio degradable Garden Waste
- **Liquid Waste:** Human liquid waste

3. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	4669	4.20
2	Maximum	1260	1.13
3	Minimum	149	0.13
4	Average	389.08	0.35

4. Various initiatives taken for Energy Conservation:

- Usage of Energy Efficient BEE STAR Rated Equipment
- Usage of Energy Efficient LED Lighting
- Maximum Usage of Day Lighting
- Installation of Roof Top Solar PV Plant of Capacity **10 kWp.**

5. Usage of Renewable Energy & Reduction in CO_2 Emission:

- The College has installed Roof Top Solar PV Plant of Capacity **10 kWp**.
- The Electrical Energy generated in 20-21 is **12000 kWh.**
- Reduction in CO_2 Emissions in 2020-21 works out to be **10.8 MT.**

6. Indoor Parameters:

No	Parameter/Value	Temperature, ^0C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	41	26	435	50
2	Minimum	40	24	109	45

7. Waste Management:

7.1 Solid Waste Management:

The recyclable waste, like paper, plastic waste is handed over to Authorized waste collecting agent for further recycling.

7.2 Organic Waste Management:

The College has installed a Vermi Composting Plant and the organic Waste is composted in the Plant, which is further used in the own garden.

7.3 E-Waste Management:

The E-Waste is disposed of through Authorized E-Waste collecting agency.

8. Rain Water Harvesting:

The College has installed the Rainwater harvesting project, the rain water falling on the terrace is collected and is used for increasing the underground water level.

9. Sustainable Initiatives:

- Maintenance of Internal Garden
- Provision of Sanitary Waste Incinerator
- Tree Plantation in the campus

10. Assumptions:

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

11. References:

- For CO_2 Emissions: www.tatapower.com
- For Energy Saved by Solar Thermal Water Heating System: www.mahaurja.com
- For Various Indoor Air Parameters: www.ishrae.com

ABBREVIATIONS

Kg	:	Kilo Gram
MSEDCL	:	Maharashtra State Distribution Company Limited
MT	:	Metric Ton
kWh	:	kilo-Watt Hour
LPD	:	Liters per Day
LED	:	Light Emitting Diode
AQI	:	Air Quality Index
PM-2.5	:	Particulate Matter of Size 2.5 Micron
PM-10	:	Particulate Matter of Size 10 Micron
ISHRAE	:	The Indian Society of Heating & Refrigerating & Air Conditioning Engineers

CHAPTER-I
INTRODUCTION

1.1 Important Definitions:

1.1.1 Environment: Definition as per environment Protection Act: 1986

Environment includes water, air and land and the inter-relationship which exists among and between Water, Air, Land and Human beings, other living creatures, plants microorganism and property

1.1.2. Environmental Audit: Definition:

An audit which aims at verification and validation to ensure that various environmental laws are compiled with and adequate care has been taken towards environmental protection and preservation

According to UNEP, 1990, "Environmental audit can be defined as a management tool comprising systematic, documented and periodic evaluation of how well environmental organization management and equipment are performing with an aim of helping to regularize the environment

1.1.3. Environmental Pollutant: means any solid, liquid and gaseous substance present in the concentration as may be, or tend to be, injurious to Environment.

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1991	The Public Liability Insurance Act
2002	The Biological Diversity Act
2010	The National Green Tribunal Act

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1989	Hazardous Waste (Management and Handling) Rules
1989	Manufacture, Storage and Import of Hazardous Chemical Rules
2000	Municipal Solid Waste (Management and Handling) Rules
1998	The Biomedical Waste (Management and Handling) Rules
1999	The Environment (Siting for Industrial Projects) Rules
2000	Noise Pollution (Regulation and Control) Rules
2000	Ozone Depleting Substances (Regulation and Control) Rules
2011	E-waste (Management and Handling) Rules

2011	National Green Tribunal (Practices and Procedure) Rules
2011	Plastic Waste (Management and Handling) Rules

1.1.6 National Environmental Plans & Policy Documents: Table No-3:

1.	National Forest Policy, 1988
2.	National Water Policy, 2002
3.	National Environment Policy or NEP (2006)
4.	National Conservation Strategy and Policy Statement on Environment and Development, 1992
5.	Policy Statement for Abatement of Pollution (1992)
6.	National Action Plan on Climate Change
7.	Vision Statement on Environment and Human Health
8.	Technology Vision 2030 (The Energy Research Institute)
9.	Addressing Energy Security and Climate Change (MoEF and Bureau of Energy Efficiency
10	The Road to Copenhagen; India's Position on Climate Change Issues (MoEF)

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1. To study Resource Consumption & CO2 Emissions
2. To Study CO_2 Emission Reduction
3. To study Indoor Air Quality Parameters
4. To study Indoor Comfort Condition Parameters
5. To Study of Waste Management
6. To Study of Rain Water Harvesting
7. To Study of Sustainable Initiatives

1.3 General Details of College: Table No 4:

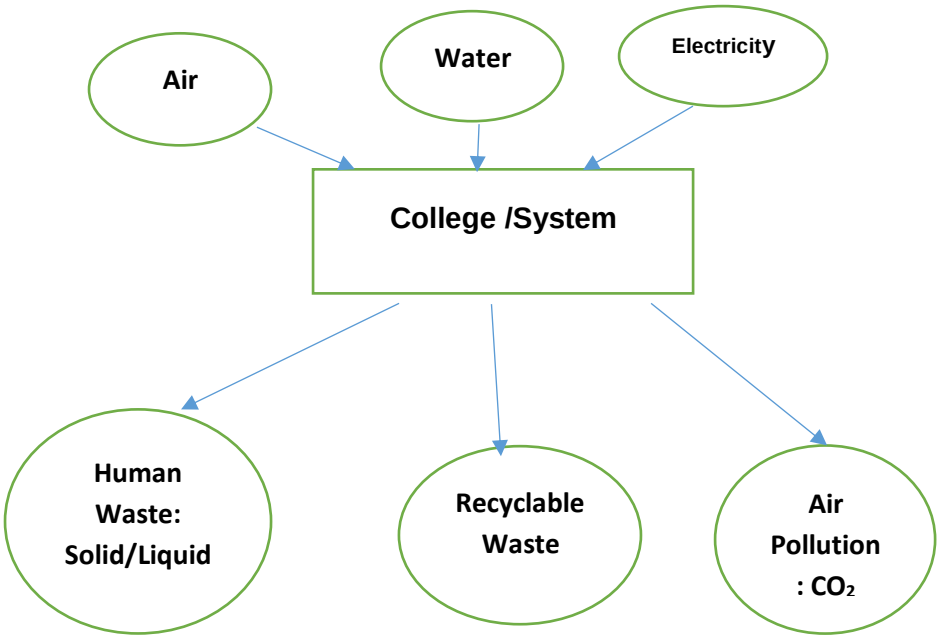
No	Head	Particulars
1	Name of Institution	Brijlal Biyani Science College
2	Address	Amaravati
3	Affiliation	Sant Gadge Baba Amaravati University

CHAPTER-II
STUDY OF CONSUMPTION OF RECOURCES & CO_2 EMISSION

The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy

We try to draw a schematic diagram for the College System & Environment as under.
Chart No 1: Representation of College as System & Study of Resources & Waste



Now we compute the Generation of CO2 on account of consumption of Electrical Energy.

The basis of Calculation for CO_2 emissions due to LPG & Electrical Energy are as under

1 kWh of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

Table No 5: Study of Consumption of Electrical Energy & CO2 Emissions: 19-20:

No	Month	Energy Consumed kWh	CO_2 Emissions, MT
1	Apr-19	865	0.78
2	May-19	166	0.15
3	Jun-19	546	0.49
4	Jul-19	1165	1.05
5	Aug-19	981	0.88
6	Sep-19	838	0.75

7	Oct-19	761	0.68
8	Nov-19	720	0.65
9	Dec-19	847	0.76
10	Jan-20	115	0.10
11	Feb-20	796	0.72
12	Mar-20	492	0.44
13	Total	8292	7.46
14	Maximum	1165	1.05
15	Minimum	115	0.10
16	Average	691.00	0.62

Chart No 2: Month wise CO_2 Emissions:

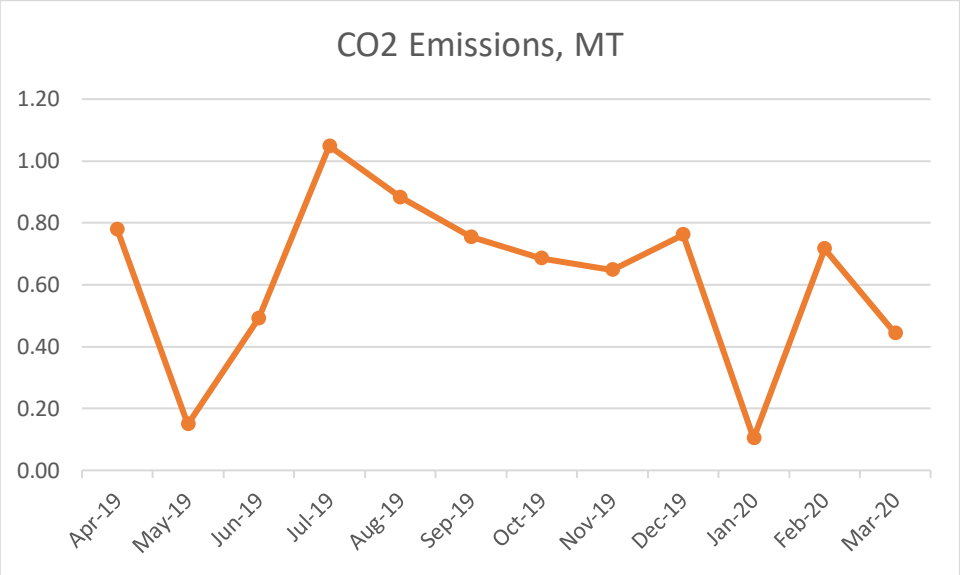


Table No 6: Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	8292	7.46
2	Maximum	1165	1.05
3	Minimum	115	0.10
4	Average	691.00	0.62

CHAPTER III
STUDY OF CO_2 EMISSION REDUCTION

The College has installed Roof Top Solar PV Plant of Capacity **10 kWp**.

In the following Table, we compute the Annual Reduction in CO_2 Emissions due to installation of Roof TOP Solar PV Plant.

Table No 7: Computation of Annual Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	10	kWp
2	Energy Generated in per kWp	4	4 kWh/kWp
3	Annual Solar Energy generation Days	300	Nos
4	Energy Generated in the Year: 20-21	12000	kWh
5	1 kWh of Electrical Energy saves	0.9	Kg/kWh
6	**Qty of CO_2 Saved by Solar PV Plant = (4)*(5) /1000**	**10.8**	**MT of CO_2**

Photograph of Roof Top Solar PV Plant:



CHAPTER IV
STUDY OF INDOOR COMFORT CONDITION

In this Chapter, we present the various Indoor Comfort Parameters measured during the Audit. The Parameters include:

1. Temperature
2. Humidity
3. Lux Level
4. Noise Level.

Table No 8: Study of Indoor Comfort Condition Parameters:

No	Parameter/Value	Temperature, ^{0}C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	41	26	435	50
2	Minimum	40	24	109	45

CHAPTER V
STUDY OF WASTE MANAGEMENT

5.1 Solid Waste Management:

The recyclable waste, like paper waste is handed over to authorized waste collecting agent for further recycling.

5.2 Organic Waste Management: The Bio degradable waste like leafy waste is composted in a Vermi composting Plant.

Photograph of Vermi Composting Plant:



5.3 E-Waste Management: The E-Waste is disposed of through Authorized Agency.

CHAPTER-VI
STUDY OF RAIN WATER HARVESTING

The College has implemented the Rain Water Harvesting Project. The College has installed Pipes from the terrace and the Rain water falling on the terrace is gathered and is used to increase the underground water level.

Photograph of Rain water Harvesting Storage Pond Section:



CHAPTER-VII
STUDY OF ENVIRONMENT FRIENDLY INITIATIVES

7.1 Internal Tree Plantation:

The College has well maintained landscaped garden in the campus.

Photograph of Tree plantation:



7.2 Provision of Sanitary Waste Incinerator:

For disposal of Sanitary Waste, a Sanitary Waste Incinerator is installed in the campus.

Photograph of Sanitary Waste Incinerator:



ENVIRONMENTAL AUDIT REPORT

of

Brijlal Biyani Science College, Amravati

Year: 2020-21

Prepared by:

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: enrichcons@gmail.com

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

An ISO 9001 : 2000 Reg. no. : RQ 91 / 2462

Maharashtra Energy Development Agency
(Government of Maharashtra Institution)
Aundh Road, Opposite Spicer College Road, Near Commissionerate of Animal Husbandary,
Aundh, Pune, Maharashtra 411067
Ph No: 020-35000450
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2021-22/CR-14/1577 22nd April, 2021

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with *MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)* under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : **M/s Enrich Consultants**
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Muktangan English School, Parvati,
Pune - 411009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme for Class 'A'*

Registration Number : ***MEDA/ECN/2021-22/Class A/EA-03***

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **21st April, 2023** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (EC)

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/BBSC/20-21/03 Date: 12/5/2021

CERTIFICATE

This is to certify that we have conducted Green Audit at Brijlal Biyani Science College, Amaravati in the Academic year 2020-21.

The College has adopted following Green Initiatives:

- Usage of Energy Efficient LED Light Fitting
- Usage of BEE STAR Rated Energy Efficient Equipment
- Maximum Usage of Day Lighting
- Installation of Roof Top Solar PV Plant of Capacity 10 kWp
- Provision of Separate bins for Dry & Wet Waste
- Installation of Vermi Composting Plant
- Tree Plantation in the campus
- Provision of Sanitary Waste Incinerator

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

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3	Study of CO_2 Emission Reduction	13
4	Study of Indoor Air Quality	14
5	Study of Indoor Comfort Condition Parameters	15
6	Study of Waste Management	16
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ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Brijlal Biyani Science College, Amaravati, for awarding us the assignment of Environmental Audit of their Amaravati Campus for the Year: 2020-21.

We are thankful to:

- Dr. D. S. Dhote, Principal

We are also thankful to other Staff members for helping us during the field study.

EXECUTIVE SUMMARY

1. Brijlal Biyani Science College, Amaravati consumes Energy in the form of **Electrical Energy** used for various gadgets, office & other facilities

2. Various Pollution due to College Activities:

- **Air pollution:** Mainly CO_2 on account of Electricity Consumption
- **Solid Waste:** Bio degradable Garden Waste
- **Liquid Waste:** Human liquid waste

3. Present Energy Consumption & CO_2 Emission:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	4669	4.20
2	Maximum	1260	1.13
3	Minimum	149	0.13
4	Average	389.08	0.35

4. Various initiatives taken for Energy Conservation:

- Usage of Energy Efficient BEE STAR Rated Equipment
- Usage of Energy Efficient LED Lighting
- Maximum Usage of Day Lighting
- Installation of Roof Top Solar PV Plant of Capacity --- kWp.

5. Usage of Renewable Energy & Reduction in CO_2 Emission:

- The College has installed Roof Top Solar PV Plant of Capacity **10 kWp**.
- The Electrical Energy generated in 20-21 is **12000 kWh.**
- Reduction in CO_2 Emissions in 2020-21 works out to be **10.8 MT.**

5. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	156	77	81
2	Minimum	109	56	61

6. Indoor Comfort Conditions:

No	Parameter/Value	Temperature, ^0C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	39	36	319	60
2	Minimum	34	35	156	40

7. Waste Management:

7.1 Solid Waste Management:

The recyclable waste, like paper, plastic waste is handed over to Authorized waste collecting agent for further recycling.

7.2 Organic Waste Management:

The College has installed a Vermi Composting Plant and the organic Waste is composted in the Plant, which is further used in the own garden.

7.3 E-Waste Management:

The E-Waste is disposed of through Authorized E-Waste collecting agency.

8. Rain Water Harvesting:

The College has installed the Rainwater harvesting project, the rain water falling on the terrace is collected and is used for increasing the underground water level.

9. Sustainable Initiatives

- Maintenance of Internal Garden
- Provision of Sanitary Waste Incinerator
- Display of Posters on Ban on Plastic
- Tree Plantation in the campus

10. Recommendation:

- It is recommended to make necessary arrangement for disposal of Laboratory Liquid Chemical Waste.

11. Notes & Assumptions:

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

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ABBREVIATIONS

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MT	:	Metric Ton
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Environment includes water, air and land and the inter-relationship which exists among and between Water, Air, Land and Human beings, other living creatures, plants microorganism and property

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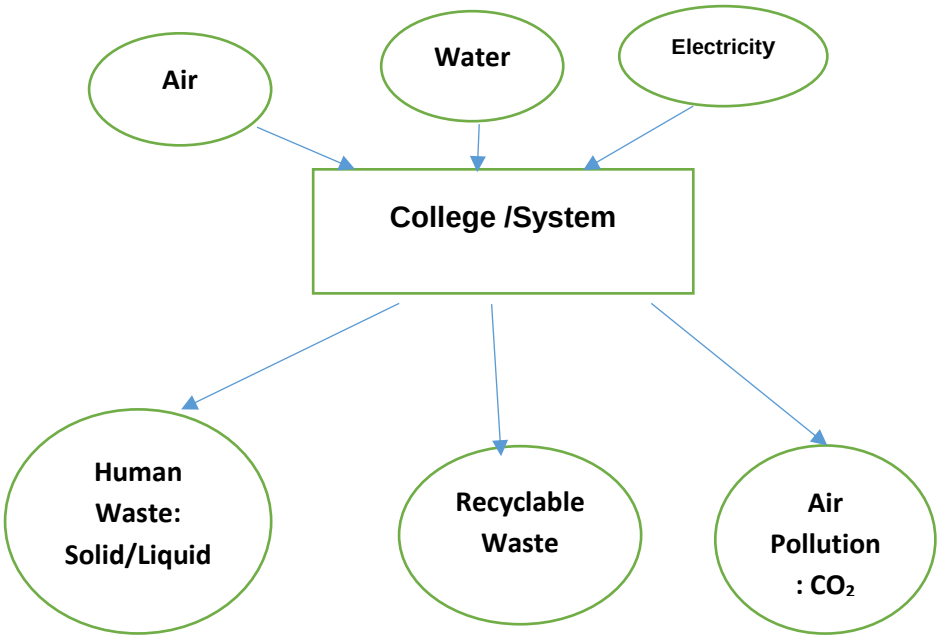
No	Head	Particulars
1	Name of Institution	Brijlal Biyani Science College
2	Address	Amaravati
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CHAPTER-II
STUDY OF CONSUMPTION OF RECOURCES & CO_2 EMISSION

The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy

We try to draw a schematic diagram for the College System & Environment as under.
Chart No 1: Representation of College as System & Study of Resources & Waste



Now we compute the Generation of CO2 on account of consumption of Electrical Energy.

The basis of Calculation for CO_2 emissions due to LPG & Electrical Energy are as under

- 1 kWh of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

Table No 5: Study of Consumption of Electrical Energy & CO2 Emissions: 20-21:

No	Month	Energy Consumed kWh	CO_2 Emissions, MT
1	Apr-20	492	0.44
2	May-20	475	0.43
3	Jun-20	475	0.43
4	Jul-20	475	0.43
5	Aug-20	149	0.13
6	Sep-20	149	0.13

7	Oct-20	149	0.13
8	Nov-20	149	0.13
9	Dec-20	1260	1.13
10	Jan-21	375	0.34
11	Feb-21	307	0.28
12	Mar-21	214	0.19
13	Total	4669	4.20
14	Maximum	1260	1.13
15	Minimum	149	0.13
16	Average	389.08	0.35

Chart No 2: Month wise CO_2 Emissions:

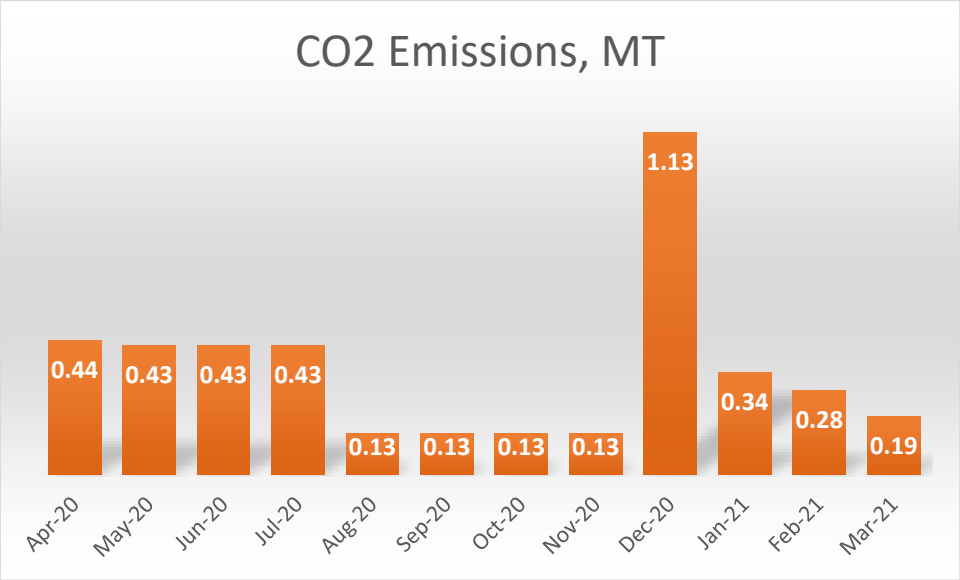


Table No 6: Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	4669	4.20
2	Maximum	1260	1.13
3	Minimum	149	0.13
4	Average	389.08	0.35

CHAPTER III
STUDY OF CO_2 EMISSION REDUCTION

The College has installed Roof Top Solar PV Plant of Capacity **10 kWp**.

In the following Table, we compute the Annual Reduction in CO_2 Emissions due to installation of Roof TOP Solar PV Plant.

Table No 7: Computation of Annual Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	10	kWp
2	Energy Generated in per kWp	4	4 kWh/kWp
3	Annual Solar Energy generation Days	300	Nos
4	Energy Generated in the Year: 20-21	12000	kWh
5	1 kWh of Electrical Energy saves	0.9	Kg/kWh
6	**Qty of CO_2 Saved by Solar PV Plant = (4)*(5) /1000**	**10.8**	**MT of CO_2**

Photograph of Roof Top Solar PV Plant:



CHAPTER IV
STUDY OF INDOOR AIR QUALITY

4.1 Importance of Air Quality:

Air: The common name given to the atmospheric gases used in breathing and photosynthesis.

By volume, Dry Air contains 78.09% Nitrogen, 20.95% Oxygen, 0.93% Argon, 0.039% carbon dioxide, and small amounts of other gases.

On average, a person inhales about **14,000 liters** of air every day. Therefore, poor air quality may affect the quality of life now and for future generations by affecting the health, the environment, the economy and the city's livability.

Rapid urbanization and industrialization has added other elements/compounds to the pure air and thus caused the increase in pollution. In order to prevent, control and abate air pollution, the Air (Prevention and Control of Pollution) Act was enacted in 1981.

Air quality is a measure of the suitability of air for breathing by people, plants and animals.

According to Section 2(b) of Air (Prevention and control of pollution) Act, 1981 '**air pollution**' has been defined as **'the presence in the atmosphere of any air pollutant**.'

As per Section 2(a) of Air (Prevention and control of pollution) Act, 1981 '**air pollutant**' has been defined as **'any solid, liquid or gaseous substance [(including noise)] present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment**

4.2 Air Quality Index:

An **Air Quality Index (AQI)** is a number used by government agencies to measure the **air pollution** levels and communicate it to the population. As the AQI increases, it means that a large percentage of the population will experience severe adverse health effects. The measurement of the **AQI** requires an **air monitor** and an **air pollutant** concentration over a specified **averaging period**.

We present herewith following important Parameters.

1. AQI- Air Quality Index
2. PM-2.5- Particulate Matter of Size 2.5 micron
3. PM-10- Particulate Matter of Size 10 micron

Table No 8: Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	156	77	81
2	Minimum	109	56	61

CHAPTER V
STUDY OF INDOOR COMFORT CONDITION PARAMETERS

In this Chapter, we present the various Indoor Comfort Parameters measured during the Audit. The Parameters include:

1. Temperature
2. Humidity
3. Lux Level
4. Noise Level.

Table No 9: Study of Indoor Comfort Condition Parameters:

No	Parameter/Value	Temperature, ^{0}C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	39	36	319	60
2	Minimum	34	35	156	40

CHAPTER VI
STUDY OF WASTE MANAGEMENT

6.1 Solid Waste Management:

The recyclable waste, like paper waste is handed over to authorized waste collecting agent for further recycling.

Photograph of Waste Collection Bins:



6.2 Organic Waste Management:

The Bio degradable waste like leafy waste is composted in a Vermi composting Plant.

Photograph of Vermi Composting Plant:



6.3 E-Waste Management: The E-Waste is disposed of through Authorized Agency.

Photograph of E-Waste Collection Bin:



6.4 Recommendation:

It is recommended to make necessary arrangement for disposal of Laboratory Liquid Chemical Waste.

CHAPTER-VII
STUDY OF RAIN WATER HARVESTING

The College has implemented the Rain Water Harvesting Project. The College has installed Pipes from the terrace and the Rain water falling on the terrace is gathered and is used to increase the underground water level.

Photograph of Rain water Harvesting Pipe Section:



Photograph of Rain water Harvesting Storage Pond Section:



CHAPTER-VIII
STUDY OF ENVIRONMENT FRIENDLY INITIATIVES

8.1 Internal Tree Plantation:

The College has well maintained landscaped garden in the campus.

Photograph of Tree plantation:



8.2 Provision of Sanitary Waste Incinerator:

For disposal of Sanitary Waste, a Sanitary Waste Incinerator is installed in the campus.

Photograph of Sanitary Waste Incinerator:



8.3 Creation of Awareness about Ban on Plastic:

The College has displayed posters emphasizing on importance of Plastic Ban.

Photograph of Poster on Ban on Plastic:



8.4 Tree Plantation:

Tree plantation event was organized in the campus.

Photograph of Tree Plantation in the Campus;



ANNEXURE-I:
VARIOUS AIR QUALITY, WATER QUALITY, NOISE & INDOOR COMFORT STANDARDS:

1. Category Wise Air Quality Index Values & Concentration of PM 2.5 & PM10:

No	Category	AQI Value	Concentration Range, PM 2.5	Concentration Range, PM 10
1	Good	0 to 50	0 to 30	0 to 50
2	Satisfactory	51 to 100	31 to 60	51 to 100
3	Moderately Polluted	101 to 200	61 to 90	101 to 250
4	Poor	201 to 300	91 to 120	251 to 350
5	Very Poor	301 to 400	121 to 250	351 to 430
6	Severe	401 to 500	250 +	430 +

2. Recommended Water Quality Standards:

No	Designated Best Use	Criteria
1	Drinking Water Source without conventional Treatment but after disinfection	pH between **6.5 to 8.5** Dissolved Oxygen **6 mg/l or more**
2	Drinking water source after conventional treatment and disinfection	pH between **6 to 9** Dissolved Oxygen **4 mg/l or more**
3	Outdoor Bathing (Organized)	pH between **6.5 to 8.5** Dissolved Oxygen **5 mg/l or more**
4	Controlled Waste Disposal	pH between **6 to 8.5**

3. Recommended Noise Level Standards:

No	Location	Noise Level dB
1	Auditoriums	20-25
2	Outdoor Playground	55
3	Occupied Class Room	40-45
4	Un occupied Class Room	35
5	Apartment, Homes	35-40
6	Offices	45-50
7	Libraries	35-40
8	Restaurants	50-55

4. Thermal Comfort Conditions: For Non-conditioned Buildings:

No	Parameter	Value
1	Temperature	Less Than 33^0 C
2	Humidity	Less Than 70%