JULY 9TH, 2023

A REPORT ON GREEN AUDIT IN PRAMATHESH BARUA COLLEGE

SUBMITTED TO THE PRINCIPAL PRAMATHESH BARUA COLLEGE, GAURIPUR, DHUBRI (ASSAM)



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1. INTRODUCTION:

The faster economic development and industrialization leads to several environmental and ecological crisis. Use of fossil fuel and de-forestation are the major reason of climate change. To address this issue, it becomes very essential to adopt the green initiative by all the stakeholders of the society and the role of higher educational institutions is more prevalent.

Pramathesh Barua College takes initiative to contribute in sustainable development goals by reducing a significant amount of Green House Gas (GHG) from the atmosphere. As a part of this initiative, the "Green Audit" of the college campus becoming the primary important for self-assessment of the institution which reflects the role of the college in mitigating the present environmental problems.

Green Audit is an effective tool to formulate a culture of sustainability by implementing it through systematic identification, quantification, documentation, reporting and monitoring of environmentally important components. Green audit will also help in preserving the rich floral and faunal diversity in and around the campus.

2. **OBJECTIVE**:

The idea of the green audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in the college campus. The main objectives of Green Audit are:

- Land use analysis of Pramathesh Barua college.
- Tree diversity of the college campus.
- Faunal diversity of the college campus.
- Weather data of the college.
- Soil properties of the college campus
- Water analysis of the college.
- Waste disposal of college.
- Transportation of the college.
- Electrical power consumption of the college

• Green initiative carried out by the college.

3. BENEFITS OF GREEN AUDIT:

- Better environmental practices of the institute.
- More efficient resource management.
- Benchmarking for environmental conservation initiatives.
- To create a green campus.
- Better waste management through reduction of waste generation and recycling.
- To create plastic free campus and create health consciousness among all the stakeholders of the college.
- Enhance the awareness for environmental conservation guidelines and duties.
- Cost saving methods through better resource management.
- Developing an environmental ethics and value systems among the students and other stakeholders.
- Develop a valuable tool to monitor the environmental and sustainable development of the college.
- Improvement of overall college profile.

4. METHODOLOGY ADOPTED FOR GREEN AUDIT

The methodology adopted to perform the entire Green Audit exercise includes: collection of data, physical inspection of the campus, observation and review of the documentation, data analysis and reporting.

Step 1 – Data Collection

Data collection was performed by using different tools such as observation, measurements and communicating with responsible persons of the college.

Following steps were taken for data collection:

- The audit team visited each building and department, library, canteen, open space, gardens of the campus and information was collected by interviewing with the responsible person.
- Land use data of the college has been collected.

- The energy data such as monthly electricity consumption and fuel consumption was collected from the officials and analyzed.
- Waste management facility such as waste bins, vermi-compost unit etc. has been visited, other waste disposal process adopted by the college has been discussed and noted.
- All flora and fauna found in the college campus has been identified and listed out.
- Water quality, soil property of the campus has been measured.

Step 2 - Campus tour and physical inspection

The audit team conducted campus tour on 24th June 2023 to collect the data.

Step 3 - Document review and verification

Available facility documentation is reviewed with facility representatives. This documentation review includes data related to-

- Land use pattern of the college.
- Geographical location with campus.
- Flora and faunal diversity of the college campus.
- Water analysis of the college.
- Waste management of college.
- Transportation of the college.
- Energy consumption and conservation measures taken by the college.
- Expenditure on green initiative during the last five years.

Step 4 – Key parameter measurement and testing

- Water test of the college
- Soil property test of the college

Step 5 - Data Analysis

- Analysis of land use land cover data.
- Weather data analysis (Average ambient temperature and humidity analysis)
- Energy consumption data analysis (Electricity and fuel consumption data)
- Water test report analysis.

Step 6 - Prepare a Report Summarizing Audit Findings

The results of our findings are summarized in this report. The report includes a description of the college campus including different facilities. The energy and environmental conservation initiatives already taken by the college authority has been mentioned in the report.

Also, the necessary observation and requirements to fulfill the green campus. Discussion of all major energy consuming systems and their operation. The report incorporates a summary of all the activities and effort performed in past few years to conserve environment and energy within the campus or outside. The report also includes the activities performed by the college authorities along with the local communities for awareness generation and community participation towards better environmental practices to address the present environmental challenges.

5. **DESCRIPTION OF THE COLLEGE CAMPUS**

The Pramathesh Barua College was established in 1964 pertaining an eco-friendly environment. The college has four campuses- main college campus, two girl's hostel campuses and a boy's hostel campus (Lalji campus). All the campus is located in Gauripur town of Dhubri District Assam.

At present the college has multiple buildings which covers administration, classrooms, computer centre, library etc. The college also has canteen and the playground, open greenery space with vegetation and trees.



Figure 1: Google Earth image of Pramathesh Barua College

6. LAND USE ANALYSIS:

Geographical location:

Pramathesh Barua College is situated in Dhubri district of Assam. The geographical location of the college is 26.0916° N, 89.9655° E. The total area of the college is 16,511.22 sq mtr comprising 4,495.04 sq mtr total buildup area and the remaining area is green plantation area except passage and footpath area. The college campus area consists of numbers of buildings with Assam type buildings and RCC buildings along with the green vegetation area and trees.

7. WEATHER DATA OF THE COLLEGE CAMPUS

The ambient air temperature and relative humidity data were obtained from the NASA website (https://power.larc.nasa.gov/data-access-viewer/)

The NASA data are satellite-retrieved; its parameters are computed on a daily average basis using NASA/GEWEX surface radiation budget model. The model considers the effect of cloud cover and local atmospheric conditions. Compared to BSRN (Baseline Surface Radiation Network) sites the NASA data showed high accuracy with Bias (less than 0.12) and RMSE (Root Mean Square Error) (less than 18%). BSRN sites are the most accurate approved ground sites.

The below table shows the monthly average air temperature and relative humidity of Pramathesh Barua College campus from July 2022 to June 2023. It has been observed that the average air temperature of the campus is ranging between 14.19°C to 27.76°C whereas the average relative humidity of the campus varies from to 39.25 % to 79.81%.

Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Maximum Air												
Temp (°C)	31.13	30.88	29.33	29.12	23.66	20.44	20.54	22.85	25.86	30.43	31.98	32.61
Minimum Air												
Temp (°C)	27.76	27.66	26.70	21.69	19.20	14.41	14.19	17.01	21.11	22.40	26.80	27.59
Average Air												
Temp (°C)	29.00	29.07	27.64	25.41	21.43	18.45	16.77	20.12	23.95	27.69	29.22	29.90
	Table 1	: Month	ıly Tem _l	peratur	e variat	ion of P	ramath	esh Bar	ua Colle	ege		

Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Max RH (%)	92.44	89.69	92.44	93.75	87.19	86.50	86.62	75.75	83.06	79.06	80.62	92.31
Min RH (%)	79.81	78.38	79.44	77.00	71.62	70.00	56.25	48.88	43.44	39.25	40.25	58.00
Avg RH (%)				85.90							63.83	78.76
Table 2: Monthly Relative Humidity variation of Pramathesh Barua College												

8. WATER QUALITY OF THE COLLEGE CAMPUS

Water quality testing is an important task of green audit as it identifies contaminants and avoids water borne diseases. Pramathesh Barua College uses ground water for their daily needs. Water is being used in the campus as drinking water, used in washrooms and for gardening and other purposes. Therefore, it is very important to test the water to ensure the quality to use for all purposes. Water used for drinking is filtered by using water purifier systeminstalled in different locations of academic buildings. Cleaning of the water filter is carried out on regular basis to ensure the better quality of drinking water.





Figure 2: Water Purifier installed in the campus

Drinking water indicators:

The following is a list of indicators often measured to identify the quality.

- Alkalinity
- Color of water
- PH Value
- Taste and odor
- Dissolved metals and salts (sodium, chloride, potassium, calcium, manganese, magnesium)
- Microorganisms such as fecal coliform bacteria (Escherichia coli),
 Cryptosporidium, and Giardia lamblia; see Bacteriological water analysis
- Dissolved metals and metalloids (lead, mercury, arsenic, etc.)
- Dissolved organics: colored dissolved organic matter (CDOM), dissolved organic carbon (DOC)
- Heavy metals

9. AIR QUALITY OF THE COLLEGE CAMPUS

Air pollution which is majorly caused due to the combustion of fossil fuel become a concern in all over the world. The degradation of air quality impacts the human health. To identify the air quality, measurement of major pollutant concentrator was carried out during the audit. Particulate Matter (PM), Carbon di oxide (CO_2) and Formaldehyde (HCHO) concentration along with ambient air temperature and relative humidity has been measured. Particulate Matter (PM) consists of various mixtures of suspended particles in the air. Particulate Matter (PM) is mainly produced by various natural and anthropogenic activities. However, the significant sources of this pollutant are factories, thermal power plants, motor vehicles, construction activities, forest fires, and natural windblown dust. Particulate Matter (PM) specifically PM_{10} and $PM_{2.5}$ significantly causes a wide variety of respiratory, cardiovascular, and pulmonary diseases.

The test was conducted with the help of air quality meter Temtop-M 2000. This instrument is sensitive to the size of particles of aerodynamic diameter of 2.5 μ m and 10 μ m. These range is assumed as the most important for affecting the health of people. All the pollutant concentrations were recorded for 60 seconds in the memory of the

instrument, which further downloaded and analyzed. Indoor and outdoor readings of $PM_{2.5}$, PM_{10} , CO_2 and HCHO were recorded.

Below table shows the measured parameters as mentioned above.

Sl.	Puilding/Plock	Measurement	PM _{2.5}	PM ₁₀	CO_2	НСНО
No	Building/Block	duration	$(\mu m/m^3)$	$(\mu m/m^3)$	(ppm)	(mg/m^3)
1	Assam Type Building	60 Sec	43.5	61.5	452	0.054
2	RUSA Building	60 Sec	55.2	79.7	430	0.049
3	Administrative building	60 Sec	41.7	60.7	443	0.052
4	Auditorium	60 Sec	37.6	53.3	411	0.029
5	RCC building (G+1)	60 Sec	43.2	59.7	442	0.045
6	RCC building (G+2)	60 Sec	36.6	52.3	438	0.030

Table 3: Air Quality Detail

10. NOISE LEVEL OF THE CAMPUS AND SURROUNDING AREA

Under the Air (Prevention and Control of Pollution) Act, 1981, noise is considered as a pollutant. Noise mostly occurs in two major situations community noise and industrial noise. Community noise is also called environmental noise and is defined as the noise emitted from all the sources except the noise from the industrial sources. As far as community noise is concerned the WHO guidelines recommend less than 35 dB(A) in classrooms which is important for good teaching and learning conditions. The noise level monitoring was carried out to assess the equivalent noise level (Leq) around the Pramathesh Barua College campus. The test was carried out for 60 min in each location and the maximum, minimum and the average noise level readings were recorded. The noise monitoring was carried out at the 4 different locations within the campus. Below table shows the measured noise level in the campus.

Sl.	Building/Block	Measurement	
No	Dunuing/ block	duration (in Sec)	Average (dB)
1	Assam Type Building	60 Sec	26
2	RUSA Building	60 Sec	38
3	Administrative building	60 Sec	54
4	Auditorium	60 Sec	28
5	RCC building (G+1)	60 Sec	29
6	RCC building (G+2)	60 Sec	21

Table 4: Noise level test in different locations

From the data obtained Table 6, it was observed that the ambient noise levels in certain locations found as slightly beyond the prescribed standard limit during testing period. The exceeding of maximum permissible limits in these areas can be attributed to the noise emerging from vehicular movements through nearby roads. Although the noise level in most of the location were found as slightly on higher side, the same is permissible by keeping in mind to minimize as much as possible and not allowed to exceed the limit. As per WHO noise quality guidelines, noise level values are summarized with regard to specific environments and effects. For each environment and situation, the guideline values take into consideration the identified health effects and are set, based on the lowest levels of noise that affect health (critical health effect).

		Standard li	mits as per WHO		
Specific Environment	Time Base	guidelines			
	(hours)	LAeq [dB]	LAmax, fast [dB]		
Outdoor living area	16	50 - 55	-		
Dwelling, indoors, Inside	16	35	-		
bedrooms	8	30	45		
Outside bedrooms	8	45	60		
School class rooms and pre-	During class	35	-		
schools, indoors					
Pre-school bedrooms,	Sleeping time	30	45		
indoors					
School, playground outdoor	During play	55	-		
Hospital, ward rooms,	8	30	40 -		

indoors	16	30	
Hospitals, treatment rooms,	-	As low as	-
indoors		possible	
Industrial, commercial,	24	70	110
shopping and traffic areas,			
indoors and outdoors			
Ceremonies, festivals and	4	100	110
entertainment events			
Public addresses, indoors	1	85	110
and outdoors			
Music through	1	85 (under	110
headphones/earphones		headphones,	
		adapted to free-	
		field values)	
Impulse sounds from toys,	-	-	120-140 (peak
fireworks and firearms			sound pressure
			(not LAmax, fast),
			measured 100 mm
			from the ear)
Outdoors in parkland and	-	Existing quiet	
conservation areas		outdoor areas	
		should b e	
		preserved and	
		the ratio of	
		intruding noise	
		to natural	
		background	
		sound should	
		be kept low	

Table 5: Standard limit of noise level as per WHO guidelines

11. TREE DIVERSITY OF THE COLLEGE CAMPUS

The college campus area is vastly diverse with a variety of tree species. These tree species are the integral part of the college. Most of these tree species are planted by the college authority through various tree plantation programs conducted in different periods of time. These plants have increased the quality of life by providing oxygen, improving air quality, climate amelioration, conservation of water, preserving soil, and supporting wildlife. The impact of these plants is not only with in the college fraternity but also the people surrounding the college. They contribute the environment by moderating the effects of the sun, rain and wind and by absorbing and filtering the sun's radiant energy, keeping the campus cool in summer. Many spices of birds are dependent on these trees mainly for food and shelter. Thus, the college campus has been playing a significant role in maintaining the environment of the entire area.

The study was carried out in the entire college campus to identify the various tree species belonging to different families are found in the campus. The following are the tree species found in the college campus.

Sl.			
NO	Name of the Plant Species	Family	Common Name
1	Cedrus deodara	Pinaceae	Devadaru
2	Phyllanthus emblica	Phyllanthaceae	Amlokhi
3	Dypsis lutescens	Arecaceae	Areca Palm
4	Mangifera indica	Anacardiaceae	Mango
5	Cascabela thevetia	Apocynaceae	Karabi
6	Hyophorbe lagenicaulis	Arecaceae	Bottle Palm
7	Caesalpinia pulcherrima	Fabaceae	Radhachura
8	Callistemon sp.	Myrtaceae	Bottle Brush Tree
9	Dalbergi asissoo	Fabaceae	Sisu
10	Delonix regia	Fabaceae	Krishnachura
11	Gmelina arborea	Verbenaceae	Gomari
12	Lagerstroemia speciosa	Lythraceae	Ajar Tree
13	Mesua ferrea	Calophyllaceae	Nahor

14 Mimusops elengi

Sapotaceae

Bakul

Table 6: Tree Diversity of College Campus

12. FAUNAL DIVERSITY OF THE CAMPUS

The faunal diversity of the college has been studied and listed as below-

Animal Group: Aves

Local Name: Common Myna

Scientific Name: Acridotheres Tristis

Local Name: House Crow

Scientific Name: Corvus Splendens

Local Name: House Sparrow

Scientific Name: Passer Domesticus

Local Name: Red-Vented Bulbul

Scientific Name: *Pycnonotus Cafer*

Local Name: Common tailor bird

Scientific Name: Orthotomussutorius

Local Name: Spotted dove

Scientific Name: Streptopelia chinensis

Local Name: Koel

Scientific Name: Eudynamysscolopaceus

Local Name: Jungle babbler

Scientific Name: *Argya striata*

Local Name: Black Crowned Night Heron

Scientific Name: Noicticoraxnycticorax

Local Name: Small Blue Kingfisher

Scientific Name: Alcedo atthis

Local Name: Great Egret

Scientific Name: Ardea alba

Animal Group: Reptilia

Local Name: Tejpia

Scientific Name: Chamaeleo sp.

Local Name: Common house gecko

Scientific Name: Hemidactylus frenatus

Animal Group: Amphibia

Local Name: Asian Common Toad

Scientific Name: Duttaphrynusmelanostictus

Local Name: Snail

Scientific Name: Achatina fulica.

Animal Group: Anthropoda

Local Name: Dragonfly

Scientific Name: Anax indicus

Local Name: Grasshopper

Scientific Name: Tettigoniaviridissima

Local Name: Honey Bee

Scientific Name: Apis florae

Local Name: Indian Cabbage White

Scientific Name: Pieris canidia

Local Name: Mottled Emigrant

Scientific Name: Catopsilia pyranthe

Local Name: Oriental Striped Tiger butterfly

Scientific Name: Danaus Genutia

Table 7: Faunal Diversity of Pramathesh Barua College

13. WASTE DISPOSAL OF THE COLLEGE

The activity and actions required to manage the waste from beginning to the final disposal is called as waste disposal process. The activities include the collection of waste, transportation, treatment and disposal of waste considering waste management process. At present the biodegradable waste are decomposed within the college campus, non-biodegradable waste such as single used plastics are burned out periodically. E-waste is generally kept in the store room. On the other hand, the wet waste such as vegetable, excess food is taken by the local vendor.

14.1 SOLID WASTE MANAGEMENT:

The college administration kept waste bins in suitable location of the building from where cleaning staffs take the wastes. From these waste bins, wastes are dumped in

a designated placeto decomposeregularly. There are different types of waste generated within the campus. Out of these some of the major wastes are as paper waste, organic waste, e-waste etc.

Separation of bio degradable waste and non-biodegradable waste is one of the major tasks of solid waste management. Pramathesh Barua College practices the separation of these two types of waste by keeping different waste bins for different waste. Biodegradable waste is taken to generate organic fertilizer through vermicomposting unit within the campus which are further used in the gardens as organic manure.





Figure 3: Waste collection bins of the College

14.2LIQUID WASTE MANAGEMENT:

Liquid waste is generated from hostels and canteen.

Liquid wastes generated by the College are of two types:

- 1. Sewage waste
- 2. Canteen effluent.

The liquid wastes are mainly drained. The college does not have any sewage treatment plant yet.

14.3 E-WASTE MANAGEMENT:

Pramathesh Barua College follows suitable mechanism to dispose E-wastes generated from various sources. E-wastes are generated from computer laboratories, academic and administrative offices. The E-waste includes out of order equipment's or obsolete items like laboratory instruments, electronic circuits, computer desktops or different computer components, laptops and accessories, printer and cartridges, charging cables, Wi-fi devices and cables, CCTV components, sound systems, display units, UPS and battery, biometric machine, scientific instruments etc. All these wastes which cannot be reused or recycled is being disposed through authorized vendors.

15.ELECTRICAL POWER CONSUMPTION AND ENERGY CONSERVATION INITIATIVES

Energy consumption in different forms has been continuously rising almost in all the sectors- agriculture, industry, transport, commercial, residential (domestic) and educational institutions. This has increased the dependency on fossil fuels and electricity. Therefore, energy efficiency improvement and possible energy conservation became a necessary objective for energy consumers. The Government of India enacted the Energy Conservation Act, 2001 in October 2001. The Energy Conservation Act, 2001 became effective from 1st March, 2002. The Act provides for institutionalizing and strengthening delivery mechanism for energy efficiency programs in the country and provides a framework for the much-needed coordination between various Government entities.

The following Tables show the basic information about the building and the utilities.

Sl. No	Basic Building Data	Value
1	Connected Load/Contract Demand	
	College campus	6 kW
	Consumer Number: 47000002912	

	 New girl's hostel campus 	14 kW
	Consumer Number: 47010105073	
	Old girl's hostel campus	1 kW
	Consumer Number: 47000014080	
	Boy's hostel campus	1 kW
	Consumer Number: 47010116203	
2	Diesel Generator set availability	25 kVA (1 No)
		Make: Mahindra Powerol
		Model: 25 kVA 1PH 3385
		TCI GM-C2
		15 kVA (1 No)
		Make: Kirloskar Oil Engines
		Ltd.
		Model: KG-15AS1-C
3	Electricity consumption (June' 2022 to April'	
	2023)	
	College campus	14,911.00 kWh
	Consumer Number: 47000002912	
	 New girl's hostel campus 	4,571.00 kWh
	Consumer Number: 47010105073	
	 Old girl's hostel campus 	2,074.00 kWh
	Consumer Number: 47000014080	
	Boy's hostel campus	835.00 kWh
	Consumer Number: 47010116203	
4	Cost of electricity consumption (June' 2022 to	
	April' 2023)	
	College campus	₹ 1,20,572.00
	Consumer Number: 47000002912	
	 New girl's hostel campus 	₹ 56,346.00
	Consumer Number: 47010105073	
	 Old girl's hostel campus 	₹ 17,014.00
	Consumer Number: 47000014080	

	Boy's hostel campus	₹ 7,542.00
	Consumer Number: 47010116203	
4.1	Diesel consumed	399.53 Ltr
	Cost of electricity consumption through DG set.	₹ 35,500.00
4.2	Total cost of electricity (Utility+DG set)	Rs. 2,36,974.00
5	Total Numbers of building covered	10 Nos
5.1	Working hours (Academic and Administration	8 Hrs(9 AM to 5PM)
	building)	
5.2	Working hours (Hostel building)	24 Hr x7 days
5.3	Working Days/week	6 Days
6	Whether sub-metering of electricity	No
	consumption for each building	

Table 8: Basic building Description

16. PRESENT ENERGY SCENARIO

16.1 ANALYSIS OF ELECTRICITY BILL OF PRAMATHESH BARUA COLLEGE.

At present the overall energy consumption is catered by the electricity supply from Assam Power Distribution Company Limited. The college has four numbers of electrical connections with consumer numbers and connected load mentioned in the table number 1.

16.2 ENERGY CONSUMPTION.

The total electricity consumption from June' 2022 to April' 2023 was 22,391.00 kWh and the total bill paid to distribution companies was ₹ 2,01,474.00

Monthly electricity consumption(kWh) and electricity bill (Rs.) paid from June'2022 to April' 2023 has shown in figures below.

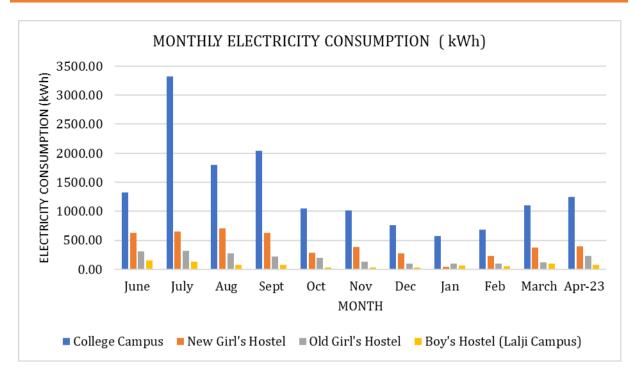


Figure 4: Monthly Electricity Consumption (June' 2022 to April 2023)

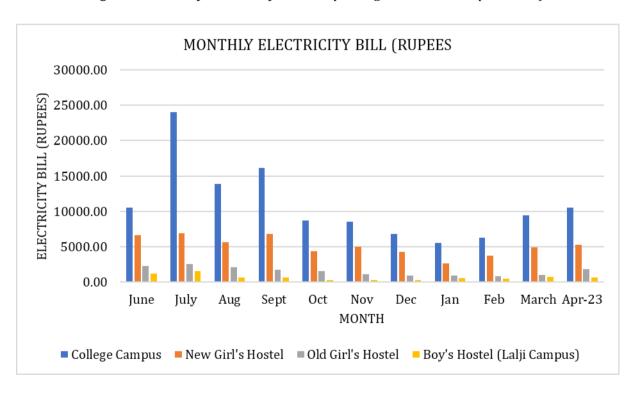


Figure 5: Monthly Electricity Bill (June 2022 to April 2023)

17. RENEWABLE ENERGY INTEGRATION IN THE CAMPUS

There was no evidence of energy generation form renewable energy sources, therefore it is recommended to install and generate energy from renewable sources, which will reduce the annual energy cost. This will also help to protect the environment as these energy sources are clean.

18. ROUTINE GREEN PRACTICES

• World Environment Day Celebration:

The Pramathesh Barua College celebrates world environment day every year through a participatory event not only within the barrier of college campus but also along with the local community. Awareness campaign was organized on various environmental issues along with tree plantation within and outside the campus were carried out during the day.

• Reducing the use of Paper:

The college administration adopts the concept of utilization of paper as less as possible. Practices like, re-use of one-sided paper for notes, sketches, rough work, rough printouts, etc.; cashless transactions, and utilizing multi user printer at central administrative locations of the Institute office also aims at reducing the use of papers.

Usage of bicycles and public transport:

The college administration always promotes the use of bicycles among the staff and students. Hostellers are discouraged from having two wheelers/cars. Three-wheeler E-Rikshaw are one of the sustainable transports adopted by the students and other staff.

• Installation of signboard and posters:

To create an awareness among all the stakeholders of the college and to initiate the behavioral change towards the sustainable environmental practices the college administration has already took initiatives to install posters, stickers and signboards. It is expected that this may reduce the wastage of resources.

19. SOME OF THE GREEN INITIATIVE CONDUCTED BY THE COLLEGE.

Tree plantation drive









Fit India freedom run and cleaning drive on 14th August 2021





Celebration of world environment day on 5th June 2020



