



Certificate No: 22EEGQ75

## CERTIFICATE

*This is to certify that*

### **M/s Madhav Institute of Technology & Science Gwalior (M.P) India 474005**

*has been assessed by us for the green practices implemented at the institute in order to meet the requirement of*

### **Green Audit**

*The green initiatives taken by the institute have been verified in the submitted report and found to be satisfactory.*

*The efforts taken by the administration to mitigate the institute's carbon footprint are highly appreciated and commendable.*



**Rajdeep Pandey**  
For Enviraj Consulting Pvt. Ltd.

**Enviraj Consulting Pvt. Ltd.**

# **GREEN AUDIT REPORT**

**(2021-2022)**



**Madhav Institute of Technology & Science**  
**Gwalior**

**Submitted by:**



**Enviraj Consulting Private Limited**

**(An ISO 14001:2015 Certified Company)**

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**July, 2022**

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## **Executive Summary**

This green audit aims to analyse green practices within the campus and a detailed account of the carbon footprint arising from the Institute internal operations in terms of carbon dioxide "equivalent" or CO<sub>2</sub>e. This can assist the institute in comparing actions to get a sense of scale and the environmental effects of its activities and operations.

During the audit, various carbon emission sources were identified and emissions from each source were determined. Further, the carbon sequestration from the plants and green projects was evaluated and net emissions were calculated.

The institute's gross carbon emissions for fiscal year 2021-22 are estimated to be 357.33 tonnes. Approximately 90.4 percent of gross emissions are attributed to electrical consumption, 6.7 percent to DG sets, and 2.9 percent to LPG consumption and transportation, respectively. Whereas carbon sequestration from trees and solar energy export can offset the 78 tonnes of emissions. The net emissions of the institute are estimated to be 278 tonnes.

### **1. Introduction**

Climate Change is the defining issue of our time and we are at a defining moment. From shifting weather patterns that threaten food production, to rising sea levels that increase the risk of catastrophic flooding, the impacts of climate change are global in scope and unprecedented in scale.

With the rise in global population, economies, and living standards, the amount of greenhouse gases (GHGs) in the atmosphere has reached record levels, resulting in global warming and climate change. To address this, governments and organizations around the world are pledging to achieve net-zero emissions of greenhouse gases.

Government of India has launched a National Action Plan on Climate Change (NAPCC) outlining multiple National Missions on climate change, involving various stakeholders.

Educational institutions are the key stakeholders that plays an influential role in local and national level policymaking by informing society through research and educating graduates. It sets ground for imparting responsible perspectives to the young minds who act as successful incubators for innovation, from which many sustainability initiatives originate.

In this context, Madhav Institute of Science and Technology, Gwalior has been responsible and responsive to implementing green practises on campus, such as solar power, tree planting, rain water harvesting, solid waste management, and energy conservation.

To improve the efficacy and impact of green practises as well as to meet with NAAC Criteria 7; Institutional Values and Best Practices, the Institution has undergone the Green Audit. A green audit evaluates an organization's environmental impacts in terms of carbon footprint, while also suggests the ways to reduce it through resource conservation and effective resource utilisation, and raising environmental awareness.

## **About Institute**

Madhav Institute of Technology & Science (MITS), Gwalior was established in 1957 by His Highness Sir Jiwaji Rao Scindia, Maharaja, of the erstwhile state of Gwalior under open door policy of Govt. of India. The foundation stone of the institute was laid by the then President Dr. Rajendra Prasad, on 20th October, 1956 and the building was inaugurated by President Dr. S. Radhakrishnan on 11th December, 1964.

The institute is affiliated to RGPV, Bhopal but has academic autonomy since 2002 to run courses of its choice. Recently the institute has been granted autonomy by UGC,

New Delhi for a period of 6 years w.e.f July 2017. The institute is also accredited by the National Assessment and Accreditation Council (NAAC) for 5 years from September 2017. Many of the programmes are accredited by the National Board of Accreditation (NBA).

The institute has a lush green environment conscious campus of around 44.6 acres which also includes 'Madhav-Van' a small teak wood forest where a large variety of birds can be sighted. The Institute offers 11 Bachelors, 18 Masters and Doctoral Degrees Programmes in Engineering and Technology. The Institute is a recognized Quality Improvement Programme (QIP) Centre for PG and Ph.D programs. The prime objective of the institute is to provide quality technical education at undergraduate and postgraduate levels.



## 2. Objectives of the Audit

The objectives of green audit are:

- Identify key emission sources of GHG in the institute

- Compute Scope 1 & Scope 2 emissions
- Record plant diversity in the campus and assess the carbon sequestration potential
- Evaluate the carbon credits from the green projects (i.e., solar power plant)
- Estimate the gross and net emissions and provide recommendations on reducing carbon footprint of the Institute

### 3. Methodology

The methodology adopted for this audit was a three-step process comprising of:

- 1. Data collection:** In this phase, exhaustive data collection was performed using different tools such as observation, survey communicating with responsible persons and measurements. Following steps were taken for data collection:
  - Site Visit
  - Data about the carbon emission sources, plants diversity was collected by observation and interview.
  - Electricity bills, solar power generation, LPG consumption data was collected from the responsible persons.
- 2. Data Analysis** - The carbon footprint analysis based on the international standard (*A Corporate Accounting and Reporting Standard*) was done for gross and net emissions estimation.
- 3. Findings & Recommendations** – On the basis data analysis results and site observations, steps for mitigating carbon footprint were recommended.

### 4. Findings and Recommendations

#### 4.1 Carbon emissions

For GHG accounting and reporting purposes, Carbon emissions are typically divided into three scopes:



- Scopes 1 emissions are direct emissions occur from sources that are owned or controlled by the organization.
- Scope 2 are indirect emissions due to electricity import.
- Scope 3 covers other indirect emissions that are a consequence of the activities of the organization, but occur from sources not owned or controlled by it.

However, because of data limitations and the lack of a consistent standard for measuring Scope 3 emissions, this report is solely based on Scope 1 and scope 2 emissions.

#### 4.1.1 Scope 1 Emissions

##### i. Diesel Generators

The institute is equipped with three diesel generators for the electricity backup.

S.N	DG Capacity	Run Time (FY21-22)	Watt Generated	Diesel Consumed (litres)	Annual Emissions (Tonnes)
1	250 KVA	115.5	23,100	6295	16.87
2	150 KVA	81.17	9,740	2598	6.96
3	25 KVA	0	0	0	0
<b>Total</b>			<b>32,840</b>	<b>8,893</b>	<b>23.83*</b>

\*Diesel produces 2.68 kgs of CO2 per litre burnt.

##### ii. Transportation

From the observation, two categories of vehicles that ply at the roads of the institute are: sedans and motorcycles. Data collection and subsequent analysis were done based on these categories. Due to unavailability of outside vehicle data, only vehicles domiciled on the campus, were considered in this report.

The following assumptions were made while estimating carbon emissions from the vehicles.

- All vehicles entering the campus use the main entrance gate.

- The average distance covered by each vehicle is 2.4 kilometres: this is the measured to and fro distance between the main gate to the hostel Buildings.
- Due to lockdowns the college was not physically open for the students. Therefore, the total working days in the FY 2021-22 is considered 60 days.

S.N	Vehicle Type	Nos	Emission Factor	Annual Emission
1	Motorcycles	262	0.12761kgCO <sub>2</sub> e/km (WRI, 2008)	4.81-ton CO <sub>2</sub> e
2	Sedans	105	0.23398kgCO <sub>2</sub> e/km (IPCC, 2006)	3.53-ton CO <sub>2</sub> e
Total Emissions				8.34 tonnes

### iii. LPG Consumption

The LPG is used in hostel mess and canteen for cooking purpose. The college hostel and canteens were closed in the FY2021-22 due to covid lockdowns. Therefore, there was no consumption of LPG till the February month. The one-month LPG consumption data is presented below:

Sr. No	Particulars	Observed Value	Unit
1	LPG Consumption	672	kgs
2	LPG Emission Factor	2.983	--
3	Emissions	2.0	tonnes

### 4.1.2 Scope 2 Emissions: Electricity Import

Sr. No	Particulars	Observed Value	Unit
1	Lowest consumption month (May)	24174	kWh
2	Peak consumption month (July)	51760	kWh
3	Avg. Monthly consumption	38030	kWh
4	Annual Consumption	456360	kWh
5	GHGs emission factor (India)*	0.7082	kgCO <sub>2</sub> per kWh
6	Annual emissions	323.19	tonnes

\*Climate Transparency report 2021

## 4.2 Carbon Sequestration from Trees

It is found that about 103,368 sq. (~ 42.7% of total) are under the green area, of which playgrounds, Madhav van, gardens form a significant part. The area breakup is presented in the table below:

Sr. No	Particulars	Value (Approx.)	Unit
1	Total Area	1,80,490	Sq.m
2	Garden	20,141	Sq.m
3	Playground	22,900	Sq.m
4	Tree plantation (Madhav Van	60,327	Sq.m
5	Built-up	77,122	Sq.m

The campus has over 2000 trees and 1000 shrubs, with the potential to sequester approximately 75 tonnes of CO<sub>2</sub> per year.

### 4.2.1 Plants' diversity in the Institute

Sr. No	Common Name	Botanical Name
1	Lime	Citrus × aurantiifolia
2	Guava	Psidium
3	Teak	Dalbergia sissoo
4	Snake Plant	Dracaena trifasciata
5	Thuja	Breynia Disticha
6	Acera palm	Dypsis lutescens
7	Babool	Vachellia nilotica
8	Bottle guard	Lagenaria siceraria
9	Neem	Azadirachta indica
10	Holy Basil	Ocimum tenuiflorum
11	Rose	Rosa
12	Mango	Mangifera indica
13	Amaltas	Cassia fistula
14	Gooseberry	Phyllanthus emblica
15	Hibiscus	Hibiscus
16	Asoka Chedi	Saraca asoca
17	Jackfruit	Artocarpus heterophyllus

### 4.3 Carbon credits from Solar Power plant

One carbon credit represents 1 ton of carbon emissions removed/reduced from the atmosphere resulting from a carbon-saving (green) project. A 100-kW grid-connected solar plant has been installed on campus, providing up to 20% of the total institute electricity needs. The majority of the solar power generated is used within the campus, but some is exported to the grid during non-peak hours or on weekends. Solar power generation data is shown below.

Sr. No	Particulars	Observed Value	Unit
1	Total Solar Power Generation	1,29,528	kWh
2	Consumption/usage	1,24,032	kWh
3	Net Export	5,494	kWh
4	GHGs emission factor	0.7082	kgCO <sub>2</sub> per kWh
5	Carbon credit - export (FY2021-22)	3.89	tonnes

### 4.4 Gross and net carbon emissions of an Institute

Particulars	Sources/Sink	Value	Unit
A. Scope 1 Emissions	LPG	2.00	tonnes
	DG Sets	23.80	tonnes
	Transportation	8.34	tonnes
	Total A	34.14	tonnes
B. Scope 2 Emissions	Electricity Consumption	323.19	tonnes
C. Carbon offset	Sequestration from Trees	75.00	tonnes
	Carbon credits from solar	3.89	tonnes
	Total C	78.89	tonnes
	<b>Gross Emissions (A+B)</b>	<b>357.33</b>	<b>tonnes</b>
	<b>Net Emissions (A+B-C)</b>	<b>278.44</b>	<b>tonnes</b>

## 4.5 Recommendations

- ✓ The net carbon emissions of the institute are found to be 278.44 tonnes. The most of the emissions comes from the electricity import. Therefore, it is recommended the reduction in carbon emissions can be further done by usage of energy efficient appliances, smart switches and increasing the capacity of renewable energy system.
- ✓ Bicycles shall replace motorbikes for internal commute if e-bike service is adopted in the campus.
- ✓ Emissions from outside vehicles can be included. The number of vehicles daily commuting in and out of the campus shall be determined by taking record of the numbers of each category of vehicle that enters the campus through its main entrance between 06:00 hours and 23:59 hours for three weekdays and a weekend.
- ✓ Only tree plantation in the campus is accounted in the calculation. The total plantation around the campus may have further reduced the emissions.
- ✓ CO<sub>2</sub> sequestration from the soil can also be included after getting the effective area in the campus.
- ✓ Estimating CO<sub>2</sub> credits from other green projects/practices like rainwater harvesting, composting that are already present in the campus will have further reduced emissions.

## Annexure: Photographs



AERIAL VIEW OF GREENERY IN CAMPUS



100 KW Solar Panels



DG Generator Sets

**Madhav Institute of Technology & Science, Gwalior**



# Green Audit Report



**2020-2021**

**MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE**

***GWALIOR, MADHYA PRADESH –  
474005***

# Madhav Institute of Technology & Science, Gwalior



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# Madhav Institute of Technology & Science, Gwalior



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## **1. INTRODUCTION:**

The green audit aims to analyse environmental practices within and outside the university campuses, which will have an impact on the eco-friendly atmosphere. Green audit can be defined as systematic identification, quantification, recording, reporting and analysis of components of university environment. It was initiated with the motive of inspecting the effort within the institutions whose exercises can cause threat to the health of inhabitants and the environment. Through the green audit, a direction as how to improve the structure of environment and there are include several factors that have determined the growth of carried out the green audit.

### **1.1. NEED FOR GREEN AUDITING**

Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable. Traditionally, we are good and efficient users of natural resources. But over the period of time excess use of resources like energy, water, are become habitual for everyone especially, in common areas. Now, it is necessary to check whether our processes are consuming more than required resources? Whether we are handling resources carefully? Green audit regulates all such practices and gives an efficient way of natural resource utilization. In the era of climate change and resource depletion it is necessary to verify the processes and convert it in to green and clean one. Green audit provides an approach for it. It also increases overall consciousness among the people working in institution towards an environment.

### **1.2. GOALS OF GREEN AUDIT**

Institute has conducted a green audit with specific goals as:

1. Identification and documentation of green practices followed by university.
2. Identify strength and weakness in green practices.
3. Analyze and suggest solution for problems identified.
4. Assess facility of different types of waste management.
5. Increase environmental awareness throughout campus
6. Identify and assess environmental risk.
7. Motivates staff for optimized sustainable use of available resources.
8. The long-term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issue before they become problem.



### 1.3. OBJECTIVES OF GREEN AUDIT

1. To examine the current practices, which can impact on environment such as of resource utilization, wastemanagement etc.
2. To identify and analyze significant environmental issues.
3. Setup goal, vision, and mission for Green practices in campus.
4. Establish and implement Environment Management in various departments.
5. Continuous assessment for betterment in performance in green

### 1.4. BENEFITS OF GREEN AUDIT TO EDUCATIONAL INSTITUTIONS

There are many advantages of green audit to an Educational Institute:

1. It would help to protect the environment in and around the campus.
  2. Recognize the cost saving methods through waste minimization and energy conservation.
  3. Empower the organization to frame a better environmental performance.
  4. It portrays good image of institution through its clean and green campus.
- Finally, it will help to build positive impression for through green initiatives the upcoming NAAC visit.

## 2. OBJECTIVES AND SCOPE

The broad aims/benefits of the eco-auditing system would be

- Environmental education through systematic environmental management approach
- Improving environmental standards
- Benchmarking for environmental protection initiatives
- Sustainable use of natural resource in the campus.
- Financial savings through a reduction in resource use
- Curriculum enrichment through practical experience
- Development of ownership, personal and social responsibility for the College campus and its environment
- Enhancement of College profile
- Developing an environmental ethic and value systems in young people

## 3. EXECUTIVE SUMMARY

The green audit is a snapshot in time, in which one assesses campus performance in complying with applicable environmental laws and regulations. Though a helpful benchmark, the audit almost immediately becomes outdated unless there is some mechanism in place to continue the effort of monitoring environmental compliance.

This audit report contains observations and recommendations for improvement of environmental consciousness.



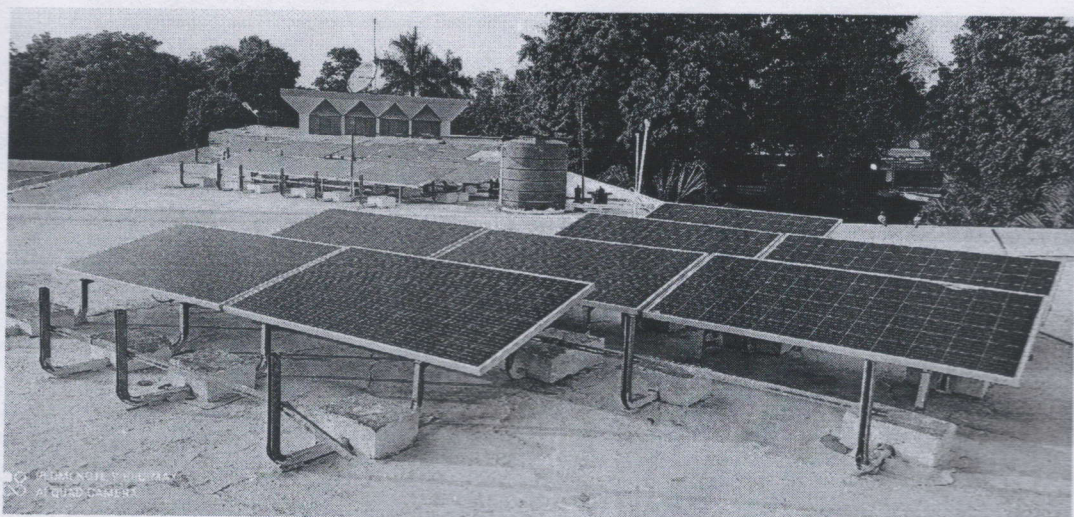
## 4. MITS INFRASTRUCTURE

### DETAILS OF TREES AND PLANTS IN CAMPUS

S.No	Botanical Name	Common Name
1	Citrus × aurantiifolia	Lime
2	Psidium	Guava
3	Dalbergia sissoo	Teak
4	Dracaena trifasciata	Snake Plant
5	Breynia Disticha	Thuja
6	Dyopsis lutescens	areca palm
7	Vachellia nilotica	Babool
8	Lagenaria siceraria	bottle gourd
9	Azadirachta indica	Neem
10	Ocimum tenuiflorum	Holy basil
11	Rosa	Rose
12	Mangifera indica	Mango
13	Cassia fistula	Amla
14	Phyllanthus emblica	Gooseberry
15	Hibiscus	Hibiscus
16	Saraca asoca	Asoka Chethi
17	Artocarpus heterophyllus	Jackfruit

### ROOF TOP SOLAR PANELS

Roof top solar panels are installed in the college building with a total capacity of 100 KW.



# Madhav Institute of Technology & Science, Gwalior



## LIBRARY

The Central Library of institute currently houses over 1,00,000 books, e-journals from Science Direct, ASME and ASCE under E-Shodh Sindhu & INFLIBNET consortium. The Institute has a high speed LAN with backbone of optical fiber and manageable switches. The institute is equipped with 100 MBPS leased line from NKN, which is providing high speed 24x7 internet facility in each nook and corner of the Institute.



## HEALTH CENTER

These centers often provide medical facilities on campus where students can receive emergency treatment and preventive care.

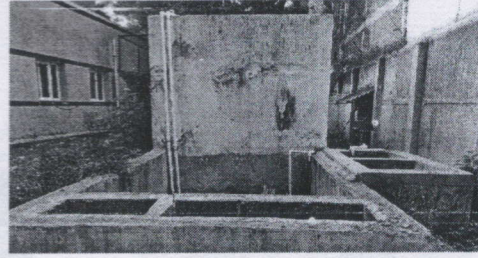
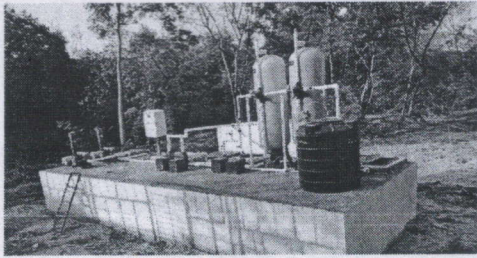


## SEWAGE TREATMENT PLANT

2 No's of Sewage Treatment Plants are installed in the College campus. The total Sewage Treatment Plant Capacity is 150 KLD.

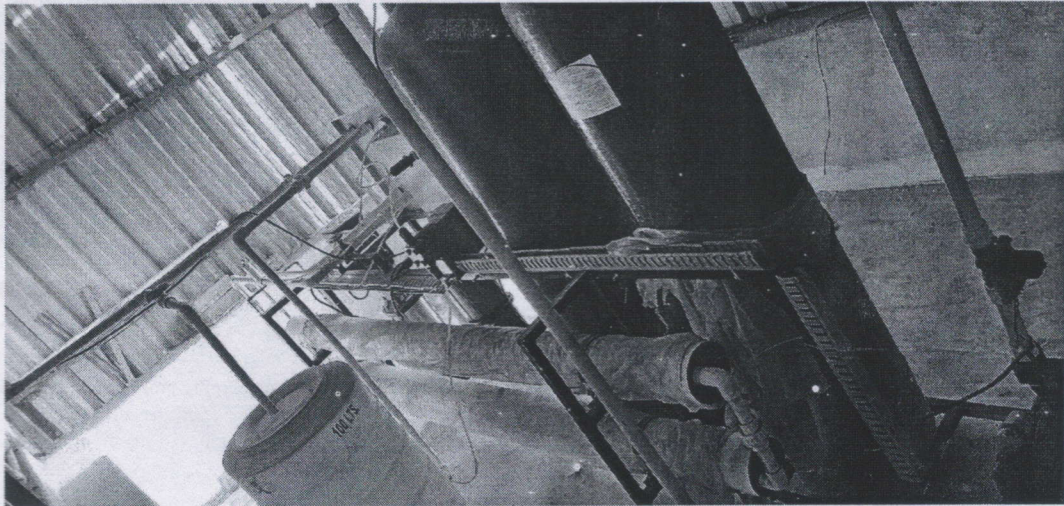
S.No	Description	Capacity in (KLD)
1	Sewage Treatment Plant – 01	100
2	Sewage Treatment Plant – 02	50

# Madhav Institute of Technology & Science, Gwalior



## RO PLANT

RO plant is provided inside the campus to supply drinking water in the campus. Two centralised commercial RO's are installed in the campus each of 1000 lit/h capacity.



# Madhav Institute of Technology & Science, Gwalior



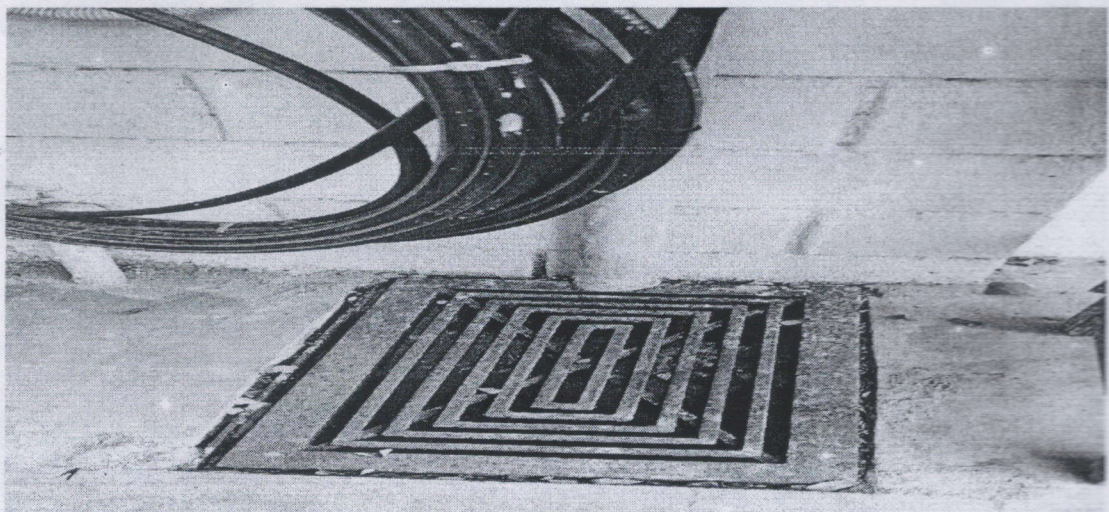
## GYMNASIUM

Open Gymnasium is provided inside the campus facility to encourage physical activity among the students and faculties.



## RAINWATER HARVESTING

The rainwater harvesting strengthens the water level of wells in the campus through ground water recharging process. Twelve rainwater harvesting units are installed each of 100 ft. depth.

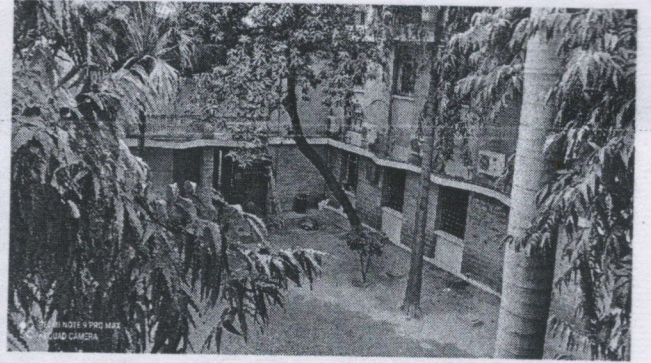
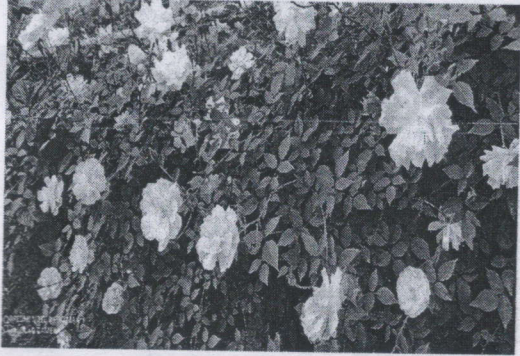




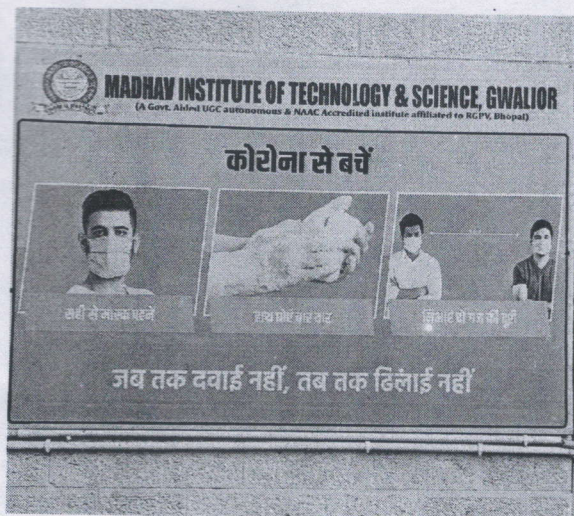
# Madhav Institute of Technology & Science, Gwalior



## VIEWS OF GREENERY

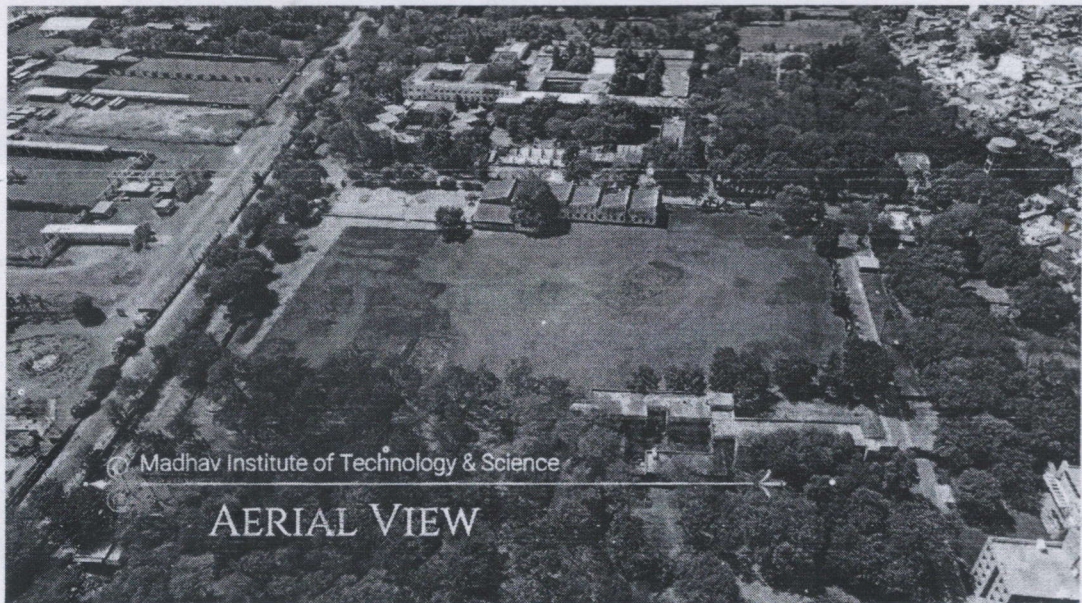


## SIGN BOARDS IN CAMPUS OF MITs



# Madhav Institute of Technology & Science, Gwalior

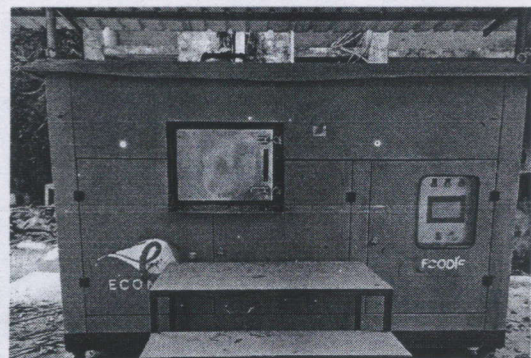




AERIAL VIEW OF GREENERY IN CAMPUS

## 5. WASTE MANAGEMENT

Due to ongoing pandemic situation, the hostels and hostel mess were remained closed for this period. Two-bin system has been implemented in the Institute to collect the biodegradable and non-biodegradable waste separately. The biodegradable waste generated is dumped into the compost plant, and the non-biodegradable waste is sold to the agency for recycling.





## E-WASTE MANAGEMENT

E-waste generated in the campus is disposed in scientific and eco-friendly manner. E-waste from college is collected and under safe disposal through the recyclers registered by the Central Pollution Control Board of Govt of India.

## 6. WATER MANAGEMENT

Water conservation is a key activity as water availability effects on the development of the campus as well as on all area of development such as farming, industries, etc. Keeping this view water conservation activity is carried out.

### SOURCES OF WATER

- Supply water from PHE
- Bore water

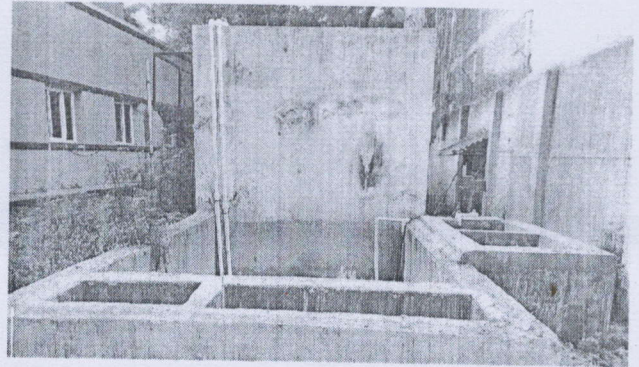
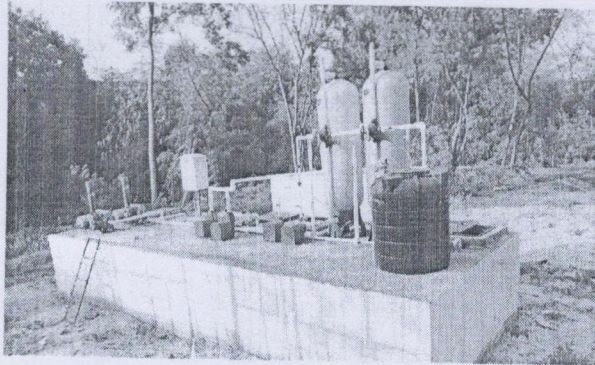
A Main source of water is Ground water is extracted to full the requirement. At present there are 6 bore wells. The college stores the water in overhead tank.

Details of bore well along with the location is given below:

S. No.	Location	Depth of Bore well
1	Between Hostel No 1 and 2	250-300 Ft
2	Hostel No 7	160 Ft
3	Hostel No 6	225 Ft
4	Cricket Ground-1	580 Ft
5	Cricket Ground-2	580 Ft
6	Director Bungalow	120 Ft

The source of wastewater is Domestic Waste Water i.e., Sewage water. The Sewage water mainly comes from Toilets of college. Two Sewage Treatment Plant was installed in the campus of capacity 100 and 50 KLD. Total sewage treatment plant capacity is 150 KLD.



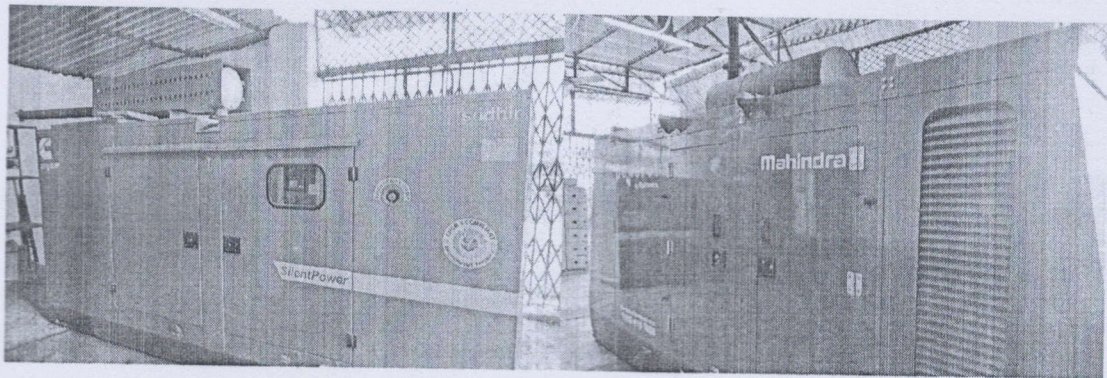


## 7. ENERGY MANAGEMENT

### DIESEL GENERATOR DETAILS

The Madhav Institute of Technology & Science has installed 3 of Diesel Generator. The following table provides the Diesel generator capacity in the college campus.

S.No	Equipment Name	Make	Capacity in (kVA)
1	Diesel Generator - 01	Mahindra	250 kVA
2	Diesel Generator - 02	Cummins	160 kVA
3	Diesel Generator - 03		25 kVA



### TRANSFORMER DETAIL

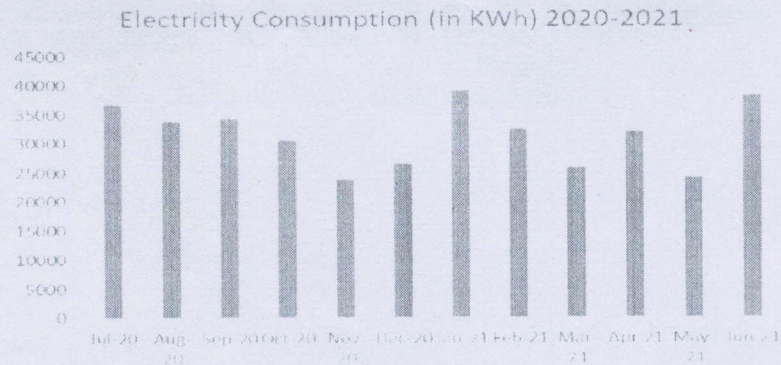
The Madhav Institute of Technology & Science has installed 2 of Transformer. The following table provides the transformer capacity in the college campus.

S.No	Equipment Name	Capacity in (kVA)
1	Transformer - 01	500
2	Transformer - 02	315



## ELECTRICITY TREND

The below graph represents the total electricity consumption trends for the year 2020 – 2021 of MITS.



## 8. SUMMARY

Green Audit is one of the important tools to check the balance of natural resources and its judicious use. Green auditing is the process of identifying and determining whether institutional practices are eco-friendly and sustainable. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area.

MITS Gwalior has conducted a "Green Audit" in the academic year 2020-2021. The main objective to carry out green audit is to check the green practices followed by MITS and to conduct a well-defined audit report to understand whether the MITS is on the track of sustainable development.

## 9. CONCLUSION

From the green audit following are the conclusions, which can be taken for improvement in the campus

1. An environmental management plan has been developed, implemented and monitored time to time at MITS Gwalior.
2. Mandatory water conservation policy e.g. conduction of water audit, Rain water Harvesting, Auto shutoff valve in overhead tanks, reuse of water after treatment etc. has been implemented in the institute
3. The institute also promote energy conservation by using LED lighting and fixtures, solar installation, Auto shutoff switches in rooms corridors and common areas.
4. All departments generate paper waste. Especially, the academic building is using one paper multiple times for printing and writing, is good practice.
5. E-waste is segregated, handled, and disposed of properly in an eco-friendly manner.
6. Reducing the use of one-time-use plastic bottles, cups, folders, pens, bouquets, decorative items will be useful to solve the problem of plastic pollution to some extent.
7. Wear Mask Signages are provided in the facility.



**10. RECOMMENDATIONS**

Following are some of the key recommendations for improving the campus environment:

- 1) A frequent visit should be conducted to ensure that the generated waste is measured, monitored, and recorded regularly and information should be made available to the administration.
- 2) The solid waste should be reused or recycled at the maximum possible places.
- 3) Install a water meter to record water usage in the college MITS premises.

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