

Email: hegjnscshushg@mp.gov.in Website: https://jnspgcollegeshujalpur.org Phone No. 07360-244358

7.1.3: Quality audits on environment and energy regularly undertaken by the Institution. The institutional environment and energy initiatives are confirmed through the following

- 1. Green audit / Environment audit
- 2. Energy audit
- 3. Clean and green campus initiatives
- 4. Beyond the campus environmental promotion activities

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JAWAHARLAL NEHRU SMRITI GOVERNMENT POST-GRADUATE COLLEGE, SHUJALPUR, DISTRICT SHAJAPUR (M.P.)

Accredited 'B' grade by NAAC

Email: hegjnscshushg@mp.gov.in

Phone No. 07360-244358



Date: 01-07-2019

Green Monitoring Committee

Green Monitoring Committee will consist of the following faculty and staff to look after the Go-Green drive in institute.

1. Chairperson - Principal

2. Secretary (Mr. D.K. Budholiya, IQAC Coordinator)

3. Faculty Representatives nominated by the Principal

Dr. ChhayaDeshmukh

- Dr. PraveenaDhariwal
- Dr. M.Y. Ansari
- Dr. B.K. Tyagi
- Mr. NemichandSankhla
- 4. Non-Teaching Staff Representative

Mr. Rajesh Saxena

5. Industry/Social Representative- Member of Alumni Association.

Mr. MahendraSitpara

The time duration for this committee is five years after which/or as per requirement the committee will be reconstituted.

1



Principal 07 19 J.N.S. Govt. PG College Shujalpur, Distt. Shajapur (M.P.)

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Policy document on Green Campus

Green Campus: A Green Campus is a place where environmental friendly practices and education works together to encourage sustainable and eco-friendly practices in the campus. The green campus concept offers an institution the opportunity to take the lead in redefining its environmental culture and developing new paradigms by creating sustainable solutions to environmental, social and economic needs of mankind.

Objectives of the Go Green Programme: The first step of the Go Green Programme involves establishing a viable Green-Campus Committee, within the organizational structure of the Institute. Hence, to give this initiative more clarity and authenticity, we now roll out a POLICYDOCUMENT spelling out the strategies, plans and other allied tasks to make this Program functional officially. We believe that greening the campus is all about sweeping away wasteful materials and using conventional sources of energies for its daily power needs, correct disposal handling, purchase of environment friendly supplies and effective recycling program. The administration of the Institute believes that everyone has to work out the time bound strategies to implement green campus initiatives. These strategies need to be incorporated into the institutional planning and budgeting processes with the aim of developing a clean and green campus. Every individual of the college campus will work, may he/she be a student, faculty and support staff to foster a culture of self-sustainability and make the entire campus environmental friendly. The Green Campus Initiatives (GCI) will enable the institution to develop the campus as a living laboratory for innovation.

1

Composition of the Go-Green Committee

1. Principal of the college- Chairperson

2. IQAC Coordinator- Secretary

3. Faculty Representatives nominated by the Principal

4. Non-Teaching Staff Representative

5. Industry/Social Representative- Member of Alumni Association.

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- Seek views of all the stakeholders to make the Go-Green Campus initiative functional throughout the year.
- Conduct the Campus environmental impacts to identify the targets for improvements.
- 3) Establish a Green Campus Environmental Ethic Awareness campaigns.
- Set forth a Green Campus Mission and a Statement of Principles.
- 5) Link Green-Campus activities to Academics in the Institute.
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- 7) Chart out a yearly planner for the Institute, local community and Stakeholders.
- 8) Develop a strategic plan and create student teams to carry out specific tasks of the strategic plan. For instance, a plan to save energy at the institute level with time bound plan to install Solar Power Station mandatorily at the top of Institute building. This will reduce the dependency on conventional electricity for power supply.
- Phase out the CFL and conventional light source such as bulbs and tube lights, halogen and mercury street/campus lights and get them replace by the LEDs.
- 10) Conduct an Annual Green, Environment and Energy Audit.
- Purchase only Energy Efficient Computers viz: "ENERGYSTAR" or any other equivalent.

- Establish public/private partnerships with personnel from federal, state, and local environmental agencies, utilities, and the business community.
- Evaluate daily operations in terms of pollution prevention, waste stream management, and energy efficiency reducing, reusing, recycling, and repairing wherever possible.
- 14) Secure a commitment up front from the people in charge that well-founded recommendations will be acted upon once audits are completed.

Promotion of "Save Energy Tips" in and outside the Institute:

- Activate power management features on your computer and monitor so that it will go into a low power "sleep" mode when you are not working on it.
- Turn off your monitor when you leave your Table.
- Activate power management features on your laser printer.
- Whenever possible, shut down rather than logging off.
- Turn off unnecessary lights and use daylight instead.
- Avoid the use of decorative lighting.
- Use LED or compact fluorescent bulbs.
- Keep lights off in conference rooms, classrooms, lecture halls when they are not in use.
- Use the fans only when they are needed.
- Unplug appliances not plugged into power strips (like TVs, Refrigerators, ACs, tea/coffeepots, printers, faxes, and chargers etc.).

Waste water Management/ Rain water harvesting: The Institute has to work in the direction of waste water management. Water flow restrictors on bathroom faucets and showers, low water flow toilets and automated urinal flushers should be used to cut down campus water use. The Institute will take all necessary measures to implement waste water management /rain water harvesting.

Major Green Campus Initiatives:

- Installation of Solar Power Station (Under process)
- Waste water Management/ Rainwater harvesting (Under process)
- Displayed poster on E-waste Management (in practice)

- Maintenance of water bodies and distribution system in the campus (in practice)
- MIS to make paperless administration (Under process)
- Plastic free Campus (in practice)
- Tree Plantation Drive (in practice)
- Cleanliness Drive (in practice)
- Landscaping and gardens (in practice)
- Use of LEDs only (in practice)
- Digital Library/ E-Learning Centre (in practice)
- Organization of sensitization programmes for the stakeholders (in practice)
- Establishment of Environment Club (in practice)
- Periodic Energy, Environment and Green Audit (in practice)
- Restricted entry of automobiles (in practice)
- No Vehicle Day observed (Proposed)

The Institute will make all the necessary efforts to involve the students, faculty and staff in "Green Campus Initiatives" by designating the volunteers of Environment Club, NSS & NCC cadets, printing T-shirts/ Caps with green campus initiative slogan specially designed for the purpose.



College

J.N.S. Governo Conege Shujalpur, Distt. Shajapur (M.P.)

4



Empirical Exergy Private Limited

Registered Office: 18-E, Sudama Nagar, Indore -452009 Office (Indore): Flat No. 201, Om Apartment, 214 Indrapuri, Indore (M.P.), Contact: +91-731-4948831, Mobile: +91-78693-27256, 88713-68108 <u>www.eeplgroups.com</u>, email:-<u>eempirical18@gmail.com</u> CIN No: U74999MP2018PTC045751

Ref No: EEPL/2022-23/C65

Date: - 27-10-2022

GREEN AUDIT CERTIFICATE

This is certified that Empirical Exergy Private Limited (EEPL) Indore M.P. has conducted green audit at Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.) for the Assessment Year 2021-22 and audit report has been submitted.

We avail this opportunity to express our deep and sincere gratitude to the management for their wholehearted support and co-operations during the green audit.

This certificate is being issued on the basis of the Green Audit conducted by EEPL.



Rajesh Kumar Singadiya (Director)

M.Tech (Energy Management), PhD (Research Scholar) Accredited Energy Auditor [AEA-0284] Certified Energy Auditor [CEA-7271] (BEE, Ministry of Power, Govt. of India) Empanelled Energy Auditor with MPUVN, Bhopal M.P. Lead Auditor ISO50001:2011 [EnMS) from FICCI, Delhi Certified Water Auditor (NPC, Govt of India) Charted Engineer [M-1699118], The Institution of Engineers (India) Member of ISHRAE [58150]





Green Audit Report CONSULTATION



Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur M.P.

PREPARED BY

EMPIRICAL EXERGY PRIVATE LIMITED

Flat No. 201, OM Apartment,214 Indrapuri Colony, Bhawarkuan, Indore – 452 001 (M. P.), India 0731-4948831, 7869327256 Email ID:eempirical18@gmail.com <u>www.eeplgroups.com</u> (Assessment Year 2021-22)





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ACKNOWLEDGEMENT

Empirical Exergy Private Limited (EEPL), Indore takes this opportunity to appreciate & thank the management of **Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.)** for giving us an opportunity to conduct green audit for the college.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.



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Certificate of Accreditation







Green Monitoring Committee







Policy Document on Green Campus

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G College Shujalour, Distt. Shajapur (M.P.)





Audit Team

The study team constituted of the following senior technical executives from **Empirical**

Exergy Private Limited,

- **4** Mr. Rakesh Pathak, [Director & Electrical Expert]
- **4** Mr. Rajesh Kumar Singadiya [Director & Accredited Energy Auditor AEA-0284]
- **4** Mrs. Laxmi Raikwar Singadiya [Energy Engineer]
- **4** Mr. Sachin Kumawat [Sr. Project Engineer]
- **4** Mr. Ajay Nahra [Engineer]
- **4** Mr. Charchit Pathak [Mechanical Engineer]
- **4** Mr. Aakash Kumawat [Assistant Jr. Engineer]





EXECUTIVE SUMMARY

Green Initiative Taken by College

- College has initiative in the field of biological control method in which one organism eat to other so they use Gambusia (larvavorus) fish to eat mosquito larva.
- College has also participated initiative to save birds campaign so that's reason they bring pots on trees for bird's drink water.

4 CAMPAIGN OF PLANTATION AND GREEN CAMPUS:

College has around 4914 trees in the campus. Its good initiative taken by management for green campus under the campaign of plantation. It's APPRECIABLE.

Audit Recommendation

4 SOLID WASTE MANAGEMENT:

- The basic principle of good waste management practice is based on the concept of 3R namely Reduce, Recycle, and Reuse. All the degradable and non-degradable waste material arecollected and processed in environmentally friendly way in the college campus.
- Biodegradable and non-biodegradable: Waste materials are collected with help of different coloured single dustbin system in the campus.

4 QR CODE SYSTEM ON TREE

While the world seems to be going digital, people lack of time to read books and process the information they contain. Hence, College can provide QR codes on the trees for its information and to exploit the rapidly growing platform for a unique purpose.

4 AIR MONITORING SYSTEM: -

Installation of "Cloud based (IoT based) Air Quality monitoring system in the Campus" tomonitor air quality index for college campus

Green Audit report prepared by EEPL, Indore, M.P.





CHAPTER-1 INTRODUCTION

1.1 About College

Jawaharlal Nehru Smriti Govt. P.G. College is situated on the city - Mandi Road, Shujalpur at a distance of 2 kms. from Shujalpur Railway Station, on the Kannod - Pachore highway. This place is lying at a distance of 80 kms. from Bhopal, the state capital; 70 kms. from Shajapur, its district headquarters; 100 kms. from Ujjain, the holy city, which is its divisional headquarters. It is 130 kms. away from Indore, the commercial capital of Madhya Pradesh. The nearest airport is at Bhopal.

Shujalpur falls under 'Malwa' region and the local dialect is malvi. Before the inception of the college higher education facilities for the students of the region were confined to cities like Bhopal, Indore, and Ujjain all of which are at a distance of more than 80 kms. From this place. The college started functioning on 1st August, 1964. It was founded by a trust called Mahavidyalaya Sthapna Samiti, Shujalpur under the chairmanship of Shri Liladhar Joshi, the erstwhile Chief Minister of 'Central India.' The college was successfully run by the Samiti for seven years with three faculties – Arts, Science and Commerce. LLB Course was opened in 1968. Later on, considering the place of its development and also its growth potential, the college was taken over by the state government on 22nd february 1971. Further, taking into account its student strength and the local demand for higher studies, the college was given the status of a PG college in the year 1997 with eight PG Courses – Five in Arts stream, two in Science, and one in Commerce. Presently it is running a total of six UG and thirteen PG programmes.

The college has all the potential for further development which is amply visible from the fact that there has been a steady growth in the student strength in the college, particularly in the last fifteen years. In spite of the mushrooming of private colleges in the area, the graph of the enrolment figure has consistently shown an upward trend. In the academic year 2020-21 the enrolment figure stands 5163. Since the college is the premier institution for higher education in the locality, and all the district headquarters are at a distance of 50 to 100 kms., the student strength of the college is expected to be constantly on the rise in the years to come. The projected student strength by 2027 is approximately 8000. The college administration is continuously striving to create enough infrastructural space in terms of classrooms, laboratories, library space, and sports facilities in order to cope with the projected student strength.





The college, as the Vision and Mission statements indicate, mostly caters to the higher educational needs of the rural backward student community. The percentage of female students (54.84), SC students (24.07) and that of the students from OBC (53.45) enrolled in the college are higher than the national average. The college, therefore, mainly focuses on the development of the student community from these sections of the society.

J.N.S. Govt. College, Shujalpur, got accredited by NAAC. The NAAC assessment took place in December, 2015 and the college was awarded "B" grade with a CGPA of 2.36.

COLLEGE FACILITIES

- ↓ Library.
- **4** Experienced Faculty.
- Use of computer & projector for teaching.
- **Well lighted & ventilated classrooms.**
- **4** Purified Drinking water.
- ↓ Toilets for Staff & Students.
- ↓ Common room for girls.
- Staff room
- Ramps & Railing.
- **Well-equipped Laboratories.**
- Various Scholarships.
- \rm Sports
- Faculty.
- Eco-friendly environment.
- Hostel





Our Vision

To strive towards turning the college into a leading centre for higher education offering a blend of general and professional courses with a view to producing employable and entrepreneurial graduates, while ensuring social and gender equity as well as developing environmental consciousness.

Our Mission

- To provide maximum opportunities for employment to the students belonging to socially and economically backward communities.
- To open up need-based and modern avenues of higher education with consistently good quality.
- **4** To ensure women empowerment in the areas of employment /entrepreneurship.
- To inculcate in the students a feeling of national pride, moral values, and gender sensitivity.

1.2About Green Auditing

Eco campus is concepts implemented in many educational institutions, all over the worldto make them sustainable because of their mass resource utilization and waste discharge in to the environment.

Green audit means to identify opportunities to sustainable development practices, enhance environmental quality, improve health, hygiene and safety, reduce liabilities achieve values of virtue. Green audit also provides a basis for calculating the economic benefits of resource conservation projects by establishing the current rates of resource use and their associated costs.

Green auditing of **"Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.)**" enables to assess the life style, action and its impact on the environment. This green audit was mainly focused on greening indicators like utilisation of green energy (solar energy) and optimum use of secondary energy sources (petrol and diesel) in the College campus, vegetation, and carbon foot print of the campus etc. The aim of green auditing is to help the institution to apply sustainable development practices and to set examples before the community and young.





Objectives of Green Auditing

The general objective of green audit is to prepare a baseline report on "Biodiversity" and alternative energy sources (solar energy), measures to mitigate resource wastage and improve sustainable practices.

The specific objectives are:

- 4 To suggest measures to make the College campus biodiversity rich
- To demarcate areas within the institute campus which have potential for restoration of biodiversity
- To make recommendations for the conservation, protection and rejuvenation of the natural vegetation and animal life by involving students and faculty members
- **4** To inculcate values of sustainable development practices through green audit mechanism.
- **4** Providing a database for corrective actions and future plans.
- To identify the gap areas and suggest recommendations to improve the green campus status of the college.

1.3 Target Areas of Green Auditing

Green audit forms part of a resource management process. Although they are individual events, the real value of green audit is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time.

Eco-campus concept mainly focuses on the efficient use of energy and water; minimize waste generation or pollution and also economic efficiency. Target areas included in this green auditing is biodiversity, green energy and carbon foot print.





1.4 Audits for Biodiversity

India is mega-biodiversity hottest hot-spot in the world with tremendous diversity in plants and animals. Such biotic forms are endemic to the different bio-geographic habitats in urban and in forest areas of the country as well. Biodiversity is defined as genetic, species and ecosystem diversity, which offers variability and therefore added values to bio-resources.

The most serious and rapidly accelerating of all the global environmental problems is the loss of biodiversity through deforestation and biodiversity cover depletion. Over the past 300 years, many species of organisms, including mammals, birds, butterflies and plants, have been lost due to many anthropogenic activities. In one year, a single mature tree will absorb up to 48 pounds of carbon dioxide from the atmosphere, and release it as oxygen.

1.5 Audit of Green Energy

According to the **Environmental Protection Agency** (**EPA**), green energy provides the highest environmental benefit and includes power produced by solar, wind, geothermal, biogas, low-impact hydroelectric, and certain eligible biomass sources. Green energy can also reduce your carbon footprint and achieve a sustainable lifestyle.







Layout of College



Green Audit report prepared by EEPL, Indore, M.P.







CHAPTER- 2 GREEN CAMPUS & SUSTAINABLE DEVELOPMENT

2.1 Green Audit

At present college has **4914 trees** in the campus. This is good initiative taken by management for green campus under the campaign of plantation.

In the survey, the focus has been given to the assessment of the present status of plants and trees on the college campus and efforts made by the college authorities for nature conservation.







Green Campus







2.2 List of plants in college campus

| Sr. No. | Name of Tree | Qty. |
|---------|---------------|------|
| 1 | Semal | 25 |
| 2 | Ashok | 50 |
| 3 | Kadam | 100 |
| 4 | Jangali Kadam | 5 |
| 5 | Baas | 800 |
| 6 | Karanj | 100 |
| 7 | Jamun Vatika | 805 |
| 8 | Gulmohar | 50 |
| 9 | Chameli | 10 |
| 10 | Raatrani | 25 |
| 11 | Champa | 40 |
| 12 | Kaijurena | 60 |
| 13 | Chandani | 40 |
| 14 | Kaner | 105 |
| 15 | Seesam | 100 |
| 16 | Amaltas | 45 |
| 17 | Gudhal | 150 |
| 18 | Palash | 320 |
| 19 | Babul | 400 |
| 20 | Bargad | 10 |
| 21 | Peepal | 15 |
| 22 | Khajur | 20 |
| 23 | Paam | 80 |
| 24 | Neem | 50 |
| 25 | Kumudani | 10 |
| 26 | Gular | 5 |
| 27 | Vishnuchakra | 4 |
| 28 | Rudraksh | 5 |
| 29 | Saami | 10 |
| 30 | Belpatra | 10 |
| 31 | Mango | 20 |
| 32 | Jaamphal | 55 |
| 33 | Satpakhi | 30 |
| 34 | Booganbeliya | 100 |
| 35 | Cactus | 60 |
| 36 | Shikhakai | 2 |
| 37 | Naag Champa | 50 |





| Sr. No. | Name of Tree | Qty. |
|---------|-----------------|------|
| 38 | Table Paam | 20 |
| 39 | Metha Neem | 5 |
| 40 | Bechandi | 3 |
| 41 | Giloy | 300 |
| 42 | Anwla | 53 |
| 43 | Moolshree | 5 |
| 44 | Bakayan | 10 |
| 45 | Madar | 10 |
| 46 | Gulab | 100 |
| 47 | Arbi | 5 |
| 48 | Badam | 20 |
| 49 | Faix | 30 |
| 50 | Paras peepal | 5 |
| 51 | Sagwan | 50 |
| 52 | Arjun | 25 |
| 53 | Mahua | 20 |
| 54 | Kachnar | 30 |
| 55 | Sarkas | 10 |
| 56 | Nariyal | 5 |
| 57 | Papita | 10 |
| 58 | Berry | 50 |
| 59 | Nakshtra Vatika | 27 |
| 60 | Navgraha Vatika | 9 |
| 61 | Herbal Garden | 150 |
| 62 | Satavar | 20 |
| 63 | Waterlilly | 20 |
| 64 | Aparjita | 5 |
| 65 | Dresina | 5 |
| 66 | Table Paam | 5 |
| 67 | Euphobion | 10 |
| 68 | Sycus | 10 |
| 69 | Christmas tree | 10 |
| 70 | Paan | 2 |
| 71 | Money Plant | 5 |
| 72 | Proton | 3 |
| 73 | Vajradanti | 10 |
| 74 | Arandi | 10 |
| 75 | Sitafal | 10 |





| Sr. No. | Name of Tree | Qty. | | | | |
|---------|--------------|------|--|--|--|--|
| 76 | Kela | 2 | | | | |
| 77 | Paras peepal | 5 | | | | |
| 78 | Khamir | 2 | | | | |
| 79 | Doomar | 2 | | | | |
| 80 | Papita | 4 | | | | |
| 81 | FoxtelPalm | 40 | | | | |
| 82 | Canacorpus | 11 | | | | |
| 83 | Bagnakhi | 5 | | | | |
| | Total | | | | | |

At present college has **4914 trees** in the campus. This is good initiative taken by management for green campus under the campaign of plantation.





Glimpse of some appreciable initiative by the college







गाईन में किया पौधारोपण alignment of the state of the state of the second states of the second s the and three is the only the seat interaction ing the प्रिकारणुः वायरस्थान् संस्था भाग काम व नवाया गया. प्रायम्प्रीय स्वावित्रमा सार्वनियस्थन को लगाय गणा उद्यान मनिति के प्रायम्प्रीय के पशिव्य व्यतिकास कि निर्देशन में निर्देशन परित्र किया सार्वन में परिवर्तना किया गया उस्त नवीत्रियम् के आपता पर मन्द्रवियालय जनान इस व्यतिकारण के प्रायम हीं, सार्वेक जुमार सार्थ उपरिचत रहे। कार्यांच पीतारोगम चार सार्थी की in arreston of othe court, , the second of t त्राक चना वा आम दरम्या हो अनेग भारत्या हो मुक्का विवय औ जनग तुम्बा वजाति यो नेतिह कम में क्वींग कुला किताल, वी क्वींग विवय मराविद्यालय का स्थान कराक उपविद्यालय का ता, करतान संगताना का स्वतं का पाइक्रान संदर्भका रहा संगतान और लोगा दिया. साथ से कर पहुंचा बा सन्दर्भ गोरान का साथ से एक सीधा जन्मर गगाने की अगीन पति साथ संगर[कार्य] अगीन की साथ हार विश्वेक प्रातीवर्ध के कार्यन गय



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Chapter-03

Carbon Foot print Analysis

3.1 About Carbon Foot Print.

Climate change is one of the greatest challenges facing nations, governments, institutions, business and mankind today.

Carbon footprint is a measure of the impact your activities have on the amount of carbon dioxide (CO_2) produced through the burning of fossil fuels and is expressed as a weight of CO_2 emissions produced in tonnes.

We focus on consumption in each of our five major categories: housing, travel, food, products and services. In addition to these we also estimate the share of national emissions over which we have little control, government purchases and capital investment.

For simplicity and clarity all our calculations follow one basic method. We multiply a use input by an emissions factor to calculate each footprint. All use inputs are per individual and include things like fuel use, distance, calorie consumption and expenditure. Working out your inputs is a matter of estimating them from your home, travel, diet and spending behaviour.

Although working out our inputs can take some investigation on your part the much more challenging aspect of carbon calculations is estimating the appropriate emissions factor to use in your calculation. Where possible you want this emissions factor to account for as much of the relevant life cycle as possible.

We all have a carbon footprint...







3.2 Methodology and Scope

The carbon footprint gives a general overview of the College greenhouse gas emissions, converted into CO₂ -equivalents and it is based on reported data from internal and external systems. The purposes of the carbon indicators are to measure the carbon intensity per unit of product, in addition to showing environmental transparency towards external stakeholders. The carbon footprint reporting approach undertaken in this study follows the guidelines and principles set out in the "Greenhouse Gas Protocol Corporate Accounting and Reporting Standard" (hereafter referred to as the GHG Protocol) developed by the Greenhouse Gas Protocol Initiative and international standard for the quantification and reporting of greenhouse gas emissions -ISO 14064. This is the most widely used and accepted methodology for conducting corporate carbon footprints. The study has assessed carbon emissions from the College Campus. This involves accounting for, and reporting on, the GHG emissions from all those activities for which the company is directly responsible. The items quantified in this study are as classified under the ISO 14064 standards: The report calculates the greenhouse gas emissions from the College. This includes electricity, as well as emission associated with diesel consumption in the institute vehicle. The emission associated with air travel, waste generation, administration, and marketing related activities has been excluded from the current study. Emissions from business activities are generally classified as scope 1, 2 or 3 areas classified under the ISO 14064 standards.

3.3 Carbon emission from electricity

Direct emissions factors are widely published and show the amount of emissions produced by power stations in order to produce an average kilowatt-hour within that grid region Unlike with other energy sources the carbon intensity of electricity varies greatly depending on how it is produced and transmitted. For most of us, the electricity we use comes from the grid and is produced from a wide variety of sources. Although working out the carbon intensity of this mix is difficult, most of the work is generally done for us.

Electricity used in the site is the significant contributors towards GHGs emission from the unit. Electricity used onsite is the most direct, and typically the most significant, a contributor to a unit's carbon footprint. Thus, using an average fuel mix of generating electricity, carbon dioxide intensity of electricity for national grid is assumed to be 0.9613 KgCO2/Kwh





(Reference: Central Electricity Authority (CEA) Baseline Carbon Dioxide Emission data http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/database_11.zip).

Electricity is purchased from the grid

Table 3.1 Electricity purchased from the grid and Emissions from the electricity Import

| Sr. no. | Year | Total unit Consumption by AVVNL | Unit | Emission Factor kg CO ² e/kWh | Emission ton CO ² e/year |
|------------|---------|---------------------------------------|------|------------------------------------------------|----------------------------------------|
| 1 | 2021-22 | 18,248 | kWh | 0.9613 | 17.54 |
| | Total | | | Total | 17.54 |

Observation :-

Total Co2 Emission by indirectly from electricity is 17.54 Ton CO²e/year in 2021-22

3.4 Biomass Calculation and CO² Sequestration of the Trees: -

1. Estimation of above ground biomass (AGB)

 $K = 34.4703 - 8.0671D + 0.6589 \ D^2$

Where = K is above ground biomass.

D is Breast height diameter in (cm)

- 2. Estimation of below ground biomass (BGD) $BGB = AGB \ x \ 0.15$
- 3. Total Biomass (TB) TB = AGB + BGB
- 4. Calculation of carbon dioxide Weight sequestered in the tree in kg. $C = W \; x \; 0.50$
- 5. Calculate the weight of Co2 Sequestered in the tree per year in kg.Co2 = C x 3.666

Where: -

AGB = Above ground biomass. D = Diameter of tree breast height BGB = Below Ground Biomass. C = Carbon TB = Total Biomass





3.5 Biomass Calculation of Trees

| Sr. no. | Tree Name | Botanical and Family Name | Average Diameter CM (25 to 100) | AGB | BGB | Total | Carbon Storage | Amount of Co2 Sequestered | Total | Total Amount of Co2 Sequestered | Annually Co2 Sequestered amount (Ton/year) |
|------------|------------------|--------------------------------|-------------------------------------------|-------|------|-------|-------------------|---------------------------------|-------|------------------------------------------|--------------------------------------------------------|
| 1 | Semal | Bombax ceiba | 18 | 109.2 | 16.4 | 125.6 | 62.8 | 230.2 | 25 | 5756 | 0.08 |
| 2 | Ashok | Saraca asoca | 22 | 185.6 | 27.8 | 213.4 | 106.7 | 391.2 | 50 | 19560 | 0.27 |
| 3 | Kadam | Neolamarckia cadamba | 24 | 231.9 | 34.8 | 266.7 | 133.3 | 488.9 | 100 | 48885 | 0.67 |
| 4 | Jangali Kadam | Neolamarckia cadamba | 26 | 283.7 | 42.5 | 326.2 | 163.1 | 598.0 | 5 | 2990 | 0.04 |
| 5 | Baas | Bambusa vulgaris | 12 | 35.4 | 5.3 | 40.7 | 20.4 | 74.7 | 800 | 59744 | 0.81 |
| 6 | Karanj | Pongamia pinnata | 14 | 54.6 | 8.2 | 62.8 | 31.4 | 115.1 | 100 | 11509 | 0.16 |
| 7 | Jamun | Syzygium cumini | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 800 | 243999 | 3.33 |
| 8 | Gulmohar | Delonix regia | 16 | 79.2 | 11.9 | 91.1 | 45.5 | 166.9 | 50 | 8347 | 0.11 |
| 9 | Chameli | Jasminum | 18 | 109.2 | 16.4 | 125.6 | 62.8 | 230.2 | 10 | 2302 | 0.03 |
| 10 | Raatrani | Cestrum nocturnum | 12 | 35.4 | 5.3 | 40.7 | 20.4 | 74.7 | 25 | 1867 | 0.03 |
| 11 | Champa | Plumeria Alba | 10 | 21.7 | 3.3 | 24.9 | 12.5 | 45.7 | 40 | 1829 | 0.02 |
| 12 | Kaijurena | | 10 | 21.7 | 3.3 | 24.9 | 12.5 | 45.7 | 60 | 2743 | 0.04 |
| 13 | Chandani | Tabernaemontan a Divaricata | 8 | 13.4 | 2.0 | 15.4 | 7.7 | 28.2 | 40 | 1128 | 0.02 |
| 14 | Kaner | Nerium indicum | 28 | 340.9 | 51.1 | 392.0 | 196.0 | 718.5 | 100 | 71850 | 0.98 |

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| Sr. no. | Tree Name | Botanical and Family Name | Average Diameter CM (25 to 100) | AGB | BGB | Total | Carbon Storage | Amount of Co2 Sequestered | Total | Total Amount of Co2 Sequestered | Annually Co2 Sequestered amount (Ton/year) |
|------------|------------------|--------------------------------|-------------------------------------------|-------|------|-------|-------------------|---------------------------------|-------|------------------------------------------|--------------------------------------------------------|
| 15 | Seesam | Sesamum | 18 | 109.2 | 16.4 | 125.6 | 62.8 | 230.2 | 100 | 23025 | 0.31 |
| 16 | Amaltas | Cassia Fastula | 28 | 340.9 | 51 1 | 392.0 | 196.0 | 718 5 | 40 | 28740 | 0.31 |
| 17 | Gudhal | Hibiscus rosa- sinensis | 24 | 231.9 | 34.8 | 266.7 | 133.3 | 488.9 | 150 | 73328 | 1.00 |
| 18 | Palash | Butea monosperma | 18 | 109.2 | 16.4 | 125.6 | 62.8 | 230.2 | 300 | 69074 | 0.94 |
| 19 | Babul | Vachellia Nilotica | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 400 | 122000 | 1.66 |
| 20 | Bargad | Ficus benghalensis | 22 | 185.6 | 27.8 | 213.4 | 106.7 | 391.2 | 10 | 3912 | 0.05 |
| 21 | Peepal | Ficus religiosa | 22 | 185.6 | 27.8 | 213.4 | 106.7 | 391.2 | 15 | 5868 | 0.08 |
| 22 | Khajur | Phoenix dactylifera | 16 | 79.2 | 11.9 | 91.1 | 45.5 | 166.9 | 20 | 3339 | 0.05 |
| 23 | Paam | Archontophoeni x alexandrae | 24 | 231.9 | 34.8 | 266.7 | 133.3 | 488.9 | 80 | 39108 | 0.53 |
| 24 | Neem | Azadirachta indica | 19 | 126.3 | 18.9 | 145.2 | 72.6 | 266.2 | 50 | 13310 | 0.18 |
| 25 | Kumudani | Nymphoides cristata | 18 | 109.2 | 16.4 | 125.6 | 62.8 | 230.2 | 10 | 2302 | 0.03 |
| 26 | Gular | Ficus Racemosa | 12 | 35.4 | 5.3 | 40.7 | 20.4 | 74.7 | 5 | 373 | 0.01 |
| 27 | Vishnucha kra | Evolvulus alsinoides | 10 | 21.7 | 3.3 | 24.9 | 12.5 | 45.7 | 4 | 183 | 0.00 |

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| Sr. no. | Tree Name | Botanical and Family Name | Average Diameter CM (25 to 100) | AGB | BGB | Total | Carbon Storage | Amount of Co2 Sequestered | Total | Total Amount of Co2 Sequestered | Annually Co2 Sequestered amount (Ton/year) |
|------------|------------------|---------------------------------------|-------------------------------------------|-------|------|-------|-------------------|---------------------------------|-------|------------------------------------------|--------------------------------------------------------|
| 28 | Rudraksh | Elaeocarpus Ganitrus Roxb | 28 | 340.9 | 51.1 | 392.0 | 196.0 | 718.5 | 5 | 3592 | 0.05 |
| 29 | Saami | Acacia spigera | 14 | 54.6 | 8.2 | 62.8 | 31.4 | 115.1 | 10 | 1151 | 0.02 |
| 30 | Belpatra | Aegle marmelos | 22 | 185.6 | 27.8 | 213.4 | 106.7 | 391.2 | 10 | 3912 | 0.05 |
| 31 | Mango | Mangifera indica | 18 | 109.2 | 16.4 | 125.6 | 62.8 | 230.2 | 20 | 4605 | 0.06 |
| 32 | Jaamphal | Psidium guajava | 15 | 66.2 | 9.9 | 76.2 | 38.1 | 139.6 | 50 | 6979 | 0.10 |
| 33 | Satpakhi | Saptaparna (Alstonia scholaris) | 16 | 79.2 | 11.9 | 91.1 | 45.5 | 166.9 | 30 | 5008 | 0.07 |
| 34 | Booganbel iya | Nyctaginaceae | 12 | 35.4 | 5.3 | 40.7 | 20.4 | 74.7 | 100 | 7468 | 0.10 |
| 35 | Cactus | Opuntia Opuntia | 10 | 21.7 | 3.3 | 24.9 | 12.5 | 45.7 | 50 | 2286 | 0.03 |
| 36 | Shikhakai | Acacia concinna | 12 | 35.4 | 5.3 | 40.7 | 20.4 | 74.7 | 2 | 149 | 0.00 |
| 37 | Naag Champa | Mesua ferrea | 22 | 185.6 | 27.8 | 213.4 | 106.7 | 391.2 | 50 | 19560 | 0.27 |
| 38 | Table Paam | Livistona rotundifolia | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 20 | 6100 | 0.08 |
| 39 | Metha Neem | Murraya koenigii | 16 | 79.2 | 11.9 | 91.1 | 45.5 | 166.9 | 5 | 835 | 0.01 |
| 40 | Bechandi | Acacia arabicae | 14 | 54.6 | 8.2 | 62.8 | 31.4 | 115.1 | 3 | 345 | 0.00 |

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| Sr. no. | Tree Name | Botanical and Family Name | Average Diameter CM (25 to 100) | AGB | BGB | Total | Carbon Storage | Amount of Co2 Sequestered | Total | Total Amount of Co2 Sequestered | Annually Co2 Sequestered amount (Ton/year) |
|------------|-----------------|-------------------------------|-------------------------------------------|-------|------|-------|-------------------|---------------------------------|-------|------------------------------------------|--------------------------------------------------------|
| 41 | Giloy | Tinospora cordifolia | 10 | 21.7 | 3.3 | 24.9 | 12.5 | 45.7 | 300 | 13716 | 0.19 |
| 42 | Anwla | Phyllanthus emblica | 16 | 79.2 | 11.9 | 91.1 | 45.5 | 166.9 | 50 | 8347 | 0.11 |
| 43 | Moolshree | Mimusops elengi | 4 | 13.1 | 2.0 | 15.0 | 7.5 | 27.5 | 5 | 138 | 0.00 |
| 44 | Bakayan | Ficus benghalensis | 12 | 35.4 | 5.3 | 40.7 | 20.4 | 74.7 | 10 | 747 | 0.01 |
| 45 | Madar | Calotropis Gigantea (Linn) | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 10 | 3050 | 0.04 |
| 46 | Gulab | Persian | 10 | 21.7 | 3.3 | 24.9 | 12.5 | 45.7 | 100 | 4572 | 0.06 |
| 47 | Arbi | Colocasia esculenta | 8 | 13.4 | 2.0 | 15.4 | 7.7 | 28.2 | 5 | 141 | 0.00 |
| 48 | Badam | Terminalia Catappa | 22 | 185.6 | 27.8 | 213.4 | 106.7 | 391.2 | 20 | 7824 | 0.11 |
| 49 | Faix | Ficus | 26 | 283.7 | 42.5 | 326.2 | 163.1 | 598.0 | 30 | 17939 | 0.24 |
| 50 | Paras peepal | Thespesia Populnea | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 5 | 1525 | 0.02 |
| 51 | Sagwan | Tectona grandis | 24 | 231.9 | 34.8 | 266.7 | 133.3 | 488.9 | 50 | 24443 | 0.33 |
| 52 | Arjun | Terminalia arjuna | 28 | 340.9 | 51.1 | 392.0 | 196.0 | 718.5 | 25 | 17962 | 0.24 |
| 53 | Mahua | Madhuca longifolia | 18 | 109.2 | 16.4 | 125.6 | 62.8 | 230.2 | 20 | 4605 | 0.06 |

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| Sr. no. | Tree Name | Botanical and Family Name | Average Diameter CM (25 to 100) | AGB | BGB | Total | Carbon Storage | Amount of Co2 Sequestered | Total | Total Amount of Co2 Sequestered | Annually Co2 Sequestered amount (Ton/year) |
|------------|--------------------------------------------|---------------------------------|-------------------------------------------|-------|------|-------|-------------------|---------------------------------|-------|------------------------------------------|--------------------------------------------------------|
| 54 | Kachnar | Bauhinia Variegata | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 30 | 9150 | 0.12 |
| 55 | Sarkas | Mary Sarkas | 23 | 208.1 | 31.2 | 239.3 | 119.6 | 438.6 | 10 | 4386 | 0.06 |
| 56 | Nariyal | Annona | 16 | 79.2 | 11.9 | 91.1 | 45.5 | 166.9 | 5 | 835 | 0.01 |
| 57 | Papita | Carica papaya | 23 | 208.1 | 31.2 | 239.3 | 119.6 | 438.6 | 10 | 4386 | 0.06 |
| 58 | Berry | Phyllanthus emblica | 12 | 35.4 | 5.3 | 40.7 | 20.4 | 74.7 | 50 | 3734 | 0.05 |
| 59 | Nakshtra Vatika | Messua ferrea Calophyllaceae | 16 | 79.2 | 11.9 | 91.1 | 45.5 | 166.9 | 27 | 4507 | 0.06 |
| 60 | Navgraha Vatika | Achyranthes aspera | 10 | 21.7 | 3.3 | 24.9 | 12.5 | 45.7 | 9 | 411 | 0.01 |
| 61 | Herbal Garden | Herbal Garden | 18 | 109.2 | 16.4 | 125.6 | 62.8 | 230.2 | 150 | 34537 | 0.47 |
| | Total Co2 Emission neutralize by the trees | | | | | | | | 14.95 | | |

College has 4914 trees in the campus. This is good initiative taken by management for green campus under the campaign of plantation. It's APPRECIABLE. There are total CO² Emission neutralize by the trees 14.95Ton/year





3.6 Calculation of CO2 Emission of college: -

| Total Carbon Footprint generated | = | Carbon footprint by electricity |
|----------------------------------|---|---------------------------------|
| by the campus | | - Carbon Neutralize by tree |

Total Carbon Foot print by campus: 17.54–14.95 = 2.59 tons/year

3.7 Other Emissions Excluded

This study did not evaluate the carbon sequestration potential of existing plantation activities and emission from the staff commuting, food supply, official flights, paper products, water supply, and waste disposal and recycling due to limited data availability. The current study identifies areas where data monitoring, recording and archiving need to be developed for enlarging the scope of mapping of GHGs emission in the future years. Accordingly, a set of tools and record keeping procedure will be developed for improving the quality of data collection for the next year carbon footprint studies.





CHAPTER- 4 WASTE MANAGEMENT

4.1 About Waste:

Human activities create waste, and it is the way these wastes are handled, stored, collected and disposed of, which can pose risks to the environment and to public health waste management is important for an eco-friendly campus. In college different types of wastes are generated, its collection and management are very challenging.

Solid waste can be divided into three categories: bio-degradable, non-biodegradable and hazardous waste. A bio-degradable waste includes food wastes, canteen waste, wastes from toilets etc. Non-biodegradable wastes include what is usually thrown away in homes and schools such as plastic, tins and glass bottles etc. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals, acids and petrol.

Unscientific management of these wastes such as dumping in pits or burning them may cause harmful discharge of contaminants into soil and water supplies, and produce greenhouse gases contributing to global climate change respectively. Special attention should be given to the handling and management of hazardous waste generated in the college. Bio-degradable waste can be effectively utilized for energy generation purposes through anaerobic digestion or can be converted to fertilizer by composting technology. Non-biodegradable waste can be utilized through recycling and reuse. Thus, the minimization of solid waste is essential to a sustainable college. The auditor diagnoses the prevailing waste disposal policies and suggests the best way to combat the problems.

| Sr.No. | Types of Waste | Particulars | | |
|--------|-----------------------|------------------------------------------------------------------|--|--|
| 1 | Solid wastes | Damaged furniture, paper waste, paper plates, food wastes | | |
| 1 | Solid wastes | etc. | | |
| 2 | Diactic waste | Pen, Refill, Plastic water bottles and other plastic containers, | | |
| Z | r lastic waste | wrappers etc. | | |
| 3 | E-Waste | Computers, electrical and electronic parts etc. | | |
| 4 | Glass waste | Broken glass wares from the labs etc. | | |
| 5 | Chemical wastes | Laboratory waste etc. | | |
| 6 | Bio-medical | Conitory Monkin etc. | | |
| | Waste | Sanitary Napkin etc. | | |

Table 4.1 Different types of waste generated in the College Campus.

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4.2 Waste management Practices adopted by the college

College has a different type of waste generated like paper, Plastic, dust and wet waste. The college provided dustbin near classroom, office, laboratories, staff room, and collect the waste material at the end of the day. The waste (Especially dry material) is collected in a big dustbin which are provided at every floor and the next day collected municipal corporation for further processing.



Figure 4.1 Waste collection bin in college campus

Recommendation

It is recommended adopted 5 Bin Waste Collection System for collect different type of waste generated in college premises.



Figure 4.2 Recommended 5 Dust Bin waste collection System

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4.3 Waste Collection Points:

Audit team also visited various departments, canteen, and residential area, to find out waste generation area and waste collection points for further improvement. Details are given in the table

| Sr. No. Location | | Dust been |
|------------------|--------------------|-----------|
| 1 | Atal Building | 15 |
| 2 | Science Building | 10 |
| 3 | 3 Law/Old Building | |
| | Total | 30 |

Table 4.2 Detailed of Waste collection Dust bin system





CHAPTER- 5 RECOMMENDATIONS AND SUGGESTIONS

5.1 QR Code System and Biodiversity:

While the world seems to be going digital, people lack the time to read books and process the information they contain. Hence, College can be provided QR codes on the trees for its information and to exploit the rapidly growing platform for a unique purpose.



Fig: 5.1 QR Code System for plants

These codes can give students all the information they need to know about the tree — from its scientific name to its medicinal value. They only need to put their smart-phones to use. QR codes to them, making it easier for everybody to learn about a plant or a tree at the tip of their fingers," If any app generating a QR code, which is available for free on the online stores, can be used to avail the information of the trees.

4 Eco-restoration programmes

• Frame long-term eco-restoration programmes for replacing exotic Acacia plantations with indigenous trees and need of the hour is to frame a holistic campus development plan.





5.2 Other Suggestions

Some of the very important suggestions are: -

- Adopt the proposed Environmentally Responsible Purchasing Policy, and work towards creating and implementing a strategy to reduce the environmental impact of its purchasing decisions.
- **4** Increase recycling education on campus.
- **4** Increase Awareness of Environmentally Sustainable Development in College campus.
- Practice Institutional Ecology- Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.
- Involve All Stakeholders- Encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in environmentally sustainable development.
- Collaborate for Interdisciplinary Approaches- To develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.
- **4** Increase reduces, reuse, and recycle education on campus.
- **U**evelop a butterfly garden that arouses appreciation towards flora and fauna diversity.
- A Name all the trees and plants (Plant DNA barcodes) with its common name and scientific name.
- Arrange training programmes on environmental management system and nature conservation.
- Renovation of cooking system in the canteen to save gas by installation solar water heater system with heat pump.
- **4** Establish a procurement policy that is energy saving and eco-friendly.





End of The Report Thanks

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Empirical Exergy Private Limited

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Ref No: EEPL/2022-23/C63

Date: - 27-10-2022

ENERGY AUDIT CERTIFICATE

This is certified that Empirical Exergy Private Limited (EEPL) Indore M.P. has conducted Energy audit at Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.) for the Assessment Year 2021-22 and audit report has been submitted.

We avail this opportunity to express our deep and sincere gratitude to the management for their wholehearted support and co-operations during the energy audit.

This certificate is being issued on the basis of the Energy Audit conducted by EEPL.

For- Empirical Exergy Private Limited



Rajesh Kumar Singadiya (Director)

M.Tech (Energy Management), PhD (Research Scholar) Accredited Energy Auditor [AEA-0284] Certified Energy Auditor [CEA-7271] (BEE, Ministry of Power, Govt. of India) Empanelled Energy Auditor with MPUVN, Bhopal M.P. Lead Auditor ISO50001:2011 [EnMS) from FICCI, Delhi Certified Water Auditor (NPC, Govt of India) Charted Engineer [M-1699118], The Institution of Engineers (India) Member of ISHRAE [58150]





Energy Audit CONSULTATION REPORT



Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur M.P.

PREPARED BY

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(Assessment Year 2021-22)

Energy Audit report prepared by EEPL, Indore, M.P.





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Energy Audit report prepared by EEPL, Indore, M.P.





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We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.



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Energy Audit report prepared by EEPL, Indore, M.P.





Certificate of Accreditation







Green Monitoring Committee







Policy Document on Green Campus

JAWAHARLAL NEHRU SMRITI GOVERNMENT POST-GRADUATE COLLEGE, SHUJALPUR, DISTRICT SHAJAPUR (M.P.)

Accredited 'B' grade by NAAC

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Policy document on Green Campus

Green Campus: A Green Campus is a place where environmental friendly practices and education works together to encourage sustainable and eco-friendly practices in the campus. The green campus concept offers an institution the opportunity to take the lead in redefining its environmental culture and developing new paradigms by creating sustainable solutions to environmental, social and economic needs of mankind.

Objectives of the Go Green Programme: The first step of the Go Green Programme involves establishing a viable Green-Campus Committee, within the organizational structure of the Institute. Hence, to give this initiative more clarity and authenticity, we now roll out a POLICYDOCUMENT spelling out the strategies, plans and other allied tasks to make this Program functional officially. We believe that greening the campus is all about sweeping away wasteful materials and using conventional sources of energies for its daily power needs, correct disposal handling, purchase of environment friendly supplies and effective recycling program. The administration of the Institute believes that everyone has to work out the time bound strategies to implement green campus initiatives. These strategies need to be incorporated into the institutional planning and budgeting processes with the aim of developing a clean and green campus. Every individual of the college campus will work, may he/she be a student, faculty and support staff to foster a culture of self-sustainability and make the entire campus environmental friendly. The Green Campus Initiatives (GCI) will enable the institution to develop the campus as a living laboratory for innovation.





Composition of the Go-Green Committee

- 1. Principal of the college- Chairperson
- 2. IQAC Coordinator- Secretary
- 3. Faculty Representatives nominated by the Principal
- 4. Non-Teaching Staff Representative
- 5. Industry/Social Representative- Member of Alumni Association.

Role of the Go-Green Campus Programme: The motivation for a successful Green Campus must begin at the top and emanate throughout the rest of the campus. Without a strong message of commitment and involvement from both the Chairperson and Members of the Committee, well-intentioned initiatives may be too fragmented to allow for Institute-wide participation. Thus, in view of this, the committee will plan and execute to:

- Seek views of all the stakeholders to make the Go-Green Campus initiative functional throughout the year.
- 2) Conduct the Campus environmental impacts to identify the targets for improvements.
- 3) Establish a Green Campus Environmental Ethic Awareness campaigns.
- 4) Set forth a Green Campus Mission and a Statement of Principles.
- 5) Link Green-Campus activities to Academics in the Institute.
- 6) Organize Awareness Programs for the students, faculty and society.
- 7) Chart out a yearly planner for the Institute, local community and Stakeholders.
- 8) Develop a strategic plan and create student teams to carry out specific tasks of the strategic plan. For instance, a plan to save energy at the institute level with time bound plan to install Solar Power Station mandatorily at the top of Institute building. This will reduce the dependency on conventional electricity for power supply.
- Phase out the CFL and conventional light source such as bulbs and tube lights, halogen and mercury street/campus lights and get them replace by the LEDs.
- 10) Conduct an Annual Green, Environment and Energy Audit.
- Purchase only Energy Efficient Computers viz: "ENERGYSTAR" or any other equivalent.





12) Establish public/private partnerships with personnel from federal, state, and local environmental agencies, utilities, and the business community. 13) Evaluate daily operations in terms of pollution prevention, waste stream management, and energy efficiency reducing, reusing, recycling, and repairing wherever possible. 14)Secure a commitment up front from the people in charge that well-founded recommendations will be acted upon once audits are completed. Promotion of "Save Energy Tips" in and outside the Institute: Activate power management features on your computer and monitor so that it will go into a low power "sleep" mode when you are not working on it. Turn off your monitor when you leave your Table. Activate power management features on your laser printer. Whenever possible, shut down rather than logging off. Turn off unnecessary lights and use daylight instead. Avoid the use of decorative lighting. Use LED or compact fluorescent bulbs. Keep lights off in conference rooms, classrooms, lecture halls when they are not in use. Use the fans only when they are needed. Unplug appliances not plugged into power strips (like TVs, Refrigerators, ACs, tea/coffeepots, printers, faxes, and chargers etc.). Waste water Management/ Rain water harvesting: The Institute has to work in the direction of waste water management. Water flow restrictors on bathroom faucets and showers, low water flow toilets and automated urinal flushers should be used to cut down campus water use. The Institute will take all necessary measures to implement waste water management /rain water harvesting. Major Green Campus Initiatives: Installation of Solar Power Station (Under process) Waste water Management/ Rainwater harvesting (Under process) Displayed poster on E-waste Management (in practice)











<u>Audit Team</u>

The study team constituted of the following senior technical executives from Empirical

Exergy Private Limited,

- **4** Mr. Rakesh Pathak, [Director & Electrical Expert]
- **Mr. Rajesh Kumar Singadiya** [Director & Accredited Energy Auditor AEA-0284]
- 4 Mrs. Laxmi Raikwar Singadiya [Energy & Chemical Engineer]
- **4** Mr. Sachin Kumawat [Sr. Project Engineer]
- **4** Mr. Ajay Nahra [Engineer]
- **4** Mr. Charchit Pathak [Mechanical Engineer]
- **4** Mr. Aakash Kumawat [Assistant Jr. Engineer]





EXECUTIVE SUMMARY

The executive summary of the energy audit report furnished in this section briefly gives the identified energy conservation measures and other recommendation during the project that can be implemented in a phased manner to conserve energy, increase productivity inside the college campus.

RECOMMENDATION: -

4 SOLAR SYSTEM

There is good potential of install 14 kWp roof top grid connected system. Expected annual solar energy generation @ 4 unit per kWp is 20,440 units.

LIGHTING SYSTEM

College has already initiated installation of energy efficient lighting in new construction building and replacement of "conventional tube light by energy efficient LED tube light. Still there are good potential for replacement of 15 no. of conventional T-8 (36 Watt)" tube light by energy efficient 20Watt LED lighting in college estimated energy saving potential is 840 kWh/Year.

4 Ceiling Fan and Exhaust Fan

Replacement of "conventional ceiling fan (60 Watt)" by energy efficient star rated fan or BLDC based energy efficient fan (28 Watt) in class rooms, laboratories and faculties cabin" have great potential for energy saving.

↓TIMER CONTROLLED STREET LIGHTS

Installation of "Timer control on high mast and street lighting" in college campus is recommended.





ENERGY CONSERVATION MEASURES FOR ELECTRICAL SYSTEM

| Case Study | Section | Identification | Observation | Recommendation | Annual Energy Saving (kWh) | Annual Cost Saving (Rs.) | Investment (Rs.) | Simple Payback Period |
|---------------|----------------------|-----------------------------------------|-----------------------------------------------------------|------------------------------------------------------------------------|----------------------------------|--------------------------------|---------------------|-----------------------------|
| 1 | Lighting System | 15 No. FTL tube light | Power consumption by T-12 FTL | Replacement of conventional (T-12) with (20 Watt LED Tube) | 840 | 5,632/- | 3,150/- | 7 month |
| 2 | Ceiling Fan | 31 No. Ceiling Fan | Power consumption by existing ceiling fan (60 Watt) | Replacement of 60W conventional ceiling fan by 28W BLDC | 3,224 | 21,616/- | 52,080/- | 2.4 year |
| 3 | Electrical System | There is good potential for solar | Installation of 17.5 KWp solar system | Installation of 17.5 KWp solar system | 18,248 | 15,2278/- | 6,30,000/- | 4.1year |





CHAPTER-1 INTRODUCTION

1.1 About College

Jawaharlal Nehru Smriti Govt. P.G. College is situated on the city - Mandi Road, Shujalpur at a distance of 2 kms. from Shujalpur Railway Station, on the Kannod - Pachore highway. This place is lying at a distance of 80 kms. from Bhopal, the state capital; 70 kms. from Shajapur, its district headquarters; 100 kms. from Ujjain, the holy city, which is its divisional headquarters. It is 130 kms. away from Indore, the commercial capital of Madhya Pradesh. The nearest airport is at Bhopal.

Shujalpur falls under 'Malwa' region and the local dialect is malvi. Before the inception of the college higher education facilities for the students of the region were confined to cities like Bhopal, Indore, and Ujjain all of which are at a distance of more than 80 kms. From this place. The college started functioning on 1st August, 1964. It was founded by a trust called Mahavidyalaya Sthapna Samiti, Shujalpur under the chairmanship of Shri Liladhar Joshi, the erstwhile Chief Minister of 'Central India.' The college was successfully run by the Samiti for seven years with three faculties – Arts, Science and Commerce. LLB Course was opened in 1968. Later on, considering the place of its development and also its growth potential, the college was taken over by the state government on 22nd February 1971. Further, taking into account its student strength and the local demand for higher studies, the college was given the status of a PG college in the year 1997 with eight PG Courses – Five in Arts stream, two in Science, and one in Commerce. Presently it is running a total of six UG and thirteen PG programmes.

The college has all the potential for further development which is amply visible from the fact that there has been a steady growth in the student strength in the college, particularly in the last fifteen years. In spite of the mushrooming of private colleges in the area, the graph of the enrolment figure has consistently shown an upward trend. In the academic year 2020-21 the enrolment figure stands 5163. Since the college is the premier institution for higher education in the locality, and all the district headquarters are at a distance of 50 to 100 kms., the student strength of the college is expected to be constantly on the rise in the years to come. The projected student strength by 2027 is approximately 8000. The college administration is continuously striving to create enough infrastructural space in terms of classrooms, laboratories, library space, and sports facilities in order to cope with the projected student strength.





The college, as the Vision and Mission statements indicate, mostly caters to the higher educational needs of the rural backward student community. The percentage of female students (54.84), SC students (24.07) and that of the students from OBC (53.45) enrolled in the college are higher than the national average. The college, therefore, mainly focuses on the development of the student community from these sections of the society.

J.N.S. Govt. College, Shujalpur, got accredited by NAAC. The NAAC assessment took place in December, 2015 and the college was awarded "B" grade with a CGPA of 2.36.

COLLEGE FACILITIES

- **4** Experienced Faculty.
- Use of computer & projector for teaching.
- **Well lighted & ventilated classrooms.**
- **4** Purified Drinking water.
- ↓ Toilets for Staff & Students.
- **4** Common room for girls.
- Staff room
- Ramps & Railing.
- Various Scholarships.
- Sports
- Faculty.
- **L**Eco-friendly environment.
- Hostel





Our Vision

To strive towards turning the college into a leading center for higher education offering a blend of general and professional courses with a view to producing employable and entrepreneurial graduates, while ensuring social and gender equity as well as developing environmental consciousness.

Our Mission

- To provide maximum opportunities for employment to the students belonging to socially and economically backward communities.
- To open up need-based and modern avenues of higher education with consistently good quality.
- **4** To ensure women empowerment in the areas of employment /entrepreneurship.
- To inculcate in the students a feeling of national pride, moral values, and gender sensitivity

1.2 About Energy Audit

Energy audit helps to understand more about the ways energy is used in any educational institute and helps in identifying areas where waste may occur and scope for improvement exists. The overall energy efficiency from generation to final consumer becomes 50%.

Energy audit is the most efficient way to identify the strength and weakness of energy management practices and to find a way to solve problems. Energy audit is a professional approach in utilizing economic, financial, and social and natural resources responsibility. Energy audits "adds value" to management control and is a way of evaluating the system.

Empirical Exergy Private Limited (EEPL), Indore M.P. carried out the "Energy Audit" at the site to find gaps in the energy consumption pattern for **Jawaharlal Nehru Smriti Govt. P.G. College** technical report is prepared as per the need and the requirement of the project.





1.3 Objectives of Energy Audit

An energy audit provides vital information base for overall energy conservation program covering essentially energy utilization analysis and evaluation of energy conservation measures. It aims at:

- Identifying the quality and cost of various energy inputs.
- Assessing present pattern of energy consumption in different cost centers of operations.
- Relating energy inputs and production output.
- Identifying potential areas of thermal and electrical energy economy.
- Highlighting wastage in major areas.
- Fixing of energy saving potential targets for individual cost centers.
- Implementation of measures for energy conservation & realization of savings.

1.4 Methodology

Methodology adopted for achieving the desired objectives viz.: Assessment of the current operational status and energy savings include the following:

- Discussions with the concerned officials for identification of major areas of focus and other related systems.
- Team of engineers visited the site and had discussions with the concerned officials / supervisors to collected data / information on the operations and load distribution within the plant and same for the overall premises. The data was analyzed to arrive at a base line energy consumption pattern.
- Measurements and monitoring with the help of appropriate instruments including continuous and / or time-lapse recording, as appropriate and visual observations were made to identify the energy usage pattern and losses in the system.
- **4** Trend analysis of costs and consumptions.
- **4** Capacity and efficiency test of major utility equipment's, wherever applicable.
- **4** Estimation of various losses
- Computation and in-depth analysis of the collected data, including utilization of computerized analysis and other techniques as appropriate were done to draw inferences and to evolve suitable energy conservation plan/s for improvements/ reduction in specific energy consumption.





1.5 Previous Years Energy Scenario

| Sr. No. | Year | Total Unit Consumption (KWH) |
|---------|--------------|------------------------------|
| 1 | 2020 to 2021 | 23245 |
| 2 | 2021 to 2022 | 18248 |



Figure 1.1 Previous Years Energy Scenario





1.6 Present Energy Scenario

College uses energy in the form of electricity purchased from MPPKVVCL grid. The college has 04 connection one is Principal BTI JNS College building with sectioned load 2 KW, Govt. JNS College building with sectioned load 2 KW, Principal BTI JNS College 6 KW, Rajmata Pnnadhyay Chatrawas 7.5KW.

Total billing amount of Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur of all four connection INR 136122/- with respect to annual energy consumption 18,248 units analysis period from Apr-2021 to Jun-2022



Figure 1.2 Present Energy Scenario Year 2021-22

Observation:-

It was observed that overall, per unit charges Rs 7.45/- paid by college. The major contribution of energy is science building with 58 % of total energy consumption





Layout of College



Energy Audit report prepared by EEPL, Indore, M.P.

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CHAPTER- 2 POWER SUPPLY SYSTEM

2.1 POWER SUPPLY SYSTEM

The power supply for the **Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur** is from MPPKVVCL with the help of 11 kV feeders. There are 02 connection one is Principal JNS College, Principal B.T.I JNS College, Govt. JNS College. building under Tariff LV2.1 non industrial with sectioned load 6KW, 2KW, 2KW. Second is Rajmata Pnnadhyay Chatrawas building under tariff LV2.2 non industrial with sectioned load 7.5kW.

Table -2.1 Details of connections in the college

| Sr. No. | Connection ID. | (Power Supply Areas) |
|---------|---------------------|-----------------------------|
| 1 | IVRS NO N3163015594 | Principal BTI JNS College |
| 2 | IVRS NO N3163015591 | Govt. JNS College |
| 3 | IVRS NO N3163015590 | Principal BTI JNS College |
| 4 | IVRS NO N3163007361 | Rajmata Pnnadhyay Chatrawas |





CHAPTER- 3 ELECTRICITY BILL ANALYSIS

3.1 Electricity Bill Analysis

Electricity bills of last one years were analysed. Detailed of unit consumption, Overall unit charges in below

Table-3.1 Monthly energy consumption 2021-22 of Principal BTI JNS College

| Principle BTI JNS College (2KW) | | | | | | | | |
|---------------------------------|---------|------------------|-----------------|-----------------------------|--|--|--|--|
| Sr. | Month & | Unit consumption | Total Amount | Overall Unit Charges | | | | |
| No | year | (KWH) | (Rs/-) | (Rs/Kwh) | | | | |
| 1 | Apr-21 | 376 | 3,550/- | 9.44 | | | | |
| 2 | May-21 | 206 | 1,814/- | 8.81 | | | | |
| 3 | Jun-21 | 245 | 2,354/- | 9.61 | | | | |
| 4 | Jul-21 | 311 | 4,485/- | 14.42 | | | | |
| 5 | Aug-21 | 212 | 1,509/- | 7.12 | | | | |
| 6 | Sep-21 | 232 | 1,560/- | 6.72 | | | | |
| 7 | Oct-21 | 277 | 0 | 0.00 | | | | |
| 8 | Nov-21 | 179 | 1,653/- | 9.23 | | | | |
| 9 | Dec-21 | 193 | 1,658/- | 8.59 | | | | |
| 10 | Jan-22 | 118 | 1,853/- | 15.70 | | | | |
| 11 | Feb-22 | 161 | 1,460/- | 9.07 | | | | |
| 12 | Mar-22 | 213 | 1,862/- | 8.74 | | | | |
| | Total | 2723 | 23,758/- | 8.95 | | | | |



Figure 3.1 Monthly Unit Consumption year-2021-22 of Principal BTI JNS College

Observation - Annual energy consumption of Principal BTI JNS College is 2,723 units and per unit charges is 8.95.





| Govt. JNS College (2KW) | | | | | | | |
|-------------------------|---------|------------------|---------------------|-----------------------------|--|--|--|
| Sr. | Month & | Unit consumption | Total Amount | Overall Unit Charges | | | |
| No | year | (KWH) | (Rs/-) | (Rs/Kwh) | | | |
| 1 | Apr-21 | 135 | 1,372/- | 10.16 | | | |
| 2 | May-21 | 99 | 1,120/- | 11.31 | | | |
| 3 | Jun-21 | 39 | 976 | 25.03 | | | |
| 4 | Jul-21 | 33 | 285 | 8.64 | | | |
| 5 | Aug-21 | 42 | 350 | 8.33 | | | |
| 6 | Sep-21 | 49 | 384 | 7.84 | | | |
| 7 | Oct-21 | 38 | 0 | 0.00 | | | |
| 8 | Nov-21 | 102 | 1,105/- | 10.83 | | | |
| 9 | Dec-21 | 157 | 1,590/- | 10.13 | | | |
| 10 | Jan-22 | 131 | 1,439/- | 10.98 | | | |
| 11 | Feb-22 | 155 | 1,447/- | 9.34 | | | |
| 12 | Mar-22 | 216 | 1,842/- | 8.53 | | | |
| | Total | 1196 | 11,910/- | 10.09 | | | |

Table-3.2 Monthly energy consumption 2021-22 of Govt. JNS College



Figure 3.2 Monthly Unit Consumption year-2021-22 of Govt. JNS College

Observation - Annual energy consumption of Govt. JNS College is 1,196 units and per unit charges is 10.09.





| Rajmata Pnnadhyay Chatrawas(7.5KW) | | | | | | | |
|------------------------------------|---------|------------------|-----------------|-----------------------------|--|--|--|
| Sr. | Month & | Unit consumption | Total Amount | Overall Unit Charges | | | |
| No | year | (KWH) | (Rs/-) | (Rs/Kwh) | | | |
| 1 | Apr-21 | 446 | 4,105/- | 9.20 | | | |
| 2 | May-21 | 510 | 4,470/- | 8.76 | | | |
| 3 | Jun-21 | 547 | 4,594/- | 8.40 | | | |
| 4 | Jul-21 | 618 | 4,673/- | 7.56 | | | |
| 5 | Aug-21 | 558 | 4,251/- | 7.62 | | | |
| 6 | Sep-21 | 503 | 4,009/- | 7.97 | | | |
| 7 | Oct-21 | 202 | 0 | 0.00 | | | |
| 8 | Nov-21 | 203 | 2,511/- | 12.37 | | | |
| 9 | Dec-21 | 52 | 1,483/- | 28.52 | | | |
| 10 | Jan-22 | 0 | 1,190/- | 0.00 | | | |
| 11 | Feb-22 | 32 | 1,400/- | 43.75 | | | |
| 12 | Mar-22 | 0 | 1,194/- | 0.00 | | | |
| | Total | 3671 | 33,880/- | 11.18 | | | |

Table-3.3 Monthly energy consumption 2021-22 at Rajmata Pnnadhyay Chatrawas



Figure 3.3 Monthly Unit Consumption year-2021-22 of Rajmata Pnnadhyay Chatrawas

Observation - Annual energy consumption of Rajmata Pnnadhyay Chatrawas is 3,671 units and per unit charges is 11.18.





| Principle JNS. Govt. JNS. College (6KW) | | | | | | | |
|-----------------------------------------|--------------------------|-------|---------------------|-----------------------------|--|--|--|
| Sr. | Month & Unit consumption | | Total Amount | Overall Unit Charges | | | |
| No | year | (KWH) | (Rs/-) | (Rs/Kwh) | | | |
| 1 | Apr-21 | 1865 | 12,877/- | 6.90 | | | |
| 2 | May-21 | 956 | 7,076 | 7.40 | | | |
| 3 | Jun-21 | 1035 | 7,475 | 7.22 | | | |
| 4 | Jul-21 | 1004 | 5,627 | 5.60 | | | |
| 5 | Aug-21 | 960 | 5,194 | 5.41 | | | |
| 6 | Sep-21 | 1037 | 5,762 | 5.56 | | | |
| 7 | Oct-21 | 933 | 0 | 0.00 | | | |
| 8 | Nov-21 | 451 | 3,814 | 8.46 | | | |
| 9 | Dec-21 | 532 | 4,098 | 7.70 | | | |
| 10 | Jan-22 | 547 | 4,377 | 8.00 | | | |
| 11 | Feb-22 | 631 | 4,838 | 7.67 | | | |
| 12 | Mar-22 | 707 | 5,436 | 7.69 | | | |
| | Total | 10658 | 66,574 | 6.47 | | | |

Table-3.4 Monthly energy consumption 2021-22 at Principal JNS. Govt. JNS. College



Figure 3.4 Monthly Unit Consumption year-2021-22 of Principal BTI JNS College

Observation - Annual energy consumption of Principal BTI JNS College is 10,658 units and per unit charges is 6.47.





3.2 On site Power Measurement

Table 3.5 Operating load measurement on various areas in college.

| Sr. No. | Location | HP | Phase | Voltage (V) | Current (Amp) | Power Factor | Input Tower (Kw) | Measured Flow (m ³ /hr.) | Running (Hr./Day) |
|---------|-----------------------------|----|-------|----------------|------------------|-----------------|---------------------|----------------------------------------|----------------------|
| 1 | Bore -1 Law/Old Building | 3 | 3 | 0 | 0 | 0 | 0 | Under Maintenance | 8-10 |
| 2 | Bore-2 Gandhi Udhyan | 3 | 3 | 403 | 4.8 | 0.68 | 2.27 | 2.8 | 8-10 |
| 3 | Bore -3 Nakshtra Vatika | 2 | 1 | 237 | 9.4 | 0.67 | 2.58 | 1.6 | 8 - 10 |
| 4 | Bore-4 Herbal Garden | 3 | 1 | 0 | 0 | 0 | 0 | Under Maintenance | 6 - 8 |
| 5 | Bore-5 Hostel | 3 | 3 | 408 | 4.7 | 0.64 | 2.12 | 2.1 | 6 - 8 |




3.3 Connected load of College Buildings

Audit team has taken connected load detail of all building (floor wise). details are given in table form

Table 3.6 Connected load of JNS college (Old building)

| Sr. No. | Location | Fan | LED | Computer | Printer | Cooler | Table fan | Tube light | Bulb |
|---------|-------------------|-----|-----|----------|---------|--------|-----------|------------|------|
| 1 | Dept. of Law | 3 | 2 | 1 | 1 | 1 | 0 | 0 | 0 |
| 2 | Dept. of commerce | 3 | 2 | 1 | 1 | 0 | 1 | 0 | 0 |
| 3 | Room – 3 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 4 | Room – 4 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 5 | Room – 5 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 6 | Room – 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | Room – 7 | 8 | 0 | 0 | 0 | 0 | 0 | 5 | 0 |
| 8 | Virtual class | 1 | 0 | 0 | 0 | 0 | 0 | 4 | 0 |
| 9 | Room – 8 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 10 | Room – 11 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | Room – 12 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | Room – 13 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | Toilet | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | Room – 14 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 0 |
| 16 | Girl's toilet | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17 | Room - 15 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |





Atal Bhavan (Ground floor)

| Sr. No. | Location | Fan | LED | Exhaust fan |
|---------|-----------------------------|-----|-----|-------------|
| 1 | G-04 Pantry | 1 | 1 | 0 |
| 2 | Cafeteria | 1 | 1 | 0 |
| 3 | G -06B.com III | 6 | 6 | 0 |
| 4 | G-07 Girls common room | 6 | 6 | 0 |
| 5 | Girl's toilet | 0 | 5 | 1 |
| 6 | G-08 B.com(A) | 9 | 7 | 0 |
| 7 | G - 19 M.com (previous) | 6 | 7 | 0 |
| 8 | G-20 M.com final | 6 | 7 | 0 |
| 9 | G - 01 Principal | 11 | 7 | 0 |
| 10 | G - 02 Established | 10 | 15 | 0 |
| 11 | Electric room | 0 | 1 | 0 |
| 12 | Staff room commerce faculty | 6 | 6 | 0 |
| 13 | G - 09 B.com -1(B) | 9 | 7 | 0 |
| 14 | G - 10 B.com -II | 9 | 7 | 0 |
| 15 | G - 11 Canteen | 6 | 6 | 0 |
| 16 | G - 12 BBA | 6 | 6 | 0 |
| 17 | G – 13 | 2 | 2 | 0 |
| 18 | G – 14 | 2 | 2 | 0 |
| 19 | G - 15 Sick room | 3 | 2 | 0 |
| 20 | G-16 Computer Lab | 6 | 6 | 0 |
| 21 | G - 17 Computer lab | 6 | 6 | 0 |
| 22 | G-18 Library | 19 | 29 | 0 |
| 23 | Ground floor outside room | 4 | 41 | 0 |
| 24 | Stairs | 0 | 2 | 0 |
| 25 | Boy's toilet | 0 | 5 | 0 |

Energy Audit report prepared by EEPL, Indore, M.P.

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Atal Bhavan (1st floor)

| Sr.No. | Location | Fan | LED | Tube light | Computer | Printer | Invertor | Exhaust fan |
|--------|-----------------------------------------------|-----|-----|------------|----------|---------|----------|-------------|
| 1 | F-38 MA Economics Previous Dept. of Economics | 6 | 8 | 0 | 0 | 0 | 0 | 0 |
| 2 | MA Hindi (previous) Dept. of Hindi | 6 | 6 | 0 | 0 | 0 | 0 | 0 |
| 3 | F- 35 MA Geography | 4 | 5 | 0 | 0 | 0 | 0 | 0 |
| 4 | F-31 MA English(previous) | 9 | 4 | 0 | 1 | 0 | 0 | 0 |
| 5 | F-32 MA English (Final) | 9 | 12 | 0 | 1 | 1 | 1 | 0 |
| 6 | MA Hindi (Final) | 9 | 5 | 0 | 0 | 0 | 0 | 0 |
| 7 | Girl's toilet | 0 | 6 | 0 | 0 | 0 | 0 | 1 |
| 8 | Girls Common room | 6 | 6 | 0 | 0 | 0 | 0 | 0 |
| 9 | F-28 | 6 | 6 | 0 | 0 | 0 | 0 | 0 |
| 10 | Dept. of Sociology | 3 | 4 | 0 | 1 | 0 | 0 | 0 |
| 11 | F-24 MA Sociology (Previous) | 9 | 12 | 0 | 0 | 0 | 0 | 0 |
| 12 | F-22 MS.(Previous) | 12 | 8 | 0 | 1 | 1 | 0 | 0 |
| 13 | F-21 Staff Room Art Faculty | 11 | 6 | 0 | 1 | 2 | 0 | 0 |
| 14 | Boy's toilet | | 5 | 0 | 0 | 0 | 0 | 0 |
| 15 | F-40 History Dept. | 6 | 6 | 0 | 0 | 0 | 0 | 0 |
| 16 | F-25 Sociology final | 9 | 12 | 0 | 0 | 0 | 0 | 0 |
| 17 | F-29 Dept. of Political science | 3 | 4 | 0 | 0 | 0 | 0 | 0 |
| 18 | F-33 Malv Sonpoda Museum | 6 | 5 | 0 | 0 | 0 | 0 | 0 |
| 19 | F-34 MA Public Admin | 6 | 8 | 0 | 0 | 0 | 0 | 0 |
| 20 | F-36 MA Economic Final | 9 | 5 | 0 | 0 | 0 | 0 | 0 |
| 21 | Outside room | 0 | 16 | 0 | 0 | 0 | 0 | 0 |
| 22 | Stairs | 0 | 2 | 0 | 0 | 0 | 0 | 0 |





Atal Bhavan (2nd floor)

| Sr. No. | Location | Fan | LED | Exhaust fan | Street light |
|---------|----------------------------------------------------|-----|-----|-------------|--------------|
| 1 | Girls' toilet | 0 | 5 | 1 | 0 |
| 2 | S-47 BA-II Sociology Polytechnic Science Hindi | 6 | 6 | 0 | 0 |
| 3 | S-46 BA-III Sociology Polytechnic Science Hindi | 6 | 6 | 0 | 0 |
| 4 | S-46 BA I, II, III Economic | 9 | 6 | 0 | 0 |
| 5 | S-43 A | 21 | 13 | 0 | 0 |
| 6 | S-43B | 21 | 13 | 0 | 0 |
| 7 | Electric room | 0 | 1 | 0 | 0 |
| 8 | S-42 BA I, II, III Geography | 9 | 8 | 0 | 0 |
| 9 | S-48 BA -II(A) -Sociology, Science, Hindi, History | 9 | 8 | 0 | 0 |
| 10 | Boy's toilet | 0 | 5 | 1 | 0 |
| 11 | Stairs | 0 | 2 | 0 | 0 |
| 12 | Ramp | 0 | 7 | 0 | 0 |
| 13 | Outside room | 0 | 17 | 0 | 0 |
| 14 | Atal Bhavan campus | 0 | 0 | 0 | 7 |
| 15 | Outside building | 0 | 0 | 0 | 18 |





New Building (Main Building) (1st floor):

| Sr. No. | Location | Fan | Ceiling Light | LED | Bulb |
|---------|-----------------------------------------|-----|---------------|-----|------|
| 1 | Moot court room | 8 | 0 | 8 | 0 |
| 2 | R-8 | 8 | 0 | 8 | 0 |
| 3 | R-9 | 8 | 0 | 8 | 0 |
| 4 | R-10 | 8 | 0 | 8 | 0 |
| 5 | R-12 Staff room | 5 | 0 | 5 | 2 |
| 6 | R-7 Virtual class | 8 | 0 | 8 | 0 |
| 7 | R-33 | 6 | 0 | 6 | 0 |
| 8 | R-32 | 6 | 0 | 6 | 0 |
| 9 | R-31 | 6 | 0 | 6 | 0 |
| 10 | R-30 | 6 | 0 | 6 | 0 |
| 11 | R-29 | 5 | 0 | 6 | 0 |
| 12 | R-28 | 6 | 0 | 6 | 0 |
| 13 | R-27 | 6 | 0 | 6 | 0 |
| 14 | R-26 | 2 | 0 | 2 | 0 |
| 15 | IQAC R-41 | 6 | 0 | 6 | 0 |
| 16 | R-38 | 6 | 0 | 6 | 0 |
| 17 | R-40 | 6 | 0 | 6 | 0 |
| 18 | R-39 | 6 | 0 | 6 | 0 |
| 19 | R-37 (ceiling light) | 5 | 7 | 8 | 0 |
| 20 | R-36 (ceiling light under construction) | 5 | 8 | 7 | 0 |
| 21 | R-35 | 4 | 0 | 2 | 0 |
| 22 | Chatra comman room | 0 | 0 | 4 | 0 |





Main Building (Ground floor)

| Sr. No. | Location | Fan | LED | Bulb | Cooler | computer | printer | Exhaust | Street Light | Projector |
|---------|-------------------------------|-----|-----|------|--------|----------|---------|---------|-----------------|-----------|
| 1 | Toilet (construction) | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | Principal room | 4 | 4 | 2 | 1 | 0 | 0 | 0 | 0 | 0 |
| 3 | Outside Principal room | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | R-3 Dept. of Botany | 8 | 8 | 2 | 0 | 1 | 1 | 0 | 0 | 0 |
| 5 | Microbiology dept. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | Computer lab 6 | 7 | 11 | 2 | 0 | 26 | 2 | 1 | 0 | 0 |
| 7 | Computer lab5 | 6 | 6 | 4 | 0 | 25 | 1 | 0 | 0 | 0 |
| 8 | Girl's toilet | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | HOD Room PG lab | 6 | 5 | 0 | 0 | 5 | 2 | 0 | 0 | 0 |
| 10 | Near HOD room | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | Near HOD room | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | near sport room | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | krida bhavan | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | Chemistry lab | 12 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | Dept. Zoology | 6 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | Outside room | 0 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17 | Stair | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19 | Outside building Street light | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 |
| 20 | Inside building street light | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 |
| 21 | Outside room | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22 | All PG. Labs | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |





Hostel (Chatrawas) Building

| Sr. No. | Location | Fan | LED | Street light |
|---------|------------------------------------|-----|-----|--------------|
| 1 | Hall-1 | 3 | 3 | 0 |
| 2 | Hall-2 | 3 | 3 | 0 |
| 3 | Hall-3 | 3 | 3 | 0 |
| 4 | Hall-4 | 3 | 3 | 0 |
| 5 | Room-1 | 2 | 2 | 0 |
| 6 | Room-2 | 2 | 2 | 0 |
| 7 | Room-3 | 2 | 2 | 0 |
| 8 | Room-4 | 2 | 2 | 0 |
| 9 | Room-5 | 2 | 2 | 0 |
| 10 | Room-6 | 2 | 2 | 0 |
| 11 | Room-7 | 2 | 2 | 0 |
| 12 | Room-8 | 2 | 2 | 0 |
| 13 | Hostel building campus and outside | 0 | 0 | 4 |





3.4 Connected Load sharing Electrical Equipment

| Sr.No. | Equipment's | Unit Power (Watt) | Quantity | Total Power (Watt) | Load share% |
|--------|-----------------------------|-------------------------|----------|--------------------------|----------------|
| 1 | Tube light(36 watt) | 36 | 15 | 540 | 0.99 |
| 2 | LED Tube(20 watt) | 20 | 674 | 13,480 | 24.67 |
| 3 | Ceiling fan | 60 | 274 | 16,440 | 30.09 |
| 4 | Computer | 85 | 66 | 5,610 | 10.27 |
| 5 | Printer | 320 | 12 | 3,840 | 7.03 |
| 6 | Exhaust | 180 | 5 | 900 | 1.65 |
| 7 | Street light | 60 | 34 | 2,040 | 3.73 |
| 8 | Cooler | 150 | 2 | 300 | 0.55 |
| 9 | Bulb | 9 | 3 | 27 | 0.05 |
| 10 | Ceiling light | 18 | 15 | 270 | 0.49 |
| 11 | Bore -1 Law/Old Building | 2238 | 1 | 2,238 | 4.10 |
| 12 | Bore-2 Gandhi Udhyan | 2238 | 1 | 2,238 | 4.10 |
| 13 | Bore -3 Nakshtra Vatika | 1492 | 1 | 1,492 | 2.73 |
| 14 | Bore-4 Herbal Garden | 2238 | 1 | 2,238 | 4.10 |
| 15 | Bore-5 Hostel | 2238 | 1 | 2,238 | 4.10 |
| 16 | Projector | 50 | 15 | 750 | 1.37 |
| | | | | 54,641 | 100 |

| Table 27 | Total load | ahara a | falactrical | aggingenant | in college |
|-----------|------------|---------|-------------|-------------|------------|
| radie-5./ | TOTAL TOAD | snare o | refectrical | equipment | in conege. |
| | | | | | |





3.5 Photograph of Electrical appliance



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CHAPTER- 4

ENERGY CONSERVATION MEASURES

4.1 Case Study

Replacement of conventional 36 Watt to energy efficient LED tube light 20 Watt in college: -

| Sr. | | | |
|-----|--------------------------------------------------|------------|------------|
| No. | Items | Parameters | Units |
| | Total Power Consumption by T-8 conventional tube | | |
| 1 | light (12 Watt Blast Power) | 48 | Watt |
| 2 | No of T-8 | 15 | Nos. |
| 3 | Working Hrs./Day | 8 | Hrs./Day |
| 4 | Working Days/Year | 250 | Days/Year |
| 5 | Rated Power of Energy Efficient T-5 (LED) | 20 | W |
| 6 | Energy Saving Potential | 840 | kWh/Year |
| 7 | Load Factor@90% Assume | 0.9 | |
| 8 | Expected Annual Energy Saving | 756 | kWh/Year |
| 9 | Overall, Per Unit Charges | 7.45 | Rs./kWh |
| 10 | Expected Money Saving | 5632 | Rs./Year |
| 11 | Cost of T-5 | 200 | Rs./ Pices |
| 12 | Investment on New Light Purchasing | 3000 | Rs. |
| 13 | Maintenance Investment@5% | 150 | Rs. |
| 14 | Total Investment | 3,150 | Rs |
| 15 | Simple Pay Back Period | 7 | Month |

Total Calculated Monetary Saving Potential in lighting = Rs 5,632 /-

Note: - Energy saving depends on the operation hour per day and load factor of the systems.





4.2 Case Study

Replacement of 60W conventional ceiling fan by 28W BLDC Energy efficient ceiling fan in college: -

| Sr. No | Item | Parameter | Unit |
|--------|---------------------------------------|-----------|-----------|
| 1 | Rated Power of Ceiling Fan | 80 | W |
| 2 | No of Fan | 31 | Nos |
| 3 | Working Hrs./Day | 8 | Hrs./Day |
| 4 | Working Days/Year | 250 | Days/Year |
| 5 | Energy Efficient BLDC Fan Rated power | 28 | W |
| 6 | Energy Saving Potential | 3224 | kWh/Year |
| 7 | Load Factor | 0.9 | |
| 8 | Expected Annual Energy Saving | 2901.6 | kWh/Year |
| 9 | Per Unit Charges | 7.45 | Rs/kWh |
| 10 | Expected Money Saving | 21616 | Rs./Year |
| 11 | Cost of New Celling Fan | 1,600 | Rs./Pices |
| 12 | Investment on New Fan Purchasing | 49600 | Rs. |
| 13 | Maintenance Investment@5% | 2,480 | Rs. |
| 14 | Total Investment | 52,080 | Rs. |
| 15 | Simple Pay Back Period | 2.4 | Year |

Total Calculated Monetary Saving Potential in Celling Fan = Rs 29,016 /-

Note: - Energy saving depends on the operation hour per day and load factor of the systems.





4.3 Case Study

Installation 14 kWp grid connected solar roof top system.

| | Theoretical capacity calculation of solar plant on Contract Demand | | | | | | |
|---|--------------------------------------------------------------------|-------|----------|--|--|--|--|
| 1 | Total Contract Demand of all connection | 17.5 | KW | | | | |
| | Maximum theoretical limit as per Net Meting policy of electricity | | | | | | |
| 2 | board | 100 | % | | | | |
| | Maximum theoretical Potential limit of solar plant as per the | | | | | | |
| 3 | contract demand | 17.5 | KW | | | | |
| 4 | Power Factor of the Electrical System | 0.8 | | | | | |
| 5 | Theoretical solar plant capacity as per contract demand | 14.00 | kWp | | | | |
| 6 | Expected Solar Unit generation @4 unit/day/KWp | 56 | KWh/Day | | | | |
| 7 | Expected Annual Solar Unit generation of the Solar Plant | 20440 | KWh/Year | | | | |
| 8 | Annual Unit consumption of college (Year 2021-22) | 18248 | kWh/Year | | | | |

| Payback Period Calculation | | | | | |
|----------------------------|---------------------------------------------------------|----------|-----------|--|--|
| 1 | Total solar unit generation of the system (14.00 kWp) | 20440 | kWh/ year | | |
| 2 | Overall Energy Charges per Unit as per electricity bill | 7.45 | | | |
| 3 | Expected revenue generation | 1,52,278 | Rs./year | | |
| 4 | Expected cost of 1kw solar plant @50Rs.perwatt | 45000 | Rs./kWp | | |
| 5 | Expected total investment | 630000 | Rs. | | |
| 6 | Simple payback period of the project | 4.1 | year | | |

Observation:

As per the theoretical calculation of solar plant capacity based on contract demand is 14.00kWp and expected annual unit generation of solar plant is 20440 units w.r.t annual energy consumption of the college in day time is 18248 units. it is justified recommended the solar plant capacity 14.00kwp is accepted.





End of The Report Thanks

Energy Audit report prepared by EEPL, Indore, M.P.



Empirical Exergy Private Limited

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Ref No: EEPL/2022-23/C64

Date: - 27-10-2022

ENVIRONMENTAL AUDIT CERTIFICATE

This is certified that Empirical Exergy Private Limited (EEPL) Indore M.P. has conducted Environmental audit at, Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.) for the Assessment Year 2021-22 and audit report has been submitted.

We avail this opportunity to express our deep and sincere gratitude to the management for their wholehearted support and co-operations during the environment audit.

This certificate is being issued on the basis of the Environmental Audit conducted by EEPL.



Rajesh Kumar Singadiya (Director)

M.Tech (Energy Management), PhD (Research Scholar) Accredited Energy Auditor [AEA-0284] Certified Energy Auditor [CEA-7271] (BEE, Ministry of Power, Govt. of India) Empanelled Energy Auditor with MPUVN, Bhopal M.P. Lead Auditor ISO50001:2011 [EnMS) from FICCI, Delhi Certified Water Auditor (NPC, Govt of India) Charted Engineer [M-1699118], The Institution of Engineers (India) Member of ISHRAE [58150]





Environment Audit Report CONSULTATION



Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur M.P.

PREPARED BY

EMPIRICAL EXERGY PRIVATE LIMITED

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ACKNOWLEDGEMENT

Empirical Exergy Private Limited (EEPL), Indore takes this opportunity to appreciate & thank the management of **Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.)** for giving us an opportunity to conduct environment audit for the college.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.



Rajesh Kumar Singadiya (Director)

M.Tech (Energy Management), PhD (Research Scholar) Accredited Energy Auditor [AEA-0284] Certified Energy Auditor [CEA-7271] (BEE, Ministry of Power, Govt. of India) Empanelled Energy Auditor with MPUVN, Bhopal M.P. Lead Auditor ISO50001:2011 [EnMS) from FICCI, Delhi Certified Water Auditor (NPC, Govt of India) Charted Engineer [M-1699118], The Institution of Engineers (India) Member of ISHRAE [5815]





Certificate of Accreditation







Green Monitoring Committee







Policy Document on Green Campus







| L. P. 2. K 3. Fr | incipal of the college- Chairperson AC Coordinator- Secretary |
|------------------------|--------------------------------------------------------------------------------------------|
| 2. K 3. Fi | AC Coordinator- Secretary |
| 3. Fr | |
| 12-28 | culty Representatives nominated by the Principal |
| 4. N | on-Teaching Staff Representative |
| 5. ln | dustry/Social Representative- Member of Alumni Association. |
| Role | of the Go-Green Campus Programme: The motivation for a successful Green Campus |
| mus | begin at the top and emanate throughout the rest of the campus. Without a strong message |
| of c | enmitment and involvement from both the Chairperson and Members of the Committee |
| well | intentioned initiatives may be too fragmented to allow for Institute-wide participation |
| Thu | , in view of this, the committee will plan and execute to: |
| 1 |) Seek views of all the stakeholders to make the Go-Green Campus initiative functional |
| | throughout the year. |
| - 2 |) Conduct the Campus environmental impacts to identify the targets for improvements. |
| |) Establish a Green Campus Environmental Ethic Awareness campaigns. |
| - it |) Set forth a Green Campus Mission and a Statement of Principles. |
| 2 |) Link Green-Campus activities to Academics in the Institute. |
| 6 |) Organize Awareness Programs for the students, faculty and society. |
| 13 |) Chart out a yearly planner for the Institute, local community and Stakeholders. |
| \$ |) Develop a strategic plan and create student teams to carry out specific tasks of the |
| | strategic plan. For instance, a plan to save energy at the institute level with time bound |
| | plan to install Solar Power Station mandatorily at the top of Institute building. This wil |
| | reduce the dependency on conventional electricity for power supply. |
| 9 |) Phase out the CFL and conventional light source such as bulbs and tube lights, haloger |
| | and mercury street/campus lights and get them replace by the LEDs. |
| 1 | 0) Conduct an Annual Green, Environment and Energy Audit. |
| | 1)Purchase only Energy Efficient Computers viz: "ENERGYSTAR" or any other |





1

| 12 | Establish public/private partnerships with personnel from federal, state, and local |
|----------|------------------------------------------------------------------------------------------|
| (2)53 | environmental agencies, utilities, and the business community. |
| 13) | Evaluate daily operations in terms of pollution prevention, waste stream management, |
| | and energy efficiency reducing, reusing, recycling, and repairing wherever possible. |
| 14) | Secure a commitment up front from the people in charge that well-tounded |
| | recommendations will be acted upon once audits are completed. |
| Promo | tion of "Save Energy Tipe" in and outside the Institute: |
| | |
| | Activate power management features on your computer and monitor so that it will go into |
| | a low power "sleep" mode when you are not working on it. |
| - 2 | Turn off your monitor when you leave your Table. |
| | Activate power management features on your laser printer. |
| - 2 | whenever possible, shut down rather than logging off. |
| - 8 | furn off unnecessary lights and use daylight instead. |
| ÷. | Avoid the use of decorative lighting. |
| ÷. | Use LED or compact fluorescent bulbs. |
| | Keep lights off in conference rooms, classrooms, lecture halls when they are not in use. |
| | Use the rans only when they are needed. |
| | tea/coffeepots, printers, faxes, and chargers etc.). |
| Waste | water Management/ Rain water harvesting: The Institute has to work in the direction |
| of wast | e water management. Water flow restrictors on bathroom faucets and showers, low water |
| flow to | ilets and automated urinal flushers should be used to cut down campus water use. The |
| Institut | e will take all necessary measures to implement waste water management /rain water |
| harvest | ing. |
| Major | Green Campus Initiatives: |
| | Installation of Solar Power Station (Under process) |
| | Waste water Management/ Rainwater harvesting (Under process) |











Audit Team

The study team constituted of the following senior technical executives from Empirical

Exergy Private Limited,

- **Mr. Rakesh Pathak**, [Director & Electrical Expert]
- **Mr. Rajesh Kumar Singadiya** [Director & Accredited Energy Auditor AEA-0284]
- **4** Mrs. Laxmi Raikwar Singadiya [Energy Engineer]
- **4** Mr. Sachin Kumawat [Sr. Project Engineer]
- **4** Mr. Ajay Nahra [Engineer]
- **4** Mr. Charchit Pathak [Mechanical Engineer]
- 4 Mr. Aakash Kumawat [Assistant Jr. Engineer]





EXECUTIVE SUMMARY

The executive summary of the environment audit report furnished in this section briefly gives the identified energy conservation measures and other recommendation during the project that can be implemented in a phased manner to conserve energy, increase productivity inside the college campus.

SUSTAINABLE INITIATIVE TAKEN BY COLLEGE

College has taken initiative for save environment.

- **4** College has single used Polythene ban, in the campus **Its appreciable.**
- **4** College has installed composite pit for all type organic waste **Its appreciable.**
- College are initiative done like community awareness, plantation, use of LED several activities are done to save and conserve e-environment. Its Appreciable

RECOMMENDATION

FRESH WATER MONITORING SYSTEM:

- Installation of "Cloud based (IoT based) ground water extraction monitoring system" for borewell to quantify fresh water consumption per day in the college.
- Install water flow meters (Mechanical or Electronics) in supply network, like college old building and new building for quantify per day water consumption and waste water generation in the college campus.

WASTE WATER TREATMENT PLANT:

Waste water generated from various departments should be collect in separate waste water collection tank. It should be treated in proposed STP after that treated water reuse activity like gardening, toilet and wash room etc.

DRIP WATER IRRIGATION AND SPRINKLER SYSTEM.

- **Use drip water irrigation system for plant and trees.**
- **Use sprinkler water system for Lawn area in the college campus.**





USE EFFICIENT WATER TAPS

Water saving taps either reduce water flow or automatically switch off to help save water. So, it is highly recommended to install efficient water taps in college campus to reduce water consumption.

USE EFFICIENT URINAL TAPS

Replacing existing inefficient fixtures with water sense labelled flushing urinal can save between 0.5 to 04 litter per flush without sacrificing performance. Installation of water saving flushing urinal will not only reduce water use in facilities but also save money on water bills.





CHAPTER-1 INTRODUCTION

1.1 About College

Jawaharlal Nehru Smriti Govt. P.G. College is situated on the city - Mandi Road, Shujalpur at a distance of 2 kms. from Shujalpur Railway Station, on the Kannod - Pachore highway. This place is lying at a distance of 80 kms. from Bhopal, the state capital; 70 kms. from Shajapur, its district headquarters; 100 kms. from Ujjain, the holy city, which is its divisional headquarters. It is 130 kms. away from Indore, the commercial capital of Madhya Pradesh. The nearest airport is at Bhopal.

Shujalpur falls under 'Malwa' region and the local dialect is malvi. Before the inception of the college higher education facilities for the students of the region were confined to cities like Bhopal, Indore, and Ujjain all of which are at a distance of more than 80 kms. From this place. The college started functioning on 1st August, 1964. It was founded by a trust called Mahavidyalaya Sthapna Samiti, Shujalpur under the chairmanship of Shri Liladhar Joshi, the erstwhile Chief Minister of 'Central India.' The college was successfully run by the Samiti for seven years with three faculties – Arts, Science and Commerce. LLB Course was opened in 1968. Later on, considering the place of its development and also its growth potential, the college was taken over by the state government on 22nd february 1971. Further, taking into account its student strength and the local demand for higher studies, the college was given the status of a PG college in the year 1997 with eight PG Courses – Five in Arts stream, two in Science, and one in Commerce. Presently it is running a total of six UG and thirteen PG programmes.

The college has all the potential for further development which is amply visible from the fact that there has been a steady growth in the student strength in the college, particularly in the last fifteen years. In spite of the mushrooming of private colleges in the area, the graph of the enrolment figure has consistently shown an upward trend. In the academic year 2020-21 the enrolment figure stands 5163. Since the college is the premier institution for higher education in the locality, and all the district headquarters are at a distance of 50 to 100 kms., the student strength of the college is expected to be constantly on the rise in the years to come. The projected student strength by 2027 is approximately 8000. The college administration is continuously striving to create enough infrastructural space in terms of classrooms, laboratories, library space, and sports facilities in order to cope with the projected student strength.





The college, as the Vision and Mission statements indicate, mostly caters to the higher educational needs of the rural backward student community. The percentage of female students (54.84), SC students (24.07) and that of the students from OBC (53.45) enrolled in the college are higher than the national average. The college, therefore, mainly focuses on the development of the student community from these sections of the society.

J.N.S. Govt. College, Shujalpur, got accredited by NAAC. The NAAC assessment took place in December, 2015 and the college was awarded "B" grade with a CGPA of 2.36.

COLLEGE FACILITIES

- **4** Library.
- Experienced Faculty.
- **4** Use of computer & projector for teaching.
- **Well lighted & ventilated classrooms.**
- **4** Purified Drinking water.
- ↓ Toilets for Staff & Students.
- **4** Common room for girls.
- ↓ Staff room or rest room for Staff.
- 4 Ramps & Railing.
- **Well-equipped Laboratories.**
- 4 Various Scholarships.
- **4** Career guidance/Placement Cell.
- Sports
- **4** Parking Area for Students & Faculty.
- **4** Eco-friendly environment.
- 🖊 Hostel





Our Vision

To strive towards turning the college into a leading centre for higher education offering a blend of general and professional courses with a view to producing employable and entrepreneurial graduates, while ensuring social and gender equity as well as developing environmental consciousness.

Our Mission

1.To provide maximum opportunities for employment to the students belonging to socially and economically backward communities.

2.To open up need-based and modern avenues of higher education with consistently good quality.

3.To ensure women empowerment in the areas of employment /entrepreneurship.

4. To inculcate in the students a feeling of national pride, moral values, and gender sensitivity

1.2 About Environment Auditing

Water audits can be a highly valuable tool for institute in a wide range of ways to improve their energy, environment and economic performance. While reducing wastages and operating costs. Water audits provide a basis for calculating the economic benefits of water conservation projects by establishing the current rates of water use and their associated cost.

1.3 Objectives of Environment Audit

The general objective of water audit is to prepare a baseline report on water conservation measures to mitigate consumption, improve quality and sustainable practices.

The specific objectives are:

- **4** To monitor the water consumption and water conservation practices.
- To assess the quantity of water, usage, quantity of waste water generation and their reduction within the college.





1.4 Target Areas of Environment audit

This indicator addresses water sources, water consumption, irrigation, storm water, appliances and fixtures aquifer depletion and water contamination are taking place at unprecedented rates. It is therefore essential that any environmentally responsible institution should examine its water use practices.

1.5 Methodology followed for conducting Environment audit

Step 1: Walk through survey

- **4** Understanding of existing water sourcing, storage and distribution facility.
- **4** Assessing the water demand and water consumption areas/processes.
- **4** Preparation of detailed water circuit diagram.

Step 2: Secondary Data Collection

- **4** Analyse historic water use and wastewater generation
- **4** Field measurements for estimating current water use
- **4** Metered & unmetered supplies.
- 4 Understanding of "base" flow and usage trend at site
- 4 Past water bills
- **Wastewater treatment scheme & costs etc.**

Step 3: Site Environment Audit Planning (based on site operations and practices)

- **4** Preparation of water flow diagram to quantify water use at various locations
- **Wastewater flow measurement and sampling plan**

Step 4: Conduction of Detailed EnvironmentAudit & Measurements

- **4** Conduction of field measurements to quantify water/wastewater streams
- ♣ Power measurement of pumps/motors
- **4** Preparation of water balance diagram
- **4** Establishing water consumption pattern
- ↓ Detection of potential leaks & water losses in the system
- **4** Assessment of productive and unproductive usage of water
- **4** Determine key opportunities for water consumption reduction, reuse & recycle.

Step 5: Preparation of Environment Audit Report

- **4** Documentation of collected & analysed water balancing and measurement details
- **4** Projects and procedures to maximize water savings and minimize water losses.
- Opportunities for water conservation based on reduce/recycle/reuse and recharge options





Layout of College



Environment Audit report prepared by EEPL, Indore, M.P.

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CHAPTER- 2 WATER CONSUMPTION AND WASTE WATER SOURCES

2.1 Details of Source of Fresh Water and Use Areas:

The main source of freshwater is borewell for the college. The freshwater is mainly used for drinking, housekeeping, gardening, domestic activity and new construction project. Details of the borewell are given in table2.1

Table: 2.1 Details of Fresh water sources

| Sr.No. | Location | Capacity (HP) | Phase | Running (Hr./Day) |
|--------|------------------------------|------------------|-------|----------------------|
| 1 | Borewell -1 Law/Old Building | 3 | 3 | 8-10 |
| 2 | Borewell-2 Gandhi Udhyan | 3 | 3 | 8-10 |
| 3 | Borewell -3 Nakshtra Vatika | 2 | 1 | 8 - 10 |
| 4 | Borewell-4 Herbal Garden | 3 | 1 | 6 - 8 |
| 5 | Borewell-5 Hostel | 3 | 3 | 6 - 8 |

2.2 Water Accounting & Metering system

It was observed that there is requirement of water flow meters on borewells to quantify per day ground water extraction from different sources.



Fig.: -2.1 Fresh water supply from borewell of college campus





2.3 Water Storage Capacity in College Campus

There is different type of tank available in college for water storage like Underground RCC tank, PVC tanks.

| Sr.no. | Location | Types of tank | No. of tanks | Capacity(Ltr.) | Total capacity |
|--------|---------------------|---------------|--------------|----------------|----------------|
| 1 | Hostal Area | PVC | 5 | 1000 | 5000 |
| 2 | Old building | PVC | 1 | 2000 | 2000 |
| 3 | Near Gandhi Udhyan | PVC | 7 | 1000 | 7000 |
| 4 | Behind Atal Bhavan | RCC | 1 | 3000 | 3000 |
| 5 | Atal Bhavan Terries | PVC | 20 | 1000 | 20000 |
| | To | 37000 | | | |

Table2.2: - Water storage tank in college campus

Photographs of water storage tanks.



Fig: - 2.2 Water Storage Tank in college campus





2.4 Fresh Water distribution layout of college

Audit team study the water sources and prepared water distribution flow system in college campus.

Water Flow Diagram of Hostel Pump



(Bore well No-05)

Fig: - 2.3 Water flow diagram from Hostel Pump (borewell no.5)





Water Flow Diagram of old Building

(Bore well No-01)



Fig: - 2.4Water Flow Diagram of Old Building




Water Flow Gandhi Udhyan

(Bore well No-02)



Fig: - 2.5Water Flow Diagram of Gandhi Udhyan(Borewell No.2)



Water Flow Herbal Garden & Nakshtra Vatika (Bore well No-03& 04)









2.5 Water use areas in college campus

Water is preliminary used for drinking, domestic, gardening and lab activity. Audit team visited various departments and buildings to determine appliances. The details of washroom, toilet and taps are given in table

| Sr. No. | Location | Urinal | Hand Wash | Toilet | Taps |
|---------|-------------------|--------|-----------|--------|------|
| 1 | Atal Bhawan | 36 | 33 | 39 | 39 |
| 2 | Science Building | 6 | 7 | 18 | 18 |
| 3 | Law/Old Building | 4 | 8 | 7 | 7 |
| 4 | Hostel Building | 0 | 4 | 18 | 18 |
| 5 | Botany Lab | 0 | 0 | 0 | 2 |
| 6 | Micro biology Lab | 0 | 0 | 0 | 2 |
| 7 | Zoology Lab | 0 | 0 | 0 | 5 |
| 8 | Chemistry Lab | 0 | 0 | 0 | 12 |
| | Total | 46 | 52 | 82 | 103 |

Table: 2.3 Details of washroom and uses taps in various areas



Fig: - 2.7 Water uses areas in college





2.6 Reverse Osmosis (RO) in college campus

 Table: 2.4 Details of RO in college campus

| Sr. No. | Location | R.O. | Water Cooler |
|---------|------------------|-------------|--------------|
| 1 | Law/Old Building | 1 | 1 |
| 2 | Science Building | 2 | 2 |
| 3 | Atal Building | 1 | 1 |
| | Total | 4 | 4 |

Observation -

It is observed during the audit RO rejected water drain in atmosphere it is recommended to collect RO rejected water a separate tank and utilized for washroom and toilet.

2.7 Fresh water uses for gardening

The one of major contribution from fresh water consumption is watering for other plants in college campus. There is good potential for water saving by adopt "Automatic Watering 360 adjustable misting nozzle irrigation Dripper's system" for plants. adjustable drip irrigation tools to provide different amounts of water depending on the water requirements of different plants. The drip speed can be set as for indoor and outdoor plants.





Adjustable Misting Nozzle Irrigation Drippers

Proposed water timer

Fig.: - 2.8 Proposed drip water irrigation system for college





2.8 Waste Water Generation sources

At present waste water generated from various departments canteen, hostels and clinical activity like washrooms, hand wash and washing of medical equipment's and RO rejected etc is discharge into drain line. it should be collected is separate tank and treat in proposed STP plants. After that treated water reuse activity like gardening, toilet and wash room etc.





CHAPTER- 3 RAIN WATER HARVESTING SYSTEM

3.1. Rain water harvesting systems

The rainwater harvesting is a technique to capture the rainwater when it precipitates, store that water for direct use or charge the groundwater and use it later.

There are typically four components in a rainwater harvesting system:

- 4 Roof Catchment.
- **4** Collection.
- **4** Transport.
- ↓ Infiltration or storage tank and use.

If rainwater is not harvested and channelized its runoffs quickly and flow out through stormwater drains. For storm-water management the recharge pits, percolation pits and porous trenches are constructed to allow storm water to infiltrate inside the soil.



Fig.: - 3.1 Components of a rooftop rainwater harvesting system





3.2 Rainwater Harvesting Potential of the College

The college has total build-up area is approx. $10,000 \text{ m}^2$. The average annual rainfall 618m and runoff coefficient 0.88 are considered for commercial building. Accordingly, above figures and consideration, estimated rainwater harvesting potential for the college is about 5438400m³/year. The following mathematical equation is used for the calculation.

RWH Potential = Rainfall (m) x Area of catchment (m^2) x Runoff coefficient



Fig 3.2 :- Proposed rain water harvesting in college





End of The Report Thanks



Empirical Exergy Private Limited

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Ref No: EEPL/2022-23/C56

Date: - 21-09-2022

GREEN AUDIT CERTIFICATE

This is certified that Empirical Exergy Private Limited (EEPL) Indore M.P. has conducted green audit at Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.) for the Assessment Year 2016-17 to 2020-21 and audit report has been submitted.

We avail this opportunity to express our deep and sincere gratitude to the management for their wholehearted support and co-operations during the green audit.

This certificate is being issued on the basis of the Green Audit conducted by EEPL.

For- Empirical Exergy Private Limited



Rajesh Kumar Singadiya (Director)

M.Tech (Energy Management), PhD (Research Scholar) Accredited Energy Auditor [AEA-0284] Certified Energy Auditor [CEA-7271] (BEE, Ministry of Power, Govt. of India) Empanelled Energy Auditor with MPUVN, Bhopal M.P. Lead Auditor ISO50001:2011 [EnMS) from FICCI, Delhi Certified Water Auditor (NPC, Govt of India) Charted Engineer [M-1699118], The Institution of Engineers (India) Member of ISHRAE [58150]





Green Audit Report CONSULTATION



Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur M.P.

PREPARED BY

EMPIRICAL EXERGY PRIVATE LIMITED

Flat No. 201, OM Apartment,214 Indrapuri Colony, Bhawarkuan, Indore – 452 001 (M. P.), India 0731-4948831, 7869327256 Email ID:eempirical18@gmail.com <u>www.eeplgroups.com</u> (Assessment Year 2016-17 to 2020-21)





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ACKNOWLEDGEMENT

Empirical Exergy Private Limited (EEPL), Indore takes this opportunity to appreciate & thank the management of **Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.)** for giving us an opportunity to conduct green audit for the college.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.



Rajesh Kumar Singadiya

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Certificate of Accreditation







Green Monitoring Committee







Policy Document on Green Campus

JAWAHARLAL NEHRU SMRITI GOVERNMENT POST-GRADUATE COLLEGE, SHUJALPUR, DISTRICT SHAJAPUR (M.P.)

Accredited 'B' grade by NAAC

Email: heginscshushg@mp.gov.in

Phone No. 07360-244358



Policy document on Green Campus

Green Campus: A Green Campus is a place where environmental friendly practices and education works together to encourage sustainable and eco-friendly practices in the campus. The green campus concept offers an institution the opportunity to take the lead in redefining its environmental culture and developing new paradigms by creating sustainable solutions to environmental, social and economic needs of mankind.

Objectives of the Go Green Programme: The first step of the Go Green Programme involves establishing a viable Green-Campus Committee, within the organizational structure of the Institute. Hence, to give this initiative more clarity and authenticity, we now roll out a POLICYDOCUMENT spelling out the strategies, plans and other allied tasks to make this Program functional officially. We believe that greening the campus is all about sweeping away wasteful materials and using conventional sources of energies for its daily power needs, correct disposal handling, purchase of environment friendly supplies and effective recycling program. The administration of the Institute believes that everyone has to work out the time bound strategies to implement green campus initiatives. These strategies need to be incorporated into the institutional planning and budgeting processes with the aim of developing a clean and green campus. Every individual of the college campus will work, may he/she be a student, faculty and support staff to foster a culture of self-sustainability and make the entire campus environmental friendly. The Green Campus Initiatives (GCI) will enable the institution to develop the campus as a living laboratory for innovation.





Composition of the Go-Green Committee

- L Principal of the college- Chairperson
- 2. IQAC Coordinator- Secretary
- 3. Faculty Representatives nominated by the Principal
- 4. Non-Teaching Staff Representative
- 5. Industry/Social Representative- Member of Alumni Association.

Role of the Go-Green Campus Programme: The motivation for a successful Green Campus must begin at the top and emanate throughout the rest of the campus. Without a strong message of commitment and involvement from both the Chairperson and Members of the Committee, well-intentioned initiatives may be too fragmented to allow for Institute-wide participation. Thus, in view of this, the committee will plan and execute to:

- Seek views of all the stakeholders to make the Go-Green Campus initiative functional throughout the year.
- 2) Conduct the Campus environmental impacts to identify the targets for improvements.
- 3) Establish a Green Campus Environmental Ethic Awareness campaigns.
- 4) Set forth a Green Campus Mission and a Statement of Principles.
- 5) Link Green-Campus activities to Academics in the Institute.
- 6) Organize Awareness Programs for the students, faculty and society.
- 7) Chart out a yearly planner for the Institute, local community and Stakeholders.
- 8) Develop a strategic plan and create student teams to carry out specific tasks of the strategic plan. For instance, a plan to save energy at the institute level with time bound plan to install Solar Power Station mandatorily at the top of Institute building. This will reduce the dependency on conventional electricity for power supply.
- 9) Phase out the CFL and conventional light source such as bulbs and tube lights, halogen and mercury street/campus lights and get them replace by the LEDs.
- 10) Conduct an Annual Green, Environment and Energy Audit.
- Purchase only Energy Efficient Computers viz: "ENERGYSTAR" or any other equivalent.





- 12) Establish public/private partnerships with personnel from federal, state, and local environmental agencies, utilities, and the business community.
- 13) Evaluate daily operations in terms of pollution prevention, waste stream management, and energy efficiency reducing, reusing, recycling, and repairing wherever possible.
- 14) Secure a commitment up front from the people in charge that well-founded recommendations will be acted upon once audits are completed.

Promotion of "Save Energy Tips" in and outside the Institute:

- Activate power management features on your computer and monitor so that it will go into a low power "sleep" mode when you are not working on it.
- Turn off your monitor when you leave your Table.
- Activate power management features on your laser printer.
- Whenever possible, shut down rather than logging off.
- Turn off unnecessary lights and use daylight instead.
- Avoid the use of decorative lighting.
- Use LED or compact fluorescent bulbs.
- Keep lights off in conference rooms, classrooms, lecture halls when they are not in use.
- Use the fans only when they are needed.
- Unplug appliances not plugged into power strips (like TVs, Refrigerators, ACs, tea/coffeepots, printers, faxes, and chargers etc.).

Waste water Management/ Rain water harvesting: The Institute has to work in the direction of waste water management. Water flow restrictors on bathroom faucets and showers, low water flow toilets and automated urinal flushers should be used to cut down campus water use. The Institute will take all necessary measures to implement waste water management /rain water harvesting.

Major Green Campus Initiatives:

- Installation of Solar Power Station (Under process)
- Waste water Management/ Rainwater harvesting (Under process)
- Displayed poster on E-waste Management (in practice)







- MIS to make paperless administration (Under process)
- Plastic free Campus (in practice)
- Tree Plantation Drive (in practice)
- Cleanliness Drive (in practice)
- Landscaping and gardens (in practice)
- Use of LEDs only (in practice)
- Digital Library/ E-Learning Centre (in practice)
- Organization of sensitization programmes for the stakeholders (in practice)
- Establishment of Environment Club (in practice)
- Periodic Energy, Environment and Green Audit (in practice)
- Restricted entry of automobiles (in practice)
- No Vehicle Day observed (Proposed)

The Institute will make all the necessary efforts to involve the students, faculty and staff in "Green Campus Initiatives" by designating the volunteers of Environment Club, NSS & NCC cadets, printing T-shirts/ Caps with green campus initiative slogan specially designed for the purpose.



G College Shujalour, Distt. Shajapur (M.P.)





Audit Team

The study team constituted of the following senior technical executives from **Empirical**

Exergy Private Limited,

- **4** Mr. Rakesh Pathak, [Director & Electrical Expert]
- **4** Mr. Rajesh Kumar Singadiya [Director & Accredited Energy Auditor AEA-0284]
- **4** Mrs. Laxmi Raikwar Singadiya [Energy Engineer]
- **4** Mr. Sachin Kumawat [Sr. Project Engineer]
- **4** Mr. Ajay Nahra [Engineer]
- **4** Mr. Charchit Pathak [Mechanical Engineer]
- **4** Mr. Aakash Kumawat [Assistant Jr. Engineer]





EXECUTIVE SUMMARY

Green Initiative Taken by College

4 CAMPAIGN OF PLANTATION AND GREEN CAMPUS:

- College has planted approx. 1000 Trees and Plant, In last five year (2016-17 to 2020-21) It's APPRECIABLE.
- College has around 4665 trees in the campus. Its good initiative taken by management for green campus under the campaign of plantation. It's APPRECIABLE.

4 SOLID WASTE MANAGEMENT:

- The basic principle of good waste management practice is based on the concept of 3R namely Reduce, Recycle, and Reuse. All the degradable and non-degradable waste material arecollected and processed in environmentally friendly way in the college campus.
- Biodegradable and non-biodegradable: Waste materials are collected with help of different coloured single dustbin system in the campus.
- ✤ QR CODE SYSTEM ON TREE

While the world seems to be going digital, people lack of time to read books and process the information they contain. Hence, College can provide QR codes on the trees for its information and to exploit the rapidly growing platform for a unique purpose.

4 AIR MONITORING SYSTEM: -

Installation of "Cloud based (IoT based) Air Quality monitoring system in the Campus" tomonitor air quality index for college campus





CHAPTER-1 INTRODUCTION

1.1 About College

Jawaharlal Nehru Smriti Govt. P.G. College is situated on the city - Mandi Road, Shujalpur at a distance of 2 kms. from Shujalpur Railway Station, on the Kannod - Pachore highway. This place is lying at a distance of 80 kms. from Bhopal, the state capital; 70 kms. from Shajapur, its district headquarters; 100 kms. from Ujjain, the holy city, which is its divisional headquarters. It is 130 kms. away from Indore, the commercial capital of Madhya Pradesh. The nearest airport is at Bhopal.

Shujalpur falls under 'Malwa' region and the local dialect is malvi. Before the inception of the college higher education facilities for the students of the region were confined to cities like Bhopal, Indore, and Ujjain all of which are at a distance of more than 80 kms. From this place. The college started functioning on 1st August, 1964. It was founded by a trust called Mahavidyalaya Sthapna Samiti, Shujalpur under the chairmanship of Shri Liladhar Joshi, the erstwhile Chief Minister of 'Central India.' The college was successfully run by the Samiti for seven years with three faculties – Arts, Science and Commerce. LLB Course was opened in 1968. Later on, considering the place of its development and also its growth potential, the college was taken over by the state government on 22nd february 1971. Further, taking into account its student strength and the local demand for higher studies, the college was given the status of a PG college in the year 1997 with eight PG Courses – Five in Arts stream, two in Science, and one in Commerce. Presently it is running a total of six UG and thirteen PG programmes.

The college has all the potential for further development which is amply visible from the fact that there has been a steady growth in the student strength in the college, particularly in the last fifteen years. In spite of the mushrooming of private colleges in the area, the graph of the enrolment figure has consistently shown an upward trend. In the academic year 2020-21 the enrolment figure stands 5163. Since the college is the premier institution for higher education in the locality, and all the district headquarters are at a distance of 50 to 100 kms., the student strength of the college is expected to be constantly on the rise in the years to come. The projected student strength by 2027 is approximately 8000. The college administration is continuously striving to create enough infrastructural space in terms of classrooms, laboratories, library space, and sports facilities in order to cope with the projected student strength.





The college, as the Vision and Mission statements indicate, mostly caters to the higher educational needs of the rural backward student community. The percentage of female students (54.84), SC students (24.07) and that of the students from OBC (53.45) enrolled in the college are higher than the national average. The college, therefore, mainly focuses on the development of the student community from these sections of the society.

J.N.S. Govt. College, Shujalpur, got accredited by NAAC. The NAAC assessment took place in December, 2015 and the college was awarded "B" grade with a CGPA of 2.36.

COLLEGE FACILITIES

- ↓ Library.
- **4** Experienced Faculty.
- Use of computer & projector for teaching.
- **Well lighted & ventilated classrooms.**
- **4** Purified Drinking water.
- ↓ Common room for girls.
- Staff room
- Ramps & Railing.
- **Well-equipped Laboratories.**
- Various Scholarships.
- \rm Sports
- Faculty.
- Eco-friendly environment.
- Hostel





Our Vision

To strive towards turning the college into a leading centre for higher education offering a blend of general and professional courses with a view to producing employable and entrepreneurial graduates, while ensuring social and gender equity as well as developing environmental consciousness.

Our Mission

- To provide maximum opportunities for employment to the students belonging to socially and economically backward communities.
- To open up need-based and modern avenues of higher education with consistently good quality.
- **4** To ensure women empowerment in the areas of employment /entrepreneurship.
- To inculcate in the students a feeling of national pride, moral values, and gender sensitivity.

1.2About Green Auditing

Eco campus is concepts implemented in many educational institutions, all over the worldto make them sustainable because of their mass resource utilization and waste discharge in to the environment.

Green audit means to identify opportunities to sustainable development practices, enhance environmental quality, improve health, hygiene and safety, reduce liabilities achieve values of virtue. Green audit also provides a basis for calculating the economic benefits of resource conservation projects by establishing the current rates of resource use and their associated costs.

Green auditing of **"Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.)**" enables to assess the life style, action and its impact on the environment. This green audit was mainly focused on greening indicators like utilisation of green energy (solar energy) and optimum use of secondary energy sources (petrol and diesel) in the College campus, vegetation, and carbon foot print of the campus etc. The aim of green auditing is to help the institution to apply sustainable development practices and to set examples before the community and young.





Objectives of Green Auditing

The general objective of green audit is to prepare a baseline report on "Biodiversity" and alternative energy sources (solar energy), measures to mitigate resource wastage and improve sustainable practices.

The specific objectives are:

- **4** To suggest measures to make the College campus biodiversity rich
- To demarcate areas within the institute campus which have potential for restoration of biodiversity
- To make recommendations for the conservation, protection and rejuvenation of the natural vegetation and animal life by involving students and faculty members
- **4** To inculcate values of sustainable development practices through green audit mechanism.
- **4** Providing a database for corrective actions and future plans.
- To identify the gap areas and suggest recommendations to improve the green campus status of the college.

1.3 Target Areas of Green Auditing

Green audit forms part of a resource management process. Although they are individual events, the real value of green audit is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time.

Eco-campus concept mainly focuses on the efficient use of energy and water; minimize waste generation or pollution and also economic efficiency. Target areas included in this green auditing is biodiversity, green energy and carbon foot print.





1.4 Audits for Biodiversity

India is mega-biodiversity hottest hot-spot in the world with tremendous diversity in plants and animals. Such biotic forms are endemic to the different bio-geographic habitats in urban and in forest areas of the country as well. Biodiversity is defined as genetic, species and ecosystem diversity, which offers variability and therefore added values to bio-resources.

The most serious and rapidly accelerating of all the global environmental problems is the loss of biodiversity through deforestation and biodiversity cover depletion. Over the past 300 years, many species of organisms, including mammals, birds, butterflies and plants, have been lost due to many anthropogenic activities. In one year, a single mature tree will absorb up to 48 pounds of carbon dioxide from the atmosphere, and release it as oxygen.

1.5 Audit of Green Energy

According to the **Environmental Protection Agency (EPA)**, green energy provides the highest environmental benefit and includes power produced by solar, wind, geothermal, biogas, low-impact hydroelectric, and certain eligible biomass sources. Green energy can also reduce your carbon footprint and achieve a sustainable lifestyle.







Layout of College



Green Audit report prepared by EEPL, Indore, M.P.







CHAPTER- 2 GREEN CAMPUS & SUSTAINABLE DEVELOPMENT

2.1 Green Audit

As per discussion with management team college has planted more than 1000 plants, In last five years (2016-17 to 2020-21). At present college has **4665 trees** in the campus. This is good initiative taken by management for green campus under the campaign of plantation.

In the survey, the focus has been given to the assessment of the present status of plants and trees on the college campus and efforts made by the college authorities for nature conservation.







2.2 List of plants in college campus

| Sr. No. | Name of Tree | Qty. |
|---------|---------------|------|
| 1 | Semal | 25 |
| 2 | Ashok | 50 |
| 3 | Kadam | 100 |
| 4 | Jangali Kadam | 5 |
| 5 | Baas | 800 |
| 6 | Karanj | 100 |
| 7 | Jamun | 800 |
| 8 | Gulmohar | 50 |
| 9 | Chameli | 10 |
| 10 | Raatrani | 25 |
| 11 | Champa | 40 |
| 12 | Kaijurena | 60 |
| 13 | Chandani | 40 |
| 14 | Kaner | 100 |
| 15 | Seesam | 100 |
| 16 | Amaltas | 40 |
| 17 | Gudhal | 150 |
| 18 | Palash | 300 |
| 19 | Babul | 400 |
| 20 | Bargad | 10 |
| 21 | Peepal | 15 |
| 22 | Khajur | 20 |
| 23 | Paam | 80 |
| 24 | Neem | 50 |
| 25 | Kumudani | 10 |
| 26 | Gular | 5 |
| 27 | Vishnuchakra | 4 |
| 28 | Rudraksh | 5 |
| 29 | Saami | 10 |
| 30 | Belpatra | 10 |
| 31 | Mango | 20 |
| 32 | Jaamphal | 50 |
| 33 | Satpakhi | 30 |
| 34 | Booganbeliya | 100 |
| 35 | Cactus | 50 |
| 36 | Shikhakai | 2 |
| 37 | Naag Champa | 50 |
| 38 | Table Paam | 20 |
| 39 | Metha Neem | 5 |
| 40 | Bechandi | 3 |
| 41 | Giloy | 300 |
| 42 | Anwla | 50 |





| Sr. No. | Name of Tree | Qty. |
|---------|-----------------|------|
| 43 | Moolshree | 5 |
| 44 | Bakayan | 10 |
| 45 | Madar | 10 |
| 46 | Gulab | 100 |
| 47 | Arbi | 5 |
| 48 | Badam | 20 |
| 49 | Faix | 30 |
| 50 | Paras peepal | 5 |
| 51 | Sagwan | 50 |
| 52 | Arjun | 25 |
| 53 | Mahua | 20 |
| 54 | Kachnar | 30 |
| 55 | Sarkas | 10 |
| 56 | Nariyal | 5 |
| 57 | Papita | 10 |
| 58 | Berry | 50 |
| 59 | Nakshtra Vatika | 27 |
| 60 | Navgraha Vatika | 9 |
| 61 | Herbal Garden | 150 |
| | Total | 4665 |

As per discussion with management team College has planted approx 1000 trees and plants, In last five years (2016-2022) **It's APPRECIABLE.**

At present college has **4665 trees** in the campus. This is good initiative taken by management for green campus under the campaign of plantation.





Some Appreciable Initiative done by college

| Sr. No. | Date of Plantation | Plantation By | Remark | | |
|------------|-----------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| 1 | 2016 | NSS Unit, Janabhiyaan Parishad, Udaan Manch | | | |
| 2 | 13-07-2019 | NSS, college staff | 25 plants | | |
| 3 | 22-01-2021 | NSS, students & college staff | Botanical Garden-Inagurated by Shri Mohan Yadav (Higher Education Minister), Shri Inder Singh Parmer Minister - School Education & General Administration | | |
| 5 | Jan-21 | NSS,students & college staff | Nakshatra Garden-Inagurated by Shri Inder Singh Parmar (Minister - School Education & General Administration) Collector- District Shajapur | | |
| 6 | 12-11-2021 | NSS, students & college staff | | | |
| 7 | Dec-21 | NSS, students & college staff | | | |
| 8 | Jan-22 | NSS, students & college staff | 101 plant | | |
| 9 | 05-04-2022 | NSS, students & college staff | Mentored by Shri Inder Singh Parmar (Minister – School Education & General Administration), Collector – District Shajapur | | |
| 10 | 29-07-2022 | NSS, students & college staff | Fruit Plant | | |





Glimpse of some appreciable initiative by the college



शाजापुर 25-09-2021

पार्क की सफाई कर मनाया स्थापना दिवस

गांव को स्वरक कारने के तिहा कार्य कोजना का त विस्तृत कर्णन where developed (reprint)

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erneli siya ange dis vision 100 fero k name secara Rite scistite 3 fami rietu gen k name genera 11 years secara secara se an it stars the ext Forse see off it sha at Forse street off it sha at forst पुन्ह निर्वाहा में राष्ट्रीय सेन्द्र से फिर प्रसंपुत विश्वास थीं, पर्यक्षमा बाराजिह ने पानी पर आपना प् अनविश्व में थीं, श्राराज रिज्येले,



महाविद्यालय राष्ट्रीय सेवा योजना एवं एनसीसी के संयुक्ततत्वावधान में हुआ कार्यक्रम आयोजन र पर्यावरण दिव

नेहरू शजालपा। जनसला ल मजाविश्वसंग शुजालपुर में राष्ट्रीय सेवा योजना एवं एनसीसी के संयुक्त लचयाधान में विश्व खाद्य सहात हवे पर्याकरण दिश्वस मनाया गया। कार्यक्रम को अध्यक्षता संख्या प्रस्तवी ್ಷ रानेश ज्यूमार सम्में द्वारा भी गई। प्राचार्य ने प्राचीन बीजों के संरक्षण पर जेर वियाः उन्होंने सोरो स्ट्रमी खडल को सई प्रवलियों के चारे में बताय, जे कि फाइका युक्तसोती है।

भागों ने प्रयोधरण संरक्षण पर और वेते हुए पर्वावरण का संस्टेनेवल बोहन जरने को समझडरा थी। हां येके त्यनी ने मोटा अनाज मोटा कपडा प्राचीन समय में उपयोग के अरे में बलते हुए जैविक खेती गतं चडत हरिवाली के पहला को तलवा। डी प्रवेश धारीवाल ने प्रकृति में पर्वावरण थक्र के बारे में प्रकाश डाला। डॉ मुझेवा



महविद्यालय परिसर में पंथारोपते हुए विद्यार्थे । अनहेतुनिधा

सिंह मेवाडा ने गिरगण कडकनाथ मर्ग 103 प्रजनियों के वारे में वताएं। उन्होंने धान की 4000 प्रजलियों एवं गेह को जला कि वागो टेक्नोलॉजी और लेनेटिक्स

के कारण अब संरक्षण की कथा पर है। वायोडागवसिंडी म्यूजियम में जर्म स्ताज्य की सहायता से इनका संरक्षण जिल्ला जा रहा है। वर्तमान में वर्मी कंपोस्ट जैविक रहाड के अभाव तथा रासापनिक खाद के प्रयोग से क्रिस जैसी पहाधारियां तेली से आफ्ने पैर प्रसार रही हैं, जिनके करण लोगों की यौत वोरतीई:

पंजाब झाला जीता तागत उदाहरण जहां से कैंसर टेन चलती है। पंजाब में मोटा अस्तान वालरा ज्यार राजस्थान से अवगात सोता है। इस अवसर पर डॉक्टर सालेंद्र सिंह नरवरिय,प्रियांध् नेमा,धमेंद्र मेवठा अति उपस्थित थे। संचलन बरिओम जैंडर ने किया व जमार जसंसी फ्रांसे लेफिनेट रवि राहीर ने मानाःसार्यसम में महाविद्यालय स्टाफ, एनसीसी, एनएसएस केंद्रेहस एवन गमाविद्यालयोग साव/सात्रापंशामिल मे।

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Chapter-03 Carbon Foot print

3.1 About Carbon Foot Print.

Climate change is one of the greatest challenges facing nations, governments, institutions, business and mankind today.

Carbon footprint is a measure of the impact your activities have on the amount of carbon dioxide (CO_2) produced through the burning of fossil fuels and is expressed as a weight of CO_2 emissions produced in tonnes.

We focus on consumption in each of our five major categories: housing, travel, food, products and services. In addition to these we also estimate the share of national emissions over which we have little control, government purchases and capital investment.

For simplicity and clarity all our calculations follow one basic method. We multiply a use input by an emissions factor to calculate each footprint. All use inputs are per individual and include things like fuel use, distance, calorie consumption and expenditure. Working out your inputs is a matter of estimating them from your home, travel, diet and spending behaviour.

Although working out our inputs can take some investigation on your part the much more challenging aspect of carbon calculations is estimating the appropriate emissions factor to use in your calculation. Where possible you want this emissions factor to account for as much of the relevant life cycle as possible.

We all have a carbon footprint...







3.2 Methodology and Scope

The carbon footprint gives a general overview of the College greenhouse gas emissions, converted into CO₂ -equivalents and it is based on reported data from internal and external systems. The purposes of the carbon indicators are to measure the carbon intensity per unit of product, in addition to showing environmental transparency towards external stakeholders. The carbon footprint reporting approach undertaken in this study follows the guidelines and principles set out in the "Greenhouse Gas Protocol Corporate Accounting and Reporting Standard" (hereafter referred to as the GHG Protocol) developed by the Greenhouse Gas Protocol Initiative and international standard for the quantification and reporting of greenhouse gas emissions -ISO 14064. This is the most widely used and accepted methodology for conducting corporate carbon footprints. The study has assessed carbon emissions from the College Campus. This involves accounting for, and reporting on, the GHG emissions from all those activities for which the company is directly responsible. The items quantified in this study are as classified under the ISO 14064 standards: The report calculates the greenhouse gas emissions from the College. This includes electricity, as well as emission associated with diesel consumption in the institute vehicle. The emission associated with air travel, waste generation, administration, and marketing related activities has been excluded from the current study. Emissions from business activities are generally classified as scope 1, 2 or 3 areas classified under the ISO 14064 standards.

3.3 Carbon emission from electricity

Direct emissions factors are widely published and show the amount of emissions produced by power stations in order to produce an average kilowatt-hour within that grid region Unlike with other energy sources the carbon intensity of electricity varies greatly depending on how it is produced and transmitted. For most of us, the electricity we use comes from the grid and is produced from a wide variety of sources. Although working out the carbon intensity of this mix is difficult, most of the work is generally done for us.

Electricity used in the site is the significant contributors towards GHGs emission from the unit. Electricity used onsite is the most direct, and typically the most significant, a contributor to a unit's carbon footprint. Thus, using an average fuel mix of generating electricity, carbon dioxide intensity of electricity for national grid is assumed to be 0.9613 KgCO2/Kwh





(Reference: Central Electricity Authority (CEA) Baseline Carbon Dioxide Emission data http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/database_11.zip).

Electricity is purchased from the grid

Table 3.1 Electricity purchased from the grid and Emissions from the electricity Import

| Sr. no. | Year | Total unit Consumption by AVVNL | Unit | Emission Factor kg CO ² e/kWh | Emission ton CO ² e/year | |
|------------|---------|---------------------------------------|------|------------------------------------------------|----------------------------------------|--|
| 1 | 2021-21 | 19,656 | kWh | 0.9613 | 18.90 | |
| | Total | 19,656 | | Total | 18.90 | |

Observation :-

Total Co2 Emission by indirectly from electricity is 18.90 Ton CO²e/year in 2021-21

3.4 Biomass Calculation and CO² Sequestration of the Trees: -

1. Estimation of above ground biomass (AGB)

 $K = 34.4703 - 8.0671D + 0.6589 \ D^2$

Where = K is above ground biomass.

D is Breast height diameter in (cm)

- 2. Estimation of below ground biomass (BGD) $BGB = AGB \ x \ 0.15$
- 3. Total Biomass (TB) TB = AGB + BGB
- 4. Calculation of carbon dioxide Weight sequestered in the tree in kg. $C = W \; x \; 0.50$
- Calculate the weight of Co2 Sequestered in the tree per year in kg.Co2 = C x 3.666

Where: -

AGB = Above ground biomass. D = Diameter of tree breast height BGB = Below Ground Biomass. C = Carbon TB = Total Biomass





3.5 Biomass Calculation of Trees

| Sr. no. | Tree Name | Botanical and Family Name | Average Diameter in CM (5 to 50) | AGB | BGB | Total | Carbon Storage | Amount of Co2 Sequestered | Total | Total Amount of Co2 Sequestered | Co2 Sequestered amount (Ton/year) |
|------------|---------------|-------------------------------|-------------------------------------------|-------|------|-------|-------------------|---------------------------------|-------|------------------------------------------|--------------------------------------------|
| 1 | Semal | Bombax ceiba | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 25 | 7625 | 0.10 |
| 2 | Ashok | Saraca asoca | 15 | 66.2 | 9.9 | 76.2 | 38.1 | 139.6 | 50 | 6979 | 0.10 |
| 3 | Kadam | Neolamarckia cadamba | 25 | 257.1 | 38.6 | 295.7 | 147.8 | 542.0 | 100 | 54197 | 0.74 |
| 4 | Jangali Kadam | Neolamarckia cadamba | 10 | 21.7 | 3.3 | 24.9 | 12.5 | 45.7 | 5 | 229 | 0.00 |
| 5 | Baas | Bambusa vulgaris | 15 | 66.2 | 9.9 | 76.2 | 38.1 | 139.6 | 800 | 111667 | 1.52 |
| 6 | Karanj | Pongamia pinnata | 18 | 109.2 | 16.4 | 125.6 | 62.8 | 230.2 | 100 | 23025 | 0.31 |
| 7 | Jamun | Syzygium cumini | 15 | 66.2 | 9.9 | 76.2 | 38.1 | 139.6 | 800 | 111667 | 1.52 |
| 8 | Gulmohar | Delonix regia | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 50 | 15250 | 0.21 |
| 9 | Chameli | Jasminum | 15 | 66.2 | 9.9 | 76.2 | 38.1 | 139.6 | 10 | 1396 | 0.02 |
| 10 | Raatrani | Cestrum nocturnum | 12 | 35.4 | 5.3 | 40.7 | 20.4 | 74.7 | 25 | 1867 | 0.03 |
| 11 | Champa | Plumeria Alba | 5 | 11.1 | 1.7 | 12.8 | 6.4 | 23.4 | 40 | 937 | 0.01 |
| 12 | Kaijurena | | | 34.5 | 5.2 | 39.6 | 19.8 | 72.7 | 60 | 4360 | 0.06 |
| 13 | Chandani | Tabernaemontana Divaricata | 5 | 11.1 | 1.7 | 12.8 | 6.4 | 23.4 | 40 | 937 | 0.01 |
| 14 | Kaner | Nerium indicum | 10 | 21.7 | 3.3 | 24.9 | 12.5 | 45.7 | 100 | 4572 | 0.06 |
| 15 | Seesam | Sesamum indicum | 15 | 66.2 | 9.9 | 76.2 | 38.1 | 139.6 | 100 | 13958 | 0.19 |
| 16 | Amaltas | Cassia Fastula | 13 | 44.3 | 6.6 | 51.0 | 25.5 | 93.5 | 40 | 3738 | 0.05 |





| Sr. | Tree Name | Botanical and Family Name | Average Diameter in CM | AGB | BGB | Total | Carbon Storage | Amount of Co2 | Total | Total Amount of Co2 | Co2 Sequestered amount |
|------|--------------|------------------------------|------------------------------|-------|------|-------|-------------------|------------------|-------|---------------------------|------------------------------|
| 110. | | | (5 to 50) | | | | Storage | Sequestered | | Sequestered | (Ton/year) |
| | | Hibiscus rosa- | | | | | | | | | |
| 17 | Gudhal | sinensis | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 150 | 45750 | 0.62 |
| | | Butea | | | | | | | | | |
| 18 | Palash | monosperma | 15 | 66.2 | 9.9 | 76.2 | 38.1 | 139.6 | 300 | 41875 | 0.57 |
| 19 | Babul | Vachellia Nilotica | 18 | 109.2 | 16.4 | 125.6 | 62.8 | 230.2 | 400 | 92099 | 1.26 |
| • • | | Ficus | | | | | | | 1.0 | | |
| 20 | Bargad | benghalensis | 10 | 21.7 | 3.3 | 24.9 | 12.5 | 45.7 | 10 | 457 | 0.01 |
| 21 | Peepal | Ficus religiosa | 18 | 109.2 | 16.4 | 125.6 | 62.8 | 230.2 | 15 | 3454 | 0.05 |
| 22 | ¥71 · | Phoenix | 1.5 | | 0.0 | 740 | 20.1 | 100 6 | • | 2502 | 0.04 |
| 22 | Khajur | dactylifera | 15 | 66.2 | 9.9 | 76.2 | 38.1 | 139.6 | 20 | 2792 | 0.04 |
| 22 | Dearr | Archontophoenix | 20 | 1447 | 21.7 | 1664 | 02.2 | 205.0 | 20 | 24400 | 0.22 |
| 23 | Paam | | 20 | 144.7 | 21.7 | 100.4 | 83.2 | 305.0 | 80 | 24400 | 0.33 |
| 24 | Neem | Azadirachta | 16 | 70.2 | 11.0 | 01.1 | 15 5 | 166.0 | 50 | 8347 | 0.11 |
| 24 | INCOM | Nymphoides | 10 | 19.2 | 11.9 | 91.1 | 45.5 | 100.9 | 50 | 0347 | 0.11 |
| 25 | Kumudani | cristata | 18 | 109.2 | 16.4 | 125.6 | 62.8 | 230.2 | 10 | 2302 | 0.03 |
| 26 | Gular | Ficus Racemosa | 15 | 66.2 | 9.9 | 76.2 | 38.1 | 139.6 | 5 | 698 | 0.01 |
| | | Evolvulus | | | | | | | | | |
| 27 | Vishnuchakra | alsinoides | 16 | 79.2 | 11.9 | 91.1 | 45.5 | 166.9 | 4 | 668 | 0.01 |
| | | Elaeocarpus | | | | | | | | | |
| 28 | Rudraksh | Ganitrus Roxb | 21 | 164.5 | 24.7 | 189.1 | 94.6 | 346.7 | 5 | 1733 | 0.02 |
| 29 | Saami | Acacia spigera | 16 | 79.2 | 11.9 | 91.1 | 45.5 | 166.9 | 10 | 1669 | 0.02 |
| 30 | Belpatra | Aegle marmelos | 21 | 164.5 | 24.7 | 189.1 | 94.6 | 346.7 | 10 | 3467 | 0.05 |
| 31 | Mango | Mangifera indica | 12 | 35.4 | 5.3 | 40.7 | 20.4 | 74.7 | 20 | 1494 | 0.02 |
| 32 | Jaamphal | Psidium guajava | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 50 | 15250 | 0.21 |

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Green Audit Report Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.) (Assessment Year 2021-22)



| Sr. no. | Tree Name | Botanical and Family Name | Average Diameter in CM (5 to 50) | AGB | BGB | Total | Carbon Storage | Amount of Co2 Sequestered | Total | Total Amount of Co2 Sequestered | Co2 Sequestered amount (Ton/year) |
|------------|--------------|-------------------------------|-------------------------------------------|-------|------|-------|-------------------|---------------------------------|-------|------------------------------------------|--------------------------------------------|
| | | Saptaparna (Alstonia | | | | | | | | | |
| 33 | Satpakhi | scholaris) | 13 | 44.3 | 6.6 | 51.0 | 25.5 | 93.5 | 30 | 2804 | 0.04 |
| 34 | Booganbeliya | Nyctaginaceae | 10 | 21.7 | 3.3 | 24.9 | 12.5 | 45.7 | 100 | 4572 | 0.06 |
| 35 | Cactus | Opuntia Opuntia | 12 | 35.4 | 5.3 | 40.7 | 20.4 | 74.7 | 50 | 3734 | 0.05 |
| 36 | Shikhakai | Acacia concinna | 16 | 79.2 | 11.9 | 91.1 | 45.5 | 166.9 | 2 | 334 | 0.00 |
| 37 | Naag Champa | Mesua ferrea | 19 | 126.3 | 18.9 | 145.2 | 72.6 | 266.2 | 50 | 13310 | 0.18 |
| 38 | Table Paam | Livistona rotundifolia | 16 | 79.2 | 11.9 | 91.1 | 45.5 | 166.9 | 20 | 3339 | 0.05 |
| 39 | Metha Neem | Murraya koenigii | 22 | 185.6 | 27.8 | 213.4 | 106.7 | 391.2 | 5 | 1956 | 0.03 |
| 40 | Bechandi | Acacia arabicae | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 3 | 915 | 0.01 |
| 41 | Giloy | Tinospora cordifolia | 7 | 11.3 | 1.7 | 13.0 | 6.5 | 23.8 | 300 | 7125 | 0.10 |
| 42 | Anwla | Phyllanthus emblica | 17 | 93.5 | 14.0 | 107.6 | 53.8 | 197.2 | 50 | 9858 | 0.13 |
| 43 | Moolshree | Mimusops elengi | 3 | 16.4 | 2.5 | 18.8 | 9.4 | 34.5 | 5 | 173 | 0.00 |
| 44 | Bakayan | Ficus benghalensis | 22 | 185.6 | 27.8 | 213.4 | 106.7 | 391.2 | 10 | 3912 | 0.05 |
| 45 | Madar | Calotropis Gigantea (Linn) | 25 | 257.1 | 38.6 | 295.7 | 147.8 | 542.0 | 10 | 5420 | 0.07 |
| 46 | Gulab | Persian | 3 | 16.4 | 2.5 | 18.8 | 9.4 | 34.5 | 100 | 3453 | 0.05 |
| 47 | Arbi | Colocasia esculenta | 7 | 11.3 | 1.7 | 13.0 | 6.5 | 23.8 | 5 | 119 | 0.00 |
| 48 | Badam | Terminalia Catappa | 24 | 231.9 | 34.8 | 266.7 | 133.3 | 488.9 | 20 | 9777 | 0.13 |

Green Audit report prepared by EEPL, Indore, M.P.

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Green Audit Report Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.) (Assessment Year 2021-22)



| Sr. no. | Tree Name | Botanical and Family Name | Average Diameter in CM (5 to 50) | AGB | BGB | Total | Carbon Storage | Amount of Co2 Sequestered | Total | Total Amount of Co2 Sequestered | Co2 Sequestered amount (Ton/year) |
|------------|--------------------|---------------------------------|-------------------------------------------|----------|------------|-------------|-------------------|---------------------------------|-------|------------------------------------------|--------------------------------------------|
| 49 | Faix | Ficus | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 30 | 9150 | 0.12 |
| 50 | Paras peepal | Thespesia Populnea | 21 | 164.5 | 24.7 | 189.1 | 94.6 | 346.7 | 5 | 1733 | 0.02 |
| 51 | Sagwan | Tectona grandis | 24 | 231.9 | 34.8 | 266.7 | 133.3 | 488.9 | 50 | 24443 | 0.33 |
| 52 | Arjun | Terminalia arjuna | 33 | 507.6 | 76.1 | 583.7 | 291.9 | 1070.0 | 25 | 26749 | 0.36 |
| 53 | Mahua | Madhuca longifolia | 26 | 283.7 | 42.5 | 326.2 | 163.1 | 598.0 | 20 | 11959 | 0.16 |
| 54 | Kachnar | Bauhinia Variegata | 22 | 185.6 | 27.8 | 213.4 | 106.7 | 391.2 | 30 | 11736 | 0.16 |
| 55 | Sarkas | Mary Sarkas | 25 | 257.1 | 38.6 | 295.7 | 147.8 | 542.0 | 10 | 5420 | 0.07 |
| 56 | Nariyal | Annona | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 5 | 1525 | 0.02 |
| 57 | Papita | Carica papaya | 25 | 257.1 | 38.6 | 295.7 | 147.8 | 542.0 | 10 | 5420 | 0.07 |
| 58 | Berry | Phyllanthus emblica | 20 | 144.7 | 21.7 | 166.4 | 83.2 | 305.0 | 50 | 15250 | 0.21 |
| 59 | Nakshtra Vatika | Messua ferrea Calophyllaceae | 15 | 66.2 | 9.9 | 76.2 | 38.1 | 139.6 | 27 | 3769 | 0.05 |
| 60 | Navgraha Vatika | Achyranthes aspera | 12 | 35.4 | 5.3 | 40.7 | 20.4 | 74.7 | 9 | 672 | 0.01 |
| 61 | Herbal Garden | Herbal Garden | 10 | 21.7 | 3.3 | 24.9 | 12.5 | 45.7 | 150 | 6858 | 0.09 |
| | | | Total Co2 | Emission | neutralize | by the tree | es | · | • | • | 10.97 |

College has 4665 trees in the campus. This is good initiative taken by management for green campus under the campaign of plantation. It's APPRECIABLE. There are total CO 2 Emission neutralize by the trees 10.97Ton/year

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3.6 Calculation of CO2 Emission of college: -

| Total Carbon Footprint generated | = | Carbon footprint by electricity |
|----------------------------------|---|---------------------------------|
| by the campus | | - Carbon Neutralize by tree |

 Total Carbon Foot
 18.90 – 10.97 = 7.93 tons/year

3.7 Other Emissions Excluded

This study did not evaluate the carbon sequestration potential of existing plantation activities and emission from the staff commuting, food supply, official flights, paper products, water supply, and waste disposal and recycling due to limited data availability. The current study identifies areas where data monitoring, recording and archiving need to be developed for enlarging the scope of mapping of GHGs emission in the future years. Accordingly, a set of tools and record keeping procedure will be developed for improving the quality of data collection for the next year carbon footprint studies.





CHAPTER- 4 WASTE MANAGEMENT

4.1 About Waste:

Human activities create waste, and it is the way these wastes are handled, stored, collected and disposed of, which can pose risks to the environment and to public health waste management is important for an eco-friendly campus. In college different types of wastes are generated, its collection and management are very challenging.

Solid waste can be divided into three categories: bio-degradable, non-biodegradable and hazardous waste. A bio-degradable waste includes food wastes, canteen waste, wastes from toilets etc. Non-biodegradable wastes include what is usually thrown away in homes and schools such as plastic, tins and glass bottles etc. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals, acids and petrol.

Unscientific management of these wastes such as dumping in pits or burning them may cause harmful discharge of contaminants into soil and water supplies, and produce greenhouse gases contributing to global climate change respectively. Special attention should be given to the handling and management of hazardous waste generated in the college. Bio-degradable waste can be effectively utilized for energy generation purposes through anaerobic digestion or can be converted to fertilizer by composting technology. Non-biodegradable waste can be utilized through recycling and reuse. Thus, the minimization of solid waste is essential to a sustainable college. The auditor diagnoses the prevailing waste disposal policies and suggests the best way to combat the problems.

| Sr.No. | Types of Waste | Particulars |
|--------|-----------------------|------------------------------------------------------------------|
| 1 | Solid wastes | Damaged furniture, paper waste, paper plates, food wastes |
| 1 | Solid wastes | etc. |
| 2 | Diactic waste | Pen, Refill, Plastic water bottles and other plastic containers, |
| | r lastic waste | wrappers etc. |
| 3 | E-Waste | Computers, electrical and electronic parts etc. |
| 4 | Glass waste | Broken glass wares from the labs etc. |
| 5 | Chemical wastes | Laboratory waste etc. |
| 6 | Bio-medical | Sonitary Norkin etc. |
| | Waste | Samary Napkin etc. |

Table 4.1 Different types of waste generated in the College Campus.

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4.2 Waste management Practices adopted by the college

College has a different type of waste generated like paper, Plastic, dust and wet waste. The college provided dustbin near classroom, office, laboratories, staff room, and collect the waste material at the end of the day. The waste (Especially dry material) is collected in a big dustbin which are provided at every floor and the next day collected municipal corporation for further processing.



Figure 4.1 Waste collection bin in college campus

Recommendation

It is recommended adopted 5 Bin Waste Collection System for collect different type of waste generated in college premises.



Figure 4.2 Recommended 5 Dust Bin waste collection System





4.3 Waste Collection Points:

Audit team also visited various departments, canteen, and residential area, to find out waste generation area and waste collection points for further improvement. Details are given in the table

| Sr. No. | Location | Dust been |
|---------|------------------|-----------|
| 1 | Atal Building | 15 |
| 2 | Science Building | 10 |
| 3 | Law/Old Building | 5 |
| | Total | 30 |

Table 4.2 Detailed of Waste collection Dust bin system





CHAPTER- 5 RECOMMENDATIONS AND SUGGESTIONS

5.1 QR Code System and Biodiversity:

While the world seems to be going digital, people lack the time to read books and process the information they contain. Hence, College can be provided QR codes on the trees for its information and to exploit the rapidly growing platform for a unique purpose.



Fig: 5.1 QR Code System for plants

These codes can give students all the information they need to know about the tree — from its scientific name to its medicinal value. They only need to put their smart-phones to use. QR codes to them, making it easier for everybody to learn about a plant or a tree at the tip of their fingers," If any app generating a QR code, which is available for free on the online stores, can be used to avail the information of the trees.

4 Eco-restoration programmes

• Frame long-term eco-restoration programmes for replacing exotic Acacia plantations with indigenous trees and need of the hour is to frame a holistic campus development plan.





5.2 Other Suggestions

Some of the very important suggestions are: -

- Adopt the proposed Environmentally Responsible Purchasing Policy, and work towards creating and implementing a strategy to reduce the environmental impact of its purchasing decisions.
- **4** Increase recycling education on campus.
- **4** Increase Awareness of Environmentally Sustainable Development in College campus.
- Practice Institutional Ecology- Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.
- Involve All Stakeholders- Encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in environmentally sustainable development.
- Collaborate for Interdisciplinary Approaches- To develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.
- **4** Increase reduces, reuse, and recycle education on campus.
- **4** Develop a butterfly garden that arouses appreciation towards flora and fauna diversity.
- A Name all the trees and plants (Plant DNA barcodes) with its common name and scientific name.
- Arrange training programmes on environmental management system and nature conservation.
- Renovation of cooking system in the canteen to save gas by installation solar water heater system with heat pump.
- **4** Establish a procurement policy that is energy saving and eco-friendly.





End of The Report Thanks



Empirical Exergy Private Limited

Registered Office: 18-E, Sudama Nagar, Indore -452009 Office (Indore): Flat No. 201, Om Apartment, 214 Indrapuri, Indore (M.P.), Contact: +91-731-4948831, Mobile: +91-78693-27256, 88713-68108 <u>www.eeplgroups.com</u>, email:-<u>eempirical18@gmail.com</u> CIN No: U74999MP2018PTC045751

Ref No: EEPL/2022-23/C54

Date: - 21-09-2022

ENERGY AUDIT CERTIFICATE

This is certified that Empirical Exergy Private Limited (EEPL) Indore M.P. has conducted Energy audit at Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.) for the Assessment Year 2016-17 to 2020-21 and audit report has been submitted.

We avail this opportunity to express our deep and sincere gratitude to the management for their wholehearted support and co-operations during the energy audit.

This certificate is being issued on the basis of the Energy Audit conducted by EEPL.

For- Empirical Exergy Private Limited



Rajesh Kumar Singadiya (Director)

M.Tech (Energy Management), PhD (Research Scholar) Accredited Energy Auditor [AEA-0284] Certified Energy Auditor [CEA-7271] (BEE, Ministry of Power, Govt. of India) Empanelled Energy Auditor with MPUVN, Bhopal M.P. Lead Auditor ISO50001:2011 [EnMS) from FICCI, Delhi Certified Water Auditor (NPC, Govt of India) Charted Engineer [M-1699118], The Institution of Engineers (India) Member of ISHRAE [58150]





Energy Audit CONSULTATION REPORT



Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur M.P.

PREPARED BY

EMPIRICAL EXERGY PRIVATE LIMITED

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(Assessment Year 2016-17 to 2020-21)

Energy Audit report prepared by EEPL, Indore, M.P.





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Energy Audit report prepared by EEPL, Indore, M.P.





ACKNOWLEDGEMENT

Empirical Exergy Private Limited (EEPL), Indore takes this opportunity to appreciate & thank the management of **Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.)** for giving us an opportunity to conduct energy audit for the college.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.



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Certificate of Accreditation







Green Monitoring Committee







Policy Document on Green Campus

JAWAHARLAL NEHRU SMRITI GOVERNMENT POST-GRADUATE COLLEGE,

SHUJALPUR, DISTRICT SHAJAPUR (M.P.)

Accredited 'B' grade by NAAC

Email: heginscshushg@mp.gov.in

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Policy document on Green Campus

Green Campus: A Green Campus is a place where environmental friendly practices and education works together to encourage sustainable and eco-friendly practices in the campus. The green campus concept offers an institution the opportunity to take the lead in redefining its environmental culture and developing new paradigms by creating sustainable solutions to environmental, social and economic needs of mankind.

Objectives of the Go Green Programme: The first step of the Go Green Programme involves establishing a viable Green-Campus Committee, within the organizational structure of the Institute. Hence, to give this initiative more clarity and authenticity, we now roll out a POLICYDOCUMENT spelling out the strategies, plans and other allied tasks to make this Program functional officially. We believe that greening the campus is all about sweeping away wasteful materials and using conventional sources of energies for its daily power needs, correct disposal handling, purchase of environment friendly supplies and effective recycling program. The administration of the Institute believes that everyone has to work out the time bound strategies to implement green campus initiatives. These strategies need to be incorporated into the institutional planning and budgeting processes with the aim of developing a clean and green campus. Every individual of the college campus will work, may he/she be a student, faculty and support staff to foster a culture of self-sustainability and make the entire campus environmental friendly. The Green Campus Initiatives (GCI) will enable the institution to develop the campus as a living laboratory for innovation.











12) Establish public/private partnerships with personnel from federal, state, and local environmental agencies, utilities, and the business community. 13) Evaluate daily operations in terms of pollution prevention, waste stream management, and energy efficiency reducing, reusing, recycling, and repairing wherever possible. 14)Secure a commitment up front from the people in charge that well-founded recommendations will be acted upon once audits are completed. Promotion of "Save Energy Tips" in and outside the Institute: Activate power management features on your computer and monitor so that it will go into a low power "sleep" mode when you are not working on it. Turn off your monitor when you leave your Table. Activate power management features on your laser printer. Whenever possible, shut down rather than logging off. Turn off unnecessary lights and use daylight instead. Avoid the use of decorative lighting. Use LED or compact fluorescent bulbs. Keep lights off in conference rooms, classrooms, lecture halls when they are not in use. Use the fans only when they are needed. Unplug appliances not plugged into power strips (like TVs, Refrigerators, ACs, tea/coffeepots, printers, faxes, and chargers etc.). Waste water Management/ Rain water harvesting: The Institute has to work in the direction of waste water management. Water flow restrictors on bathroom faucets and showers, low water flow toilets and automated urinal flushers should be used to cut down campus water use. The Institute will take all necessary measures to implement waste water management /rain water harvesting. Major Green Campus Initiatives: Installation of Solar Power Station (Under process) Waste water Management/ Rainwater harvesting (Under process) Displayed poster on E-waste Management (in practice)











<u>Audit Team</u>

The study team constituted of the following senior technical executives from Empirical

Exergy Private Limited,

- **4** Mr. Rakesh Pathak, [Director & Electrical Expert]
- **Mr. Rajesh Kumar Singadiya** [Director & Accredited Energy Auditor AEA-0284]
- 4 Mrs. Laxmi Raikwar Singadiya [Energy & Chemical Engineer]
- **4** Mr. Sachin Kumawat [Sr. Project Engineer]
- **4** Mr. Ajay Nahra [Engineer]
- **4** Mr. Charchit Pathak [Mechanical Engineer]
- **4** Mr. Aakash Kumawat [Assistant Jr. Engineer]





EXECUTIVE SUMMARY

The executive summary of the energy audit report furnished in this section briefly gives the identified energy conservation measures and other recommendation during the project that can be implemented in a phased manner to conserve energy, increase productivity inside the college campus.

RECOMMENDATION: -

4 SOLAR SYSTEM

There is good potential of install 17.5 kWp roof top grid connected system. Expected annual solar energy generation @ 4 unit per kilowatt is 21900 units.

LIGHTING SYSTEM

College has already initiated installation of energy efficient lighting in new construction building and replacement of "conventional tube light by energy efficient LED tube light. Still there are good potential for replacement of 15 no. of conventional T-8 (36 Watt)" tube light by energy efficient 20Watt LED lighting in college estimated energy saving potential is 840 kWh/Year.

4 Ceiling Fan and Exhaust Fan

- Replacement of "conventional ceiling fan (60 Watt)" by energy efficient star rated fanor BLDC based energy efficient fan (28 Watt) in class rooms, laboratories and faculties cabin" have great potential for energy saving.
- Replacement of "conventional exhaust fan (180 Watt)" by energy efficient star rated fan or BLDC based energy efficient Fan (40 Watt) in college campus class rooms, laboratories and faculties cabin have great potential for energy saving.

↓ TIMER CONTROLLED STREET LIGHTS

Installation of "Timer control on high mast and street lighting" in college campus is recommended.

4 ENERGY MANAGEMENT WORKSHOP AND TRAINING

Conduct awareness and training programs for faculty, student and non-teaching staffs. Conduct seminars, workshops and exhibitions on energy management education.





ENERGY CONSERVATION MEASURES FOR ELECTRICAL SYSTEM

| Case Study | Section | Identification | Observation | Recommendation | Annual Energy Saving (kWh) | Annual Cost Saving (Rs.) | Investment (Rs.) | Simple Payback Period |
|---------------|----------------------|-----------------------------------------|-----------------------------------------------------------|------------------------------------------------------------------------|----------------------------------|--------------------------------|---------------------|-----------------------------|
| 1 | Lighting System | 15 No. FTL tube light | Power consumption by T-12 FTL | Replacement of conventional (T-12) with (20 Watt LED Tube) | 840 | 7,560/- | 3,150 | 5 |
| 2 | Ceiling Fan | 31 No. Ceiling Fan | Power consumption by existing ceiling fan (60 Watt) | Replacement of 60W conventional ceiling fan by 28W BLDC | 3,224 | 29,016/- | 52,080 | 1.8 |
| 3 | Electrical System | There is good potential for solar | Installation of 17.5 KWp solar system | Installation of 17.5 KWp solar system | 19,656 | 2,17,175/- | 6,69,354 | 3.1 |





CHAPTER-1 INTRODUCTION

1.1 About College

Jawaharlal Nehru Smriti Govt. P.G. College is situated on the city - Mandi Road, Shujalpur at a distance of 2 kms. from Shujalpur Railway Station, on the Kannod - Pachore highway. This place is lying at a distance of 80 kms. from Bhopal, the state capital; 70 kms. from Shajapur, its district headquarters; 100 kms. from Ujjain, the holy city, which is its divisional headquarters. It is 130 kms. away from Indore, the commercial capital of Madhya Pradesh. The nearest airport is at Bhopal.

Shujalpur falls under 'Malwa' region and the local dialect is malvi. Before the inception of the college higher education facilities for the students of the region were confined to cities like Bhopal, Indore, and Ujjain all of which are at a distance of more than 80 kms. From this place. The college started functioning on 1st August, 1964. It was founded by a trust called Mahavidyalaya Sthapna Samiti, Shujalpur under the chairmanship of Shri Liladhar Joshi, the erstwhile Chief Minister of 'Central India.' The college was successfully run by the Samiti for seven years with three faculties – Arts, Science and Commerce. LLB Course was opened in 1968. Later on, considering the place of its development and also its growth potential, the college was taken over by the state government on 22nd February 1971. Further, taking into account its student strength and the local demand for higher studies, the college was given the status of a PG college in the year 1997 with eight PG Courses – Five in Arts stream, two in Science, and one in Commerce. Presently it is running a total of six UG and thirteen PG programmes.

The college has all the potential for further development which is amply visible from the fact that there has been a steady growth in the student strength in the college, particularly in the last fifteen years. In spite of the mushrooming of private colleges in the area, the graph of the enrolment figure has consistently shown an upward trend. In the academic year 2020-21 the enrolment figure stands 5163. Since the college is the premier institution for higher education in the locality, and all the district headquarters are at a distance of 50 to 100 kms., the student strength of the college is expected to be constantly on the rise in the years to come. The projected student strength by 2027 is approximately 8000. The college administration is continuously striving to create enough infrastructural space in terms of classrooms, laboratories, library space, and sports facilities in order to cope with the projected student strength.





The college, as the Vision and Mission statements indicate, mostly caters to the higher educational needs of the rural backward student community. The percentage of female students (54.84), SC students (24.07) and that of the students from OBC (53.45) enrolled in the college are higher than the national average. The college, therefore, mainly focuses on the development of the student community from these sections of the society.

J.N.S. Govt. College, Shujalpur, got accredited by NAAC. The NAAC assessment took place in December, 2015 and the college was awarded "B" grade with a CGPA of 2.36.

COLLEGE FACILITIES

- **4** Experienced Faculty.
- Use of computer & projector for teaching.
- Well lighted & ventilated classrooms.
- **4** Purified Drinking water.
- ↓ Toilets for Staff & Students.
- **4** Common room for girls.
- Staff room
- Ramps & Railing.
- **Well-equipped Laboratories.**
- Various Scholarships.
- Sports
- Faculty.
- **4** Eco-friendly environment.
- Hostel





Our Vision

To strive towards turning the college into a leading center for higher education offering a blend of general and professional courses with a view to producing employable and entrepreneurial graduates, while ensuring social and gender equity as well as developing environmental consciousness.

Our Mission

- To provide maximum opportunities for employment to the students belonging to socially and economically backward communities.
- To open up need-based and modern avenues of higher education with consistently good quality.
- **4** To ensure women empowerment in the areas of employment /entrepreneurship.
- To inculcate in the students a feeling of national pride, moral values, and gender sensitivity

1.2 About Energy Audit

Energy audit helps to understand more about the ways energy is used in any educational institute and helps in identifying areas where waste may occur and scope for improvement exists. The overall energy efficiency from generation to final consumer becomes 50%.

Energy audit is the most efficient way to identify the strength and weakness of energy management practices and to find a way to solve problems. Energy audit is a professional approach in utilizing economic, financial, and social and natural resources responsibility. Energy audits "adds value" to management control and is a way of evaluating the system.

Empirical Exergy Private Limited (EEPL), Indore M.P. carried out the "Energy Audit" at the site to find gaps in the energy consumption pattern for **Jawaharlal Nehru Smriti Govt. P.G. College** technical report is prepared as per the need and the requirement of the project.

Energy Audit report prepared by EEPL, Indore, M.P.





1.3 Objectives of Energy Audit

An energy audit provides vital information base for overall energy conservation program covering essentially energy utilization analysis and evaluation of energy conservation measures. It aims at:

- Identifying the quality and cost of various energy inputs.
- Assessing present pattern of energy consumption in different cost centers of operations.
- Relating energy inputs and production output.
- Identifying potential areas of thermal and electrical energy economy.
- Highlighting wastage in major areas.
- Fixing of energy saving potential targets for individual cost centers.
- Implementation of measures for energy conservation & realization of savings.

1.4 Methodology

Methodology adopted for achieving the desired objectives viz.: Assessment of the current operational status and energy savings include the following:

- Discussions with the concerned officials for identification of major areas of focus and other related systems.
- Team of engineers visited the site and had discussions with the concerned officials / supervisors to collected data / information on the operations and load distribution within the plant and same for the overall premises. The data was analyzed to arrive at a base line energy consumption pattern.
- Measurements and monitoring with the help of appropriate instruments including continuous and / or time-lapse recording, as appropriate and visual observations were made to identify the energy usage pattern and losses in the system.
- **4** Trend analysis of costs and consumptions.
- **4** Capacity and efficiency test of major utility equipment's, wherever applicable.
- **4** Estimation of various losses
- Computation and in-depth analysis of the collected data, including utilization of computerized analysis and other techniques as appropriate were done to draw inferences and to evolve suitable energy conservation plan/s for improvements/ reduction in specific energy consumption.





1.5 Previous Years Energy Scenario

| Previous Years Unit Consumption | | | | | |
|---------------------------------|------------------------------------------|-------------------------------|------------------------------------------|----------------------------------------------|------------------------------------|
| Year | Principal BTI JNS College (2KW) | Govt. JNS College (2KW) | Principal BTI JNS College (6KW) | Rajmata Pnnadhyay Chatrawas (7.5KW) | Total Unit Consumption (KWH) |
| 2016 to 2017 | 5140 | 1740 | 7415 | 2980 | 17275 |
| 2017 to 2018 | 4449 | 3680 | 13124 | 3512 | 24765 |
| 2018 to 2019 | 3827 | 4615 | 9005 | 3648 | 21095 |
| 2019 to 2020 | 4876 | 2207 | 10906 | 5436 | 23425 |



Figure 1.1 Previous Years Energy Scenario





1.6 Present Energy Scenario

College uses energy in the form of electricity purchased from MPPKVVCL grid. The college has 04 connection one is Principal BTI JNS College building with sectioned load 2 KW, Govt. JNS College building with sectioned load 2 KW, Principal BTI JNS College 6 KW, Rajmata Pnnadhyay Chatrawas 7.5KW.

Total billing amount of Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur of all four connection INR 197162/- with respect to annual energy consumption 19656 units analysis period from Jul-2020 to Jun-2021



Figure 1.2 Present Energy Scenario Year 2020-21

It was observed that overall, per unit charges Rs10/- paid by college. The major contribution of energy is new building with 56% of total energy consumption





Layout of College



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Page 20





CHAPTER- 2 POWER SUPPLY SYSTEM

2.1 POWER SUPPLY SYSTEM

The power supply for the **Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur** is from MPPKVVCL with the help of 11 kV feeders. There are 02 connection one is Principal Govt. JNS College, Principal B.T.I JNS College, Govt. JNS College. building under Tariff LV2.1 non industrial with sectioned load 6KW, 2KW, 2KW. Second is Rajmata Pnnadhyay Chatrawas building under tariff LV2.2 non industrial with sectioned load 7.5kW.

| Table -2.1 Details of connections in the colle | ge |
|------------------------------------------------|----|
|------------------------------------------------|----|

| Sr. No. | Connection ID. | (Power Supply Areas) |
|---------|---------------------|-----------------------------|
| 1 | IVRS NO N3163015594 | Principal BTI JNS College |
| 2 | IVRS NO N3163015591 | Govt. JNS College |
| 3 | IVRS NO N3163015590 | Principal BTI JNS College |
| 4 | IVRS NO N3163007361 | Rajmata Pnnadhyay Chatrawas |





CHAPTER- 3 ELECTRICITY BILL ANALYSIS

3.1 Electricity Bill Analysis

Electricity bills of last one years were analysed. Detailed of unit consumption, Overall unit charges in below

| Table-5.1 Monthly energy consumption 2020-21 of Principal B11 JNS Conege |
|--------------------------------------------------------------------------|
| Principal BT1 JNS College |

| r micipai D 11 JNS College | | | | | | | |
|----------------------------|--------|------------------|-----------------|---------------------|--|--|--|
| Month & | | Unit consumption | Total Amount | Overall Unit | | | |
| Sr.No. | Year | (kWh/month) | (R s/-) | Charges (Rs/kWh) | | | |
| 1 | Jul-20 | 199 | 3499/- | 17.58 | | | |
| 2 | Aug-20 | 216 | 3652/- | 16.91 | | | |
| 3 | Sep-20 | 274 | 3897/- | 14.22 | | | |
| 4 | Oct-20 | 303 | 2267/- | 7.48 | | | |
| 5 | Nov-20 | 214 | 1685/- | 7.87 | | | |
| 6 | Dec-20 | 204 | 1588/- | 7.78 | | | |
| 7 | Jan-21 | 226 | 1767/- | 7.82 | | | |
| 8 | Feb-21 | 234 | 2033/- | 8.69 | | | |
| 9 | Mar-21 | 304 | 3392/- | 11.16 | | | |
| 10 | Apr-21 | 376 | 3550/- | 9.44 | | | |
| 11 | May-21 | 206 | 1814/- | 8.81 | | | |
| 12 | Jun-21 | 245 | 2354/- | 9.61 | | | |
| | Total | 3001 | 31498/- | 10.61 | | | |



Figure 3.1 Monthly Unit Consumption year-2020-21 of Principal BTI JNS College

Observation - Annual energy consumption of Principal BTI JNS College is 3001 units and per unit charges is 10.61.

Energy Audit report prepared by EEPL, Indore, M.P.





| | Govt. JNS College | | | | | | | |
|--------|-------------------|------------------|---------------------|-----------------------------|--|--|--|--|
| | Month & | Unit Consumption | Total Amount | Overall Unit Charges | | | | |
| Sr.No. | Year | (kWh) | (Rs/-) | (Rs/Kwh) | | | | |
| 1 | Jul-20 | 24 | 1710/- | 71.25 | | | | |
| 2 | Aug-20 | 28 | 1952/- | 69.71 | | | | |
| 3 | Sep-20 | 27 | 1855/- | 68.70 | | | | |
| 4 | Oct-20 | 124 | 1875/- | 15.12 | | | | |
| 5 | Nov-20 | 225 | 1954/- | 8.68 | | | | |
| 6 | Dec-20 | 97 | 1116/- | 11.51 | | | | |
| 7 | Jan-21 | 100 | 1150/- | 11.50 | | | | |
| 8 | Feb-21 | 126 | 1327/- | 10.53 | | | | |
| 9 | Mar-21 | 125 | 1311/- | 10.49 | | | | |
| 10 | Apr-21 | 135 | 1372/- | 10.16 | | | | |
| 11 | May-21 | 99 | 1120/- | 11.31 | | | | |
| 12 | Jun-21 | 39 | 992/- | 25.44 | | | | |
| | Total | 1149 | 17734/- | 27.03 | | | | |

Table-3.2 Monthly energy consumption 2020-21 of Govt. JNS College



Figure 3.2 Monthly Unit Consumption year-2020-21 of Govt. JNS College

Observation - Annual energy consumption of Govt. JNS College is 1149 units and per unit charges is 27.03.





| Table-3 | Table-3.3 Monthly energy consumption 2020-21 at Rajmata Pnnadhyay Chatrawas | | | | | | | |
|---------|-----------------------------------------------------------------------------|------------------|---------------------|-----------------------------|--|--|--|--|
| | Rajmata Pnnadhyay Chatrawas | | | | | | | |
| | Month & | Unit Consumption | Total Amount | Overall Unit Charges | | | | |
| Sr.No. | Year | (kWh) | (R s/-) | (Rs/kWh) | | | | |
| 1 | Jul-20 | 261 | 3,390/- | 12.99 | | | | |
| 2 | Aug-20 | 343 | 3960/- | 11.55 | | | | |
| 3 | Sep-20 | 368 | 3905/- | 10.61 | | | | |
| 4 | Oct-20 | 317 | 3695/- | 11.66 | | | | |
| 5 | Nov-20 | 292 | 3516/- | 12.04 | | | | |
| 6 | Dec-20 | 276 | 2995/- | 10.85 | | | | |
| 7 | Jan-21 | 229 | 3130/- | 13.67 | | | | |
| 8 | Feb-21 | 470 | 4764/- | 10.14 | | | | |
| 9 | Mar-21 | 398 | 4761/- | 11.96 | | | | |
| 10 | Apr-21 | 446 | 4105/- | 9.20 | | | | |
| 11 | May-21 | 510 | 4470/- | 8.76 | | | | |
| 12 | Jun-21 | 547 | 4594/- | 8.40 | | | | |
| | Total | 4457 | 47285/- | 10.99 | | | | |



Figure 3.3 Monthly Unit Consumption year-2020-21 of Rajmata Pnnadhyay Chatrawas

Observation - Annual energy consumption of Rajmata Pnnadhyay Chatrawas is 4457 units and per unit charges is 10.





Principal BTI JNS College (6KW) Month & **Unit Consumption Total Amount Overall Unit Charges** Year (kWh) (Rs/-)Sr.No. (Rs/kWh) Jul-20 525 10,016/-19.08 1 2 Aug-20 818 12025/-14.70 3 922 13.59 Sep-20 12528/-4 Oct-20 1139 8871/-7.79 5 Nov-20 732 5746/-7.85 Dec-20 712 5345/-7.51 6 7 Jan-21 844 6382/-7.56 8 954 7154/-Feb-21 7.50 9 Mar-21 547 5150/-9.41 10 1865 12877/-6.90 Apr-21 7076/-11 May-21 956 7.40 12 Jun-21 1035 7475/-7.22 Total 11049 100645/-9.71





Figure 3.4 Monthly Unit Consumption year-2020-21 of Principal BTI JNS College

Observation - Annual energy consumption of Principal BTI JNS College is 11049 units and per unit charges is 9.71.

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3.2 On site Power Measurement

Table 3.5 Operating load measurement on various areas in college.

| Sr.No. | Location | HP | Phase | Voltage (V) | Current (Amp) | Power Factor | Input Tower (Kw) | Measured Flow (m ³ /hr.) | Running (Hr./Day) |
|--------|-----------------------------|----|-------|----------------|------------------|-----------------|---------------------|----------------------------------------|----------------------|
| 1 | Bore -1 Law/Old Building | 3 | 3 | 0 | 0 | 0 | 0 | Under Maintenance | 8-10 |
| 2 | Bore-2 Gandhi Udhyan | 3 | 3 | 407 | 4.7 | 0.65 | 2.15 | 2.3 | 8-10 |
| 3 | Bore -3 Nakshtra Vatika | 2 | 1 | 234 | 9.4 | 0.67 | 2.55 | 1.4 | 8 - 10 |
| 4 | Bore-4 Herbal Garden | 3 | 1 | 0 | 0 | 0 | 0 | Under Maintenance | 6 - 8 |
| 5 | Bore-5 Hostel | 3 | 3 | 406 | 4.9 | 0.62 | 2.14 | 2.1 | 6 - 8 |



Figure 3.5 On Site Power Measurement

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3.3 Connected load of College Buildings

Audit team has taken connected load detail of all building (floor wise). details are given in table form

Table 3.6 Connected load of JNS college (Old building)

| Sr. No. | Location | Fan | LED | Computer | Printer | Cooler | Table fan | Tube light | Bulb |
|---------|-------------------|-----|-----|----------|---------|--------|-----------|------------|------|
| 1 | Dept. of Law | 3 | 2 | 1 | 1 | 1 | 0 | 0 | 0 |
| 2 | Dept. of commerce | 3 | 2 | 1 | 1 | 0 | 1 | 0 | 0 |
| 3 | Room – 3 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 4 | Room – 4 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 5 | Room – 5 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 6 | Room – 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | Room – 7 | 8 | 0 | 0 | 0 | 0 | 0 | 5 | 0 |
| 8 | Virtual class | 1 | 0 | 0 | 0 | 0 | 0 | 4 | 0 |
| 9 | Room – 8 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 10 | Room – 11 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | Room – 12 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | Room – 13 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | Toilet | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | Room – 14 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 0 |
| 16 | Girl's toilet | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17 | Room - 15 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |





Atal Bhavan (Ground floor)

| Sr. No. | Location | Fan | LED | Exhaust fan |
|---------|-----------------------------|-----|-----|-------------|
| 1 | G-04 Pantry | 1 | 1 | 0 |
| 2 | Cafeteria | 1 | 1 | 0 |
| 3 | G -06B.com III | 6 | 6 | 0 |
| 4 | G-07 Girls common room | 6 | 6 | 0 |
| 5 | Girl's toilet | 0 | 5 | 1 |
| 6 | G-08 B.com(A) | 9 | 7 | 0 |
| 7 | G - 19 M.com (previous) | 6 | 7 | 0 |
| 8 | G-20 M.com final | 6 | 7 | 0 |
| 9 | G - 01 Principal | 11 | 7 | 0 |
| 10 | G - 02 Established | 10 | 15 | 0 |
| 11 | Electric room | 0 | 1 | 0 |
| 12 | Staff room commerce faculty | 6 | 6 | 0 |
| 13 | G - 09 B.com -1(B) | 9 | 7 | 0 |
| 14 | G - 10 B.com -II | 9 | 7 | 0 |
| 15 | G - 11 Canteen | 6 | 6 | 0 |
| 16 | G - 12 BBA | 6 | 6 | 0 |
| 17 | G – 13 | 2 | 2 | 0 |
| 18 | G – 14 | 2 | 2 | 0 |
| 19 | G - 15 Sick room | 3 | 2 | 0 |
| 20 | G- 16 Computer Lab | 6 | 6 | 0 |
| 21 | G - 17 Computer lab | 6 | 6 | 0 |
| 22 | G-18 Library | 19 | 29 | 0 |
| 23 | Ground floor outside room | 4 | 41 | 0 |
| 24 | Stairs | 0 | 2 | 0 |
| 25 | Boy's toilet | 0 | 5 | 0 |

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Atal Bhavan (1st floor)

| Sr.No. | Location | Fan | LED | Tube light | Computer | Printer | Invertor | Exhaust fan |
|--------|-----------------------------------------------|-----|-----|------------|----------|---------|----------|-------------|
| 1 | F-38 MA Economics Previous Dept. of Economics | 6 | 8 | 0 | 0 | 0 | 0 | 0 |
| 2 | MA Hindi (previous) Dept. of Hindi | 6 | 6 | 0 | 0 | 0 | 0 | 0 |
| 3 | F- 35 MA Geography | 4 | 5 | 0 | 0 | 0 | 0 | 0 |
| 4 | F-31 MA English(previous) | 9 | 4 | 0 | 1 | 0 | 0 | 0 |
| 5 | F-32 MA English (Final) | 9 | 12 | 0 | 1 | 1 | 1 | 0 |
| 6 | MA Hindi (Final) | 9 | 5 | 0 | 0 | 0 | 0 | 0 |
| 7 | Girl's toilet | 0 | 6 | 0 | 0 | 0 | 0 | 1 |
| 8 | Girls Common room | 6 | 6 | 0 | 0 | 0 | 0 | 0 |
| 9 | F-28 | 6 | 6 | 0 | 0 | 0 | 0 | 0 |
| 10 | Dept. of Sociology | 3 | 4 | 0 | 1 | 0 | 0 | 0 |
| 11 | F-24 MA Sociology (Previous) | 9 | 12 | 0 | 0 | 0 | 0 | 0 |
| 12 | F-22 MS.(Previous) | 12 | 8 | 0 | 1 | 1 | 0 | 0 |
| 13 | F-21 Staff Room Art Faculty | 11 | 6 | 0 | 1 | 2 | 0 | 0 |
| 14 | Boy's toilet | | 5 | 0 | 0 | 0 | 0 | 0 |
| 15 | F-40 History Dept. | 6 | 6 | 0 | 0 | 0 | 0 | 0 |
| 16 | F-25 Sociology final | 9 | 12 | 0 | 0 | 0 | 0 | 0 |
| 17 | F-29 Dept. of Political science | 3 | 4 | 0 | 0 | 0 | 0 | 0 |
| 18 | F-33 Malv Sonpoda Museum | 6 | 5 | 0 | 0 | 0 | 0 | 0 |
| 19 | F-34 MA Public Admin | 6 | 8 | 0 | 0 | 0 | 0 | 0 |
| 20 | F-36 MA Economic Final | 9 | 5 | 0 | 0 | 0 | 0 | 0 |
| 21 | Outside room | 0 | 16 | 0 | 0 | 0 | 0 | 0 |
| 22 | Stairs | 0 | 2 | 0 | 0 | 0 | 0 | 0 |





Atal Bhavan (2nd floor)

| Sr. No. | Location | Fan | LED | Exhaust fan | Street light |
|---------|----------------------------------------------------|-----|-----|-------------|--------------|
| 1 | Girls' toilet | 0 | 5 | 1 | 0 |
| 2 | S-47 BA-II Sociology Polytechnic Science Hindi | 6 | 6 | 0 | 0 |
| 3 | S-46 BA-III Sociology Polytechnic Science Hindi | 6 | 6 | 0 | 0 |
| 4 | S-46 BA I, II, III Economic | 9 | 6 | 0 | 0 |
| 5 | S-43 A | 21 | 13 | 0 | 0 |
| 6 | S-43B | 21 | 13 | 0 | 0 |
| 7 | Electric room | 0 | 1 | 0 | 0 |
| 8 | S-42 BA I, II, III Geography | 9 | 8 | 0 | 0 |
| 9 | S-48 BA -II(A) -Sociology, Science, Hindi, History | 9 | 8 | 0 | 0 |
| 10 | Boy's toilet | 0 | 5 | 1 | 0 |
| 11 | Stairs | 0 | 2 | 0 | 0 |
| 12 | Ramp | 0 | 7 | 0 | 0 |
| 13 | Outside room | 0 | 17 | 0 | 0 |
| 14 | Atal Bhavan campus | 0 | 0 | 0 | 7 |
| 15 | Outside building | 0 | 0 | 0 | 18 |





New Building (Main Building) (1st floor):

| Sr. No. | Location | Fan | Ceiling Light | LED | Bulb |
|---------|-----------------------------------------|-----|---------------|-----|------|
| 1 | Moot court room | 8 | 0 | 8 | 0 |
| 2 | R-8 | 8 | 0 | 8 | 0 |
| 3 | R-9 | 8 | 0 | 8 | 0 |
| 4 | R-10 | 8 | 0 | 8 | 0 |
| 5 | R-12 Staff room | 5 | 0 | 5 | 2 |
| 6 | R-7 Virtual class | 8 | 0 | 8 | 0 |
| 7 | R-33 | 6 | 0 | 6 | 0 |
| 8 | R-32 | 6 | 0 | 6 | 0 |
| 9 | R-31 | 6 | 0 | 6 | 0 |
| 10 | R-30 | 6 | 0 | 6 | 0 |
| 11 | R-29 | 5 | 0 | 6 | 0 |
| 12 | R-28 | 6 | 0 | 6 | 0 |
| 13 | R-27 | 6 | 0 | 6 | 0 |
| 14 | R-26 | 2 | 0 | 2 | 0 |
| 15 | IQAC R-41 | 6 | 0 | 6 | 0 |
| 16 | R-38 | 6 | 0 | 6 | 0 |
| 17 | R-40 | 6 | 0 | 6 | 0 |
| 18 | R-39 | 6 | 0 | 6 | 0 |
| 19 | R-37 (ceiling light) | 5 | 7 | 8 | 0 |
| 20 | R-36 (ceiling light under construction) | 5 | 8 | 7 | 0 |
| 21 | R-35 | 4 | 0 | 2 | 0 |
| 22 | Chatra comman room | 0 | 0 | 4 | 0 |





Main Building (Ground floor)

| Sr. No. | Location | Fan | LED | Bulb | Cooler | computer | printer | Exhaust | Projector | Street Light |
|---------|-------------------------------|-----|-----|------|--------|----------|---------|---------|-----------|-----------------|
| 1 | Toilet (construction) | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | Principal room | 4 | 4 | 2 | 1 | 0 | 0 | 0 | 0 | 0 |
| 3 | Outside Principal room | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | R-3 Dept. of Botany | 8 | 8 | 2 | 0 | 1 | 1 | 0 | 0 | 0 |
| 5 | Microbiology dept. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | Computer lab 6 | 7 | 11 | 2 | 0 | 26 | 2 | 1 | 1 | 0 |
| 7 | Computer lab5 | 6 | 6 | 4 | 0 | 25 | 1 | 0 | 0 | 0 |
| 8 | Girl's toilet | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | HOD Room PG lab | 6 | 5 | 0 | 0 | 5 | 2 | 0 | 0 | 0 |
| 10 | Near HOD room | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | Near HOD room | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | near sport room | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | krida bhavan | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | Chemistry lab | 12 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | Dept. Zoology | 6 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | Outside room | 0 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17 | Stair | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19 | Outside building Street light | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 20 | Inside building street light | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 21 | Outside room | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |





Hostel (Chatrawas) Building

| Sr. No. | Location | Fan | LED | Street light |
|---------|------------------------------------|-----|-----|--------------|
| 1 | Hall-1 | 3 | 3 | 0 |
| 2 | Hall-2 | 3 | 3 | 0 |
| 3 | Hall-3 | 3 | 3 | 0 |
| 4 | Hall-4 | 3 | 3 | 0 |
| 5 | Room-1 | 2 | 2 | 0 |
| 6 | Room-2 | 2 | 2 | 0 |
| 7 | Room-3 | 2 | 2 | 0 |
| 8 | Room-4 | 2 | 2 | 0 |
| 9 | Room-5 | 2 | 2 | 0 |
| 10 | Room-6 | 2 | 2 | 0 |
| 11 | Room-7 | 2 | 2 | 0 |
| 12 | Room-8 | 2 | 2 | 0 |
| 13 | Hostel building campus and outside | 0 | 0 | 4 |





3.4 Connected Load sharing Electrical Equipment

| Sr. No. | Equipment's | Unit Power (watt) | Quantity | Total Power (Watt) | Load share% |
|---------|-----------------------------|----------------------|----------|--------------------------|----------------|
| 1 | Tube light (36 watt) | 36 | 15 | 540 | 1 |
| 2 | LED Tube (20 watt) | 20 | 674 | 13480 | 25 |
| 3 | Ceiling fan | 60 | 274 | 16440 | 31 |
| 4 | Computer | 85 | 66 | 5610 | 10 |
| 5 | Printer | 320 | 12 | 3840 | 7 |
| 6 | Exhaust | 180 | 5 | 900 | 2 |
| 7 | Street light | 60 | 34 | 2040 | 4 |
| 8 | Cooler | 150 | 2 | 300 | 1 |
| 9 | Bulb | 9 | 3 | 27 | 0 |
| 10 | Ceiling light | 18 | 15 | 270 | 1 |
| 11 | Bore -1 Law/Old Building | 2238 | 1 | 2238 | 4 |
| 12 | Bore-2 Gandhi Udhyan | 2238 | 1 | 2238 | 4 |
| 13 | Bore -3 Nakshtra Vatika | 1492 | 1 | 1492 | 3 |
| 14 | Bore-4 Herbal Garden | 2238 | 1 | 2238 | 4 |
| 15 | Bore-5 Hostel | 2238 | 1 | 2238 | 4 |
| | Т | otal | | 53.9 KW | 100 |

Table-3.7 Total load share of electrical equipment in college.



Figure 3.6 Connected load in sharing on Electrical appliance





3.5 Photograph of Electrical appliances



Computer & Printer









LED Street Light



Ceiling light



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CHAPTER- 4

ENERGY CONSERVATION MEASURES

4.1 Case Study

Replacement of conventional 36 Watt to energy efficient LED tube light 20 Watt in college: -

| Sr. No | Items | Parameters | Units |
|--------|-----------------------------------------------|------------|------------|
| 1 | Total Power Consumption by T-8 | /18 | Watt |
| 1 | conventional tube light (12 Watt Blast Power) | 40 | vv att |
| 2 | No of T-8 | 15 | Nos. |
| 3 | Working Hrs./Day | 8 | Hrs./Day |
| 4 | Working Days/Year | 250 | Days/Year |
| 5 | Rated Power of Energy Efficient T-5 (LED) | 20 | W |
| 6 | Energy Saving Potential | 840 | kWh/Year |
| 7 | Load Factor@90% Assume | 0.9 | |
| 8 | Expected Annual Energy Saving | 756 | kWh/Year |
| 9 | Overall, Per Unit Charges | 10 | Rs./kWh |
| 10 | Expected Money Saving | 7560 | Rs./Year |
| 11 | Cost of T-5 | 200 | Rs./ Pices |
| 12 | Investment on New Light Purchasing | 3000/- | Rs. |
| 13 | Maintenance Investment@5% | 150/- | Rs. |
| 14 | Total Investment | 3,150/- | Rs |
| 15 | Simple Pay Back Period | 5 | Month |

Total Calculated Monetary Saving Potential in lighting = Rs 7,560 /-

Note: - Energy saving depends on the operation hour per day and load factor of the systems.





4.2 Case Study

Replacement of 60W conventional ceiling fan by 28W BLDC Energy efficient ceiling fan in college: -

| Sr. No | Item | Parameter | Unit |
|--------|---------------------------------------|-----------|-----------|
| 1 | Rated Power of Ceiling Fan | 80 | W |
| 2 | No. of Fan | 31 | Nos |
| 3 | Working Hrs./Day | 8 | Hrs./Day |
| 4 | Working Days/Year | 250 | Days/Year |
| 5 | Energy Efficient BLDC Fan Rated power | 28 | W |
| 6 | Energy Saving Potential | 3224 | kWh/Year |
| 7 | Load Factor | 0.9 | |
| 8 | Expected Annual Energy Saving | 2901.6 | kWh/Year |
| 9 | Per Unit Charges | 10 | Rs/kWh |
| 10 | Expected Money Saving | 29016 | Rs./Year |
| 11 | Cost of New Celling Fan | 1,600 | Rs./Pices |
| 12 | Investment on New Fan Purchasing | 49,600/- | Rs. |
| 13 | Maintenance Investment@5% | 2,480/- | Rs. |
| 14 | Total Investment | 52,080/- | Rs. |
| 15 | Simple Pay Back Period | 1.8 | Year |

Total Calculated Monetary Saving Potential in Celling Fan = Rs 29,016 /-

Note: - Energy saving depends on the operation hour per day and load factor of the systems.





4.3 Case Study

Installation 14.8 kWp grid connected solar roof top system.

| | Theoretical capacity calculation of solar plant on Contract Demand | | | | | | | |
|---|-------------------------------------------------------------------------------|-------|----------|--|--|--|--|--|
| 1 | Total Contract Demand of all connection | 17.5 | KW | | | | | |
| 2 | Maximum theoretical limit as per Net Meting policy of electricity board | 100 | % | | | | | |
| 3 | Maximum theoretical Potential limit of solar plant as per the contract demand | 17.5 | KW | | | | | |
| 4 | Power Factor of the Electrical System | 0.85 | | | | | | |
| 5 | Theoretical solar plant capacity as per contract demand | 14.88 | KWp | | | | | |
| 6 | Expected Solar Unit generation @4 unit/day/KWp | 59.5 | kWh/Day | | | | | |
| 7 | Expected Annual Solar Unit generation of the Solar Plant | 21717 | KWh/Year | | | | | |
| 8 | Annual Unit consumption of college (Year 2020-21) | 19656 | kWh/Year | | | | | |

| | Payback Period Calculation | l | |
|---|---------------------------------------------------------|------------|----------|
| 1 | Total solar unit generation of the system (14.88 kwp) | 21717 | kWh/year |
| 2 | Overall Energy Charges per Unit as per electricity bill | 10 | Rs./unit |
| 3 | Expected revenue generation | 2,17,175/- | Rs./year |
| 4 | Expected cost of 1kw solar plant @50Rs.perwatt | 45,000/- | Rs./kwp |
| 5 | Expected total investment | 6,69,375/- | Rs. |
| 6 | Simple payback period of the project | 3.1 | year |

Observation:

As per the theoretical calculation of solar plant capacity based on contract demand is 14.88kwp and expected annual unit generation of solar plant is 21717.5 units w.r.t annual energy consumption of the college in day time is 19656 units. it is justified recommended the solar plant capacity 14.88kwp is accepted.

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End of The Report Thanks

Energy Audit report prepared by EEPL, Indore, M.P.



Empirical Exergy Private Limited

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Ref No: EEPL/2022-23/C55

Date: - 21-09-2022

ENVIRONMENTAL AUDIT CERTIFICATE

This is certified that Empirical Exergy Private Limited (EEPL) Indore M.P. has conducted Environmental audit at, Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.) for the Assessment Year 2016-17 to 2020-21 and audit report has been submitted.

We avail this opportunity to express our deep and sincere gratitude to the management for their wholehearted support and co-operations during the environment audit.

This certificate is being issued on the basis of the Environmental Audit conducted by EEPL.

For- Empirical Exergy Private Limited



Rajesh Kumar Singadiya (Director)

M.Tech (Energy Management), PhD (Research Scholar) Accredited Energy Auditor [AEA-0284] Certified Energy Auditor [CEA-7271] (BEE, Ministry of Power, Govt. of India) Empanelled Energy Auditor with MPUVN, Bhopal M.P. Lead Auditor ISO50001:2011 [EnMS) from FICCI, Delhi Certified Water Auditor (NPC, Govt of India) Charted Engineer [M-1699118], The Institution of Engineers (India) Member of ISHRAE [58150]





Environment Audit Report CONSULTATION



Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur M.P.

PREPARED BY

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ACKNOWLEDGEMENT

Empirical Exergy Private Limited (EEPL), Indore takes this opportunity to appreciate & thank the management of **Jawaharlal Nehru Smriti Govt. P.G. College Shujalpur (M.P.)** for giving us an opportunity to conduct environment audit for the college.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.



Rajesh Kumar Singadiya

(Director)

M.Tech (Energy Management), PhD (Research Scholar) Accredited Energy Auditor [AEA-0284] Certified Energy Auditor [CEA-7271] (BEE, Ministry of Power, Govt. of India) Empanelled Energy Auditor with MPUVN, Bhopal M.P. Lead Auditor ISO50001:2011 [EnMS) from FICCI, Delhi Certified Water Auditor (NPC, Govt of India) Charted Engineer [M-1699118], The Institution of Engineers (India) Member of ISHRAE [5815]





Certificate of Accreditation







Green Monitoring Committee







Policy Document on Green Campus







| Principal of the college- Chairperson IQAC Coordinator- Secretary Faculty Representatives nominated by the Principal Non-Teaching Staff Representative Industry/Social Representative- Member of Alumni Association. Role of the Go-Green Campus Programme: The motivation for a successful Green Campus must begin at the top and emanate throughout the rest of the campus. Without a strong message of commitment and involvement from both the Chairperson and Members of the Committee well-intentioned initiatives may be too fragmented to allow for Institute-wide participation Thus, in view of this, the committee will plan and execute to: Seek views of all the stakeholders to make the Go-Green Campus initiative functional throughout the year. Conduct the Campus environmental linpacts to identify the targets for improvements. Establish a Green Campus Environmental Ethic Awareness campaigns. Set forth a Green Campus Mission and a Statement of Principles. Link Green-Campus activities to Academics in the Institute. Organize Awareness Programs for the students, faculty and society. Chart out a yearly planner for the Institute, local community and Stakeholders. Develop a strategic plan and create student teams to carry out specific tasks of the strategic plan. For instance, a plan to save energy at the institute level with time bound plan to install Solar Power Station mandatorily at the top of Institute building. This wit reduce the dependency on conventional electricity for power supply. Phase out the CFL and conventional light source such as bulbs and tube lights, haloge and mercury street/campus lights and get them replace by the LEDs. Conduct an Annual Green, Environment and Energy Audit. Purchase only Energy Effici | Comp | osition of the Go-Green Committee |
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Audit Team

The study team constituted of the following senior technical executives from Empirical

Exergy Private Limited,

- **Mr. Rakesh Pathak**, [Director & Electrical Expert]
- **Mr. Rajesh Kumar Singadiya** [Director & Accredited Energy Auditor AEA-0284]
- **4** Mrs. Laxmi Raikwar Singadiya [Energy Engineer]
- **4** Mr. Sachin Kumawat [Sr. Project Engineer]
- **4** Mr. Ajay Nahra [Engineer]
- **4** Mr. Charchit Pathak [Mechanical Engineer]
- **4** Mr. Aakash Kumawat [Assistant Jr. Engineer]





EXECUTIVE SUMMARY

The executive summary of the environment audit report furnished in this section briefly gives the identified energy conservation measures and other recommendation during the project that can be implemented in a phased manner to conserve energy, increase productivity inside the college campus.

SUSTAINABLE INITIATIVE TAKEN BY COLLEGE

College has following initiative taken in last five years (2016-2017 to 2020-21)

- **4** College has single used Polythene ban, in the campus **Its appreciable.**
- **4** College has installed composite pit for all type organic waste **Its appreciable.**
- College are initiative done like community awareness, plantation, use of LED several activities are done to save and conserve e-environment. Its Appreciable

RECOMMENDATION

FRESH WATER MONITORING SYSTEM:

- Installation of "Cloud based (IoT based) ground water extraction monitoring system" for borewell to quantify fresh water consumption per day in the college.
- Install water flow meters (Mechanical or Electronics) in supply network, like college old building and new building for quantify per day water consumption and waste water generation in the college campus.

WASTE WATER TREATMENT PLANT:

Waste water generated from various departments should be collect in separate waste water collection tank. It should be treated in proposed STP after that treated water reuse activity like gardening, toilet and wash room etc.

DRIP WATER IRRIGATION AND SPRINKLER SYSTEM.

- **4** Use drip water irrigation system for plant and trees.
- **4** Use sprinkler water system for Lawn area in the college campus.

USE EFFICIENT WATER TAPS

Water saving taps either reduce water flow or automatically switch off to help save water. So, it is highly recommended to install efficient water taps in college campus to reduce water consumption.





USE EFFICIENT URINAL TAPS

Replacing existing inefficient fixtures with water sense labelled flushing urinal can save between 0.5 to 04 litter per flush without sacrificing performance. Installation of water saving flushing urinal will not only reduce water use in facilities but also save money on water bills.





CHAPTER-1 INTRODUCTION

1.1 About College

Jawaharlal Nehru Smriti Govt. P.G. College is situated on the city - Mandi Road, Shujalpur at a distance of 2 kms. from Shujalpur Railway Station, on the Kannod - Pachore highway. This place is lying at a distance of 80 kms. from Bhopal, the state capital; 70 kms. from Shajapur, its district headquarters; 100 kms. from Ujjain, the holy city, which is its divisional headquarters. It is 130 kms. away from Indore, the commercial capital of Madhya Pradesh. The nearest airport is at Bhopal.

Shujalpur falls under 'Malwa' region and the local dialect is malvi. Before the inception of the college higher education facilities for the students of the region were confined to cities like Bhopal, Indore, and Ujjain all of which are at a distance of more than 80 kms. From this place. The college started functioning on 1st August, 1964. It was founded by a trust called Mahavidyalaya Sthapna Samiti, Shujalpur under the chairmanship of Shri Liladhar Joshi, the erstwhile Chief Minister of 'Central India.' The college was successfully run by the Samiti for seven years with three faculties – Arts, Science and Commerce. LLB Course was opened in 1968. Later on, considering the place of its development and also its growth potential, the college was taken over by the state government on 22nd february 1971. Further, taking into account its student strength and the local demand for higher studies, the college was given the status of a PG college in the year 1997 with eight PG Courses – Five in Arts stream, two in Science, and one in Commerce. Presently it is running a total of six UG and thirteen PG programmes.

The college has all the potential for further development which is amply visible from the fact that there has been a steady growth in the student strength in the college, particularly in the last fifteen years. In spite of the mushrooming of private colleges in the area, the graph of the enrolment figure has consistently shown an upward trend. In the academic year 2020-21 the enrolment figure stands 5163. Since the college is the premier institution for higher education in the locality, and all the district headquarters are at a distance of 50 to 100 kms., the student strength of the college is expected to be constantly on the rise in the years to come. The projected student strength by 2027 is approximately 8000. The college administration is continuously striving to create enough infrastructural space in terms of classrooms, laboratories, library space, and sports facilities in order to cope with the projected student strength.





The college, as the Vision and Mission statements indicate, mostly caters to the higher educational needs of the rural backward student community. The percentage of female students (54.84), SC students (24.07) and that of the students from OBC (53.45) enrolled in the college are higher than the national average. The college, therefore, mainly focuses on the development of the student community from these sections of the society.

J.N.S. Govt. College, Shujalpur, got accredited by NAAC. The NAAC assessment took place in December, 2015 and the college was awarded "B" grade with a CGPA of 2.36.

COLLEGE FACILITIES

- Library.
- Experienced Faculty.
- 4 Use of computer & projector for teaching.
- **Well lighted & ventilated classrooms.**
- **4** Purified Drinking water.
- ↓ Toilets for Staff & Students.
- **4** Common room for girls.
- ↓ Staff room or rest room for Staff.
- 4 Ramps & Railing.
- **Well-equipped Laboratories.**
- 4 Various Scholarships.
- **4** Career guidance/Placement Cell.
- Sports
- **4** Parking Area for Students & Faculty.
- Eco-friendly environment.
- 🖊 Hostel





Our Vision

To strive towards turning the college into a leading centre for higher education offering a blend of general and professional courses with a view to producing employable and entrepreneurial graduates, while ensuring social and gender equity as well as developing environmental consciousness.

Our Mission

1.To provide maximum opportunities for employment to the students belonging to socially and economically backward communities.

2.To open up need-based and modern avenues of higher education with consistently good quality.

3.To ensure women empowerment in the areas of employment /entrepreneurship.

4. To inculcate in the students a feeling of national pride, moral values, and gender sensitivity

1.2 About Environment Auditing

Water audits can be a highly valuable tool for institute in a wide range of ways to improve their energy, environment and economic performance. While reducing wastages and operating costs. Water audits provide a basis for calculating the economic benefits of water conservation projects by establishing the current rates of water use and their associated cost.

1.3 Objectives of Environment Audit

The general objective of water audit is to prepare a baseline report on water conservation measures to mitigate consumption, improve quality and sustainable practices.

The specific objectives are:

- **4** To monitor the water consumption and water conservation practices.
- To assess the quantity of water, usage, quantity of waste water generation and their reduction within the college.





1.4 Target Areas of Environment audit

This indicator addresses water sources, water consumption, irrigation, storm water, appliances and fixtures aquifer depletion and water contamination are taking place at unprecedented rates. It is therefore essential that any environmentally responsible institution should examine its water use practices.

1.5 Methodology followed for conducting Environment audit

Step 1: Walk through survey

- **4** Understanding of existing water sourcing, storage and distribution facility.
- **4** Assessing the water demand and water consumption areas/processes.
- **4** Preparation of detailed water circuit diagram.

Step 2: Secondary Data Collection

- **4** Analyse historic water use and wastewater generation
- **4** Field measurements for estimating current water use
- **4** Metered & unmetered supplies.
- **4** Understanding of "base" flow and usage trend at site
- Past water bills
- **Wastewater treatment scheme & costs etc.**

Step 3: Site Environment Audit Planning (based on site operations and practices)

- **4** Preparation of water flow diagram to quantify water use at various locations
- **Wastewater flow measurement and sampling plan**

Step 4: Conduction of Detailed EnvironmentAudit & Measurements

- **4** Conduction of field measurements to quantify water/wastewater streams
- Power measurement of pumps/motors
- **4** Preparation of water balance diagram
- **4** Establishing water consumption pattern
- ↓ Detection of potential leaks & water losses in the system
- **4** Assessment of productive and unproductive usage of water
- **4** Determine key opportunities for water consumption reduction, reuse & recycle.

Step 5: Preparation of Environment Audit Report

- **U** Documentation of collected & analysed water balancing and measurement details
- **4** Projects and procedures to maximize water savings and minimize water losses.
- Opportunities for water conservation based on reduce/recycle/reuse and recharge options





Layout of College



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CHAPTER- 2 WATER CONSUMPTION AND WASTE WATER SOURCES

2.1 Details of Source of Fresh Water and Use Areas:

The main source of freshwater is borewell for the college. The freshwater is mainly used for drinking, housekeeping, gardening, domestic activity and new construction project. Details of the borewell are given in table2.1

Table: 2.1 Details of Fresh water sources

| Sr.No. | Location | Capacity (HP) | Phase | Running (Hr./Day) |
|--------|------------------------------|------------------|-------|----------------------|
| 1 | Borewell -1 Law/Old Building | 3 | 3 | 8-10 |
| 2 | Borewell-2 Gandhi Udhyan | 3 | 3 | 8-10 |
| 3 | Borewell -3 Nakshtra Vatika | 2 | 1 | 8 - 10 |
| 4 | Borewell-4 Herbal Garden | 3 | 1 | 6 - 8 |
| 5 | Borewell-5 Hostel | 3 | 3 | 6 - 8 |

2.2 Water Accounting & Metering system

It was observed that there is requirement of water flow meters on borewells to quantify per day ground water extraction from different sources.



Fig.: -2.1 Fresh water supply from borewell of college campus





2.3 Water Storage Capacity in College Campus

There is different type of tank available in college for water storage like Underground RCC tank, PVC tanks.

| Sr.no. | Location | Types of tank | No. of tanks | Capacity(Ltr.) | Total capacity |
|--------|------------------------------|---------------|--------------|----------------|----------------|
| 1 | Hostal Area | PVC | 5 | 1000 | 5000 |
| 2 | Old building | PVC | 1 | 2000 | 2000 |
| 3 | Near Gandhi Udhyan | PVC | 7 | 1000 | 7000 |
| 4 | Behind Atal BhavanRCC13000 | | | | 3000 |
| 5 | Atal Bhavan Terries | PVC | 20 | 1000 | 20000 |
| | Total water Storage Capacity | | | | 37000 |

Table2.2: - Water storage tank in college campus

Photographs of water storage tanks.



Fig: - 2.2 Water Storage Tank in college campus





2.4 Fresh Water distribution layout of college

Audit team study the water sources and prepared water distribution flow system in college campus.

Water Flow Diagram of Hostel Pump



(Bore well No-05)

Fig: - 2.3Water flow diagram from Hostel Pump (borewell no.5)





Water Flow Diagram of old Building

(Bore well No-01)



Fig: - 2.4Water Flow Diagram of Old Building




Water Flow Gandhi Udhyan

(Bore well No-02)



Fig: - 2.5Water Flow Diagram of Gandhi Udhyan(Borewell No.2)



Water Flow Herbal Garden & Nakshtra Vatika (Bore well No-03& 04)



Fig: - 2.6 Water Flow Diagram of water flow herbal garden & Nakshatra Vatika (Borwell No.3,4)

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2.5 Water use areas in college campus

Water is preliminary used for drinking, domestic, gardening and lab activity. Audit team visited various departments and buildings to determine appliances. The details of washroom, toilet and taps are given in table

| Sr. No. | Location | Urinal | Hand Wash | Toilet | Taps |
|---------|-------------------|--------|-----------|--------|------|
| 1 | Atal Bhawan | 36 | 33 | 39 | 39 |
| 2 | Science Building | 6 | 7 | 18 | 18 |
| 3 | Law/Old Building | 4 | 8 | 7 | 7 |
| 4 | Hostel Building | 0 | 4 | 18 | 18 |
| 5 | Botany Lab | 0 | 0 | 0 | 2 |
| 6 | Micro biology Lab | 0 | 0 | 0 | 2 |
| 7 | Zoology Lab | 0 | 0 | 0 | 5 |
| 8 | Chemistry Lab | 0 | 0 | 0 | 12 |
| | Total | 46 | 52 | 82 | 103 |

Table: 2.3 Details of washroom and uses taps in various areas





Fig: - 2.7 Water uses areas in college

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2.6 Reverse Osmosis (RO) in college campus

 Table: 2.4 Details of RO in college campus

| Sr. No. | Location | R.O. | Water Cooler |
|---------|------------------|-------------|--------------|
| 1 | Law/Old Building | 1 | 1 |
| 2 | Science Building | 2 | 2 |
| 3 | Atal Building | 1 | 1 |
| | Total | 4 | 4 |

2.7 Fresh water uses for gardening

The one of major contribution from fresh water consumption is watering for other plants in college campus. There is good potential for water saving by adopt "Automatic Watering 360 adjustable misting nozzle irrigation Dripper's system" for plants. adjustable drip irrigation tools to provide different amounts of water depending on the water requirements of different plants. The drip speed can be set as for indoor and outdoor plants.



Adjustable Misting Nozzle Irrigation Drippers



Proposed water timer

Fig.: - 2.8 Proposed drip water irrigation system for college





2.8 Waste Water Generation sources

At present waste water generated from various departments canteen, hostels and clinical activity like washrooms, hand wash and washing of medical equipment's and RO rejected etc is discharge into drain line. it should be collected is separate tank and treat in proposed STP and ETP plants. After that treated water reuse activity like gardening, toilet and wash room etc.





CHAPTER- 3 RAIN WATER HARVESTING SYSTEM

3.1. Rain water harvesting systems

The rainwater harvesting is a technique to capture the rainwater when it precipitates, store that water for direct use or charge the groundwater and use it later.

There are typically four components in a rainwater harvesting system:

- 4 Roof Catchment.
- **4** Collection.
- **4** Transport.
- ↓ Infiltration or storage tank and use.

If rainwater is not harvested and channelized its runoffs quickly and flow out through stormwater drains. For storm-water management the recharge pits, percolation pits and porous trenches are constructed to allow storm water to infiltrate inside the soil.



Fig.: - 3.1 Components of a rooftop rainwater harvesting system





3.2 Rainwater Harvesting Potential of the College

The college has total build-up area is approx. $10,000 \text{ m}^2$. The average annual rainfall 618m and runoff coefficient 0.88 are considered for commercial building. Accordingly, above figures and consideration, estimated rainwater harvesting potential for the college is about 5438400m³/year. The following mathematical equation is used for the calculation.

RWH Potential = Rainfall (m) x Area of catchment (m^2) x Runoff coefficient



Fig 3.2 :- Proposed rain water harvesting in college





End of The Report Thanks

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Jawaharlal Nehru Smriti Government Post-Graduate College, Shujalpur District Shajapur (M.P.) Accredited 'B' grade by NAAC

Email: heginscshushg@mp.gov.in

Phone No. 07360-244358



POLICY FOR PLASTIC FREE COLLEGE CAMPUS The Institute follows UGC guidelines for the Ban of Plastic Use in Higher Education Institutions

Plastics, being a Hazardous element in the society posing a major threat to the livelihood of Mankind and other being in the world. The environment is getting polluted at the never before pace sparing no mediums due to plastics. So it is becoming a key responsibility of every citizen of our country not just to "Say No to Plastics" but also to create awareness among the community as whole to stop this pollution and leave behind a green and pollution free place for our future generations.

So, strongly supporting the cause, from year 2015, Jawaharlal Nehru Smriti Government Post-Graduate College, Shujalpur, has implemented the phase-wise ban on use of Plastics in its campus, in particular single use plastics. The policy statement is as under

- 1. Ban use of single-use plastics in the institution's premises and hostel.
- 2. Periodic awareness drives and sensitization workshops on the harmful impacts of single use plastics in and off campus.
- 3. Mandate all students to avoid bringing non-bio-degradable plastic items to the institution.
- 4. Encourage students to sensitize their respective households about harmful effects of plastics and make their households 'plastic free'.
- 5. Encourage students to use alternative solutions like cloth bags, paper bags, metallic containers, etc., instead of plastic bottles, bags, covers and other goods on campuses.
- 6. Constant monitoring of Plastic ban in the campus by institutional Green Committee and student volunteers to ensure the planning and implementation of the policies.

Coordinator IQAC



Principal J.N.S. Govt. PG College Shujalpur, Distt. Shajapur (M.P.)

Environmental promotional activities in college campus and beyond the campus



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The college staff, students, NSS and NCC units are actively involved in plantation drives and environment awareness programs in and beyond the college campus.