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05 April 2021

Carbon footprint and Energy audit at VIPW

CII – Sohrabji Godrej Green Business Centre (CII – Godrej GBC) acknowledges with thanks the cooperation extended to the CII team for completing the carbon footprint and energy audit at Vijaya Institute of Pharmaceutical Sciences for Women (VIPW).

The interactions and deliberations with VIPW team were exemplary and the whole exercise was thoroughly a rewarding experience for CII. We deeply appreciate the interest, enthusiasm, and commitment of VIPW team towards environmental sustainability.

We are sure that the recommendations presented in this report will be implemented and the VIPW team will further improve their environmental performance.

Kind regards,

Yours sincerely,




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Confederation of Indian Industry
125 Years - Since 1895



**Vijaya Institute of Pharmaceutical
 Sciences for Women**

Carbon Footprint and Energy Audit



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Acknowledgement



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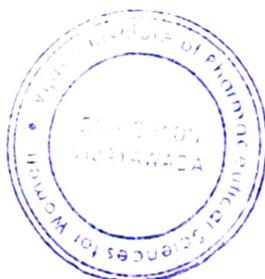
Carbon footprint, energy audit, green audit, and environmental audit

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Executive Summary

The growth of countries across the world is leading to increased consumption of natural resources. There is an urgent need to establish environmental sustainability in every activity we do. In a modern economy, environmental sustainability will play a critical role in the very existence of an organization.



An educational institution is no different. Built environment, especially an educational institution, has a considerable footprint on the environment. Impact on the environment due to energy consumption, water usage and waste generation in an educational institute is prominent. Therefore, there is an imminent need to reduce the overall environmental footprint of the institution.

As an Institution of higher learning, Vijaya Institute Of Pharmaceutical Sciences For Women (VIPW) firmly believes that there is an urgent need to address the environmental challenges and improve their environmental footprint.

True to its belief, VIPW has implemented few projects such as installation of biogas plant for generating biogas from canteen waste and LED lamps for lighting. CII team congratulates VIPW team for their efforts.

Keeping VIPW's work in energy efficiency, CII recommends the following to be taken by the competent team at VIPW:




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Work towards achieving carbon neutrality: INDC puts emphasis on creating an additional carbon sink of 2.5 to 3 billion tonnes of CO₂ equivalent through additional forest and tree cover by 2030. Presently, VIPW's net carbon emission is 498.6 MT CO₂e. VIPW should focus on energy efficiency, renewable energy and carbon sequestration as tools that will enable them to offset the present carbon emissions and achieve carbon neutrality.

Installation of solar rooftop: Renewable energy plays a very important role in improving the environmental footprint of an organization. By increasing the share of renewable energy in VIPW's energy portfolio, the overall carbon footprint of the college can be reduced. Presently, based on the roof area available at VIPW campus, 25 kW of solar rooftop can be installed. This will result in generation of 26500 units of electricity annually ultimately resulting in 45% of renewable energy share in VIPW portfolio. Renewable share will also reduce the 29.93 MT CO₂e.

Installation of additional biogas plant: VIPW has already installed a biogas plant for generating biogas from canteen waste. Presently, sewage water is being let out to the drain without treatment. An opportunity exists to generate biogas from the untreated sewage water and use the generated biogas to substitute LPG used in the college. In 2019, VIPW had used 2 MT of LPG. By generating biogas from sewage water, about 0.93 MT of LPG can be replaced which will result in carbon savings of 2.79 MT CO₂e.

Improve energy efficiency of the college: It is recommended to adopt latest energy efficient technologies for reducing energy consumption in fans, lighting, and air conditioners. We recommend the following projects to be implemented at the earliest:




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- Replace conventional 60W ceiling fans with energy efficient BLDC fans of 30W
- Replace conventional 36W tube lights with LED lights of 15W
- Install air conditioners energy savers to save energy in spilt air conditioners




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Carbon Footprint and Energy Audit

Vijaya Institute of Pharmaceutical Sciences for Women (VIPW) and CII are working together to identify opportunities for improvement in energy efficiency and carbon reduction. This report highlights all the potential proposals for improvement through the audit and analysis of the data provided by VIPW for lighting, air conditioning, ceiling fans and biogas potential.

The report also details the carbon emissions from college operation. For carbon emissions, scope 1 and scope 2 emissions are calculated from the data submitted by VIPW. The report emphasizes on the GHG emission reduction potential possible through reduction in power consumption.

Submission of Documents

Carbon footprint and energy audit at VIPW was carried out with the help data submitted by VIPW team. VIPW team was responsible for collecting all the necessary data and submitting the relevant documents to CII for the study.

Carbon Footprint and Energy Audit

Data submitted and collected during the visit was used to calculate carbon footprint of the campus and assess energy consumption and finally provide necessary recommendation for environmental improvement.




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Note

Carbon footprint and energy audit are based on the data provided by VIPW team and discussions CII team had with VIPW team. The scope of the study does not include the exclusive verification of various regulatory requirements related to environmental sustainability.



CII has the right to recall the study, if it finds (a) major violation in meeting the environmental regulatory requirements by the location and (b) occurrence of major accidents, leading to significant damage to ecology and environment.



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OPPORTUNITIES FOR IMPROVEMENT

As a part of the overall environmental improvement study at VIPW, carbon footprint calculations were also carried out. The objective of calculating the carbon footprint of the campus is to find the present level of emissions from campus operation and what initiatives that the VIPW can take to offset the emissions. By offsetting the emissions, the college can become carbon neutral in the future by adopting energy efficient processes, increase in renewable energy share and tree plantation.

Carbon footprint calculations:

To help delineate direct and indirect emission sources, improve transparency, and provide utility for different types of organizations and different types of climate policies and business goals, three “scopes” (scope 1, scope 2, and scope 3) are defined for GHG accounting and reporting purposes.

For calculating carbon footprint of the campus, Scope 1 & Scope 2 emissions are being considered. Since day scholars use college provided transportation and hostelers stay in campus, Scope 1 and Scope 2 are the highest contributors to overall emissions. For this reason, Scope 3 is not being calculated.

Scope 1: Direct GHG Emissions

Direct GHG emissions occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled DG sets, canteen, vehicles, etc.; emissions from chemical production in owned or controlled process equipment. Direct CO₂ emissions from the combustion of biomass shall not be included in scope 1 but reported separately.




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VIPW Scope 1 emissions for 2019:

Sources of Scope 1 emissions in VIPW:

- 1) Diesel used for DG Set
- 2) Diesel used for college owned transportation
- 3) LPG used for canteen, hostel, and lab

Sr	Fuel Type	Description	Activity Data	Units	Emission Factor	Units	CO2 eq. Emissions	Units
1	Diesel	DG Set	5.40	KL	2.64	T CO2/KL	14.26	Tons
2	LPG	LPG for canteen and hostel	2.05	MT	2.98	T CO2/T	6.11	Tons
3	Diesel	College bus	11.40	KL	2.64	T CO2/KL	30.10	Tons
4	LPG	LPG for Lab	0.08	MT	2.98	T CO2/T	0.23	Tons

Total Scope 1 emissions of VIPW : 50.70 Tons (for year 2019)



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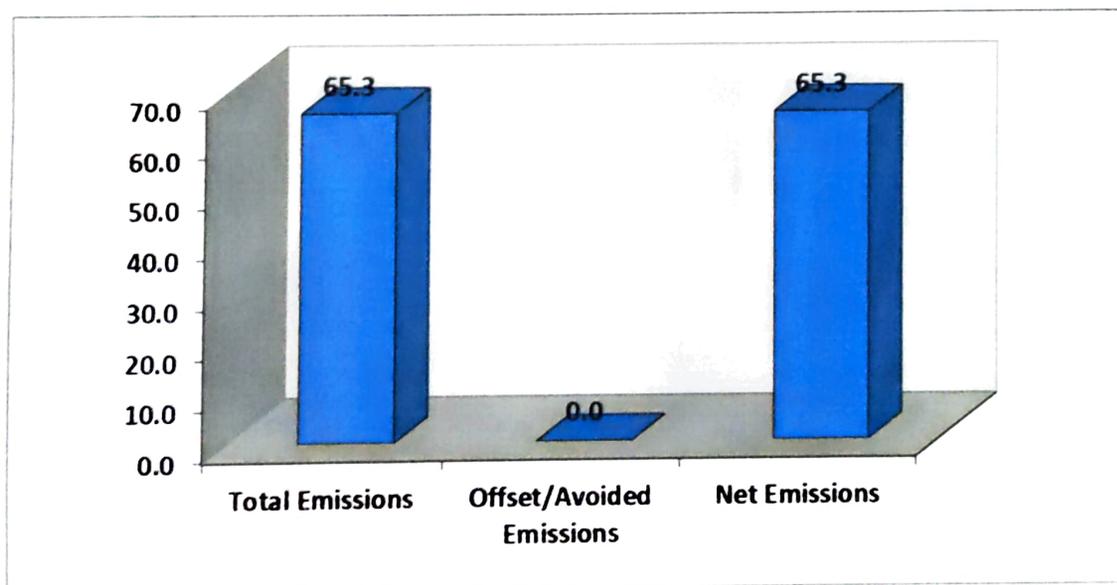
Scope 2: Electricity Indirect GHG Emissions

Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by a company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company. Scope 2 emissions physically occur at the facility where electricity is generated.

VIPW Scope 2 emissions for 2019:

Electricity purchased from grid : 79683 units

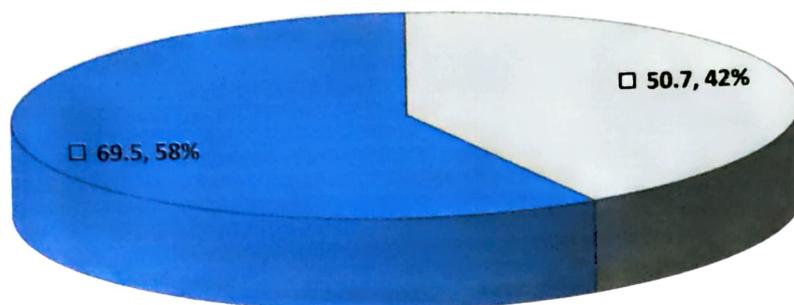
Scope 2 Breakup



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GHG Emission Summary of VIPW



□ Scope 1 ■ Scope 2

Scope 1	50.7	MT CO2 eq.
Scope 2	65.3	MT CO2 eq.
Total	116.0	MT CO2 eq.




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Develop a roadmap to increase contribution of renewable energy in the overall energy consumption

To have a continued focus on increasing renewable energy utilization to 100% which will also lead to reduction in GHG emissions, it is suggested to develop a detailed roadmap on RE utilization. The roadmap should broadly feature the following aspects -

- Renewable energy potential of VIPW and the maximum offset that can be achieved at VIPW
- Percentage substitution with renewable energy that VIPW wants to achieve in a specified timeframe
- Key tasks that needs to be executed to achieve the renewable energy target
- Specific financial break up for each of the projects highlighting the amount required, available and the utilization status as on date
- A regular review mechanism to ensure progress along the lines of the roadmap should be framed
- The roadmap should also highlight important milestones/key tasks, anticipated bottlenecks & proposed

Renewable energy roadmap should be used as a base to frame GHG emissions reduction target

It is suggested to use the developed renewable energy roadmap to correlate the GHG reduction that each of the renewable energy project will achieve. This approach will provide a base to set targets for reduction in GHG emissions. The action plan for renewable energy will shoulder the action plan for GHG emissions reduction and work towards achieving carbon neutrality.





Explore the option of other onsite and offsite renewable energy projects

The renewable energy field has been witnessing many private investors due its increased market demand and attractive policies in many states. There are Renewable Energy Independent Power Producers (RE IPPs) who have installed RE based power plants like wind, small hydro and solar PV. GOC can consider having a long-term power purchase agreement with these RE IPPs in purchasing fixed quantity of power for a period of 5 to 10 years.

Evolve a system to monitor the implementation of various GHG mitigation opportunities

VIPW has an action plan to reduce its GHG emissions. VIPW should also evolve a system to monitor the implementation of various GHG mitigation opportunities. It is recommended to use a Gantt chart to mark out the action plan for the activities and track its implementation. Gantt chart will serve as an excellent way to instantly monitor and comprehend all different tasks in one place which would ease tracking of implementation.




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Install 25 kWp of Solar rooftop in VIPW campus

VIPW energy portfolio does not include any renewable energy component. Renewable energy is one of the important steps to be taken up by the college to reduce their overall carbon footprint. Based on the details provided by VIPW team, the roof area has the capacity to hold 25 kW of solar panel. 25 kWp of solar rooftop can generate **36,500** units of electricity per year. This will account to **45%** of total energy consumption of the campus.

Additionally, 25 kWp of solar rooftop can offset **29.93 MT CO₂e** per annum. This accounts for 25% of overall carbon emissions from the campus.

RESCO model for solar rooftop installation:

A Renewable Energy Service Company (RESCO) is an ESCO Energy service company which provides energy to the consumers from renewable energy sources. RESCO or BOOT model is about pay as you consume the electricity.

- Solar Power Plant is owned by the RESCO or Energy Company
- Customer must sign a Power purchase Agreement (PPA) with actual investor at mutually agreed tariff and tenure
- Customer only pays for electricity consumed
- RESCO developer is responsible for its annual operations & maintenance (O&M)
- The RESCO gets the benefit by selling the surplus power generated to the DISCOM




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Solar Power Plant
Source: www.bluebirdsolar.com



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Install additional biogas plant at VIPW campus

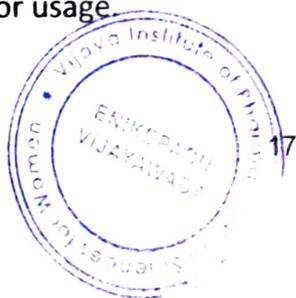
Presently, sewage water is being let out to the drain without treatment. An opportunity exists to generate biogas from the untreated sewage water and use the generated biogas to substitute LPG used in the college.

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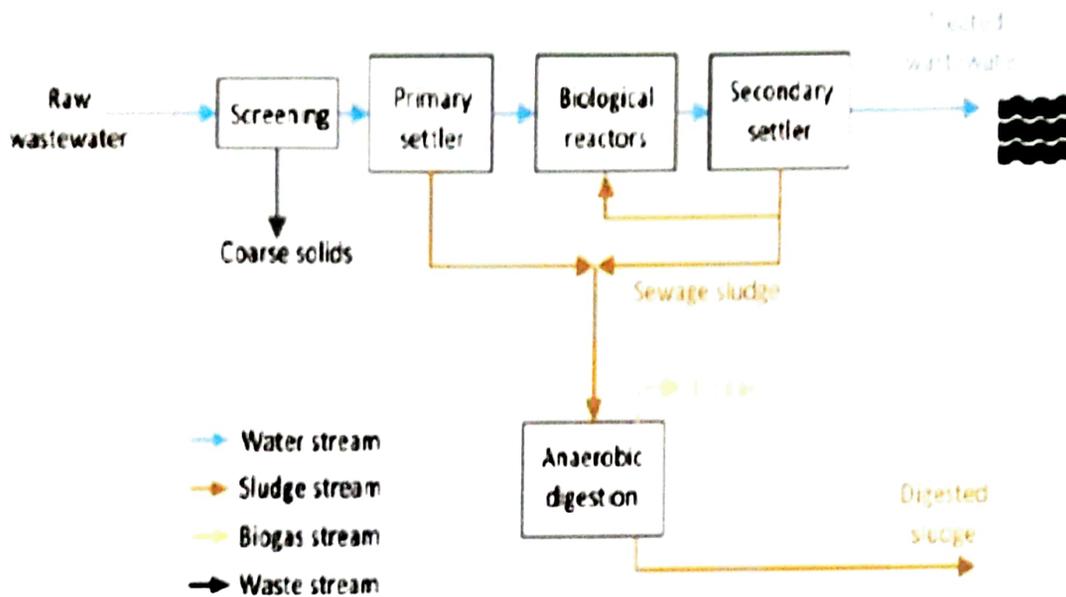
Biogas Production Potential of Wastewater

The sewage water is a useful waste as 1% of it in any quantity is a sludge which when subjected to anaerobic digestion will produce biogas. Wastewater is the effluent from household, commercial establishments and institutions, hospitals, industries and so on. Sewage water source contains large amount of organic material which can be efficiently recovered in as sludge which and when subjected to anaerobic digestion, the sludge produces methane gas (biogas).

Biogas is a mixture of gases containing 50-75% Methane, and 25-50% Carbon dioxide while 0-10% Nitrogen, 0-3% Hydrogen disulphide and 0-2% Hydrogen may be present as impurities which is produced by anaerobic digestion of organic material i.e. a sequential enzymatic breakdown of biodegradable organic material (Biomass) in the absence of oxygen. The process is usually carried out in a digester tank known as biodigester. Biogas is an important energy source used as cooking gas, to generate electricity, etc. thus producing biogas from wastewater is an efficient and sustainable waste management and renewable energy technique. One of the major environmental problems of the world today is waste management and wastewater constitutes a huge environmental problem to the society thus the need for wastewater treatment to recover and also recycle the recovered water for usage.

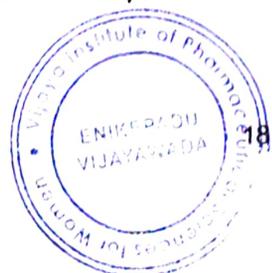



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The physical process: this is the mechanical treatment of the water that involves removal of debris from the raw wastewater right from the point it enters the plant. The screening and primary settling of debris. Wastewater enters the treatment plant through the inlet chamber from where it is channeled to the coarse screen that removes solid waste.

The biological process: this involve the biotreatment of the sewage in the bioreactors. It is the heart of the treatment plant where a biological process takes place. The bioreactors of a treatment plant are usually large tanks consisting of several mammoth rotors and submersible mixers. While the rotor introduces atmospheric oxygen into the sewage, the submersible mixers keep the biomass in suspension thus several reactions takes place in the bioreactors.



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