Confederation of Indian Industry

125 Years - Since 1895

2020

Carbon Footprint and Energy Audit

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Confederation of Indian Industry

125 Years - Since 1895

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BUILDING INDIA FOR A NEW WORLD
Lives, Livelihood, Growth

N Muthusezhiyan
Principal Counsellor

Confederation of Indian Industry
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17 November 2020

Carbon footprint, energy audit, green audit and environmental audit

CII – Sohrabji Godrej Green Business Centre (CII – Godrej GBC) acknowledges with thanks the cooperation extended to the CII team for completing the study at Sree Venkateswara College of Engineering, Nellore.

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

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

Kind regards,

Yours sincerely,

N Muthusezhiyan
Principal Counsellor

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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, Sree Venkateswara College of Engineering, Nellore (SVCN) firmly believes that there is an urgent need to address the environmental challenges and improve their environmental footprint.

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

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

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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, SVCN's net carbon emission is 644.9 MT CO2e. SVCN 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 SVCN's energy portfolio, the overall carbon footprint of the college can be reduced. Presently, based on the roof area available at SVCN campus, 75 kW of solar rooftop can be installed. This will result in generation of 109500 units of electricity annually ultimately resulting in 70% of renewable energy share in SVCN portfolio. Renewable share of 70% will also reduce the 89.79 MT CO2e.

Installation of additional biogas plant: SVCN 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, SVCN had used 10.260 MT of LPG. By generating biogas from sewage water, about 1.875 MT of LPG can be replaced which will result in carbon savings of 5.59 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 80W ceiling fans with energy efficient BLDC fans of 30W
- Replace conventional 40W tube lights with LED lights of 18W
- Install air conditioners energy savers to save energy in spilt air conditioners

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Carbon Footprint and Energy Audit

Sree Venkateswara College of Engineering, Nellore (SVCN) 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 SVCN 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 SVCN. The report emphasizes on the GHG emission reduction potential possible through reduction in power consumption.

Submission of Documents

Carbon footprint and energy audit at SVCN was carried out with the help data submitted by SVCN team. SVCN 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 SVCN team and discussions CII team had with SVCN 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 SVCN, carbon footprint calculations were also carried out. The objective of calculating the carbon footprint of the campus is find the present level of emissions from campus operation and what initiatives that the SVCN can take to offset the emissions. By offsetting the emissions, the college can to 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 contributor 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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SVCN Scope 1 emissions for 2019:

Sources of Scope 1 emissions in SVCN:

1) Diesel used for DG Set

2) Diesel used for college owned transportation

3) LPG used for canteen

Scope 1 Emissions

Fuel Combustion

S No	Fuel Type	Description	Activity Data	Units	Emission Factor	Units	CO2 eq. Emissions	Units
1	Diesel	DG Set	3.50	KL	2.64	T CO2/KL	9.24	Tons
2	LPG	Canteen and hostel	10.26	MT	2.98	T CO2/T	30.57	Tons

Company Owned Vehicles

S No	Type of Vehicle	Mode of Data Entry	Activity Data	Units	Emission Factor	Units	CO2 eq. Emissions	Units
1	Bus	Fuel used	149760.0	Kg	3.1863	kg CO2/kg	477.180288	Tons

Total Scope 1 emissions of SVCN : 517.00 Tons (for year 2019)

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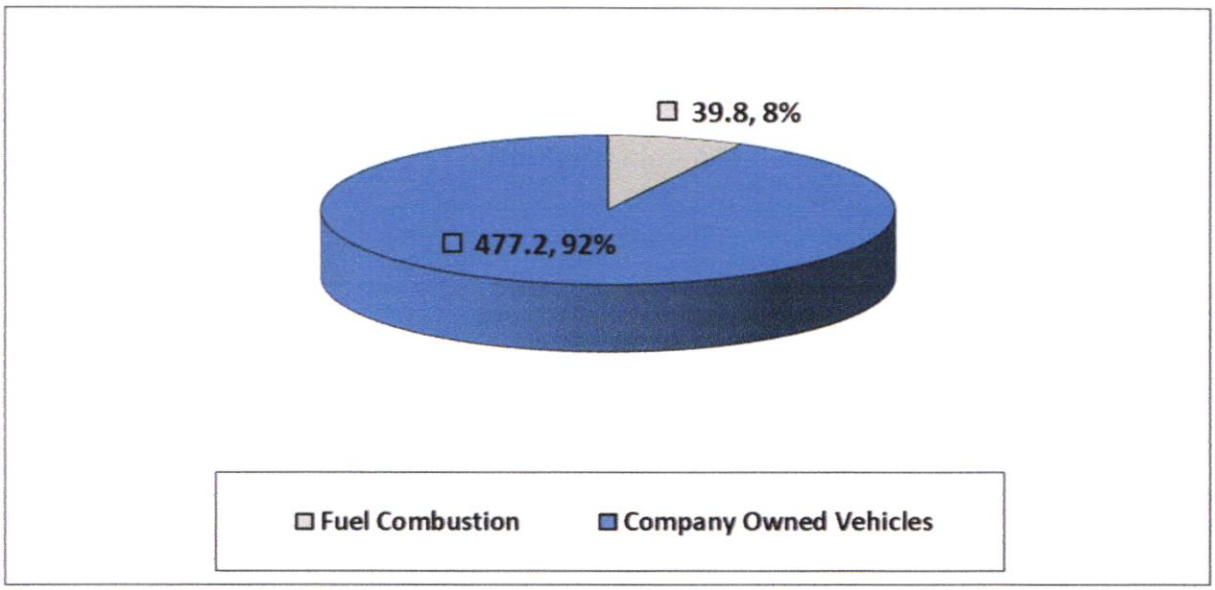
Scope 1 Breakup



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.

SVCN Scope 2 emissions for 2019:

Electricity purchased from grid : 156000 units

Electricity / Utility Consumption

S No	Source	Grid	Quantity	Units	Emission Factor	Units	Total Emission	Units
1	Electricity Purchased from Grid	India Average	156000	kWh	0.82	kg CO2/kWh	127.92	Tons

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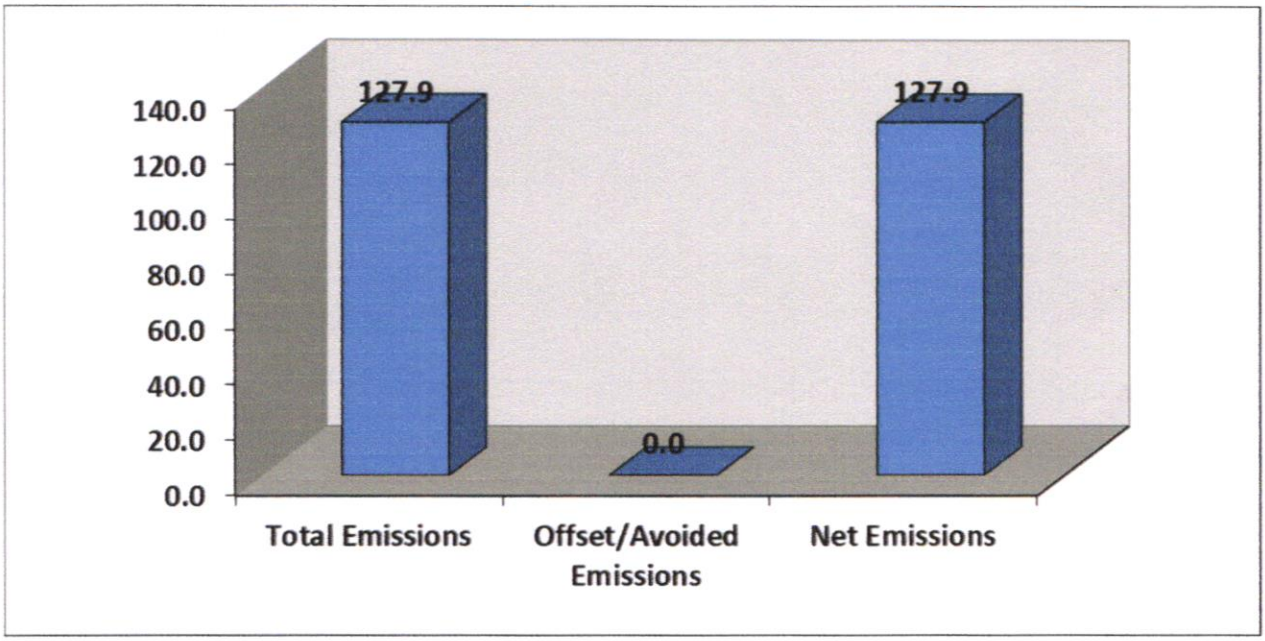
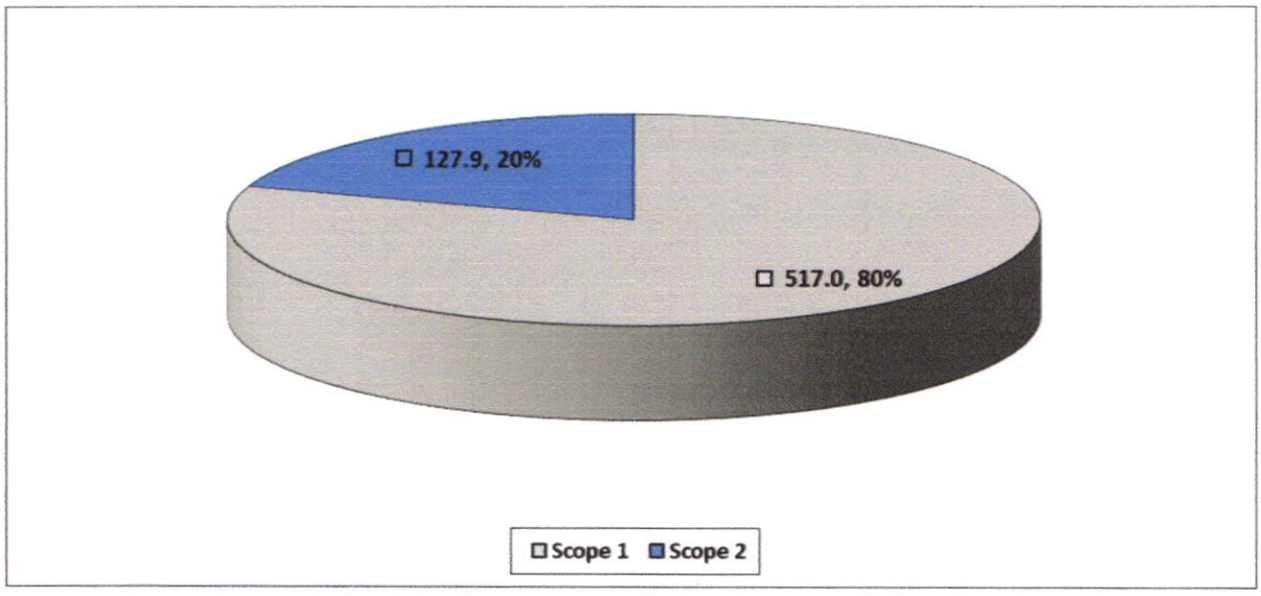
Scope 2 Breakup



GHG Emission Summary of SVCN



Scope 1	517.0	MT CO2 eq.
Scope 2	127.9	MT CO2 eq.
Total	644.9	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 SVCN and the maximum offset that can be achieved at SVCN
- Percentage substitution with renewable energy that SVCN 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.

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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

SVCN has an action plan to reduce its GHG emissions. SVCN 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 75 kWp of Solar rooftop in SVCN campus

SVCN 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 SVCN team, the roof area has the capacity to hold 75 kW of solar panel. 75 kWp of solar rooftop can generate **1,09,500** units of electricity per year. This will account to **70%** of total energy consumption of the campus.

Additionally, 75 kWp of solar rooftop can offset **89.79 MT CO2e** per annum. This accounts for 14% 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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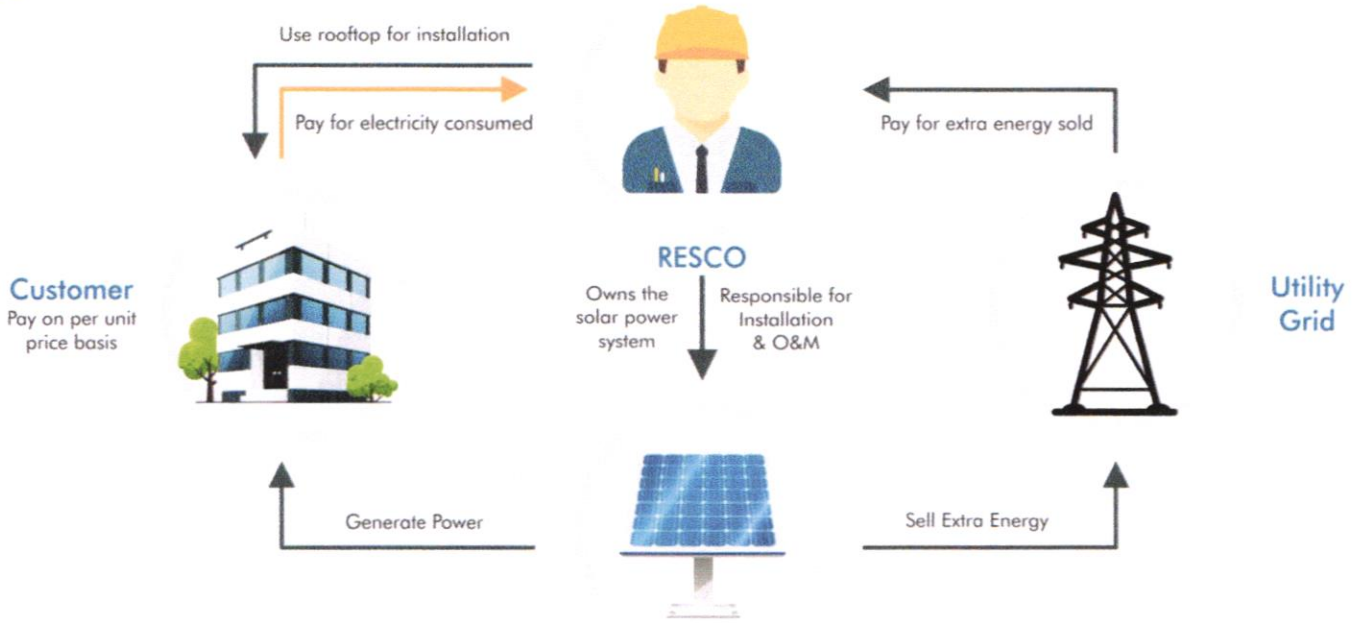

Solar Power Plant

Source: www.bluebirdsolar.com

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Install additional biogas plant at SVCN campus

SVCN 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, SVCN had used 10.260 MT of LPG. By generating biogas from sewage water, about 1.875 MT of LPG can be replaced which will result in carbon savings of 5.59 MT CO2e.

Biogas Production Potential of Wastewater

The sewage water is a useful waster 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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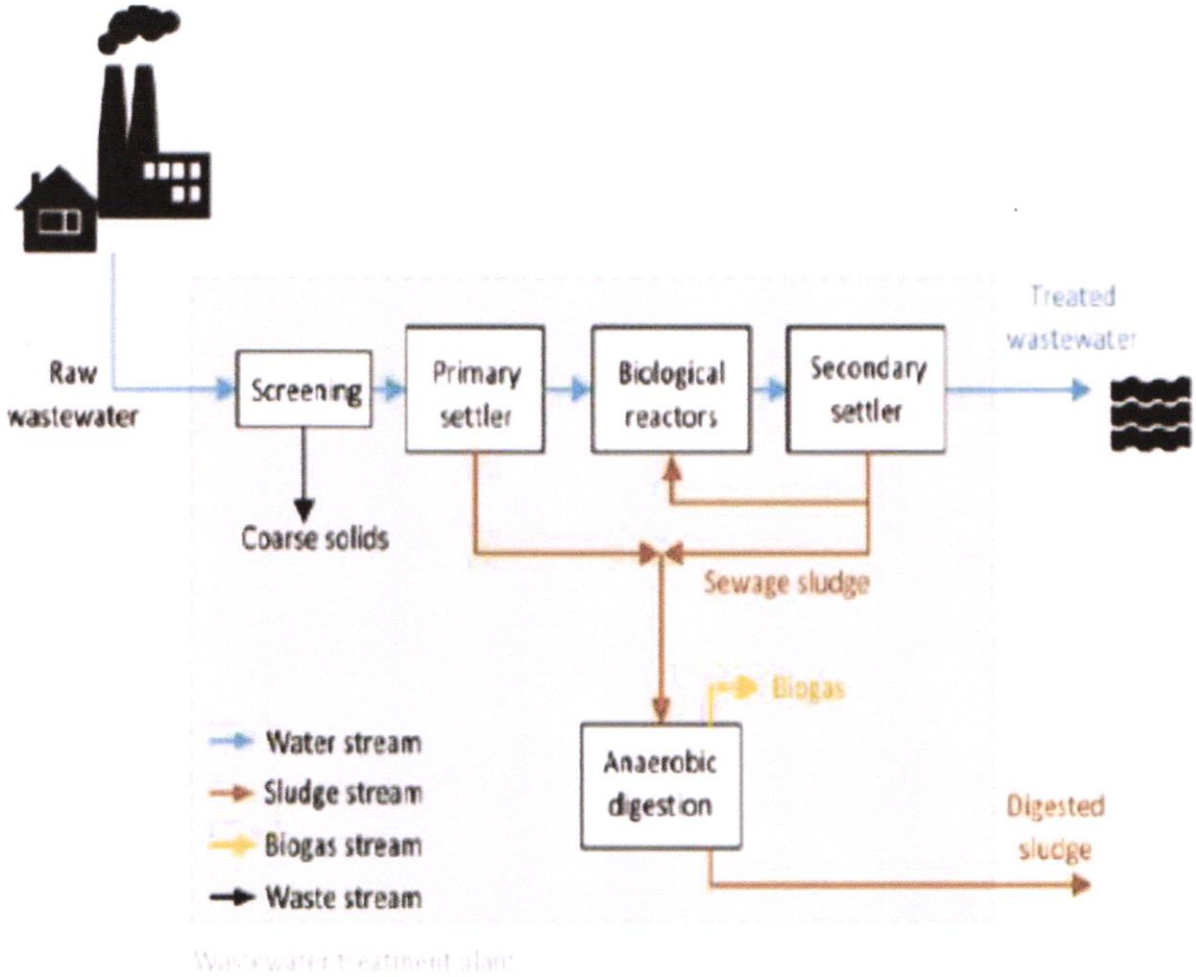

The physical process: this is the mechanical treatment of the water that involves removal of debris from the raw wastewater right from the point it enters the plant. The screening and primary settling of debris. Wastewater enters the treatment plant through the inlet chamber from where it is channeled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