



Date: 13-03-2019

## POLICY DOCUMENT FOR GREEN CAMPUS INITIATIVES

The institution understands the importance and essence in implementing green concepts in the campus. It believes in education combined with environmentally friendly practices, like **Gurukula**, the Indian traditional education system, to promote sustainable development. The college is implementing green initiatives with determination with a long-term commitment, and is taking the initiative in the right direction through its NSS, Engineering department, and all other departments concerned wherever necessary. The following practices are undertaken by the college.

- 1. Water Resources:** The institute constantly practices and implements rain water recycling and harvest rain water to resolve and manage water scarcity problems that may arise in the future. The maintenance staff under Engineering Department-
  - regularly inspects tap leakages and
  - attend to repair needs immediately to avoid loss of potable water.
  - the use of water is minimized in hostels by use of dish washing machines.
- 2. Energy Consumption:** The college believes in reduced the waste in energy consumption. We believe in the slogan 'Energy saved is energy generated'. The following instructions are strictly practiced on campus:
  - Turn off the monitor when you leave your table.
  - Turn off unnecessary lights and use daylight instead.
  - Use LED or compact fluorescent bulbs as much as possible
  - Switch off lights, fans in conference rooms, classrooms, seminar halls when not in use.
- 3. Renewable energy:** The institute trusts in promoting solar energy. The college has solar street lights as a part of a small initiative of utilizing renewable energy. In addition to this, we believe in encouraging and promoting adaptation of solar power equipment among stake holders. In this regard, our college conducts various awareness programs.
- 4. Conserve Natural Resources:** The institute has preserved age old trees like tamarind, mango, neem and palm trees. The institute takes all the requisite measures to protect them. Along with the management, our institute follows best practices towards establishment and maintenance of green campus.
- 5. Restricted entry of motor vehicles:** All the vehicles of college staff/ faculty members are expected to possess emission certification before entering the college campus. The college encourages the employees and students to use public transport, bicycles, etc. to limit the emissions. The college has one bus to transport students/staff from Karimnagar, which helps in reducing pollution and consumption of petrol of up to 50 bikes.
- 6. Pedestrian-friendly pathways:** The College adheres to the pedestrian-friendly walkways in the campus. Pedestrian-friendly pathways are properly marked with suitable logo/sign.

7. **Promoting the use of bicycles:** The institution encourages the students to use bicycles especially with in the campus. Some students regularly use bicycles. This initiative helps in promoting fuel saving attitude among the future users.
8. **Ban on use of plastic:** JNTUHCEJ is committed to make the campus plastic-free zone. Therefore, there is a complete ban on single-use plastics in class room, labs, canteens in the institution's premises and hostels. Awareness activities are conducted to promote reduced use of plastic inside and outside the campus. NSS conducts awareness programme in this regard.
9. **Land scaping with trees and plants:** As per green practices, our campus moves in direction of a green institution by planting more trees within and outside the campus and creating awareness with stakeholders by spreading the concept of eco-friendly culture to the nearby community and wherever possible.
10. **Waste Management:** The College believes in reducing or minimizing the waste. The following initiatives are practiced:
  - Keep a stack of paper that has been printed on one side and use it for day to day rough paper work.
  - Use more readout material in soft form. Reduce the hard readout material. Use more of e-mail for officially communicating the information needed, online reading etc.
  - Minimize the use of fertilizers and pesticides in college grounds, opting to the use of compost produced on site wherever possible.
  - Ensure that all cleaning products used by college staff have a negligible harmful impact on the environment.
  - Use two types of bins separately for biodegradable and non-biodegradable wastes in the college campus as well as in hostels.
  - Reusing the class room furniture by altering them, thereby reducing the metal waste.
  - Women wash rooms are provided with incinerators to destroy sanitary napkins for easy disposal in an environmental friendly way. They are easily converted to ash and disposed.

PRINCIPAL

**PRINCIPAL**  
• JNTUH College of Engineering Jagtial  
Nachupally (Kondagattu), Kodimial(M)  
Jagtial(Dist)-505 501, Telangana.





**Confederation of Indian Industry**  
125 Years - Since 1895



**COLLEGE OF ENGINEERING JAGTIAL**  
**(JNTUH CEJ)**  
**Green Landscape Audit**

**2021**

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachapally (Kandeguda), Kodimuri(M)  
Jagtial (Dist)-505 501, Telangana.





Confederation of Indian Industry  
125 Years: 1895-2020  
CII – Sohrabji Godrej Green Business Centre  
Survey No. 64, Kothaguda Post, NearHITEC City,  
Ranga Reddy Dist., Hyderabad - 500 084, INDIA  
Tel: +91-40-44185111 Fax: 91-40-44185189  
Email: [envirogbc@cii.in](mailto:envirogbc@cii.in)  
Website: [www.greenbusinesscentre.com](http://www.greenbusinesscentre.com)

# Acknowledgement

**N Muthusezhiyan**  
Principal Counsellor

26 April 2021

## 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 College of Engineering Jagtial (JNTUH CEJ)

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

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

*Kind regards,*

Yours sincerely,

**N Muthusezhiyan**  
Principal Counsellor

**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kondapettu), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana





# Executive Summary

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, College of Engineering Jagtial (JNTUH CEJ) firmly believes that there is an urgent need to address the environmental challenges and improve their environmental footprint.

Based on the data submitted by JNTUH CEJ team, following improvement opportunities have been identified in the campus in terms of landscaping:

- Implement ecosystem restoration by development of theme gardens in unused areas of the campus
- Develop green corridors and connection between existing areas in the campus
- Develop natural areas to encourage bird roosting and nesting in built-up areas
- Increase tree density and canopy cover in the built-up areas by planting more fruit yielding tree
- Conduct regular flora surveys for improving the existing data
- Develop strategies for regular monitoring & prevention of invasive plant species





**By addressing the improvement opportunities, the campus would be able to achieve the following benefits:**

- Identifying & implementation of proper measure for conservation of endangered floral species in the campus
- Reduce the microclimate temperature of the campus by 1-2 degrees which is quite significant
- As many of the species have the capability to absorb contaminants in the air and therefore this would lead to better air quality in the campus
- This can evolve as an excellent educational campus for spreading awareness on biodiversity and benefit the nation at large

**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kondapet), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.





# Introduction

## **Urbanisation and its effect on loss of biodiversity**

Urbanization causes biodiversity to decline. As cities grow vital habitat is destroyed or fragmented into patches not big enough to support complex ecological communities. In the city, species may become endangered or even locally extinct as natural areas are swallowed up by the urban jungle.

Ironically, it is urban growth that is often responsible for the introduction of non-native species, either accidentally or deliberately, for food, pets or for aesthetic reasons.

## **Documentation of Flora**

Knowledge on biodiversity of any geographical region is of paramount importance for sustainable management and conservation plans. The foremost task in the conservation process is to prepare an inventory of species. It is necessary to have full knowledge regarding the habit, habitat, distribution and phenology of various plants for their proper conservation.

The documentation of flora will help in identifying, documenting and promoting the conservation of native flora in India. This in turn will help in promoting native species for landscapes as they suit the growing interest in "low-maintenance" gardening and landscaping.

Many species are vigorous & hard and can survive winter, cold and summer heat. These species, once established, can flourish without irrigation or fertilization and are resistant to most pests & diseases.





### **Need for Documentation of Flora**

The knowledge building on significance and importance of various flora existing around us is the need of the hour. Loss of the biodiversity is likely to result in loss of various other taxonomic groups.

### **Serve as a ready reckoner:**

Most of the campuses have huge landscape with diverse floral species. Nevertheless, the availability of information on these species is minimal. Hence, the documentation of the species would serve as an educational material on the details of species existing within the campus

### **Public Visibility:**

Despite having various Biodiversity initiatives in place within the campus most of the campuses lack the visibility of the measures taken in conservation. The study will create awareness & visibility of the campus on various conservation measures implemented to the occupants as well as to the visitors.

Also, the organization will gain visibility globally amongst its shareholders for the positive steps taken towards protecting biodiversity.

### **Conservation of species:**

Due to urbanization most of the floral species are under tremendous pressure. The need of the hour is to conserve and protect these species. The study would help in identifying such species in the campus which need to be conserved.

## Plantation & Maintenance techniques

### Selection of species

- Native species like *Azadirachta indica* (Neem), *Pongamia pinnata* (Pongam tree), *Cassia fistula* (Indian shower tree), *Butea monosperma* (Flame of the forest) and also fruit bearing species like *Mangifera indica* (Mango), *Manilkara sapota* (Chikoo), *Syzygium cumini* (Jamun Tree), *Psidium guajva* (Guava), *Annona squamosal* (Custard apple), *Punica granatum* (Pomegranate), *Phyllanthus emblica* (Indian Gooseberry), *Citrus sinensis* (Sweet lime) and *Citrus limon* (Lirne) to be selected for plantation
- Saplings of 2-3 ft height to be considered for plantation in public areas
- Plantation can be taken up as avenues (roadside plantation) and green belts (thick plantation In one area)
- Fruit plantation can be taken up in protected areas, institutions with large areas. Special care to be taken in maintenance since these plants also generate revenue

### Digging of pits

Pits to be dug about one month prior to the plantation date and it should be exposed to sunlight.

This will help in killing of harmful disease-causing bacteria and virus.

- In places of no availability of proper sunlight, dry trash to be filled in the pit and burnt.
- Pit size should be normally 2ft<sup>3</sup> or 3ft<sup>3</sup> and in soils which are very hard 4ft<sup>3</sup> or above to be dug.
- Further to the digging of pit, the bottom of the pit should be loosened up to 6-9 inches.
- While digging, we can observe different soil profiles. Topsoil will be soft and contains enough nutrients for nourishing the plant. The topsoil should be deposited on one end and hard soil on the other end. While filling the pit with soil, the topsoil only should be used. The topsoil from the non-plantation area around the pit to be collected and mixed with manure and used for filling of the pit.



## Transportation

- Visit to the nurseries and enquire about plant species like availability, size, age and girth prior to the plantation. Also, the size of the packet in which the plant is existing to be enquired.
- Ensure that the material is available in the nursery and allotted to pick up
- The saplings to be watered one or two days prior to the movement of plants to plantation area.
- The plants to be procured at least 15 days prior to plantation.
  - The saplings to be watered as soon as they reach the plantation area and regularly thereafter.
  - They should be kept in shade, non-windy & protected areas.
- The above said steps to be followed for movement of plants near to the pits within the plantation area.
- Enough water to be stored for watering the plants after plantation. Also, tools and manpower to be kept in place to ensure proper plantation of saplings
- If the sapling is bushy with many branches, then the branches are to be trimmed before plantation.

## Plantation

- The poly bag around the root ball to be carefully cut with a knife / sickle / scissors without disturbing the roots
- Rope and stakes are to be kept ready to support the plant after plantation.
- Regular watering to be done to the plants followed by mulching (loosening of top 3 – 4 inches of soil)
- Mulching will help in conservation of moisture, aeration of roots and control of weeds.
- Note: At least 5% of extra plants to be procured for timely gap filling and to ensure 100% survival. Care to be taken for these plants like other plants.

## Recommendations for Enhancing Flora in Campus

### 1. Implement Ecosystem Restoration

- Develop naturalised areas in the Open Area segments
  - Wastelands in the campus can be converted to a Park
- 'Theme Gardens' can be developed in unused areas of the campus to increase proportion of natural area

### 2. Enhance Ecosystem Protection

- Protect and maintain the existing Open Area segments

### 3. Planting more fruit yielding trees

- Increase tree density and canopy cover in the built-up areas

### 4. Increase number of Native Plants in the Landscape area

- Increase native plants to boost native biodiversity
  - Bees, butterflies and other insects
- Healthy native plant growth will help in easy identification of invasive alien species

### 5. Introduce more native species in Open Areas

### 6. Preventing/ Decreasing Invasive Alien Species Spread

- Identify potential threatening species in advance and implement quarantine measures
  - Mass Eradication techniques for larger spreads
- Commitment to complete eradication
- Manual Uprooting of small populations

### 7. Develop natural areas to encourage bird roosting and nesting in built-up areas





## 8. Introduce features to attract birds in the built-up areas

- Bird feeders
- Water troughs/ Bird baths
- Nesting material

## 9. Improve measures for rainwater harvesting in paved and un-paved areas

- Open fields, parks, pavement landscapes, etc.
- Develop outdoor parks in open areas

# Conclusion

Tree plantations lead to a tremendous reduction in net emissions of the campus. Therefore, JNTUH CEJ needs to develop a roadmap to include tree plantation as a strategy to reduce overall carbon emissions of the campus.

**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagattu), Kodimial(M),  
Jagtial (Dist) 505 501, Telangana.





**Confederation of Indian Industry**  
125 Years - Since 1895



**COLLEGE OF ENGINEERING JAGTIAL (JNTUH CEJ)**  
**Carbon Footprint and Energy Audit**

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagattu, Medimil(M))  
Jagtial (Dist)-505 501, Telangana.

2021





Confederation of Indian Industry  
125 Years - Since 1895

# CONTENTS

03	Acknowledgment
04	Executive Summary
08	Carbon Footprint & Opportunities for Improvement
27	Conclusion

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagatla, Kodimla(M)  
Jagtial (Dist)-505 901, Telangana.





# Acknowledgement



**N Muthusezhiyan**  
Principal Counsellor



Confederation of Indian Industry  
125 Years: 1895-2020  
CII – Sohrabji Godrej Green Business Centre  
Survey No. 64, Kothaguda Post, Near HITEC City,  
Ranga Reddy Dist., Hyderabad - 500 084, INDIA  
Tel: +91-40-44185111 Fax: 91-40-44185189  
Email: [envirogbc@cii.in](mailto:envirogbc@cii.in)  
Website: [www.greenbusinesscentre.com](http://www.greenbusinesscentre.com)

26 April 2021

## 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 College of Engineering Jagtial (JNTUH CEJ)

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

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

*Kind regards,*

Yours sincerely,

**N Muthusezhiyan**  
Principal Counsellor

**PRINCIPAL**  
JNTUH College of Engineering Jagtial<sup>3</sup>  
Nachupally (Kondagani), Kodimial(M)  
Jagtial (Dist) 505 507, Telangana.





# 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, College of Engineering Jagtial (JNTUH CEJ) firmly believes that there is an urgent need to address the environmental challenges and improve their environmental footprint.

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

Keeping JNTUH CEJ work in energy efficiency, CII recommends the following to be taken by the competent team at JNTUH CEJ:

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kondapettu), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.



**Work towards achieving carbon neutrality:** INDC puts emphasis on creating an additional carbon sink of 2.5 to 3 billion tonnes of CO<sub>2</sub> equivalent through additional forest and tree cover by 2030. Presently, JNTUH CEJ's net carbon emission is 855.4 MT CO<sub>2</sub>e. JNTUH CEJ 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 JNTUH CEJ's energy portfolio, the overall carbon footprint of the college can be reduced. Presently, based on the roof area available at JNTUH CEJ campus, 100 kW of solar rooftop can be installed. This will result in generation of 146000 units of electricity annually ultimately resulting reduction of 120 MT CO<sub>2</sub>e.

**Installation of additional biogas plant:** JNTUH CEJ 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, JNTUH CEJ had used 20.50 MT of LPG. By generating biogas from sewage water, about 3.60 MT of LPG can be replaced which will result in carbon savings of 11.18 MT CO<sub>2</sub>e.

**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:





- Replace conventional 70W 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 spllt air condltioners



# Carbon Footprint and Energy Audit

College of Engineering Jagtial (JNTUH CEJ) 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 JNTUH CEJ 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 JNTUH CEJ. The report emphasizes on the GHG emission reduction potential possible through reduction in power consumption.

## Submission of Documents

Carbon footprint and energy audit at JNTUH CEJ was carried out with the help data submitted by JNTUH CEJ team. JNTUH CEJ 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.

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kondapattu), Kodimal(M)  
Jagtial (Dist)-505 501, Telangana.





**Note**

Carbon footprint and energy audit are based on the data provided by JNTUH CEJ team and discussions CII team had with JNTUH CEJ 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.

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kondapally), Kodimial(M)  
Jagtial (Dist)-508 581, Telangana.



# OPPORTUNITIES FOR IMPROVEMENT

As a part of the overall environmental improvement study at INTUH CEJ, 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 JNTUH CEJ 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 CO<sub>2</sub> emissions from the combustion of biomass shall not be included in scope 1 but reported separately.





**JNTUH CEJ Scope 1 emissions for 2019:**

Sources of Scope 1 emissions in JNTUH CEJ:

- 1) Diesel used for DG Set
- 2) Diesel used for college owned transportation
- 3) LPG used for canteen

S No	Fuel Type	Description	Activity Data	Units	Emission Factor	Units	CO2 eq. Emissions	Units
1	LPG	Canteen and hostel	20.52	MT	2.98	T CO2/T	61.15	Tons
2	Diesel	DG set and transport	17.57	KL	2.64	T CO2/KL	46.38	Tons

**Total Scope 1 emissions of JNTUH CEJ : 107.50 Tons (for year 2019)**

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagaon), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.

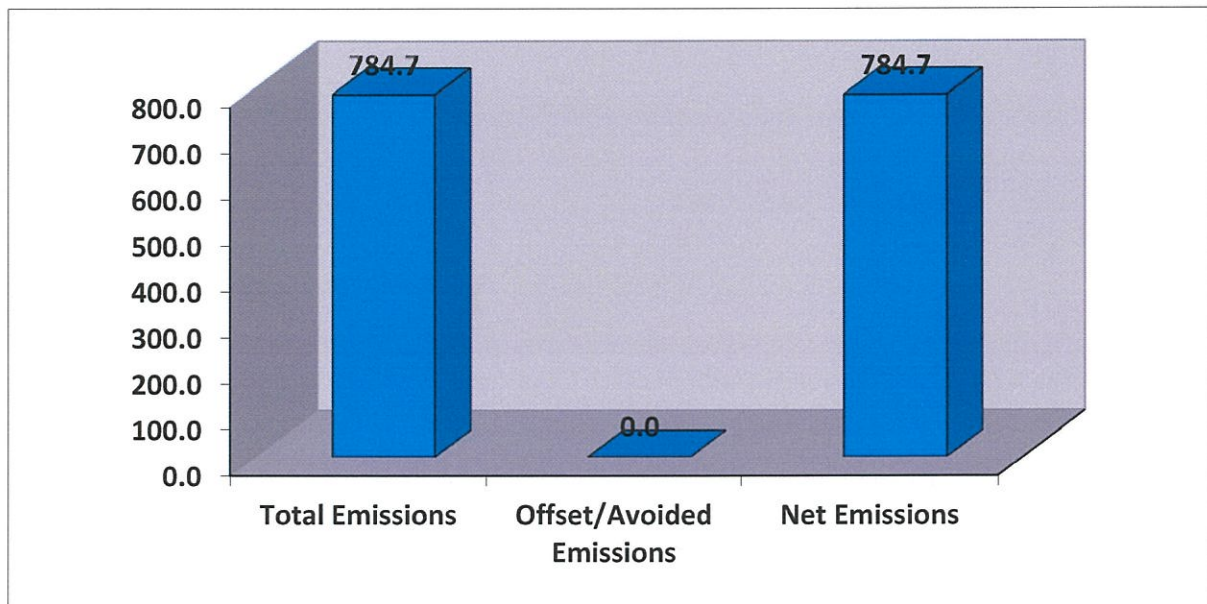
### Scope 2: Electricity Indirect GHG Emissions

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.

#### JNTUH CEJ Scope 2 emissions for 2019:

Electricity purchased from grid : 9,12,000 units

#### Scope 2 Breakup

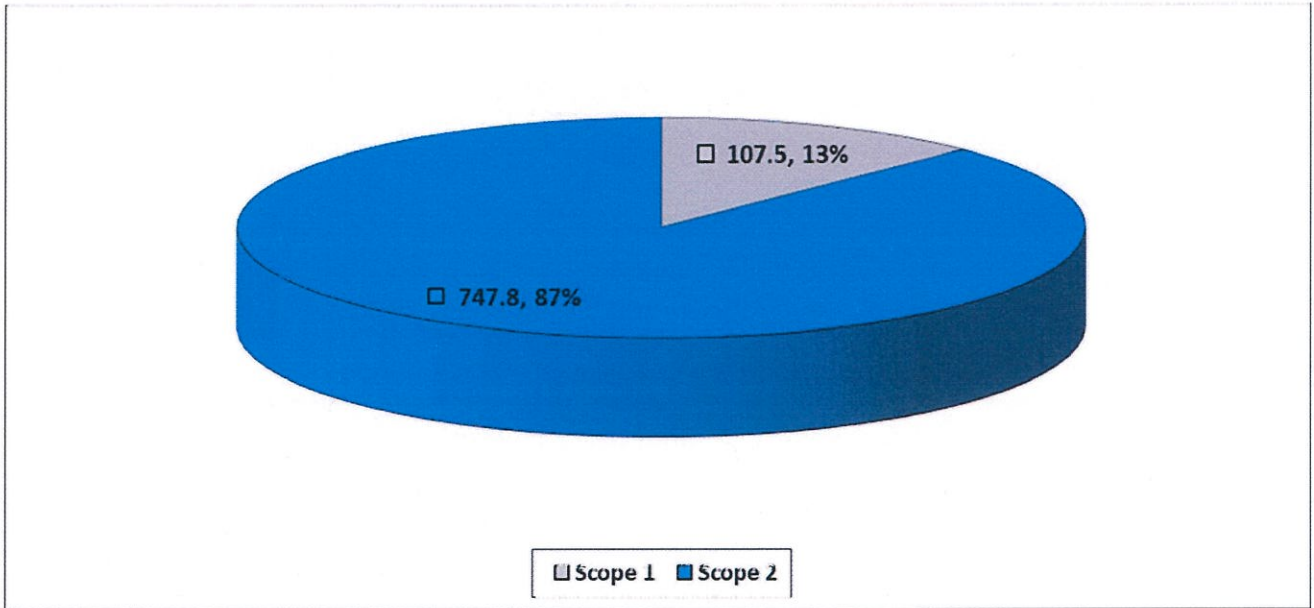


  
**PRINCIPAL**  
 JNTUH College of Engineering Jagtial  
 Nachupally (Kongagattu), Kodimal(M)  
 Jagtial (Dist)-505 501, Telangana.





### GHG Emission Summary of JNTUH CEJ



Scope 1	107.5	MT CO2 eq.
Scope 2	747.8	MT CO2 eq.
Total	855.4	MT CO2 eq.

**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kondapet), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.

## **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 JNTUH CEJ and the maximum offset that can be achieved at JNTUH CEJ
- Percentage substitution with renewable energy that JNTUH CEJ 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.

QOC 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**

JNTUH CEJ has an action plan to reduce its GHG emissions. JNTUH CEJ 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.

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagolu), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.



## Install 100 kWp of Solar rooftop in JNTUH CEJ campus

JNTUH CEJ 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 JNTUH CEJ team, the roof area has the capacity to hold 100 kW of solar panel. 100 kWp of solar rooftop can generate **1,46,000** units of electricity per year.

Additionally, 100 kWp of solar rooftop can offset **120 MT CO<sub>2</sub>e** 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

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagattu), Kodimial(M)  
Jagtial (Dist) 505 501, Telangana.





Source: [www.bluebirdsolar.com](http://www.bluebirdsolar.com)

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kondapally), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.



## Install additional biogas plant at JNTUH CEJ campus

JNTUH CEJ 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.

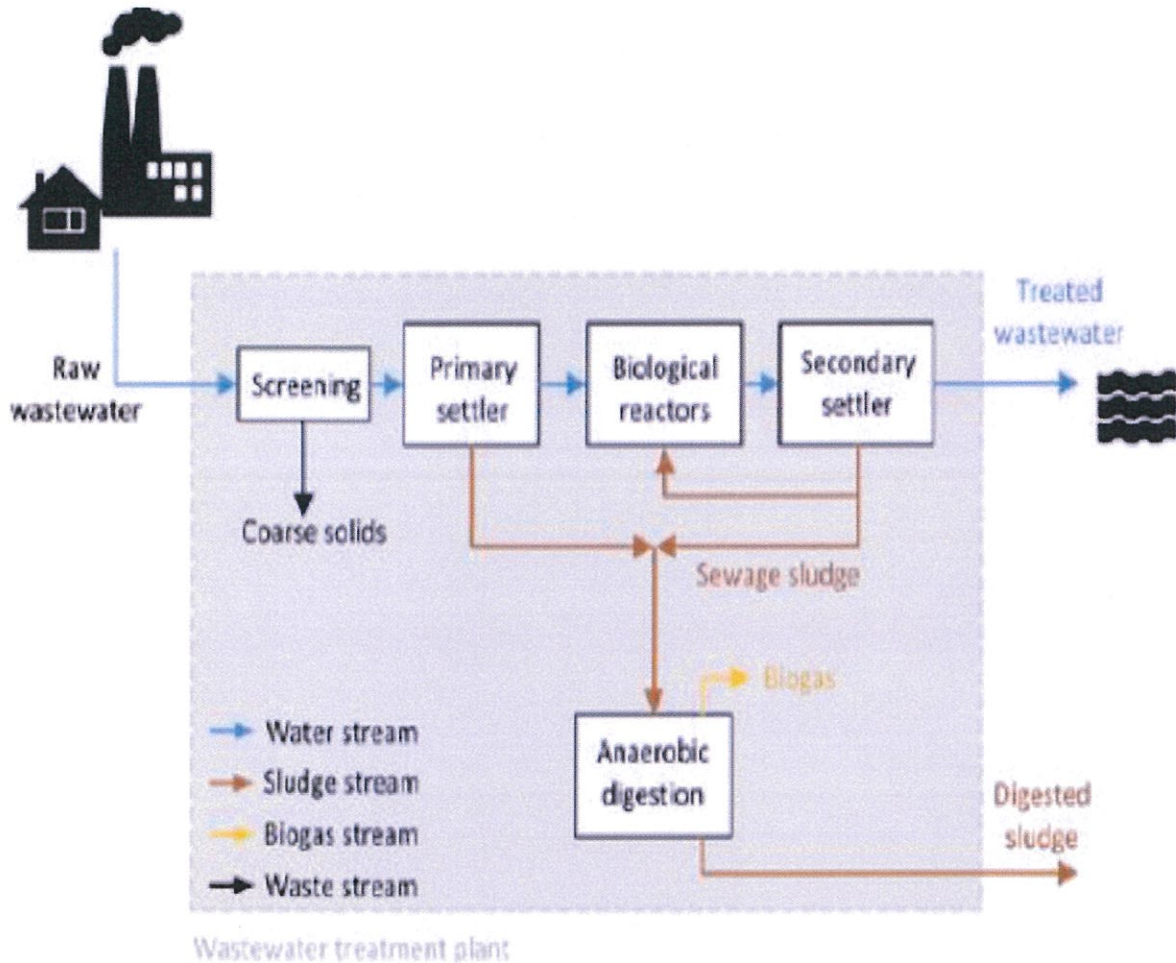
JNTUH CEJ had used 20.52 MT of LPG. By generating biogas from sewage water, about 3.75 MT of LPG can be replaced which will result in carbon savings of 11.18 MT CO<sub>2</sub>e.

### 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.





**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.

From the bioreactor, the sewage enters the sedimentation tank. Here the biological process ends and sludge is separated from water such that the clean water is passed to the disinfection tank for disinfection and onward discharge for use while the sludge is removed by the returned activation sludge (RAS) pump that removes and sends part to the anaerobic digestion chamber while some are return to the anaerobic bioreactor for reactivation.

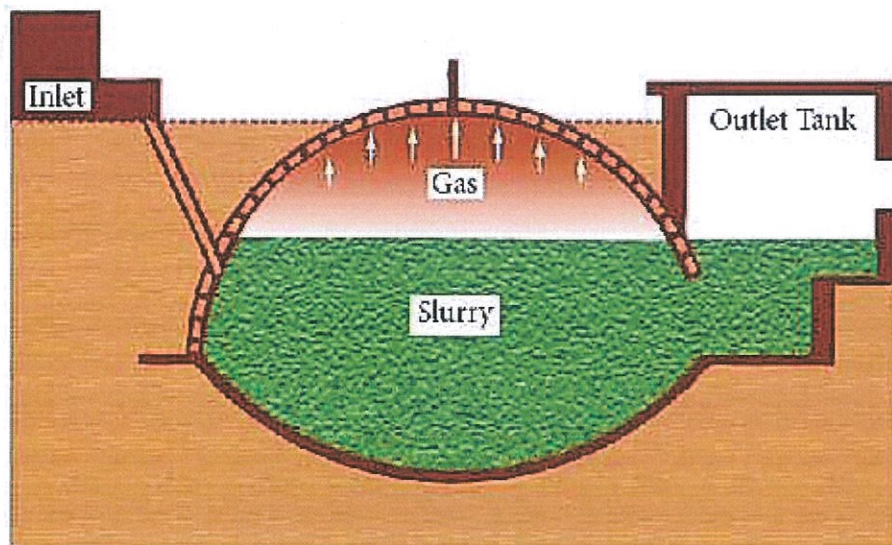
Production of biogas is an anaerobic digestion whereby microorganisms break down biodegradable material in the absence of oxygen to produce methane/carbon dioxide used to generate electricity and heat. Sludge from the treatment plant (primary and activated sludge) is the main feedstock (biodegradable organic matter) in the biogas production plant of a wastewater treatment plant and the biogas production process involves series of steps. The combine sludge resulting from primary and secondary water treatment is gathered, sieved and thickened to a dry solids content of up to 7% before entering the digesters. Optionally, the sludge can be pretreated by disintegration technologies with the aim to improve the gas yield. In the anaerobic digestion process, the sludge is pumped into the anaerobic continuously stirred tank reactors where digestion takes place.

In the process, microorganisms break down part of the organic matter that is contained in the sludge and produce biogas, which is composed of methane, carbon dioxide and trace gases. The raw biogas produced is dried and hydrogen sulphide and other trace substances removed and burned in burners after treatment. The digested sludge is dewatered, and the water reintroduce into the treatment plant while the remaining undigested matter used for organic fertilizer.



**Calculations:**

Sewage water available per day	:	20 KL
Sludge in 20KL of sewage water	:	1% (200 kg)
From 6kg of organic waste	:	1 kg of biogas can be produced
Therefore, from 200 kg	:	33.32 kg of biogas can be produced
1 kg of biogas	:	0.45kg of LPG
Per day equivalent LPG production	:	15 kg per day
Annual LPG production for 250 days	:	3750 kg
No. of 19 kg LPG cylinders that can be substituted:	:	196 cylinders
Cost of 19 kg cylinder	:	Rs. 1350 / cylinder
Savings	:	196 cylinders X Rs. 1350 / cylinder
	:	Rs. 2, 64, 600 / annum
Investment	:	Rs. 5, 00, 000
Payback	:	2 years
Annual emission reduction potential	:	11.18 T CO <sub>2</sub>



# ENERGY EFFICIENCY

Annual energy consumption of JNTUH CEJ campus is 9, 12, 000 units. There are major blocks in the campus which consumes energy for their operation. Major energy consumers are:

1. Air conditioners
2. Fans
3. Lighting

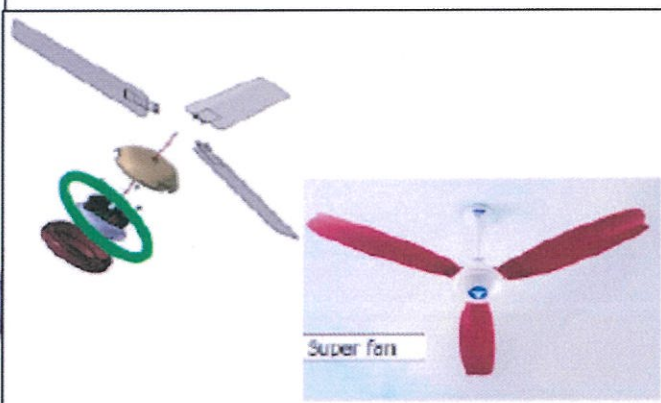
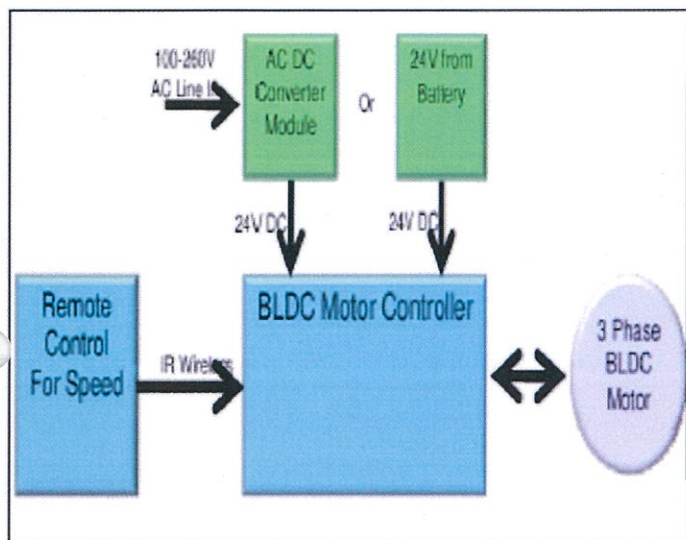
## Replace Conventional Ceiling Fans with Energy Efficient BLDC Fans

During the Energy Audit at JNTUH CEJ, a detailed study was carried out to identify the potential for replacing the existing ceiling fans with BLDC super fans. There are 580 fans operating in JNTUH CEJ campus.

Instead of conventional ceiling fans, latest technology BLDC fans which consume only 30W can be installed in the newly constructed building. A brushless DC (BLDC) motor is a synchronous electric motor powered by direct-current (DC) electricity and having an electronic commutation system, rather than a mechanical commutator and brushes. A BLDC motor has an external armature called the stator, and an internal armature called the rotor.

The rotor can usually be a permanent magnet. Typical BLDC motor-based ceiling fan has much better efficiency and excellent constant RPM control as it operates out of fixed DC voltage. The proposed BLDC motor and the control electronics operate out of 24V DC through an SMPS having input AC which can vary from 90V to 270V. The operational block diagram of a BLDC motor is as follows:





### Calculations:

With the replacement of existing ceiling fans with Super Fans the energy consumption is likely to reduce by 58% per fixture. Considering 500 fans being replaced with super-efficient BLDC fans, 20 kW can be saved. Considering the average operating hours to be 2000 and unit cost as Rs. 7.50, the calculations are as follows:

Total no. of fans in college	:	580
No. of fans considered for calculation	:	500
Energy consumption per fan	:	70 W
Total energy consumption of fans	:	70W X 500 fans
	:	35 kW
Super-efficient BLDC fans energy consumption	:	30 W
Savings from 70W to 30 W	:	58%
Total savings in fans energy consumption	:	58% of 35 kW
	:	20 kW



Savings per year	:	20 kW X 2000 hrs X Rs. 7.50 / unit
	:	Rs. 3,00,000
Investment	:	Rs. 10, 00, 000
	:	3.30 years
Annual emission reduction potential	:	32.80 T CO2

**Install Air conditioners energy saver for spilt air conditioners:**

**Present status:** As per the data obtained from JNTUH CEJ team, the campus has majorly 2 TR units installed. There are 124 spilt air conditioners installed operating 8 hours a day.

**Observation:** With the data collected we observed varying operating hours of AC's based on the interaction with the local user. Based on the extensive observation it can be assumed that each fixture is being operated for 2000 hours in the buildings.

**Recommendation:**

We recommend installing "Airtron", an energy saver that can be installed at every individual unit of AC. The Airtron is the world's most advanced AC SAVER, with all the controls of a Precision AC. The Airtron's dual sensors reference the Room and Coil & Ambient Temp, and uses complex, multiple algorithms in a "closed-loop circuit" to reduce the Compressor Run-Time, to ensure the high savings while maintaining and displaying the Set temperature accurately. The Airtron is Programmable for geographical location and climate and adapts automatically to changes in season and ambient conditions.

This unique device has been developed on Patent-Published technology and approved by leading MNC'S, PSU'S and Govt. Departments. The Airtron is validated by EESL (Energy Efficiency Services Ltd.), Ministry of Power, Government of India, for 44% savings. The Airtron has been validated on

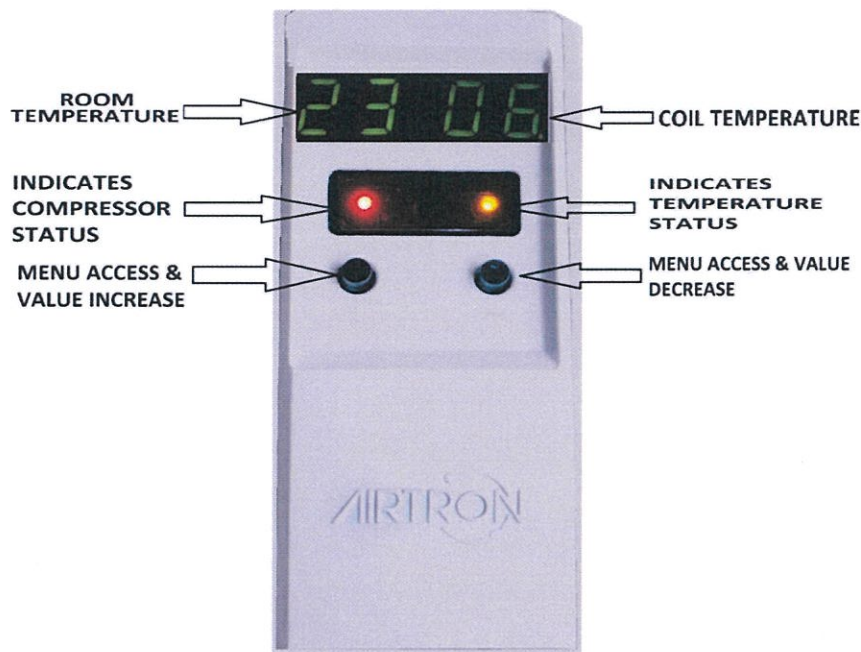


all AC's Inverters, 5 Star, Splits, Multi Splits, Packages, ducts, Windows, Cassettes from 1.0 - 20.0 TR, LG Itd, Videocon Ltd, Tata Communications, L&T, Nestle, Ashok Leyland etc. The AIRTRON comes with a Remote for setting the Room Temperature, and In a Non-Flammable Polycarbonate Enclosure, with SMPS Power Supply, to tolerate wide Voltage and Current fluctuations, Surges, Spikes and Sags.

In our case, Airtron installation can reduce the energy consumption of each fixture by 15% on a conservative basis. For a total energy consumption, for air conditioners, as 100 units per hour, 15 units per hour can be saved. It is recommended to install Airtron energy saver in a phase wise manner preferably in the batches of 10 units.

Saving Calculation: Considering the operating hours to be 2000 and unit cost as Rs 7.50/-.

- Monetary annual savings : Rs 2,25,000/-
- Total investment : Rs 1,00,000/-
- Payback period : 6 months
- Annual emission reduction potential : 24.60 MT CO2



### Replace Conventional Lamps with LED Lamps

As per the data submitted, the total number of all the lighting fixtures installed are 930 tube lights.

The details are as under:

<b>Types of fixtures</b>	<b>40 W Tube</b>
<b>No of fixtures</b>	930
<b>No of hours in Operation</b>	2000

The campus should be keen in harnessing the day lighting available thereby reducing the use of artificial lighting.

Based on the occupancy, monitoring should be ensured to reduce excessive consumption of energy.

Major savings in energy through lighting fixtures can be achieved by replacing all the above existing fixtures with LED's meeting the required LUX levels. The LED's being less energy consuming while maintaining the equivalent lux is the more sustainable option. The replacement of lighting fixtures should be done as per failure replacement policy i.e. change the old fixture with LED when it fails

#### **Advantages of LED**

- Lower energy consumption: The energy consumption of LEDs is low when compared to the other conventional sources for the same amount of Lumen output.

#### Performance comparison of different type lights

<b>Type of Lamp</b>	<b>Lumen/ Watt</b>	<b>CRI</b>	<b>Life hours</b>
HPSV lamps	90-120	Bad (22-25)	15,000-20,000
Metal Halide lamps	65-90	Good (65-90)	18,000
LED lamps	100-150	Very Good (> 80)	10,000 – 12,000



- **High S/P ratio:** LEDs have higher scotopic/photopic ratio (S/P ratio). The eye has two primary light sensing cells called rods and cones – cones function in day light and process visual information whereas rods function in night light. The cone dominated vision is called photopic and the rod dominated vision is called scotopic. The S/P ratio indicates the measure of light that excites rods compared to the light that excites cones. In office environments, illumination is more effective if the S/P ratio is high as it is under scotopic region. LEDs hence are ideally suited for these applications as they have a high S/P ratio.
- **Longer life-time:** LEDs have longer life time of around 1,00,000 hours. This is equivalent to 11years of continuous operation or 22 years of 50% operation.
- **Faster switching:** LED lights reach its brightness instantly upon switching and can frequently be switched on/off without reducing the operational life expectancy.
- **Greater durability and reliability:** As LEDs are solid-state devices and uses semi-conductor material; they are sturdier than conventional sources that use filaments or glass. LEDs can also withstand shock, extreme temperatures and vibration as they don't have fragile materials as components.
- **Good Colour Rendering Index (CRI):** The color rendering index, i.e., measure of a light sources' ability to show objects as perceived under sunlight is high for LEDs. The CRI of natural sunlight is 100 and LEDs offer CRI of 80 and above.
- LED offers more focused light and reduced glare. Moreover, it does not contain pollutants like mercury. LED technology is highly compatible for solar lighting as low-voltage power supply is enough for LED illumination.



Calculations are as follows:

<b>Existing Lighting Fixtures</b>	<b>40 W Tube</b>
<b>Existing power consumption (kW)</b>	36 kW
<b>Proposed LED Wattage (W)</b>	15
<b>LED power consumption (kW)</b>	13.50 kW
<b>Energy saving (kW)</b>	22.50 kW
<b>Operating hours</b>	2000

Annual monetary savings	:	Rs 3, 37, 000/-
Investment needed	:	Rs 4, 50, 000/-
Payback period	:	2 Years
Annual Emission reduction potential	:	36.90 MT of CO2

## Conclusion

JNTUH CEJ has initiated few energy efficiency activities in their campus. While CII appreciates the plant team for their efforts, we would like to emphasize that opportunity exists to further reduce the energy consumption. Installation of renewable energy is to be given major focus. RESCO model can be adopted to install renewable energy without upfront capital investment. We in CII are sure that all the recommendations mentioned in the report will be implemented by JNTUH CEJ team and the overall environmental performance of the campus will be improved.

**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kondragattu), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.





## List of Vendors

Equipment	Supplier Name	Contact Person	Mail Address	Contact Number
AC Energy Saver	Gloabtel Convergence Ltd	Mr Chirag Morakhia	chirag@gloabtel.com	9324176440
AC Energy Saver	Magnatron International	Mr Kishore Mansata	indiaenergysaver@gmail.com	9748727966
BLDC Ceiling Fans	Atomberg Technologies Pvt Ltd	Ms Roshni Noronha	roshninoronha@atomberg.com	9987366655
BLDC Ceiling Fans	Versa Drives	Mr Sathish	sathish@versadrives.com	94885 94382
LED	Havells India Ltd	Mr. Sunil Sikka	sunil.sikka@havells.com	0120-4771000
LED	Kwality Photonics Pvt. Ltd.	Mr. K. Vijay Kumar Gupta	kwality@kwalityindia.com	+ 91 40 2712 3555
LED	OSRAM Lighting Pvt. Ltd.	Mr Nitin Saxena	N.saxena@osram.com	+91 124 626 1300
LED	Reckon Green Innovations Pvt Ltd	Mr Krishna Ravi	krishna@reckongreen.com	9985333559

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kor. Jagtial), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.





**Confederation of Indian Industry**  
125 Years - Since 1895



**COLLEGE OF ENGINEERING JAGTIAL (JNTUH CEJ)**  
**Environmental Audit**  
**Water Conservation and Waste Management**

**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kandamatta), Kodiminti (v)  
Jagtial (Dist)-505 501, Telangana.

2021





Confederation of Indian Industry  
125 Years: 1895-2020  
CII – Sohrabji Godrej Green Business Centre  
Survey No. 64, Kothaguda Post, NearHITEC City,  
Ranga Reddy Dist., Hyderabad - 500 084, INDIA  
Tel: +91-40-44185111 Fax: 91-40-44185189  
Email: [envirogbc@cii.in](mailto:envirogbc@cii.in)  
Website: [www.greenbusinesscentre.com](http://www.greenbusinesscentre.com)

# Acknowledgement

**N Muthusezhiyan**  
Principal Counsellor

26 April 2021

## 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 College of Engineering Jagtial (JNTUH CEJ)

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

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

*Kind regards,*

Yours sincerely,

**N Muthusezhiyan**  
Principal Counsellor

**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kondaganattu), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.



# 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.

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, College of Engineering Jagtial (JNTUH CEJ) firmly believes that there is an urgent need to address the environmental challenges and improve their environmental footprint.

True to its belief, JNTUH CEJ has implemented rainwater harvesting in the campus. Continuing with rainwater harvesting, the college can also investigate the following recommendations:

- **Attain water positive status:** JNTUH CEJ should focus on capturing the harvested rainwater to substitute freshwater consumption, work on sustainable groundwater beyond the fence and create a framework towards attaining water positive status over a period. Presently, JNTUH CEJ is consuming nearly 200 KL of fresh water per day. Since metering is not available, the water consumption is calculated rather than measure value.





The first step is to increase the water conservation activities in the campus to reduce water consumption at source. The next step is to increase the rainwater harvesting capacity to completely offset the freshwater requirements of the plant. JNTUH CEJ can also explore adopting lakes, desilting of ponds and restoration of water bodies in localities surrounding the campus. Water getting harvested in those structures can offset the freshwater consumption of the college.

- **Install water efficient fixtures:** Best way to conserve water is at the source. Therefore, JNTUH CEJ will have to install water efficient fixtures to reduce water consumption. Some of the water efficient fixtures are:
  - Waterless urinals
  - Electronic taps (e-taps)
  - Electronic flush urinals (e-flush)
  - Foam taps
  - Spring loaded push taps
  - Low flush cistern
- **Install sewage treatment plant / rootzone treatment:** JNTUH CEJ uses more than 200 KL of fresh water per day. Considering that 100 KL of water is being let to drain without treatment, good opportunity exists to reduce freshwater consumption by treating the sewage water and using the recycled water for gardening and flushing application. Install biogas plant and phytoremediation in series to recycle water and reduce freshwater consumption.
- **Install water flow meters:** Water flow meters are vital in understating the water consumption patterns of the campus. Presently, the water consumption is calculated rather than being measured. Water flow meters gives an accurate status if water consumption in the campus and from the water consumption values, the roadmap for water conservation activities can be prepared.



- **Install level sensors for main water tank:** Main source of water for the campus are borewells. The borewells pump water to the main water tank. The pump supplying water to the main tank is switched on/off manually based on the tank level. In the present operation, there is a chance that the overflow of water may occur because of human interference and may lead to water and energy wastage. Therefore, it is recommended to install water level sensors for the tank operate the pumps automatically based on the level of water in the tank.
- **Segregate waste at source:** JNTUH CEJ has provided bins for waste collection. The effectiveness of the system is still not up to standards. Therefore, JNTUH CEJ must embark on awareness creation methods to increase the effectiveness of collection and provide more bins for proper waste segregation.
- **Maintenance of waste management yard:** Currently, the waste management yard is not being maintained up to standards. The waste management yard is to be maintained just like raw materials storage room. Waste is nothing but a resource in wrong place. Therefore, by maintaining the waste management yard, quality of wastes can be maintained.

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kodagattu), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.





# Environmental Audit

JNTUH CEJ and CII are working together to identify opportunities for improvement in water management, and waste management. This report highlights all the potential proposals for improvement through the audit and analysis of the data provided by JNTUH CEJ for water consumption and waste management. The report details the process conducted for the analysis such as on ground surveys performed for listing the type of water consumers with consumption per year, types of waste generated and disposal mechanisms.

## Submission of Documents

Environmental audit at JNTUH CEJ was carried out with the help data submitted by JNTUH CEJ team. JNTUH CEJ team was responsible for collecting all the necessary data and submitting the relevant documents to CII for the study.

## Preliminary Study

After the receipt of documents, a desktop review of the data for quality check, followed by preliminary study was carried out by CII. In case of discrepancy/inadequacy/non-clarity of data, CII - Godrej GBC team got in touch with the JNTUH CEJ team for clarification/additional information.

## Environmental Audit

Data submitted and collected during the visit was used to assess the water and waste management practices of the campus and finally provide necessary recommendation for environmental improvement.



## Note

Environmental audit is based on the data provided by JNTUII CEJ 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.

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kondragattu), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.





# Water Conservation

To achieve a water positive status by continuous reduction of freshwater consumption should be the ultimate focus of JNTUH CEJ. Increased and focused attention should be given to attain water sustainability in future by inculcating the discipline of water conservation.

Fresh water consumption of JNTUH CEJ	:	200 KL per day (KLD) (Calculated)
Source of water	:	Borewells
Number of water meters installed	:	NIL
Rainwater harvesting	:	carried out for roof area

According to the report, 'Water in India: Situation & Prospects', India is the largest consumer of groundwater in the world with an estimated usage of 230 km<sup>3</sup> per year. Approximately 60 per cent of the demand from agriculture and irrigation, and about 80 per cent of the domestic water demand, is met through groundwater. As per the Department of Drinking Water and Sanitation nearly 90 per cent of the rural water supply is from groundwater sources. This has led to an increased pressure on aquifers and the resulting hydrological imbalance.

**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagattu), Kodimial(M)  
Jagtial (Dist.-505 501, Telangana.

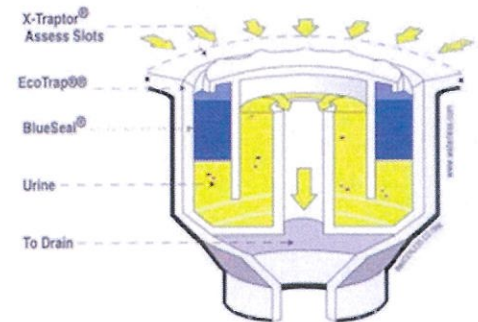
## Recommendations for water conservation:

**1) Waterless urinals:** Waterless urinals look like regular urinals without a pipe for water intake. Men use them normally, but the urinals don't flush. Instead, they drain by gravity. Their outflow pipes connect to a building's conventional plumbing system. In other words, unlike a composting toilet, which leaves you to deal with your waste, these urinals send the urine to a water treatment plant.

### Waterless Urinal



### Waterless Urinal

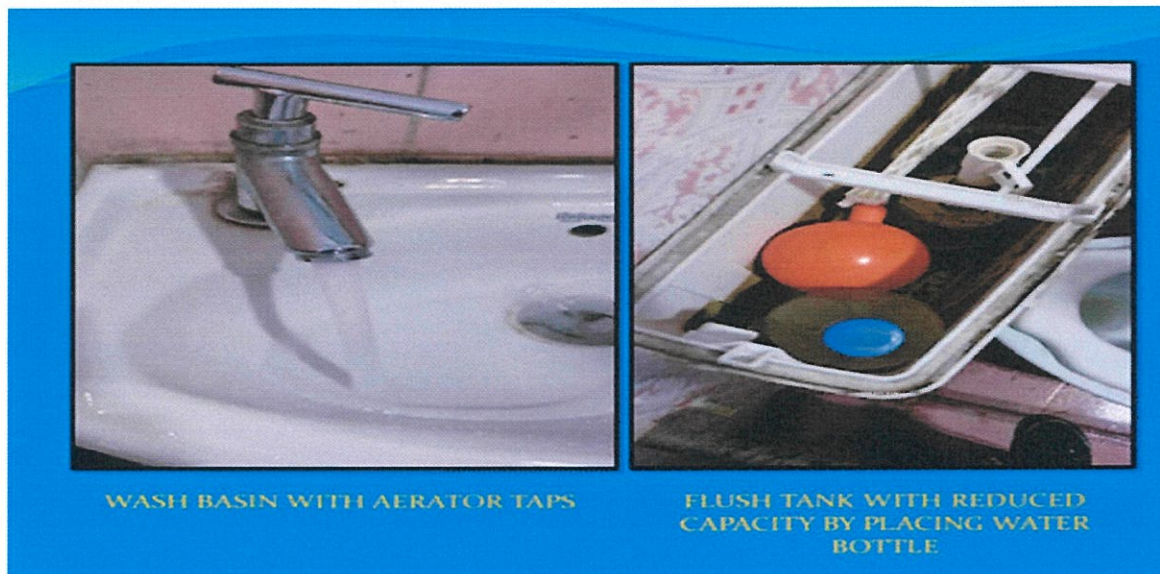


- a. Urine flows into the drain insert of the EcoTrap.
- b. Inside of the EcoTrap the urine moves through a floating layer of proprietary immiscible BlueSeal liquid, which creates a barrier, preventing sewer gases and urine odors from entering the restroom area.
- c. The urine below the BlueSeal barrier overflows into the central tube and travels down into the drain line.
- d. Approximately 1500 sanitary uses are possible with just 3 ounces of BlueSeal. When the BlueSeal liquid is gone, it is simply replenished. This only takes about 20 seconds to perform and the EcoTrap is not touched.



e. Urine sediments are retained within the EcoTrap. Replacement is easy and need only be done 2 to 4 times per year depending on traffic to the urinal. As tool called the X-Traptor must be used to remove the EcoTrap. The use of the special tool helps to minimize vandalism. The entire process of replacement only takes 3 to 4 minutes.

**2) Volume reduction in flush tanks:** One simple method is to add a one-liter equivalent water bottle in the flush tank thereby reducing its consumption majorly. One-liter savings in the tank will help to save approximately by 20% and doesn't require any investment.



**3) Rainwater harvesting:** Water harvesting or more precisely rainwater harvesting is the technique of collection and storage of rainwater at surface or in subsurface aquifer, before it is lost as surface run off. In artificial recharge, the ground water reservoirs are recharged at a rate higher than natural conditions of replenishment.

According to a report by the Central Groundwater Board published in 2007, the selection of a suitable technique for artificial recharge of ground water depends on various factors. They include:



- a) Quantum of non-committed surface runoff available
- b) Rainfall pattern
- c) Land use and vegetation
- c) Topography and terrain profile
- d) Soil type and soil depth
- e) Thickness of weathered / granular zones
- ) Hydrological and hydrogeological characteristics
- g) Socio-economic conditions and infrastructural facilities available
- h) Environmental and ecological impacts of artificial recharge scheme proposed

**Rainwater Harvesting Techniques in Urban Area**

In urban areas rainwater is available from roof tops of buildings, paved and unpaved areas. This water could be stored and used to replace freshwater as well as used for recharging the aquifer.







#### **4) Display water balance/conservation status at entrance of all blocks for overall involvement of all students & staff**

It is suggested to display specific water consumption numbers in terms of domestic use at the entrance of each blocks to create awareness among all students and stakeholders visiting the facility. This daily/continuous awareness creation will ultimately help in reduction of water consumption by students.

### **Water Saving Gadgets**

It is suggested to display specific water consumption numbers in terms of domestic use at the entrance of each blocks to create awareness among all students and stakeholders visiting the facility. This

#### **Electronic Taps (e-taps)**

The latest trend in industries is to install electronic taps (e-taps). The advantages of using e-taps are as mentioned below:

- Unlike conventional taps, there is no twisting or turning in e-taps. They have a sensor, which cuts off water supply completely when not in use. This helps in saving up to 70% water during hand wash.
- E-taps enable hands free operation. No fear of cross contamination or contact with germs. E taps score very high on hygiene. It is the most ideal choice for multipurpose and multi-user washrooms.
- E-taps can work efficiently up to raw water TDS of 1,800 ppm.
- The touch free electronic taps, available in AC and DC models consume minimal power only. The AC model has an efficient battery back-up, while the DC model runs on just 4 alkaline batteries.



### Operation of Electronic Taps

This has been successfully implemented in several hotels & restaurants. Of late, several industries have also started implementing this proposal. Thus, there is a good potential to optimize the freshwater consumption by replacing the existing taps with e-taps.

### Electronic flush (e-flush) urinals

The latest trend in industries is to install e-flush urinals. The advantages of using e-flush urinals are as mentioned below:

- E-flush urinals are fitted with a sensor, which senses the usage and flush with water for few seconds after use. This helps in saving 70% water during urinal flush.
- E-flush urinals enable hands-free operation and score very high on hygiene. It is the most ideal choice for multipurpose and multi-user washrooms.
- E-flush urinals can work efficiently up to raw water TDS of 1,800 ppm.
- The touch free e-flush urinals available in AC and DC models consume minimal power only. The AC model has an efficient battery back-up, while the DC model runs on just 4 alkaline batteries.



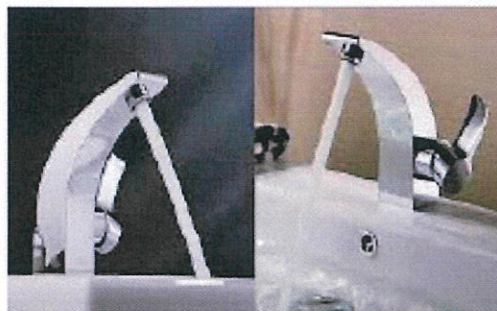


**Photographs: Electronic flush urinals**

### Hand wash

### Foam taps

Conventional taps are used in the hand wash areas which results in wastage of large quantities of fresh water. Foam taps are a better fit in these high consumption areas. They consume 25-30% less water than conventional taps.



**Photographs: Foam taps**

### Spring loaded Push taps

Spring loaded push type tap is an alternate device for minimizing hand wash water. The spring-loaded push taps operate with the simple mechanism of pressing the knob for water. The knob is automatically released back to close position in 5-7 seconds. This saves about 30-40% of water compared to the conventional taps.



**Photographs: Spring loaded push taps**

### Low flush cistern

The latest model closets are water efficient and operate in dual mode, with a single flush releasing 2 litres of water and the dual flush releasing 4 litres per flush. This results in excellent water savings.



**Photographs: Low flush cisterns**

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagsana), Kodimal(M)  
Jagtial (Dist) 506 501, Telangana.





### **Install sewage treatment plant – Rootzone treatment:**

JNTUH CEJ uses more than 40 KL of fresh water per day. Considering 10 KL of water is being let to drain without treatment, good opportunity exists to reduce freshwater consumption by treating the sewage water and using the recycled water for gardening and flushing application. Install biogas plant and phytoremediation in series to recycle water and reduce freshwater consumption.

JNTUH CEJ 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.

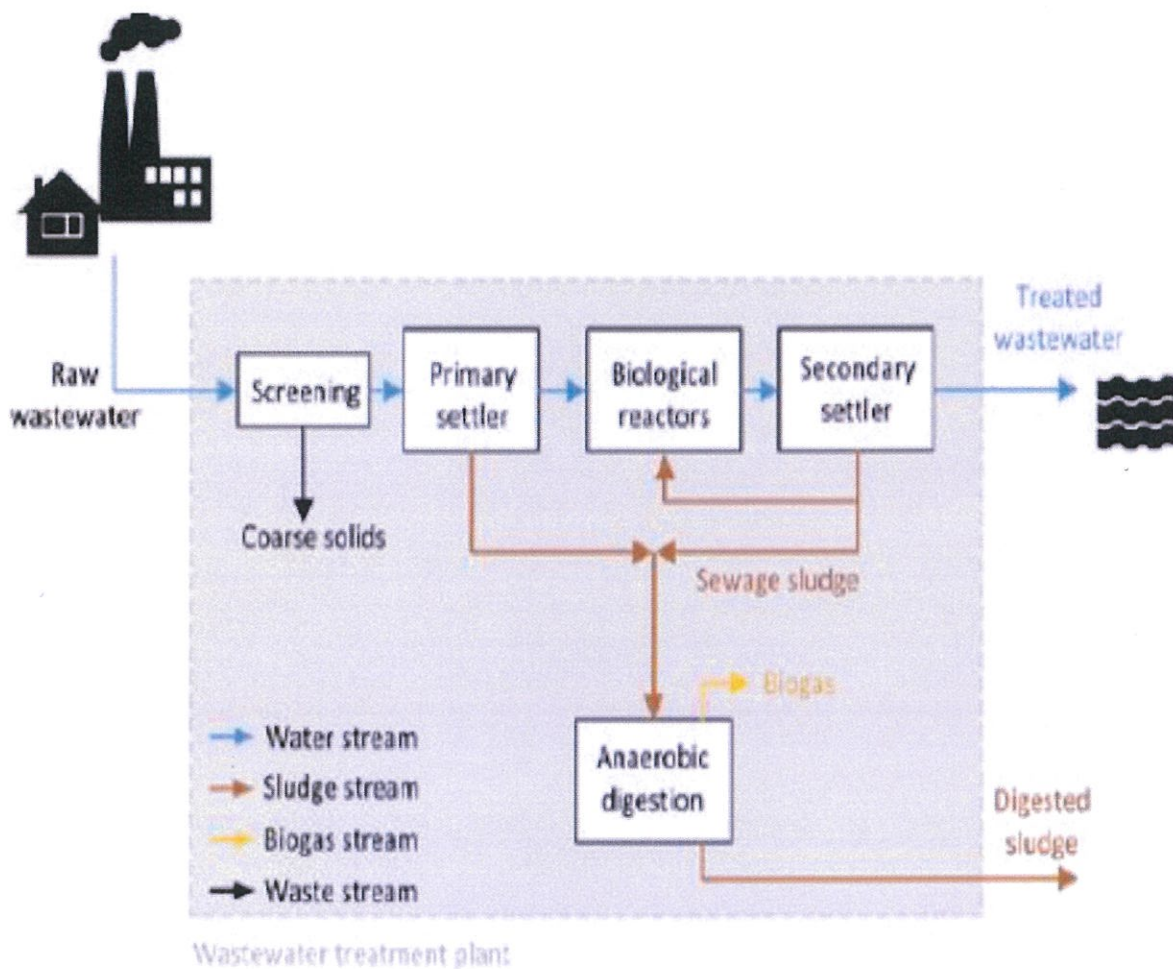
In 2019, JNTUH CEJ had used 20.50 MT of LPG. By generating biogas from sewage water, about 3.6 MT of LPG can be replaced which will result in carbon savings of 11.10 MT CO<sub>2</sub>e.

### **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.



**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.



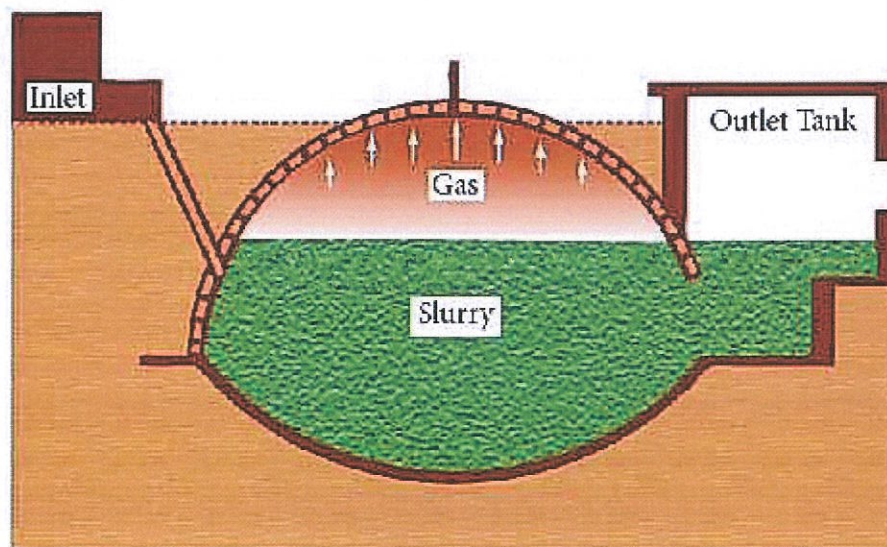
**The biological process:** this involves the biotreatment of the sewage in the bioreactors. It is the heart of the treatment plant where a biological process takes place. The bioreactors of a treatment plant are usually large tanks consisting of several mammoth rotors and submersible mixers. While the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

From the bioreactor, the sewage enters the sedimentation tank. Here the biological process ends and sludge is separated from water such that the clean water is passed to the disinfection tank for disinfection and onward discharge for use while the sludge is removed by the returned activation sludge (RAS) pump that removes and sends part to the anaerobic digestion chamber while some are returned to the anaerobic bioreactor for reactivation.

Production of biogas is an anaerobic digestion whereby microorganisms break down biodegradable material in the absence of oxygen to produce methane/carbon dioxide used to generate electricity and heat. Sludge from the treatment plant (primary and activated sludge) is the main feedstock (biodegradable organic matter) in the biogas production plant of a wastewater treatment plant and the biogas production process involves series of steps. The combined sludge resulting from primary and secondary water treatment is gathered, sieved and thickened to a dry solids content of up to 7% before entering the digesters. Optionally, the sludge can be pretreated by disintegration technologies with the aim to improve the gas yield. In the anaerobic digestion process, the sludge is pumped into the anaerobic continuously stirred tank reactors where digestion takes place.

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kondapattu), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.

In the process, microorganisms break down part of the organic matter that is contained in the sludge and produce biogas, which is composed of methane, carbon dioxide and trace gases. The raw biogas produced is dried and hydrogen sulphide and other trace substances removed and burned in burners after treatment. The digested sludge is dewatered, and the water reintroduced into the treatment plant while the remaining undigested matter is used for organic fertilizer.



### Rootzone treatment:

'Root Zone' is a scientific term used to cover all the biological activity among different types of microbes, the roots of plants, water, soil, and the sun. It consists of planted filter-beds containing gravel, sand, and soil. The RZWT system utilizes nature's way of biologically processing domestic & industrial effluents. This effective technology called Decentralised Wastewater Systems (DEWATS) was developed in the 1970s in Germany and has been successfully implemented in different countries, mainly in Europe and America.



The root zone wastewater treatment system makes use of biological and physical-treatment processes to remove pollutants from wastewater. Due to its natural process, there is no need to add any input such as chemicals, mechanical pumps or external energy. This reduces both the maintenance and energy costs.

- To accomplish this, the root zone wastewater treatment undertakes the following steps:
- Pre-treatment done in a Settler – a device that separates the liquid from the solid First treatment takes place in a Anaerobic Baffled Reactor – a device with several identical chambers through which the effluent moves from top to bottom.
- Second treatment happens in an Anaerobic Filter – a device filled with a filter material (cinder), through which the effluent moves from top to bottom.
- Third treatment takes place in a Planted Gravel Filter – a structure filled with gravel material and planted with water-resistant reed plants, which provide oxygen to the passing effluent.

The Root Zone Wastewater Treatment system takes into account the natural slope of the ground, so that water flows from one device to another without any external energy input such as motor pump. Once the reed plants create an



established stand, usually after the first growing season, the reed bed requires little or no maintenance. The plant foliage will soon blend naturally into the landscape, ever changing with the seasons and creating a pleasing sight as well!



### **Install water flow meter:**

Water flow meters are vital in understating the water consumption patterns of the campus. Presently, the water consumption is calculated rather than being measured. Water flow meters gives an accurate status if water consumption in the campus and from the water consumption values, the roadmap for water conservation activities can be prepared.



Water Meters would have many advantages:

- Encourage water conservation – important given strain on water resources
- Encourage allocatively efficient distribution. People would consume to where the marginal cost = marginal utility
- In long term lower overall water consumption would reduce leading to even lower water bills.

PRINCIPAL  
 JNTUH College of Engineering Jagtial  
 Nachupally (Kondagattu), Kodimial(M)  
 Jagtial (Dist)-505 501, Telangana.





**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagatt), Kodimikal(M)  
Jagtial (Dist)-505 501, Telangana.

# Waste Management

India has drawn world's attention with its high paced urbanization and industrialization. Over the last decade, India has emerged as the fastest growing country with rapid economic growth. A renewed focus on sustainable growth and development is imperative as India strives to maintain its high GDP growth rate in its pursuit of achieving developed country status by the year 2022. However, the flip side of higher economic growth has resulted in increased consumption of the natural resources, increased waste generation and hence ecological degradation.

**Present status:** JNTUH CEJ has initiated waste management activities inside its facility. Separate bins have been provided for different types of wastes. Waste bins are provided throughout the campus and students are being urged to use the bins effectively.

**Observation:** Though the collection of waste is being done in an orderly fashion, the storage of waste needs an improvement. Presently, the wastes are segregated at the source. The collected wastes are then taken to waste storage yard. The storage of wastes in the waste storage yard needs to be improved upon.







**Recommendation:** The waste management yard must be maintained in a similar fashion as that of a raw material storage room. Therefore, a total revamp of the waste storage yard is to be carried out. By doing so, the quality of the materials stored in the yard will not deteriorate and can be used as a raw material for a subsequent process.

**Enhance awareness creation, training and capacity building**

JNTUH CEJ should focus on implementing sustainable waste management practices. JNTUH CEJ should regularly interact with Pollution Control Board and TSD operators to enhance knowledge on waste management. The team should also take efforts to communicate the waste management and other policies and activities to all students in the college.

**Achieve zero liquid discharge status**

JNTUH CEJ has already invested in STP to treat and recycle water. The treated water from STP can be used to substitute freshwater by utilizing the treated water in both high end and low-end applications.

PRINCIPAL  
JNTUH College of Engineering Jagtial  
Nachupally (Kondaguda), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.



## Conclusion

Environmental sustainability is a continuous process and there is always a scope for improvement. JNTUH CEJ has displayed itself as an advocate of environmental sustainability by getting environmental audit carried out. The organization has implemented several initiatives and measures to enhance efficiency and to optimize resource intensity. The journey ahead in the path towards environmental excellence has immense scope for improvement as brought out by this report.

JNTUH CEJ needs to focus and work on areas efficiency levels needs to be enhanced. For example: waste management. The observations and suggestions put forth by the report would help the facility in improving its environmental performance and pave way for ecologically sustainable growth.

This report may be taken as a guide and roadmap for achieving higher performance rating in environmental stewardship. As one of the pioneers and leaders JNTUH CEJ shoulder the task of further 'learning – teaching – learning' to improve, excel, and continue the innovative efforts for success of their students and associates.

**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagattu), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana.



18-19.

Website : [www.jntuhcej.ac.in](http://www.jntuhcej.ac.in)  
E-Mail : [nssunitjntuhcej@gmail.com](mailto:nssunitjntuhcej@gmail.com)



Phone: Off: 8985898501

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**COLLEGE OF ENGINEERING, JAGTIAL**  
**Nachupally (Kondagattu), Kodimial (M), Jagtial Dist.-505 501, Telangana (India)**

**Dr. M N RAJASHEKAR**

*M.Sc., Ph.D..*

**Professor of Mathematics Dept., &  
NSS Programme Officer**

No.JNTUHCEJ/02/05/2019

Dt: 18-02-2019

**CIRCULAR**

NSS Unit of our college is going to organize **“One Week Special Camp”** from 19-02-2019 to 24-02-2019 at Himmathraopet village.

In this regard all the NSS volunteers are requested to attend and make the event grand success.

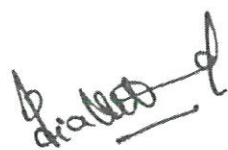
NSS PROGRAM OFFICER

- Copy to PA to Principal
- Copy to PA to Vice Principal
- Copy to all heads to circulate among staff and students
- Copy to chairman CRC 1<sup>st</sup> year
- Copy to Hostel Manager to circulate among the hostel students
- Copy to EE
- Copy to AR
- Copy to all notice boards.

**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagattu), Kodimial (M)  
Jagtial (Dist)-505 501, Telangana.

**Report of the Programme**  
**Academic Year (2018-19)**

Title of the Programme	One week Special Camp
Name of the activity	Awareness Programme (Visit to nearby village - Himath raopet to provide awareness on cleanliness)
Date	19-02-2019 to 24-02-2019
NSS Programme Officer	Dr. M.N.Rajashekar
Place	Himath raopet village
No. of Participants (Students+staff)	45
Name of sponsored organisation	MHRD, NSS UNIT, JNTU Hyderabad
Nature of sponsorship (Total Grants received if any)	-
Objective of the programme	To Provide information how to keep the surrounding clean and to make people aware of use of paper carry bags in place of plastic bags to combat plastic pollution.
Outcome of the programme	Villagers were made aware of use of paper carry bags instead of plastic bags and covers.
News Published Photos (If any)	
Photo gallery	



**NSS Program Officer**



**Principal**  
**PRINCIPAL**

JNTUH College of Engineering Jagtial  
Nachupally (Kondagattu), Kodimial(M)  
Jagtial (Dist.)





  
**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagattu), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana

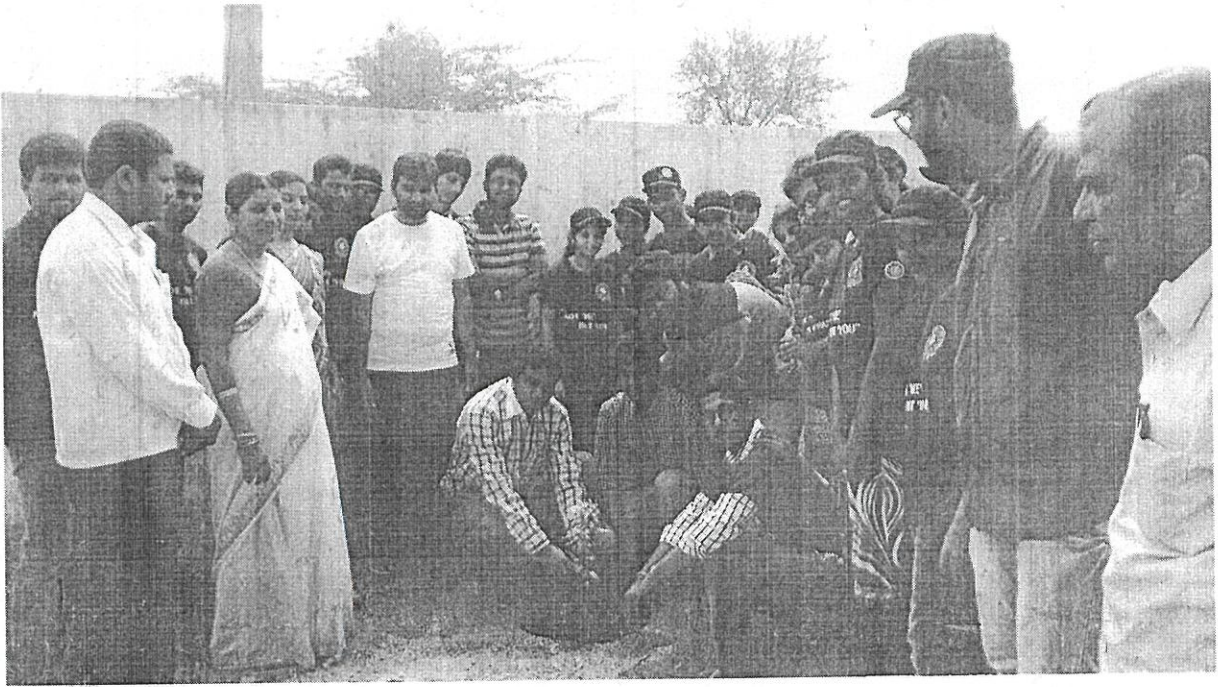




**PRINCIPAL**

JNTUH College of Engineering Jagtial  
Nachupally (Kondagattu), Kodimial(M)  
Jagtial (Dist)-505 501, Telangana





  
**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagattu), Kordimal(M)  
Dated: 15/05/2024



**PRINCIPAL**  
JNTUH College of Engineering Jagtial  
Nachupally (Kondagattu), Kodimairi  
Jagtial (Dist)-505 501, Telangana





శిబిరంలో విద్యార్థినులు

## రాంసాగర్లో ఎన్ఎస్ఎస్ శిబిరం

రాంసాగర్(కొడిమ్యాల), న్యూన్టుడే : మండలంలోని రాంసాగర్ గ్రామంలో జేఎస్సీయూ నాచుపల్లి కళాశాలలోని ఎన్ఎస్ఎస్ విభాగం ఆధ్వర్యంలో జాతీయ సేవా పథకం (ఎన్ఎస్ఎస్) కార్యక్రమాన్ని ఆదివారం ప్రారంభించారు. తిర్మలాపూర్ సహకార సంఘం అధ్యక్షుడు పునుగోటి కృష్ణారావు, ఎన్ఎస్ఎస్ ప్రోగ్రాం అధికారి డాక్టర్ రాజశేఖర్ కార్యక్రమాన్ని ప్రారంభించి మాట్లాడారు. వారం పాటు నిర్వహించే శిబిరంలో భాగంగా గ్రామంలో చేపట్టబోయే వివిధ కార్యక్రమాల గురించి వివరించారు. కార్యక్రమంలో సర్పంచి పుట్ల గంగాధర్, ఎన్ఎస్ఎస్ వలంటీర్లు, గ్రామస్థులు పాల్గొన్నారు.

Eenadu cej 19-02-18

## ఎన్ఎస్ఎస్ వాలంటీర్ల స్వచ్ఛభారత్

రాంసాగర్(కొడిమ్యాల), న్యూన్టుడే: జేఎస్సీయూ నాచుపల్లి కళాశాలలోని ఎన్ఎస్ఎస్ విభాగం ఆధ్వర్యంలో మండలంలోని రాంసాగర్ గ్రామంలో నిర్వహిస్తున్న ప్రత్యేక శిబిరంలో భాగంగా వలంటీర్లు సోమవారం గ్రామంలో స్వచ్ఛభారత్ కార్యక్రమం నిర్వహించారు. ఈ సందర్భంగా గ్రామంలోని ఆయా కార్యాలయ వద్ద పెరిగిన గడ్డిని, పిచ్చియొక్కెలు, చెత్తను తొలగించి పరిసరాలను శుభ్రం చేశారు. అనంతరం గ్రామంలోని ప్రభుత్వ ఉన్నత పాఠశాల లోని 8, 9, 10వ తరగతి విద్యార్థులకు భవిష్యత్తులో విద్యా



చెత్తను తరలిస్తున్న వలంటీర్లు

ఉపాధి అవకాశాలను గురించి అవగాహన కల్పించారు. పదో తరగతి విద్యార్థులు రానున్న వార్షిక పరీక్షల నేపథ్యంలో ఎలాంటి భయాందోళనకు, ఒత్తిడికి గురి కాకుండా పరీక్షలకు సన్నద్ధం కావాలని, పదో తరగతి అనంతరం గల విద్యా పఠాశాలను గురించి విద్యార్థులకు వివరించారు. సర్పంచి పి. గంగాధర్, తిర్మలాపూర్ సహకార సంఘం అధ్యక్షుడు పి. కృష్ణారావు, ఎన్ఎస్ఎస్ ప్రోగ్రాం అధికారి డాక్టర్ రాజశేఖర్, పాఠశాల ప్రధానోపాధ్యాయురాలు ఊర్మిశాదేవి, ఉపాధ్యాయులు, విద్యార్థులు, వలంటీర్లు పాల్గొన్నారు.

Eenadu cej 20-02-18

## ఎన్ఎస్ఎస్ వలంటీర్ల శ్రమదానం

రాంసాగర్(కొడిమ్యాల): జేఎస్సీయూ నాచుపల్లి కళాశాల లోని ఎన్ఎస్ఎస్ విభాగం ఆధ్వర్యంలో రాంసాగర్ గ్రామంలో నిర్వహిస్తున్న ప్రత్యేక శిబిరంలో భాగంగా మంగళవారం శ్రమదానం కార్యక్రమం నిర్వహించారు. ఈ సందర్భంగా వలంటీర్లు గ్రామంలోని చెత్తను తొలగించడం, రైతుల చేనులో పత్తిని సేకరించడం తదితర పనులు నిర్వహించారు. కార్యక్రమంలో ఎన్ఎస్ఎస్ ప్రోగ్రాం అధికారి డాక్టర్ రాజశేఖర్, సర్పంచి పి. గంగాధర్, తిర్మలాపూర్ సహకార సంఘం అధ్యక్షుడు పి. కృష్ణారావు, వలంటీర్లు పాల్గొన్నారు.



శ్రమదానంలో పాల్గొన్న వలంటీర్లు

Eenadu cej 21-02-18

PRINCIPAL  
JNTUH College of Engineering Jagtjal  
Nachupally (Kondagattu), Kodiluru  
Jagtjal (Dist) 508 001, T.