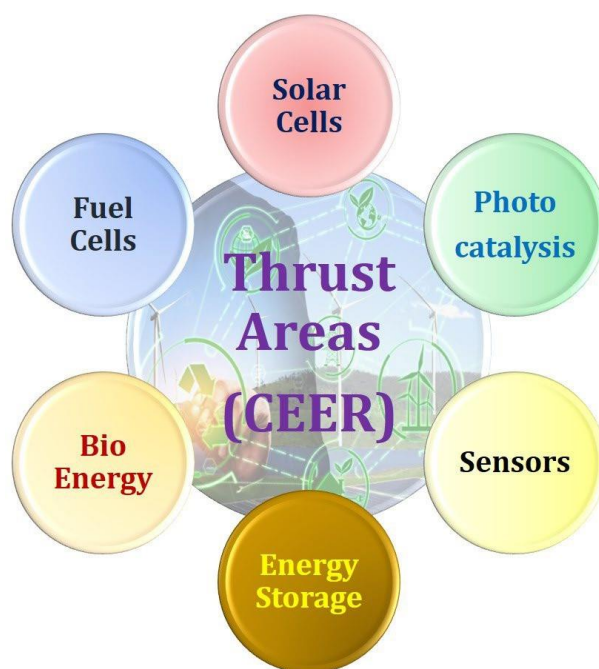


Sathyabama Institute of Science and Technology

Initiatives towards Green House Gas reduction

2024-2025

Sathyabama Institute of Science and Technology had a vision to venture into reduction of greenhouse gases since 2000 and encouraged the researchers to pursue alternate fuel research. As an outcome numerous initiatives were taken in bioenergy and solar energy sectors. The outcome of which led to the successful implementation of a Centre of Excellence for Energy Research (CEER), bestowed to the institution by the Ministry of Human Resource Development, Govt. of India in October 2014. The Centre functions in research and developmental activities leading to the development of products, technologies in various alternate energy fields shown below.



Amongst all solar cells and bioenergy research has crossed TRLs 9 and have gone into commercialization. The ultimate objective is to be in par with our Nation's objective to achieve Net Zero emissions by 2070. The implementation of alternate energy forms in the institution has been initiated since 2018 and hence 2017-2018 is considered as the baseline year. Centre for Waste Management, Sathyabama Institute of Science and Technology manages the inventories and records the emission reductions in the institution with implementation of

alternate energy strategies throughout the institution since 2018. GHG accounting and reporting at the institution is based on the following principles:

- RELEVANCE
- COMPLETENESS
- CONSISTENCY
- TRANSPARENCY
- ACCURACY

Being an educational institution, Scope 1 emissions is only in terms of Transportation of materials, products, waste, and employees that accounts to approximately 37,84,000 T CO₂E with an average of 120 buses operated for a total of 300 days in a year with a maximum of 40 Litres per day consumption of diesel. and Fugitive emissions that covers hydrofluorocarbon (HFC) emissions with 0.082 TCO₂E per annum from one AC. With about 1500 ACs in campus it accounts to 123 TCO₂E during the use of refrigeration and air conditioning equipment. Scope 2 emissions include the emissions related with the purchase of electricity from the board which accounts to 4777.425 TCO₂E. Total emissions account to 3788900 TCO₂E.

Continuing to operate the biodiesel, biogas and accelerated biocomposting facilities the emissions have come down to 3087300 TCO₂E

Biodiesel Operated Buses - Initiative 1:

Biodiesel Plant for the usage in Institutional buses and Gensets. The institution operates a pilot scale biodiesel production unit that converts 50 litres of waste cooking oil generated in the institution mess. This initiative prevents approximately 15,000 to 20,000 Litres of waste cooking oil from being consumed, thrown into the sewer line or dumped onto the landfill every year. The waste cooking oil is properly assessed and converted into Biodiesel. The produced biodiesel is evaluated to meet the ASTM standards. Fifteen of the institution buses are operated with B15 blends of diesel. Also, two of the Gensets are powered with B-100. With this initiative the institution has reduced 4,82,460 TCO₂E from 37,84,000 TCO₂E per annum by operating biodiesel powered buses and gensets which is 33,01,540 TCO₂E . The institution has set it's target to achieve 50 percent by increasing the blending percentage as well as the number of biodiesel powered buses. The scope for the institution to reduce emissions is huge and will be achieved as set by the nation.



Biodiesel Plant housed in Eachampoondi Village, Cuddalore District in the STI Hub, a DST-Sathyabama Joint initiative

Initiative 2 :Biodiesel for pumpsets and gensets in Mittapalli, Aadhanur, Eachampoondi, Meensuruti villages Apart from directly contributing , the institution through its biofuel promotion activities has also contributed to Carbon footprint reductions. About 5300 L of biodiesel has been given away for operating pumpsets in Mitapalli village, Aadhanur village, Eachampoondi village in Tamilnadu. The institution is also taking initiatives to provide biodiesel to power fish catching boats in Meensuruti village in Kattumannarkoil Taluk, Cuddalore district. In addition to the biodiesel plant commissioned in the Centre for Waste management Laboratory at Sathyabama Institute of Science and Technology, a pilot scale biodiesel plant has been set up in Cuddalore to cater to the diesel requirements in few of the villages in Kattumannarkoil Taluk. This way 2.14 TCO₂E has been achieved indirectly by the initiatives taken by our institution during 2023-2024, which would have been high with diesel used as a fuel. The target will be to increase in cumulative reduction of 5, 10, 15, 20 tonne year after year in next four years and achieve a total of 55 TCO₂E by 2028. Through the Science Technology and Innovation hub established at Kattumannarkoil Taluk C,D block Cuddalore District around 150 marginal and non-workers including women have been trained to make biodiesel from waste cooking oil. They are given sufficient awareness on the impact of consuming several times fried waste cooking oil and throwing away of the same on landfills

and into the sewer lines. They have been trained to check the quality of the oil, categorize it for biodiesel production, divert it for other application like detergent soap making, 1 Litre biodiesel production and 20 L pilot scale biodiesel production.





Pumpsets being fuelled with Biodiesel

Initiative 3: Diversion of Vegetable Market Waste to Accelerated Biocompost

Vegetable market waste is huge menace to the landfill and can be potentially converted into compost. A study was completed based on which a 100 kg capacity accelerated composting machine which operates with the bioformulation proven by the faculty of Sathyabama Institute of Science and Technology to convert Vegetable Market Waste to Compost has been successfully demonstrated in Eachampoondi Village, Cuddalore District. The Investigators from Centre for Waste Management, Sathyabama Institute of Science and Technology are

operating this project through the STI hub established at Cuddalore. More than 25 non-workers and marginal workers have been trained to collect, segregate and process the vegetable market waste generated at Meensuruti village Sandhai (Market Place) to produce compost. The characteristics in terms of nutrient value have been studied and proven in several fields. From 1 tonne of market waste 1.6 t CO₂e is given out. By diverting this to accelerated compost 1.6 TCO₂E can be reduced. Through the Vegetable Market Waste to Compost , Sathyabama has achieved reduction of 25.2 TCO₂E in the last year.



Biocompost ready for packaging



Biocompost distribution in Kattumannarkoil, Cuddalore



Biocompost for Sales

Initiative 4 Food Waste to Biogas

Based on the FAO's food waste emission factor of 2.5 ton CO₂e ton⁻¹, India's emission from food waste works out to 172 MtCO₂e per year. The institution caters to more than 15000 people through the extremely large cooking facility available in campus. Following the Food waste

hierarchy, apart from donating the excess food for the needy, diverting the waste food for cattle and piglet farms, on an average 500 to 1000kg of food waste is diverted for biogas generation daily . Because of this initiative apart from saving three commercial cylinders every day, 2 to 2.5 TCO₂E has been reduced by diverting the food waste for biogas production instead of dumping on to the landfills. The institution has set up a 1 Tonne capacity biogas plant with Scrubber and Collecting Balloon facilities. The unit is continuously monitored by maintaining ideal pH, alkalinity and VFA in the anaerobic digester. By continuing to implement the above initiatives at a larger capacity the institution will thrive to achieve Net Zero by 2050. Periodic energy and environmental audits are conducted by the institution audits in terms of the various types of waste generated and how the waste is effectively utilized or diverted for value added products production including biodiesel, biogas, biocompost, biochar etc., The energy audit is also pursued as per the GHG Protocol Corporate standard accounting for Scope 2 emissions as indicated in Section 5 of the document given in the link.



Biogas Plant with 12ft biogas collected in the balloon adjacently diverted for cooking



Biogas fuelled stove used for Appalam frying