

SCHOOL OF ENVIRONMENTAL STUDIES

COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

Cochin University P. O., Kochi - 682 022, Kerala, India

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Carbon footprint evaluation report of Cochin University of Science and Technology

Brief description of the university campus:

Cochin University of Science and Technology main campus is situated in Kalamassery with a Total Campus Area (Main Campus) – of 182.43 Acres and a Total Built-up Area (Main Campus) – of 177665.8 m² including faculties, technological centers, classrooms, laboratories, library, gymnasium, food services, and administrative offices.

The university has a current population of 3178 students (mainly postgraduates), 255 teaching staff, and 713 non-teaching staff. The Cochin University campus is by far the largest in terms of area and enrollment.

GHG Protocol:

Cochin University started to measure CF in the year 2016 and marked this as the baseline year with the objective of quantifying the greenhouse gases produced by the institution. This environmental management tool allows the development of measures to reduce the environmental impact of the activities carried out on the campus.

The GHG Protocol separates emissions into three scopes. Scope 1, direct emissions, includes those emissions from sources owned or controlled by the organization; Scope 2, indirect emissions, covers emissions from the organization's purchased electricity consumption; and Scope 3, other indirect emissions, includes emissions that result from activities within the organization, but from sources that are not owned or controlled by it.

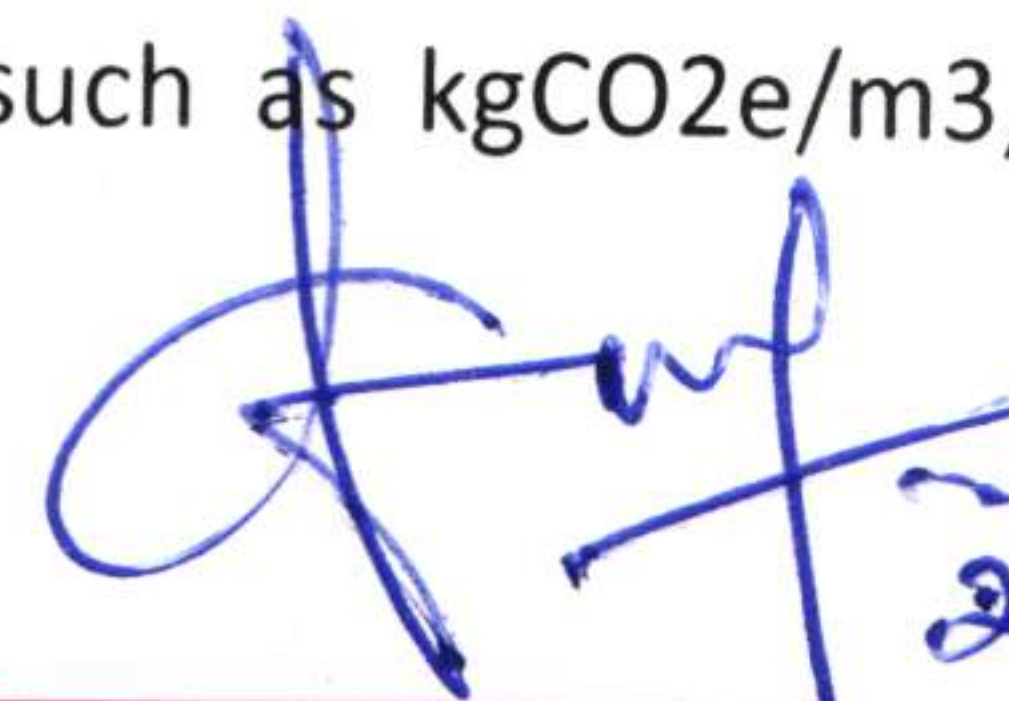
Materials and Method:

Evaluation of Direct and Indirect Emissions:

The emissions generated by activities on the university campus that are related to Scopes 1 to 2 of the GHG Protocol standard and the sources of data used for their calculation are evaluated and recorded. To establish the base of the study, the operational control that quantified GHG emissions where the organization can develop or apply management policies was used to define the scope of inputs.

The following steps were used in order to determine the GHG emissions related to each category:

1. Determine the energy consumption in each category, such as kWh of electric consumption and liters of liquefied petroleum gas (LPG) consumption.
2. Find the updated GHG emissions factor associated with each category, such as kgCO₂e/m³, tCO₂e/kWh, kgCO₂e/km traveled, etc.


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3. Calculate the amount of CO₂e in each category by multiplying consumption per emission factor associated with each category.

A simple expression to reflect in the arithmetic term CF calculation is the following:

$$CF (t CO_2 e) = \sum_{i=1}^n (X_i \times F_i)$$

where X_i and F_i are the amount of energy (LPG, diesel, and electricity) and GHG emission factor per type of energy, respectively.

Inventory analysis data and sources of acquisitions

Category	Subcategory	Source
Scope 1 Fuel used for fleet and other services	Diesel and LPG	Engineering and Administrative Departments, CUSAT
Scope 2 Imported electricity		Electrical Department, CUSAT

The total Scope 1 and 2 carbon emissions in tCO₂e (tons (t)) of carbon dioxide (CO₂) equivalent (e) as per the GHG protocol for the inventory conducted in 2022 is **2024.11**, and the total Scope 1 and 2 carbon emission for the baseline year (2016), tCO₂e was **2267.77**. There was a reduction of **243.66** tCO₂e within a span of 6 years. The university is working in tune with the government of Kerala to achieve carbon neutrality by the year 2050 and moving forward with a target carbon reduction of 4 – 5 % every year. The university reduced the carbon emission under scope 2 by purchasing electricity (20%) from hydroelectric sources and installing a 75 KWh solar plant. As the university expands, more interventions are made to reduce carbon emissions under scope 1 of the GHG protocol. 4 Biogas plants have already been set up at the girls' and boys' hostels and are operational now. The university is planning to replace existing fleets with LNG or electric vehicles. The university is also moving forward to offset carbon emissions by planting more trees under the green campus initiative.

The university has planned to conduct a detailed study on the Scope 3 emissions under GHG protocol as per the ISO standard 14064 and LCA methodology. Scope 3 emissions are the outcome of an organization's activities that other organizations control; a detailed survey and collection of data from all spheres of activity in the university has to be carried out. This will give an exact picture of carbon emissions per student/staff in the university.

The details of carbon emissions under scopes 1 and 2 of the baseline year (2016) and the last conducted inventory (2022) are provided in the **Annexure**.


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Evaluation of scope 1 & 2 carbon emissions in CUSAT Main campus

Baseline year: 2016.


Sl. No	Used for	Emission source and unit	Level of consumption /production	Uncertainty level	GHG emission factor	Total Carbon emission tCO ₂ e/annum	Net GHG emission tCO ₂ e/annum	Source
Scope 1								
	Restaurant, cafeteria, student's hostel. etc.	LPG in (Kg)	1.2345 t	low	2.99 tCO ₂ e	3.69	9.21 (www.cea.gov.in)	
	Departmental labs	LPG in (L)	0.3478 t	medium	2.99 tCO ₂ e	1.04		
	Institutional vehicles	Diesel in (L)	1.6721 t	high	2.4 tCO ₂ e	4.01		
	Generators	Diesel in (L)	0.1934 t	low	2.4 tCO ₂ e	0.47		
Scope 2								
	Electric System	Grid electricity (Kwh)	2858.94 MWh/yr	high	0.79 tCO ₂ e	2,258.56	2,258.56	(www.cea.gov.in)

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**Evaluation of Scope 1 & 2 carbon emissions in CUSAT Main Campus
for the year 2022**

Sl. No	Used for	Emission source and unit	Level of consumption/production	Uncertainty level	GHG emission factor	Total Carbon emission tCO ₂ e/annum	Net GHG emission tCO ₂ e/annum	Source
Scope 1								
1.	Restaurant, cafeteria, student's hostel. etc.	LPG in (Kg)	1.7361 t	low	2.99 tCO ₂ e	5.19	5.19 + 1.37 + 5.79 + 0.60 - 4.82 = 8.13 tCO₂e (www.cea.gov.in)	
2.	Departmental labs	LPG in (kg)	0.4592 t	medium	2.99 tCO ₂ e	1.37		
3.	Institutional vehicles	Diesel in (L)	2.4162 t	high	2.4 tCO ₂ e	5.79		
4.	Generators	Diesel in (L)	0.2518 t	medium	2.4 tCO ₂ e	0.60		
5.	Waste to recycle	Biogas	37500 m ³ x 0.43 = 16125 kg LPG = 1.6125 t LPG	medium	2.99 tCO ₂ e	4.82		
Scope 2								
1.	Electric System	Grid electricity (Kwh)	3192.54 MWh/yr	high	0.79 tCO ₂ e	2,522.11	2,522.11 - 1.71 - 504.42 = 2015.98 tCO₂e (www.cea.gov.in)	
2.	Electric System	Solar plant (75 KWh)	2.16 MWh	medium	0.79 tCO ₂ e	1.71		
3.	Electric System	Hydroelectric (20%) of total consumption.	638.51 MWh	low	0.79 tCO ₂ e	504.42		


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