

**INDIAN INSTITUTE OF TECHNOLOGY DELHI**  
**GREENHOUSE GAS EMISSION INVENTORY**  
**CALENDAR YEAR 2025**

Emission of Greenhouse Gases (GHGs) from human activities is the primary driver of climate change that is the most pressing environmental hazard faced by humanity today. As per the GHG Protocol emissions are categorized as (i) Scope 1, direct emissions due to the activity of an organization, (ii) Scope 2, emissions from purchased electricity, and (iii) Scope 3, indirect emissions in the value chain of the organizations.

IIT Delhi is committed to be a good global citizen by taking an active role in solving this crisis by attaining NetZero status by 2040. The annual GHG Emission Inventory mandated by the IIT Delhi Sustainability Policy is a key step in this regard. This inventory rigorously assesses the Scope 1 and Scope 2 emissions as well as some key components of our Scope 3 emissions as per the GHG Protocol.

Table 1 shows the Scope 1 and Scope 2 emissions. Table 2 shows the emissions by activity. It includes all Scope 1 and Scope 2 emissions. Scope 3 emissions are not in the control of IIT Delhi. Even the data required to estimate most of these emissions are not available to us. Hence, we report only those activities where we could estimate the emissions with a reasonable degree of confidence.

<b>TABLE 1: GHG EMISSION INVENTORY</b>		
<b>No</b>	<b>ACTIVITIES</b>	<b>EMISSION TONS CO2 EQ</b>
1	Academic labs	4.7831
2	R&I park	3.7172
3	IIT Markets and canteens	477.5194
4	Hostel mess	2024.4400
5	Catering for events	6.6023
6	IIT bus	34.8833
7	IIT Hospital	5.2091
8	Construction and maintenance	12.4900
9	Backup DG	389.2264
10	Waste	506.8147
11	Fugitive Emissions	2.2100
	<b>SCOPE I TOTAL</b>	<b>3467.8954</b>
1	Electricity Academic and Institute Facility areas	25021.7100
2	Electricity hostel areas	3175.432425
3	Electricity bank	60.6938

4	Electricity For Residential Area	1878.7923
	<b>SCOPE II TOTAL</b>	<b>30136.6285</b>
1	Food Preparation in Residential Area	303.1408
2	Employee Daily Commute	129.9671
3	Bank Van and School Bus	121.3945094
4	Outside IIT Visits (Conferences/ Non Academics)	20102.19432
5	Goods Supply and other logistics Transportations	84.1380
6	Waste Treated Outside the IIT	617.1216
7	Sold and Discarded Items	69.0581
8	Purchased Good and Services	1129.1902
	<b>SCOPE III TOTAL</b>	<b>22438.7762</b>

TABLE 2: GHG EMISSIONS FROM IITD ACTIVITIES

Purpose	Activities	Emission_Tons_CO 2_EQ	Primary Source of Emission
R&D	Academic labs	4.783067688	LPG for experiments
	R&I park	3.71715288	Gas welding, 3D printing
FOOD PREP	Restaurants and canteens	477.5194104	LPG and PNG for cooking
	Hostel mess	2024.44	PNG for cooking
	Catering for events	6.60228192	LPG for cooking
	Faculty and staff quarters	303.1407666	PNG and LPG for cooking
	Fugitive emission	2.197	Gas leakage from in-house refrigerant for food storage
TRANSPORTATION	Resident faculty and staff commute	23.12485171	Fuel for personal vehicles
	Travel to non-academic events	94.31813953	Fuel for train and planes
	Travel to conferences and fieldwork by students	20007.87618	Fuel for train and planes
	Travel by Hospital staffs, doctors and supply from vendor	8.805597293	Fuel for bike, cars and van

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	IIT School bus, van and school visitors	86.51125936	Fuel for bus and van
	IIT bus	34.88325	Fuel for bus
	Bank van	1.1118864	Fuel for van
	Bank employee commute	11.52542899	Fuel used for personal vehicles
	Hospital	5.209145533	Fuel for ambulance
	Goods supply	51.46603083	Fuel for kitchen goods supply
	Waste Collection	3.227947248	Fuel use for van, tractors for waste collection
	Waste disposal	32.67198854	Fuel use for van, tractors for waste disposal outside IITD
	Fogging truck	0.012982206	Fuel used in Fogging truck
WORKS	Construction and maintenance	12.49002723	Cement, paint, welding
	Other Scope 1 services	2.854243	Fogging
WASTE	Residential	616.745868	Organic waste
	Hospital and lab	0.375723	Bio-medical waste
	Biogas plant	503.58672	Emission during Biogas generation
	Sold and Discarded items	69.05805617	Metals, Furniture and electronics waste
ENERGY	Electricity Academic and Institutional areas	25021.70996	SCOPE 2 Emission from 45298962 kwh consumption
	Electricity hostel areas	3175.432425	
	Electricity bank	60.69380625	SCOPE 2 emission from 176806 kwh consumption
	Electricity Faculty/staff quarters	1878.7923	SCOPE 2 Emission from 5320000 kwh consumption
	Backup DG	389.2263765	Diesel
SERVICES	Purchased goods and services	1129.190193	Metals, Furniture and electronics items and

			services purchased
<b>TOTAL</b>		<b>56043.30025</b>	

 SCOPE 1
  SCOPE 2
  SCOPE 3

## Methods

### 1. R&D

1.1.Academic Labs: A survey is conducted to determine the amount of gases used per year in all academic labs.

Emission Factor:

1. Propane: (i) CO<sub>2</sub> = 1.5414 kg/L  
 (ii) CH<sub>4</sub> = 0.0000476 kg/L  
 (iii) N<sub>2</sub>O = 0.00000319 kg/L
2. Cement : 0.59719 kg CO<sub>2</sub> e/ kg
3. Welding : 0.0208 kg CO<sub>2</sub> e/kg

1.2.R&I Park: A survey is conducted to assess the amount of gas used for welding in all startups and the emissions due to 3D printing.

Emission Factor:

- Cotton / Fabric: 3.8 kg CO<sub>2</sub>e/ kg
- Gas Welding: 0.0208 kg CO<sub>2</sub>e/kg
- 3D printing: 0.00118 kg CO<sub>2</sub>e/ kg
- PCB Assembly: 0.0016 kg CO<sub>2</sub>e/kg

### 2. FOOD PREPARATION

2.1.Restaurants and Canteens: A survey is conducted to determine the annual LPG consumption in all restaurants and canteens on campus.

Emission Factor:

1. LPG : 2.89 kg CO<sub>2</sub>e per kg
2. PNG : (i) CO<sub>2</sub> = 1.9 kg CO<sub>2</sub> per SCM  
 (ii) CH<sub>4</sub> = 0.000133 kg CO<sub>2</sub> per SCM  
 (iii) N<sub>2</sub>O = 0.0000057 kg CO<sub>2</sub> per SCM

2.2.Hostel Mess: A survey is conducted to assess the annual PNG consumption in all hostel messes.

2.3.Catering for Events: Information on events is gathered from email records over the past year. The amount of LPG used for additional dining is estimated based on discussions with catering staff. (2–3 events per three months, each serving approximately 400 extra meals).

Emission Factor:

LPG : (i) 1.473 kg CO<sub>2</sub> per litre  
 (ii) 0.00012 kg CH<sub>4</sub> per litre

2.4.Faculty and Staff Quarters: A survey is conducted to estimate the annual PNG consumption for 42 faculty and staff members, and the data is extrapolated to represent 700 campus residents.

Emission Factor:

- 1.Electricity : 0.495 kg CO<sub>2</sub>e per kWh
- 2.Bike (Petrol) : (i) 0.111 kg CO<sub>2</sub> per km  
 (ii) 0.0000632 kg CH<sub>4</sub> per km  
 (iii) 0.000002 kg N<sub>2</sub>O per km
- 3.Car(Petrol) : (i) 0.163 kg CO<sub>2</sub> per km  
 (ii) 0.0000128 kg CH<sub>4</sub> per km  
 (iii) 0.0000012 kg N<sub>2</sub>O per km
- 4.Car(Diesel) : (i) 0.163 kg CO<sub>2</sub> per km  
 (ii) 0.0000017 kg CH<sub>4</sub> per km  
 (iii) 0.0000012 kg N<sub>2</sub>O per km
- 5.Car(CNG) : (i) 0.173 kg CO<sub>2</sub> per km  
 (ii) 0.0000632 kg CH<sub>4</sub> per km  
 (iii) 0.0000014 kg N<sub>2</sub>O per km

## TRANSPORTATION

3.1.Resident Faculty and Staff Commute: A survey of 42 campus-resident faculty and staff members is conducted to determine their daily institutional travel distances.

Mode of Travel Distribution:

- 26.19% Bikes
- 28.57% Petrol Cars
- 2.38% Diesel Cars
- 0% CNG Cars

Emission Factor:

- Bike = 0.111 kg CO<sub>2</sub> per km
- Car = 0.168 kg CO<sub>2</sub> per km

3.2.Travel to Non-Academic Events: Travel data for various tech and sports events from club members is collected for one year.

Emission Factor:

- Flight = 0.074 kg CO<sub>2</sub> per kg
- Train = 0.035 kg CO<sub>2</sub> per kg

3.3.Travel to Conferences by Students and faculty: The data is collected from a total of 10 departments/Centres/ Schools to determine the frequency and destinations of their international and national conference and academic event travels over their course duration and is extrapolated to represent all 33 such entities or departments.

3.4.Travel to Fieldwork by Faculty and Students : The data is collected from a total of 25 departments to determine frequency and destinations of their fieldtrips over the entire course duration and is extrapolated to represent all 33 such entities or departments.

3.5.IIT School Bus: Data on the total number of school buses and vans, along with their annual fuel consumption, is gathered from IIT School.

Emission Factor:

Bus : (i) 0.101 kg CO<sub>2</sub> per km  
 (ii) 0.0000004 kg CO<sub>2</sub> per km  
 (iii) 0.0000032 kg CO<sub>2</sub> per km

3.6.IIT Buses: Data on the total number of buses and their annual fuel consumption is collected from the Institute's Junior Engineer.

Emission Factor:

CNG= 1.88 kg CO<sub>2</sub> per m<sup>3</sup>

3.7.Bank Van: The bank van's transportation data is collected from the bank's branch manager. A fixed travel distance of 20 km per trip is assumed based on discussions with authorities.

Emission Factor: Bank Van : (i) 0.23 kg CO<sub>2</sub> per km  
 (ii) 0.0000062 kg N<sub>2</sub>O per km

3.8.Hospital Ambulances: Fuel consumption data for both ambulances is collected from the Medical Administration Officer.

Emission Factor:

- Diesel : (i) 0.168 kg CO<sub>2</sub> per km  
 (ii) 0.00000017 kg CH<sub>4</sub> per km  
 (iii) 0.00000632 kg N<sub>2</sub>O per km
- CNG : (i) 0.23 kg CO<sub>2</sub> per km  
 (ii) 0.0000472 kg CH<sub>4</sub> per km  
 (iii) 0.000002 kg N<sub>2</sub>O per km

3.9 Goods Supply Transportation from Vendors : A survey was conducted at different markets and canteens to get the yearly distance travelled by the vendor .

Emission Factor:

- CNG = 0.23 kg CO<sub>2</sub> per km
- CNG = 0.0472 kg CH<sub>4</sub> per km
- CNG = 0.0019 kg N<sub>2</sub>O per km
- Petrol = kg CO<sub>2</sub> per kg
- Diesel = 0.23 kg CO<sub>2</sub> per km

## WORKS

4.1.Construction and Maintenance: Information from tenders was analysed to estimate resource consumption. Since it was challenging to attribute values to a single year, the total material usage

was divided by the overall tenure of the tender, and corresponding values were used for calculations.

Emission Factors:

- Cement : 979.43 kg CO<sub>2</sub>e per ton of material
- Paint :12 kg CO<sub>2</sub>e emission per 10 L of paints
- Welding metal : 0.0208 kg CO<sub>2</sub>e per kg of welding metal

## WASTE

5.1. Residential waste: Waste generated from residential areas and hostels is included under the overall category of “solid waste generated.” Waste is segregated into plastic and cardboard, paper, metals, paid bottles and glass as per the institute’s collection system. Emission factors and yearly quantities for each waste type are taken directly from the institutional records, following the methodology used for campus-wide waste accounting. The total emission from solid waste generation is calculated using standard emission factors (kg CO<sub>2</sub>e per kg or ton) provided in the waste-management database.

5.2. Hospital and Lab Waste: Biomedical waste from hospital and laboratories is managed as a separate waste stream. As per institutional records, biomedical waste is quantified on a weekly basis and processed through authorized treatment facilities. Emissions from biomedical waste are calculated using the standard factor of 0.13 kg CO<sub>2</sub>e per kg as provided in the waste-management database.

5.3 Sold and Discarded items : Sold and discarded items such as metal scrap, furniture scrap, and electronic waste are accounted for under Scope-3 emissions. The total amount of items sold is recorded along with the corresponding selling price, and emissions are calculated using standard emission factors expressed per Indian Rupee (INR). Metal scrap, furniture scrap, and electronic items are assigned specific emission factors based on their material composition. For electronics, emissions are estimated assuming a composition of 70% plastic and 30% metal, applying the respective emission factors for each component. Total emissions from all categories are summed to obtain the yearly emissions associated with sold and discarded items.

## ELECTRICITY

6.1. Electricity Consumption: Separate electricity bills are available for academic buildings, hospitals, streetlights, residential areas, canteens, and markets but for banks, hostels and residential are collected through surveys and by obtaining bills from banks, hostels, and residential. Electricity consumption data was provided by Mr. Sachin, Junior Engineer, IITD.

Emission Factor: 0.495 kg CO<sub>2</sub> per kWh.

**Note:** Electricity consumption data is for 2024 calendar year.

## 7. PURCHASED GOODS AND SERVICES

Purchased goods and services are included under Scope-3 emissions and account for emissions associated with procurement of furniture, metals, electronics, plastics, installation services, and digital services. Emissions are calculated using spend-based emission factors (kg CO<sub>2</sub>e per INR) due to the absence of supplier-specific life-cycle data. Each item category is assigned a standard emission factor based on international databases, and total emissions are derived by multiplying the net expenditure with the corresponding emission factor. The yearly emissions represent the combined impact of all purchased materials and services recorded during the reporting period.

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