Annual Carbon Report (2023)

Covering academic year 2022/23

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Index

Carbon footprint report

Chitkara University

Punjab Campus

1. Summary

- Scope 1 and 2 emissions contribute 14.3% and 84% respectively. The value of **Scope 1** emissions is **261.77 tCO_2e** and **scope 2** emissions are major emissions with **1531.35 tCO_2e.**
- Chitkara University, Punjab has also made a Carbon Management Plan (CMP) to reduce direct Scope 1 and 2 emissions (due to gas use and electricity).
- Scope 3 emissions make 1.5% of our total carbon footprint with **28.167 tCO_2e**, mainly due to travel and the procurement of goods and services. A key focus of 2023 is therefore establishing an accurate scope 3 baseline and developing a reduction plan.
- The total greenhouse gas emissions of the Chitkara university for 2022-2023 was **1821.287 tCO_2e.**
- Our research is still making a big difference in lowering carbon emissions across society.
- We delivered an Environmental consciousness and sustainable development Goals faculty induction program.
- The university adopted the Climate Action Framework (CAF) to set up the following goals –
  - **Being Net Zero Carbon in its Scope 1 and 2 emissions by 2030.**
  - **A 50% reduction in its Scope 3 emissions by 2030.**
  - **Being Net Zero Carbon in its Scope 1, 2 and 3 emissions by 2040.**

2. Terms and definitions

1. **Global warming potential (GWP)** – Factor describing the radiative forcing impact of one mass-based unit of a given GHG relative to an equivalent unit of carbon dioxide over a given period.

2. **Carbon dioxide equivalent (CO_2e)** - Unit for comparing the radiative forcing of a GHG to carbon dioxide.

   Carbon dioxide equivalent = mass of given GHG × its Global warming potential

3. About Carbon Footprint

Background

One of the biggest and most lasting risks to the world in the twenty-first century is climate change, which largely affects agriculture and jeopardizes food security. Additionally, it hastens the erosion of coastal zones, exacerbates natural disasters, wipes out species, and spreads vector-borne illnesses. It results from a rise in temperature caused by an increase in the atmospheric concentration of greenhouse gases. The frequent climate-related calamities have a negative impact on all seven continents. It is a direct result of excessive greenhouse gas emissions caused by human activities, particularly unregulated fossil fuel burning and other changes in land use.

Understanding greenhouse gases and their emissions, sources, and sinks is the first step towards lowering emissions and the harm they cause on any scale—global, regional, national, organizational, household, and individual. In order to reduce the impact of climate change on the environment, natural resources, and people, the report aims to comprehend greenhouse gas assessments, sometimes referred to as carbon footprint assessments.

4. GHG global warming potentials used

The global warming potential (GWP) is an indicator that describes the radiative characteristics of greenhouse gases that remain in the atmosphere and their relative effectiveness in absorbing outgoing infrared light. This basically depicts the warming impact of a specific greenhouse gas in the atmosphere today in relation to carbon dioxide for a unit mass.

Greenhouse Gas	Chemical formula	Global warming potential of the 4th assessment report
1. Carbon dioxide	CO_2	1
2. Methane	CH_4	25
3. Nitrous oxide	N_2O	298

4. Hydrofluorocarbons	HFCs	124-14800
5. Perfluorocarbons	PFCs	7390-12200
6. Sulphur Hexafluoride	SF_6	22800
7. Nitrogen Trifluoride	NF_3	-

5. Scope of the report

The scope of this report is to present the Chitkara University's carbon emissions for academic year 2022/23. It explores the campus response to climate change up to 30 June 2023 and the formation of the Climate action plan. Introduces the plans for the new climate action team to take this agenda forward, building on past success.

6. Components of Carbon footprint

As an organization, you must manage your emissions if you want to combat climate change. You must be conscious of the various ways in which you exacerbate the situation in this respect. If so, your efforts to reduce emissions could not be comprehensive.

- The following are the three groups that contribute to carbon emissions:
- **Scope 1 - Direct emissions:** Direct emissions are those produced by sources that the firm directly owns or controls, such as industrial operations, the burning of boiler fuel, or corporate cars.
- **Scope 2 – Indirect Emissions:** These emissions come from the steam, heat, and electricity the firm purchased.
- **Scope 3 – Other Indirect Emissions:** These emissions come from facilities that the organization does not directly control or manage but that are important to its operations, such as those for the manufacture of raw materials, transportation, and waste disposal.

7. Emission Factors

Emission factors are utilized for converting the quantity of relevant greenhouse gas emissions that will be produced from the input measure of the emission source. Emission factors impact how accurate a carbon footprint is.

Carbon dioxide emission coefficients by Fuel

Carbon Dioxide (CO_2) factors	Pounds CO_2	Kilograms CO_2	Pounds CO_2	Kilograms CO_2

	Per unit of volume or mass	Per unit of volume or mass	Per million Btu	Per Million Btu
Propane	12.68 gallon	5.75 gallon	138.63	62.88
Diesel and home heating fuel (Distillate fuel oil)	22.45 gallon	10.19 gallon	163.45	74.14
Coal (all types)	3876.61 short ton	1758.40 short ton	211.87	96.10
Natural gas	120.96 thousand cubic ft	54.87 thousand cubic ft	116.65	52.91
Jet fuel	21.50 gallon	9.75 gallon	159.25	72.23
Aviation gas	18.33 gallon	8.32 gallon	152.54	69.19
Municipal Solid waste[a,b]	1552.88 short ton	704.38 short ton	109.98	49.89
Waste oil[a]	22.51 gallon	10.21 gallon	163.14	74.00

Data source: *Carbon factors provided by the U.S. Environmental Protection Agency. Inventory of U.S. Green House Gas Emission and Sinks.*

[a] *Carbon factors for municipal solid waste, and waste oil are provided by the U.S. Environmental Protection Agency, Greenhouse Gas Emission Factor Hub.*

[b] *The carbon factor for municipal solid waste has been adjusted to apply both to biogenic and non-biogenic waste.*

Note: To convert to carbon equivalents, multiply by 12/44.

8. Calculating Carbon footprint

One may easily determine their carbon footprint by following the International Organization for Standardization (ISO) - 14064 guidelines for measuring GHG emissions.

Step 1: The amount of CO_2e released

Calculate the amount of CO_2e released from fuel, gas and electricity (USEPA)

Energy/Fuel	CO_2 per quantity
Petrol	2.32 kg per liter
Diesel	2.65 kg per liter
Liquified Petroleum Gas (LPG)	2.98 kg per kg
Electricity- Grid	0.81 kg per KWh
Coal	1.65 kg per kg

Step 2: Collect the operation data of activity

- Petrol/Diesel: Add the total liters of fuel consumed in a year.

- LPG: The typical gas cylinder has a 14 kg gas weight. Multiply the number of cylinders used in a year by 14. In case of gas pipeline, the amount of LPG consumed can be calculated from the last and recent reading in a monthly bill.
- Electricity: Find the number of units mentioned in the monthly electricity bill. Multiply the monthly units by 12.

Step 3: Multiply the activity data with respective CO_2 emissions

- Electricity: Input value x 0.81 = Output value in (kg of CO_2e)
- Petrol: Input value x 2.32 = Output value in (kg of CO_2e)
- Diesel: Input value x 2.65 = Output value in (kg of CO_2e)
- LPG: Input value x 2.98 = Output value in (kg of CO_2e)

Adding all four output values will give the carbon footprint. Divide this value by 1000 and carbon footprint will be calculated in tonnes.

9. Sources of carbon emissions

Chitkara University Rajpura is a private university located in Rajpura, Punjab, India. It was founded in 2005 and has over 15,000 students. The university is committed to sustainability and has a number of initiatives in place to reduce its carbon footprint.

The present document reports the carbon dioxide equivalent of the Chitkara University from 1st July 2022 to 31st June, 2023.

Higher education institutions are encouraged to set objectives to become carbon neutral in near future in order to set an example for others. The carbon footprint can thus serve as a crucial tool for not only identifying the biggest emitters but also for raising awareness among staff and students of the many effects produced by routine campus activities. This holds true for all endeavours, including academic and administrative pursuits.

Primary greenhouse gases include -

1. Carbon dioxide (CO_2)
2. Methane (CH_4)
3. Nitrous oxide (N_2O)
4. Ozone (O_3)

5. Chlorofluorocarbons (CFCs)
6. Hydrofluorocarbons (HCFC s and HFCs)
7. Nitrogen Trifluoride (NF_3)

Type of greenhouse gas emissions

Scope 1 emissions: These are the emissions created by combustion to generation of energy on campus from our combined heat and power plants, gas burnt in boilers, petrol/diesel used in university vehicles and some LPG that is used in limited locations.

Scope 1 emissions includes company facilities and company vehicles.

Scope 1 emissions	Year	Activity	Emission factor	kg CO2e	tCO2e
Diesel -DG SET	2017-2018	112200	2.65	297330	297.3
	2018-2019	60800	2.65	161120	161.1
	2019-2020	39400	2.65	104410	104.4
	2020-2021	17200	2.65	45580	45.6
	2021-2022	38400	2.65	101760	101.8
	2022-2023	94600	2.65	250690	250.7

Diesel - Transport	2017-2018	71657	0.177	12683.3	12.683
	2018-2019	72608	0.177	12851.6	12.851
	2019-2020	68916	0.177	12198.1	12.198
	2020-2021	66374	0.177	11748.2	11.748
	2021-2022	60426	0.177	10695.4	10.695
	2022-2023	62642	0.177	11087.6	11.087

Scope 2 emissions: Emissions created from purchased energy (electricity) as the electricity generated at the campus is not enough. It is used for lighting, electrical equipments, computers used on the campus.

Scope 2 emissions includes purchased electricity, purchased heating and cooling, purchased steam.

Scope 2 emissions	Year	Activity	Emission factor	kg CO_2 e	tCO_2e
Electricity (Grid)	2017-2018	4741482	0.81	3840600.1	3840.6
	2018-2019	5721530	0.81	4634439.3	4634.4
	2019-2020	6635172	0.81	5374489.3	5374.5
	2020-2021	2985878	0.81	2418561.2	2418.6
	2021-2022	2474880	0.81	2004652.8	2004.7
	2022-2023	1890565	0.81	1531357.7	1531.4

Scope 3 emissions: Scope 3 emissions includes indirect emissions which are created by others that are outside the direct control of the university but are created because of our activities. For example, students and staff travelling to the university, waste being collected, and items being purchased.

Scope 3 emissions includes employee commuting, purchased goods/services, business travel, waste, end of life treatment.

The biggest scope 3 emissions include the emissions from the air travel, both national and international travel. *

The fuel used in aeroplane over long distance flights is generally jet fuel, which is basically refined kerosene-based fuel. So, we have used emission factors of jet fuels for calculating emissions from national and international travel by faculty and staff. Though this category is measured and included in the carbon emission report, there is very less scope for improvement in this category. These are indirect emissions of the university and include one of the largest scope emissions.

9.75 kg of CO_2 emissions per gallon of jet fuel consumed is used. Methane (CH_4) factor used is 0 gram/ gallon of jet fuel and N_2O factor of 0.30 gram/gallon of jet fuel was used.

Air travel was divided into following three categories and emission factors used are reported below:

Category	Volume unit	kgCO_2/unit	gCH_4/unit	gN_2O/unit
Air travel - short haul (< 300 miles)	miles	0.207	0.0064	0.0066

Air travel – medium haul (≥300 miles < 2300 miles)	miles	0.129	0.0006	0.0041
Air travel – Long haul (≥ 2300 miles)	miles	0.163	0.0006	0.0052

The total emissions in Scope 3 includes for the current year includes -

Category	Total emissions (in CO2e)
Air travel – short haul	482
Air travel – medium haul	14876
Air travel – long haul	12810
Total emissions	28167

10. Reporting

The reporting of all the emissions is in carbon dioxide equivalent, denoted as CO_2e. So, we try to find out all the sources and emissions from the sources and we seek to reduce all emissions and their impact on environment. For example, Methane is 25 time more damaging than carbon dioxide that's why people are encouraged to reduce their red meat in take.

11. Energy provision on campus

Grid electricity

- Our purchased electricity forms the major scope 2 emissions of the University. The **1890565 kWh** of electricity was purchased in the financial year 2022/23, which generated 1531357.7 tCO2e emissions. Continual efforts are being made to reduce this number and from base year 40% reduction in the year 2022/23 has been achieved.

Solar photovoltaic

- Our solar photovoltaic (PV) network generated **318659.2 kWh** of electricity in 2022/23, saving **258114 tCO_2e** and equivalent to **Rs 2,19,3969** of electricity.

- There is some scope for further roof-mounted PV systems and plans are being developed to maximise these, which could potentially increase our capacity by 10%. This will require and investment of around Rs 4,00,000 with paybacks of 3-4 years. The priority should always be for demand reduction which has a much better return on investment and effort (the 'greenest' energy is that which is not used in the first place).

    - **Solar Thermal**

      Hostels (Vasco, Marco polo, Nightingale, Columbus, Pie A, B and C) have all been benefitted from solar thermal systems. Used to generate hot water they typically produced around 20381 kWh of heat each year.

Scope3: Indirect emissions from goods and services we procure

For the university the major components of scope 3 emissions are due to travel and the procurement of goods and services.

Our Scope 3 emissions are someone else's Scope 1 and 2, so addressing these emissions requires wider engagement with the University community and our supply chains.

A key focus for 2023 is establishing an accurate scope 3 baseline and developing a reduction plan.

- **Emissions from commuting**

  Our Environmental Policy includes a specific objective to minimize carbon emissions from regular commuting to and from campus by encouraging the use of car sharing, public transport, cycling or walking.

  The University monitors greenhouse emissions associated with commuting travel using the historic travel survey data

12. Carbon Sinks/offsetting

Carbon offsetting is considered as the position of last resort on the carbon reduction hierarchy of 'avoid, reduce, replace and offset' and there is debate around its validity as an approach. Whilst we are committed to systematically working to reduce our carbon emissions, it may be necessary to offset *residual* emissions to achieve carbon neutrality in Scope 1 and 2 in 2030, and Scope 3 in 2040.

Trees are the great sinks of carbon, which means they liberate oxygen and absorb carbon dioxide from the atmosphere. The rate of carbon sequestered depends upon the growth characteristics of tree species, the growing conditions where the tree has been planted and the

density of tree's wood. The carbon sequestration capacity is at greatest when the comparatively young, between 20 and 50 years.

We can classify the tree population into two types here depending upon the density of the trees grown. Different strategies are adopted for measuring the carbon sequestered by the densely planted trees and the individual ("open grown") trees, such as tress planted along pathways, in parks.

To get the yearly sequestration rate, we can roughly estimate the CO_2 sequestered in a given tree and divide it by the tree's age.

At Chitkara University, there are around 9000 trees with more than 70 tree species. So, the first approach for determination of carbon sequestration by individual trees:

This method is directly taken from "**Method for calculating Carbon Sequestration by trees in Urban and Suburban Settings"** by U.S. Department of Energy, Energy Information Administration.

The method requirements –

1. Species of the tree
2. Year in which it is planted
3. Age of the tree when it is planted

To get the right age of the tree when it is planted is the most tedious task of all.

The following worksheet is used for carbon sequestration calculations

A. Species characteristics (Refer to table 1)			B. Tree Age	C. Number of age 0 trees planted	D. Survival factor (Refer	E. Number of surviving trees (C x D)	F. Annual sequestration rate (Kg/ tree)	G. Carbon sequestered (in kg) (E x F)
Name	Tree type (H or C)	Growth Rate (S, M or F)						

Chitkara University Rajpura is taking a number of steps to reduce its carbon footprint. These include:

- **Investing in renewable energy:** The university has installed solar panels on its campus and is planning to install a wind turbine.
- **Improving energy efficiency:** The university is upgrading its lighting and HVAC systems to make them more energy efficient.
- **Reducing water consumption:** The university is installing water-saving fixtures and is working to reduce water leakage.
- **Reducing waste generation**: The university is composting food waste and recycling paper, plastic, and metal.

Chitkara University Rajpura is committed to sustainability and is taking several steps to reduce its carbon footprint. The university's efforts are helping to make a difference in the fight against climate change.