Greenhouse Gas (GHG) Emissions Calculation for King Saud University Main Campus (2024)

QS - Environmental sustainability - ES7 Emissions Efficiency

By Dr. Omar Alrehaili

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Greenhouse gas emissions are calculated for all GHG emissions related activities within KSU campus as CO_2e (carbon dioxide equivalent). This include calculating direct emissions (scope 1) and indirect emissions (scope 2) following the GHG's protocols corporates standard.

The total emissions will be the summation of Scope 1 and Scope 2 emissions in tonnes (tCO2e) for the last full reporting year. The following calculations are made for KSU main campus in Riyadh Saudi Arabia for the year 2024.

Scope 1 emissions (Direct Emissions):

Direct emissions cover the Greenhouse Gas (GHG) emissions that the university makes *directly* within campus including:

1) Emissions from transportation within campus:

The estimated annual number of trips (cars entering and leaving KSU campus) according to operation and maintenance department at KSU for year 2024 is 9,532,353 trips. These trips include trips made by students, faculty, employees, and visitors to campus academic, businesses, and commercial buildings.

- Estimated annual number of car trips: 9,532,353 trips
- Estimated distance per trip: 8 km/trip
- Average petrol cars emission factor: 0.192 kg CO_2e/km

Activity data = 9,532,353 trips × 8 km/trip = **76,258,824 km annually**

Using formula for Calculate CO_2e:

$$CO_2e = \text{Activity Data} \times \text{Emission Factor}$$

$CO_2e = 76{,}258{,}824 \text{ km} \times 0.192 \text{ kg } CO_2e/\text{km} =$ **14,643.7 tonnes CO_2e**

2) Emissions from running boiler due to burning of deasil fuel:

According to operation and maintenance department, KSU campus uses deasil fuel to run boilers inside campus as following:

- Litter of annual deasil fuel consumption in campus: 5,443,000 L
- Emission factor: 2.68 kg CO_2e/L

Using formula for Calculate CO_2e:

$$CO_2e = \text{Activity Data} \times \text{Emission Factor}$$

CO_2e = 5,443,000 L×2.68 kg CO_2e/L=	**14,577.6 tonnes CO_2e**

3) Emissions from running chillers due to using liquefied petroleum gas (LPG)

According to operation and maintenance department, KSU campus uses LGP to run chillers inside campus as following:

- Litter of Annual LPG consumption in campus: 625,241 L
- Emission factor: 1.51 kg CO_2e/L

Using formula for Calculate CO_2e:

$$CO_2e = \text{Activity Data} \times \text{Emission Factor}$$

CO_2e = 625,241 L×1.51 kg CO_2e/L=	**944.1 tonnes CO_2e**

Total Scope 1 = 14,643.7 + 14,577.6 + 944.1 = 30,165.4 tonnes CO_2e

Scope 2 emissions (Indirect Emissions):

Indirect emissions are the emissions the university makes *indirectly* including electricity usage for cooling, heating, and all other electivity uses in building and streets within campus.

- Electricity usage for 2024:   755,974,949.38 kWh
- Saudi Arabia grid emission factor (latest IEA data): 0.56 kg CO_2e/kWh (location-based method)

Using formula for Calculate CO_2e:

- $$CO_2e = \text{Activity Data} \times \text{Emission Factor}$$

CO_2e = 755,974,949.38 kWh×0.56 kg CO_2e/kWh=	**423,345.97 tonnes CO_2e**

Total Scope 2 = 423,345.97 tonnes CO_2e

Total GHG Emissions for KSU campus in 2024 as CO_2e is

453,511.37 tonnes CO_2e

Summary of CO_2e Emissions

Scope	Source	CO_2e (tonnes)
1	Vehicles	14,643.7
1	Diesel (boiler)	14,577.6
1	LPG (chillers)	944.1
1	**Total Scope 1**	**30,165.4**
2	Electricity	423,345.97
2	**Total Scope 2**	**423,345.97**
Total CO_2e		**453,511.37 tonnes**