Emission Factors and Sources for All the Sectors

Transport[1]

Car Type	Emission Factor (kg CO_2/km)
Sedan	0.23659
4*4	0.23663
Luxury	0.246

Petrol - 0.59792 kgco2e/liter

Flights are considered are direct from Qatar to destination[1]

Journey Discription	Time (hrs)	Distance (two way) in kilometers	Conversion (RFI = 3)	Class	Emission Factor (kg CO_{2e}) economy/business
Europe (London,)	6.4	10490	0.38/1.1	Economy/Business	0.138/0.401
South Asia (Delhi)	3.5	5108	0.38/1.1	Economy/Business	0.149/0.43
SouthEast Asia and Oceania (Philippines)	9	14584	0.38/1.1	Economy/Business	0.138/0.401
Americas (Mexico)	18	22296	0.38/1.1	Economy/Business	0.138/0.401
Gulf (Jeddah)	2	2664	0.43/0.67	Economy/Business	0.156/0.2336
Middle East (Morocco)	8	11316	0.38/1.1	Economy/Business	0.138/0.401
Africa (South Africa)	8.55	12424	0.38/1.1	Economy/Business	0.138/0.401

The cities chosen in this study are arbitrary and at times taken at the far-end of the continent or based on the population based in Qatar.

RFI stands for Radiative Forcing Index. This is a factor for the increased global warming effect of greenhouse gases emitted at high altitude. The RFI for domestic flights is 2.0 because it spends less time

at high altitude and in Qatar, there are no domestic flights, so we use RFI as 3 for short and long haul flights.

The Intergovernmental Panel on Climate Change (IPCC) gives an RFI for air travel as 2.7 in 1992 and ranging from 2.2 to 3.4 for the year 2050 depending on various different scenarios. As the science of Radiative Forcing is new and uncertain and the IPCC has stated that it could be as high as 15 the we use RFI of 3 for high altitude flights.

Sector	Emission Factor
Electricity[2]	0.539 kg CO_2/kWh
Water[2]	8.2 kg CO_2/m^3
Wastewater[3]	0.5 kg CO_2/m^3
LPG[4] (first convert kg into liters – 1 kg= 1.95 liters)	1.53 kg CO_2/liter

Waste category[5]	Emission factor (kg CO2/kg)
Organic waste	0.626
Plastic waste	0.009
Paper waste	1.041
Other waste (as considered as waste)	0.445

Food Products[6]	Emission factor (kg CO2/kg)
Poultry	0.3337
Beef	108.2617
Lamb & goat	33.68
Fish	1.596

Milk – inc. cheese	1.2648
Wheat and wheat products	0.3893
Rice	0.7067

Sources

1 https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019, accessed 20th December 2019
2- Emission factors of electricity and water generation are taken from Kahramaa reports
3- Wastewater - https://ghgprotocol.org/sites/default/files/standards_supporting/Ch5_GHGP_Tech.pdf, accessed 20th December 2019
4,5 – LPG, Waste- https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019, accessed 20th December 2019
6 – Emission intensities for various food products were taken from http://www.fao.org/faostat/en/#data/EI, and Greenhouse gas emissions from aquaculture, A life cycle assessment of three Asian systems, FAO, Rome, 2017. Emission factor for different products were chosen from countries based on the quantity of imports. For instance, India is the major exporter for rice and beef to Qatar, wheat comes from Pakistan, lamb/goat from Australia, poultry from Brazil, milk, chest and fish from Qatar.