



GOVERNMENT OF INDIA

**OFFICE OF THE DIRECTOR GENERAL OF CIVIL AVIATION
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AVIATION ENVIRONMENT CIRCULAR 1 OF 2012

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Estimation of Carbon Footprint for Developing National Carbon Emission Inventory for the Indian Aviation Sector.

1. BACKGROUND

Human induced climate change is now recognized by the global community as the greatest environmental threat of the 21st century. Nearly every human activity is associated with production of greenhouse gas (GHG) emissions either directly or indirectly. Most of the GHG emissions are from direct burning of fossil fuels for power, industry, transportation, domestic use, etc. The most important greenhouse gas produced by human activities is carbon dioxide.

As evidence of climate change continues to grow, so does the need to find a global solution to this problem. While aviation's contribution to global emissions of greenhouse gases remains relatively small, in the order of 2-3%, the aviation's share is likely to increase as the industry continues to grow rapidly on a global basis. If adequate steps are not taken in an objective manner, increases in aviation's emissions could potentially neutralise emission reductions achieved in other sectors, such as electricity production.

The aviation industry comprised of a number of stakeholders, including airlines, aircraft manufacturers, engine manufacturers, airport operators, ground handlers, catering companies, air navigation service provider, air traffic management, passengers, etc. Therefore, coordination between these entities is required in order to deliver the most accurate estimate of the carbon footprint.

2. DEFINITIONS

Aviation Emissions - Aviation emissions include only the emissions from aircraft (both from domestic and international operations) including all phases of flight and APU use. The Kyoto Protocol excludes emissions from “International Aviation”, while ground-based airport emissions are included in national inventories.

Airport Emissions - All emissions from activities associated with the operation and use of an airport, including ground support equipment, power generation and ground transport. Such activities can occur inside and outside the airport perimeter fence and may be the responsibility of the airport operator or other stakeholders.

Carbon Footprint is a measure of the impact of the human activities on the environment, and in particular climate change. It relates to the amount of greenhouse gases produced in our day-to-day lives through burning fossil fuels for electricity, heating and transportation etc. The carbon footprint is a measurement of all greenhouse gases we individually produce and has units of tonnes (or kg) of carbon dioxide equivalent.

Carbon Neutral- Being carbon neutral, or having a net zero carbon footprint, refers to achieving net zero carbon (i.e., carbon dioxide) emissions by balancing a measured amount of carbon released with an equivalent amount sequestered, mitigated, or offset. The carbon neutral concept may be extended to include other GHGs measured in terms of their carbon dioxide equivalence – the impact a GHG has on the atmosphere expressed in the equivalent amount of CO₂.

Carbon Neutral Growth- Growth in an activity with no net increase in CO₂ emissions.

Greenhouse Gas (GHG) - Gases in the atmosphere that absorb and emit radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect and increases in anthropogenic GHG have been linked to increases in global average temperatures since the mid-20th century, known as climate change. The most significant GHG associated with an airport is carbon dioxide (CO₂). Other GHGs included in the Kyoto Protocol are methane (CH₄), nitrous oxide (N₂O), hydro fluorocarbons (HFC), per fluorocarbons (PFC), sulphur hexafluoride (SF₆). Airports can also be sources of emissions that affect climate, such as oxides of nitrogen (NO_x) and ozone (O₃).

Landing and Take-off Cycle (LTO) - The standard LTO cycle begins when the aircraft crosses into the mixing zone (or 3,000 ft) as it approaches the airport on its descent from cruising altitude, lands and taxis to the gate. The cycle continues as the aircraft taxis to the runway for take-off and climb out as its heads out of the mixing zone (or 3000 ft) and back up to cruising altitude. One aircraft LTO is equivalent to two aircraft

operations (one landing and one take-off). The four specific operating modes in an ICAO reference LTO cycle are: Take-off, climb, approach and taxi/ground idle.

Offset Credit - An offset credit is generated upon the implementation, monitoring, and certification of an off-site project that reduces CO₂ emissions (or sequesters CO₂), reductions that would not have occurred without that project.

Offsetting- Offsetting is to “cancel out” or “neutralize” emissions of CO₂ (and other GHG emissions) by financing projects that reduce CO₂ emissions (or result in the removal of atmospheric CO₂) and that would not have otherwise been implemented. Airport operators can achieve this by purchasing properly certified offset credits.

Scope 1 Emissions- GHG emission from sources that are owned or controlled by the stakeholders. This can include emissions from combustion in boilers, airport power generation facilities, airport fleet vehicles, etc in case of airport operator and emission from aircraft, APU, energy consumed in airline offices, airline vehicles, etc for airlines. In the case of renewable fuel sources, such as wood waste, wood pellets, the net GHG emissions should be considered.

Scope 2 Emissions - GHG emissions from the off-site generation of electricity (and heating or cooling), purchased by the airport operator or electricity consumed by airline.

Scope 3 Emissions - GHG emissions from aviation related activities from sources not owned or controlled by the airport operator or airline. Scope 3 is an optional reporting category that allows for the treatment of all other emissions. Examples include aircraft emissions, emissions from airline and other tenant activities, and ground transport vehicles not owned and controlled by the airport operator.

3. PURPOSE

The objective of this circular is to facilitate the stakeholders to assess their own carbon footprint. It will also help them to prepare a multipronged strategy in order to comply with the relevant regulations and policies without adversely affecting their growth. The sum of these carbon footprints will also help to develop the National Carbon Inventory for the civil aviation sector.

4. APPLICABILITY

The provisions of this circular shall be applicable to the following:

- a) Airport having annual aircraft movements more than 10,000,

- b) All scheduled domestic airlines, and
- c) Non-scheduled operators except the following:
 - Flights of aircraft with MTOW < 5,700 kg
 - Flights by an airline offering < 243 flights per period for 3 consecutive 4-month periods or < 10,000 tonnes CO₂ per year
 - Flights on routes offering < 30,000 seats per year
 - Military flights
 - Search & rescue, fire fighting, humanitarian and emergency medical service flights
 - Visual flight rule flights
 - Head of state flights
 - Circular flights
 - Training flights

The above stakeholders shall report the progress towards achieving the goal on an annual basis.

5. ESTIMATION ON AVIATION CARBON FOOTPRINT

5.1 Setting a Boundary for the Carbon Footprint

In order to construct a carbon footprint, a boundary must be defined that will determine which emission sources are to be included. In the case of an organization, the boundary line is usually set by the organization depending upon their requirements and the sources that fall either under their direct control or can be influenced.

5.2 Period for Collection of Data

Carbon footprints are required to be constructed on an annual basis. The organizations shall compile the relevant data for carbon inventory for the complete calendar year i.e. from January to December.

5.3 Responsibilities of Stakeholders

5.3.1 Airlines

Airlines shall be responsible for collection of the following data:

- a) fuel consumption data for aircraft main engines and APUs, which will form the bulk of their emissions,

- b) energy consumption data by any facilities or offices not located at airports (since the energy consumption of any facilities located at airports will be addressed by the airport operator), and
- c) fuel consumption data for airline-owned vehicles and other ground support facilities or vehicles.

5.3.2 Airports

Airports shall be responsible for collection of the following data:

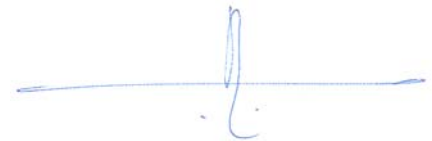
- a) fuel consumption data from the power station and emergency power generators,
- b) energy consumption data by any facilities or offices located at airports (including the energy consumption by the third parties such as offices of airlines and other agencies inside the airports),
- c) fuel consumption data for airport-owned support vehicles, ground support facilities and staff vehicles, and
- d) fuel consumption data for fire training imparted inside the airport.

6. EXPANSION OF SCOPES

The airlines and airport operators shall increase the scope of the data to be included in the carbon inventory as indicated in Annexure-I.

7. SUBMISSION OF DATA

The airport operators and airlines shall submit the data to DGCA at the beginning of next calendar year and latest by 31st January in a prescribed format given at Annexure-II.



(E.K. Bharat Bhushan)
Director General of Civil Aviation

Annexure - I

Airport related emission sources:

Source	Description	Type of data	Period
Scope 1: Airport Owned or Controlled Sources			
Power plant	Power plants used to generate power for the airport	Fuel consumed for power generation such as coal, oil, gas, etc.	2011
Vehicles fleet	Airport vehicles or equipment (e.g., GPU) moving inside and outside airport boundary	Fuel consumed by the vehicles such as petrol, diesel, CNG, LPG, etc	2012
Ground Support Equipment (GSE)	Airport equipment	Fuel consumed by the support equipment such as petrol, diesel, CNG, LPG, etc	2012
Emergency power	Airport owned emergency power supply or generators	Diesel used for emergency power generation	2011
Fire training	Fire training exercises imparted within the airport boundary	Fuel consumed during the training such as petrol, diesel, CNG, LPG, etc	2011
Scope 2: Off-site Electricity Generation (Airport)			
Electricity consumption	Electricity purchased by the airport operator for heating, cooling, lighting of terminal building, runways, etc	Energy consumed by the airport operator	2011
Scope 3: Other Airport-Related Activities an Airport Operator Can Influence			
Landside traffic /ground access vehicles (GAV)	All landside vehicles not owned by airport operator, operating on airport property	Fuel consumed by the support equipment such as petrol, diesel, CNG, LPG, etc	2012
Ground support equipment (GSE)	Tenant or contractor owned GSE for the handling and servicing of aircraft on the ground,	Fuel consumed by the support equipment such as petrol, diesel, CNG, LPG, etc	2012
Employee Travel	Vehicle used by the airport employees	Fuel consumed by the support equipment such as petrol, diesel, CNG, LPG, etc	2012

Airline related emission sources:

Source	Description	Type of data	Period
Scope 1: Airline Owned or Controlled Sources			
Aircraft main engines	Aircraft engines	Fuel consumed by the aircraft engines	2011
Aircraft APUs	Auxiliary power units	Fuel consumed by the APU	2011
Vehicle fleet	Airline vehicles or equipment moving inside and outside airport boundary	Fuel consumed by the vehicles such as petrol, diesel, CNG, LPG, etc	2011
Scope 2: Off-site Electricity Generation (Airline)			
Electricity consumption	Electricity purchased by the airline from the airport offices and other facilities located inside and outside the airport	Energy consumed by the airline inside and outside airport boundary	2011
Scope 3: Other Activities an Airline Can Influence			
Employee Travel	Vehicle used by the airport employees	Fuel consumed by the support equipment such as petrol, diesel, CNG, LPG, etc	2012

Annexure - II**Format for Airport Operators:**

Airport			
Calendar Year			
Total Movements			
Total Passengers			
Total Cargo (t)	(in metric tonnes)		
Scopes	Fuel/Energy consumed	Carbon Emission	Comments
Scope 1	ATF: Petrol: Diesel: CNG: LPG: Any other:		Total fuel consumed by power plant, furnaces, emergency power and airport vehicles and equipment (category wise breakup in metric tonnes)
Scope 2	Offices inside airport: Offices outside airport: Any other:		Total energy consumed by the operator (in MWH)
Scope 3	NOT REQUIRED FOR 2011. TO BE INCLUDED FROM 2012.		Landside road traffic/ground access vehicles (GAV), Ground support equipment (GSE), Employee travel, etc
Name of Authorized Personnel and Designation	Signature		Date

Format for Airline Operators:

Airline			
Calendar Year			
Total Movements			
Total Passengers			
Total Cargo (t)	(in metric tonnes)		
Total RTK			
Scopes	Fuel/Energy consumed	Carbon Emission	Comments
Scope 1	ATF: Petrol: Diesel: CNG: LPG: Any other:		Total fuel consumed by aircraft, APUs airline vehicles and equipment (category wise breakup in metric tonnes)
Scope 2	Offices inside airport: Offices outside airport: Any other:		Total energy consumed by the airline for offices and other facilities within and outside airport (in MWH)
Scope 3	NOT REQUIRED FOR 2011. TO BE INCLUDED FROM 2012.		Employee Travel
Name of Authorized Personnel and Designation	Signature		Date