



India's Action Plan

On Reducing Carbon Emissions from Civil Aviation

2015

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Introduction

India is the seventh largest country by area and the second most populous country with over 1.2 billion people in the world. India is the largest democracy in the world and one of the countries with most ancient civilizations. Home to the ancient Indus Valley Civilization and a region of historic trade routes and vast empires, the Indian subcontinent was identified with its commercial and cultural wealth for much of its long history.

India signed the UNFCCC on 10th June, 1992 and ratified it on 1st November, 1993. The Kyoto Protocol to the UNFCCC was adopted in 1997, which requires developed countries and economies in transition to reduce their Greenhouse Gas (GHG) emissions below 1990 levels. India acceded to the Kyoto Protocol on 26th August, 2002. As per the UNFCCC and its protocol, developing countries such as India, do not have binding on GHG mitigation commitments in recognition of their small contribution as well as low financial and technical capacities.

India continues to face the challenges of sustaining its rapid economic growth while dealing with the global threat of climate change. This threat emanates from accumulated GHG emissions in the atmosphere, anthropogenically generated through long-term and intensive industrial growth. Climate change may alter the distribution and quality of India's natural resources and adversely affect the livelihood of its people. With an economic closely coupled with its natural resources and climate sensitive sectors such as agriculture, water and forestry, India may face a major threat because of the projected changes in climate in the years to come.

India is engaging actively in multilateral negotiations in a positive, constructive and forward looking manner with an objective to establish an effective, cooperative and equitable global approach based on the principle of Common but Differentiated Responsibilities (CBDR) and respective capabilities. The success of India's efforts would be significantly enhanced provided the developed countries affirm their responsibility for GHG emissions and fulfil their commitments to transfer new and additional resources and climate friendly technologies to support both adaptation and mitigation in developing countries.

At present, India is the world's ninth largest aviation market with more than 80 operational airports with 17 airports having international operations, more than 700 aircraft, 14 scheduled airlines and nearly 120 non-scheduled operators. Currently, India's aviation industry caters to nearly 122 million domestic and 47 million international passengers. Over the next decade, the market could reach 337 million domestic and 84 million international passengers. Therefore, the Indian aviation industry has a huge potential for growth in the years to come.

Intergovernmental Panel on Climate Change (IPCC) report has established that aviation's contribution to climate change, though small at present, could grow if appropriate actions are not taken to offset the growth. Although developing countries such as India, do not have any legal binding on reduction of GHG emissions, however, several proactive initiatives are being taken by its all stakeholders to reduce or minimize carbon emissions from aviation sector.

Being a signatory to UNFCCC, India strongly believes that principles of CBDR and respective capabilities enshrined in the UNFCCC should be respected and acknowledged while addressing the climate change related issues in international aviation sector. The principle of CBDR shall be adopted in totality which lays down the foundation for further actions to curb emissions from international aviation.

International Civil Aviation Organization (ICAO), which serve as the global forum of States for international civil aviation, shall also respect and consider the principles and provisions made in UNFCCC. ICAO shall keep in mind the differentiated responsibilities based on historic emissions and shall classify the actions between developed and developing countries while finalizing goals, various measures including market-based measures, monitoring, reporting and verifying (MRV) instead of implementing equal standards and requirements for all its Member States.

International air transport in developed States has a matured and stable market with large market shares. But the aviation markets of developing countries are growing market and have not stabilize yet. Any action to reduce/minimize emissions from international aviation for developing countries may directly hamper the growth of the aviation sector by imposing restrictions and stopping its expansion. Developing countries should not be made to pay the burden of accumulative historical emissions of the developed countries. Developed countries should come forward to share their responsibilities towards their per capita high emissions.

Article 2.2 of Kyoto Protocol requires Annex I Parties to the UNFCCC to reduce or limit their emissions in a legally binding way through ICAO. Such countries shall take the lead in making substantial quantified reductions of GHG emissions from international aviation in line with Article 3.1 of Kyoto Protocol. Further, developed countries shall also respect their statement to provide financial, technological and capacity building support to developing countries in order to make them capable to address the international aviation and climate change related issues in an efficient manner.

The international air transport in developing countries have started much later and have a small market share but with a rapid growth in the sector and any restrictions in limiting the carbon loads will definitely have an adverse impact on their growth.

Further, air transport industry in developing nations are way behind that of developed nations in respect of state-of-art technology, modern aircraft fleet, technological development in air traffic management (ATM), infrastructure, operational capabilities, manpower and capacity building, etc. Recognizing the special needs and capabilities of developing countries in line with the principles of UNFCCC and its Kyoto Protocol, ICAO shall appreciate the fact that the emissions from international aviation of developing countries will increase to meet their social and economical needs till the market matures.

With large population, India's economy is still at a growing stage and its per capita emissions and per capita air travel are relatively low than other developed countries. It may be mentioned here that air travel play an important role in driving economic development of any nation. Therefore, any action to cut down emissions from international aviation will also affect the growth of a country.

India's State Action Plan has been formulated highlighting the on-going measures being adopted by Indian aviation industry with regard to climate change **on voluntary basis**. This action plan has been developed in fulfillment to **ICAO's Resolutions A38-19 (2013)**. However, ICAO needs to duly consider the following elements while addressing the climate change issues:

- i) The efforts to address Climate Change in international aviation sector must abide by the principles and provisions of the UNFCCC and its Kyoto protocol in particular the principles of Equity and Common but Differentiated Responsibilities.
- ii) Any measures taken should not constitute disguised restrictions on international trade.
- iii) ICAO must also consider a comprehensive assessment of the possible social, economic, technical and environmental implications of the measures for developing countries taking into account that international aviation play a vital role in the facilitation of world trade and, therefore, its impact on social

and economic development in developing countries while addressing the climate change.

- iv) On the control of GHG emissions, ICAO should be bound by the approach in UNFCCC, in regard to the consensus rule and adhere to an inclusive and transparent process and a multilateral approach consistent with the principles and provisions of the UNFCCC.
- v) ICAO must also seek to promote transfer of financial resources and technologies from developed countries to developing countries in accordance with the developed countries obligations under the UNFCCC.

The State Action Plan must be considered in the context of national and regional circumstances of India and therefore these plans must be understood as purely voluntary actions that take into account the specific national context and not as part of a global goal in the international aviation transport. In this context, there is a need to ensure the transfer of financial resources, technology transfer and deployment and capacity building support to developing countries for enabling them to voluntarily undertake action plans.

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Measures Adopted towards Reduction of Carbon Emissions from Civil Aviation

2.1 Measures Adopted by Airlines

It was felt that the stakeholders shall be made aware about the impact of aviation on environment. As a forward step in this direction, the stakeholders were sensitized about the adverse impact and the simple measures that can be adopted to minimize the same. They were also briefed about the global best industry practices that have been adopted by the aviation industry to reduce or minimize the carbon emissions.

The main source of carbon emissions from aviation is the exhaust coming out of the aircraft engines and the Auxiliary Power Unit (APU). Apart from engines and APU, the other direct sources that do contribute towards carbon emissions are ground support equipment, vehicles operating inside the airports, etc. As indirect sources, heating/cooling plants, energy consumption for airport terminal buildings, airport and runway lighting systems, firefighting equipment, etc. are also responsible for contributing towards carbon emissions. Therefore, any savings in fuel and energy consumptions will directly reduce the carbon emissions from aviation. Fuel cost of any airline is the largest constituent of their operational cost and any saving in fuel cost leads to decrease in the total operational cost with an addition benefit of reduction in carbon emissions as well. With this objective, airlines have started adopting following measures that help them in reducing their fuel consumptions leading to reduction in carbon emissions too.

- a) Upgradation of aircraft fleet through renewal and engine modernization program for better fuel efficiency and adoption of airframe and engine performance improvement packages.

- b) The average age of fleet with Indian carriers is comparatively low. With a view to further improve fuel efficiency, airlines have started looking towards new aircraft models with state-of-art technologies and more fuel efficient engines that may result in substantial reduction in emissions in future. For example, Air India has acquired Boeing 787 Dreamliner which offers superior economic performance with 15% lower fuel consumption than current aircraft in the same category, lower operating costs, lower maintenance and lower carbon dioxide emissions. For future deliveries, airlines have ordered A320NEOs and B737Max options, which are fitted with new technology geared turbofans with an aim to further improve the fuel efficiency thereby reducing carbon emission.
- c) Engine core water wash at regular intervals to increase fuel efficiency.
- d) Use of Computerized Fuel Plan (CPF) as conservative criteria for computing fuel requirements for a flight path with information of taxi out and congestion at destination airports which can avoid carriage of extra fuel.
- e) Usage of APU run time has been replaced by ground electrical power and air conditioning by airport based support system which has both environmental benefits for airports as well as financial savings.
- f) Airlines have also adopted “Single Engine Taxi-in/out” policies and procedures specific to their operations leading to saving in their operational cost besides environmental savings. Pilots are being trained to undertake such single engine operations without compromising with the safety.
- g) Airlines have been advised to make use of thrust reversal judiciously during landing roll for significant savings on fuel and maintenance costs.

- h) Besides, airlines are being encouraged to adopt delayed deceleration approaches with aircraft kept in clean aerodynamic configuration during the approach phase of flight to reduce fuel burn below 10,000 ft.
- i) Most of the airlines have procured a 'New Flight Planning System' which helps in preparing flight plans automatically by optimizing the routes and provides cost effective routing on day-to-day basis for every flight. It is a most important environment friendly technical and operational integration tool.
- j) Few airlines have also shifted to Electronic Flight Bags (EFB) which is a major initiative towards paperless cockpit replacing printed route navigation maps, briefing documents and technical manuals. By avoiding heavy manuals, airlines have advantage of saving weight and thus fuel in everyday operations.
- k) Further, new procedures have been established which take into consideration deteriorating aircraft performance, uneconomical use of aircraft systems and unnecessary carrying of dead weights reducing drag due to dirt and rough surfaces in the critical zones of the fuselage, wings and empennage, etc. which makes the aircraft more fuel efficient.

2.2 Measures Adopted by Airports

Airports in India are committed to conduct its business in an environment friendly and sustainable manner by minimizing the impact of their activities on the environment through optimization of natural resource utilization and energy consumption resulting in reduced emissions. Energy conservation and renewable energy development along with emission reduction is an integral part of their business strategy towards achieving credibility and sustainability in the aviation business.

Airports in India have identified the emission sources from airlines and other business units operating within the premises of the airports and started working to

minimize them such as on-site fuel consumption and electricity consumption, etc. With this objective, airports have started adopting following measures to reduce emissions.

- a) Adoption of Carbon Accounting & Management System (CAMS) for reducing airports GHG emissions which is based on the guidelines provided in the ISO 14064-1 for quantification and reporting of greenhouse gas emissions and removals. Airports are also using Environment Management System (ISO 14001), Energy Management System (ISO 50001:2011) and Green House Gas Reporting (ISO 14064) mechanism which helps them to develop and implement policy, objectives and action plans taking into account legal and other requirements for GHG reduction.
- b) Participation in Airport Carbon Accreditation Programs at various levels for emission reduction.
- c) Participation in Leadership in Energy and Environment Design (LEED) with an objective to reduce pollution & waste management, provision for eco-friendly vehicles, rain water harvesting, use of recycled water, energy-efficient electric lighting, etc. Indira Gandhi International Airport (IGIA), Delhi is the one of the airport in the world having LEED Gold accreditation.
- d) Use of advanced aerobridges fitted with Bridge Mounted Equipment (BMEs) such as Fixed Electrical Ground Power (FEGP) and Pre-conditioned Air (PCA) which helps in minimizing aircraft and vehicular pollution at the airport and prevents the use of APU at parking bay.
- e) Use of dedicated Compressed Natural Gas (CNG) vehicles and electrically operated baggage tugs and buggies for transport of baggage, cargo and passenger in the apron, cargo and passenger terminal building.

- f) Installation of solar power plant at airside premises and solar water heaters at the terminals in order to promote renewable energy use. Airports are also exploring the possibility of CDM registration.
- g) Implementation of environment friendly initiatives by Airports Authority of India (AAI) as an Air-Navigation Service Provider (ANSP), for reducing the carbon footprint of civil aviation by providing better connectivity, flexibility and reduction in track miles, connector routes, etc. Conditional routes have been implemented to promote the concept of flexible use of airspace between defence and civil which provides significant reduction in track miles leading to time saving and fuel saving.
- h) Implementation of Continuous Descent Approach (CDA) at IGIA, Delhi airport that permits an aircraft to maintain a fuel-efficient arrival flight path while landing with reduce emissions and noise loads. It is planned to extend CDA operations to other airports to gain widespread reduction in emissions from en-route phase to landing.
- i) Implementation of Performance Based Navigation (PBN) procedures at several airports. PBN affords development of air-routes/arrival-departure paths/approach procedure that lead to efficient aircraft operations utilizing advanced aircraft navigation capabilities. The optimization is achieved through reduction in track miles, optimized descent profile for arrival, efficient climb profile for departures and enhancement in airspace capacity thereby reducing delays and holding. These measures reduce fuel burn leading reduction in emission.
- j) Reduction in separation on final approach which has helped in enhancing airport capacity thereby reducing arrival holding at lower altitudes. Low

altitude holding is one of the major contributors to release of emissions in the environment; since jet engines are known to be in-efficient at lower altitudes. Implementation of Tactical Flow Management significantly improves arrival management thereby minimizing the requirement of arrival holdings at lower altitude.

- k) Enhancing on-time performance by airlines which has significant impact on pollution caused by aircraft on ground. These measures have drastically reduced departure congestion and long queues of aircraft awaiting their turn for take-off. Better management of departure has inevitably contributed to quick departure, efficient climb profile, availability of preferred flight levels thereby resulting in reduced fuel burn and reduction in emissions.
- l) Training and workshops for stakeholders viz. airlines, air traffic control units, ground handling units and other business partners on environmental measures.

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Future Initiatives

In future, more emphasis will be given on PBN and ATM related technical issues to further streamline congestions at airports and airspace, avoid delays at runways for take-off and landings, etc.

Launch of GPS-aided geo augmented navigation (GAGAN) satellite based navigation system which has been jointly developed by Indian Space Research Organization and Airport Authority of India and certified by the DGCA. The system provides improved efficiency, direct routes, approach with vertical guidance at runways, reduced workload of flight crew and air traffic controllers, increased fuel savings and reduction in carbon emission for the benefit of environment.

Emphasis will be made on use of biofuel in civil aviation as and when such fuels are made available and commercially viable.
