ICAO-UNDP-GEF Capacity Building and Assistance Project

By ICAO Secretariat

In 2014, the International Civil Aviation Organization (ICAO) established a partnership with the United Nations Development Program (UNDP) to support Member States' requests for assistance in reducing CO_2 emissions from international aviation. Financing for the partnership came from the Global Environment Facility (GEF). This partnership resulted in an assistance project, called *Transforming the Global Aviation Sector: Emissions Reduction from International Aviation*, which aligns with the ICAO State Action Plan initiative and supports States' efforts to increase their capacity to advance the implementation of emission reduction measures. Multiple activities of the project have focused on capacity building to implement emission mitigating technical and operational measures, particularly supporting the needs of developing States and Small Island Developing States (SIDS).

The project had four primary objectives:

I. To develop guidance documents to facilitate approaches to reduce aviation emissions in developing States and SIDS
II. To set up a Low-Carbon Knowledge Sharing Platform
III. To devise an analytical tool for States' use in comparing the cost and effectiveness of emission mitigation initiatives
IV. To demonstrate an easily replicable, low emission installation by way of a pilot project, which serves as an example for developing States and SIDS

DEVELOPING GUIDANCE DOCUMENTS TO FACILITATE APPROACHES TO REDUCE AVIATION EMISSIONS IN DEVELOPING STATES AND SIDS

A number of developing States and SIDS have expressed interest in committing to reducing the environmental impact of international aviation but only have limited human and financial resources to do so. Therefore, ICAO developed four guidance documents that support State's ambition to implement policies and measures that will support their emission reduction plans. While each of these documents focus on supporting developing States and SIDS, the information contained therein can provide support to any ICAO Member State. All of these documents are free to download from the ICAO-UNDP-GEF Project website[1].

Regulatory and Organizational Framework to Address Aviation Emissions

- This guidance document provides details on why it is important to reduce international aviation emissions, the policy options available for doing so, why regulatory and organizational frameworks may be necessary, and the steps States can take to implement the necessary changes. Building upon the experience of several States, concrete actions are presented to create synergies between environmental policies. In addition, the guidance document illustrates how the State can structure its civil aviation authority in order to integrate environmental policies in the most cost-effective way and ensure that the implementation of priority actions is not compromised.

1 https://www.icao.int/environmental-protection/Pages/ICAO_UNDP.aspx

FIGURE 1: ICAO-UNDP-GEF Feasibility Studies

Financing Aviation Emissions Reductions

- This guidance document provides ICAO Member States with an overview of project financing for low carbon technologies, the role of public and private organizations in providing financing, and a list of financing programmes and policies to help them fund their mitigation measures. While recognizing that each State has different challenges and opportunities, this document provides insight into public climate financing programmes and how they may be accessed to provide long-term sustainable growth in the international aviation sector.

Renewable Energy for Aviation

- While ICAO's focus is on international aviation CO_2 reduction activities, developing airport renewable energy projects can also minimize CO_2 from many energy-consuming activities at airports beyond those that relate to international civil aviation. Therefore, this guidance document aims to inform ICAO Member States on how renewable energy can be deployed to reduce CO_2 emissions from international aviation activities at and around airports. The document provides a greater understanding of energy usage in relation to aviation activities, including electricity, heating and passenger mobility. It also explores the close linkage between climate change and energy policies, and emphasizes the necessity to create synergies between both policies, so that their impacts are maximized.

Sustainable Aviation Fuels Guide

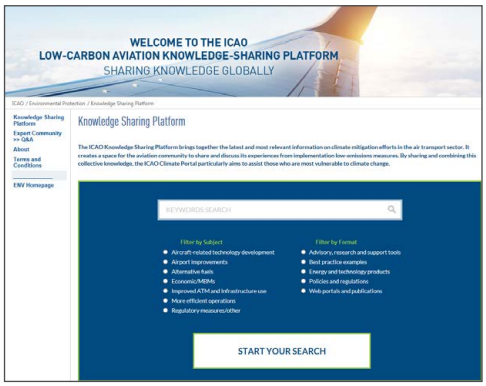
- This document provides a step-by-step guide for each State or international aviation stakeholder that may be interested in producing, commercializing and deploying sustainable aviation fuels (SAF), supported by practical case studies. The document also provides practical guidance on the national conditions that can support the development of a SAF market, while highlighting that "one size does not fit all". It also details the technical characteristics for the production of SAF, introduces schemes for sustainability certification, and highlights that thorough feasibility studies are a pre-requisite to the further consideration of a SAF supply chain.

SETTING UP A LOW-CARBON KNOWLEDGE SHARING PLATFORM

Amongst the many products and guidance materials that ICAO has developed to support States' plans for reducing their carbon emissions is the ICAO Knowledge Sharing Platform. The ICAO Knowledge Sharing Platform[2] brings together the latest and most relevant information on climate mitigation efforts, as well as other environmental issues, in the air transport industry. It can be used to build-up a State's Action Plan or identify a low carbon emission strategy for an individual airport. By sharing and combining this collective knowledge, the ICAO Knowledge Sharing Platform aims to assist ICAO member States and aviation stakeholders reducing their environmental impact and enhancing sustainability

2 https://www.icao.int/environmental-protection/knowledge-sharing/Pages/default.aspx

FIGURE 2: ICAO-UNDP-GEF Knowledge Sharing Platform Preview



The information used to populate the database was drawn from a variety of internal ICAO sources, as well publicly available third party sources. The platform includes more than 1,000 examples of low emission aviation measures from different States across all ICAO regions, such as projects, policies, guidance documents, tools, and outreach initiatives. From the list of search results, individual initiatives can be selected to learn more about that measure and whether it would apply to a State's or stakeholder's circumstances.

DEVISING AN ANALYTICAL TOOL FOR STATES' USE IN COMPARING THE COST AND EFFECTIVENESS OF EMISSION MITIGATION INITIATIVES

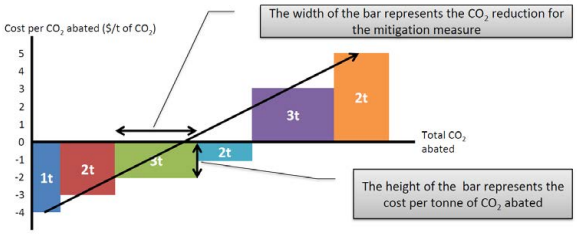
Numerous measures are available to States and their aviation stakeholders seeking to reduce CO_2 emissions from international aviation, but limited financial and technical resources represent a challenge for the implementation of these measures, and as such prioritizing is a necessity. In this context, the ICAO-UNDP-GEF project enabled the development of a tool to support States and their stakeholders in their discussions on the prioritization of the implementation of CO_2 mitigation measures for international aviation.

This tool is based on the concept of the Marginal Abatement Cost (MAC) curve. MAC curves illustrate the relative CO_2 reductions amongst possible mitigation measures on a comparative cost basis. They provide a simple but quantitative way to compare the costs and amount of emission reductions for numerous projects.

Marginal Abatement Costs

Any emissions mitigation project has a limit on the maximum possible CO_2 emissions reductions. Similarly, each proposed measure requires a specific investment to achieve those reductions. Marginal Abatement Cost curves, also called MAC curves, are a way to compare projects on a common basis. By evaluating projects in terms of the cost to reduce one ton of emissions, analysts can readily compare various projects. MAC curves plotted according to cost/tonne (shown as $/tonne) of CO_2 reduced compare multiple project costs while highlighting the total potential emissions reductions.

FIGURE 3: How to Read a MAC Curve



ICAO analyzed emissions mitigation measures, using exert knowledge and the information included in the State Action Plans submitted by its Member States. Using these data, ICAO developed global MAC curves, which can be used to simplify the process of calculating the emission reduction costs for specific projects and so putting the amount of emission reductions in priority order.

MAC Curve Tool

The MAC Curve Tool allows States to conduct a dedicated and tailor-made cost-benefit analysis of the most popular mitigation measures included in the ICAO basket of measures to reduce CO_2 emissions from international aviation. It is simple to use and requires a limited amount of information from the user, adjusting to the specific circumstances of States.

The results of the analysis performed by the tool will guide Civil Aviation Authorities and the national stakeholder teams who developed the State Action Plan, as they

FIGURE 4: ICAO-UNDP-GEF Solar Panel Pilot Project Concept

select and prioritize mitigation measures to be included in the plan. The tool provides a brief overview of potential emission reductions for a given scenario, and since the tool allows the tailoring of MAC curves to the individual reality of States, the implementation of measures can be prioritised in light of a State's particular circumstances.

The ICAO MAC Curve tool is available for State Action Plan Focal Points on the dedicated ICAO Portal Action Plan for Emissions Reduction page[3].

DEMONSTRATING AN EASILY REPLICABLE, LOW EMISSION INSTALLATION BY WAY OF A PILOT PROJECT, WHICH SERVES AS AN EXAMPLE FOR DEVELOPING STATES AND SIDS

One of the main deliverables under the ICAO-UNDP-GEF project was a small-scale project that could be easily replicated, and which would illustrate both the use of clean energy and the associated CO_2 reductions for international aviation operations. After the assessment of a few potential mitigation measures were assessed in different States, the decision was made to implement a solar-at-gate pilot project in Jamaica. While focusing the pilot project on the reality of Small Island Developing States (SIDS), this climate change mitigation action also embeds a climate change adaptation measure, as it was designed to withstand Category 5 weather events.

ICAO implemented this pilot project at two Jamaican airports to demonstrate how SIDS could use renewable energy at an airport to reduce CO_2 emissions from international aircraft operations. Aircraft conventionally use of on-board auxiliary power units (APU) and ground power units (GPU) to provide electricity and cabin climate control while an aircraft is parked at the gate. Gate electrification equipment, comprised of a pre-conditioned air (PCA) unit and a 400 Hz ground power frequency converter, was installed at airport gates used for international flights at Norman Manley International Airport in Kingston and Sangster International Airport in Montego Bay.

A photovoltaic solar power facility was installed at Normal Manley Airport, sized to supply the new electricity demand to operate the gate electrification equipment. The solar power facility planned for at Sangster Airport will be provided by a private supplier to be identified by the airport, thus illustrating the possibility to combine

3 http://portallogin.icao.int/

public and private financing sources. The combination of electricity generated by photovoltaic cells and electric gate equipment used in lieu of fuel-fired equipment completely eliminated the carbon and local air quality emissions from previous operations. The project resulted in 176,000 kg CO_2 emissions avoided per year and 4,400 tonnes of CO_2 over the projects life cycle. To support the public education mission of the project, a computer display showing real-time electricity generation from the solar project and the practical emission reduction benefits presented in cars removed or trees planted is included in the airport terminal.

This small-scale demonstration project now serves as a model for other airports to follow and replicate as an emission mitigation strategy.

CONCLUSIONS

ICAO met each of the ICAO-UNDP-GEF project's four primary objectives, and learned many lessons along the way. In line with ICAO's "No Country Left Behind" initiatives, the tools, guidance and project examples developed through the ICAO-UNDP-GEF Project can provide emissions reductions benefits to all ICAO Member States, particularly developing States and SIDS. All ICAO Member States are invited to explore the outcomes and deliverables of this project, available on the ICAO-UNDP-GEF Project webpage[1]. ICAO Member States are also encouraged to inform ICAO of additional assistance needs concerning CO_2 emissions reductions. Based on the success of this project, ICAO hopes to continue carrying out various capacity building and assistance projects in support of States' efforts to reduce CO_2 emissions reductions from international civil aviation.