Introduction to the LTAG Monitoring and Reporting (LMR) Methodology

By Marcela Anselmi (Brazil)[1] and Michael Lunter (Netherlands)[1]

INTRODUCTION

The 41st ICAO Assembly, in its Resolution A41-21, adopted, in 2022, the long-term global aspirational goal (LTAG) for international aviation of net-zero carbon emissions by 2050, in support of the Paris Agreement's temperature goal, while also recognizing that each State's special circumstances and respective capabilities will inform the ability of each State to contribute to the LTAG within its own national timeframe. In order to allow for the monitoring of the progress towards the achievement of LTAG, Resolution A41-21, paragraph 9, also requested the ICAO Council to consider the necessary methodologies for the regular monitoring of progress on the implementation of all elements of the basket of measures towards the achievement of the LTAG[2].

In response to Resolution A41-21, paragraph 9, and a further request by the Council, as well as the Global Framework adopted by CAAF/3, the Committee on Aviation Environmental Protection (CAEP) developed a comprehensive and robust LTAG Monitoring and Reporting (LMR) Methodology to provide a standardized global approach to track aviation's progress on decarbonization, enabling transparent and informed decision-making across the international aviation sector. The LMR methodology, delivered by CAEP/13, will be considered by the Council at its 235th Session (April - July 2025), to inform global policy decisions at the upcoming 42nd ICAO Assembly in September/October 2025.

The LMR methodology aims to assess progress on the implementation of CO_2 emissions reduction measures towards the achievement of the LTAG, including the past and future CO_2 emissions reductions, the cost impacts of efforts to achieve the LTAG, the impact on the development of the sector, as well as the cost impacts of a changing climate on international aviation.

In addition to this methodology, ICAO also monitors progress on the implementation of all elements of the basket of measures towards the achievement of the LTAG, through the ICAO environment Stocktaking process, the review of the ICAO Vision for SAF, monitoring of information from State Action Plans for international aviation CO_2 emissions reduction and means of implementation.

The LMR methodology follows key objectives and principles: 1) address the request from Assembly resolution A41-21 (paragraph 9 refers) insofar as it is within CAEP's remit to do so; 2) allow for the review of historical performance of the international aviation sector and updated outlooks; 3) leverage existing relevant data, methods, tools and analyses from ICAO; and 4) evolve and be enhanced over time to address existing gaps in data or methods.

1 Marcela Anselmi and Michael Lunther are Co-Rapporteurs of LMR-TG of the ICAO Council's Committee on Aviation Environmental Protection (CAEP).

2 ICAO Assembly Resolution A41-21: https://www.icao.int/environmental-protection/Documents/Assembly/Resolution_A41-21_Climate_change.pdf

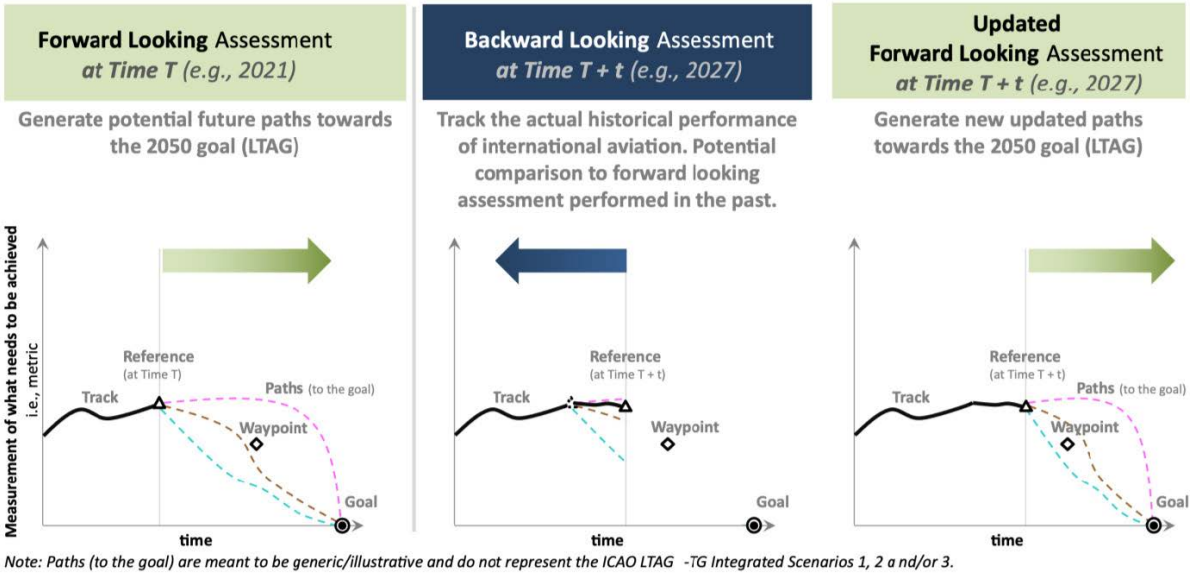

FIGURE 1: Description of the Backward- and Forward-Looking Assessments of the LMR Methodology

OVERVIEW OF THE LMR METHODOLOGY

1. LMR Methodology: Backward- and Forward-Looking Assessments

Against the above principles and working from the Assembly Resolution A41-21 requirements to monitor progress towards the achievement of the LTAG, the proposed LMR methodology combines two key components described in Figure 1:

1- **Backward-looking assessments** to track actual historical performance of the international aviation sector in context of previous forward-looking assessments, along with

2- **Forward-looking assessments** that comprise updated/refreshed forecasts and projections towards 2050.

Forward-looking assessments include the regular CAEP Trends assessment and updated analyses and projections described in the 2022 LTAG Report, such as assessments of the costs of the impacts to achieve the LTAG[3].

While some of the elements of the LMR methodology would leverage historical and recurring work by CAEP (e.g., CAEP Trends), some elements are new(er) such as the backward-looking assessments that aim to put recent actual historical data, in context of previous forward-looking assessments. This will allow identifying the progress against the LTAG integrated scenarios, CAEP Trends and against any updated forward-looking assessments.

Therefore, the proposed high-level approach, including backward- and forward-looking assessments, will allow ICAO to make the following assessments, as described in Figure 2:

b) to track the actual performance (e.g., residual CO_2 emissions) of the international aviation sector;
c) to place the actual performance in context of the previously projected trends;
d) to provide description and/or explanation of the contribution from individual drivers and measures (e.g., traffic, technology, operations, and/or SAF) and their effects on the actual performance of the sector; and
e) to update the forward-looking assessments to generate new/updated paths towards the 2050 goal based on the latest available historical data at the time.

3 2022 ICAO LTAG Report: https://www.icao.int/environmental-protection/LTAG/Pages/LTAGreport.aspx

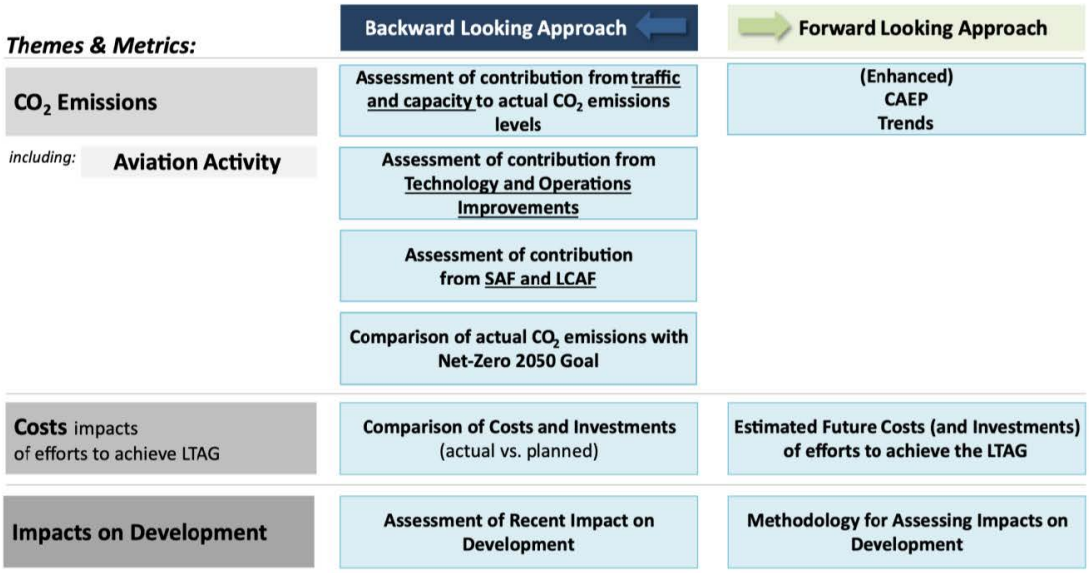

FIGURE 2: Description of the outcomes of the LMR Methodology

2. LMR Methodology: A Tiered Approach for a Phased Implementation

Along with the backward- and forward-looking assessments, the LMR methodology is further characterized by a tiered approach, consisting of a core methodology (i.e., Tier 1), an extension of Tier 1 that would provide additional insights (i.e., Tier 2) and a more advanced methodology (i.e., Tier 3).

Tier 1 captures elements of the LMR methodology that meet the minimum requirements from Resolution A41-21 (paragraph 9 refers), with confidence of successful implementation in the near-term. This Tier allows for a descriptive approach, comparison to previous forward-looking assessments (e.g., CAEP Trends, LTAG Report), relevant milestones (e.g., CAAF/3 global aspirational Vision), and existing data sources and methodologies.

In developing the methodology, the data, methods, and tools already available in ICAO will be leveraged, instead of creating new data or new reporting requirements.

With additional resources and further data and modelling capabilities, additional elements from Tiers 2 and 3 could contribute to enhancing the LMR methodology in the future. As the methodology moves towards Tiers 2 and 3, an additional level of understanding and granularity of the underlying drivers and factors influencing the observed trends can be provided. Tiers 2 and 3 seek also to explain these trends by gathering, analyzing and reporting additional data and, as such, this would require additional resources and further data and modelling.

Some limitations to the data available to ICAO have been identified and further work will enable ways to be proposed to address them.

The assessments of the **"cost impacts of the efforts to achieve the LTAG**" would update estimated costs as well as track actual costs of efforts to achieve the LTAG focusing on fuel savings from aircraft technology improvements and cost premiums from SAF and LCAF as part of Tier 1, and expanding to other types of costs (e.g., aircraft technology non-recurring costs, operational costs) in Tier 2 and costs of hydrogen and electricity for alternative propulsion aircraft in Tier 3.

The **"impact on the development of the sector"** will explore how to assess the impact of the incremental costs associated with the efforts to achieve the LTAG on the demand for international aviation. Under Tier 1, the LMR methodology would scope out an assessment of potential changes in future traffic estimates due to changes in the costs impacts of efforts to achieve the LTAG out to 2050.

Similarly, the methodology will also include an assessment of **"cost impacts of a changing climate"** relating to the costs of inaction to climate change, with an initial focus on extreme weather events.

Implementation and Output of the Methodology

The LMR methodology will be implemented, starting only with Tier 1 and reports will be delivered on a 3-year-cycle basis.

All the data and assessments will be integrated in a comprehensive output of the LMR methodology, in the format of a public ICAO technical report, to enable transparent and informed decision-making across the international aviation sector. Other reporting formats for communication to particular audiences will also be considered as resources permit.

Following the 42nd Session of the Assembly, ICAO will undertake the work to deliver the first Report from the LTAG Monitoring and Reporting to the 43rd Session of the Assembly in 2028.

With the creation of a robust monitoring and reporting methodology, this new framework provides a standardized global approach to measure aviation's progress towards decarbonization and to adjust the course of the sector as needed.