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SUSTAINABLE AVIATION FUEL IN DEVELOPING NATIONS: CHALLENGES, PROGRESS, AND THE PATH FORWARD

(Presented by India)

EXECUTIVE SUMMARY

This paper examines the role of Sustainable Aviation Fuel (SAF) as a pivotal instrument for decarbonizing international aviation, particularly in the context of developing nations. Guided by global policy frameworks such as International Civil Aviation Organization (ICAO)'s Long-Term Aspirational Goal (LTAG) and the 5% CO_2 emissions reduction target by 2030, the paper underscores the urgent need to scale up SAF production and deployment.

It highlights India's strategic initiatives, including blending targets, participation in the Assistance, Capacity-building and Training for Sustainable Aviation Fuels (ACT-SAF) programme, and advancements in certification and infrastructure, as a model for proactive engagement. Despite this momentum, the paper identifies a host of challenges such as limited production capacity, regulatory and financial constraints, and uneven global policy readiness. It concludes with a suite of targeted recommendations, ranging from fast-tracking certification to establishing regional SAF hubs and unlocking blended finance. With coordinated action, the aspirational goals for aviation decarbonization can evolve into shared milestones of environmental progress and equitable development.

Action: The Assembly is invited to:

a) note the progress made by India in scaling the production and certification of Sustainable Aviation Fuel as mentioned in section 2;
b) note the challenges discussed in this paper;
c) reiterate urgency and opportunity of SAF as a short-to-medium term decarbonisation lever; and
d) encourage States to Leverage participation in ACT-SAF to access **tailored feasibility studies**, **policy advisory services**, and **training modules** aligned with local conditions.

Strategic Goals:	This working paper relates to Strategic Goal – *Aviation is Environmentally Sustainable.*
Financial implications:	Not applicable

References:	Annex 16 — *Environmental Protection* Doc 10201, Third ICAO Conference on Aviation and Alternative Fuels (CAAF/3) Report

1. INTRODUCTION

1.1 In accordance with the International Civil Aviation Organization (ICAO) Assembly Resolution A41-21, States are encouraged to strive to achieve net-zero emissions by 2050. It states that "the Long-term aspirational goal (LTAG) is a collective global aspirational goal, and it does not attribute specific obligations or commitments in the form of emissions reduction goals to individual States, and urges each State to contribute to achieving the goal in a socially, economically and environmentally sustainable manner and in accordance with national circumstances."

1.2 During the Third Conference on Aviation Alternative Fuels (CAAF/3), ICAO adopted the "Global Framework for Sustainable Aviation Fuels (SAF), Lower Carbon Aviation Fuels (LCAF) and other Aviation Cleaner Energies" which included a collective global aspirational Vision to reduce CO_2 emissions in international aviation by 5% by 2030 through the use of SAF, LCAF and other aviation cleaner energies (compared to zero cleaner energy use). The framework provides a detailed guidance on policy and planning, regulatory framework, implementation support and financing.

1.3 According to recent estimates, SAF accounted for only 3% of global renewable fuel production capacity in 2023, with output concentrated in a limited number of countries. In 2024, SAF production doubled to approximately 1 million tonnes (1.3 billion litres), raising its share to 11% of renewable fuel output, though it still represented just 0.3% of global jet fuel consumption. Despite this growth, the pace remains insufficient. To meet the 5% CO_2 emissions reduction target by 2030, as adopted by ICAO Member States during CAAF/3, SAF production must scale up exponentially to reach at least 14 million tonnes annually.

1.4 In 2022, ICAO launched the Assistance, Capacity-building and Training for Sustainable Aviation Fuels (ACT-SAF) programme to provide tailored support to States at various stages of SAF development and deployment. While ACT-SAF has made commendable progress—such as conducting feasibility studies, delivering technical training, and supporting regional SAF roadmaps—many States continue to face persistent challenges.

2. ACCELERATING SAF MOMENTUM: INDIA'S MULTI-PRONGED APPROACH TO AVIATION DECARBONIZATION

2.1 The Indian Government has recommended to blend SAF with aviation turbine fuel (ATF) in the near future with the following initial indicative blending percentages (initially for international flights):

- 1% in 2027;
- 2% in 2028; and
- 5% in 2030.

2.2 India has joined ICAO's ACT-SAF programme. The Feasibility Study being carried out by ICAO will allow for a comprehensive analysis of the petrochemical industry, abundant and diverse

feedstocks, research institutions, which will lead to a better understanding of the challenges and opportunities, and will lead to sound recommendations for strengthening the SAF ecosystem in the country.

2.3 The Indian National Accreditation Board (NABCB) has signed the Memorandum of Understanding with the ICAO approved sustainability certification scheme (SCS) ISCC to provide accreditation to certification bodies in India for certification of SAF as per ISCC Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) scheme requirements.

2.4 Indian OMCs informed that the blending targets for 2027 would be met by the use of co-processing of non-edible oils in the refineries as co-processing pathways in existing refineries allow for a rapid scale-up of SAF production without the need for new infrastructure.

3. CHALLENGES OF SAF DEVELOPMENT AND DEPLOYMENT IN DEVELOPING NATIONS

3.1 SAF is an imperative and the most impactful lever to reduce CO_2 emissions for aviation by 2050 alongside other levers such as technology breakthroughs and operational improvement.

3.2 The 5% CO_2 emissions reduction target by 2030, adopted under the ICAO Global Framework during CAAF/3, is a bold and necessary step toward decarbonizing international aviation. However, realizing this collective aspirational vision hinges on overcoming a complex web of technical, regulatory, and economic challenges, particularly for developing countries.

3.2.1 Limited SAF Production Capacity: As of 2024, SAF accounts for only 0.3% of global jet fuel consumption. To meet the 5% CO_2 emissions reduction goal, production must scale up to at least 14 million tonnes annually by 2030, a nearly 14-fold increase

3.2.2 Certification and Regulatory Bottlenecks: India’s indigenous SAF technologies, for instance, are not yet approved under ASTM D7566 pathways. The certification process is lengthy, costly, and requires original equipment manufacturer (OEM) validation, which can take up to a year.

3.2.3 Feedstock and Infrastructure Gaps: Many developing nations lack robust feedstock supply chains, carbon intensity databases, innovation and knowledge diffusion pathways, and multi-feedstock certification protocols. These gaps hinder both investment and operational scalability.

3.2.4 Financial Constraints: High upfront costs for SAF production facilities and certification deter small-scale producers. Without targeted subsidies, tax incentives, or access to climate finance, many States may struggle to participate meaningfully and may run the risk of being left behind.

3.2.5 Uneven Global Readiness: While some regions (e.g., the European Union, the United States, the United Kingdom) have introduced SAF mandates and funding mechanisms, others are still in early planning stages. This asymmetry risks creating market distortions and undermining the global nature of the target.

4. STRATEGIC PATHWAYS AND RECOMMENDATIONS TO ADVANCE SAF IN DEVELOPING NATIONS

4.1 In its current trajectory, the 5% CO_2 emissions reduction target is technically possible but politically and economically improbable without urgent and coordinated action. Even industry leaders like the International Air Transport Association (IATA) have sounded the alarm and have warned that industry's net zero cannot be achieved without substantial and coordinated government intervention.

4.2 However, the target remains valuable as a policy signal, with the potential to galvanize investment, innovation, and international cooperation. The ICAO framework's emphasis on flexibility, capacity-building, and financing support is a step in the right direction, but implementation must accelerate dramatically.

- Fast-track SAF certification pathways**,** especially for technologies developed in emerging economies.
- Expand the pool of ICAO-approved sustainability certification schemes to reduce bottlenecks.
- Establish regional SAF hubs with shared infrastructure and pooled testing facilities.
- Mobilize blended finance mechanisms to de-risk private investment in SAF.
- Strengthen international cooperation through ACT-SAF and other ICAO-led platforms.

4.3 While the 5% CO_2 emissions reduction goal by 2030 is daunting, it is not out of reach, provided that States, industry, and international institutions act decisively and inclusively. For countries such as India, the path forward lies in turning policy ambition into practical action, backed by global solidarity and equitable support mechanisms. The next few years will be critical in determining whether this vision becomes a milestone or a missed opportunity.

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