



**TEMPLATE FOR FEASIBILITY STUDIES
ON SUSTAINABLE AVIATION FUELS**

Version 1.0 (July 2023)

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FOREWORD

The ICAO Assistance, Capacity-building and Training for Sustainable Aviation Fuels (ACT-SAF) Programme was launched in June 2022. Its objective is to enable States to develop their full potential in SAF development and deployment, in line with the ICAO's *No Country Left Behind initiative*, the 2050 ICAO Vision for SAF, and the three main pillars of sustainable development – economic, social, and environmental, recognized by the United Nations.

This template has been developed in the context of the ICAO ACT-SAF Programme to facilitate the preparation of standardized feasibility studies on SAF. The template can be used to assess the feasibility of SAF development and deployment both at the State and Regional (i.e. group of States) level. ICAO has also developed a guide to assist in the preparation of feasibility studies following the structure defined in this template. The use of the template and the guide is not mandatory, but offers reference to States commencing feasibility studies.

The information to be included in a feasibility study will be determined by the preparer to demonstrate the potential for the SAF development and deployment in the State under consideration. To ensure the consistency of information across different feasibility studies, it is recommended that all sections of the template be elaborated in a clear and concise manner. In parts where this may not be applicable, an appropriate explanation should be provided. It should also be noted that this template is by no means exhaustive, and a feasibility study may incorporate additional elements as appropriate.

The structure of the template is summarized as follows:

- Executive Summary
- Section 1: State-specific Information
- Section 2: Evaluation of Feedstocks and Pathways for SAF Production
- Section 3: Implementation Support and Financing
- Section 4: Action Plan

For any questions, assistance, or suggestions, please contact the ICAO Secretariat by email (officeenv@icao.int) indicating “**ACT-SAF FS template**” in the subject of the email message.

ICAO extends its appreciation to all our ACT-SAF Partners who have contributed to the preparation of this Template.

EXECUTIVE SUMMARY

The Executive Summary provides a concise, high-level overview of the entire feasibility study, highlighting the most important and relevant findings and recommendations for decision-makers. It provides an overview of the background, the key findings of the study, policy implications and the opportunities mapped.

Summarize the findings of the study such as the recommendations for feedstock and fuel conversion technologies prioritization, land use change and greenhouse gas life-cycle emissions reduction potential, and socio-economical and policy-related findings, including synergies with other (neighbouring) States.

Highlight key issues associated with the development, deployment and commercialization of SAF in the State under consideration, from multiple perspectives, such as from the government, fuel producers, feedstock producers, airlines, and other key stakeholders.

A. Background

Provide a brief overview of the background of the feasibility study, including the reasons for conducting the study and its main objectives.

B. Key findings

Summarize the key findings of the feasibility study, highlighting the most important and relevant information for the State and its stakeholders. This should include an overview of the different types of feedstocks that were evaluated, the potential for expanding the use of different types of feedstock, and the critical success factors for the development, deployment and commercialization of Sustainable Aviation Fuels (SAF), including the key findings from the Action Plan developed.

C. Policy implications

Provide an analysis of the policy environment in the State and the policy implications of the study's findings.

D. Opportunities and challenges

Identify and describe the opportunities for implementing SAF in an action plan, including the potential for feedstock expansion, the availability of financing, and the potential for reducing greenhouse gas emissions.

It will also highlight any challenges and barriers that need to be addressed in order to realize these opportunities.

List of Definitions, Abbreviations and Acronyms

SECTION 1. STATE-SPECIFIC INFORMATION

Provide information on the specific circumstances of the State, explaining the unique characteristics and factors that could affect the development and deployment of SAF in the State under consideration.

1.1 Geography and Climate

Provide specific information that relates to the development and deployment of SAF in the State, including geographical characteristics, climate zones (relevant for feedstock), deforestation and land degradation issues, etc.

1.2 Trade and Governance

Provide information relating to trade and governance issues that pertain to the development and deployment of SAF in the State. In addition, the institutional framework of stakeholders, public and private (including on financing), should be mapped out.

1.3 Demographics

Provide historical population information, including employment aspects relating to aviation fuels, and to the aviation sector globally.

1.4 Vulnerability to Climate Change

Provide information relating to the vulnerability of the State to climate change focusing on issues relating to SAF

1.5 Agriculture

Provide information on agricultural practices focusing on SAF feedstock, soil conditions, etc.

1.6 Energy

Provide information on energy infrastructure, including refinery capacity, and historical production and use of aviation fuels (conventional and SAF), cleaner energy sources; energy transition plan(s), roadmaps and policies etc. On policies, it may also include existing supporting/inhibitory policies, stakeholders' interests and strategies (trajectories/targets) towards SAF, international/regional agreements towards environmental protection that may not necessarily be related to air transport.

1.7 Aviation fuel supply chain

Provide information on supply chain that relate to aviation fuels (ground transport facilities, airports etc.), as well as options for SAF integration into the aviation fuel supply chain (upstream/downstream blending, ASTM certification).

SECTION 2. EVALUATION OF FEEDSTOCKS AND PATHWAYS FOR SAF PRODUCTION

SAF is defined as renewable or waste-derived aviation fuels that meets sustainability criteria. A SAF pathway is defined as a specific combination of feedstock and conversion process used for SAF production. For the purposes of this Template, assessments should start with the feedstocks, which will then define the potential conversion processes that could be used for SAF production.

Provide information supporting the evaluation of each feedstock-conversion pathway identified for SAF production in the State under consideration. Four main categories to be considered (for more details on what is included under each category, refer to section 2.2 onward):

1. **Detailed information on each feedstock**
2. **Sustainability-related issues, including greenhouse gas emissions**
3. **Economic/Market-related Issues**
4. **Overall Assessment.**

Consultation with the State and its stakeholders (fuel providers, energy/agricultural authorities, etc.) on each of these categories will result in a better understanding of the State’s circumstances and priorities, facilitating its evaluation. Depending on the complexity of the evaluation, the study may provide both qualitative and quantitative aspects (e.g. land and yields for particular feedstocks, minimum fuel selling prices). An overall assessment (see section “Summary of evaluated feedstock”) will provide a topline perspective of the most viable pathways, which a State may then focus its implementation support on.

2.1 Summary of evaluated feedstocks

Fill-in the table below to provide a list of all feedstocks considered and the associated conversion pathway(s) together with a qualitative evaluation, based on the results of the assessment specific to the State, described in the following section 2.2 onward, as follows (examples of approaches will be provided in the Guide):

- Feedstock evaluation
- Sustainability evaluation
- Economic/markets evaluation
- Overall evaluation (weighted indicator based on the three scores above)

Feedstock Considered	Conversion pathway	Feedstock evaluation	Sustainability evaluation	Economic/markets evaluation	Overall
Feedstock 1 (e.g. oils and fats)	HEFA				
	Co-processing				
Feedstock 2 (e.g. MSW)	AtJ				

2.2 Detailed information on Feedstock 1

Replicate this section as many times as needed based on the evaluated feedstocks.

2.2.1 Feedstock-related Information

Provide information on Feedstock 1, including on:

1. *Availability assessment*
2. *Main production areas*
3. *Historical production*
4. *Suitable conversion processes for SAF production*
5. *Possibility for production expansion and projections*
 - a. *Potential for expansion of production on unused lands*
 - b. *Potential of yield increase in existing production areas*
6. *Key stakeholders*
7. *Technological-readiness level*
8. *Use in other modes of transport, if applicable*

2.2.2 Sustainability-related issues, including greenhouse gas emissions

Provide information on sustainability aspects associated with Feedstock 1, using as a basis the Sustainability Themes, and related Criteria, for CORSIA Sustainable Aviation Fuels, as follows:

1. *Greenhouse Gases (GHG)*
2. *Carbon stock*
3. *Greenhouse gas Emissions Reduction Permanence*
4. *Water*
5. *Soil*
6. *Air*
7. *Conservation*
8. *Waste and Chemicals*
9. *Seismic and Vibrational Impacts*
10. *Human and labor rights*
11. *Land use rights and land use*
12. *Water use rights*
13. *Local and social development*
14. *Food security*

Provide a readiness analysis of pathways for sustainability certification, including under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). Explain how the priority pathways can be used to streamline the sustainability certification process and promote the use of SAF. Discuss the potential benefits and challenges of using the defined priority pathways for the sustainability certification and the implications for the development and implementation of SAF in the State's aviation industry.

2.2.3 Economic/Market-related Issues

Provide information relating to expanding the use of Feedstock 1, including strategic and financial considerations.

This may also include assessments on economic value-add, jobs created, and/or other socio-economic benefits.

In addition, if the feedstock is also used in the production of other types of biofuels could impact the business case of SAF, the assessments may be included in this section.

2.2.4 Overall assessment

Provide a Feasibility Matrix to summarize the information in the previous sections. The matrix should illustrate opportunities and major constraints with regard to the maturity of Feedstock 1 supply chain, as well as the feasibility of the entire supply chain, including available technology options. See Appendix for an example.

SECTION 3. IMPLEMENTATION SUPPORT AND FINANCING

Provide information on implementation support and financing needed for the implementation of the priority pathways identified the previous section. Discuss different sources of financing for the identified SAF pathways according to the State possibilities.

3.1 Implementation Support

Provide information relating to capacity-building and assistance needs for the implementation of each pathway, including:

1. *Technical/technological needs*
2. *Training needs*
3. *...*

3.2 Financing

Provide information on each pathway, including:

1. *Financial analysis (establish the economics associated with the production of SAF; the analysis should report the levelized cost of SAF and/or SAF feedstocks and the required break-even CO₂ price to compete with fossil fuel based Jet. The financial analysis will also include different agreed sensitivities)*
2. *Financing possibilities and sources*
3. *Funding proposal submissions, including CAPEX and OPEX estimates*
4. *...*

SECTION 4. ACTION PLAN

4.1 Policy and Regulatory Framework

Provide recommendations/options for enabling policies for an efficient and sustainable value chain for SAF, highlighting policies necessary to promote SAF development and to secure feedstock availability in the future. Identify obstacles and solutions to overcome the challenges related to policy and regulatory framework, highlighting the potential benefits.

4.2 Critical Success Factors

Identify critical success factors for the implementation of SAF, including CO₂ emissions reductions potential, access to funding, feedstock availability, processing and technology capacity, market structure and logistics, SAF certification, regulatory framework and support policies.

Economic measures leading to the success of SAF deployment, such as the emergence of SAF accounting and reporting systems (e.g. book and claim), potentially increasing the viability of SAF projects may also be highlighted.

4.3 Action Plan

Provide a detailed action plan in a table format including, at a minimum, the description of the recommended actions, the timeline (year or quarter of year) of each action (e.g. stakeholder engagement, proof of concept, trials/pilots, scale-up, etc.), and the responsible entity for each action.

The action plan should be aligned with the State's existing and planned governmental policies related to the SAF development processes, if any, and should focus on the most promising feedstock(s) and pathway(s) as identified in Section 2.
















The action plan should also include details dedicated to risk management: identification of risks, probability to occur, level of impact, and proposal for action. A SWOT-based approach may be incorporated.

Taking into account the information in 4.1 and 4.2 above, typical categories to be included in the action plan are: Structural Organization, Business Plan & Implementation, Funding, Feedstock, Processing & Technology, Market Structure & Logistics, Regulatory Framework & Support Policies.

Linkage to the ICAO State Action Plan process to support the anticipated LTAG monitoring process should also be included.

Appendix

Example for a Feasibility Matrix (refer to Section 2.2.4 – Overall assessment)

Sugar Cane					
Feedstock Availability	Technology Readiness				
<p>Qualities </p> <ul style="list-style-type: none"> • Feedstock suitability • Energetic potential • High yield • Well established 	<p>T1: Biomass processing</p> <ul style="list-style-type: none"> • Basic infrastructure in place • Fermentation and ethanol processing facility (distillery) in place, however, limited capacity • Production limited to pharmaceutical grade alcohol 				
<p>Constraints/ challenges </p> <ul style="list-style-type: none"> • Need for prime agricultural land • Very limited cultivation area • Dependant on irrigation and fertilizer • Serious sustainability concerns: Water requirements basically rule out sustainable ethanol and biofuel production • Low production volume • Production of molasses insufficient to justify set-up of regional supply chain and establishment of costly infrastructure 	<p>T2: Fuel Conversion pathway(s)</p> <ul style="list-style-type: none"> • Alcohol-to-jet (ATJ) • Sugar-to-Jet (STJ) <ul style="list-style-type: none"> • Direct Sugar to Hydrocarbons (DSHC) • Synthesized Iso-Paraffinic bio-jet (SIP) • Conversion technologies not yet fully commercialized 				
<p>Risk mitigation options</p> <ul style="list-style-type: none"> • No perspectives for significant expansion of cultivation area • Serious environmental and sustainability concerns 	<p>Technological complexity</p> <ul style="list-style-type: none"> • Very high 				
	<p>Economic viability</p> <ul style="list-style-type: none"> • Low to moderate 				
	<p>Biofuel /AAF potential</p> <table border="1"> <tr> <td>In general</td> <td>• High </td> </tr> <tr> <td>In Burkina Faso</td> <td>• Very low  </td> </tr> </table>	In general	• High 	In Burkina Faso	• Very low  
In general	• High 				
In Burkina Faso	• Very low  				
<p>Future biomass potential  </p> <ul style="list-style-type: none"> • Very low/ zero   					

Source: Feasibility Study on the Use of Sustainable Aviation Fuels in Burkina Faso (https://www.icao.int/environmental-protection/Documents/FeasibilityStudy_BurkinaFaso_Report-Web.pdf)