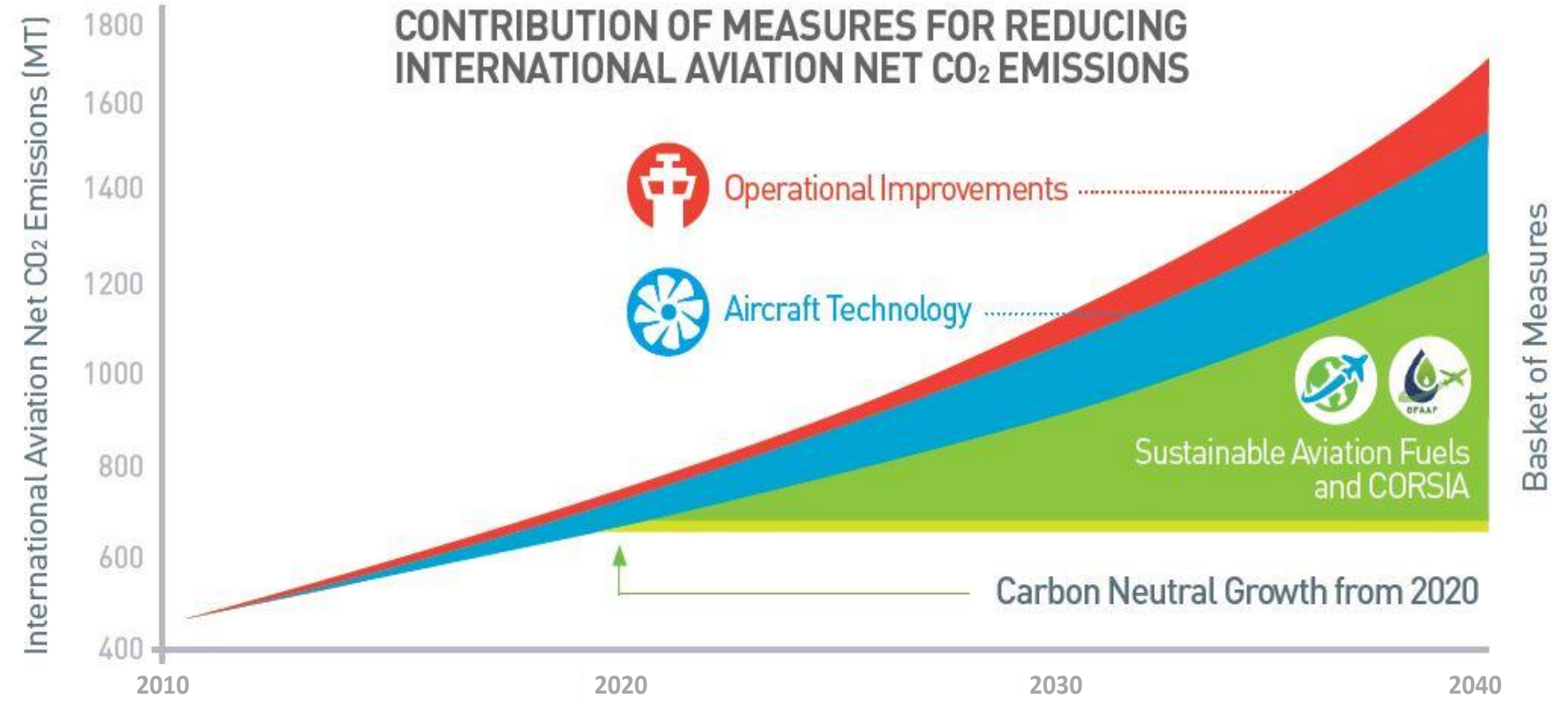
Capacity Building for CO_2 mitigation from international aviation - Fourth Seminar
Mombasa, Kenya
12-14 December, 2018

Results of the feasibility studies on SAF:

Africa and the Caribbean

By Neil Dickson, Chief, Environmental Standards Section, ICAO


CONTRIBUTION OF MEASURES FOR REDUCING INTERNATIONAL AVIATION NET CO_2 EMISSIONS
International Aviation Net CO_2 Emissions (MT)
1800
1600
1400
1200
1000
800
600
400
2010
2020
2030
2040
Operational Improvements
Aircraft Technology
Sustainable Aviation Fuels and CORSIA
Carbon Neutral Growth from 2020
Basket of Measures

SAF Needs and Benefits

- Mitigates CO_2 emissions
  - Savings of up to 80%
- Contributes to meet International GHG reduction agreements
  - cannot be achieved just with technological measures
- Improves energy security

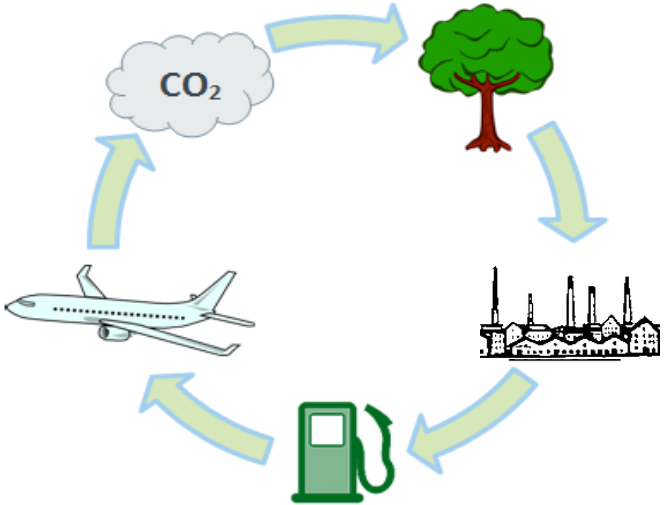
- Promotes **new internal industries** and production schemes
- Improves **competitiveness** at long term of the sector: ***Green Tourism***
- Improves Local Air Quality (LAQ)

What are Sustainable aviation fuels (SAF)

- Must meet the same safety standards as current aviation fuels
- "Drop-in" fuels : fuels that are fully compatible with existing aircraft and fuel-supply systems
- To be considered sustainable by ICAO, aviation fuels will need to meet defined sustainability criteria

Where do the benefits of SAF come from?

Fuels made from biomass



CO_2 emitted by combustion is up-taken by plant growth

What is ICAO's role in SAF?

ICAO is facilitating SAF development and deployment

- Sharing information and best practices, including through ICAO's Global Framework for Aviation Alternative Fuels (GFAAF)
- Ongoing work within ICAO's Committee on Aviation Environmental Protection (CAEP)
- Development of sustainability criteria
- Organization of information-sharing events

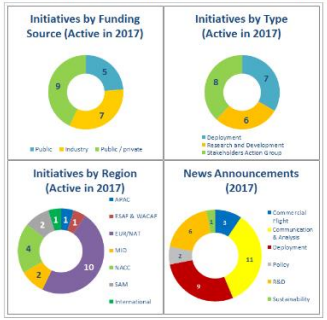
CAAF/2 – Mexico City, Mexico (11-13 October 2017)

ICAO Global Framework for Aviation Alternative Fuels

- Database for relevant activities
  - News and Activities
  - Initiatives and Projects
  - Facts and Figures
  - Frequently asked questions
  - ICAO Vision
  - Literature
  - Additional Links
  - And…

Facts and Figures

Click the image below to view Facts and Figures from 2017



Frequently Asked Questions

Click here to find the answers to frequently asked questions about aviation fuels.

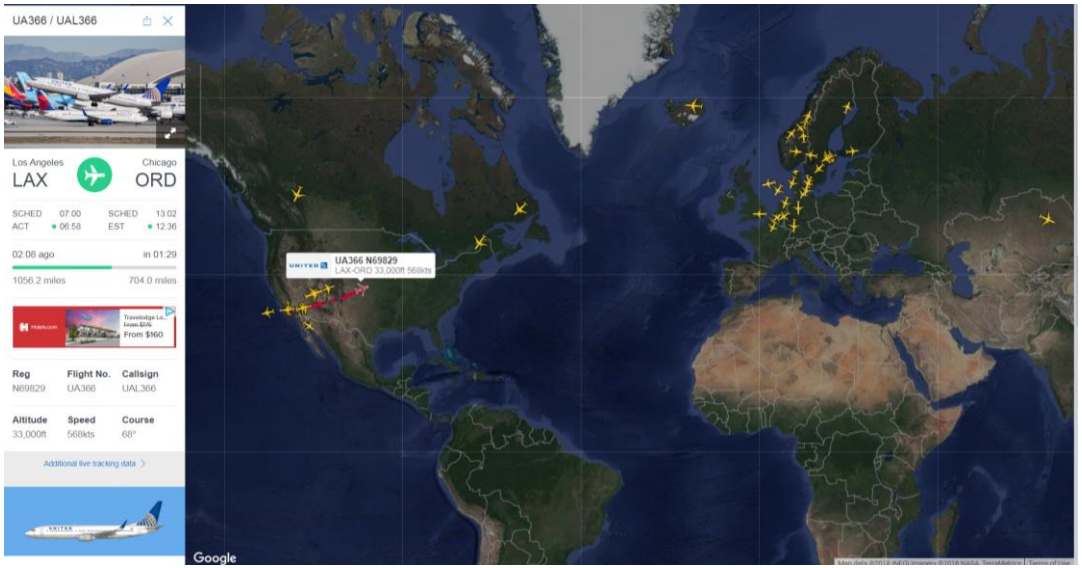
ICAO Vision

Click here to read the 2050 ICAO Vision for Sustainable Aviation Fuels, as endorsed by the ICAO Council in March 2018.

Contact Us

States and stakeholders are invited to send information about their news, activities, and initiatives to:
officeenv@icao.int

ICAO GFAAF - Aviation Live Feed



The live feed is based on publically-available information from airports and airlines involved in on-going alternative fuel purchase agreements.

6
Alternative fuel conversion processes certified for use in aviation

5
Airports regularly distributing blended alternative fuel

>150,000
Commercial flights have used a blend of alternative fuel

Sustainable Aviation Fuels Guide

ICAO-UNDP/GEF Assistance Project

Components of the ICAO-UNDP/GEF Project

1. IMPLEMENTING AVIATION LOW EMISSIONS MEASURES: COSTS AND ENVIRONMENTAL BENEFITS ASSESSMENT
2. DEVELOPMENT OF 4 GUIDANCE DOCUMENTS TO FACILICATE LOW EMISSIONS AVIATION IN DEVELOPING STATES AND SIDS
3. ICAO INTEGRATED ENVIRONMENTAL TECHNICAL PLATFORM
4. PILOT PROJECT ON AVIATION LOW EMISSIONS MEASURES

SAF Guide – Purpose

- Provides guidance aimed at Developing States and SIDS on:
  - **Conditions for promoting SAF**
  - **How to produce SAF**
  - **How to promote the use of SAF**
- Also includes **case studies and best practices**

SAF Guide – Main Themes

- Highlighted that:
  - **States and stakeholders** around the world **are already involved** in SAF deployment projects
  - **Many feedstocks and conversion processes** are available for SAF production
  - The SAF industry is **quickly evolving**

Capacity Building for CO_2 Mitigation from International Aviation

OBJECTIVE 1
ACTION PLANS DEVELOPMENT:
Improved capacity of the National Civil Aviation authorities to develop an Action Plan on CO_2 emissions reduction from international aviation in accordance with ICAO recommendations

OBJECTIVE 2
AVIATION ENVIRONMENTAL SYSTEMS (AES):
Efficient CO_2 emissions monitoring system for international aviation developed in each selected Member State

OBJECTIVE 3
IMPLEMENTATION OF MITIGATION MEASURES:
Priority mitigation measures identified, evaluated and partly implemented

FEASIBILITY STUDIES
TO BE DEVELOPED WITH PROJECT FUNDING

The feasibility studies will provide the governments of the selected States decision-making tools that may unveil new opportunities to get to the edge of innovations for a sustainable aviation sector.

Four feasibility Studies on Sustainable Aviation Fuels

- ✓ DOMINICAN REPUBLIC
- ✓ TRINIDAD & TOBAGO
- ✓ BURKINA FASO
- ✓ KENYA

Objectives of the Studies

- Identify **singularities and opportunities** of a potential SAF Supply Chain
- Define **potential capacity**: Feedstocks and SAF production
- Define **demand**, considering cost/benefit and prices
- Evaluate the **environmental impact** (GHG, water, resources) and local development impact
- Look for **implementation keys** (policies, challenges and alternatives)

SAF Feasibility Study

DOMINICAN REPUBLIC

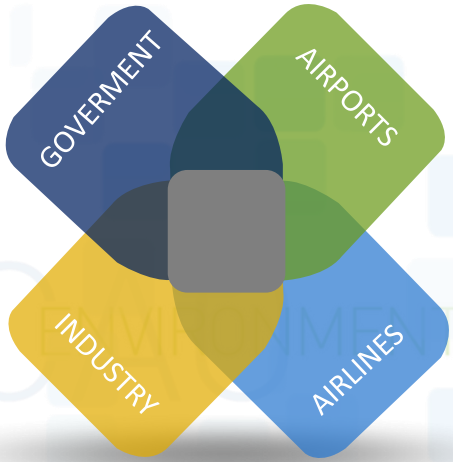
Feedstock

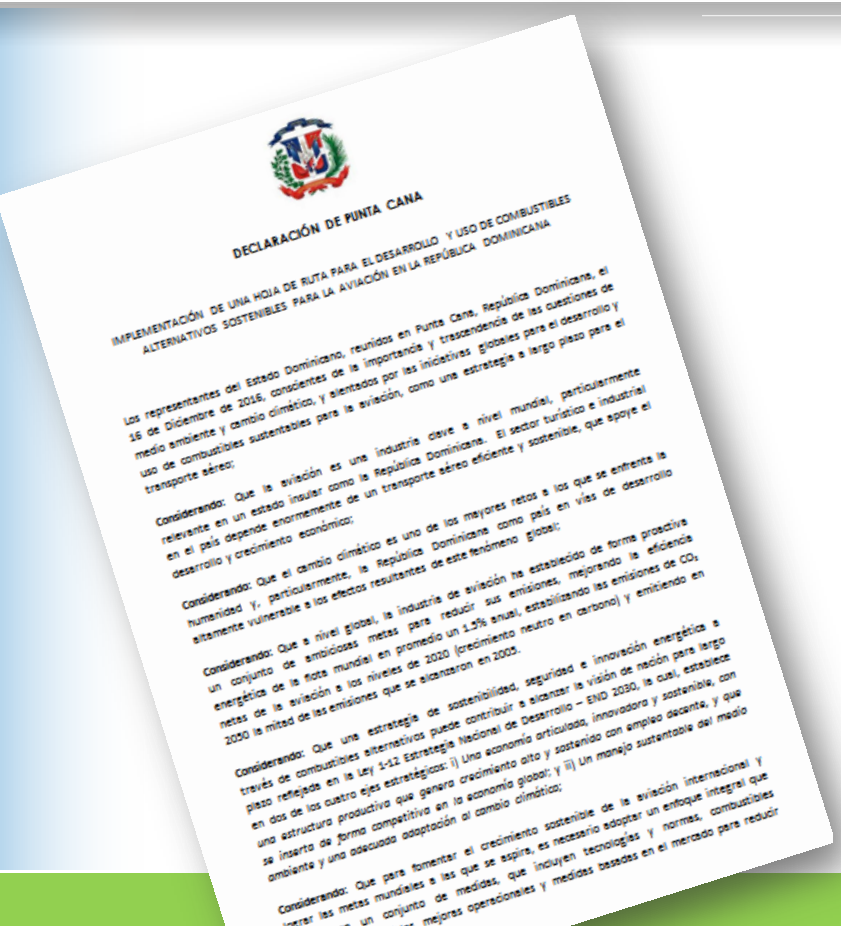
- **vegetable oils & fats** → low potential
- production of municipal or industrial **wastes** is limited and disperse
- major **agricultural residues** are being currently used
- However, the country has a **significant potential** on **sugarcane** which could be renewed to produce SAF with the SIP or ATJ conversion projects.



Roapmap Strategy

- Short Term (2017 – 2018):
  - Establish information sharing mechanisms for SAFs
- Medium term (2018 – 2020)
  - Adapt regulations & standards
  - Disseminate the relevance of the use SAFs
  - Increase R&D on feedstock capacity
- Long term (from 2020)
  - Promote sustainable implementation of a value chain
  - Establish incentive measures for stable demand





DECLARACIÓN DE PUNTA CANA

IMPLEMENTACIÓN DE UNA HOJA DE RUTA PARA EL DESARROLLO Y USO DE COMBUSTIBLES ALTERNATIVOS SOSTENIBLES PARA LA AVIACIÓN EN LA REPÚBLICA DOMINICANA

Los representantes del Estado Dominicano, reunidos en Punta Cana, República Dominicana, el 16 de Diciembre de 2016, conscientes de la importancia y trascendencia de las cuestiones de medio ambiente y cambio climático, y alentados por las iniciativas globales para el desarrollo y uso de combustibles sustentables para la aviación, como una estrategia a largo plazo para el transporte aéreo;

Considerando: Que la aviación es una industria clave a nivel mundial, particularmente relevante en un estado insular como la República Dominicana. El sector turístico e industrial en el país depende enormemente de un transporte aéreo eficiente y sostenible, que apoye el desarrollo y crecimiento económico;

Considerando: Que el cambio climático es uno de los mayores retos a los que se enfrenta la humanidad y, particularmente, la República Dominicana como país en vías de desarrollo altamente vulnerable a los efectos resultantes de este fenómeno global;

Considerando: Que a nivel global, la industria de aviación ha establecido de forma proactiva un conjunto de ambiciosas metas para reducir sus emisiones, mejorando la eficiencia energética de la flota mundial en promedio un 1.5% anual, estabilizando las emisiones de CO_2 netas de la aviación a los niveles de 2020 (crecimiento neutro en carbono) y emitiendo en 2050 la mitad de las emisiones que se alcanzaron en 2005.

Considerando: Que una estrategia de sostenibilidad, seguridad e innovación energética a través de combustibles alternativos puede contribuir a alcanzar la visión de nación para largo plazo reflejada en la Ley 1-12 Estrategia Nacional de Desarrollo – END 2030, la cual, establece en dos de los cuatro ejes estratégicos: i) Una economía articulada, innovadora y sostenible, con una estructura productiva que genera crecimiento alto y sostenido con empleo decente, y que se inserta de forma competitiva en la economía global; y ii) Un manejo sustentable del medio ambiente y una adecuada adaptación al cambio climático;

Considerando: Que para fomentar el crecimiento sostenible de la aviación internacional y lograr las metas mundiales a las que se aspira, es necesario adoptar un enfoque integral que incluya un conjunto de medidas, que incluyen tecnologías y normas, combustibles mejores operacionales y medidas basadas en el mercado para reducir

DECLARACIÓN DE PUNTA CANA

IMPLEMENTACIÓN DE UNA HOJA DE RUTA PARA EL DESARROLLO Y USO DE COMBUSTIBLES ALTERNATIVOS SOSTENIBLES PARA LA AVIACIÓN EN LA REPÚBLICA DOMINICANA

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Do not expect the others to change your reality. YOU can make a change that would ***inspire*** *all*

SAF Feasibility Study

Trinidad & Tobago

Feedstock

- Feedstocks considered: **agricultural products** (sugarcane), **algae**, **waste gases** from petrochemical industry, and **Municipal solid wastes.**
- **Low volumes of feedstock availability -** insufficient for scale production with current production technologies.
- Due to existing **expertise in fuel management and processing,** Trinidad and Tobago could play a primary role in the supply of SAF in the Caribbean region, using imports from neighboring nations



Roapmap Strategy

- Short-Term (2018-2023)
  - Develop national strategy for carbon pricing and GHG emissions.
  - Support Gas To liquid industry from Natural Gas
- Medium-Term (2023-2028)
  - Adapt waste disposal policies to increase availability for SAF production
- Long Term (2028-)
  - Conduct a feasibility study for SAFs produced from imported and local renewable biomass.

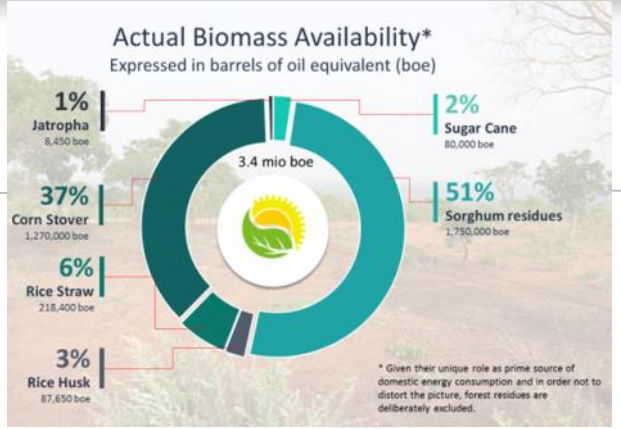
SHORT TERM (1-5 YEARS) Provide direct support to specific industry developments	MEDIUM TERM (5-10 YEARS) Plan for the deployment and promote SAFs	LONG TERM (10+ YEARS) Support R&D on large scale production of SAFs
ACTION	ACTION	ACTION
• Develop a nationwide strategy for carbon pricing and GHG emission, and the use of biofuels for aviation, marine, and land transport. • Reinforce government's support to ensure the efficient development of the GTL-FT industry to gain a comparative advantage in future markets for BTL-SAFs. • Evaluate the feasibility, and if viable install a solar farm at PIARCO International Airport to supply renewable energy for airport operations including powering EVs for GSE. • While evaluations are on-going to incorporate EVs powered by solar panels at PIARCO International Airport, TT can rapidly begin to reduce GHG from GSE through the following transitional measures: i. The provision of 7.6 per cent biodiesel processed from used cooking oil to fuel diesel-powered GSE. ii. The installation of two mobile high-flow fueling CNG stations in the north and south terminals to power GSE fitted to run on CNG.	• Revise and modify existing policy on the handling and disposal of waste from residential, industrial, and commercial sectors to ensure selective disposal of the organic portion: i. Develop and launch capacity building workshops on recycling and organic waste separation for the general public, and academic and public institutions. ii. Explore the idea of updating the nation's waste sites to engineered advances landfills to allow for the capture of LFG and use of the CH_4 portion as an affordable local source of renewable feedstock for BTL-SAFs production. • Investigate and if feasible, increase to 30 per cent the blend mix of biodiesel produced from UCO for GSE.	• Evaluate supplementing volumes of existing waste biomass, including MSW, with imports from neighboring nations. • Develop nationwide specific routes for the collection of organic residential and industrial waste as well as agricultural waste separately from MSW collection routes. • Conduct a feasibility study, including economic analysis, and consequent pilot project for the deployment of BTL-SAFs processed from imported and local renewable waste biomass. • Enact policy to support the use of EVs for private and public vehicles owners.

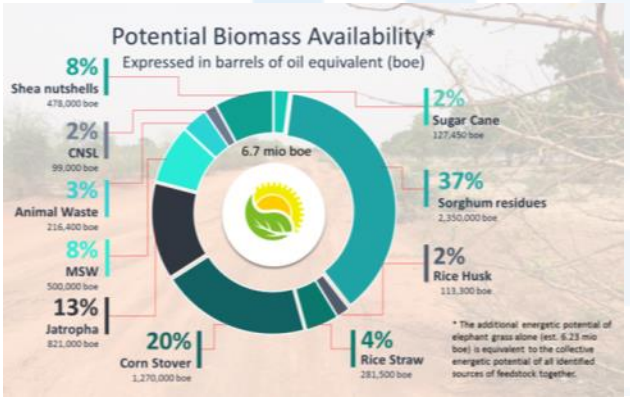
SAF Feasibility Study

Burkina Faso

Feedstocks

- **Positive outlook for the use of cashew and shea nutshells**
- **Significant potential** for increased use of sorghum residues and jatropha
- Expansion of **sugarcane** seems limited
- **Animal waste fats and municipal solid waste-** potentially attractive for SAF production





Roapmap Strategy

- Short-Term (2018-2023)
  - Secure buy-in from national stakeholders
  - Set up central coordinating platform
- Medium-Term (2023-2028)
  - Provide small holders with financing
  - Promote central purchasing
  - Explore potential for carbon financing
- Long Term (2028-)
  - Investigate concept for a multi-feedstock processing plant.

First Stage (2018)	Second Stage (2018-2020)	Third Stage (from 2020)
• Secure **critical buy-in** among national stakeholders from across the political and sectoral spectrum to formulate a shared vision and facilitate critical mobilization; • **Unity of effort and stakeholder integration**: set-up of an independent central coordinating platform (representing government, civil society, private sector and strategic partners/ investors) to be equipped with operational autonomy and budget authority; • **Business White Paper**: Draft business plan for a national biofuel supply chain that allows to secure public climate finance and international development	• Improve overall market functionality for farmers and feedstock suppliers ➢ Promote establishment of (i) central purchasing counterparty and (ii) agricultural seed production company; • Provide smallholders with access to micro-finance (e.g. loans for farm inputs and crop-insurance); • Explore potential for carbon finance and REDD+; • Reallocate revenues from mining operations; • Quantify and credit socio-economic co-benefits towards the cost of production; • Encourage and incentivize strategic	• Facilitate international cooperation and coordination: ➢ Capacity building, technical assistance and technology transfer; ➢ Scientific and technical R&D conducted under multi-lateral and bilateral agreements to mutually share risks, minimize duplication of effort, and benefit from international best practices; • Investigate concept for a multi-feedstock processing plant;

SAF Feasibility Study

Kenya

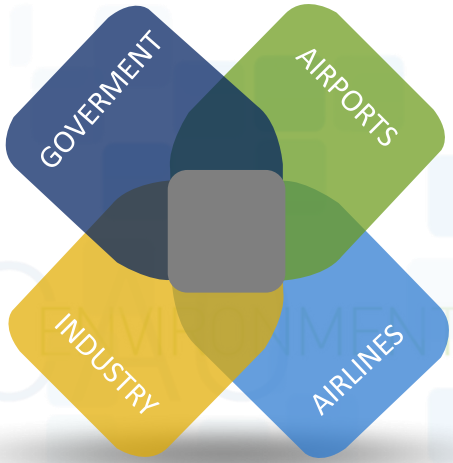
Feedstocks

- **Seventeen feedstock types evaluated**
- **Significant potential** for waste-based feedstocks (sugar-cane by-products, water hyacinth, used cooking oil, MSW)
- available in **significant quantities** and already aggregated or localised in specific regions



Roapmap Strategy

- Short-Term (2018-2023)
  - Develop cooperation and capacity building initiatives
- Medium-Term (2023-2028)
  - Demonstrate the potential and prove viability of projects
- Long Term (2028-)
  - Determine implementation plan of a waste-based SAF supply chain



Conclusions

- Technical Assistance can be a catalyst to trigger initiatives at the State Level
- Advocacy and mobilization of different stakeholders is important for SAF projects
- An important role of ICAO is providing technical assistance and outreach

ICAO

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South American (SAM) Office
Lima

ICAO Headquarters
Montréal

Western and Central African (WACAF) Office
Dakar

European and North Atlantic (EUR/NAT) Office
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THANK YOU