AFCAC/EASA WORKSHOP ON ACCELERATION OF DEVELOPMENT AND DEPLOYMENT OF SUSTAINABLE AVIATION FUELS (SAF) in AFRICA
3-5 July 2023

The Role of Sustainable Aviation Fuels (SAF) in Decarbonizing Air Transport: Challenges and Opportunities

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ASCENT Project 93: Regional Supply chain analysis

Objective:

- Work with regional partners to design and analyze SAF supply chains in three regions: Latin America and the Caribbean, Africa and Southeast Asia.
- Create training modules/course/and graduate programs on the design and analysis of SAF production and supply chains.

Project Benefits:

- Identify potential for SAF production in the 3 regions that consider new pathways to optimize SAF production.
- The data collected will direct stakeholders to identify desired locations and potential for SAF production.

ASCENT – the Aviation Sustainability Center – is a cooperative aviation research organization co-led by Washington State University and the Massachusetts Institute of Technology. Also known as the Center of Excellence for Alternative Jet Fuels and Environment, ASCENT is funded by the FAA, NASA, the Department of Defense, Transport Canada, and the Environmental Protection Agency. ASCENT works to create science-based solutions for the aviation industry's biggest challenges.

Geographical scope

Lead: Washington State University

Leads: Massachusetts Institute of Technology / Hasselt University

Lead: University of Hawaii

Research approach

Create working groups in each country

Working groups will consist of academia, biomass producers, fuel and aviation industry, government, NGOs.

Design and Analysis of Regional Supply Chains

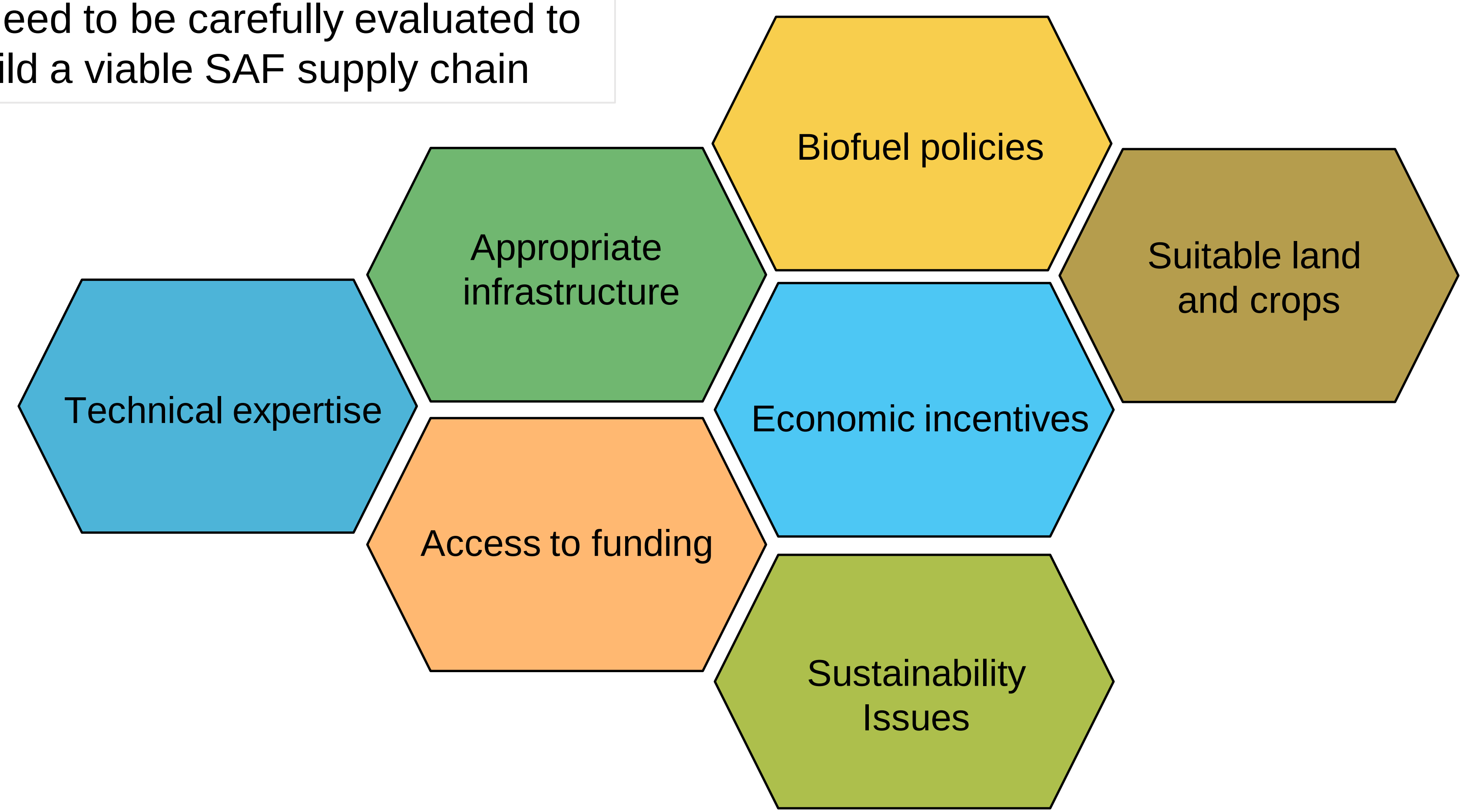
Students will conduct their Ph.D. studies on the design and assessment of SAF Regional Supply chains on their countries.

Create training modules / courses

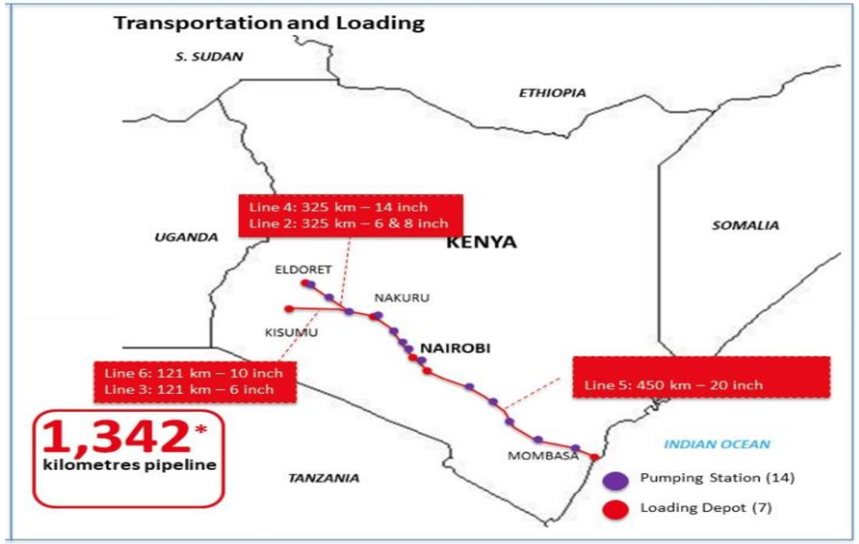
Create online courses and training modules to be used by all students.

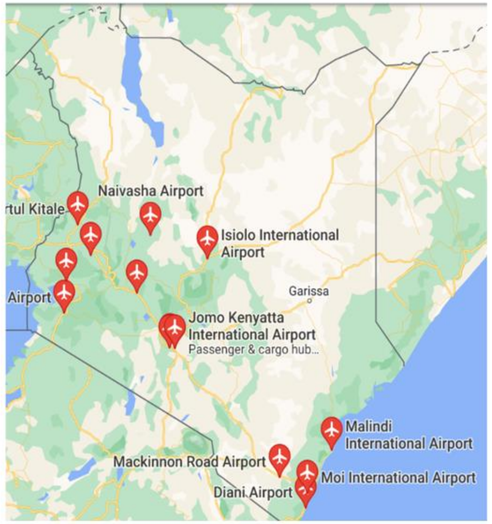
SAF Supply Chain Challenges in developing countries

Every country and region has a unique set of challenges and opportunities that need to be carefully evaluated to build a viable SAF supply chain



Kenya study case: Background





- Kenya used to have a **refinery in Mombasa** that was closed for commercial reasons in 2013. All jet fuel used in Kenya is currently imported

- Kenya has a **liquid fuel pipeline system** that connects the port of Mombasa and the old refinery with the **main airports**.

- A study commissioned by ICAO and published in 2018 examined the feasibility of various **potential feedstocks for SAF** production in Kenya, including an initial assessment of key barriers. (UCO, MSW etc)

- There is an active SAF engagement in Kenya and there is planned workshop on **11 and 12th September 2023**

- Eni Spa, an Italian Energy firm has signed MOU with Government for the production of Bioenegy and was granted with 250,000 acres of land in the country.

https://www.icao.int/environmental-protection/Documents/FeasabilityStudy_Kenya_Report-Web.pdf

Kenya study case: Status and next steps

Current Status

Established a working relationship to build a task force to **develop a <u>concrete roadmap</u> toward a SAF production plant in Kenya**

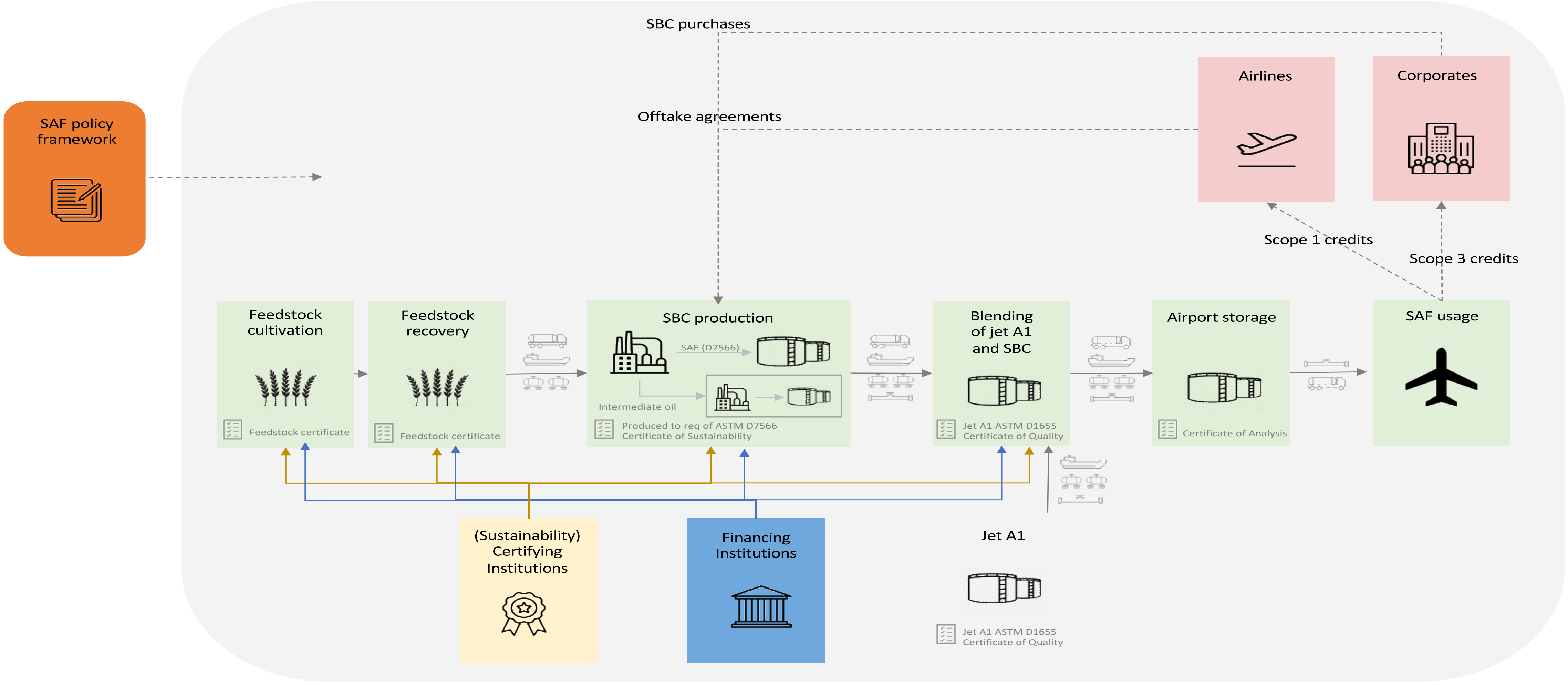
International Stakeholders include GIZ, the World Bank, MIT/U Hasselt

The team will conduct detailed studies on key supply chain challenges together with local stakeholders

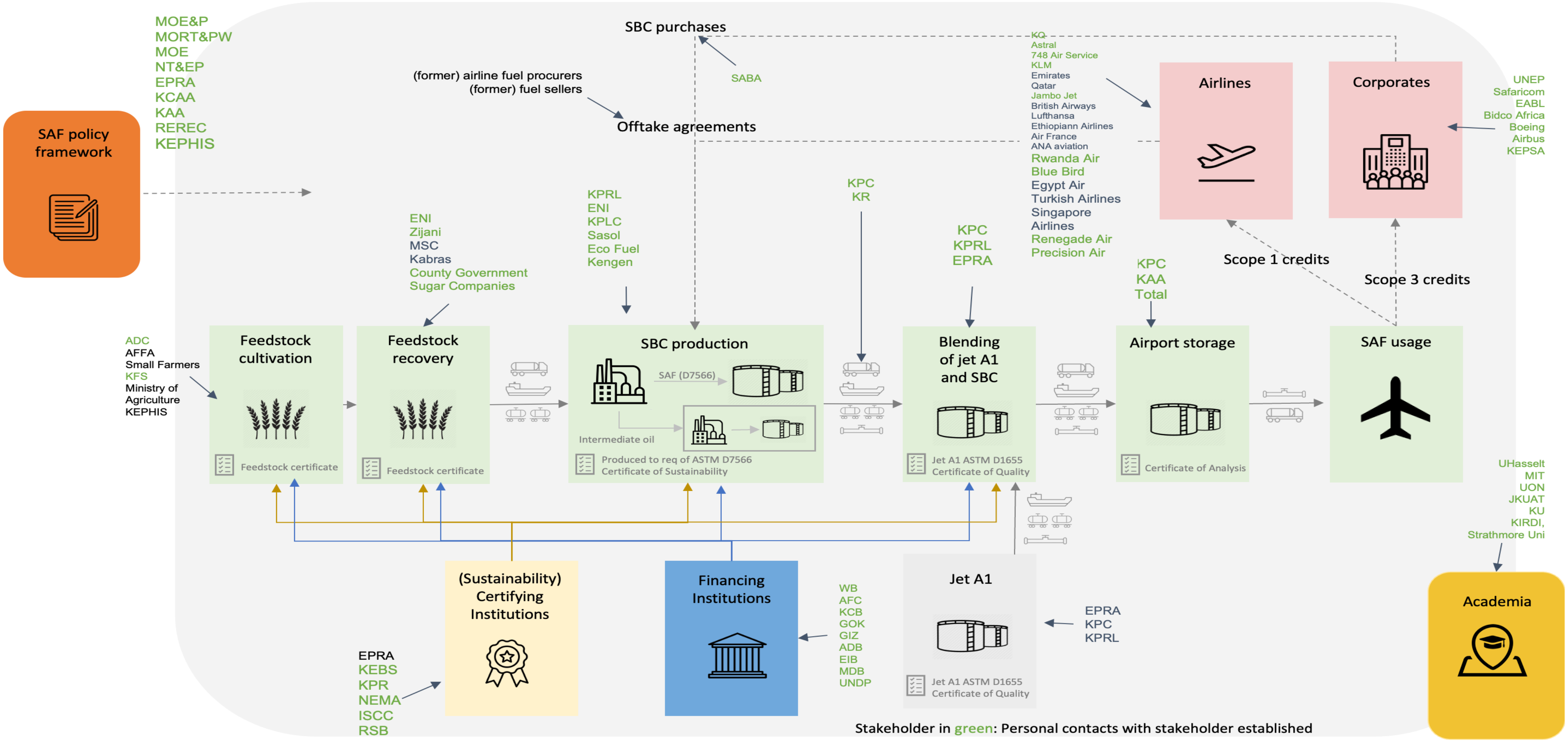
Next steps

- Outreach to local and international stakeholders: Workshop to discuss a potential work plan on **11th and 12th September in Kenya**
- **Deep-dive discussions on several key topics.**

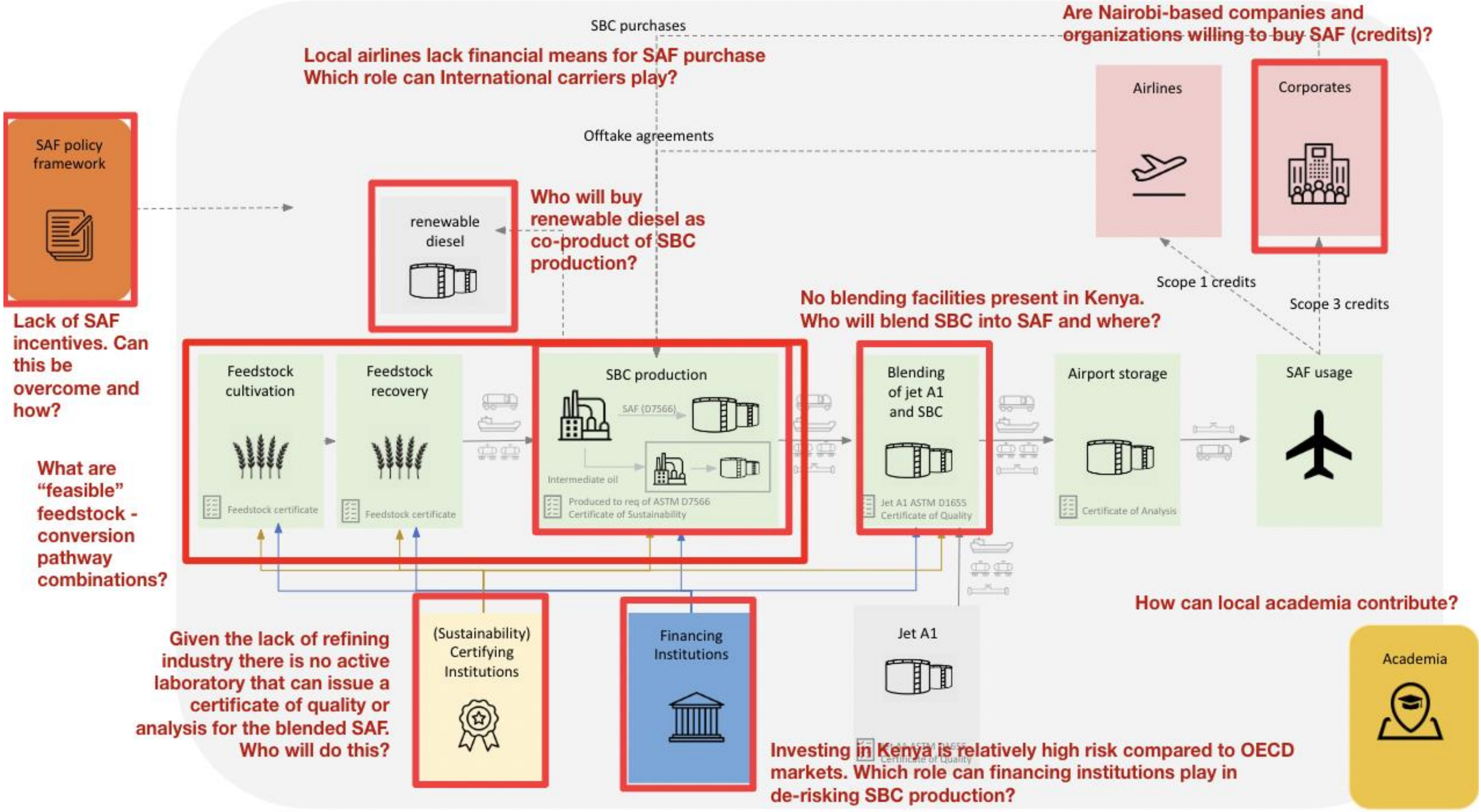
Kenya stakeholder mapping (1 of 2)



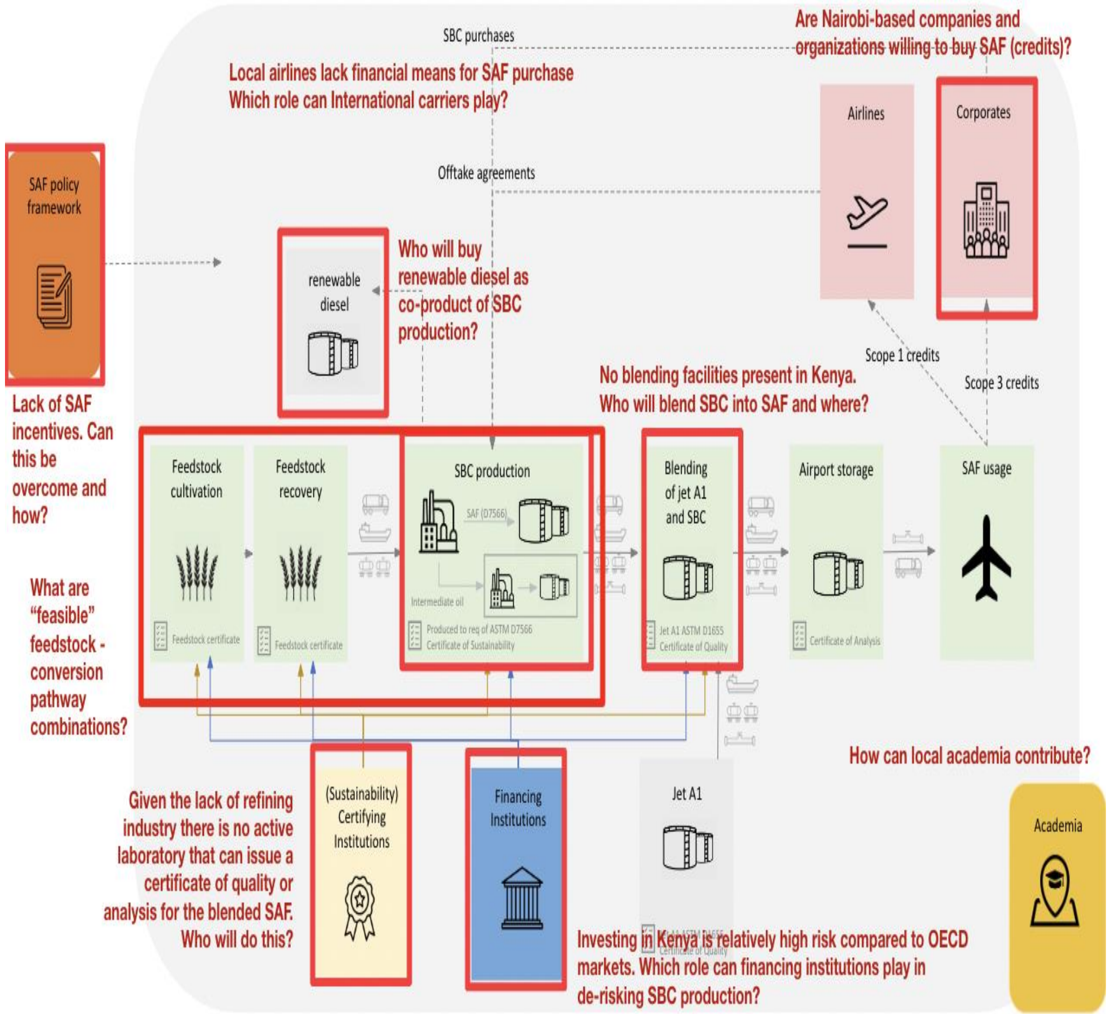
Kenya stakeholder mapping (2 of 2)



Key challenges in Kenya

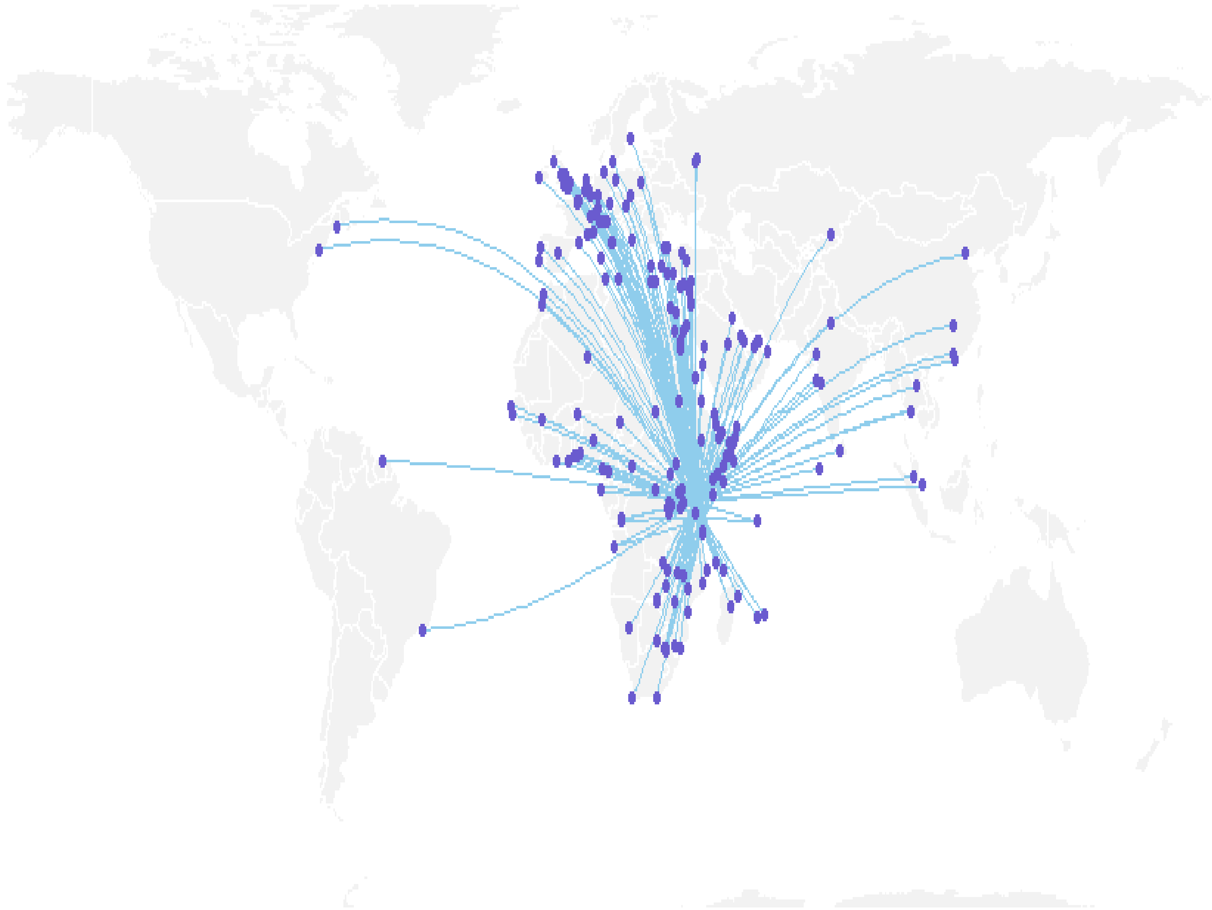


Key challenges in Kenya Cont..



Currently conducting deep dives on:

Green premium

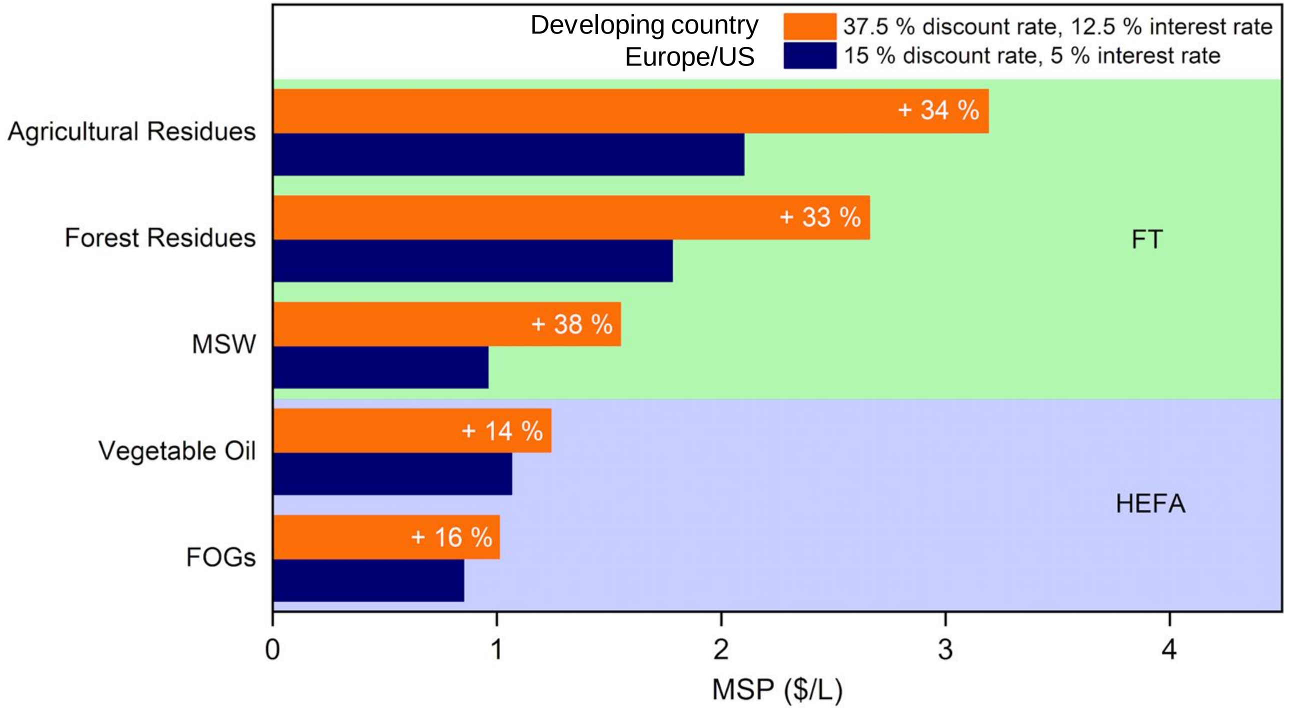


International flights from NBO and MBA in 2019 by international Carriers.

Currently investigating flight-specific ticket increases due to **the green premium** of a 2000 bpd HEFA facility (satisfying approx. **10% of total jet demand in Kenya**), and develop green premium distribution strategies.

The importance of de-risking SAF investment in developing countries

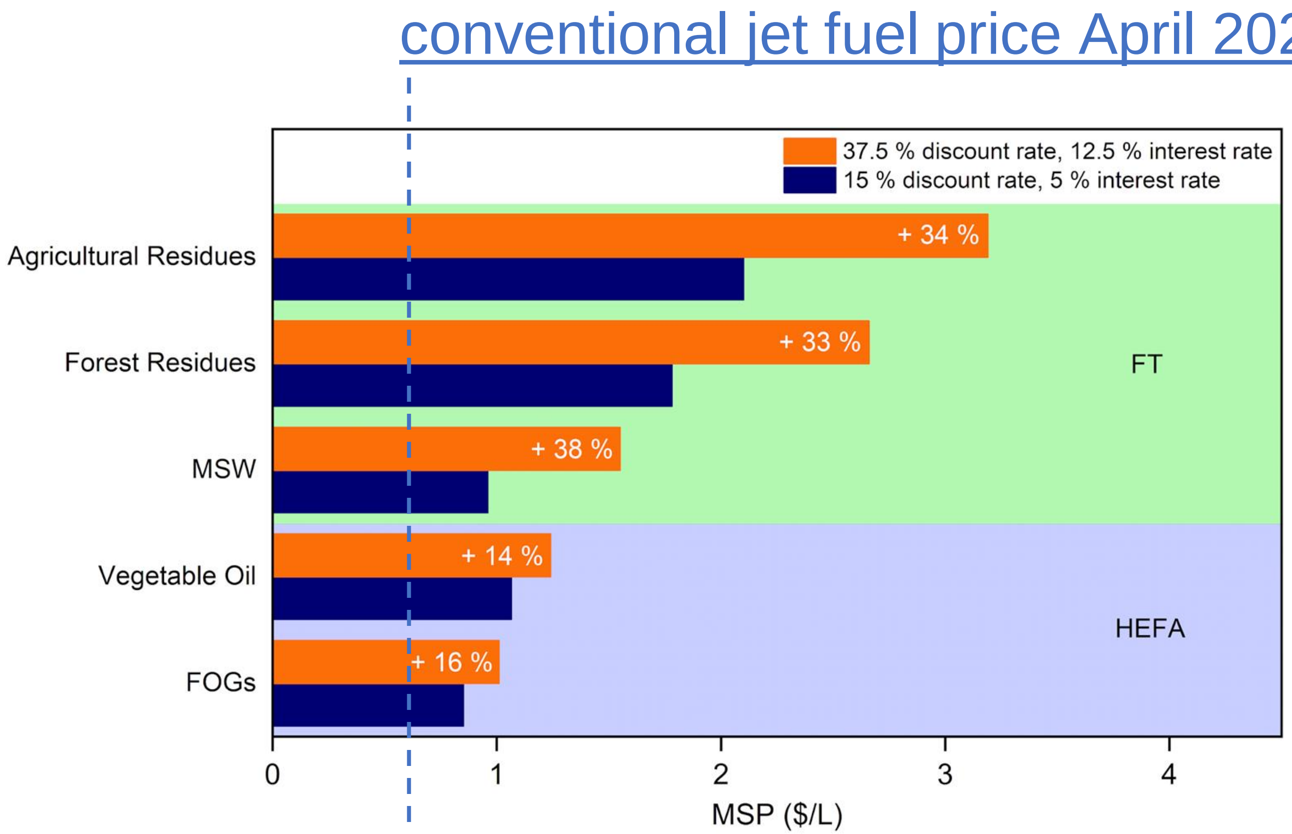
Higher risk premiums drive up the SAF costs in developing countries.



Source: Own calculations based on publicly available DCFROR models for SAF (Hydroprocessed esters and fatty acids TEA V2.2 developed by Kristin Brandt et al. 2022, Fischer Tropsch TEA V2.2 developed by Kristin Brandt et al. 2022) . These are n-th plant estimates.
Key Assumptions: Equity/loan split: 70/30, Duration 20 years, inflation: 2%. Discount rate and loan interest asssumed as mentioned above. No monetary incentives included.
FOG: Fats, Waste Oils and Greases
MSW: Municipal solid waste

Driving down risk premiums for SAF production would be a **major factor** in reducing the costs of producing SAF in these countries

The importance of de-risking SAF investment in developing countries



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But even if risk premiums are down to OECD levels, there is still a **cost gap** with conventional jet fuel to make up for (“the green premium).

The importance of de-risking SAF investment in developing countries

”**Coalitions**” will be needed to drive down risk premiums and distribute the green premium – for each specific SAF investment case.

- **Financing agreements** with international development banks;
- **Offtake agreements** from (international) airlines;
- **Scope 3 credit purchases** by corporates;
- **Government commitments** (expertise, regulation)
- Training in SAF to Technical Experts

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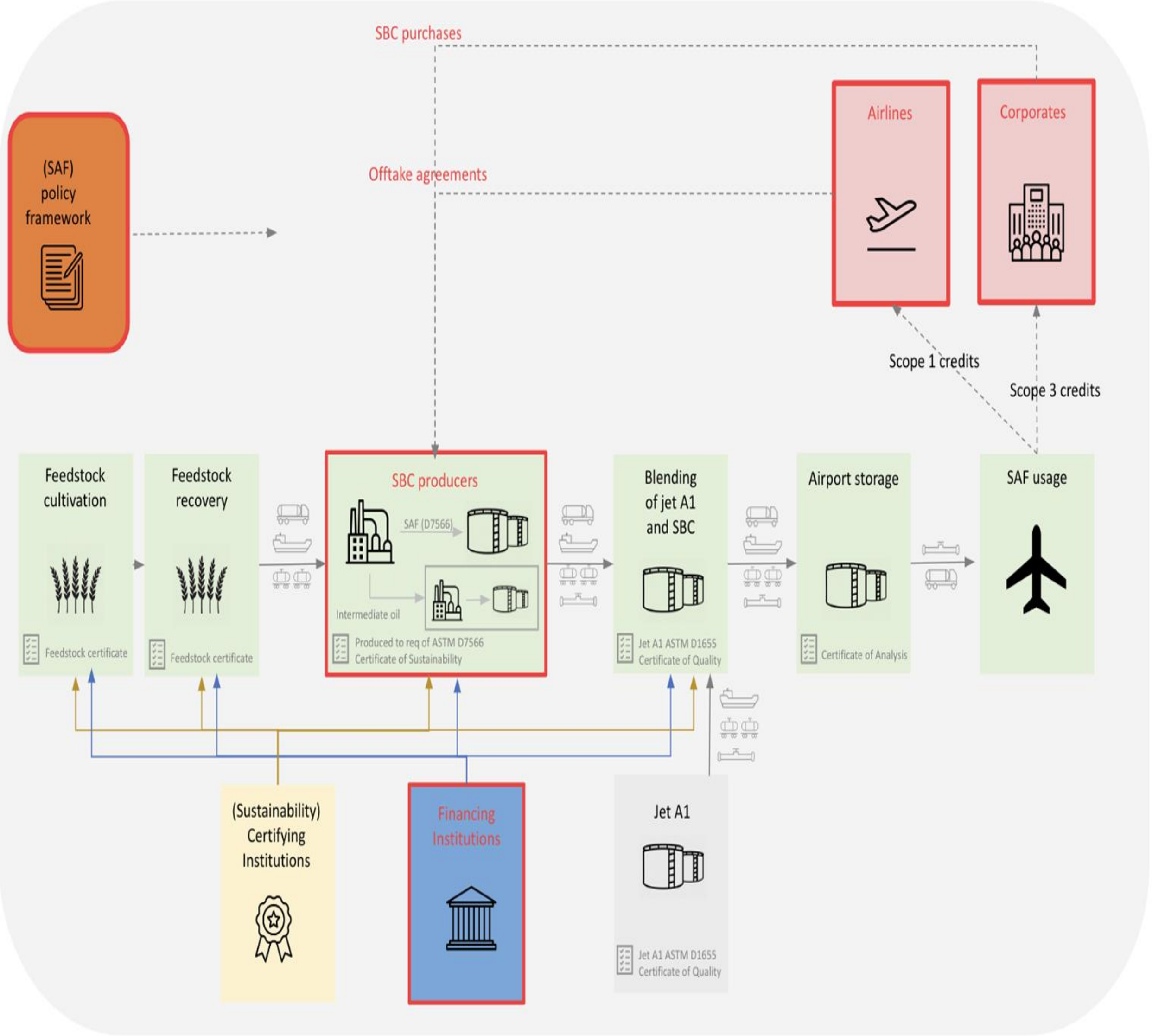
Many entities are active in building such coalitions at the moment.



SAF TOOLKIT FOR ACCELERATED DEPLOYMENT

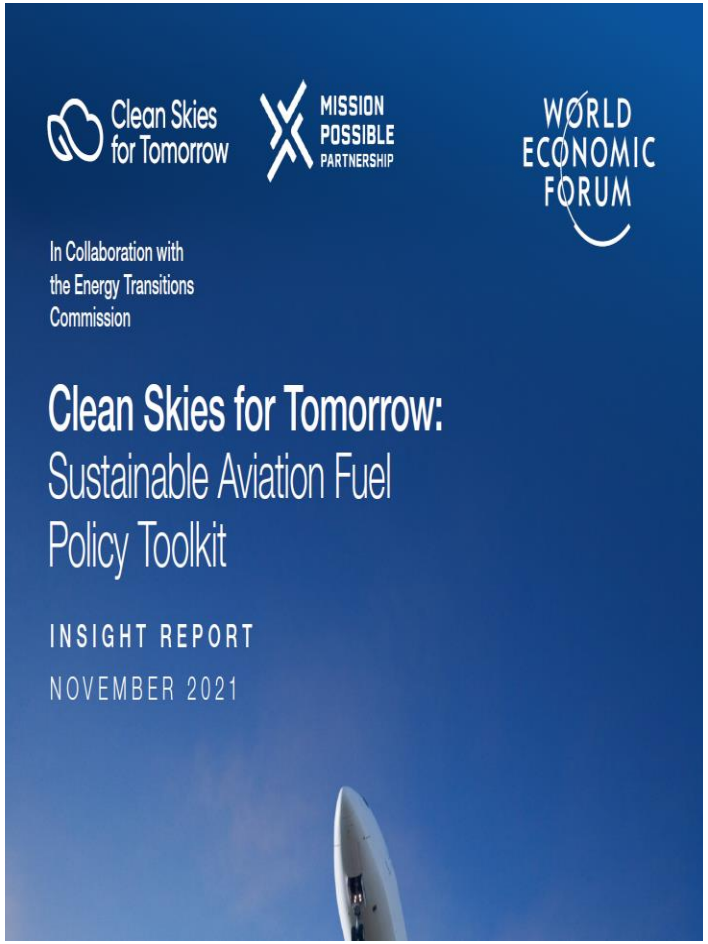
- The toolkit draws from the **experience and diversity** of the CST SAF Ambassadors group (UK, UAE, Kenya, Singapore, Netherlands) and the wider CST community through support of World Economic Forum

- The toolkit provides a **helpful resource to policy-makers** around the world.

- Toolkit aims to support **governments and policy-makers** as they develop and implement national SAF strategies

- It includes a range of **policy options to support** the scaled production and use of SAF in their regions.
- These policy options are a **cross-section** of the most influential mechanisms but are not prescriptive.

- Policy-makers should undertake their **own national analysis** and adapt the recommendations to the local context before any implementation.



https://www.weforum.org/reports/clean-skies-for-tomorrow-sustainable-aviation-fuel-policy-toolkit/

SAF TOOLKIT CONT..

Indicative profile of aviation decarbonization technology deployment

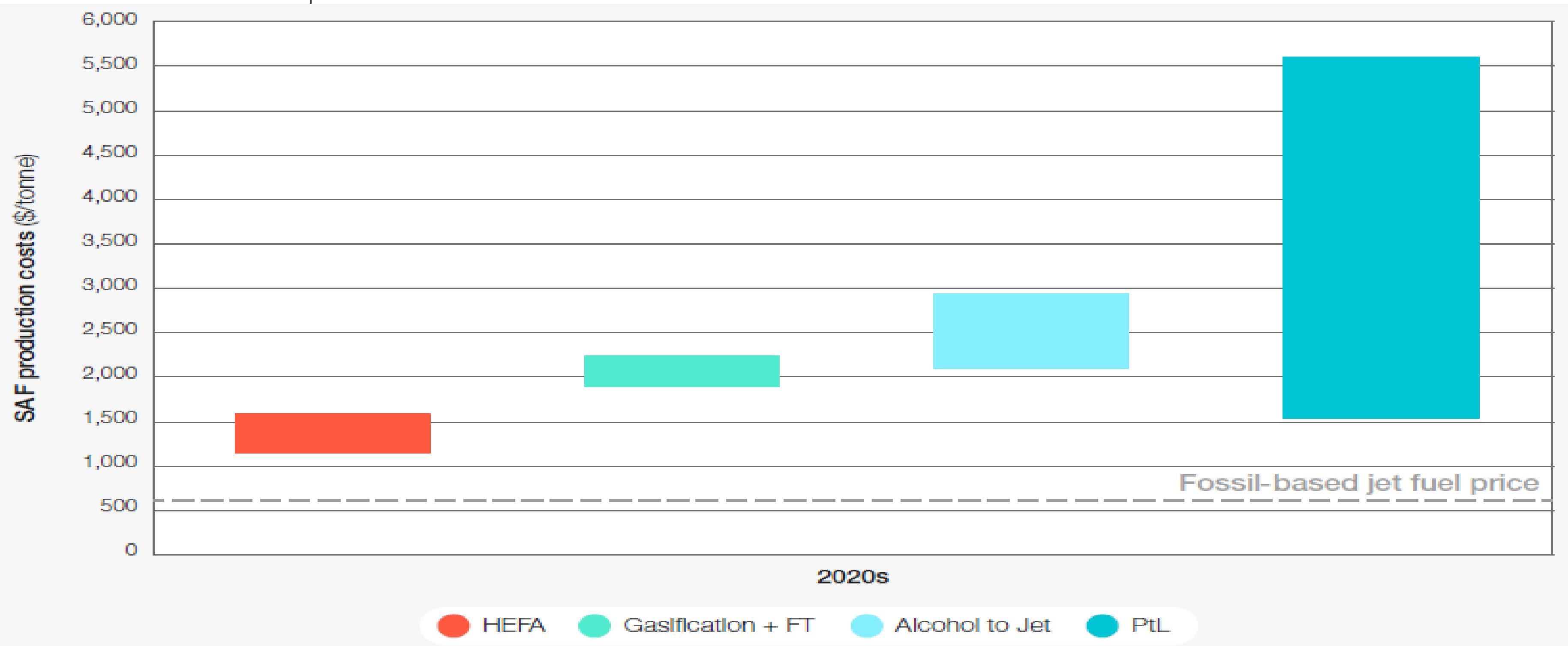
	2020	2025	2030	2035	2040	2045	2050
Commuter » 9-19 seats » < 60 minute flights » <1% of industry CO_2	SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF
Regional » 50-100 seats » 30-90 minute flights » ~3% of industry CO_2	SAF	SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF
Short haul » 100-150 seats » 45-120 minute flights » ~24% of industry CO_2	SAF	SAF	SAF	SAF potentially some Hydrogen	Hydrogen and/or SAF	Hydrogen and/or SAF	Hydrogen and/or SAF
Medium haul » 100-250 seats » 60-150 minute flights » ~43% of industry CO_2	SAF	SAF	SAF	SAF	SAF potentially some Hydrogen	SAF potentially some Hydrogen	SAF potentially some Hydrogen
Long haul » 250+ seats » 150 minute + flights » ~30% of industry CO_2	SAF	SAF	SAF	SAF	SAF	SAF	SAF

Source: Air Transport Action Group, Waypoint 2050, 2021

SAF TOOLKIT -KEY SAF PRODUCTION PATHWAY

- Fischer-Tropsch (FT)
- Hydroprocessed esters and fatty acids (HEFA)
- Alcohol (isobutanol) to jet (ATJ)
- Alcohol (ethsnol) to jet (ATJ)
- Synthesized iso-paraffins (SIP)
- Power to Liquid (PtL)

SAF TOOLKIT –INDICATIVE SAF COSTS BY PRODUCTION PATHWAY

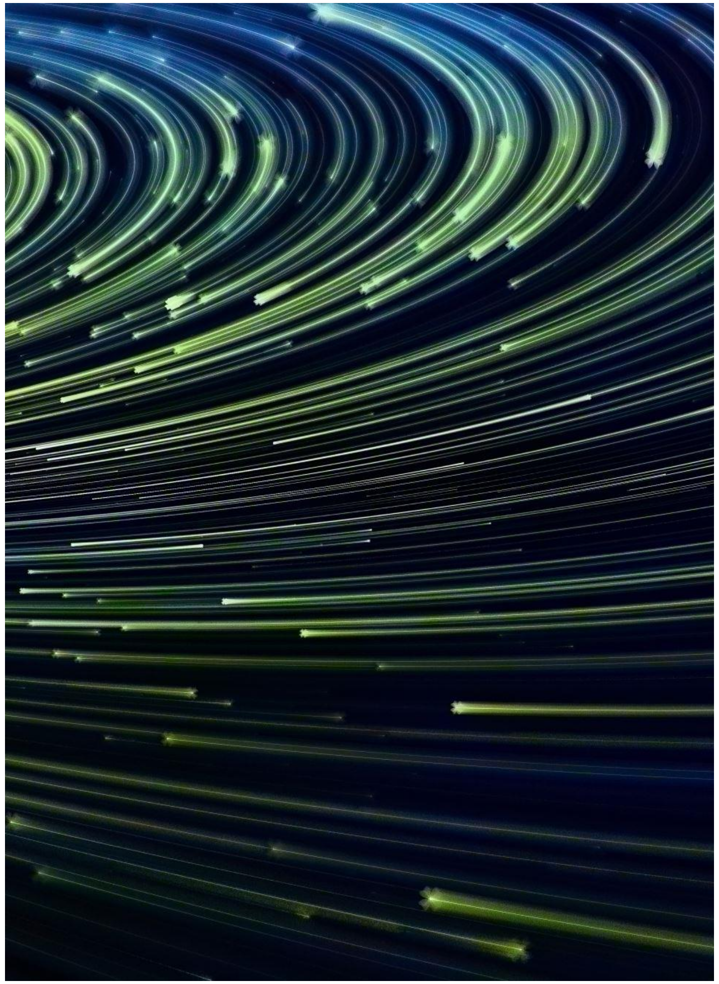


Source: World Economic Forum, *Clean Skies for Tomorrow: Sustainable Aviation Fuel as a Pathway to Net-Zero Aviation*, 2021
Note: Lower range for PtL in regions with cheaper renewable power

SAF TOOLKIT - IDENTIFIED MAJOR CHALLENGES FOR DEPLOYMENT

- Technological readiness
- Cost differential (2-4 times of Jet A)
- Major Investment required
- Lack of SAF strategies
- Sectoral allocation vs other transport mode
- Lack of policy and regulatory framework
- Level playing field - No global mandate

SAF TOOLKIT- KEY DEVELOPMENT CHALLENGES



Insufficient legal and institutional framework on SAF

Overreliance on rain-fed and slow maturing feedstock

Inadequate research, knowledge transfer and development on SAF

Lack of knowledge, and capacity among stakeholders on SAF

Lack of funding & Water shortages

Production costs vs fossil fuel prices

Food value chain conflicts that could lead to food insecurity

Inefficient feedstock collection systems

SAF TOOLKIT-POLICY OPTIONS

Creation of SAF **marketplace** at scale

Supply-side enabling policy measures to support deployment

Demand side measures

Need for feedstock sustainability

Fund and **promote SAF RD**

Provision of direct and indirect SAF subsidies

Stimulate SAF demand through a SAF blending mandate

Facilitation and harmonization of SAF certification

Reduction of **SAF import barriers**

Support global adoption of SAF production technologies

OPPORTUNITIES IN THE IMPLEMENTATION OF SAF IN AFRICA

large **volumes of wastes** and residues

Strong **government commitment** to renewable energy

Social, **environmental** and economic benefits

RECOMMENDATION

Development of **National SAF policy**

Need **for incentive policy** to increase production of SAF

Need for **Capital investment** to scale up production

Capacity building through technical training to experts and Knowledge transfer.

Support SAF pilot projects

Need to undertake research on biofuel feedstock and **Funding Research through Local** universities

Creation of **stakeholder** awareness & Working Groups

Thank you for your attention !

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