Summary of the result of the Kenya Sustainable Aviation Fuel Feasibility Study

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National Focal Point of Kenya

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- ACTION PLAN
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- Sustainable Aviation Fuels
- Roadmap
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Milestones for Kenya Action Plan

Aviation Environmental Working Group (AEWG) created **January** | **2012**

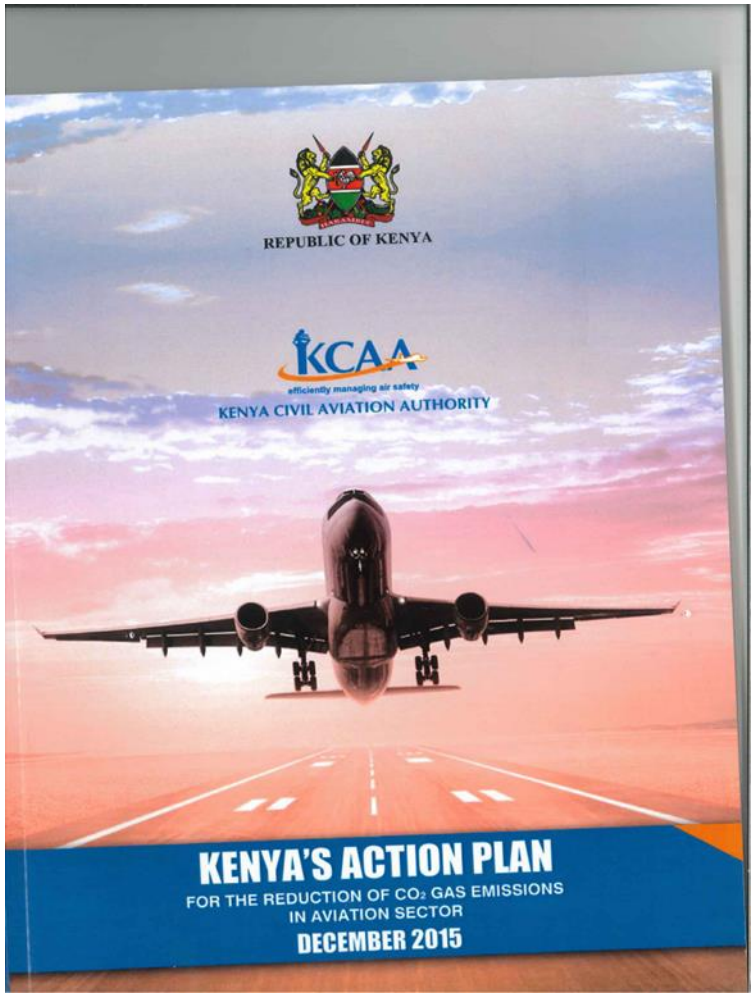
1st. Action Plan submitted | **2012**

ICAO-EU Assistance Project | **2014**

2nd. Action Plan submitted | **2015**

ACTION PLAN FOR THE REPUBLIC OF KENYA ON AVIATION SECTOR

- National Environment Working Group (Aviation Environmental Working Group (AEWG)) created in 2012, enhanced in 2015.
- More than 14 stakeholders involved, more still joining.
- An AIC was issued in late 2015



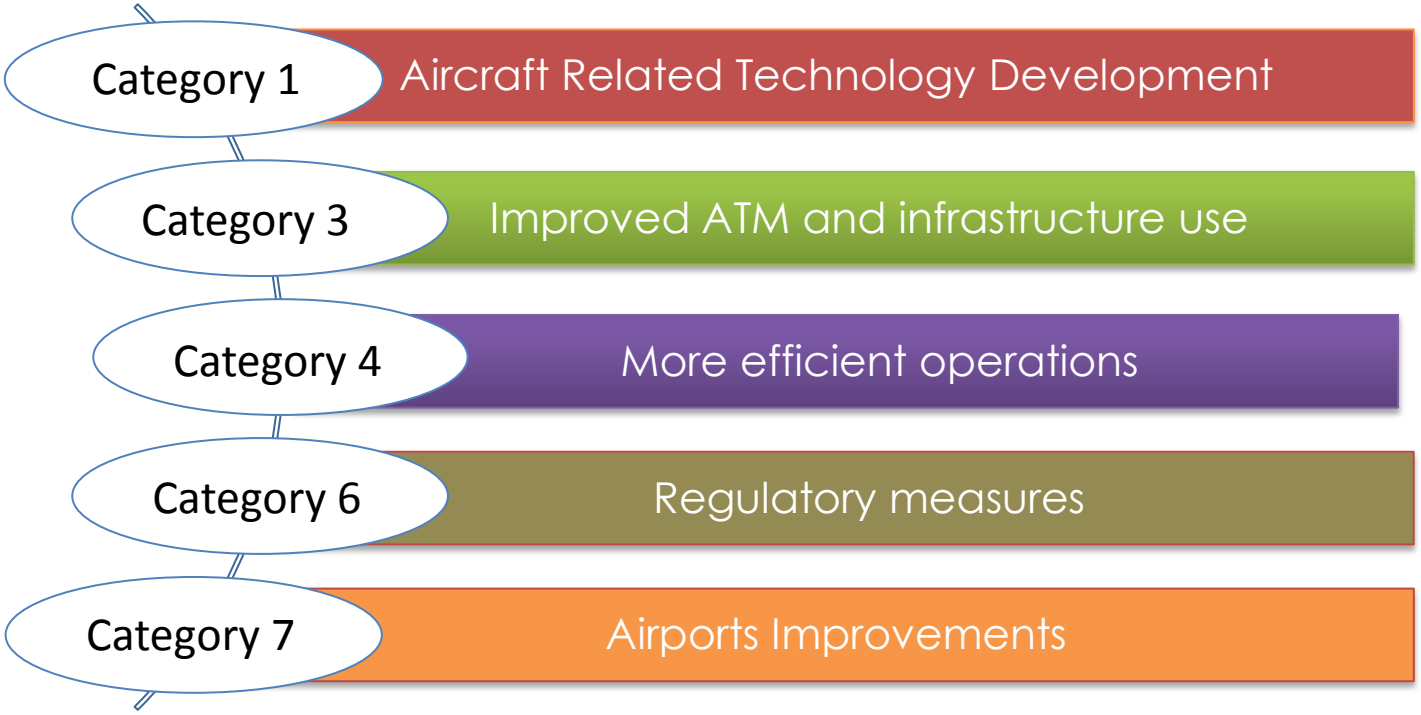
Aviation Environmental Working Group (AEWG)

- Kenya Civil Aviation Authority (ANSP and Regulator)
- Ministry of Transport
- National Environment Management Authority (NEMA)
- Ministry of Environment
- Kenya Airports Authority
- Meteorology Department
- Department of Defence

- Kenya Airways
- Kenya Association of Air Operators
- SAX/540
- Kenya Aerotech
- African Express Airways
- Ground Handling Service Providers

Selected Mitigation Measures

BASKET OF MEASURES FOR KENYA



Sustainable Aviation Fuels

- One of the promising mitigation measures identified in Kenya's State Action Plan is the development and deployment of sustainable aviation fuels (SAF) for international aviation, that have the potential to reduce life-cycle CO2 emissions compared to current aviation fuel.
- As part of the ICAO-EU assistance project, a study into the feasibility of a commercial SAF supply chain in Kenya was commissioned

Roadmap

- Is there enough sustainable biomass available in the region?
- Will it be economically viable to produce bio-derived jet fuels?
  - **Refining pathways**
  - **Competition for biomass**
- What are the challenges?
- What are the opportunities?

The study examined the feasibility of various potential feedstocks based on conflicting uses, logistics, co-benefits, volumes and socio-economic factors.

It identifies paths and required actions that could be pursued by relevant stakeholders to develop a viable SAF industry.

It identifies key barriers and presents fact-based outcomes to assist stakeholders to prepare business and policy recommendations.

It is anticipated that this study will help advance the creation of a regionally replicable SAF supply chain in Kenya that may provide significant economic, social and environmental benefits for the country in the coming decades.

This report identifies the current state of affairs relating to biofuels in Kenya, the policy environment, the infrastructure that is already in place, existing and potential feedstocks, and risks and opportunities.

It provides guidance on a pathway to a domestic SAF industry given the identified constraints and resources, framed within the context of the unique issues that Kenya and many other African States face as they strive to transition from emerging, to a middle-income economies.

Issues Considered

Food insecurity

Drought and climate change

Logistics – poor roads, aggregation systems

Over 75% of agricultural output is from small-scale, rain-fed farming or livestock production – industrial scale farming rare

80% of Kenya is classified as arid or semi-arid (ASAL);

Promising Feedstocks for Kenya

Criteria

- Can deliver significant volumes, reliably
- Sustainable including not competing with food
- Low cost – delivered cost of feedstock plus conversion costs
- Viable, transferable technology to Kenyan conditions
- Can provide social benefits – eg reward communities and help environment
- Increased potential of attracting investors – risk and reward

SAF Feedstocks for Kenya

Used Cooking Oil (UCO)

- Large volumes – high growth/energy dense
- Proven conversion technologies/can utilise existing petroleum infrastructure
- Sustainable/waste does not compete with food/improved environmental outcomes

Sugar Cane Tops

- Large volumes/NOT energy dense/region limited
- Conversion technologies still to be commercialised/some conversion tech certified
- Sustainable - does not compete with food/reward for farmer
- Medium to long term option requiring further study

Municipal Solid Waste

- Very large volumes/Not energy dense
- Conversion technologies still to be commercialised/some conversion tech certified
- Sustainable - does not compete with food/social and environmental outcomes
- Medium to long term option requiring further study

Water Hyacinth

- Medium to large volumes possible/region limited/low energy density/hi moisture
- Would help solve significant social, environmental and economic issues
- Difficult to harvest and process
- Long term option requiring in-depth study

Recommendation

It is recommended that focus be directed to waste-based feedstocks, namely, used cooking oil (UCO) in the short to medium term, and municipal solid waste (MSW), sugarcane field byproducts (cane tops) and water hyacinth in the long term.

All of these are available in significant quantities and are either already aggregated or localised in specific regions.

Recommendation

It is recommended that priority be given to UCO feedstock for a number of reasons:

- it is a waste available in significant volume and which grows rapidly, annually;
- new legislation encourages aggregation and beneficial reuse;
- there is a proven SAF conversion pathway certified for use in aircraft up to a 50 per cent blend and;
- there are social and environmental co-benefits through avoiding release to the environment and potentially providing an income stream to the community.

Why UCO?

HEFA biofuel production requires H_2 to hydrotreat the biomass.

Can potentially utilize existing petroleum refinery infrastructure

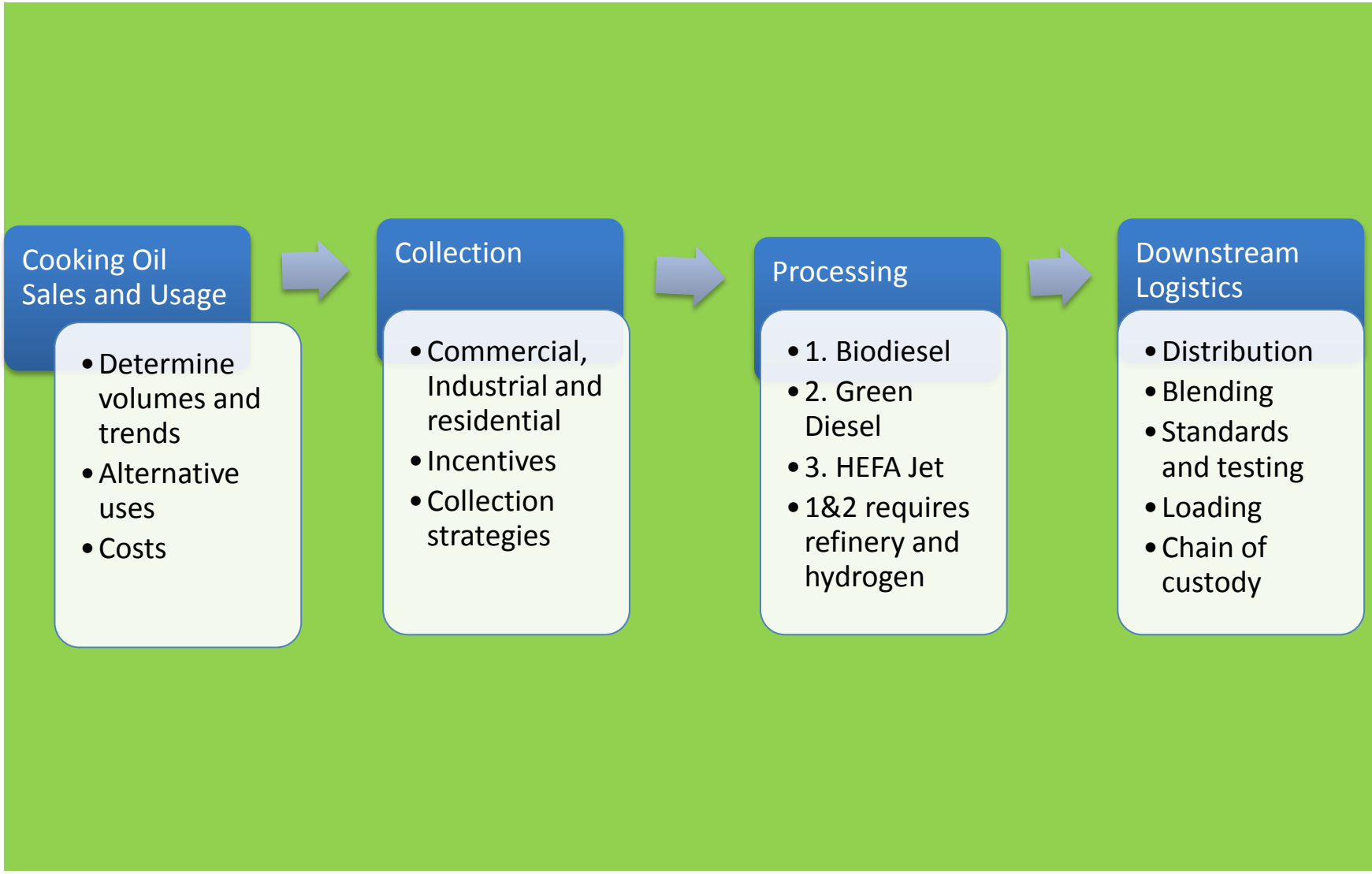
Boeing has been exploring the potential to blend HEFA-diesel in low concentrations with fossil jet since 2014. Expects ASTM certification in 2018.

Next Steps

The roadmap articulates a potential pathway(s) to achieving the objective of establishing a commercial SAF industry

The recommended focus is on UCO as it is a proven pathway as little research is required, rather it is a technology and logistics exercise

Key Steps in HEFA Jet Supply Chain



Roadmap for a Kenyan SAF Supply Chain to Meet International Aviation Requirements

This report puts forward a 10-year roadmap and action plan to mobilize stakeholders and resources, to institute favorable policy and legislation, and to systematically assess the technical, economic and sustainability aspects of each pathway in order to ensure that a de-risked, investible business case can be realized to allow a national SAF industry to be established

Aviation Environmental Working Group (AEWG)

Kenya Meteorological Department

Thank you for your attention.
Questions?

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