Future of Alternative Fuels in Dominican Republic

Instituto Dominicano de Aviacion Civil

5
Certified conversion processes to produce alternative fuels for aviation

4
Airports regularly blending alternative fuel with conventional aviation fuel

>100,000
Commercial flights have used a blend of alternative fuel

Content

- The Dominican Republic Action Plan on Emissions Reduction (DRAPER)
- The sustainability concepts
- Technologies for SAF production
- Feedstock
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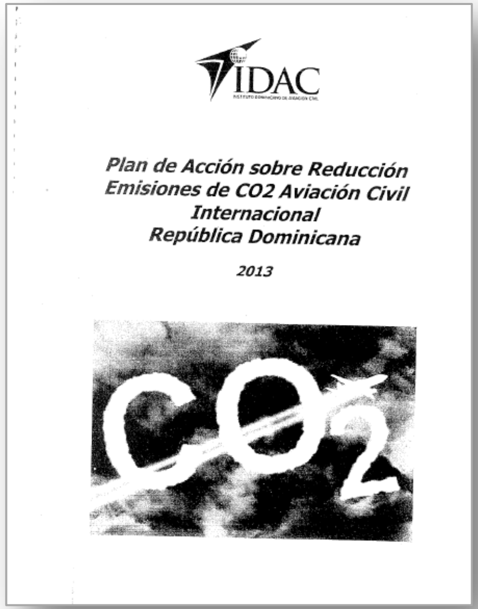
- Market barriers and solutions
- Blending mandate
- Benefits through economic development
- CO_2 emissions savings
- Stakeholders

Dominican Republic Action Plan on Emission Reduction (DRAPER)

2014



The ICAO – EU project has been providing continuous assistance for updating the plan in accordance with the ICAO Standards

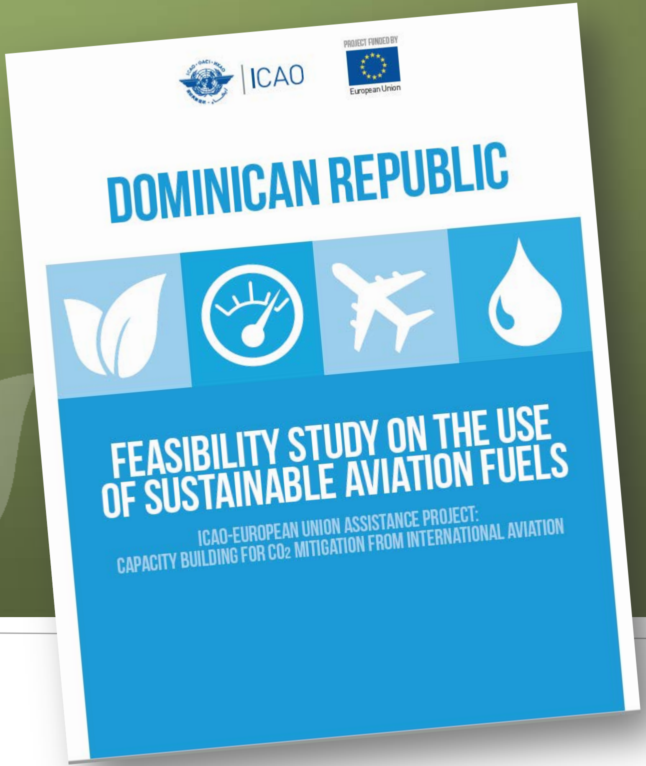
2015-2018

2019-2022

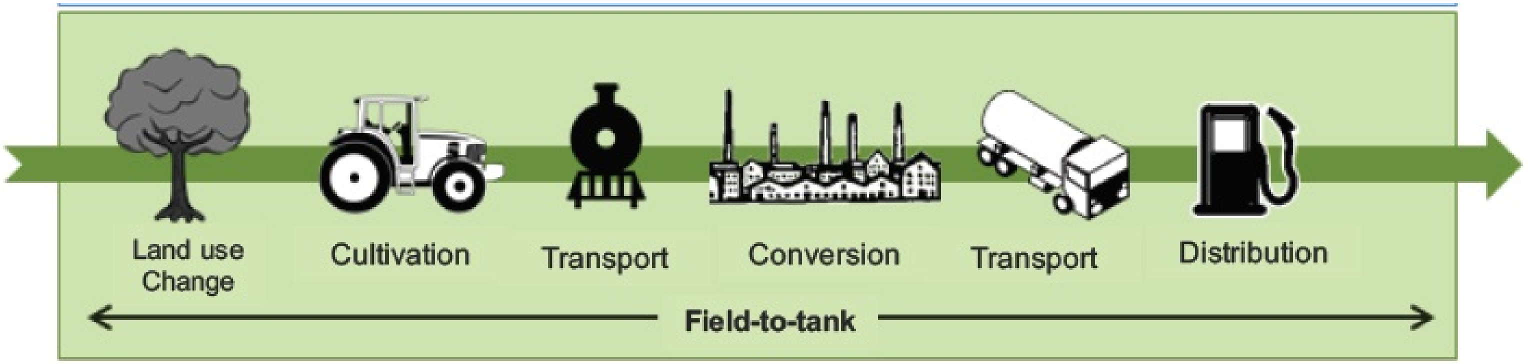
The new DRAPER will be available by June 2018

Initiatives on SAFs supported by the ICAO - EU project

Feasibility studies on SUSTAINABLE AVIATION FUELS ✓✓



Punta Cana Declaration (2016)



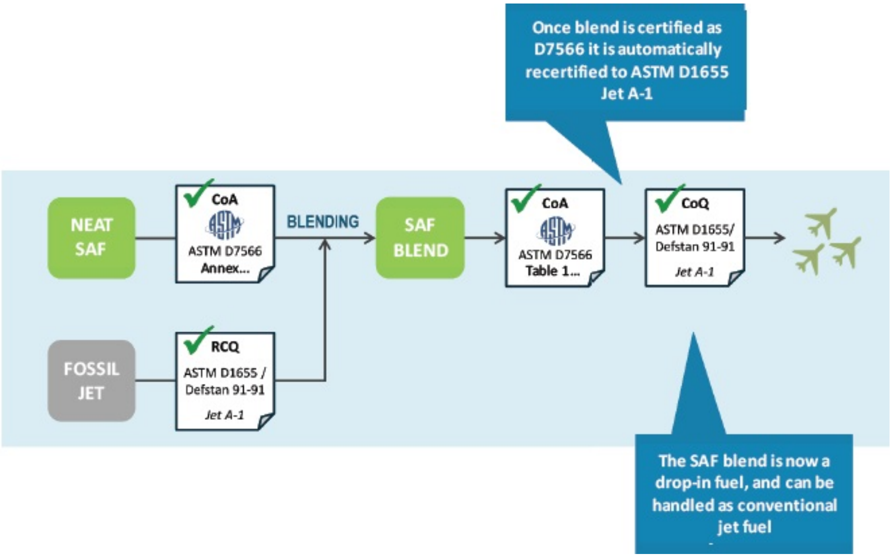
The multiple steps from feedstock production to final combustion of a fuel, constitute its life-cycle. To assess the emissions savings from the use of alternative fuels, a comprehensive accounting must be done of all emissions across all steps of the fuel's life-cycle, called a life-cycle analysis. If the total emissions from an alternative fuel are less than the total emissions from fossil fuel, there is an environmental benefit attributable to that fuel.

Technology for SAFs

Technology	Maximum Blend (v/v)	Feedstocks (examples)
Fischer-Tropsch (FT) & (FT-SKA)	50%	Wastes (as MSW, coal, gas, sawdust…
Hydroprocessed Esters and Fatty Acids (HEFA)	50%	Palm oil, camelina oil, jatropha oil, usedcooking oil…
Synthetic Iso-Paraffin (SIP)	10%	Sugarcane, sugar beet
Alcohol To Jet (ATF) (from Isobutanol)	30%	Sugarcane, sugar beet, sawdust, lignocellusic residues (i.e. straw)

FIGURE 4

Diagram showing the blending and use process for the synthetic fuels (in this case AAF) and the different quality standards AAF meets at different steps[18] (Source: ICAO).



Feedstock

One of the primary criteria for assessing the feasibility of the local production of alternative fuels relates to access to adequate feedstock. A stable, reliable and cost-competitive supply of sustainably obtained feedstock is key for any SAF production facility. When the feedstock can be produced locally, there are additional local benefits (wages, taxes, rural development, etc.) that are highly valuable.

Vegetable oils constitute the feedstock type that can most easily be converted into fuel.

Algae have not been considered as feedstock in this study, because production of fuel from this source has been found to be uneconomical in most bioenergy applications

In the Dominican Republic, accessible volumes of unused wastes, including municipal solid wastes (MSW), are not available in suffi cient quantities.

Evidenced by its historic production, despite of the current potential for the feedstocks mentioned above being limited, the Dominican Republic has a signifi cant potential for the production of SAF from sugarcane, that has being declining for the last 30 years

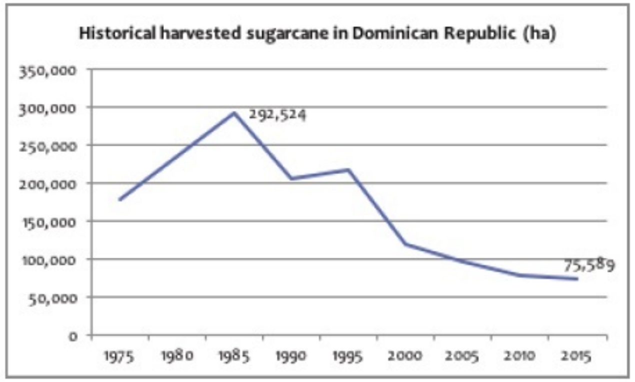


FIGURE 5

Changes in the surface of sugarcane crop considering the harvested sugarcane areas. Data obtained from INAZUCAR (www.inazucar.gov.do)

Regulatory Framework

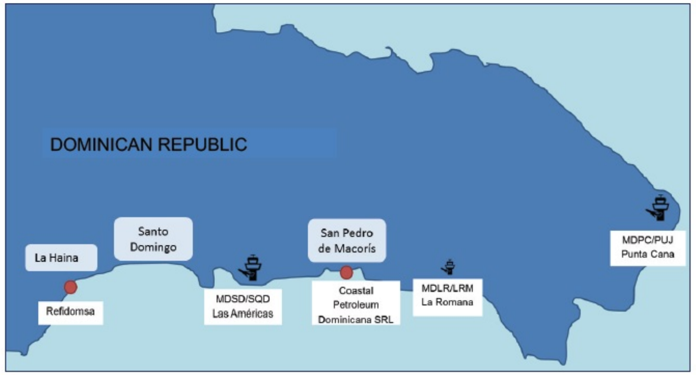
- The Dominican Republic includes in its regulatory system relevant laws and decrees concerning benefits and incentives for the production of alternative fuels and renewable energy.
- These correspond to a national strategy driven by energy dependence and the countries' vulnerability to climate change. The most representative regulations are the Law 57-07 on Incentives for renewable energies and special regimes, and the Decree 202-08.
- The Dominican Republic regulates prices and commercial margins for distributors of all hydrocarbons. This regulation helps to establish incentives and/or regulations for the introduction of alternative fuels, as stakeholders are already accustomed to a regulated market.

Jet Fuel Infraestructure

- From there, the aviation kerosene is transported to the airports' fuel farms by truck. At the major airports, the fuel is uplifted by hydrant systems available at some gates, while others need to be served by refuelling vehicles (tanker trucks). At the remaining airports, the fuel is served by refuelling vehicles.

- Each airport (group) in the Dominican Republic has a unique jet fuel supplier. This limits price competition, but as selling prices are regulated by the government, those managers consulted at major airports indicated that this system makes the management of the fuel supply simpler.

FIGURE 7
Location of the alternative import dock and storage owned by Coastal Petroleum Dominicana that could be available for JetA1.
Source: (Author)



Barriers and Solutions

Market Barriers

- Usually, AAF production depends on feedstocks that are indexed commodities. This means that commodities' prices are dependent on market competition arising from uses other than AAF production.
- Some cosmetics, plastics, chemicals or even road fuels in strongly environment-regulated markets, such as in the United States or the European Union, usually have a higher selling price than jet fuel.
- In general, it is expected to be challenging for AAF to reach price parity with the price of conventional jet fuel even if production costs can be lowered, and regardless of the fossil fuel price, because when the cost of fossil fuel rises again, commodity prices will likely increase as well.

- Solutions:
  - Confine the value chain. Restrict, by contract or regulation, the final destination of the possible final products to AAF fuel.
  - Use feedstocks and inputs that are not commodities (like some wastes). Here, neither the feedstock nor the intermediate products have a potential market other than AAF.
  - Using low volume/high value chemicals to compensate price changes. Some high value chemicals could be produced during the refining process (saleable by-products as financial supporters to the global business case).
  - Subsidizing. The market inefficiency in the form of a price gap can be offset through governmental support.

Benefits Through ED

- It is expected that an increase in the development of sugarcane production in the Dominican Republic would imply, directly and indirectly, various benefits for the country.
- These benefi ts can be summarized according to the tax revenues generated on imports (materials, machinery), on the generated added value, incomes from farmers and workers at the mills, transport, and storage.
- Considering that a farmer could economically depend on sugarcane production with a minimum of 8 ha, the direct employment could increase (without considering the transport, mill or later processing) to at least 3,000 stable jobs in 2050.

Making a Cleaner Aviation | Feasibility Study

ICAO

DRWG7 | Alternative Fuels

Research on Alternative Fuels

- ❑ Feasibility studies on Bio fuels
- ❑ Incentives
- ❑ Partnerships

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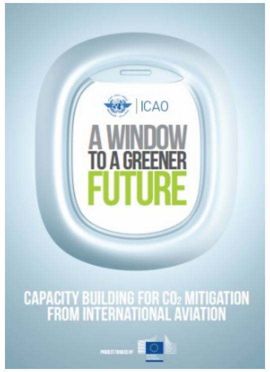

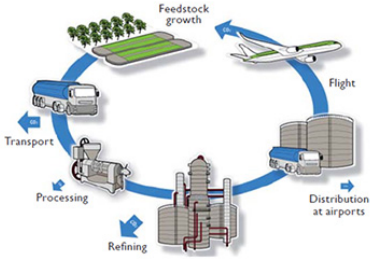

Emissions Savings

TABLE 3
Savings of CO2 equivalent due to the use of AAF according to the two different blending roadmaps analysed in the case study using a theoretical maximum GHG savings of 80%.

Pathway		2020	2030	2050
ATJ	Targeted blend %	5.0%	7.1%	29.3%
	GHG savings (t CO_{2eq})	63,281	104,983.07	795,259.03
SIP	Targeted blend %	1.0%	1.4%	5.9%
	GHG savings (t CO_{2eq})	12,656	20,996.61	159,051.81


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Stakeholders

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Presidencia de la República Dominicana
Consejo Nacional para el Cambio Climático y el Mecanismo de Desarrollo Limpio

IDAC – Instituto Dominicano de Aviación Civil

Ministerio de Energía y Minas – República Dominicana

MIC – Ministerio de Industria y Comercio – República Dominicana

Comisión Nacional de Energía – Somos lo que creemos

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DIGENOR

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Aerolineas MAS

SAP Group

PAWA Dominicana

Dominican Wings

Helidosa Aviation Group

ACSA – Air Century, S.A.

Food and Agriculture Organization of the United Nations

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Aviation making a better tomorrow.....Today

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