

# AIRBUS



## Global SAF initiatives

**NISA** Workshop  
Nordic Initiative for Sustainable Aviation

Tuesday November 20, 2018 - Copenhagen



# Sustainable Aviation Biofuels: how to make them economically viable?

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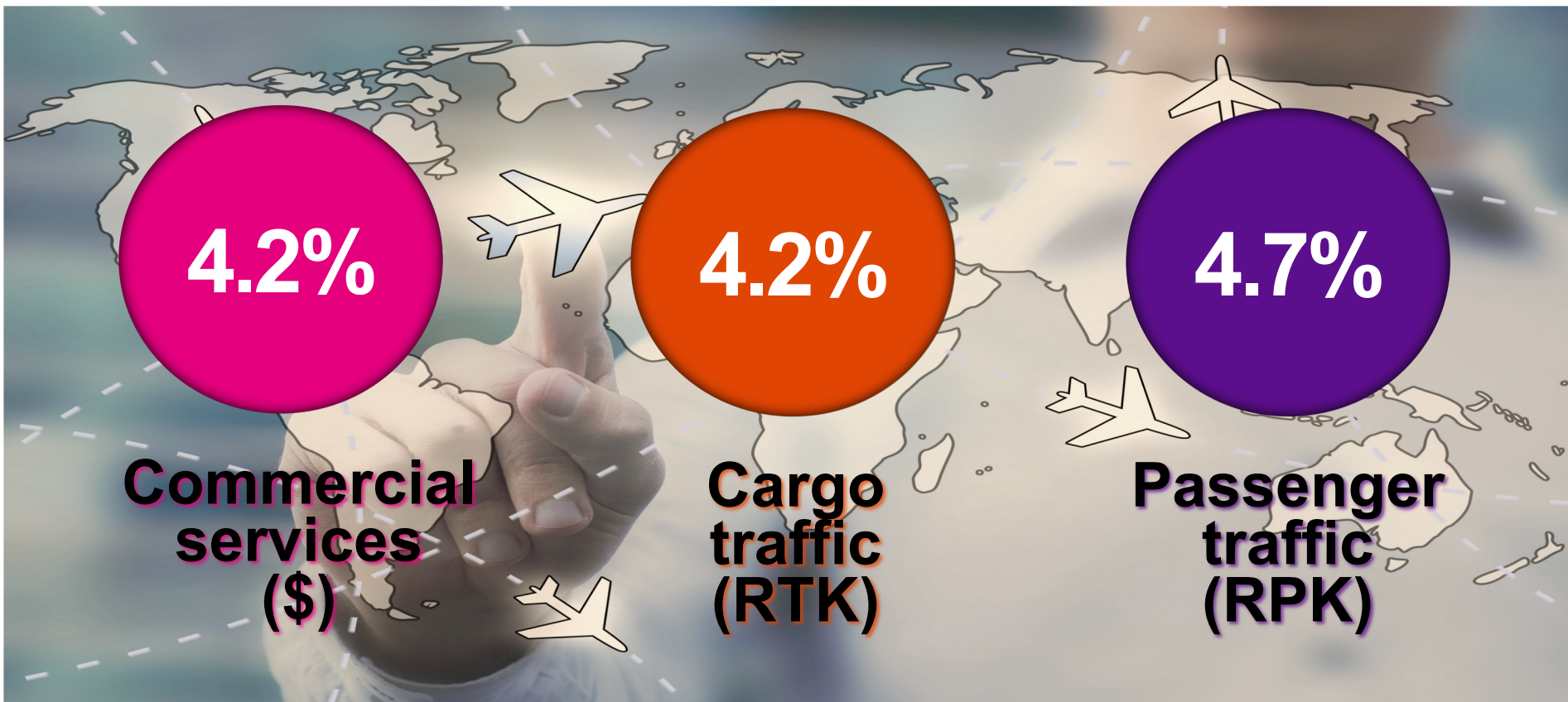
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# **Global Aviation : A Growing Market with Environmental Commitments**

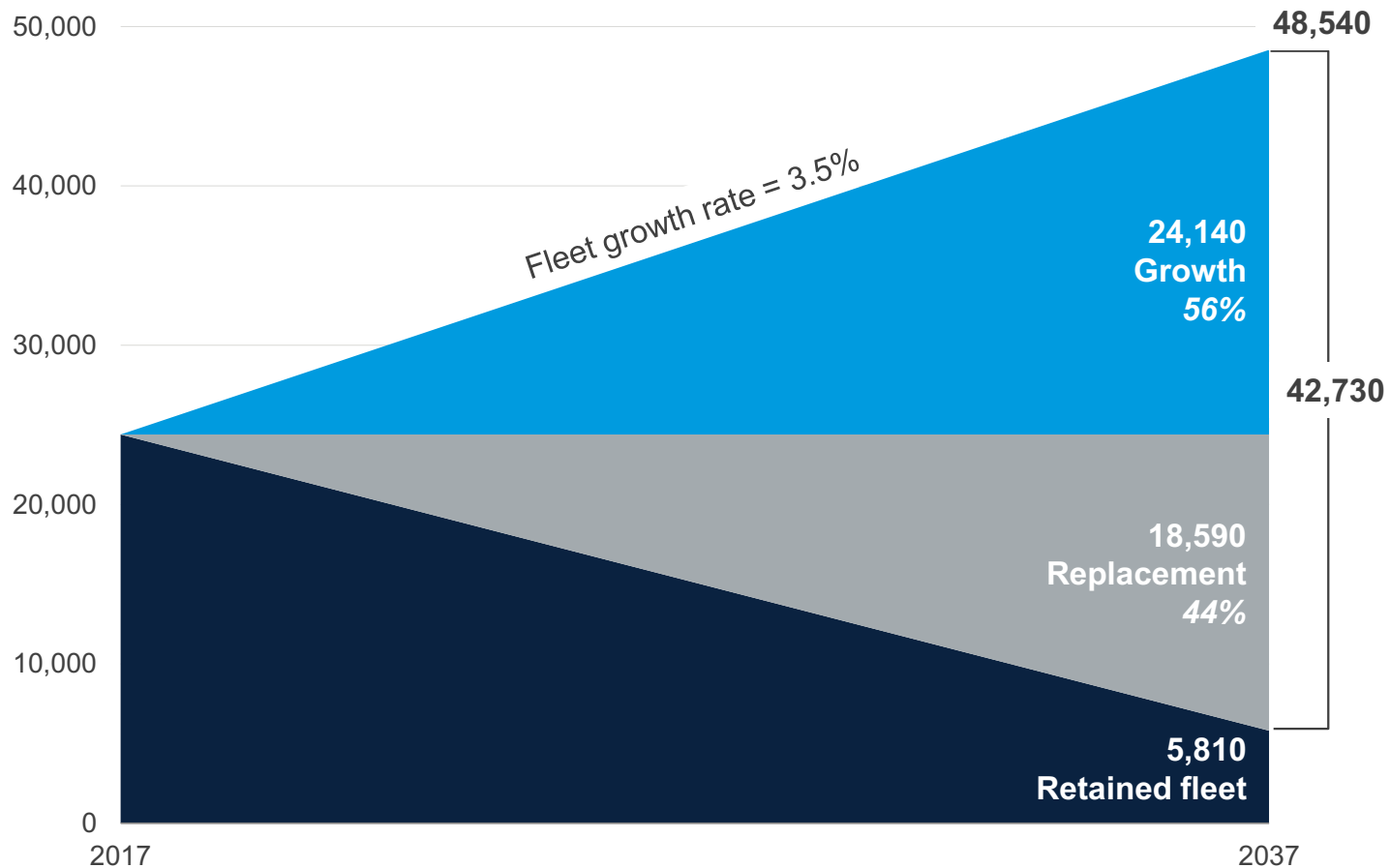
# Aviation Market Outlook 2018-2037



**Resilient market expected to continue long-term growth rate of 5%**



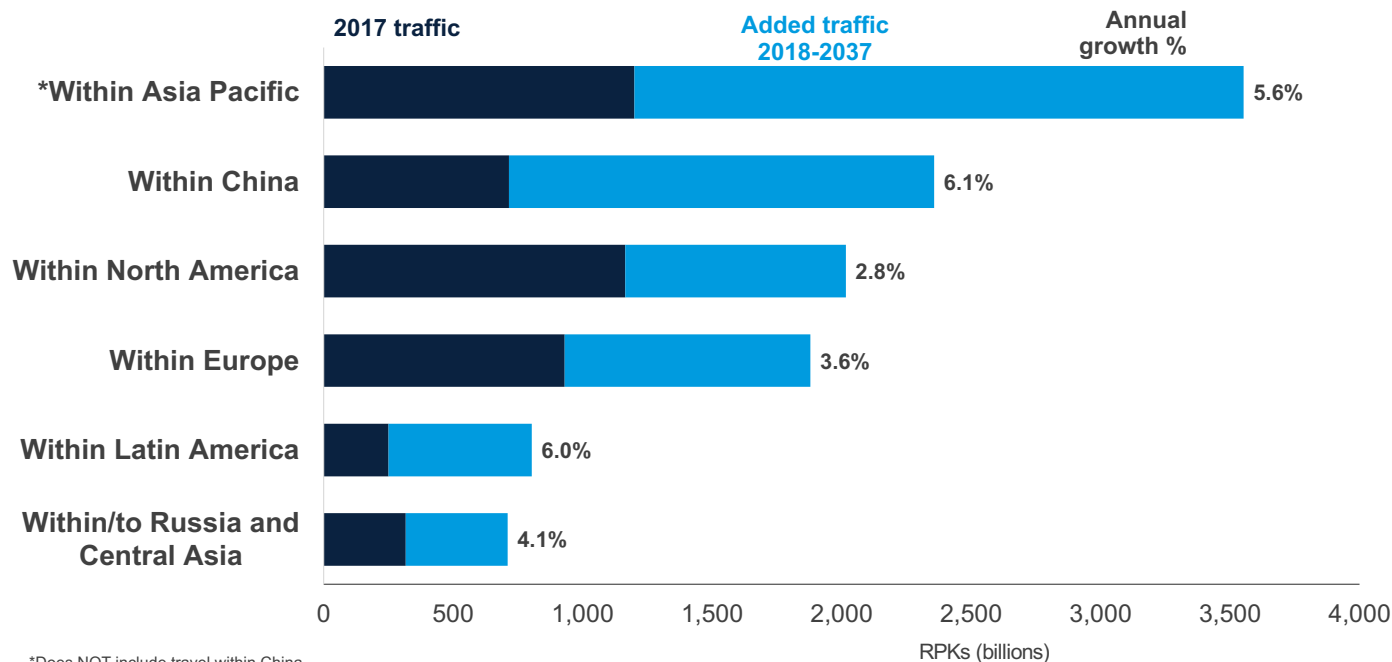
# Current world aircraft fleet will double in size



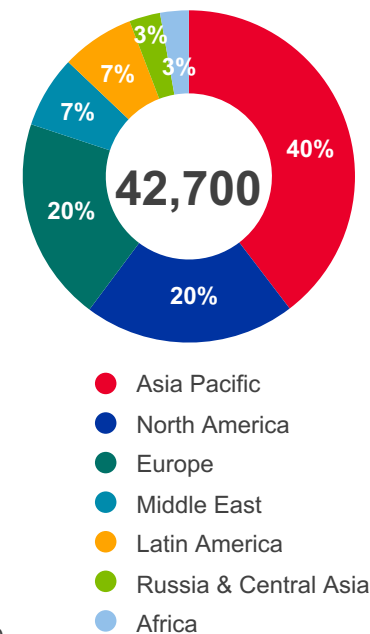
**Airlines will need 42,700 new airplanes valued at \$6.3 trillion**

# Asia Pacific region driving the demand for new aircraft

## Air travel growth by market



## New airplane deliveries by region

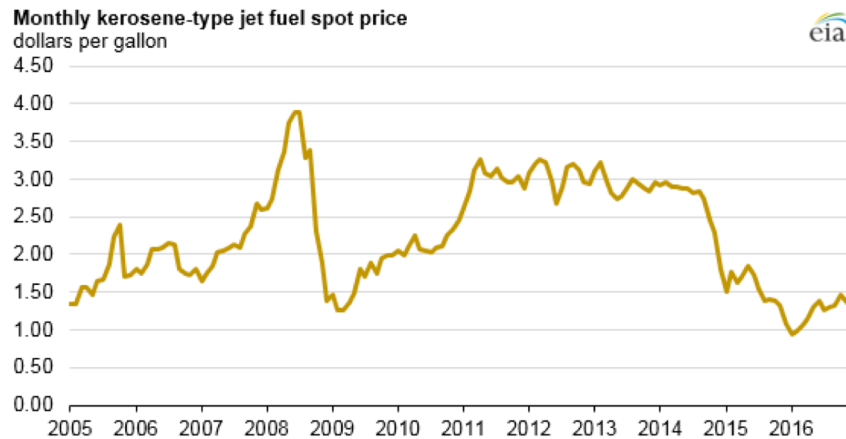


**North America & Europe will account for 40% of new airplanes deliveries**

# Growth of traffic will impact economic and environmental sustainability

## Costs Issues

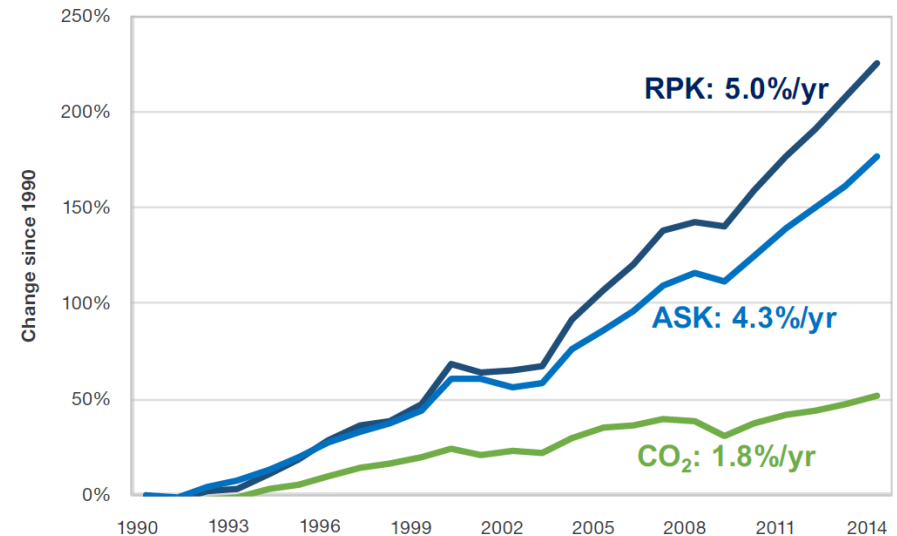
“Fuel Bill” is a major, unpredictable and variable operating cost for airlines



Source: <sup>1</sup>IATA Fact Sheet – Fuel, June 2017, figures: U.S. Energy Information Administration, [Spot Prices for Petroleum Oil and Petroleum Products](#), February 2017

## CO<sub>2</sub> emissions Issues

Aviation share of CO<sub>2</sub> emissions could grow without action



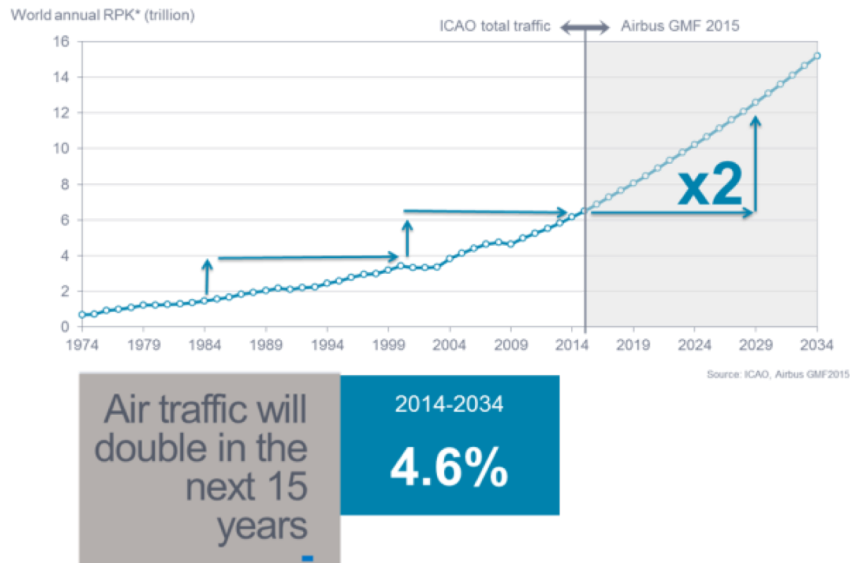
Source: Boeing Commercial Outlook 2018 - 2037

# AIRBUS

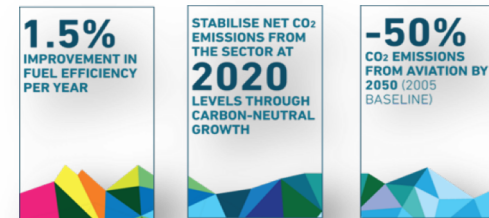
**Policy (EU RED II, CORSIA)**

# Context

**Aviation growth** raises more and more **environmental challenges...**



**Aviation Industry is committed to ambitious targets...**

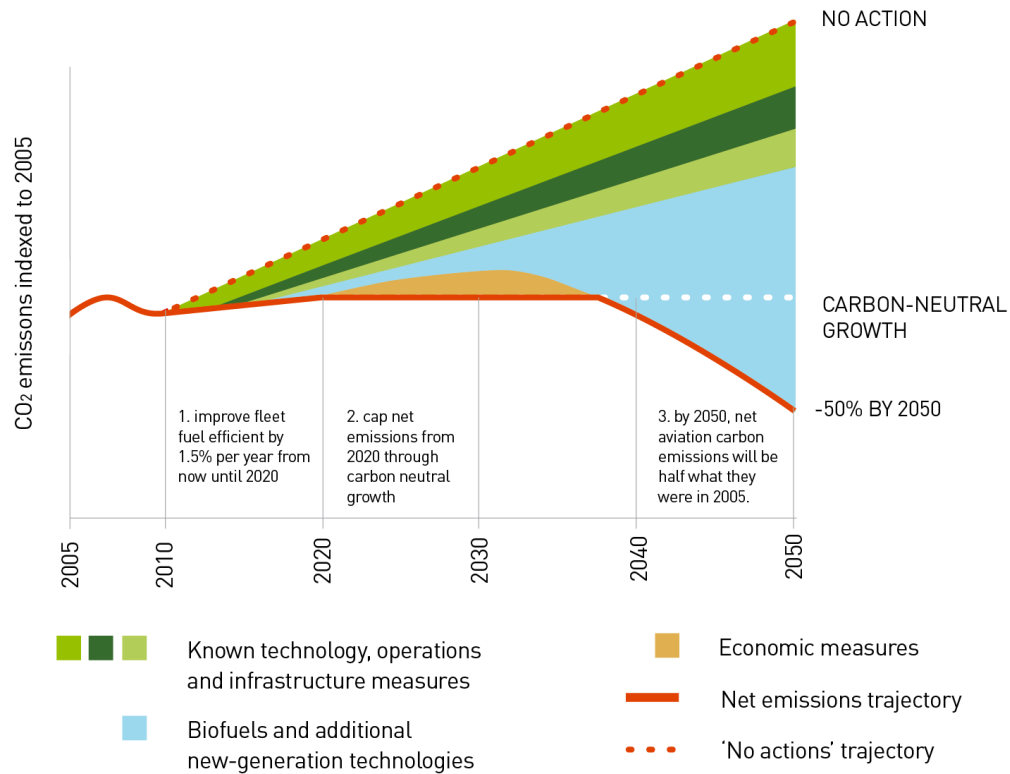


and has identified the **basket of measures...**



**Sustainable Fuels are a key pillar to reach the targets**

# Aviation GHG reduction Targets



# CORSIA Main elements

The **CORSIA** (**C**arbon **O**ffsetting & **R**eduction **S**cheme for **I**nternational **A**viation) is the **first ever global scheme** to offset international emissions over 2020

- Objective:
  - Complement a broader basket of measures to achieve the **global aspirational goal** (of carbon-neutral growth from 2020 onwards).
- Coverage:
  - The offsetting requirements is set on the basis of a **route based approach** (e.g. a route is covered if both States connecting the route are participating in the scheme), but **all emissions need to be reported**





# CORSIA Main elements

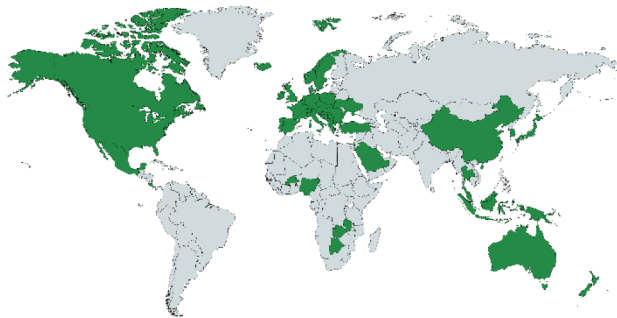
- Implementation:

“Phase-in” and route approach: determines the routes with offsetting obligations.

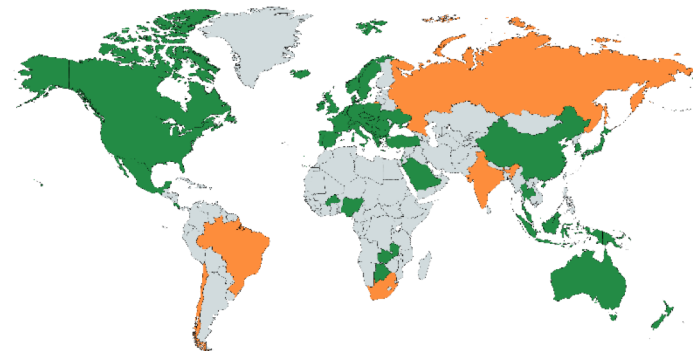
Starting with participation of States on a voluntary basis, followed by the participation of all States (except the exempted States) → 72 States (As of 23 August 2017) representing more than 87.7% of international aviation activity, intend to voluntarily join from its outset

- .....HOWEVER.....

All states, will need to implement and require MRV compliance

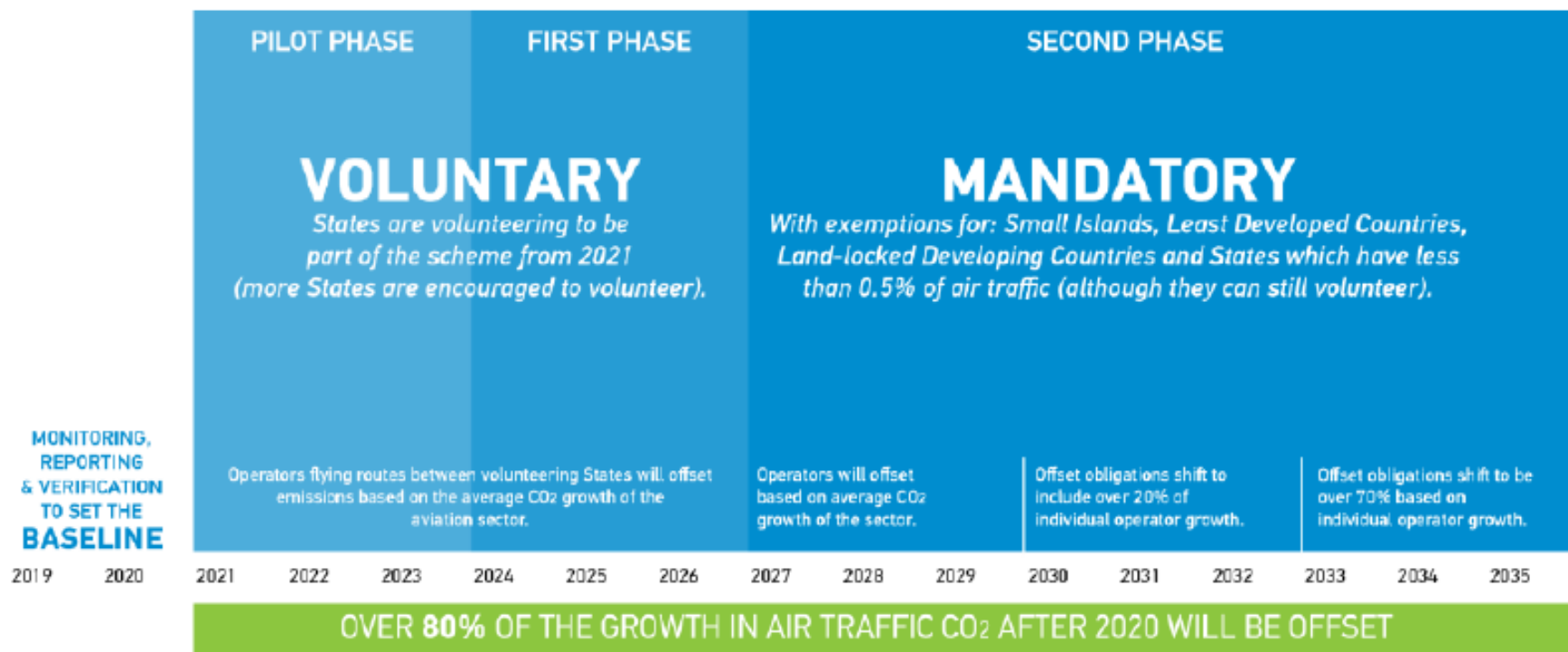


**2021-2026 (Voluntary Phase)**



**2027-2035 (Mandatory Phase)**

# CORSIA roadmap

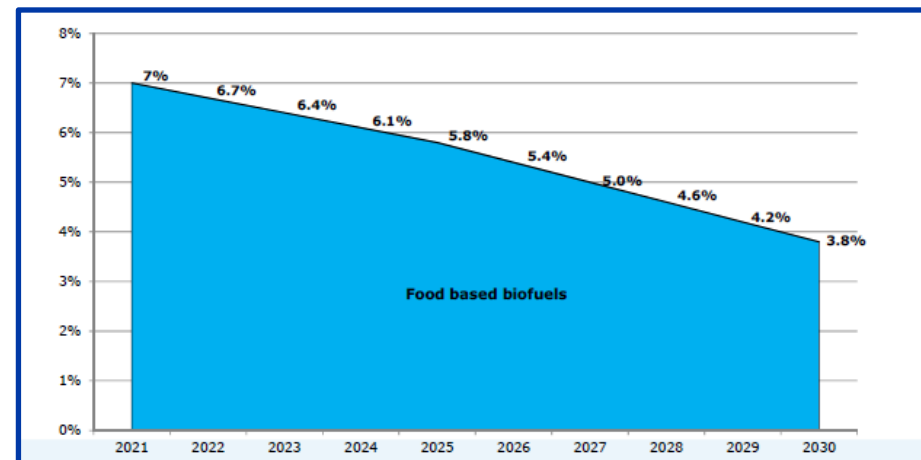
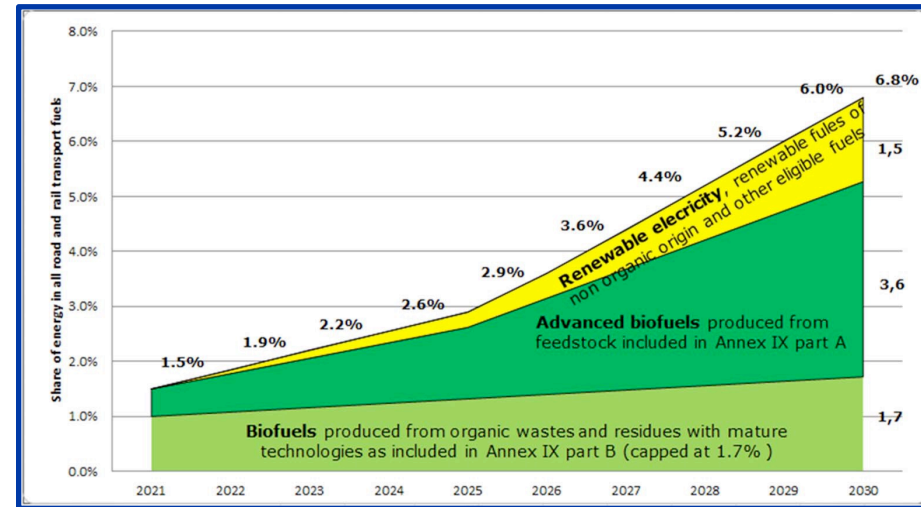


# CORSIA implementation

WHO	WHAT	WHEN
Airline Operations > 10,000 tonnes CO2 international aviation  * excluding: humanitarian, medical and firefighting	MRV CO2 All International flights	Annually from 2019
	Offsetting CO2 flights between participating States	Every three years from 2021

# REDII – Renewable Energy Directive

- Directive project “post 2020”
  - Agreement between Commission, Council, Parliament
  - The aviation sector is explicitly part of the directive
- Objectives
  - 14% of renewable energy in 2030 including
    - Food based feedstocks: 7% to 4% cap in energy content
    - Annex IX part A: 0,2% in 2022, 1% in 2025 and 3,5% in 2030
    - Annex IX part B: 1,7% cap in energy content
  - Double counting for annex IX feedstocks (part A & B)
  - Multiplier 1,2 for Aviation only if it comes from non food based feedstocks.



# Sustainable Aviation Fuels in CORSIA

To be eligible in CORSIA, Sustainable Fuels must:

- Reduce the CO<sub>2</sub> emissions at source on a 89g CO<sub>2</sub>e/MJ reference – the threshold is 10% for CORSIA.
  - CO<sub>2</sub> reduction is calculated for each type of SAF used
  - Reductions are proportional vs. Performance of conventional fuel (effective gain calculated on supply chain LCA)
  - LCA calculation includes:
    - Direct emissions all along the supply chain
    - Indirect emissions (ILUC)
  
- Be eligible:
  - Comply with sustainability criteria defined in the SARP document « *CORSIA Sustainability Criteria for Sustainable Aviation Fuel* »
  - Have been certified by a certification standard « *Sustainable Certification Scheme* » approved by ICAO and included in the document « *CORSIA Approved Sustainability Certification Schemes* »

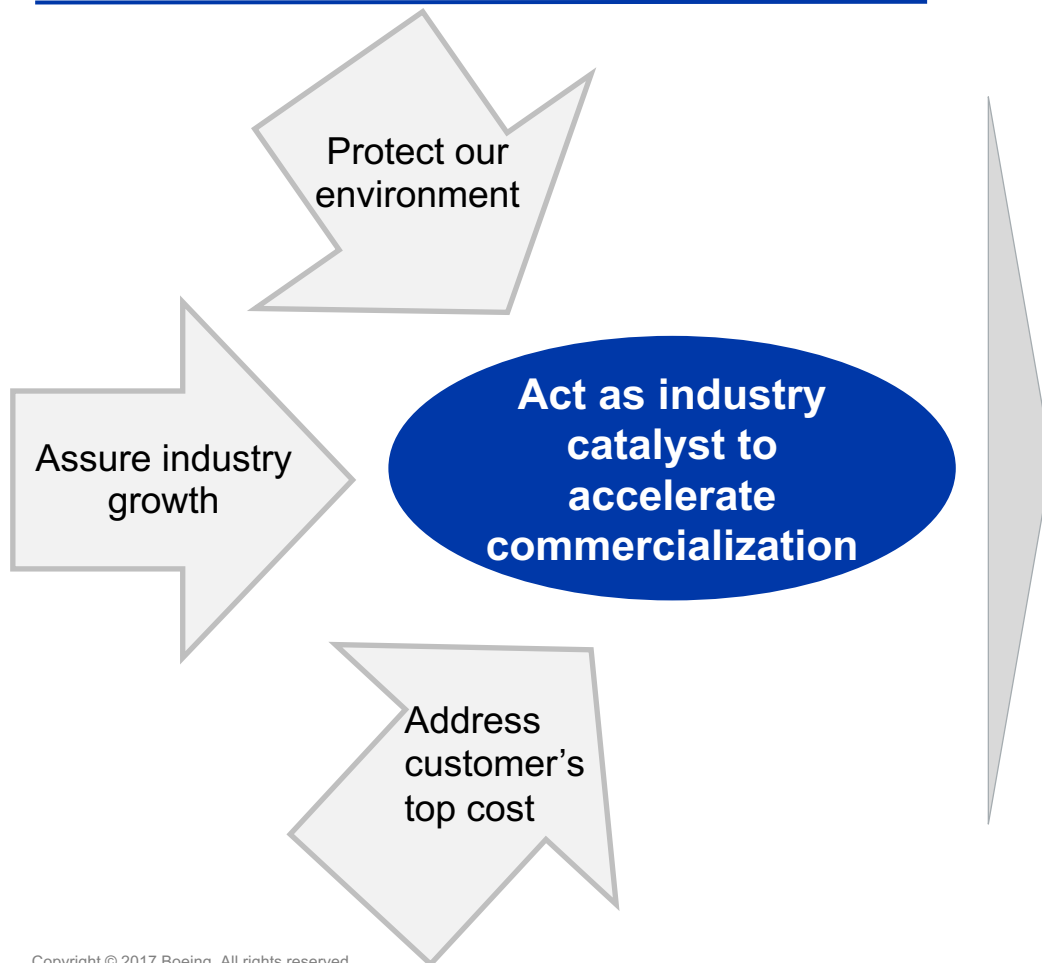


# How to make SAF value chain economically viable

# Boeing Strategy and Actions

Ultimate goal is to catalyze a vibrant commercial market

## Boeing's Role



## Core activities

**Fuels approval**



**Support and Advocacy**



**Feedstock and Pathway R&D**





# Economic viability: sweet spot in a local environment

Take advantage of specific features of a given ecosystem

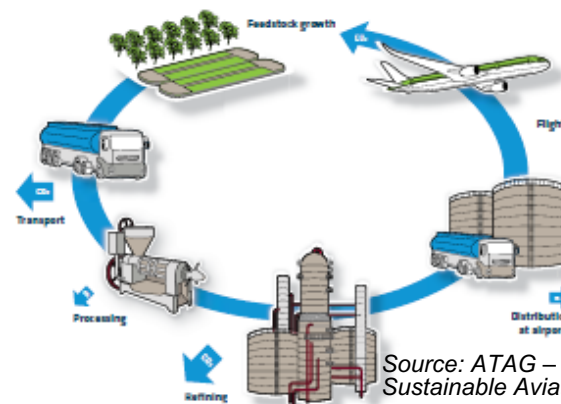
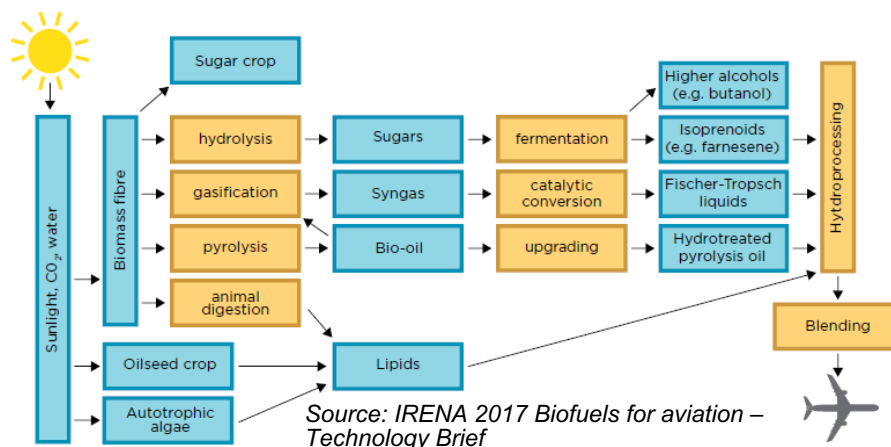
## Find a sweet spot

- Feedstock
- Technology and processing
- Molecule properties

## By leveraging local environment

- Strategic stakes
- Regulations and market measures
- Existing infrastructure

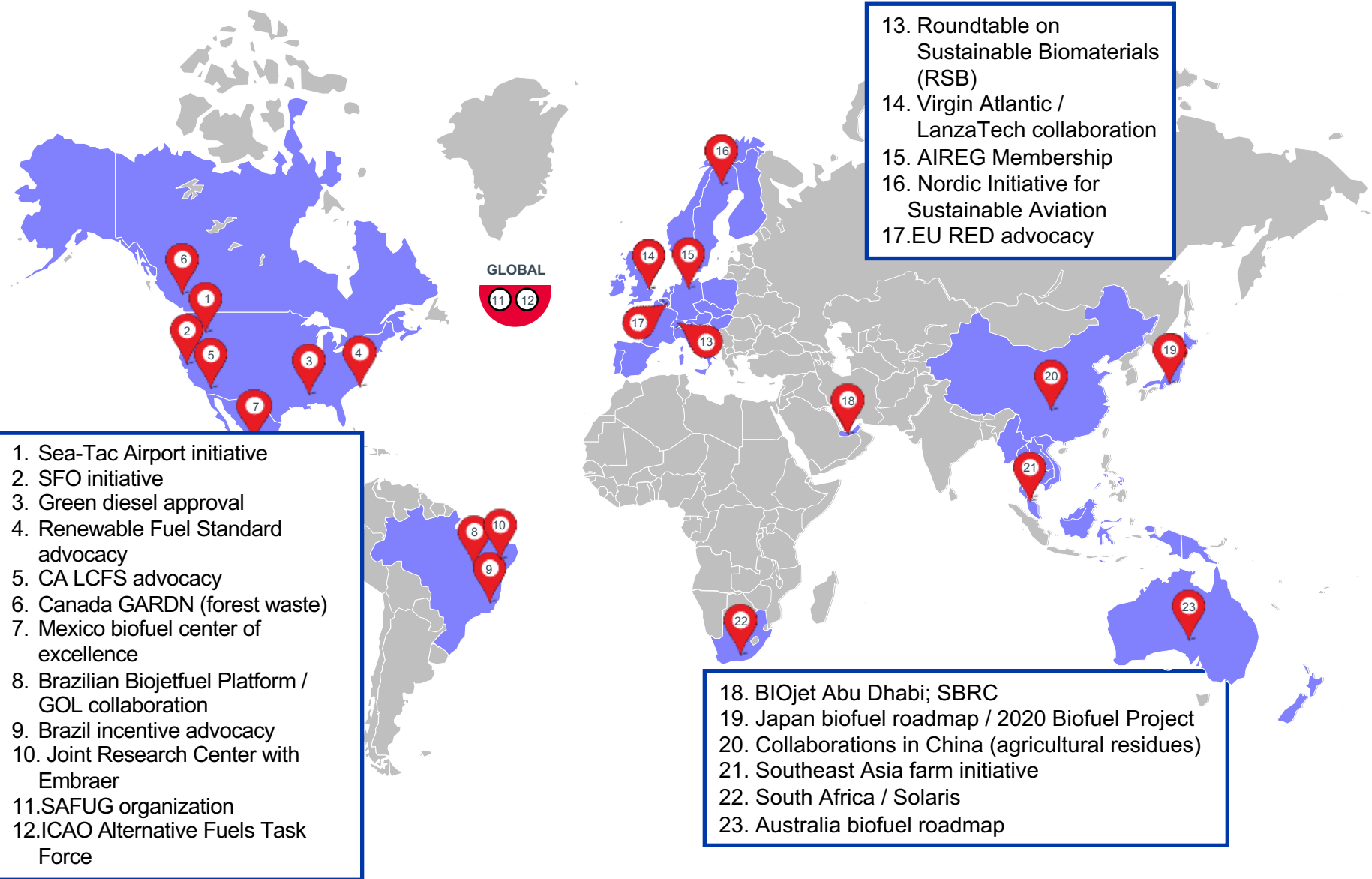
## While meeting strict sustainability criteria





# Boeing Global Biofuel Engagements

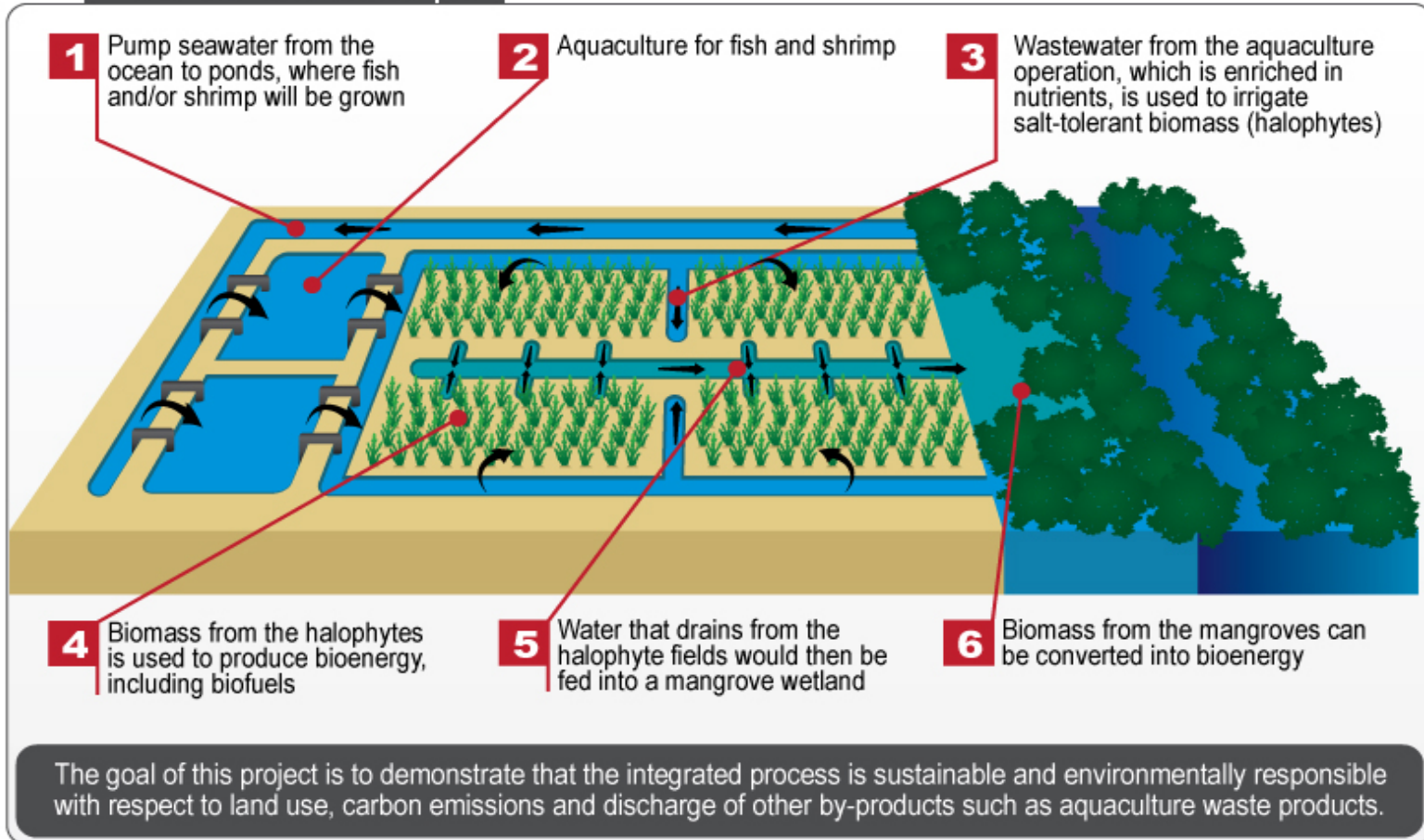
Accelerate biofuel market viability to shrink aviation CO<sub>2</sub> footprint



# UAE – Combining Food and Energy

## SEAS Concept: Seawater Energy and Agriculture System

### The ISEAS concept



# UAE – Combining Food and Energy

SEAS Concept: Seawater Energy and Agriculture System



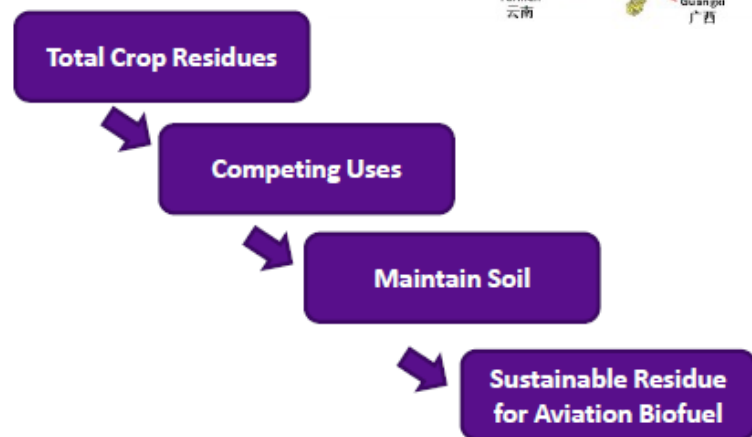
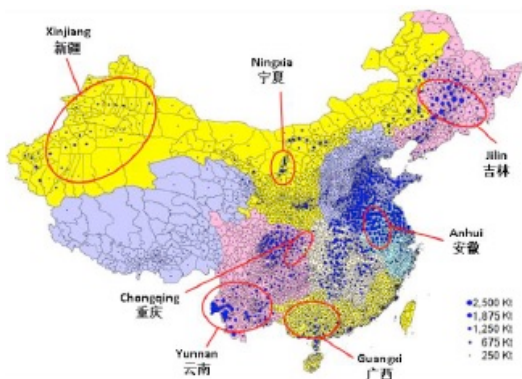


# China – Agricultural residues potential

Huge capacity, yet severe air pollution

## Feedstock availability

Evaluation of collectable quantity based on retaining soil sustainability



## Conversion technologies

Process assessment and technical optimization

Collaboration with Guangzhou Institute of Energy Conversion

- Lab-scale feasibility demonstrated
- 2 pilot plants built
- Techno-economic analysis performed



**Pilot Plant (Yingkou, Liaoning)**  
**Capacity: 165 gallons/day**

# Brazil – Untapped potential for aviation biofuels

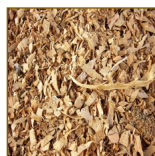
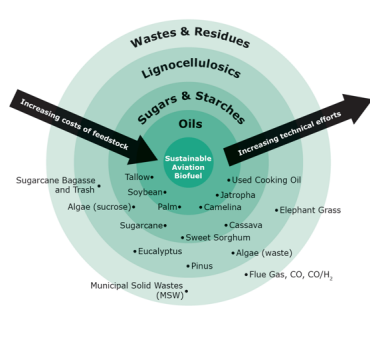
Collaboration with Brazilian stakeholders to assist in the identification and development of value chains

## Brazil, the “biomass country”

0.5% of Brazil’s territory replaced 1/3 of its gasoline needs

## Joint Research Center with Embraer

Projects dedicated to better understand the feasibility of aviation biofuels in Brazil



Eucalyptus



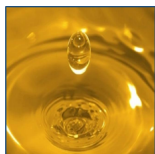
Macaba



Sugarcane Ethanol



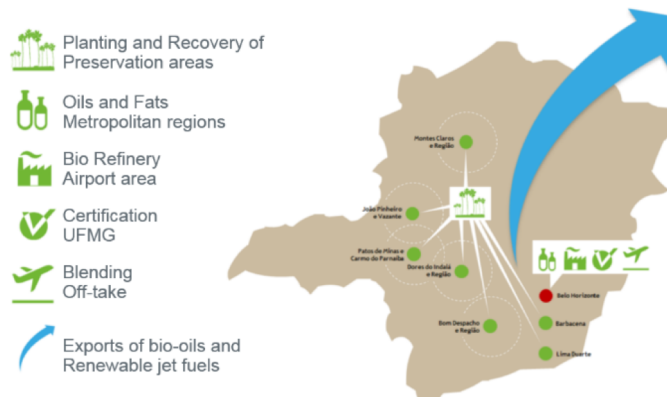
Halophytes



Soybean oil



Sugarcane Bagasse



Kerosene price among the highest in the world, supplied in remote areas

2017 USD\$ (av.): >1.2 Brasilia vs. 0.6 Madrid



**Boeing is committed to partnering for a better future**





# AIRBUS

Airbus' specific projects  
&  
Conclusion

# Airbus Collaboration Strategy

- Policies, regulations and guidelines
- Sustainable growth
- Business development
- Social and environmental responsibility

## Key external Drivers

### Airline Environmental Strategy

- Position on climate change
- CSR
- EMS
- Cross-industry partnership
- Communications

Aircraft technology

Aircraft Operations

Air Traffic Management

Sustainable aviation fuels

CORSIA



**AIRBUS** Expertise

Transverse and Collaborative Initiatives

Sustainable Aviation Engagement Programme

## SAEP

The SAEP integrates the 5 pillars into one single strategy

Based on the main aviation drivers and airlines' environmental strategy

Using Airbus expertise

# SAEP Status & Main achievements

- ✓ In 3 years of Programme
- ✓ 8 airlines engaged so far
- ✓ 11 projects in place



## SAEP collaboration projects 2015-2017



**British Airways**

-  
A380 Noise improvements at LHR

-  
with EPA & Navblue



**Garuda Indonesia**

-  
CORSIA implementation

-  
VERTIS

**China Airlines**

-  
A350 Deliveries with alternative fuels

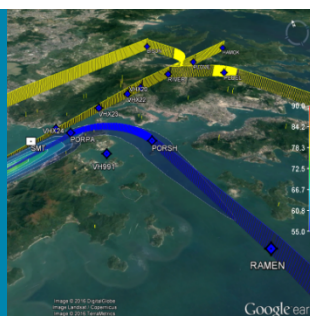
-  
with Total



**Cathay Pacific**

-  
A350 Noise improvements at HKG

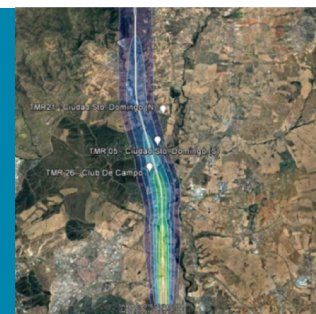
-  
with NavBlue



**Iberia**

-  
A330 & A320 Noise reduction in MAD

-  
with NavBlue



**Cathay Pacific**

-  
A350 Deliveries with alternative fuels

-  
with Total



**Cathay Pacific**

-  
A340 recycling

-  
with Tarmac

# SAEP collaboration projects in 2018



Thailand  
-  
CORSIA  
implementation  
-  
VERTIS

Iberia  
-  
Zero cabin  
Waste  
-  
with Iacobucci



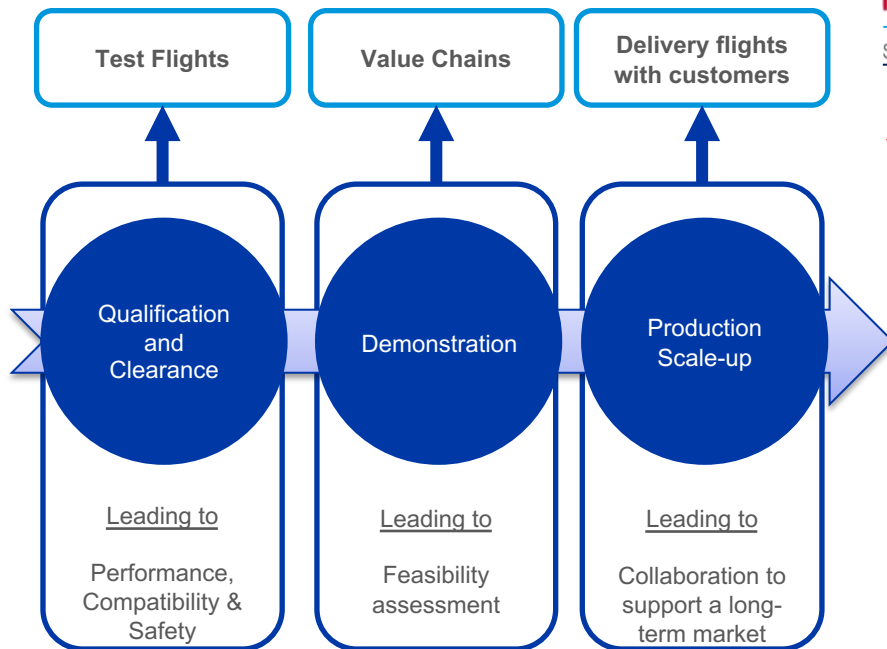
Iberia  
-  
A350 Deliveries  
with alternative  
fuels  
-  
with Total

Jetblue  
-  
A320s  
Deliveries with  
alternative  
fuels  
-  
with SkyNRG

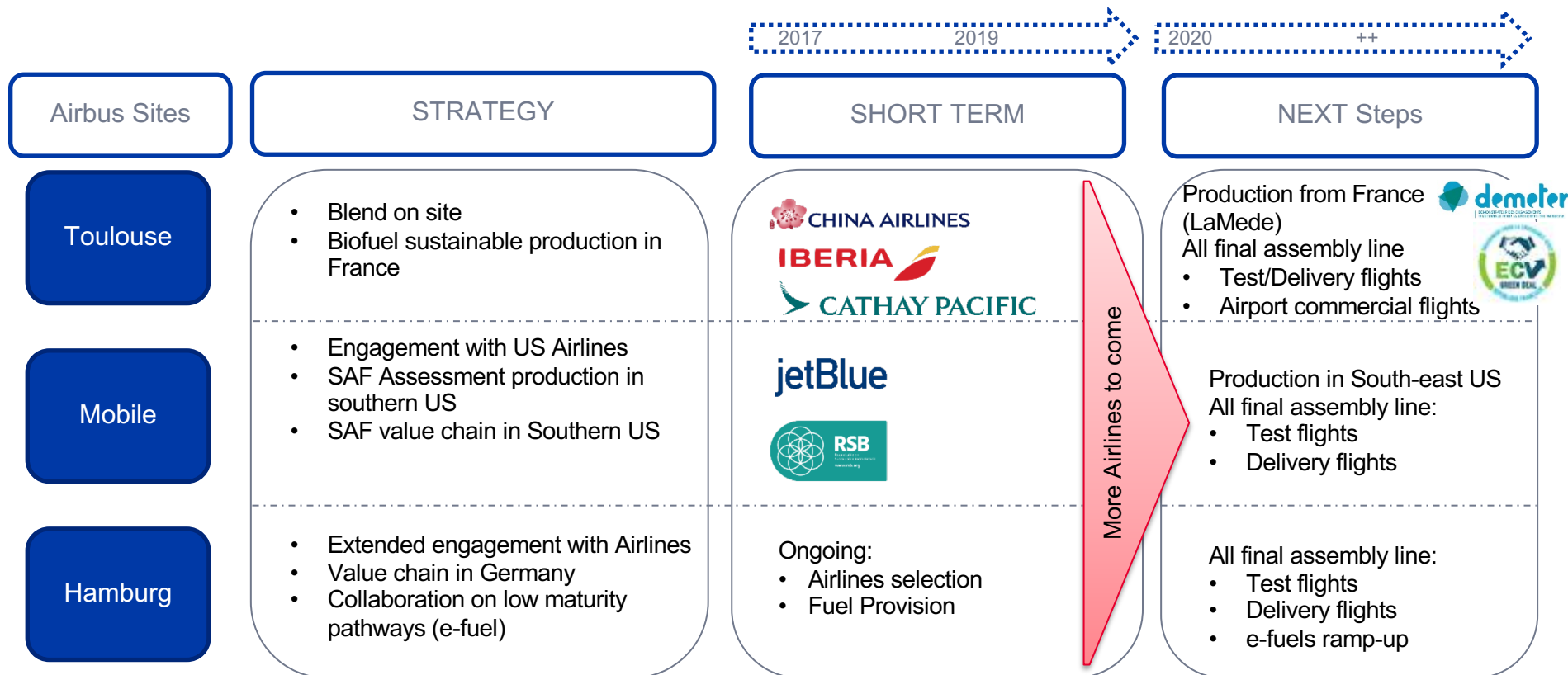


# Sustainable Aviation Fuels : The AIRBUS experience

- ☆ Flight
- Feasibility study
- Local Bodies
- Airbus sites

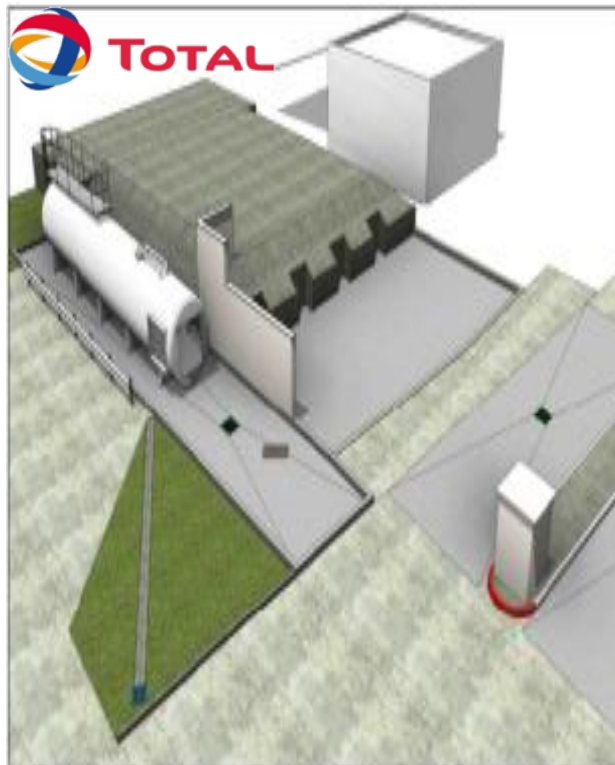


# Sustainable alternative fuels strategy & portfolio of projects





# The SAF delivery platform in Toulouse



1. 50 m3 storage capacity of pure Biojet
2. Fully connected to the existing fuelling facility
3. 10% SIP\* blend done on a monthly basis
4. Transparent aircraft fuelling operations
5. Quality checks performed regularly on samples (JET-A1 ASTM compliance)

\*Synthesized Iso-Paraffins



**Cathay Pacific**

-  
A350 Deliveries  
with alternative  
fuels (48)

**China Airlines**

-  
A350 Deliveries  
with alternative  
fuels (4)



**Iberia**

-  
A350 Deliveries  
with alternative  
fuels (1)

And more to come in 2019...

# The SAF initiative in South-east US



- **Project 1 : Airlines Delivery flights**
  - 1<sup>st</sup> Flight performed from Mobile (Alabama) on Sept19th – Total of 10 flights (acceptance & ferry) in 2018
  - 15,5% blend UCO Fuel supplied by AirBp
- **Project 2 : Regular flights from Mobile with fixed level of SAF blend (all Airlines)**
- **Project 3 : SAF production from South-east US**
  - Assessment of potential feedstocks done with RSB
  - Potential production volumes under investigation with local stakeholders

# Conclusion

- Strong partnerships based on a comprehensive approach is key to address environmental challenges
- The use of Sustainable Aviation Fuels is demonstrated
- SAF are now in a phase of Industrialization and Ramp-Up even if volumes are low
- Industrial Partnerships are more and more a reality
- Airports (BioHubs) and States (incentives and regulations) take action to support industry and to promote Sustainable Fuels
- Airbus takes his part to support its customers through concrete projects and extended partnerships

Thank you