ICAO ENVIRONMENT

ACT-SAF #11 SERIES

Implementing ICAO Global Framework – Step-by-step examples of SAF policy making

6 May 2024

1. Opening

Mrs. Jane Hupe
Deputy Director
ICAO Environment

Objectives

Provide participants with real-life examples of step-by-step SAF policy making and the processes to get there

ACT-SAF Series #11 Speakers

Ewa Oney

Team Leader at European Commission

European Union

Darlan Silva Dos Santos

Technical Advisor

ANAC

Brazil

Prem Lobo

Energy Division Manager

FAA

United States of America

Agenda

- Opening remarks by ICAO
- ICAO update on ACT-SAF activities
- Presentation by Directorate General for Mobility and Transport (DG MOVE) of the European Commission
- Presentation by the National Agency for Civil Aviation (ANAC) of Brazil
- Presentation by the Federal Aviation Authority (FAA) of the United States
- Questions and answers with the audience
- Closing remarks by ICAO

ICAO update on ACT-SAF programme

ACT-SAF newsletter provides useful updates on SAF developments

ICAO ENVIRONMENT

ACT SAF Newsletter

April 2024

The "**ICAO Assistance, Capacity-building and Training for Sustainable Aviation Fuels (ACT-SAF) programme**" Programme is supporting States to develop their full potential in SAF, through specific training activities, development of feasibility studies, and other implementation support initiatives.

For more details on ACT-SAF click here

ICAO ACT-SAF Series

The ACT-SAF Series offers training sessions held on a monthly basis. It delivers comprehensive training to ACT-SAF Partners on an array of important SAF-related topics, ranging from sustainability, to policy, economics/financing certification and logistics.

Ten ACT-SAF Trainings have been delivered to date, and are available on the ACT-SAF Series website, and ICAO.TV .

ACT-SAF Series – List of Training Sessions

ICAO ACT-SAF SERIES

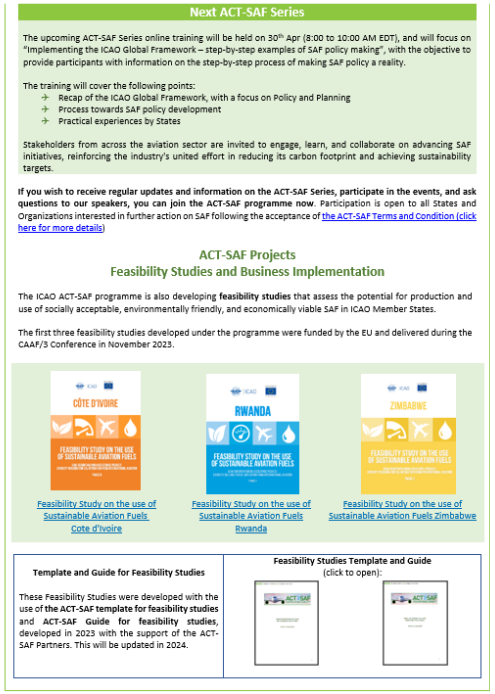
#1 – An introduction to SAF
#2 – SAF Sustainability and Reporting under CORSIA
#3 – SAF technology and certification
#4 – SAF Policies
#5 – SAF conversion processes
#6 – SAF Accounting and book and claim systems
#7 – SAF logistics
#8 – Launch of the 2024 ACT-SAF Season
#9 – Green Hydrogen for Aviation
#10 – ICAO methodologies and tools for life cycle assessment

ACT-SAF Series #10

The tenth event of the ACT-SAF Series, held on 28th March 2024, focused on providing participants with knowledge on ICAO's methodologies and tools for life cycle assessment (LCA). More than 100 ACT-SAF partners attended the training, which covered the following aspects:

- CORSIA default life cycle assessment values
- How to request new default LCA to ICAO
- The methodologies, models and databases used for CORSIA LCA calculations.
- Practical examples on the use of LCA models
- Use of LCA models for certification of SAF in CORSIA

The recording of this session and the presentation are now available on the ACT-SAF Series website.



Next ACT-SAF Series

The upcoming ACT-SAF Series online training will be held on 30th Apr (8:00 to 10:00 AM EDT), and will focus on "Implementing the ICAO Global Framework – step-by-step examples of SAF policy making", with the objective to provide participants with information on the step-by-step process of making SAF policy a reality.

The training will cover the following points:

- Recap of the ICAO Global Framework, with a focus on Policy and Planning
- Process towards SAF policy development
- Practical experiences by States

Stakeholders from across the aviation sector are invited to engage, learn, and collaborate on advancing SAF initiatives, reinforcing the industry's united effort in reducing its carbon footprint and achieving sustainability targets.

If you wish to receive regular updates and information on the ACT-SAF Series, participate in the events, and ask questions to our speakers, you can join the ACT-SAF programme now. Participation is open to all States and Organizations interested in further action on SAF following the acceptance of the ACT-SAF Terms and Condition (click here for more details)

ACT-SAF Projects
Feasibility Studies and Business Implementation

The ICAO ACT-SAF programme is also developing **feasibility studies** that assess the potential for production and use of socially acceptable, environmentally friendly, and economically viable SAF in ICAO Member States.

The first three feasibility studies developed under the programme were funded by the EU and delivered during the CAAF/3 Conference in November 2023.

Feasibility Study on the use of Sustainable Aviation Fuels Cote d'Ivoire

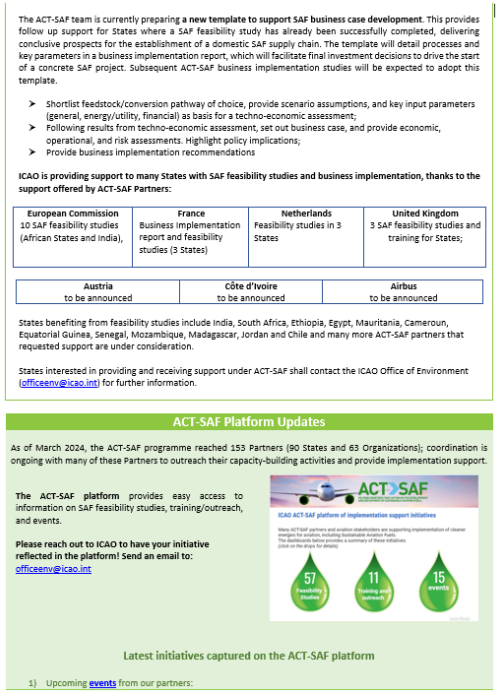
Feasibility Study on the use of Sustainable Aviation Fuels Rwanda

Feasibility Study on the use of Sustainable Aviation Fuels Zimbabwe

Template and Guide for Feasibility Studies

These Feasibility Studies were developed with the use of **the ACT-SAF template for feasibility studies** and **ACT-SAF Guide for feasibility studies**, developed in 2023 with the support of the ACT-SAF Partners. This will be updated in 2024.

Feasibility Studies Template and Guide
(click to open):



The ACT-SAF team is currently preparing **a new template to support SAF business case development**. This provides follow up support for States where a SAF feasibility study has already been successfully completed, delivering conclusive prospects for the establishment of a domestic SAF supply chain. The template will detail processes and key parameters in a business implementation report, which will facilitate final investment decisions to drive the start of a concrete SAF project. Subsequent ACT-SAF business implementation studies will be expected to adopt this template.

- Shortlist feedstock/conversion pathway of choice, provide scenario assumptions, and key input parameters (general, energy/utility, financial) as basis for a techno-economic assessment;
- Following results from techno-economic assessment, set out business case, and provide economic, operational, and risk assessments. Highlight policy implications;
- Provide business implementation recommendations

ICAO is providing support to many States with SAF feasibility studies and business implementation, thanks to the support offered by ACT-SAF Partners:

European Commission	France	Netherlands	United Kingdom
10 SAF feasibility studies (African States and India),	Business implementation report and feasibility studies (3 States)	Feasibility studies in 3 States	3 SAF feasibility studies and training for States;

Austria	Côte d'Ivoire	Airbus
to be announced	to be announced	to be announced

States benefiting from feasibility studies include India, South Africa, Ethiopia, Egypt, Mauritania, Cameroun, Equatorial Guinea, Senegal, Mozambique, Madagascar, Jordan and Chile and many more ACT-SAF partners that requested support are under consideration.

States interested in providing and receiving support under ACT-SAF shall contact the ICAO Office of Environment (officeenv@icao.int) for further information.

ACT-SAF Platform Updates

As of March 2024, the ACT-SAF programme reached 153 Partners (90 States and 63 Organizations); coordination is ongoing with many of these Partners to outreach their capacity-building activities and provide implementation support.

The ACT-SAF platform provides easy access to information on SAF feasibility studies, training/outreach, and events.

Please reach out to ICAO to have your initiative reflected in the platform! Send an email to:
officeenv@icao.int

Latest initiatives captured on the ACT-SAF platform

1) Upcoming **events** from our partners:

Links to access **past ACT-SAF training** material

Updates on support for **SAF feasibility studies / business implementation** from ACT-SAF partners

ACT-SAF platform updates

- Feasibility studies
- Training and outreach
- Events

ACT-SAF platform of implementation support initiatives

- **ACT-SAF tracks implementation support initiatives from our partners**
  - Easy to access resource in ICAO ACT-SAF website, with information on feasibility studies, training/outreach, and events
  - Reduces duplication of efforts across partners/stakeholders
  - Reach out to ICAO to have your initiative reflected in the platform

ICAO ACT-SAF platform of implementation support initiatives

Many ACT-SAF partners and aviation stakeholders are supporting implementation of cleaner energies for aviation, including Sustainable Aviation Fuels.
The dashboards below provides a summary of these initiatives
(click on the drops for details)

Recently published outreach/publications by ACT-SAF Partners

World Economic Forum

Scaling up SAF Supply: Overcoming Barriers in Europe, the US and the Middle East

- Showcases critical technologies for scaling SAF and their advantages/challenges
- Analysis of future SAF volumes
- Focus on adequate regulation and policy to enable global SAF scaling
- https://www.weforum.org/publications/scaling-sustainable-aviation-fuel-supply-overcoming-barriers-in-europe-north-america-and-the-middle-east/

Recently published feasibility studies in ACT-SAF Partner States

Department of Energy's Pacific Northwest National Laboratory (PNNL)

Cost-effective opportunities to produce SAF from low-cost wastes in the U.S.

- Identification of site where large airports are close enough to major waste-producing centres for SAF refineries
- Focus on classes of waste and potential volumes
- https://www.pnnl.gov/news-media/garbage-could-replace-quarter-petroleum-based-jet-fuel-every-year

Pacific Northwest NATIONAL LABORATORY

RESEARCH | PEOPLE | PARTNER WITH PNNL | FACILITIES & CENTERS

April 17, 2024 | Feature

Garbage Could Replace a Quarter of Petroleum-Based Jet Fuel Every Year

Understanding where Americans produce the most garbage—and where the busiest airports are—can inform where to build waste-to-fuel facilities

JoAnna Wendel, PNNL

Media Contact: PNNL News & Me

ACS Sustainable Chemistry & Engineering

pubs.acs.org/journal/ascecg

Research Article

Cost-Effective Opportunities to Produce Sustainable Aviation Fuel from Low-Cost Wastes in the U.S

Timothy Seiple,* Yuan Jiang, Lesley J. Snowden-Swan, Nicholas Betzsold, Karthikeyan K. Ramasamy, and Corinne Fuller

Cite This: *ACS Sustainable Chem. Eng.* 2023, 11, 12326−12335 | Read Online

ACCESS | Metrics & More | Article Recommendations | Supporting Information

ABSTRACT: Converting low-cost wet organic and municipal solid wastes into sustainable aviation fuel (SAF) represents an immediate opportunity to help decarbonize the aviation sector. To accelerate the commercialization of waste-to-energy technologies, we identify feasible deployment opportunities in the United States (U.S.) for two emerging SAF pathways including direct hydrothermal liquefaction for blended wet organic wastes and gasification with methanol synthesis for municipal solid waste. The impact of fuel credits on plant locations, scales, and performance is investigated by varying the target jet fuel price from a baseline 5 year average of USD $1.97 per gasoline gallon equivalent (GGE) to a RIN credit-adjusted target of USD $2.70/GGE. Total feedstock utilization and SAF output are summarized nationally, by state, and by proximity to existing jet fuel storage and major airports. Depending on carbon credit price, between 40 and 100 sites in the U.S. could produce between 13 and 21 billion L/y (3−5 billion gal/y) of SAF, representing 15−25% of total annual jet fuel use, thereby reducing the carbon intensity of the aviation sector by up to 10−18%. Identified opportunities can help focus future SAF efforts in geographic regions with abundant low-cost feedstock supply in proximity to jet fuel storage and demand.

A) Hydrothermal Liquefaction: Wet Waste → Bio-oil → Refinery → SAF

B) Gasification: MSW → Syngas → Methanol → Refinery → SAF

KEYWORDS: *techno-economic analysis and resource analysis, biofuels, organic wastes, decarbonize, hydrothermal liquefaction, gasification*

Scaling up SAF feasibility studies & business cases

- **Need to scale up SAF feasibility studies by 2025 and beyond**
- **Further need to develop SAF business cases** (assessment of SAF project viability) to facilitate investment decisions for commencement of concrete SAF projects

Upcoming SAF feasibility studies & business cases (2024 - 2026) with contributions to ENV Voluntary Fund

European Union	France	United Kingdom
• Support 10 SAF feasibility studies for African States and India • Project kicked-off in April 2024	• Support 3 SAF feasibility and business implementation studies, focused in African States	• Support 3 SAF feasibility and business implementation studies, focused in African States
Netherlands	**Austria**	**Airbus**
• Support 3 SAF feasibility studies, for States in various regions	• Support SAF feasibility studies (TBC)	• Support SAF feasibility studies (TBD)

- **Targeting ACT-SAF feasibility studies & business cases in 20 States by 2025, and 50 States by 2028**
- **More contributions are required for additional studies**

ACT-SAF support for feasibility studies

ICAO –EU ACT-SAF Assistance Project Kick-off meeting on 29 April 2024

- Implementation of feasibility studies for the development of SAF eligible under CORSIA
- Updates on:
  - Project status, governance, timelines, expected results
- States engagement and discussions on expectations

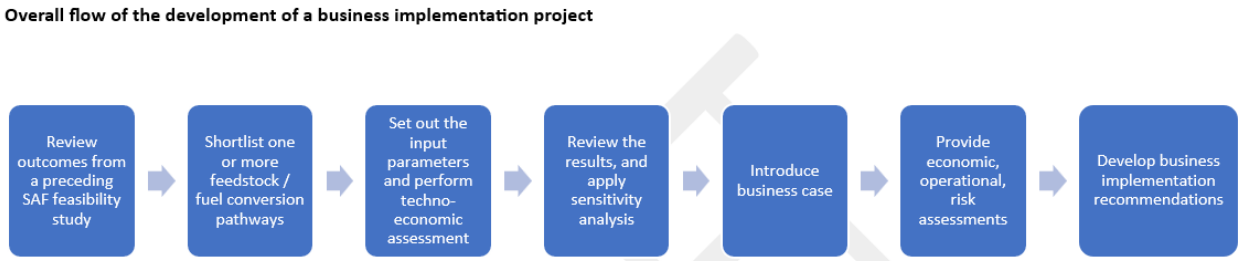
ICAO – EU ACT-SAF ASSISTANCE PROJECT
Capacity building for Sustainable Aviation Fuels eligible under CORSIA

ICAO – EU ACT-SAF ASSISTANCE PROJECT
KICK-OFF MEETING

Ongoing: SAF business implementation report template

- **As a follow up to the SAF feasibility study template/guide, ICAO has prepared a draft template to support SAF business implementation**
  - Currently incorporating comments/inputs from small group of ACT-SAF partners (Kenya, Airbus, IATA, Oneiros, SAF Investor, Sustainable Flight Solutions)
  - Advanced draft will be shared with all ACT-SAF partners for further comments
  - Plan to publish in late-May/June 2024, to coincide with related capacity-building efforts

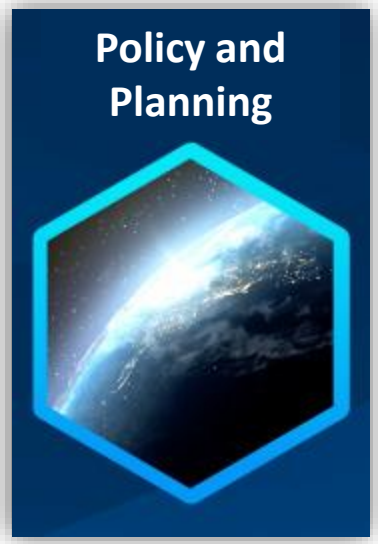
- Executive Summary
- Section 1: Scenario and Assumptions
- Section 2: Techno-economic assessment and results
- Section 3: Economic and Operational Assessment of the project
- Section 4: Risk assessment
- Section 5: Business Implementation recommendations

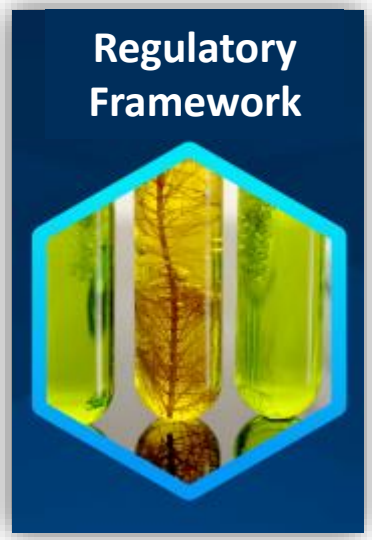


ICAO Global Framework on SAF, LCAF and other Aviation Cleaner Energies

Building Block 1 – Policy and Planning

ICAO Global Framework on SAF, LCAF and other Aviation Cleaner Energies





- Supports global scale up of aviation cleaner energies – Collective Vision to reduce 5% CO2 by 2030
- Provides clarity, consistency and predictability to all stakeholders on 1) policy and planning, 2) regulatory framework, 3) implementation support, and 4) financing – 4 Building Blocks
- Monitors the implementation progress on emissions reductions and means of implementation
- Aspiring to have cleaner energy production facilities in all regions by CAAF/4 (no later than 2028)
- To update the Vision at CAAF/4 on the basis of market developments

CAAF/3 Global Framework – 4 Building Blocks

1. Policy and Planning

- Global aspirational **Vision** to reduce international aviation CO_2 emissions by **5% by 2030**
- Each State's **special circumstances and respective capabilities**
- **CAAF/4** no later than 2028, with a view to update Vision
- **Collaborative effort** across different stakeholders, and encourage **State policies, action plans and roadmaps**
- Implementation **monitored** and periodically **reviewed**

2. Regulatory Framework

- **CORSIA eligibility framework as accepted basis** for SAF, LCAF and other aviation cleaner energies
- Increase the **number of SCS**, additional fuel production **pathways / life-cycle values**
- Parameters for **fuel accounting methodologies**, leveraging on CORSIA MRV system
- **Study of fuel accounting systems** to determine any possible ICAO role

3. Implementation Support

- **Robust, targeted and tailored** capacity -building and implementation support
- **Building on ACT-CORSIA and ACT-SAF programmes**
- Facilitate **partnerships**, and exchange of best practices
- Develop **policy toolkit/guidance** and support **State Action Plans**
- Support **feasibility studies**, **pilot projects**, which may facilitate access to investment
- Support **access to technology**

4. Financing

- **Advocacy and outreach** for greater investment in aviation cleaner energy projects, including UN and international financial community
- Welcome and request for **operationalization of ICAO Finvest Hub** to facilitate better access to public fund / private investment, to respond to Resolution A41-21, para 18. a)
- Expedite work to **consider the establishment of a climate finance initiative or funding mechanism under ICAO**, to respond to A41-21, para 18. b)

Building Block 1 – Policy and Planning

1. Policy and Planning

- Global aspirational **Vision** to reduce international aviation CO_2 emissions by **5% by 2030**
- Each State's **special circumstances and respective capabilities**
- **CAAF/4** no later than 2028, with a view to update Vision
- **Collaborative effort** across different stakeholders, and encourage **State policies, action plans and roadmaps**
- Implementation **monitored** and periodically **reviewed**

5. States are encouraged to implement policies in support of the Vision, in a socially, economically and environmentally sustainable manner and in accordance with their special circumstances and respective capabilities.

6. In developing these policies, States are invited to consider the usefulness and benefits of the non-exhaustive and non-prescriptive list of potential policy components contained within the 'toolkit' in paragraph 18 below, noting that ICAO guidance provides further detail on these potential policy components and the guidance does not provide any endorsement of specific policies.

7. In developing and implementing their policies, States are encouraged to recognize:

   a) the need for, and benefits of, a combination of policies under a coherent and coordinated national plan for the scale-up in production and deployment of SAF, LCAF and other aviation cleaner energies, noting that no one single policy is likely to deliver the best and most efficient outcomes and that the appropriate policy-mix will differ between States due to different national circumstances;

   b) the need for policies to take into account cost impacts and affordability, and to avoid extraterritorial measures;

   c) the need for policies to take into account the latest scientific and technological developments;

   d) the importance of the policy's transparency, certainty and stability, for aircraft operators, feedstock producers, fuel producers, financial institutions and other relevant stakeholders; and

   e) the need for policies to be applied in accordance with the Chicago Convention and its relevant instruments and any appropriate bilateral and multilateral agreements in place between States, with particular regard for the fundamental principles of non-discrimination, fair and equal opportunity; and the avoidance of market distortion.

8. States are encouraged to work together towards the harmonization of policies, to the extent possible and appropriate to circumstances, across States and regions as a longer-term objective.

ICAO Guidance on Potential Policies and Coordinated Approaches for the deployment of SAF

- **Developed by CAEP based on studies performed since 2016**
- **A support reference for ICAO States to develop SAF production**
  - Insight on types of policy measures and their impacts
  - Examples of policies used or under preparation
  - Links to additional helpful resources
- **Completes a toolbox of guidance material for ICAO States**
- **Can be used in combination with the ICAO SAF Rules of Thumb**
- https://www.icao.int/environmental-protection/Documents/SAF/Guidance%20on%20SAF%20policies%20-%20Version%202.pdf

Guidance provides details on various policy options, divided into 3 impact areas and 8 categories

Impact area: Stimulating Growth of SAF Supply

1 Government funding for RDD	2 - Targeted incentives and tax relief to expand SAF supply infrastructure	3 - Targeted incentives and tax relief to assist SAF facility operation	4 - Recognition and valorization of SAF environmental benefits
1.1 - Government R&D 1.2 - Government demonstration and deployment	2.1 - Capital grants ; 2.2 - Loan guarantee programs 2.3 - Eligibility of SAF projects for tax advantaged business status ; 2.4 - Accelerated depreciation/'bonus' depreciation 2.5 - Business Investment Tax Credit (ITC) for SAF investments 2.6 - Performance-based tax credit 2.7 – Bonds / Green Bonds	3.1 Blending incentives: Blender's Tax Credit 3.2 – Production incentives: Producer's Tax Credit 3.3 - Excise tax credit for SAF 3.4 - Support for feedstock supply establishment and production	4.1 – Recognize SAF benefits under carbon taxation 4.2 - Recognize SAF benefits under cap and-trade systems 4.3 - Recognize non-carbon SAF benefits: improvements to air quality 4.4 - Recognize non-carbon SAF benefits: reduction in contrails

Impact area: Creating Demand for SAF

5- Creation of SAF mandates	6 - Update existing policies to incorporate SAF	7 – Demonstrate government leadership
5.1 - Mandate renewable energy volume requirements in the fuel supply 5.2 - Mandate reduction in carbon intensity of the fuel supply	6.1: Incorporating SAF into existing national policies 6.2: Incorporating SAF into existing subnational, regional or local policies	7.1 Policy statement to establish direction 7.2: Government commitment to SAF use, carbon neutral air travel

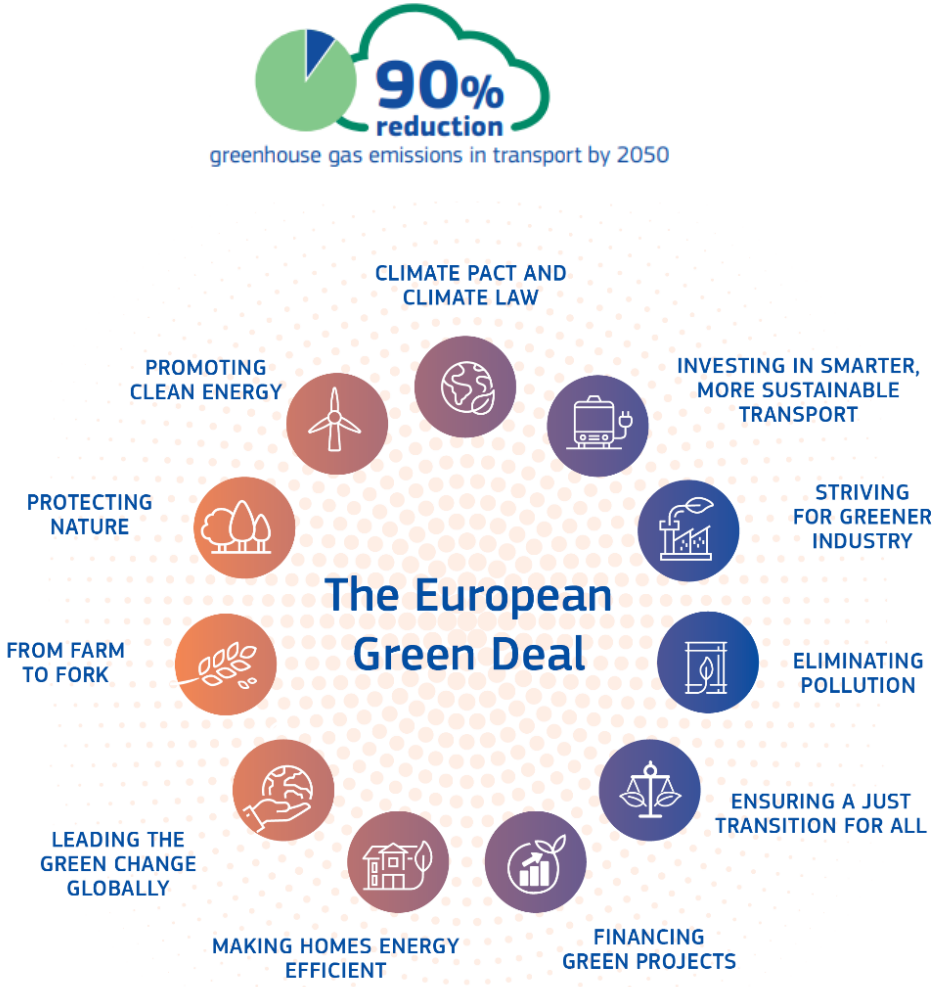
Impact area: Enabling SAF Markets

8 - Market enabling activities
8.1 - Adopt clear and recognized sustainability standards and life cycle GHG emissions methods for certification of feedstock supply and fuel production 8.2 - Support development/recognition of systems for environmental attribute ownership and transfer 8.3 - Support SAF stakeholder initiatives

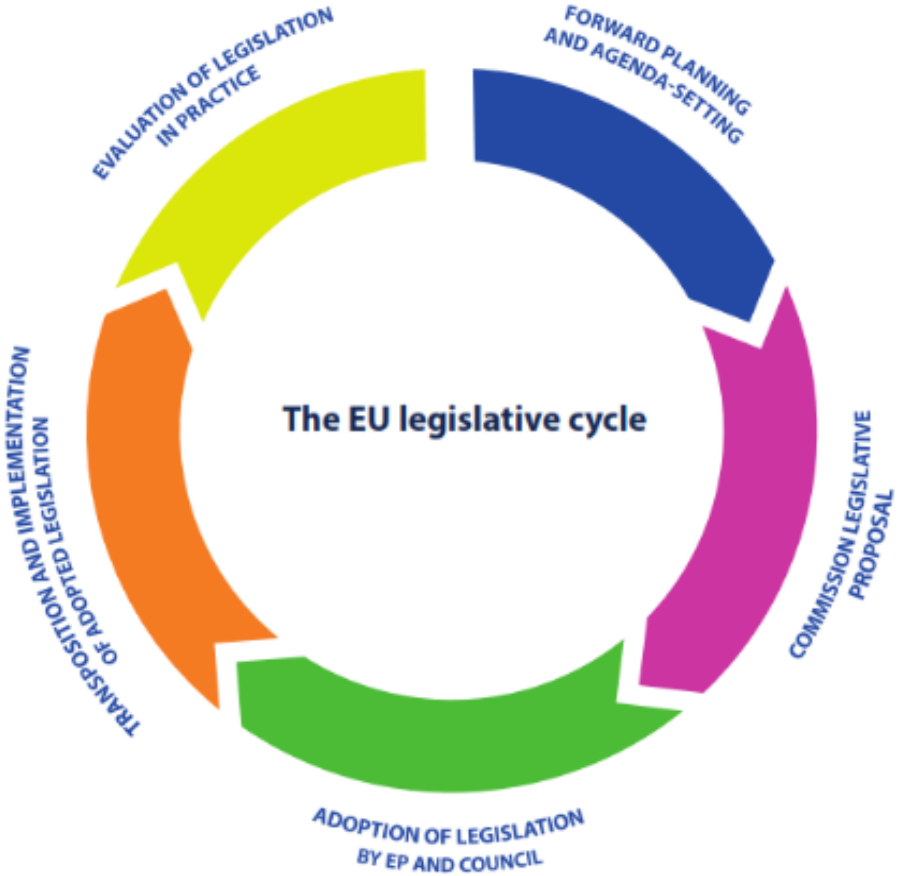
Presentation by the Directorate General for Mobility and Transport (DG MOVE) of the European Commission

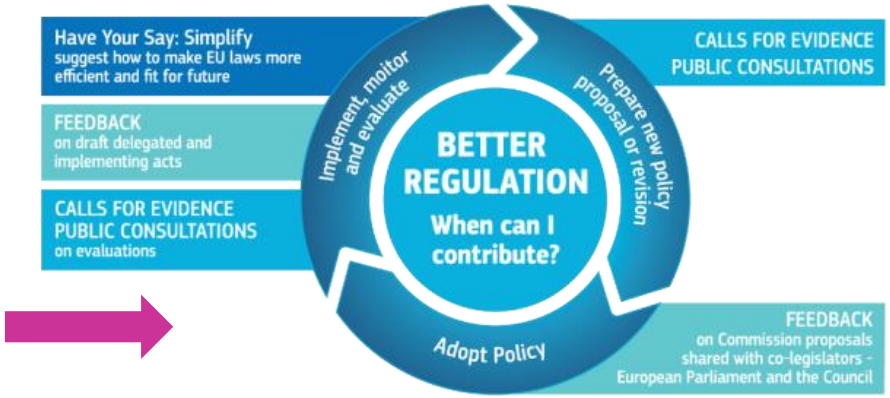
Political priorities

- 2020 European Green Deal: the EU to be **climate neutral in 2050**.
- 2021 European Climate Law: turns the political commitment into a legal obligation and a trigger for investment.
- 2021 intermediate target: reduce emissions by at least **55% by 2030** through ‘Fit for 55’ package of legislative proposals.
- 2023 adoption of **ReFuelEU Aviation Regulation**.



EU policy-making





ELEMENTS ADDRESSED IN THE IMPACT ASSESSMENT

- **PROBLEM**
  Identification and definition
- **SUBSIDIARITY CHECK**
  Exercise of competence
- **OBJECTIVES**
  Setting SMART goals
- **POLICY OPTIONS**
  Determining realistic alternatives considering proportionality
- **COSTS & BENEFITS**
  Assessment of the economic, social and environmental impact
- **MONITORING & EVALUATION**
  Measuring the results

Consultations

Stakeholder consultations:

- Public feedback on the roadmap (inception impact assessment).
  - 121 feedback received from public authorities, industry, NGOs, academics and citizens.
- Two roundtables with Member States and stakeholders:
  - First roundtable on the problem definition,
  - Second roundtable on policy options.
- Open public consultation:
  - 156 replies to the questionnaire to gather views on identified problem drivers, draft policy measures and policy options, and evidence on expected costs and benefits.
- Public feedback on the proposal adopted by the Commission:
  - 92 feedback received.

Inter-department consultations and negotiations

Sustainable aviation fuels – ReFuelEU Aviation (europa.eu)

Impact assessment

ELEMENTS ADDRESSED IN THE IMPACT ASSESSMENT

- **PROBLEM** Identification and definition
- **SUBSIDIARITY CHECK** Exercise of competence
- **OBJECTIVES** Setting SMART goals
- **POLICY OPTIONS** Determining realistic alternatives considering proportionality
- **COSTS & BENEFITS** Assessment of the economic, social and environmental impact
- **MONITORING & EVALUATION** Measuring the results

Regulatory Scrutiny Board (RSB)

EUROPEAN COMMISSION

Brussels, 14.7.2021
SWD(2021) 633 final

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Accompanying the

Proposal for a Regulation of the European Parliament and of the Council on ensuring a level playing field for sustainable air transport

{COM(2021) 561 final} - {SEC(2021) 561 final} - {SWD(2021) 634 final}

Opinion on impact assessment - SEC(2021)561
English (739.8 KB - PDF - 9 pages) Download

Impact assessment report - SWD(2021)633
English (3.8 MB - PDF - 142 pages) Download

Summary of the impact assessment report - SWD(2021)634
English (376.9 KB - PDF - 3 pages) Download

Available languages (23)

Policy options

Policy options were structured around a regulatory requirement consisting of a **SAF obligation** which allows ensuring a **level playing field** in the air transport sector.

Set of policy options

Obligation on fuel suppliers to distribute SAF at all EU airports

Obligation on airlines to uptake SAF when flying from EU airports

Obligation on fuel suppliers to distribute SAF and on airlines to uptake jet fuel at EU airports

Targets designed in SAF volumes (incl. synthetic sub-targets) vs in jet fuel CO2 intensity reduction
Scope of flights departing from the EU

Choice of instrument

- Because of the **highly integrated EU aviation internal market**, efforts to decarbonize the sector will be most efficient by **regulating directly and uniformly** all aviati and fuel market actors across the EU.

- Transition to SAF requires significant investments. It is important the set of rules defined by the regulatory framework is:
  - **Uniform** (avoid creation different measures at national level)
  - **Robust** (easy to implement and monitor)
  - **Long-term** (provide certainty to the new market)

Official Journal of the European Union — EN L series

2023/2405 — 31.10.2023

REGULATION (EU) 2023/2405 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 18 October 2023
on ensuring a level playing field for sustainable air transport (ReFuelEU Aviation)

(Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 100(2) thereof,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the national parliaments,

Having regard to the opinion of the European Economic and Social Committee (1),

After consulting the Committee of the Regions,

Acting in accordance with the ordinary legislative procedure (2),

Whereas:

(1) Over the past decades, air transport has played a crucial role in the Union's economy and in the everyday lives of Union citizens, as one of the best performing and most dynamic sectors of the Union economy. It has been a strong driver for economic growth, jobs, trade and tourism, as well as for connectivity and mobility for businesses and citizens alike, and one of the main connectors between outermost regions and the mainland, particularly within the Union air transport market. Growth in air transport services has significantly contributed to improving connectivity, fostering cohesion, and reducing regional disparities within the Union, in particular for peripheral, outermost, sparsely populated and insular regions, as well as with third countries, and has been a significant enabler of the Union economy.

Flanking measures

Collaboration

Fostering **cross-sectoral collaboration and matchmaking**

Renewable and Low Carbon Fuels (RLCF) Alliance

Strengthening **global collaboration at ICAO**

LTAG, CAAF/3, CORSIA, ACT-SAF

Production

Financing to de-risk SAF production at all technology maturity stages

Horizon Europe, Innovation Fund, InvestEU, Global Gateway, EU taxonomy

Accelerating **qualification of new SAF pathways** and permitting of **new plants**

EU SAF Clearing House, Net Zero Industry Act

Uptake

Financing to narrow down the price gap between SAF and fossils

SAF Allowances, Emissions Trading System, energy taxation

Increasing **transparency** on SAF uptake and supply chain **flexibility**

Environmental label, EU taxonomy, SAF accounting methodology

Long-term market predictability for SAF scale-up

ReFuelEU Aviation Regulation

Negotiations

07/21
Commission proposal

06/22
Council amendments to the proposal

07/22
Parliament amendments to the proposal

09/10/23
Compromise voted in Council

13/09/23
Compromise voted in Parliament

09/22 – 04/23
Council-Parliament-Commission negotiations

20/11/2023
Entry into force

Today
Secondary acts, IT developments

01/01/2025
First SAF mandates

Presentation by the National Agency for Civil Aviation (ANAC) of Brazil

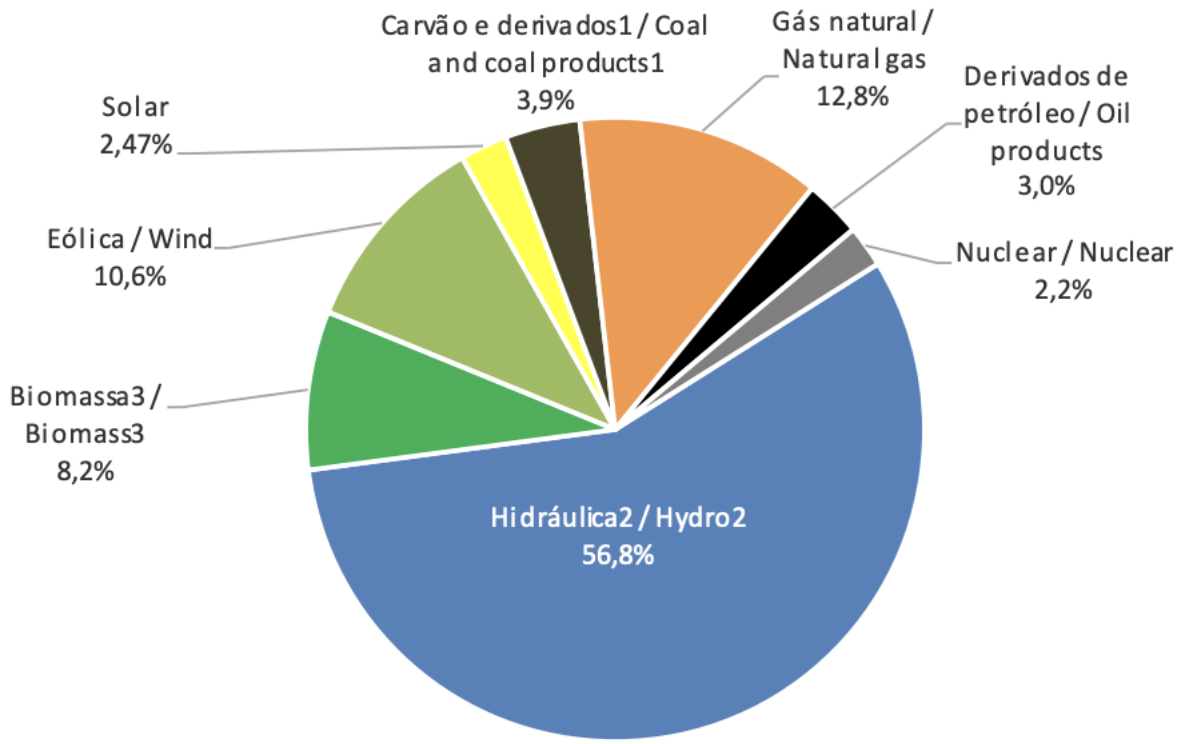
Brief Background

- Brazil has a long and rich tradition of biofuels production.
  - In the 1970's there was a governmental program to foster ethanol production.
- Today, it is mandatory to blend ethanol and biodiesel in the fossil fuel for ground transportation.
  - 27.5% blending for ethanol (up to E100) and 14% for biodiesel.
- Brazil is one of the largest biofuels producers in the world and is widely recognized as a model for sustainable and efficient biofuel production.

Brief Background

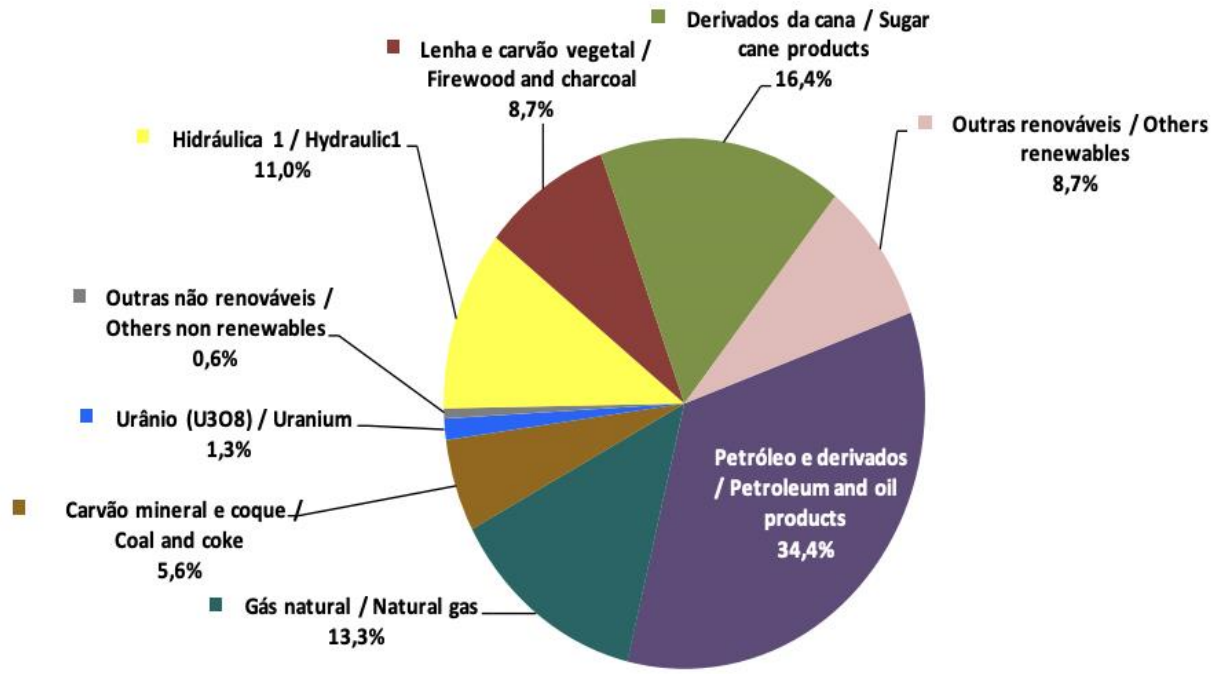
- **Electricity matrix: >84% non-fossil**

Chart 1.1.b – Total Electricity Supply by Source



- **Energy matrix: >44% renewable sources**

Chart 1.3.b – Total Energy Supply

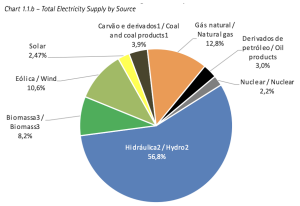


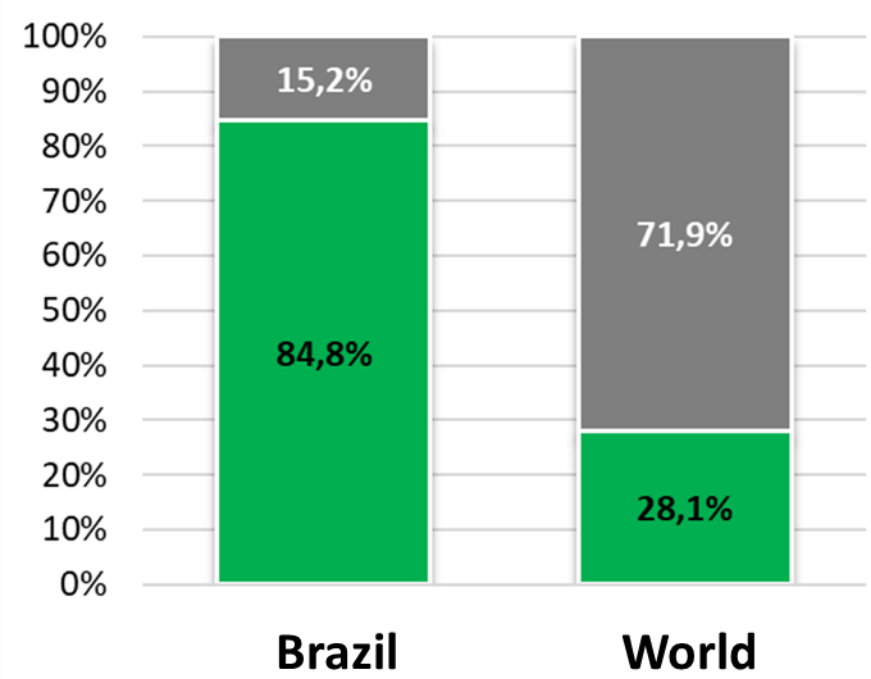
1. Inclui importação de eletricidade oriunda de fonte hidráulica. 1 kWh = 860 kcal (equivalente térmico teórico - primeiro princípio da termodinâmica). Ver Anexo VI.6 - Tratamento das informações. / *Includes electricity imports originated from hidraulic sources. 1 kWh = 860 kcal (physical equivalent - First Principle of Thermodynamics). Look Appendix VI.6.*

Sources: IEA and EPE

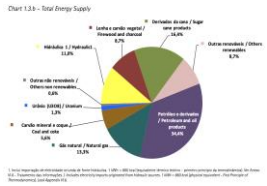
Brief Background

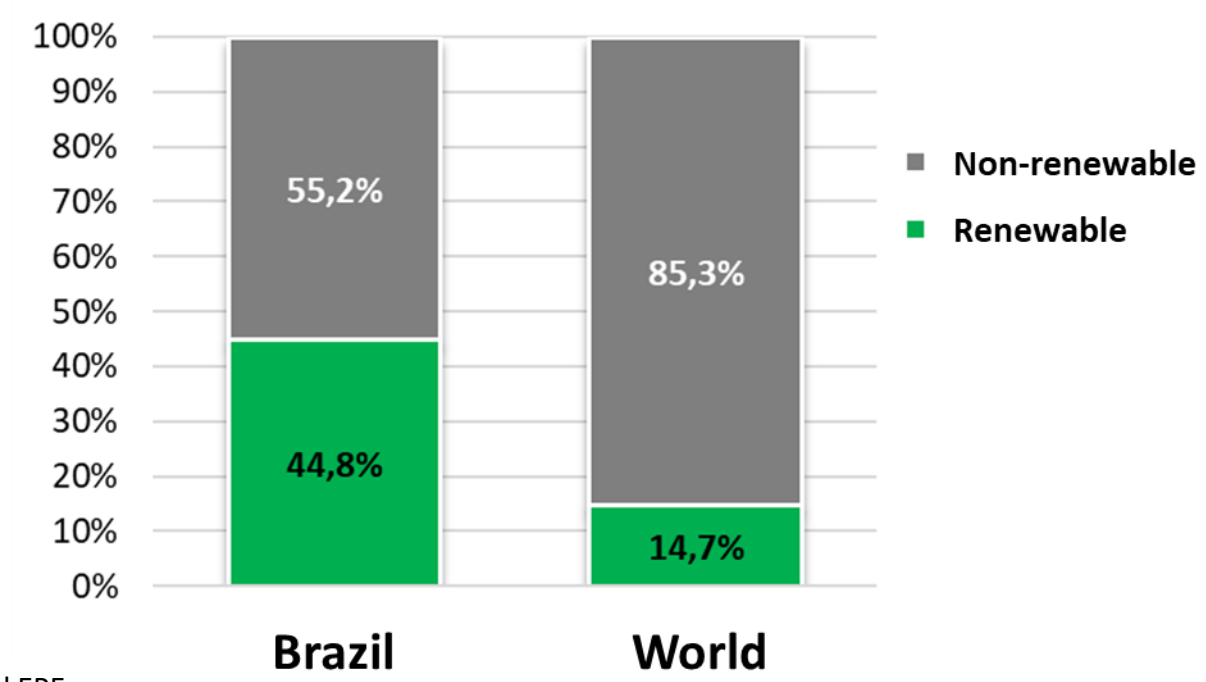
- **Electricity matrix: >84% non-fossil**





- **Energy matrix: >44% renewable sources**





Sources: IEA and EPE

Brazilian Strategy

Deep Dive

Fuel of the Future

- **Apr/2021 - Government-wide effort resulting in the creation of a Technical Committee (led by the Ministry of Energy):**
  - **Multi-modal synergies**
  - **Reduction of the CI in the national energy matrix**
  - **Stimulate innovation and technology development**

Fuel of the Future

GOVERNO FEDERAL BRASIL UNIÃO E RECONSTRUÇÃO

anp

epe Empresa de Pesquisa Energética

ANAC Agência Nacional de Aviação Civil

BNDES

IBAMA

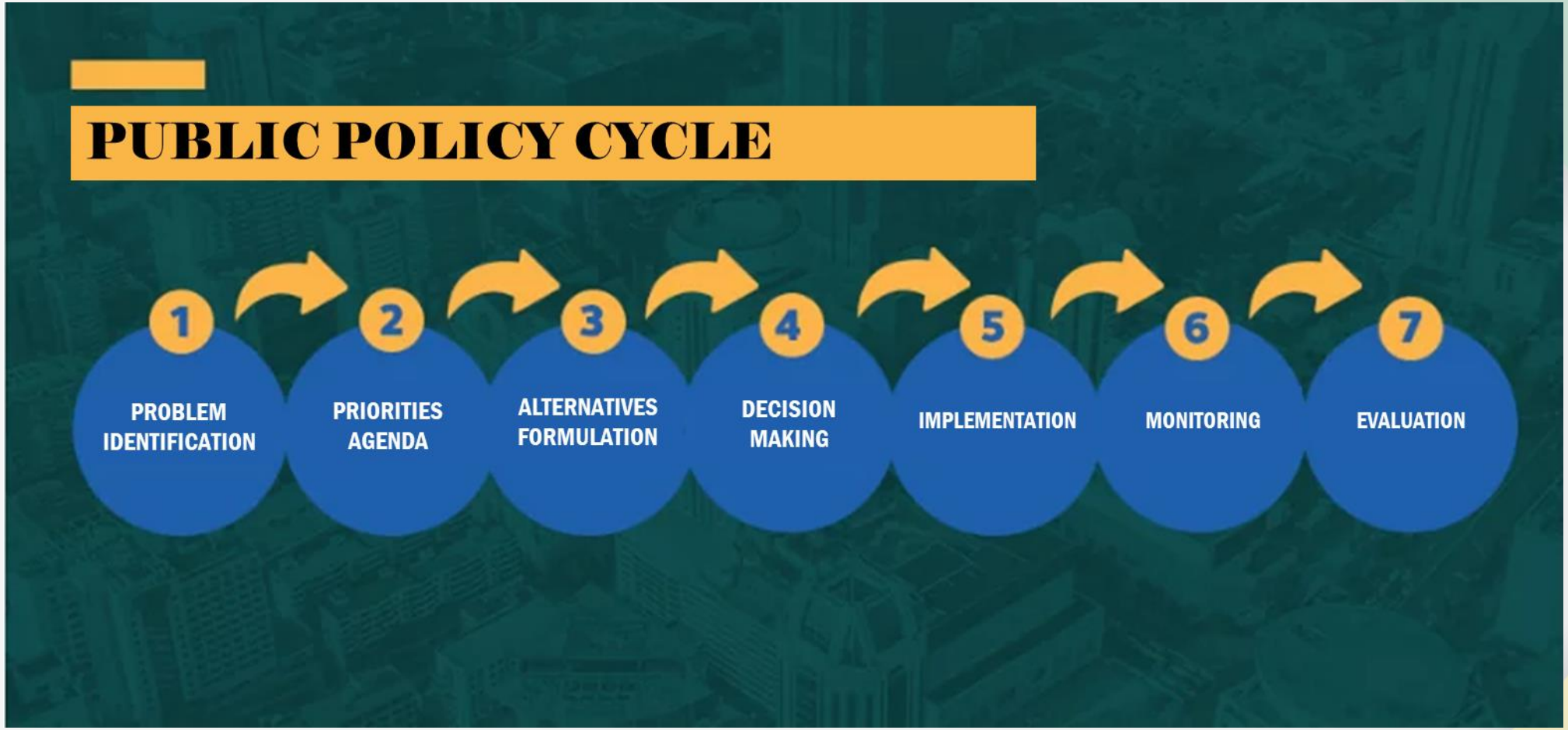
INMETRO

- **Apr/2021 - Government-wide effort resulting in the creation of a Technical Committee (led by the Ministry of Energy):**
  - **Multi-modal synergies**
  - **Reduction of the carbon intensity in the national energy matrix**
  - **Stimulate innovation and technology development**

Subcommittees

- **Otto Cycle** → Road Transportation
- **Diesel Cycle** → Road Transportation
- **ProBioCCS** → Carbon Capture and Storage
- **ProBioQAV** → SAF
- **Maritime Fuels** → Maritime biofuels
- **RD&I** → Integrated Research, Development & Innovation

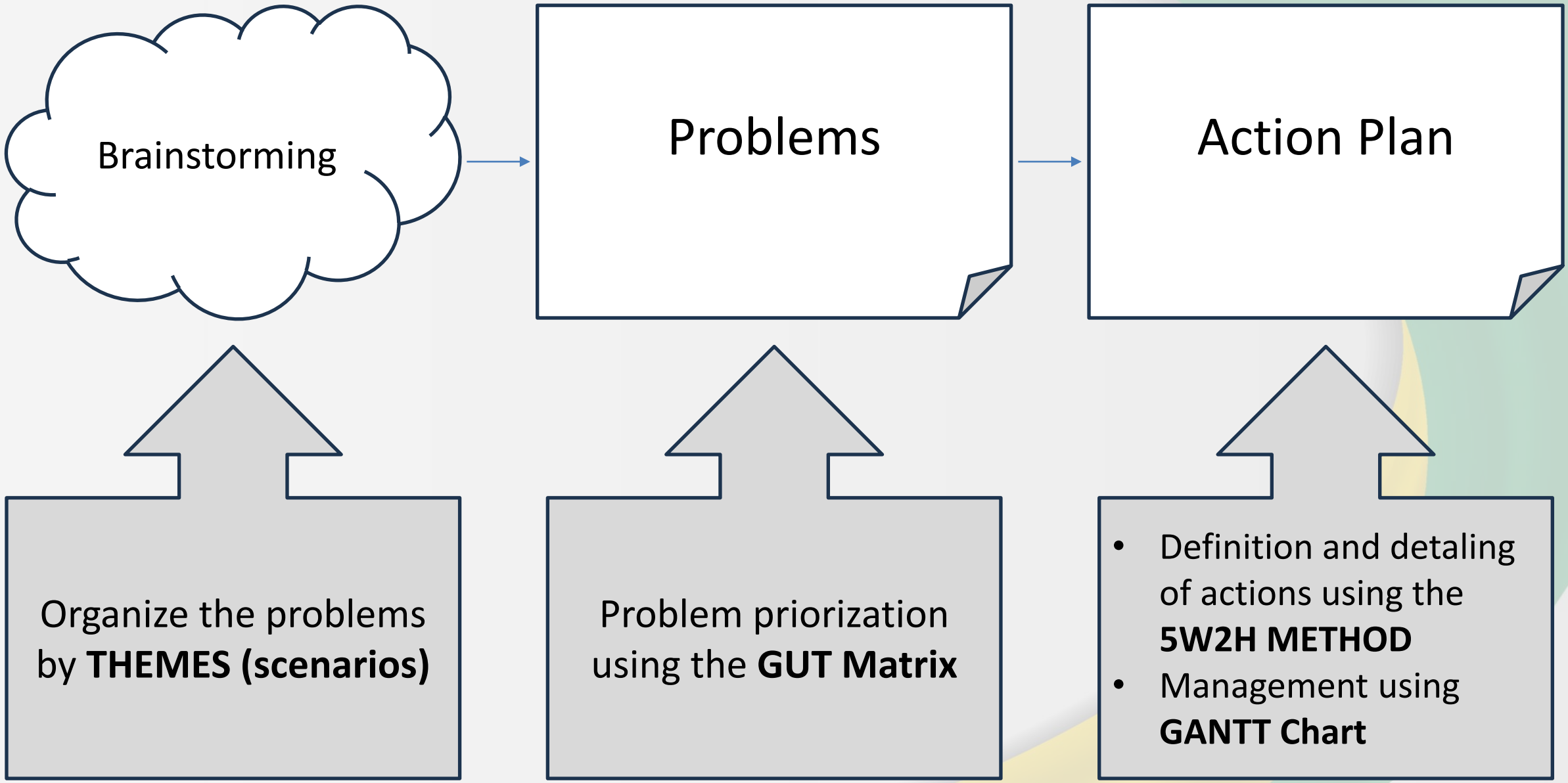
Scope



Scope of the Technical Commitee

Law+Regulation+Continuous improvement

Methodology

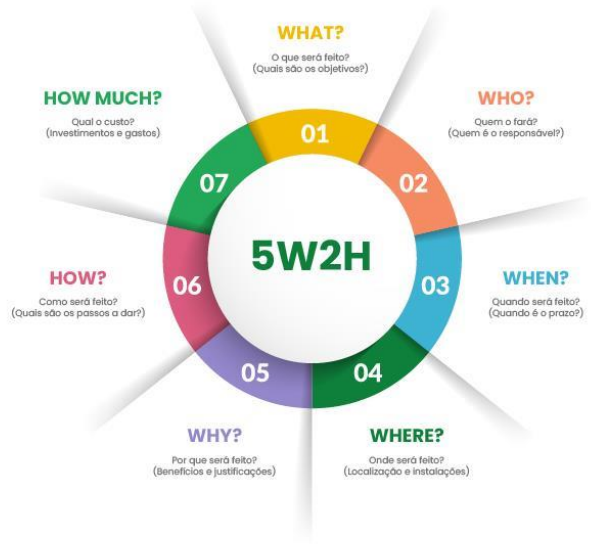


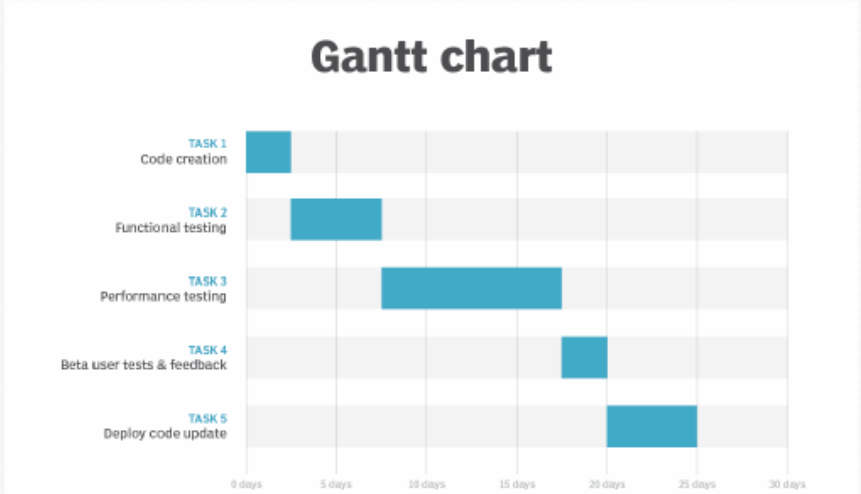
Methodology

GUT matrix

G	U	T
Gravity What are the effects?	**Urgency** Can this wait?	**Tendency** Will this get worse?
5 Extremely serious	5 Extremely urgent	5 It will get worse fast
4 Very serious	4 Very urgent	4 It will get worse in a short term
3 Serious	3 Urgent	3 It will get worse in a medium term
2 Less serious	2 Less urgent	2 It will get worse in a long term
1 Not serious	1 Not urgent	1 It will probably not get worse

SYDLE





Decision making process

Decision scenarios

- Scenario 1 – Do nothing
  - Offset with carbon credits or SAF from other countries
  - No investment (Capex), but does not generate any benefit

- Scenario 2 – Invest in SAF production
  - Reduce the national energy matrix emissions by using more renewables
  - High initial investment (Capex), but with high return on investment, in addition to social benefits

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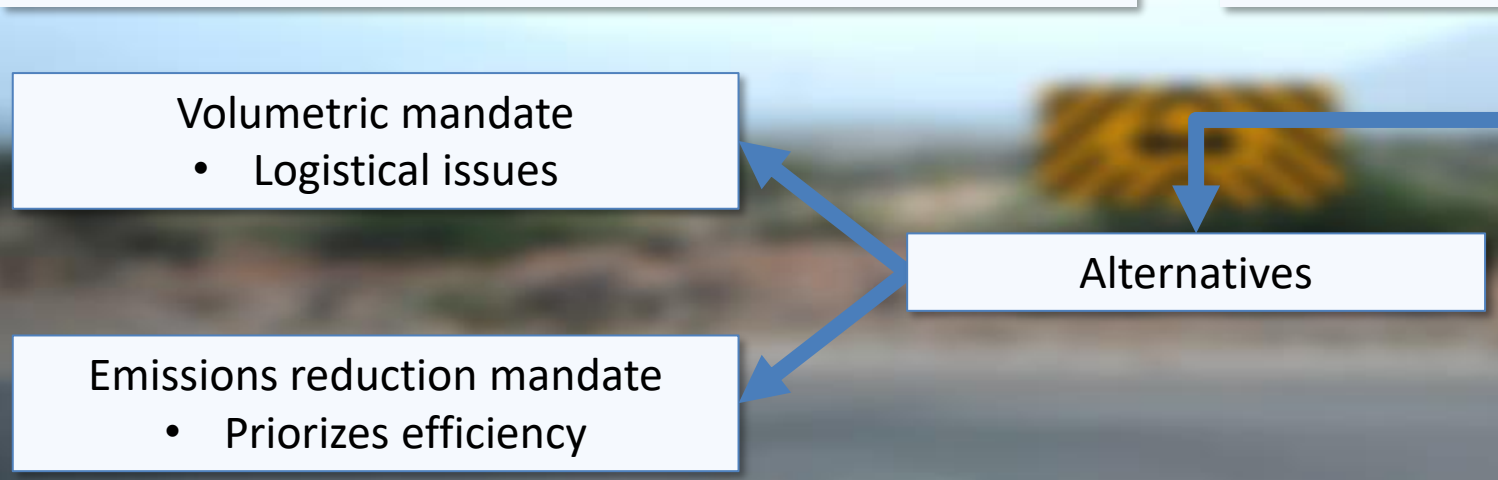
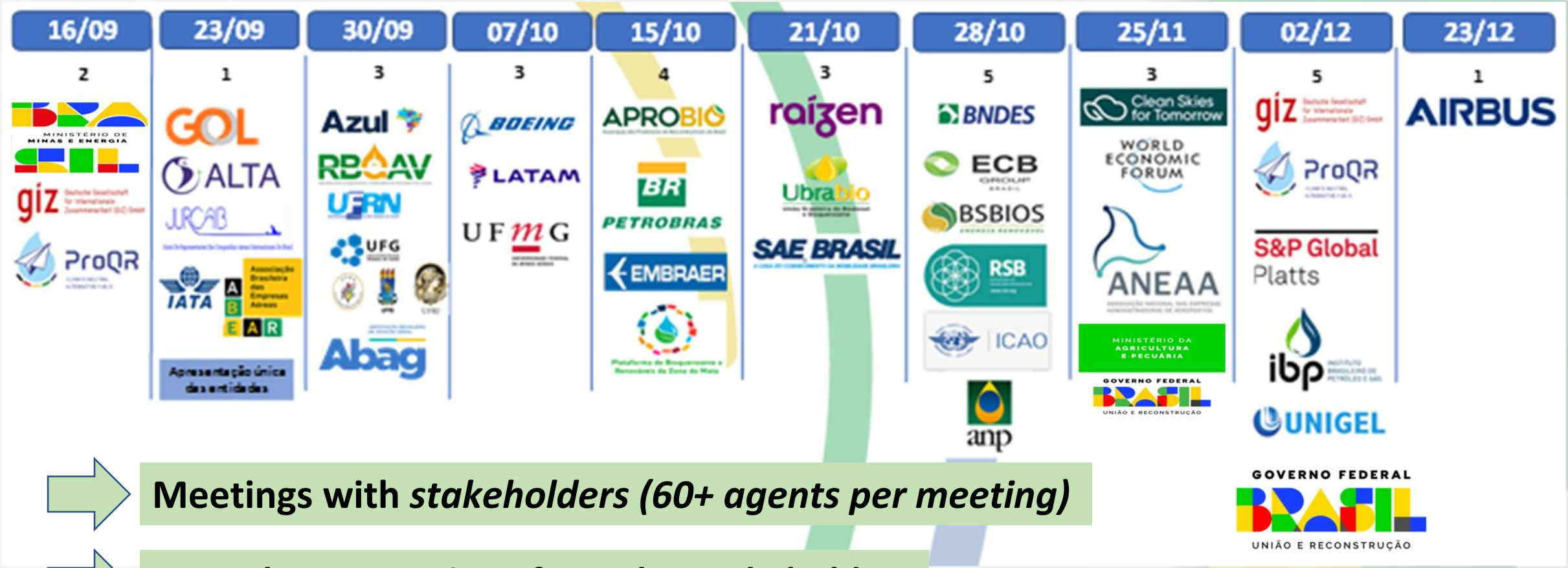
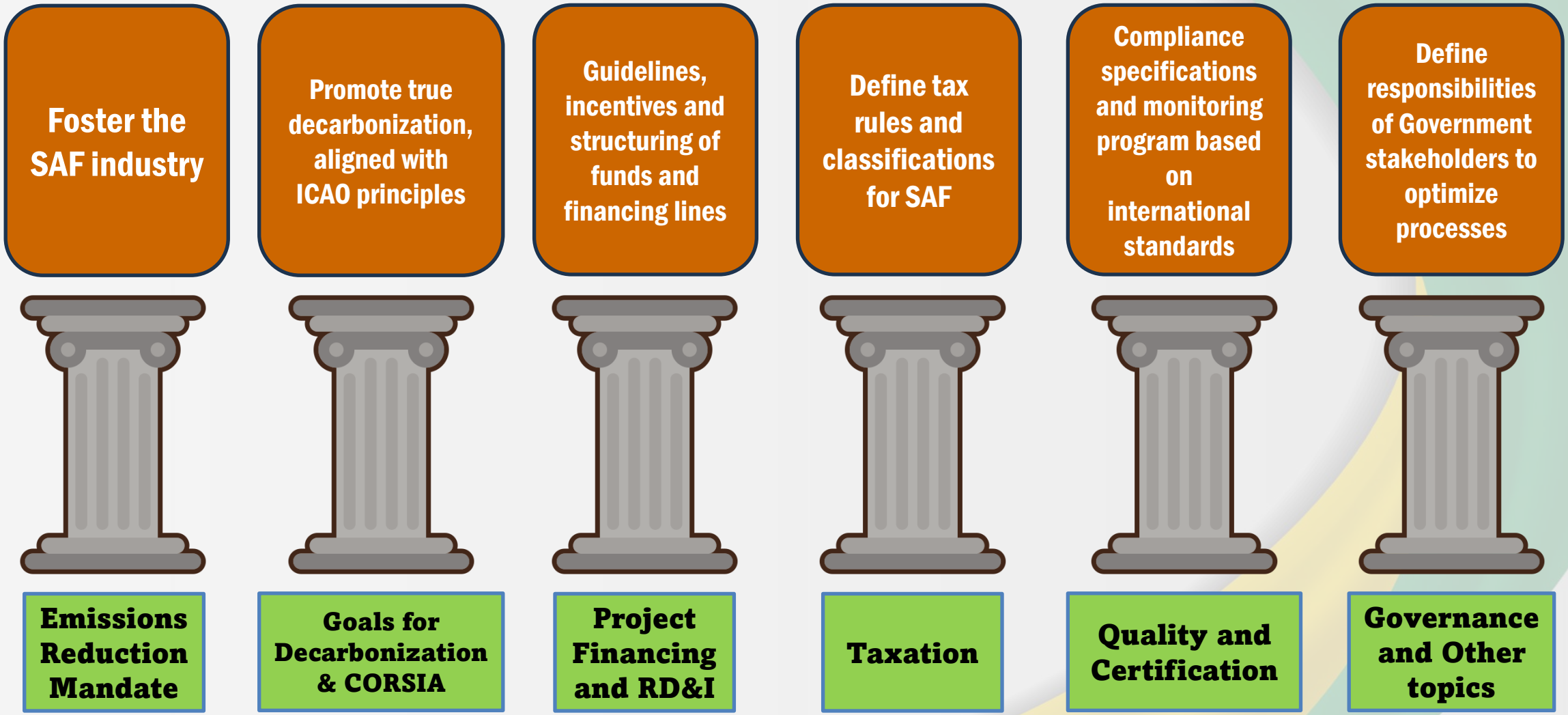


Public consultation (1st round - 2021)



Preliminary results - Premisses

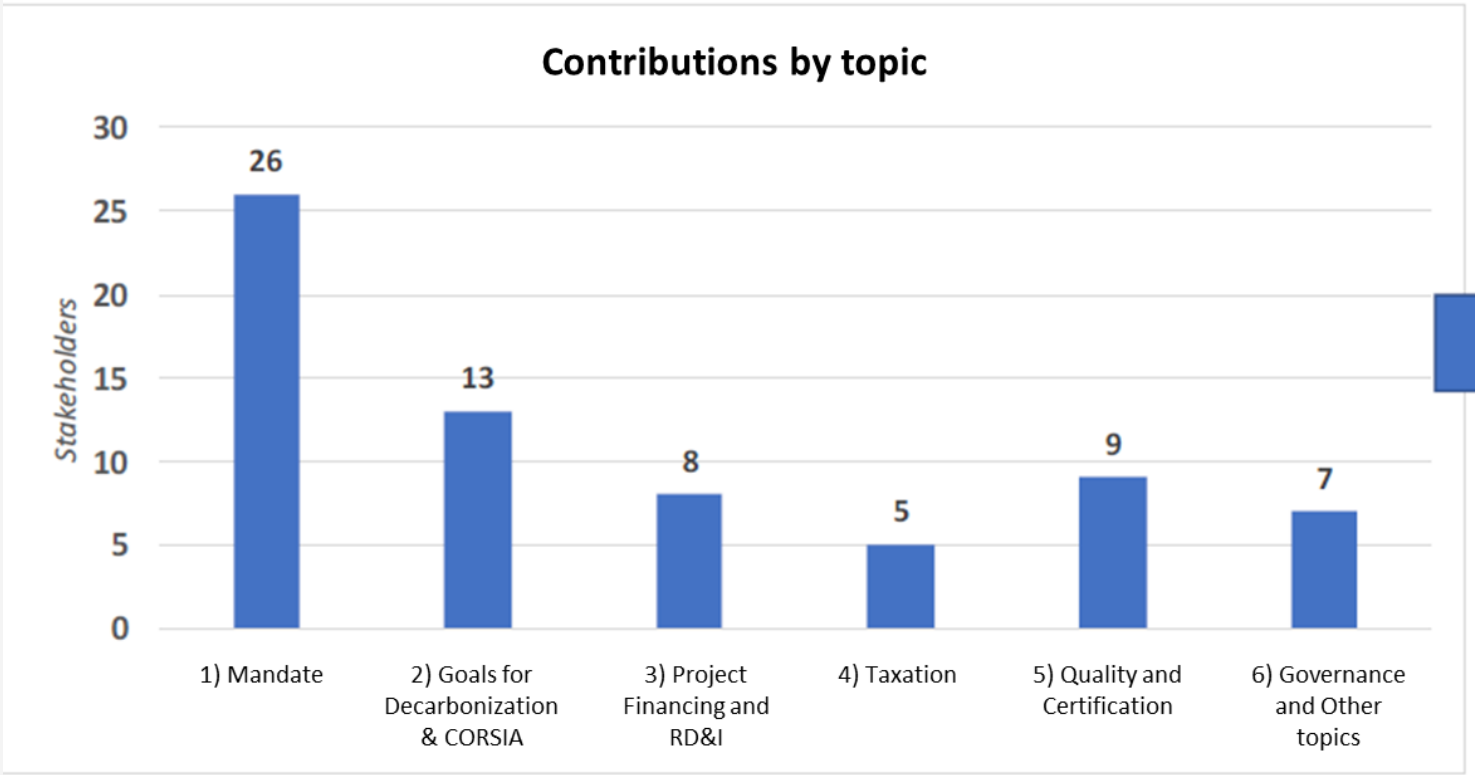
ACT SAF

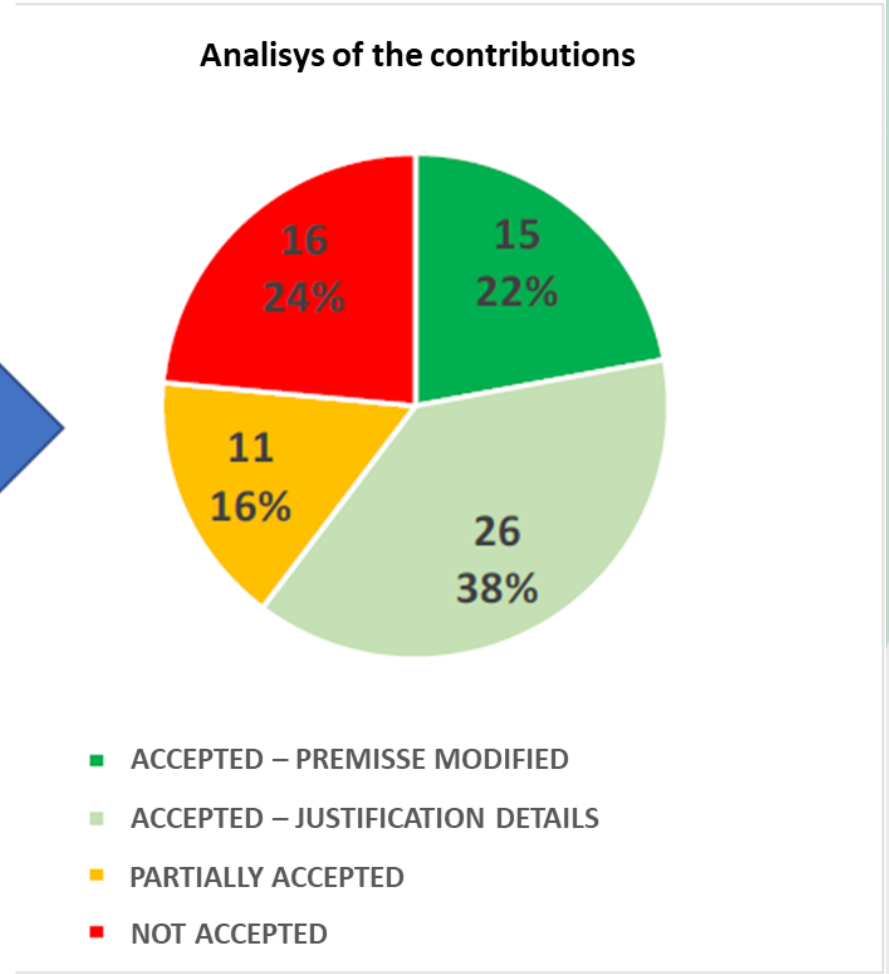


Public consultation (2nd round)

ACT SAF

68 Contributions



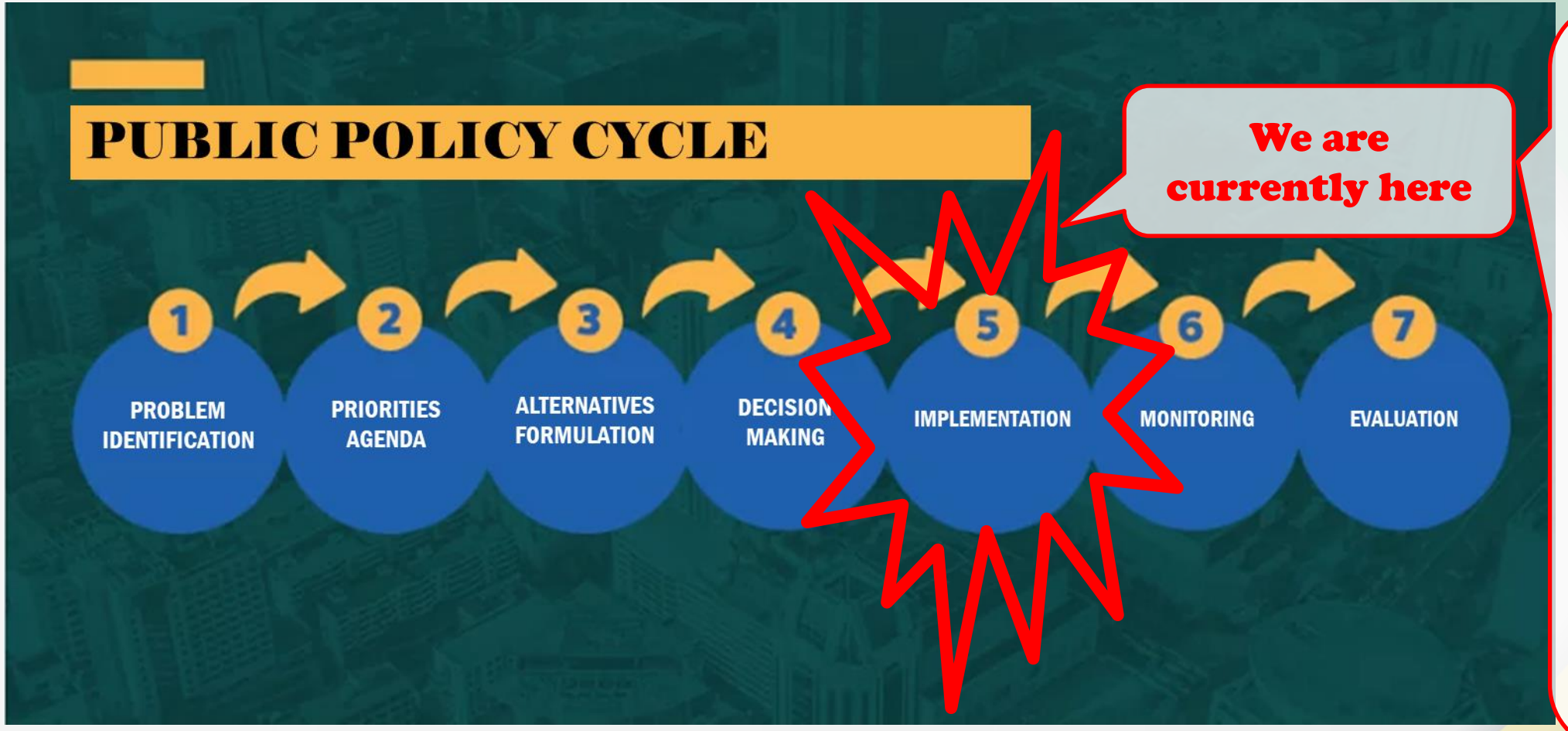


9 out of 27 premisses were modified

Final results

- **Bill that institutes an emissions reduction mandate by the use of SAF, imposed on the domestic airlines from 2027 until 2037.**
- **Alignment between national policies and CORSIA**
- **Techology neutral: do not exclude any feedstock, technology or pathway**
- **Cost-efficient model: market based mechanisms, such as Book&Claim**

Current status



- **Bill was presented to Congress in sep/2023**
- **It was approved by the Chamber of Deputies in feb/2024**
- **We are expecting final approval by the Senate still in the 1st half of 2024**

Scope of the Technical Commitee

Law+Regulation+Continuous improvement

Presentation by the Federal Aviation Authority (FAA) of the United States

Federal Aviation Administration

Development of Sustainable Aviation Fuel Policies in the United States

Presented by: **Prem Lobo**
Presented to: **ICAO ACT-SAF Series #11**
Date: **May 6, 2024**

U.S. SAF Policy Development Timeline

2006
Commercial Aviation Alternative Fuels Initiative (CAAFI)

2013
Aviation Sustainability Center (ASCENT)

Jun 2016
Federal Alternative Jet Fuels R&D Strategy

Sep 2021
White House Announcement

Nov 2021
U.S. Aviation Climate Action Plan

Aug 2022
Inflation Reduction Act

Sep 2022
Grand Challenge Roadmap

Jan 2023
U.S. National Blueprint for Transportation Decarbonization

Commercial Aviation Alternative Fuels Initiative (CAAFI)

- Public-Private coalition for commercial aviation to engage the emerging alternative fuels industry
- Sponsored by:
  - FAA, A4A, ACI, AIA
- Enable development of alternative jet fuels:
  - Equivalent safety/performance (drop-in)
  - Comparable cost
  - Environmental improvement
  - Security of energy supply
- State and Regional Support
- International Cooperation

CAAFI®

ASCENT Center of Excellence

- For 20 years, FAA Office of Environment and Energy has relied on university centers of excellence to:
- Provide knowledge to inform decision making on environment and energy
- Enable innovative solutions to cost-effectively mitigate aviation's environmental impacts
- Support student instruction on the environmental challenges facing aviation (674 students supported and counting).

ASCENT Research Portfolio

- 2013 - ASCENT established
- Portfolio covers SAF, Emissions, Noise, Operations, and Analytical Tools
- Currently overseeing a large increase in the COE portfolio

https://ascent.aero/

Lead Universities:
Washington State University (WSU)
Massachusetts Institute of Technology (MIT)*

Core Universities:
Boston University (BU)*
Georgia Institute of Technology (Ga Tech)*
Missouri University of Science and Technology (MS&T)*
Oregon State University (OSU)
Pennsylvania State University (PSU)*
Purdue University (PU)*
Stanford University (SU)*
University of Dayton (UD)
University of Hawaii (UH)
University of Illinois at Urbana-Champaign (UIUC)*
University of North Carolina at Chapel Hill (UNC)*
University of Pennsylvania (UPenn)*
University of Tennessee (UT)
University of Washington (UW)

Multiple international partners

Advisory Committee (57 orgs)
5 airports
4 airlines
9 NGO/advocacy
8 aviation manufacturers
10 feedstock/fuel manufacturers
21 R&D, service to aviation sector

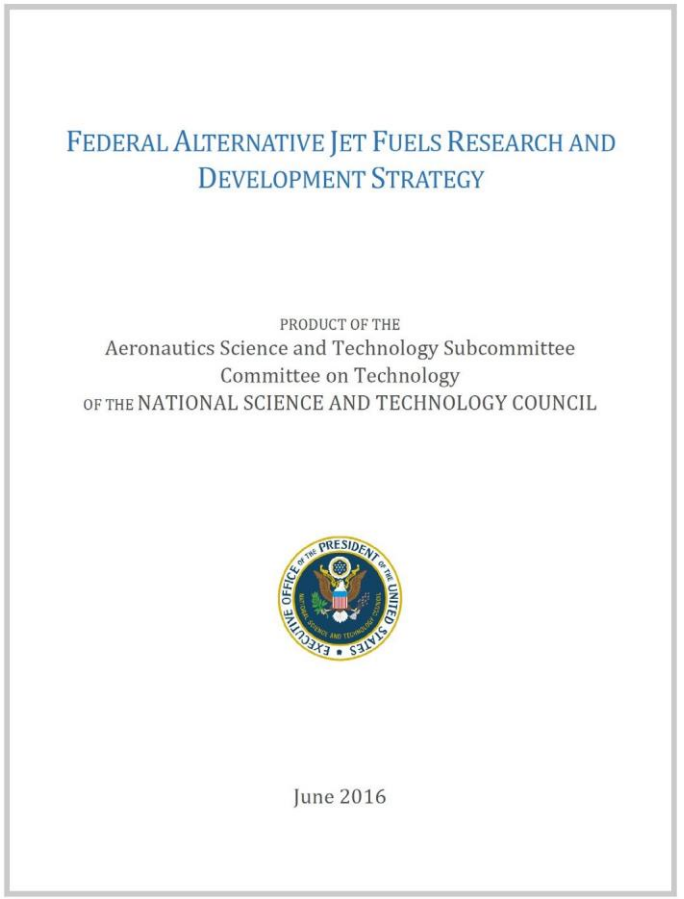
ASCENT Support

Federal Aviation Administration
Transport Canada
NASA
Environmental Protection Agency
Defense Logistics Agency - Energy
U.S. Dep't of Energy
U.S. Dep't of Agriculture
Air Force Research Laboratory

Federal Alternative Jet Fuels R&D Strategy

- Set out prioritized Federal R&D goals and objectives to address key scientific and technical challenges that inhibit the development, production, and use of economically viable alternative jet fuels at commercial scale

- Key categories:
  - Feedstock Development, Production, and Logistics
  - Fuel Conversion and Scale-Up
  - Fuel Testing and Evaluation
  - Integrated Challenges


FEDERAL ALTERNATIVE JET FUELS RESEARCH AND DEVELOPMENT STRATEGY

PRODUCT OF THE
Aeronautics Science and Technology Subcommittee
Committee on Technology
OF THE NATIONAL SCIENCE AND TECHNOLOGY COUNCIL

June 2016

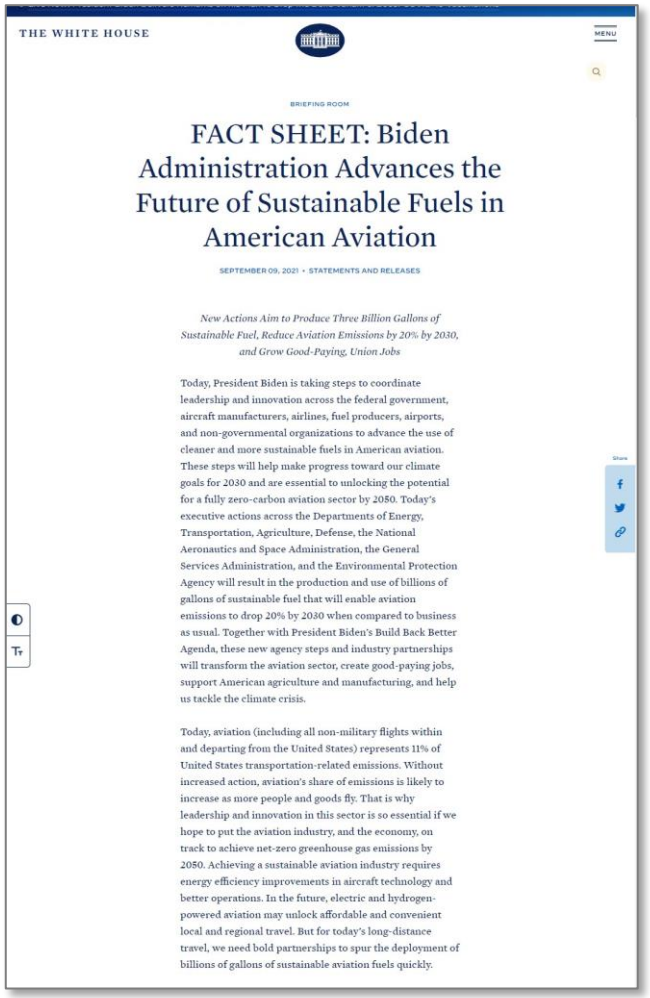
White House Sustainable Aviation Event

On September 9, 2021, government and industry leaders met to discuss actions and make new announcements regarding efforts to address aviation and climate change in the near-term, with a view to long-term ambition.

Key federal actions include:

- A new Sustainable Aviation Fuel Grand Challenge to inspire the dramatic increase in the production of sustainable aviation fuels to at least 3 billion gallons per year by 2030;
- An increase in R&D activities to demonstrate new technologies that can achieve at least a 30% improvement in aircraft fuel efficiency;
- Efforts to improve air traffic and airport efficiency to reduce fuel use, eliminate lead exposure, and ensure cleaner air in and around airports; and
- The demonstration of U.S. leadership both internationally and through the federal example.

"…the Administration also plans to release an aviation climate action plan in the coming months, which will set forth a comprehensive plan for aviation."



THE WHITE HOUSE

MENU

BRIEFING ROOM

FACT SHEET: Biden Administration Advances the Future of Sustainable Fuels in American Aviation

SEPTEMBER 09, 2021 • STATEMENTS AND RELEASES

New Actions Aim to Produce Three Billion Gallons of Sustainable Fuel, Reduce Aviation Emissions by 20% by 2030, and Grow Good-Paying, Union Jobs

Today, President Biden is taking steps to coordinate leadership and innovation across the federal government, aircraft manufacturers, airlines, fuel producers, airports, and non-governmental organizations to advance the use of cleaner and more sustainable fuels in American aviation. These steps will help make progress toward our climate goals for 2030 and are essential to unlocking the potential for a fully zero-carbon aviation sector by 2050. Today's executive actions across the Departments of Energy, Transportation, Agriculture, Defense, the National Aeronautics and Space Administration, the General Services Administration, and the Environmental Protection Agency will result in the production and use of billions of gallons of sustainable fuel that will enable aviation emissions to drop 20% by 2030 when compared to business as usual. Together with President Biden's Build Back Better Agenda, these new agency steps and industry partnerships will transform the aviation sector, create good-paying jobs, support American agriculture and manufacturing, and help us tackle the climate crisis.

Today, aviation (including all non-military flights within and departing from the United States) represents 11% of United States transportation-related emissions. Without increased action, aviation's share of emissions is likely to increase as more people and goods fly. That is why leadership and innovation in this sector is so essential if we hope to put the aviation industry, and the economy, on track to achieve net-zero greenhouse gas emissions by 2050. Achieving a sustainable aviation industry requires energy efficiency improvements in aircraft technology and better operations. In the future, electric and hydrogen-powered aviation may unlock affordable and convenient local and regional travel. But for today's long-distance travel, we need bold partnerships to spur the deployment of billions of gallons of sustainable aviation fuels quickly.

White House Sustainable Aviation Fact Sheet:
https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/09/fact-sheet-biden-administration-advances-the-future-of-sustainable-fuels-in-american-aviation/

U.S. Aviation Climate Action Plan

State Action Plan submission to International Civil Aviation Organization (ICAO)

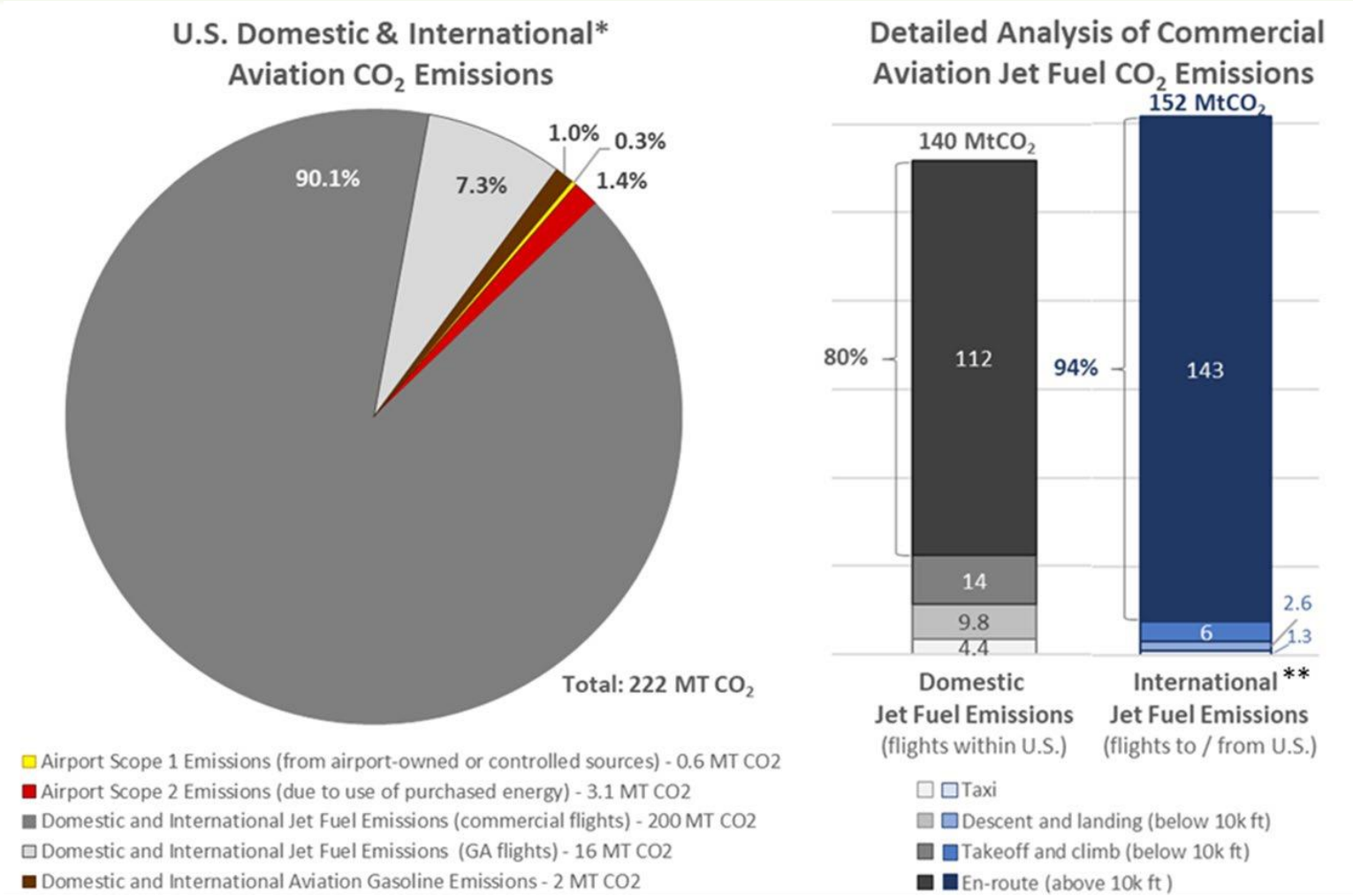
- On November 9, 2021, Secretary of Transportation Pete Buttigieg announced the *United States Aviation Climate Action Plan*, which describes a whole-of-government approach to put the aviation sector on a path toward achieving net-zero emissions by 2050.

- The plan builds on individual and sector-wide commitments announced by the U.S. aviation industry, and highlights specific actions and policy measures to foster innovation and drive change across the entire U.S. aviation sector.

- Climate Action Plan Press Release:
  https://www.faa.gov/newsroom/us-releases-first-ever-comprehensive-aviation-climate-action-plan-achieve-net-zero

- Climate Action Plan Document:
  https://www.faa.gov/sites/faa.gov/files/2021-11/Aviation_Climate_Action_Plan.pdf

Analysis of U.S. Aviation CO2 Emissions in 2019



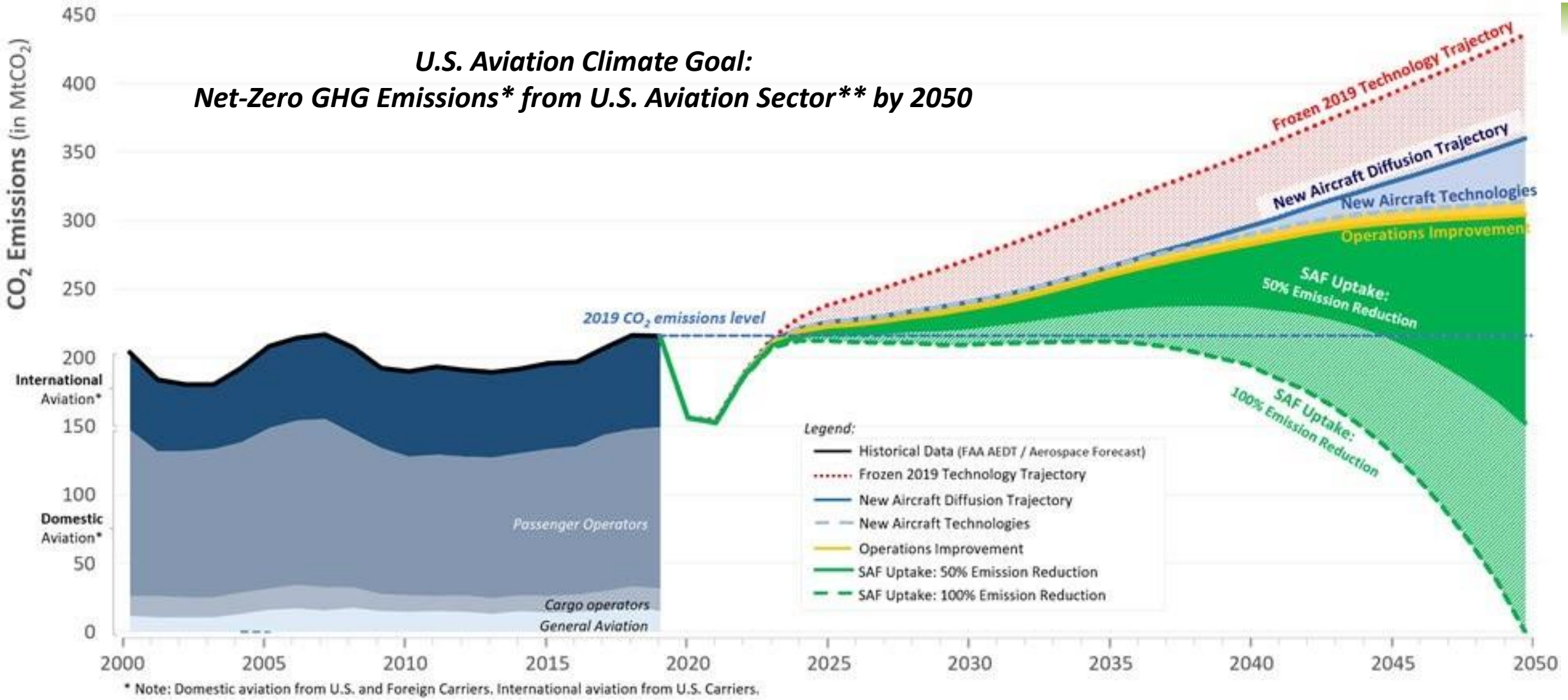
* CO_2 emissions from (1) domestic aviation (i.e., flights departing and arriving within the United States and its territories) from U.S. and foreign operators and (2) international aviation (i.e., flights between two different ICAO Member States) from U.S. operators (only). Airport scopes 1 and 2 added for this specific analysis (figure).

** International aviation to / from the United States, regardless of the operator of the flights i.e., including both U.S. and foreign operators.

Aviation CO_2 Emissions

ACT SAF

U.S. Aviation Climate Goal:
Net-Zero GHG Emissions* from U.S. Aviation Sector** by 2050



* Note: Domestic aviation from U.S. and Foreign Carriers. International aviation from U.S. Carriers.

NOTE: Analysis conducted by BlueSky leveraging FAA Aerospace Forecast and R&D efforts from the FAA Office of Environment & Energy (AEE) regarding CO2 emissions contributions from aircraft technology, operational improvements, and SAF

Federal Aviation Administration

U.S. SAF Grand Challenge

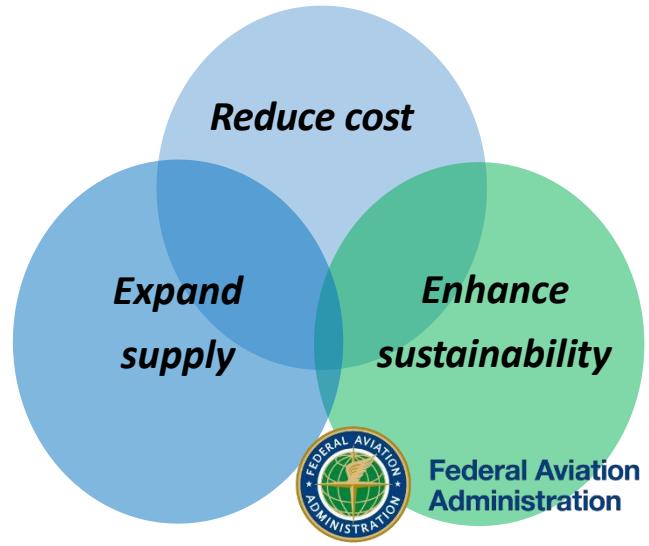
Sustainable Aviation Fuel Grand Challenge

- Agreement by the U.S. Departments of Transportation, Energy, and Agriculture to lead a whole of government approach
- Achieve 3 billion gallons of domestic SAF production in 2030 and put U.S. on trajectory to 35 billion gallons per year by 2050
- At least a 50% reduction in life cycle greenhouse gas emissions, as compared to conventional jet fuel
- Multi-agency roadmap to focus federal actions to support industry scale-up

MEMORANDUM OF UNDERSTANDING
SUSTAINABLE AVIATION FUEL GRAND CHALLENGE

Among the
THE U.S. DEPARTMENT OF ENERGY,
THE U.S. DEPARTMENT OF TRANSPORTATION and the
THE U.S. DEPARTMENT OF AGRICULTURE

September 9, 2021



https://www.energy.gov/eere/bioenergy/articles/sustainable-aviation-fuel-grand-challenge-roadmap-flight-plan-sustainable

U.S. SAF Grand Challenge Roadmap Structure

- Feedstock Innovation
- Conversion Technology Innovation
- Building Supply Chains
- Policy and Valuation Analysis
- Enabling End Use
- Communicating Progress and Building Support

- 26 Workstreams
- 139 Activities
- 2030 & 2030-2050 impact timeframes

https://www.energy.gov/eere/bioenergy/articles/sustainable-aviation-fuel-grand-challenge-roadmap-flight-plan-sustainable

SAF Grand Challenge Implementation Next Steps

Sustainable Aviation Fuel Grand Challenge

Sustainable Aviation Fuel Grand Challenge

Inaugurated on Sept. 9, 2021, the Sustainable Aviation Fuel Grand Challenge is the result of the U.S. Department of Energy (DOE), the U.S. Department of Transportation (DOT), the U.S. Department of Agriculture (USDA), and other federal government agencies working together to develop a comprehensive strategy for scaling up new technologies to produce sustainable aviation fuels (SAF) on a commercial scale.

The SAF Grand Challenge will guide federal actions to support industry to reduce the cost, enhance the sustainability, and expand the production and use of SAF to:

- Produce 3 billion gallons per year of domestic SAF production that achieve a minimum of a 50% reduction in life cycle greenhouse gas emissions compared to conventional fuel by 2030.
- Meet a goal of supplying 100% of projected domestic aviation jet fuel use, or 35 billion gallons of annual production, by 2050.

SAF Grand Challenge Roadmap

To achieve the SAF Grand Challenge 2030 and 2050 goals, the interagency team worked with other government agencies; stakeholders from national labs, universities, non-governmental organizations; and the aviation, agricultural, and energy industries to develop the *SAF Grand Challenge Roadmap: Flight Plan for Sustainable Aviation Fuel*.

SAF Grand Challenge Partners

Successful implementation of the SAF Grand Challenge will require close collaboration of agencies across the federal government—particularly DOE, USDA, DOT and its

SAF Grand Challenge Roadmap

To achieve the SAF Grand Challenge 2030 and 2050 goals, the interagency team worked with other government agencies; stakeholders from national labs, universities, non-governmental organizations; and the aviation, agricultural, and energy industries to develop the *SAF Grand Challenge Roadmap: Flight Plan for Sustainable Aviation Fuel*.

- SAF Grand Challenge Roadmap Implementation Framework
  - Inventory of current federal agency capabilities and programs that support the SAF Grand Challenge action areas
  - Identifies current program gaps and barriers
- SAF Grand Challenge Progress Report
  - Update on progress achieved since the signing of the MOU establishing the SAF Grand Challenge
  - Will be released annually going forward
  - Will include a description of the metrics to track progress
  - Will include highlighted accomplishments within Roadmap Action Areas

https://biomassboard.gov/sustainable-aviation-fuel-grand-challenge

Inflation Reduction Act (IRA)
Production support through 2027

IRA Tax Credits

SAF Tax Credit — §13203 : 2023-2024

- Achieves 50% lifecycle GHG reduction
- $1.25 per gallon up to $1.75 for additional lifecycle emissions reduction ($0.01 for every 1% in GHG reduction)

Clean Fuels Production Credit — §13704 : 2025-2027

- Lifecycle GHG <50kg CO2e/MMBTU (Jet Baseline = 94kg CO2e/MMBTU)
- Enhanced value for SAF up to $1.75 for 100% reduction

Text - H.R.5376 - 117th Congress (2021-2022): Inflation Reduction Act of 2022 | Congress.gov | Library of Congress

FAST - SAF and Low Emissions Technology Grant Program

FAST Grant Program

FAST Grants
FAST-SAF & FAST-Tech

New grant program under section 40007 of IRA

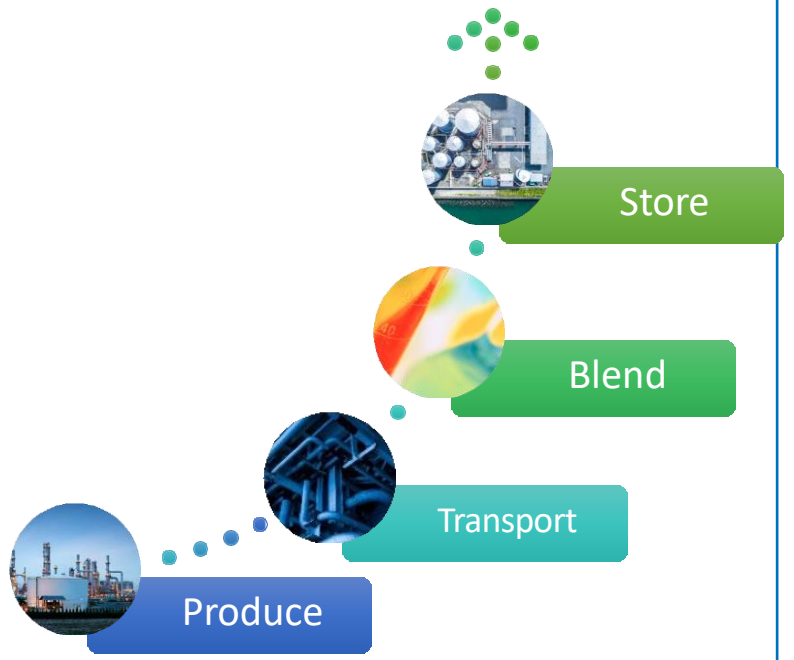
Fueling Aviation's Sustainable Transition

Key Objective: *make investments to accelerate the production and use of SAF, thereby supporting the goals of the SAF Grand Challenge, to meet U.S. aviation climate goals to reduce aviation carbon emissions*

$297 million (total) competitive grant program

- ❑ $245 million for SAF projects to enable production, transport, blending, or storage of SAF
- ❑ $46 million to develop or apply low-emission aviation technologies

Grant award announcements anticipated Summer 2024



https://www.faa.gov/general/fueling-aviations-sustainable-transition-fast-grants

Dr. Prem Lobo

Energy Division Manager

Office of Environment and Energy

Federal Aviation Administration

Email: Prem.Lobo@faa.gov

Federal Aviation Administration

Questions and Answers

Closing Remarks

ACT-SAF Series calendar

ACT SAF

ACT-SAF Series - SEASON 2
✓ #8 Introduction into 2024
✓ #9 Green Hydrogen for aviation
✓ #10 ICAO tools for lifecycle assessment
✓ #11 ICAO Global Framework – Step-by-step SAF policy making
#12 SAF in State Action Plans
#13 CAAF/3 Global Framework
#14 Multi-stakeholder SAF Alliances
#15 Feasibility assessments
#16 Updates on recent developments (policies)

Next episode
30 May 2024

ICAO

North American Central American and Caribbean (NACC) Office
Mexico City

South American (SAM) Office
Lima

ICAO Headquarters
Montréal

Western and Central African (WACAF) Office
Dakar

European and North Atlantic (EUR/NAT) Office
Paris

Middle East (MID) Office
Cairo

Eastern and Southern African (ESAF) Office
Nairobi

Asia and Pacific (APAC) Sub-office
Beijing

Asia and Pacific (APAC) Office
Bangkok

THANK YOU