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AVIATION

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FLYING**GREEN**
Release 2.3
Your journey manual

July 2025

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Purpose

Welcome to the FlyingGreen User Manual, your comprehensive guide for navigating and utilising the innovative FlyingGreen platform. This manual is designed for all users, whether you're a new or an experienced user, and aims to provide all the necessary information to understand and operate the FlyingGreen platform effectively.

Within this document, you will find detailed instructions, guidelines, and visual aids to help you make the most of FlyingGreen's functionalities.

From data representation to practical implementation, this reference manual covers every aspect of the FlyingGreen platform, ensuring you have the knowledge required to leverage its features to their fullest potential.

Thank you for choosing FlyingGreen.

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FlyingGreen in brief

Welcome to the **FlyingGreen** platform.

FlyingGreen platform, developed by EUROCONTROL's **Aviation Sustainability Unit (ASU)** in cooperation with key aviation stakeholders.

As unique one-stop-shop, FlyingGreen supports ECAC Member States and the aviation sector in their efforts toward decarbonisation and climate change adaptation. Our comprehensive toolkit includes the following pillars:

- **NetZero**: Embark on a data-driven journey toward achieving zero emissions by 2050. Explore what-if scenarios to inform strategic decisions.
- **FuellingDecarb**: Access centralised information on transitioning from fossil to sustainable aviation fuels. Utilise our 'green fuels' calculator and resource hub.
- **ClimAdapt**: Build resilience to climate change, by using our climate risk pre-screening or ECO assessment tools and repository of information on risk assessment and adaptation.
- **DecarbFin**: Facilitating access to funding and providing good practices and tools for compliance with EU sustainability regulations.

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FlyingGreen functionalities

Pillars	R2.3
NetZero	• Improved traffic and emission values • ANSP / AUA area selections • Links with environmental management systems such as GreenATM, ACA. --- • Flight Phases filter improvements --- • Fleet Renewal & Revolution (e- and H_2) What If slider • Air Traffic Management and Airline Operation Improvements What if slider including detailed improvements per flight phase --- • Log In and save-retrieve multiple projects --- • KPI overview for ANSP and Airport views • Environmental costs bar chart including impact on ticket price and demand (assuming a -0.1-elasticity value which will be updated in a next release to reflect better values per market segments)
FuellingDecarb	• Estimation tool covers 2025, 2035 & 2045 in addition to existing 2030, 2040 & 2050. --- • Select the conversion provider : TU Delft or Trinity college of Dublin --- • Hydrogen and Electric powered aircraft, updates (new input data and formulas). --- • Gap electricity : Infrastructures deployment costs estimation for Wind Onshore & Offshore, Solar and Nuclear. --- • SAF Costs and prices : Estimate the SAF levelised cost and Minimum selling Price globally and per feedstock/Pathway. --- • Display SAF and Hydrogen Costs graphical representation --- • Electricity Share : display the electricity repartition (renewable, low-carbon, other) for “Global” , “Allowed” and “Used” electricity. Customize the repartition for each feedstock.

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FlyingGreen functionalities

Pillars	R2.3
ClimAdapt	• Airport Operators, ANSPs, Airlines Climate Change Adaptation Planning Checklists • Repository of Information and Guidance
DecarbFin	• Landing Page Design & Structure • Funding Basket: add, select, remove and link essentials to build an EU & Private funding business case • Funding Booster including Financial Instruments, Use Cases, Frameworks & Roadmaps & Trends & Metrics dashboard

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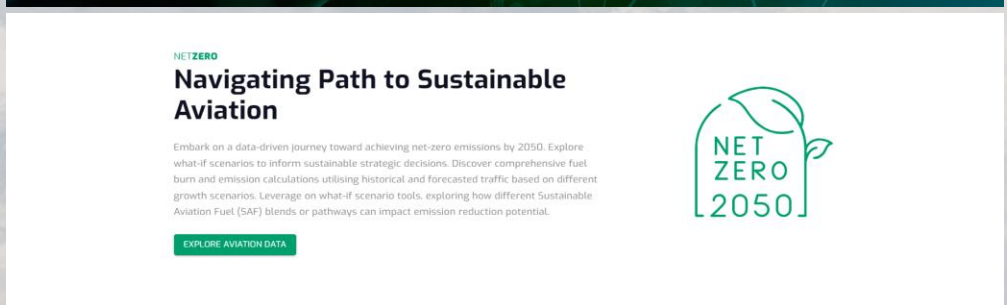
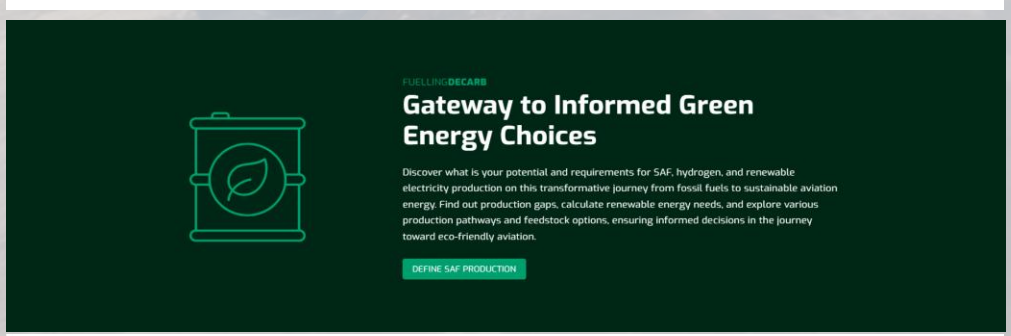
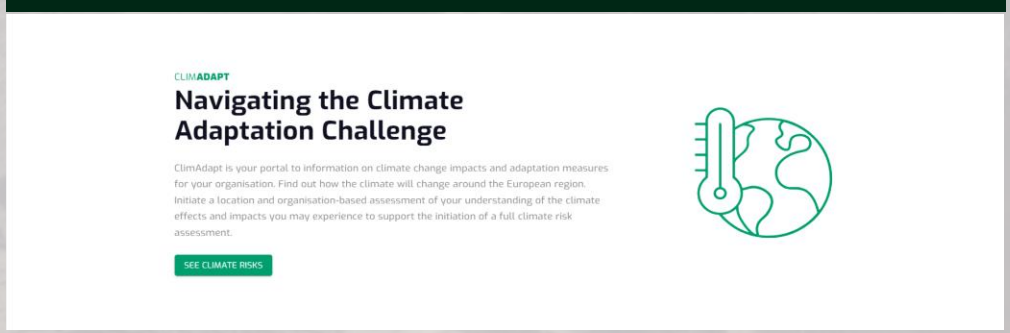
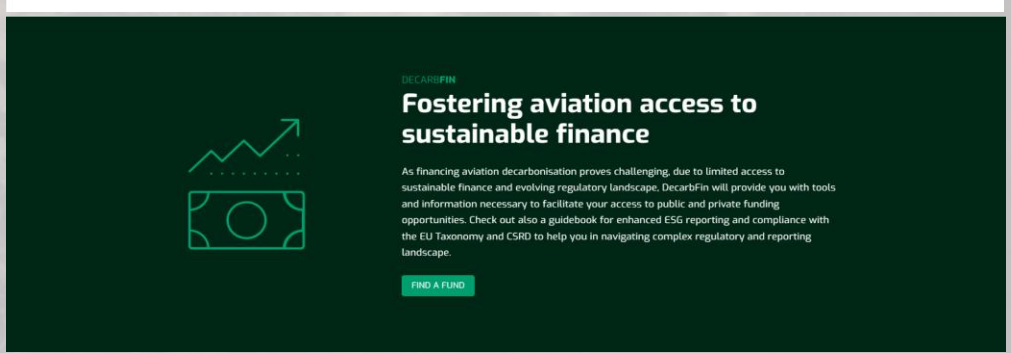
FlyingGreen

Supporting a sustainable future for aviation









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Pillars common features

1. **User Manual Download**
2. **Version number**
3. **Login**
   Enabling saving/retrieving project data

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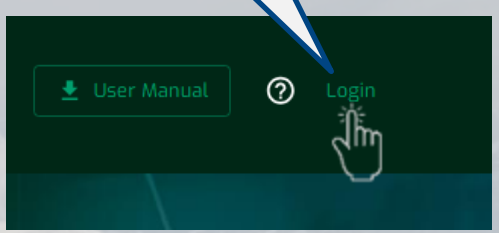
Pillars common features/Login

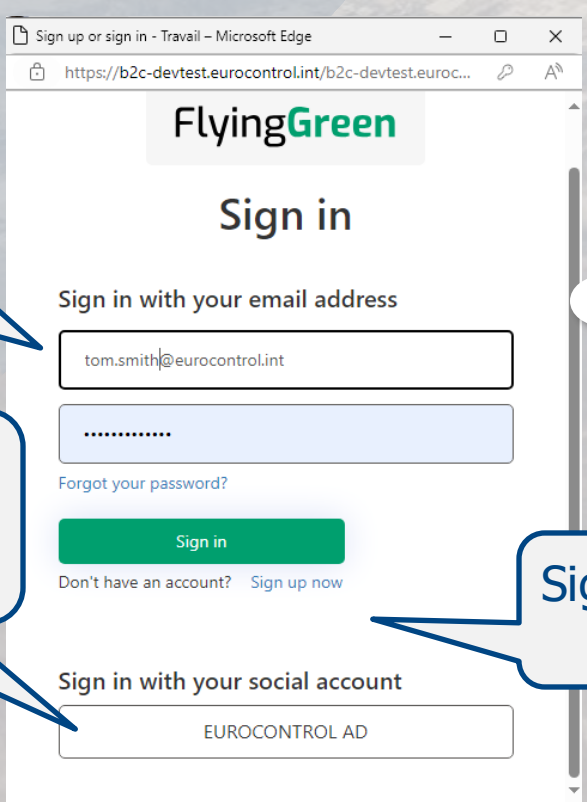
1 Login



2 *You Already Have an Account*

Sign in with your email address

Sign in with your Eurocontrol account



3 *You do not have an Account and need to sign up*

Sign Up: Create an account

Authenticator App needed on your mobile phone to enable the login process

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NetZero

Navigating Path to Sustainable Aviation

1 Zone

2 Filters & What If

3 Emissions

4 Fuel Burn

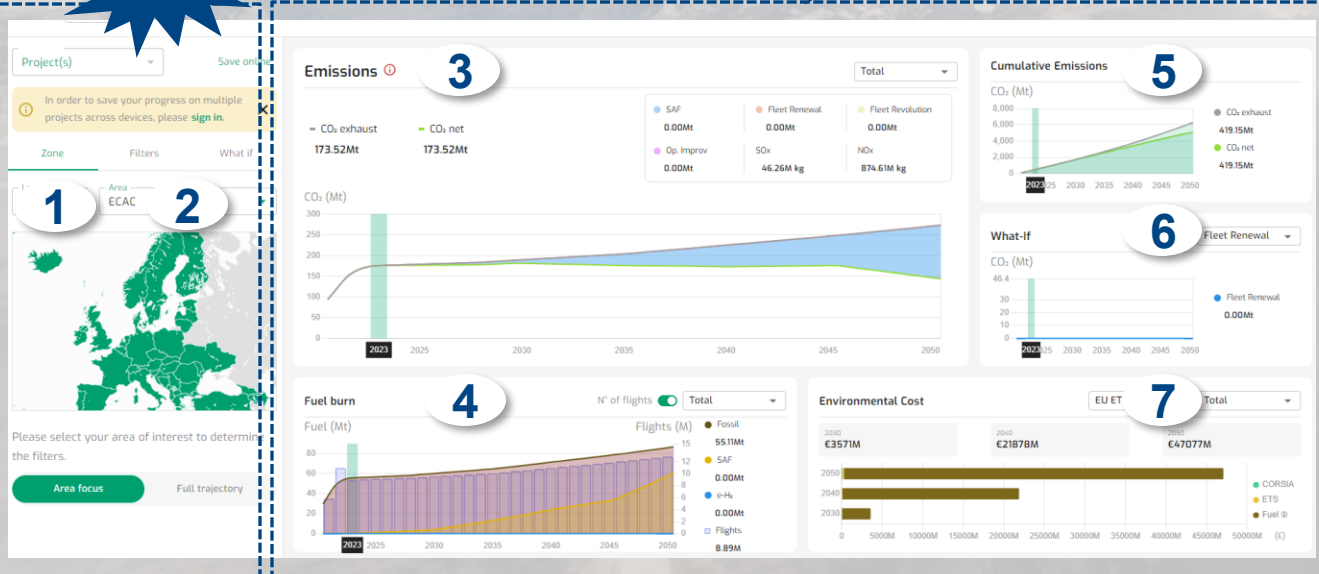
5 Cumulative Emissions

6 What if / KPIs

7 Environmental Costs

New

Log in to save your projects



Based on EUROCONTROL data and traffic forecasts, get an estimate of future trip fuel burn and emissions towards 2050 in different operational views and with traffic filtering options. Explore what-if scenarios to inform sustainable strategic decisions. Leverage on what-if scenario tools, exploring how Sustainable Aviation Fuel (SAF) volumes, technological and operational improvements can impact emission reduction potential. See an indication of additional environmental costs from SAF and market-based measures.

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NET ZERO 2050

Functionalities

Project Data	1	Save/Retrieve/Delete Project

Emissions estimate

Area	2	Select the Area and Level of interest
Emissions	3	View the Emissions (totals, average and reference)
Fuel Burn Number of Flights	4	View the Fuel Burn and Flights number
Cumulative emissions	5	View the Cumulative Emissions
What if	6	View the KPIs or results per category
Environmental Costs	7	View the Environmental Costs
Filters	8	Select the Flight criteria Filters
Scenarios	9	Select the Aviation Outlook Scenario

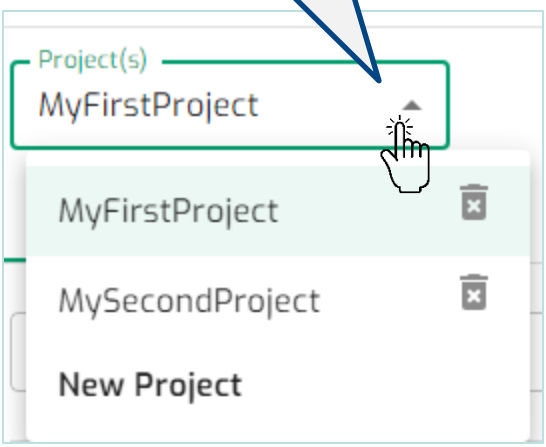
What-if estimates

SAF Blend	10	Customise the SAF Blend
Fleet, Air Traffic Mgt and Economic Prices	11	Customise the Fleet, Air Traffic Management and Economic Prices

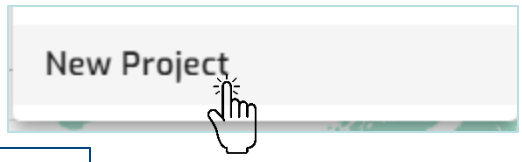
1 Save/Retrieve/Delete Project data

You need to login to enable project data management

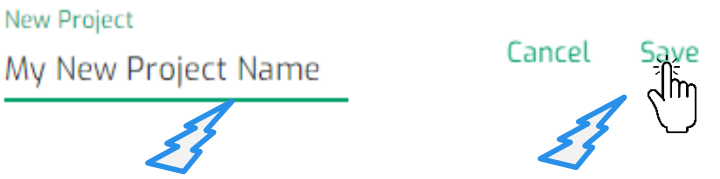
1 Display Projects list



2 Create New Project and save data



And

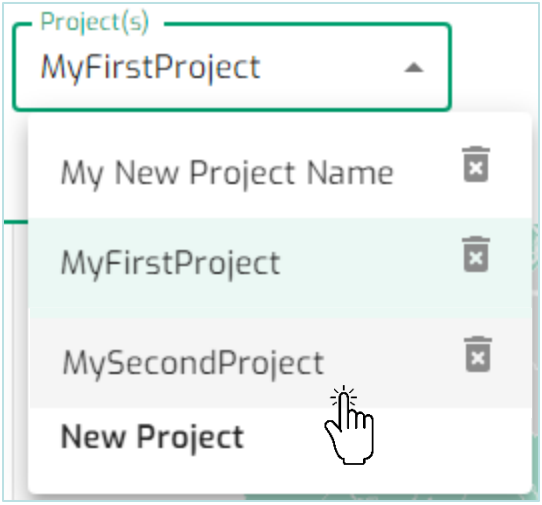


Enter New project name

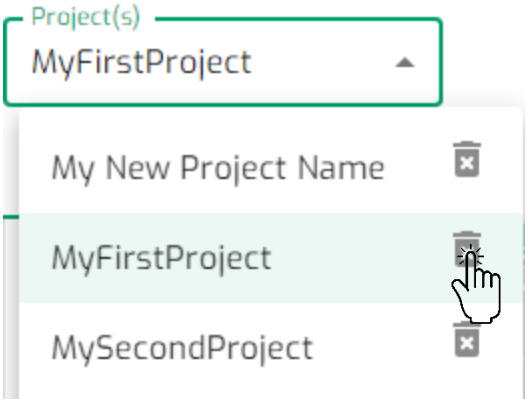
And Save the Net Zero information displayed

3 Update data in current project

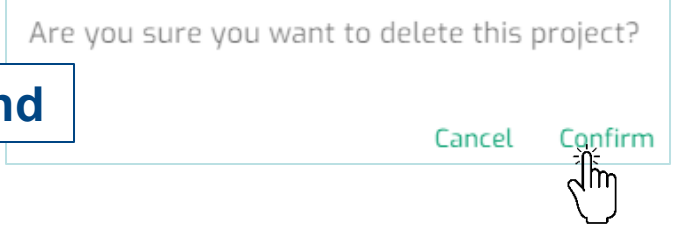
4 Retrieve project data



5 Delete Project



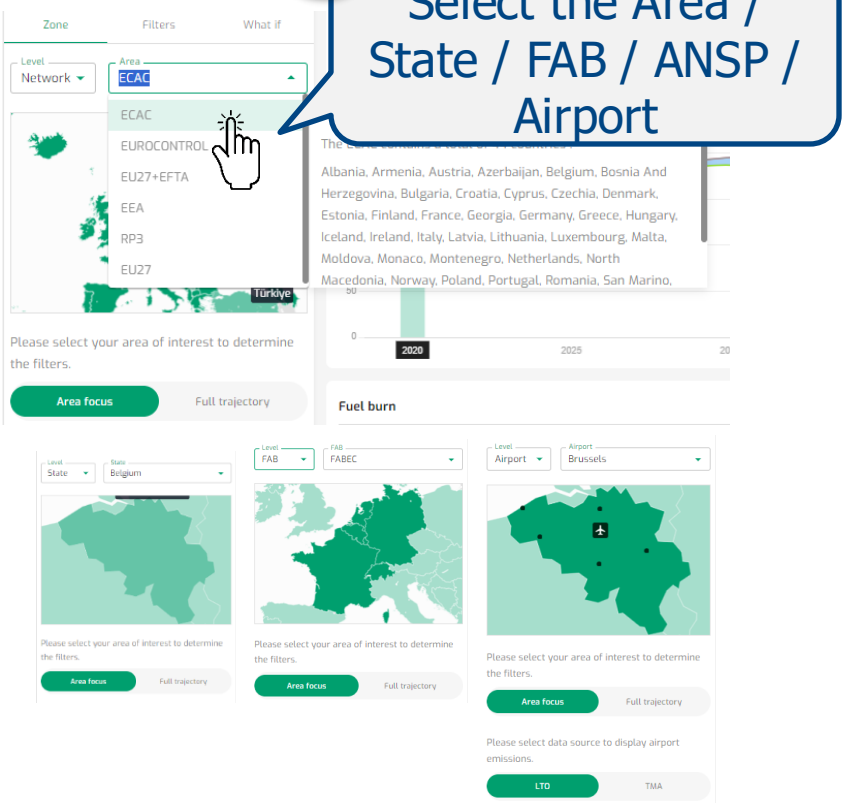
And



2 Select the Area and Level of interest

1 Select the Level

2 Select the Area / State / FAB / ANSP / Airport



Default

Default Level value is Network
Default Area value is ECAC
Default State value is Belgium
Default FAB value is FABEC
Default ANSP value is Skeyes
Default Airport value is Brussels

Output

The Level and Area selection update the Emissions, Fuel burn, Cumulative Emissions and What-if Graphs.

Data

UN list of countries. The designations employed do not imply the expression of any opinion whatsoever on the part of EUROCONTROL concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Generally, Airports with, on average, more than 10 movements per day are included.

Definition

Network: group of states
State: nation or territory considered as an organized political community under one government
FAB (Functional Airspace Block): an airspace block based on operational requirements and established regardless of State boundaries.

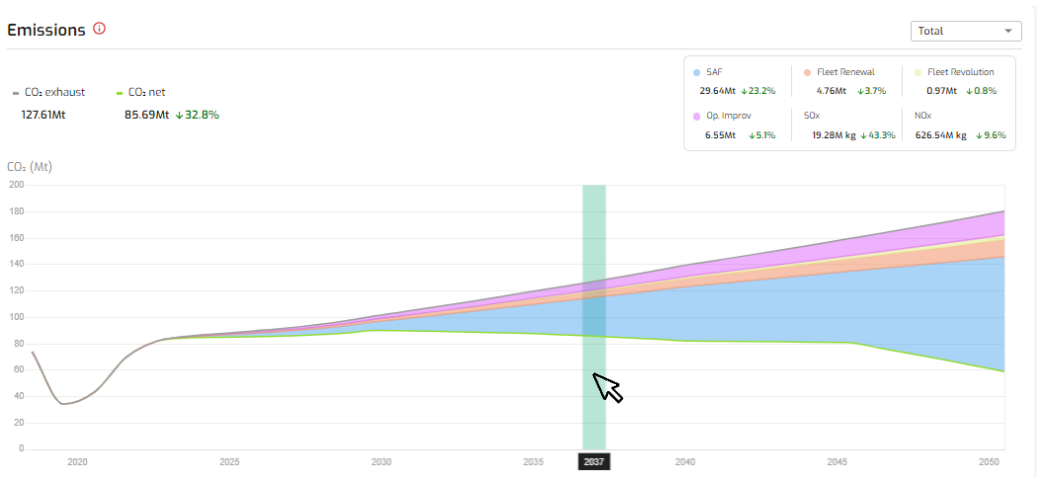
3 View the Emissions (totals, average and reference)

Default

Default values CO_2 exhaust, CO_2 net, SAF, Fleet Renewal, Fleet Revolution, Operation Improvements, NOx, SOx
Default Emissions View Total

Output

The Emissions results vary depending on the Zone selected, the Filters and the What if values. The total emissions of one year, and the reduction potential of in-sector improvements are visible at the top of the graph.



Data

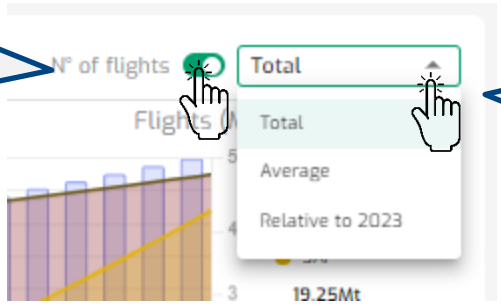
EUROCONTROL uses trajectories from operational systems (CPR data) and Advanced Emission Modelling tools (based on BADA3.16) to calculate historical emissions. The latest STATFOR forecasts are used to generate future trajectories and to calculate estimated future emissions in the different area selections.

Definition

Total value presents absolute total values of emissions
Average values present values per flight
Relative values present the yearly relative change compared to the reference year (currently 2024)

4 View the Fuel Burn & Number of Flights

1 View/Hide the number of flights



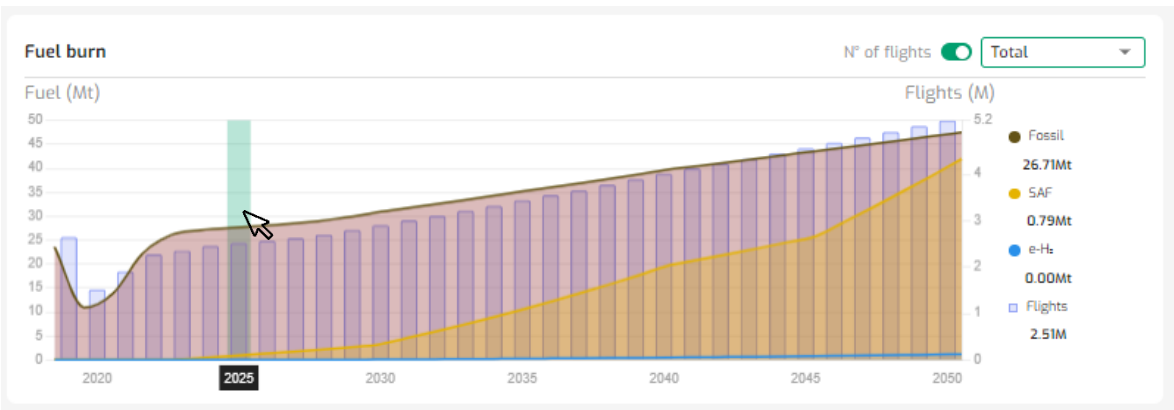
2 Select Emissions View mode

Default

Default values Fossil, SAF, e-H_2 and Number of flights

Output

The Fuel Burn results vary depending on the Zone selected, the Filters and the What if simulation. The Fuel Burn of one year is visible at the top of the graph. The graph shows total fuel burn and average fuel burn per flight. The H_2 and electricity energy is based on the percentage of fleet revolution chosen.

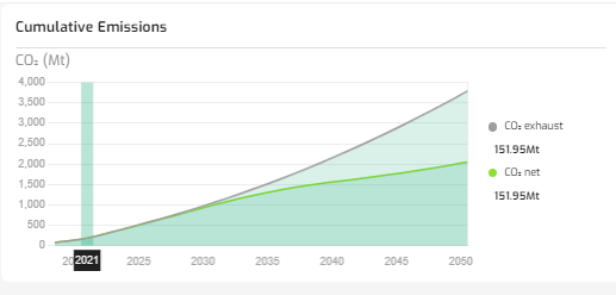


Data

Fuel burn historical values are calculated for each flight using the EUROCONTROL Advanced Emission Model (AEM) based on latest aircraft/engine fuel burn and emission models with BADA3.16. Estimated Fuel burn values towards 2050 are based on actual trajectories of reference year (usually the last full year) and traffic growth rates as published by STATFOR.

5 View the Cumulative Emissions

1 View the Cumulative Emissions graph



Default

Default values CO_2 exhaust and CO_2 net

Output

The Cumulative Emissions results vary depending on the Zone selected, the Filters and the What if simulation. The Cumulative Emissions of one year is visible by travelling on top of the graph.

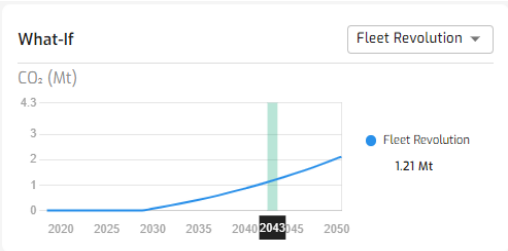
Data

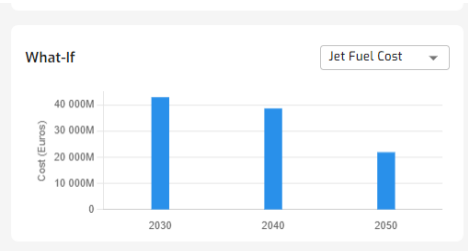
The yearly results from the main graph are added to indicate the cumulative emission results for CO_2 (as CO_2 remains in the atmosphere for many decades).

6 View the What if results

1

View the results graph





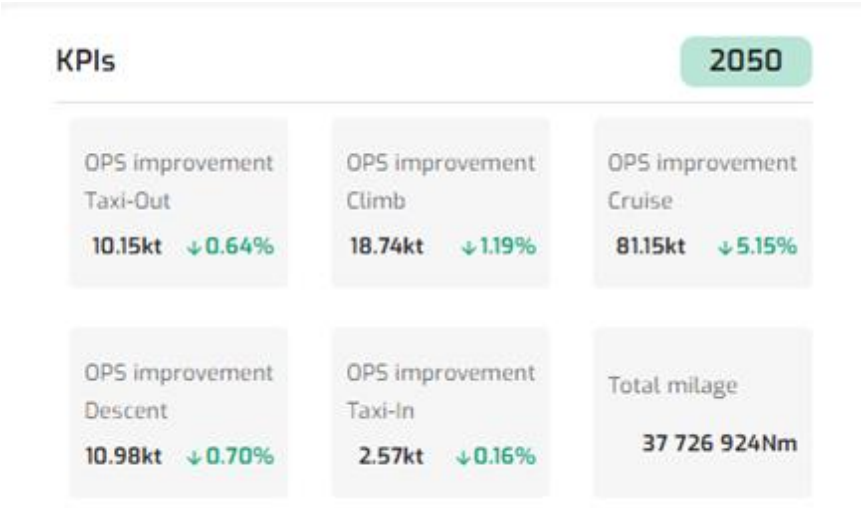
Default Default view Fleet Renewal

Output The What if results vary depending on the Zone selected, the Filters and the What if simulation. The What if results of one year are visible by travelling on top of the graph.

Data The results for the parameters are extracted from the results in the main emission, fuel burn and cost calculation. This graphs presents simply an easier overview of expected results over time for only one parameter.

1

Or view the KPI overview



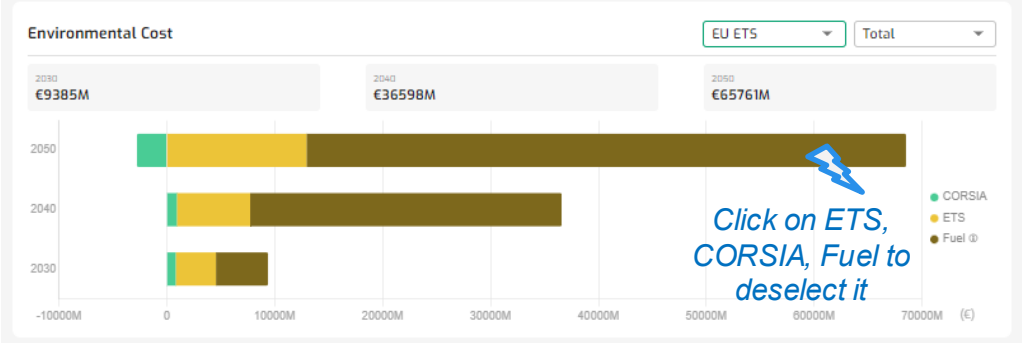
Default Default view In ANSP and Airport views, a KPI overview is shown

Output The KPI results depend on the Zone selected, the Filters and the What if simulation. The What if results of one year are visible by travelling on top of the KPI overview.

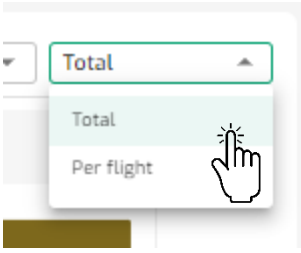
Data The results for the parameters are extracted from the results in the main emission, fuel burn and cost calculation. This overview presents simply an easier overview of expected results over time for the main indicators of interest (improvements and cost impact)

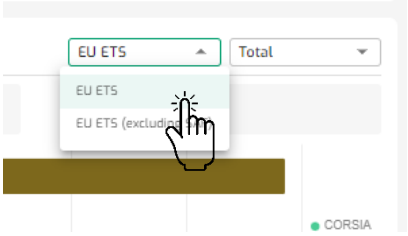
7 View the Environmental Costs

1 View the Environmental Cost bar chart



1 Click on the view : Total or Per Flight and choose the calculation wished : EU ETS excluding or not SAF





Default

Default values EU ETS and Total view

Output

The Environmental costs vary depending on the Zone selected and the What if simulation. The Environmental cost are visible for 3 years: 2030, 2040 and 2050.

Data

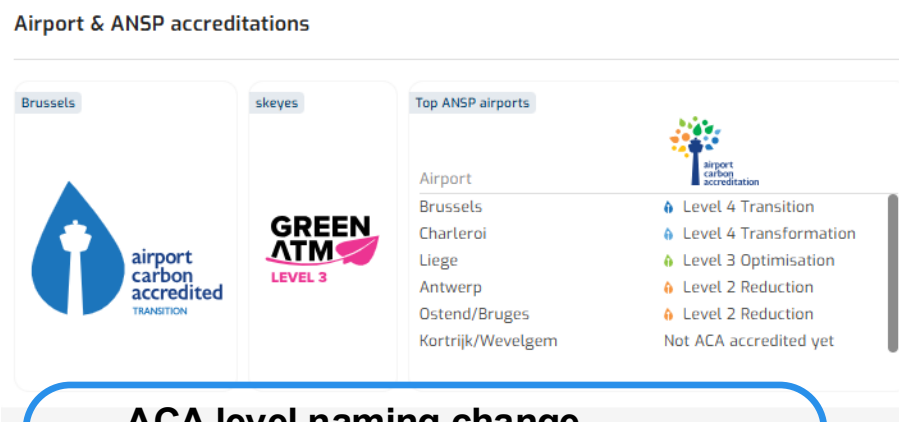
Data to calculate additional environmental costs are synchronized with assumptions from Eurocontrol Aviation Outlook 2050 (see below).
EU ETS cost are assumed to offset the total remaining net emissions, both taking into consideration LCA values (option EU ETS), and not taking into consideration SAF lifecycle values (the option with SAF excluded).
Simplified CORSIA costs only appear if emission values for eligible flights are higher than 85% of 2019 emissions and then taking CORSIA sectoral growth factors into consideration (linear progression from zero towards SGF 2,6 in 2050). Only sectoral offset methodologies are included to avoid too high calculation complexities.

Price of travel (2025/2050)			
Price of CO_2 allowances (€/t)	Moderate (80€/369€)	Moderate (80€/369€)	Moderate (80€/369€)
Price of conventional fuel (€/t)	Low (720€/834€)	Moderate (715€/819€)	High (1.408€/1.554€)
Price of Sustainable Aviation Fuel (€/t)	Moderate (1.897€/1.720€)	Moderate (1.897€/1.720€)	High (2.537€/2.406€)

7 View the Environmental Management status

1

View the Environmental management systems used



ACA level naming change

The ACA level naming has changed. The updated naming will appear on the August 2025 version of the platform.

Default

In the ANSP and Airport views, instead of the cost graphs an overview is presented on the EMS status of ANSP and airports

Output

Indication of the Environmental Systems that are applied at the ANSP and different national Airports.

Data

ANSP

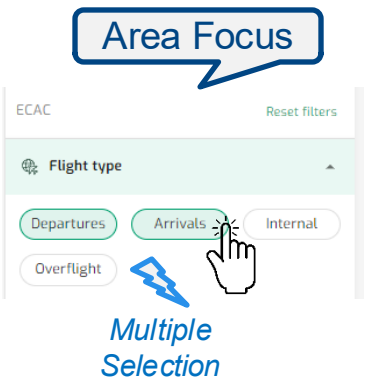
Several Environmental Systems may be applied at ANSP level, such as EMAS, GreenATM, ISO 14000 family, etc.
The CANSO GreenATM programme is a voluntary environmental accreditation designed for ANSPs to assess and enhance their environmental performance. It offers a structured framework with five maturity levels, evaluating areas such as governance, operational efficiency, infrastructure, and stakeholder engagement. Participation in the GreenATM programme is entirely voluntary for ANSPs. It serves as an independent, industry-endorsed accreditation of their environmental efforts.

Airports

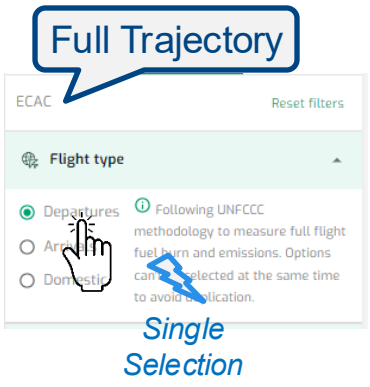
The Airport Carbon Accreditation (ACA) programme, developed by Airports Council International (ACI), is a globally recognized certification that helps airports measure, manage, and reduce their carbon emissions. It offers a six-level framework, from mapping emissions to achieving net zero, and is based on independent assessment and annual verification.

8 Select the Flight criteria Filters

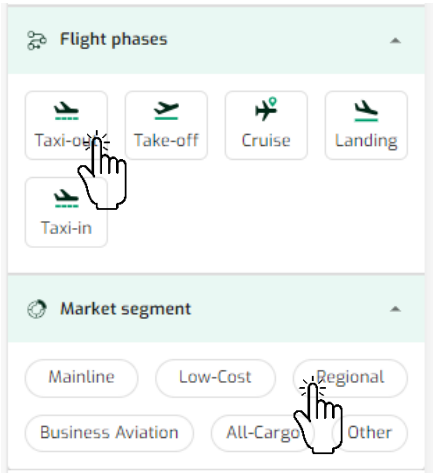
1 Select Flight type

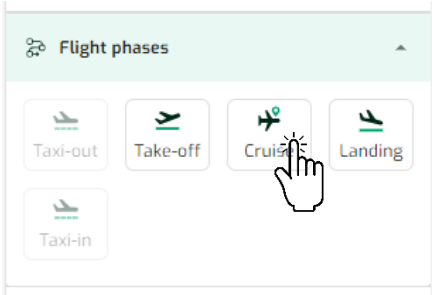


OR



2 Adjust Filters





Default

Default Area of interest is Area focus.
Default Flight type Area Focus is Departures and Arrivals
Default Flight type Full trajectory is Departures
No Default Flight phases for Area focus or Full trajectory
No Default Market segment for Area focus

Output

The Are of interest and filters selection update the Emissions, Fuel burn, Cumulative Emissions and What-if Graphs.

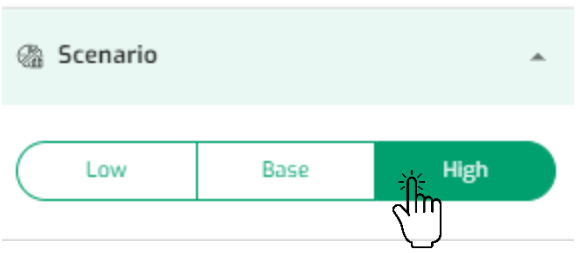
Data

Emission values are calculated using 2 different methodologies. The Area focus presents Fuel burn and Emissions within the Area selected. Finetune the type of traffic to be presented by Departures to outside the Area selected, Arrivals to within the Area selected, Internal flight withing the Area selected, and Overflying traffic of the Area selected.

With the Full trajectory method, the Fuel burn, and Emissions of the Full trajectory are presented. Possible traffic selections are Full emission and Fuel burn of departing traffic from the Area selected, from Arrivals to the Area selected and from Domestic flights. Traffic selections cannot be selected simultaneously to avoid overlap.

9 Select the Aviation Outlook Scenario

1 Select the Scenario



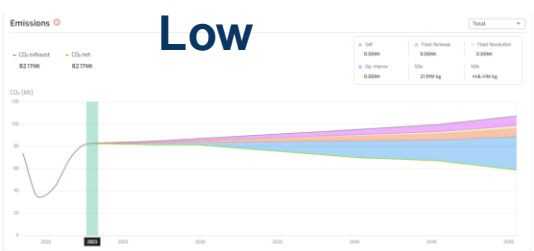
Default

Default Scenario value is Base

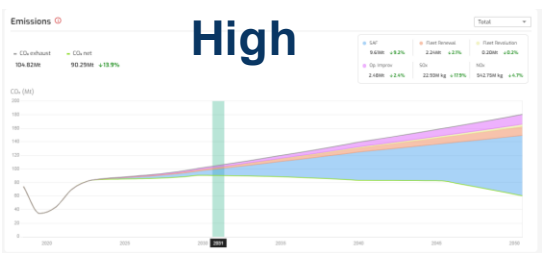
Output

The Low, Base and High Scenarios represent traffic hypothesis. The Scenario changes the Emissions, Fuel burn, Cumulative Emissions and What-if Graphs values.

Low



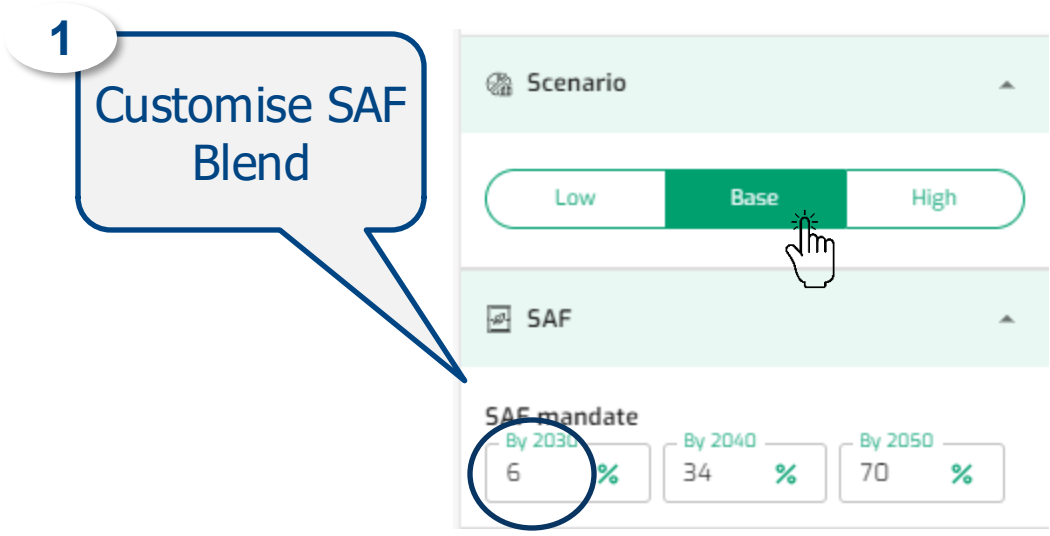
High



Data

Traffic numbers and Emission and Fuel burn are based on High, Base and Low scenario as applied in the EUROCONTROL Aviation Outlook 2050. Each scenario presents different growth rates that are reflected in the emission Fuel burn graphs.

10 Customise the SAF Blend



Default

Default Blend Low scenario: 4% in 2030, 26% in 2040, 50% in 2050
Default Blend Base scenario: 6% in 2030, 34% in 2040, 70% in 2050
Default Blend High scenario: 10% in 2030, 49% in 2040, 88% in 2050

Bio-SAF/synth-SAF ratios are applied according to ReFuelEU mandate.

Output

The Blend % changes the CO_2 net curve on the Emissions and Cumulative emissions graph and the SAF curve on the Fuel Burn graph.

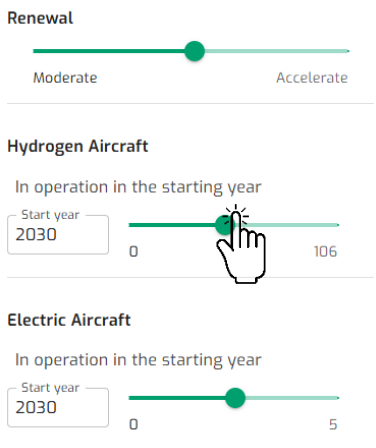
Data

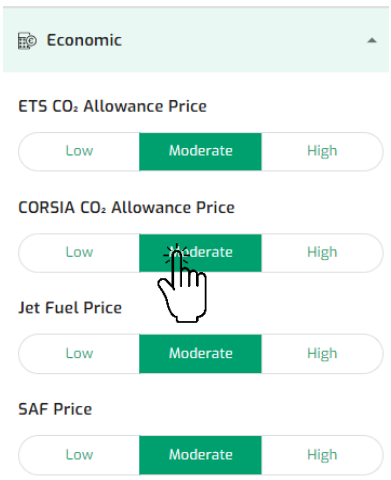
To assess the impact of the use of Sustainable Aviation Fuels on the NET emission values, input the percentages of SAF blend in the different years and the specific SAF pathway. Default values in the base scenario are aligned with the ReFuelEU SAF requirements. LCA values applied are: 65% emission reduction for bio-SAF and 70% emission reduction for synthetic SAFs.

11 Customise the Fleet, Air Traffic Management and Economic Prices

1

Customise The Fleet and Economic Prices



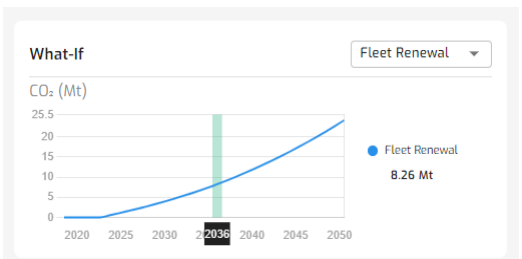


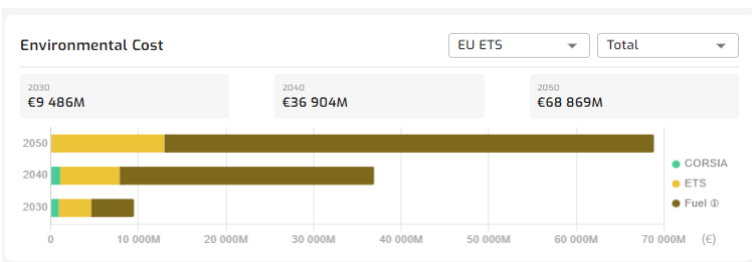
Default

Default Levels Moderate (Fleet and Air Traffic Management) or Moderate (Economic Scenario)

Output

The different levels update the Emissions, Fuel burn, Cumulative Emissions, What-if and Environmental Cost Graphs.





Data

Fleet evolution, revolution input impacts forecasted emission reductions. Default values are aligned with the EUROCONTROL Aviation Outlook 2050. For revolution a/c the user can enter expected year of introduction and the amount of e- or H_2 a/c deliveries as percentage of max estimated deliveries. The maximum amount of deliveries is based on the ambitious scenario of the Alliance of Zero Emission Aircraft (AZEA). The reduction potentials per year are extrapolated towards final results in 2050 in the different scenarios. For fleet evolution, the user can select delay or accelerated fleet renewal (with a certain number of years).

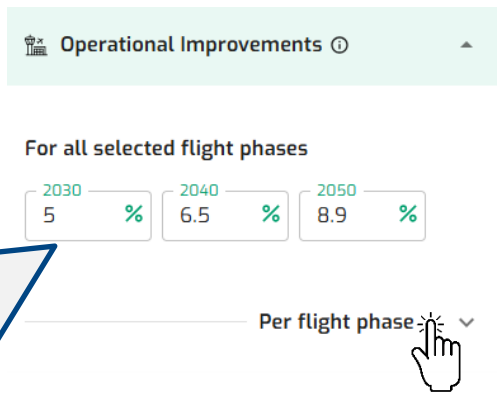
The user can select specific improvement percentages using the sliders and/or select low, moderate or high prices for fuels, SAF and CO_2 as indicated in the Eurocontrol Long-Term forecast 2050.

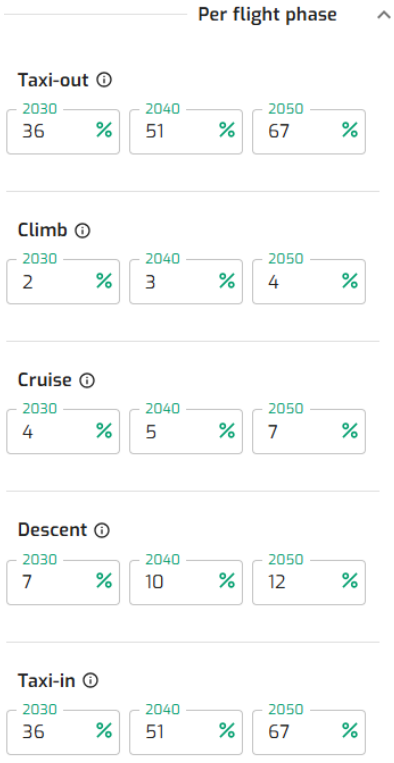
The state view includes the impact on ticket price and subsequent impact on demand. In this release very simple values and methodologies are applied (not specified per market segment or other filters), assuming fixed operational margins and fuel cost shares of airlines, to present the user with only an indication of possible impact. The price elasticity value applied is -0.1.

11 See the impact of operational improvements

1

Customise Operational improvements per flight phase



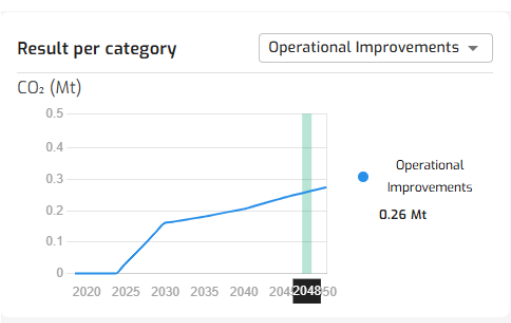


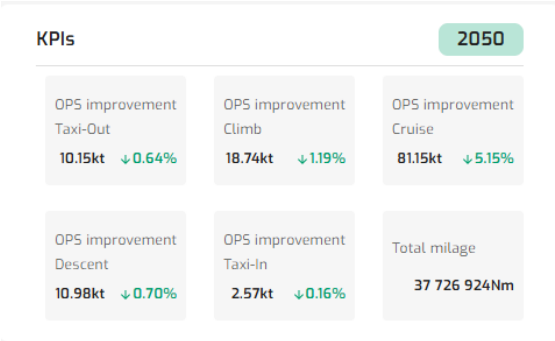
Default

Default Levels Moderate (Fleet and Air Traffic Management)

Output

The different input of operational improvements update Emissions (with indicated reduction of emissions from operational improvements, Fuel burn, Cumulative Emissions, What-if and Environmental Cost Graphs.





Data

The user can select his/her/their specific improvement percentages per flight phase. Each flight phase presents indications of potential improvement percentages for different operational concepts. The operational improvements are only applied to the available trajectory segments in the selected zone/area. E.g. taxi operational improvements will not affect upper area airspace emissions.

NetZero journey

NetZero step-by-step

Emissions	○ Check the Emissions for ECAC in 2035
Fuel Burn	○ Check the Fuel Burn for ECAC in 2035
Filters	○ Check only the departures, take-off phase and Mainline market segment for ECAC through the years
Scenarios	○ Check the high scenario for ECAC through the years
SAF Blend	○ Change the % of SAF blending for 2030 for ECAC
Fleet, Air Traffic Mgt and Economic Prices	○ Consider High Fleet Renewal and a Moderate scenario for ATM and Airline operation Improvements or enter specific improvements per flight phase. Set the SAF Price on the highest possible level.

The advantages of your journey

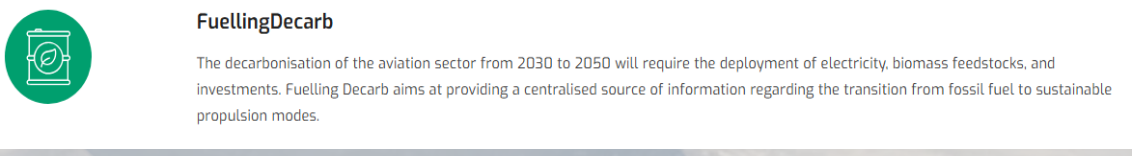
1. Have the latest EUROCONTROL emission data of your area of interest available.
2. See the impact of operational changes on fuel burn and emission values.
3. Benchmark your emission values with those of different area of interests and using different methodologies.
4. Get an indication of additional environmental cost due to regulations (ReFuelEU, EU ETS, CORSIA), and impact on ticketprice and demand.

SUPPORTING EUROPEAN AVIATION

EUROCONTROL

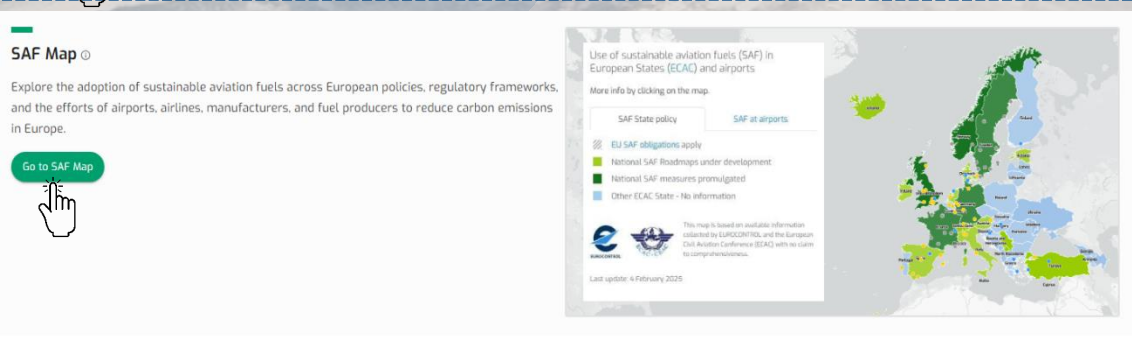
FuellingDecarb

Gateway to Informed Green Energy Choices

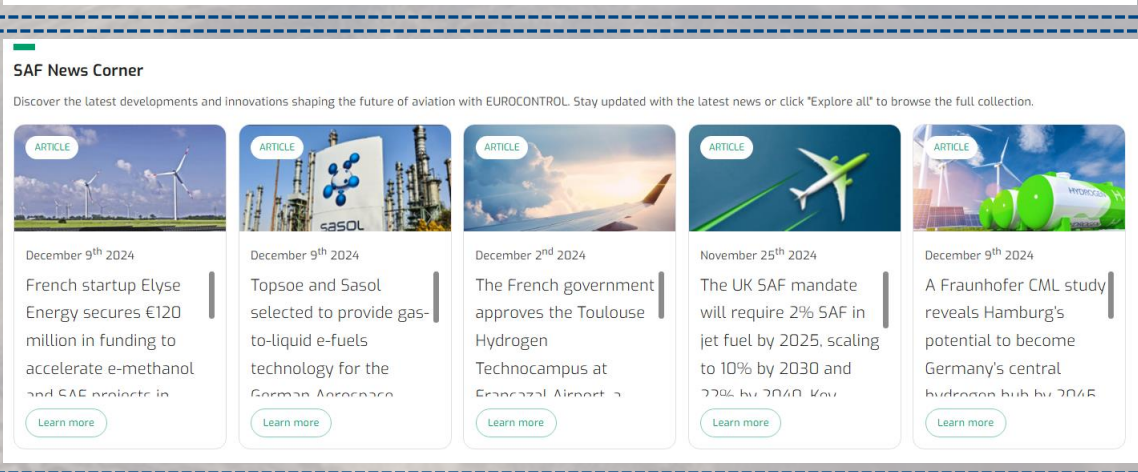


1 Estimation tool

2 SAF Map



3 SAF News Corner



The FuellingDecarb pillar of the platform allows to assess the volumes, costs and Minimum Selling Prices of Sustainable Aviation Fuel and the quantities of electricity and feedstock required to produce Sustainable Aviation Fuel (SAF) but also hydrogen, electricity for hydrogen and electric powered aircraft.

SUPPORTING EUROPEAN AVIATION

EUROCONTROL

Functionalities 1/2

Fuel Assessment

Settings	1	Select the Fuel Assessment tool settings
Fuel Estimate	2	View the Fuel Assessment page
Bio SAF	3	The Bio SAF Fuel production, units, electricity required, GHGs, cost & Minimum Selling Price
SAF Coproduct	4	Assess the SAF Coproducts production
Synthetic SAF	5	The Synthetic SAF fuel production, electricity required, units GHGs, Costs & Minimum Selling Price
Electric Aircraft	6	The Electric Aircraft electricity production
Hydrogen Aircraft	7	The Hydrogen fuel production
Allocated Renewable Electricity	8	Assess the volume of Green electricity (produced with renewable energy) necessary for Fuel production
Electricity Share	9	Display Global, Allocated & Used electricity
Fill the Renewable Electricity gap	10	Plan the Renewable electricity infrastructures to fill the Renewable electricity gap with costs

SUPPORTING EUROPEAN AVIATION

EUROCONTROL

Functionalities 2/2

Fuel Assessment

Allocated Low-Carbon Electricity	11	Assess the Low-Carbon electricity necessary for Fuel production
Fill the Low Carbon Electricity gap	12	Plan the Low-Carbon electricity infrastructures to fill the Low-Carbon electricity gap with costs
Allocated Other Electricity	13	Assess the Others energy category of electricity necessary for Fuel production
Needs & Production	14	View needs & production chart (SAF, Hydrogen fuel and Electric aircraft)
SAF & H_2 Costs Graph	15	Graphical display of SAF and H2 costs for each feedstock/pathway

SAF Map

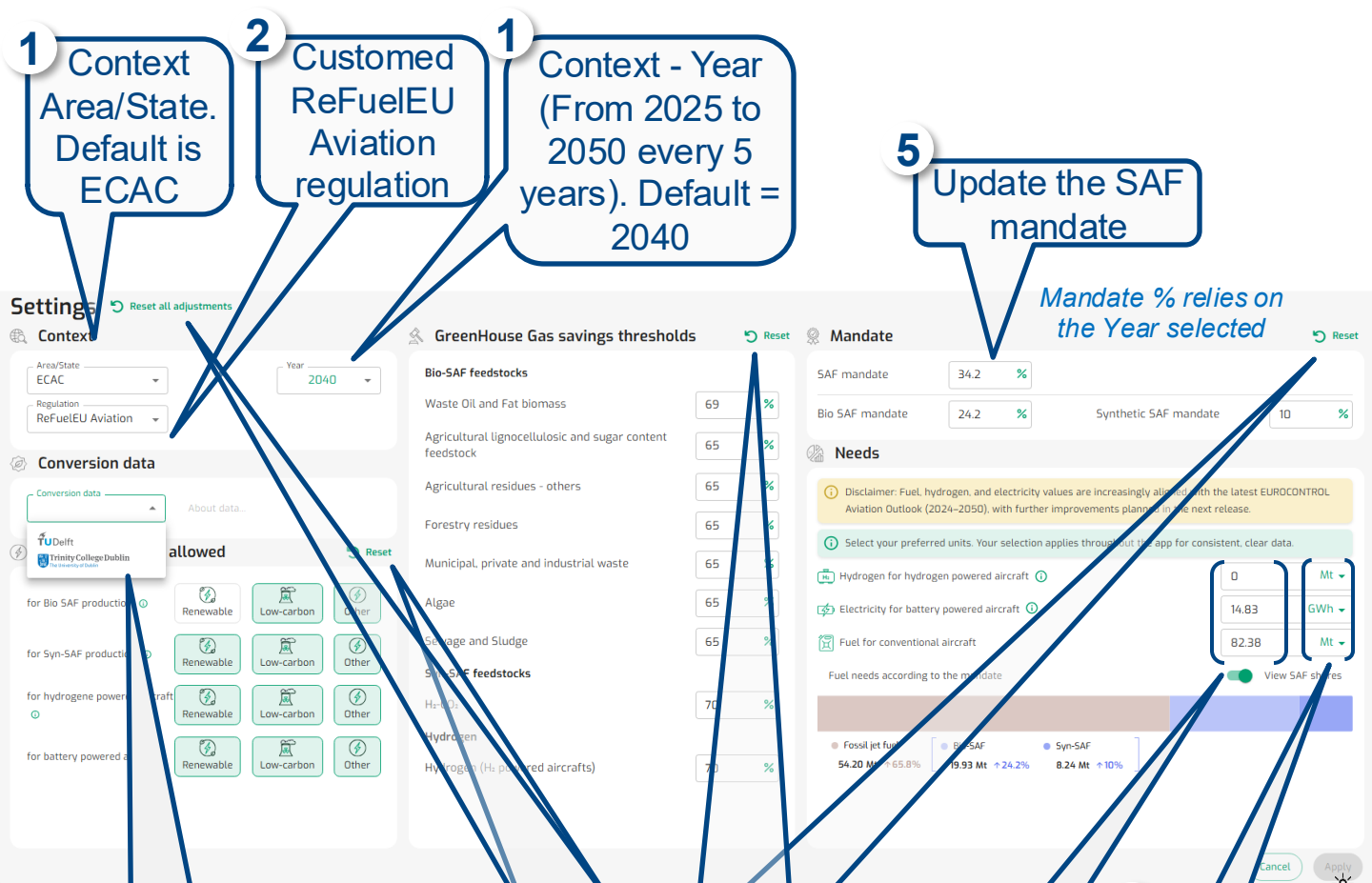
SAF Map	16	View the SAF map

SAF News Corner

SAF News	17	View the SAF news

1 Select the Fuel Assessment tool settings (1/2)

1. Select an Area / State & Year
2. Customed RefuelEU Aviation regulation
2. Reset Customed to Default RefuelEU Aviation
3. Select the mass & energy conversion provider
4. Complete the Needs
4. Modify the Needs
4. Modify the Units
5. Modify the SAF mandate



1 Select the Fuel Assessment tool settings (2/2)

Default

Default Area is ECAC
Default Year is 2040
Default Regulation is ReFuel EU Aviation (Mandate corresponding to 2040)
Needs values are prefilled for some Areas / States

Output

The Settings impact the Fuel Assessment goals to reach on SAF production, Hydrogen production and Electric production.

Data

EU Commission, EASA and ICAO. ECAC Member States list.

Definition

SAF: Sustainable Aviation Fuel, a bio or synthetic fuel used to power aircraft with smaller carbon footprint than conventional jet fuel.

GHGs: Green House Gas savings

Feedstock: Sources from which the SAF is produced. The feedstock is here presented in two different categories considered.
Bio SAF feedstocks : biomass such as agricultural and forestry residues, municipal waste or algae.
Synthetic SAF feedstocks: H2-CO2

Electricity sources
Renewable: In this context, electricity source coming from renewable source (i.e solar, hydroelectric, wind).
Low-carbon: In this context, electricity produced with nuclear power plants.
Other: in this context, electricity sources not coming from renewable or low-carbon sources (such as coal, oil and gas electricity sources).

Battery powered aircraft: Aircraft partially or fully powered via an electric battery (hybrid-electric or full electric aircraft).

Hydrogen powered aircraft: Aircraft powered by hydrogen via Direct combustion in jet engines or via fuel cell to produce electricity for electric engines.

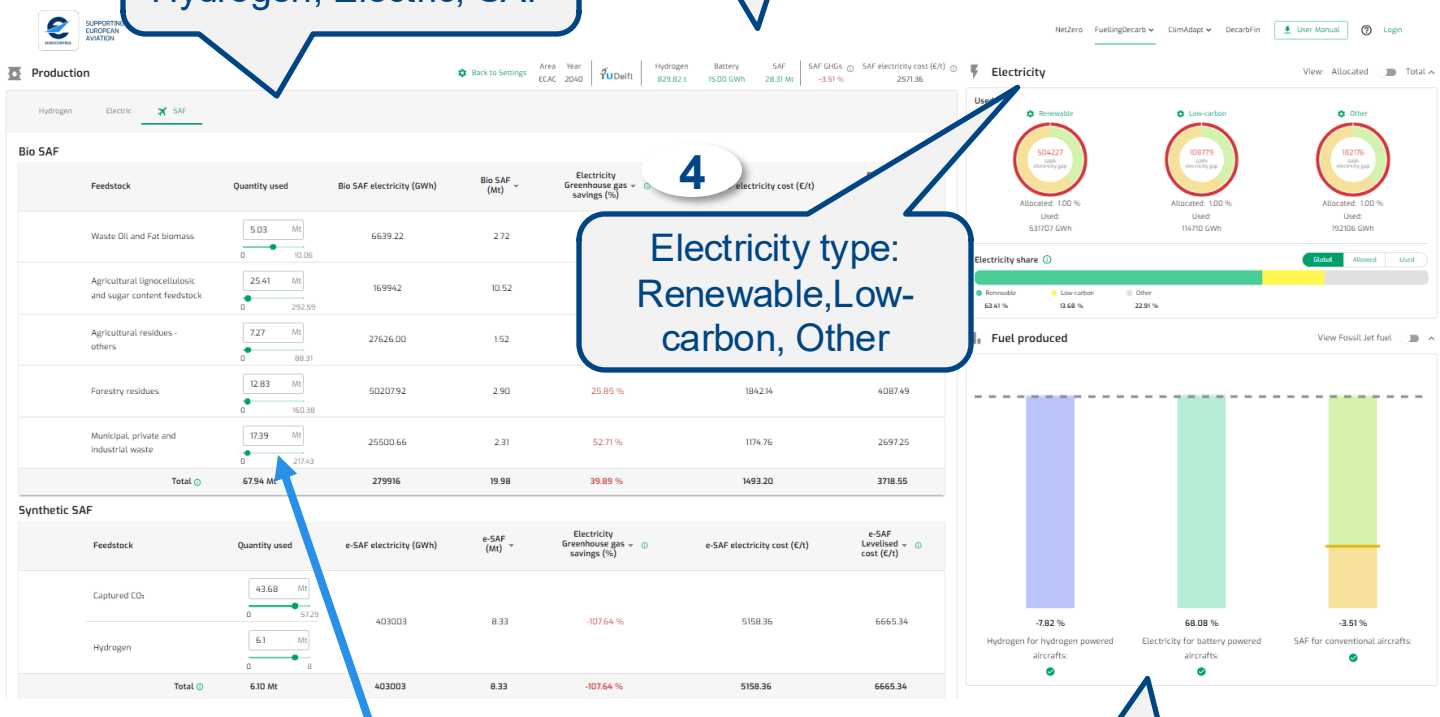
2 View the Fuel Assessment page (1/2)

1. View the Bio & Synthetic SAF
2. View the Electric Aircraft Electricity
3. View the Hydrogen Fuel Production
4. View the Electricity (Renewable, Low-carbon & Other)
5. View the Fuel produced

1 2 3

Header : Results summary

Production type : Hydrogen, Electric, SAF



4 Electricity type: Renewable,Low-carbon, Other

5 Fuel produced: Hydrogen, Electric and SAF

For some States data is provided, some States do not have existing data the counters start from 0 but the configuration is possible

2 View the Fuel Assessment page (2/2)

Default

Default Fuel is SAF
Default Electricity are Renewable, Low-Carbon & Other
Quantities values are prefilled for EU27, ECAC, US, China and World Areas / States

Output

The Fuel Assessment provides information on the Fuel to produce. The different zones of the Fuel Assessment allows a personalised configuration of the Fuel produced.

Data

CONCAWE and Imperial College London data, EUROCONTROL research, EUROSTAT, FAO, Fraunhofer Institute for Solar Energy Systems, ICCT, IEA, EEA, Project SkyPower, TU Delft, Trinity College of Dublin, ASTM standards. For more details on SAF pathways data, please also consult "About data" section on the site.

Definition

TU Delft SAF conversion available:

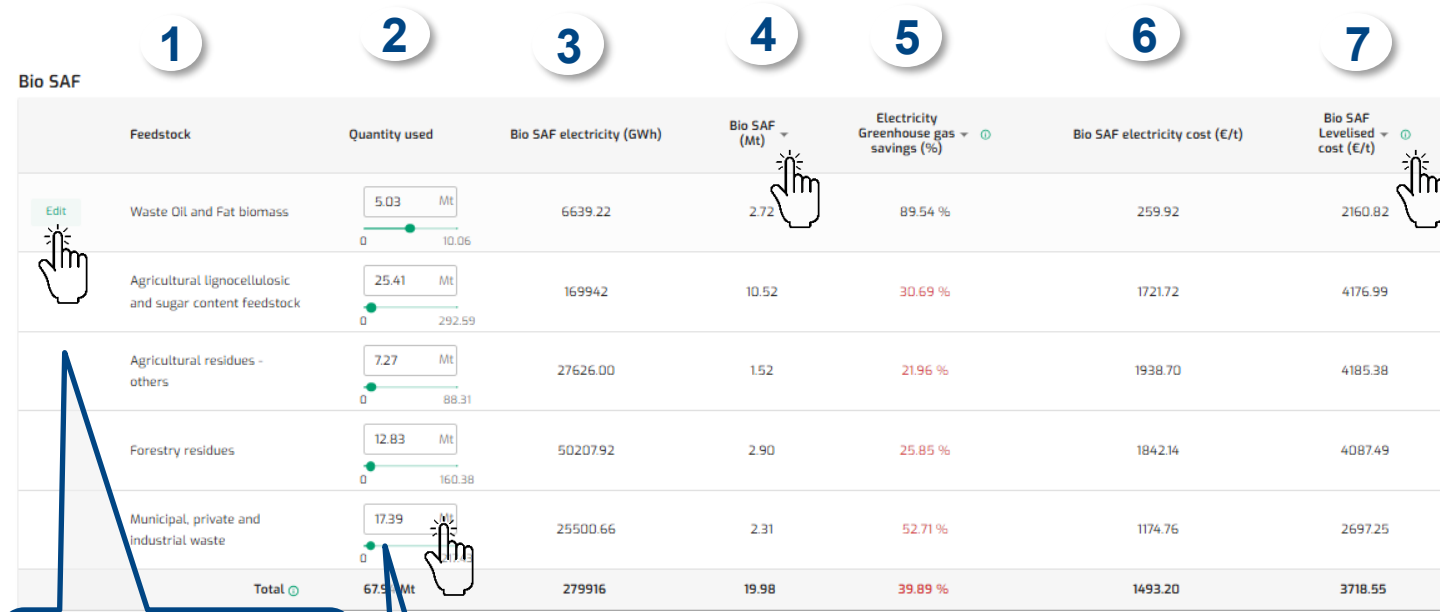
- HEFA-SPK: Hydrotreated Esters and Fatty Acids (HEFA) transformed in Synthesised Paraffinic Kerosene.
- FT-SPK: Synthesised paraffinic kerosene produced via Fischer-Tropsch process.
- ATJ : Alcohol to Jet production process
- ATJ-SPK: Synthesised paraffinic kerosene produced with Alcohol to Jet
- PTL : Power to Liquid via Fischer-Tropsch synthesis process.

Trinity College Dublin SAF conversion available:

- HEFA-SPK (NG no CCS): Natural gas for heat & H_2 no carbon capture sequestration.
- FT-SPK: Synthesised paraffinic kerosene produced via Fischer-Tropsch process.
- MtJ: bioMethanol to Jet process. Agricultural residues to produce biomethane, methanol and convert it to jetfuel (ASTM D4054 certification ongoing).
- HTL: Hydrothermal liquefaction via electricity or hydroge, (not yet certified).
- PTL : Power to Liquid via liquid sorbent DAC and Fischer-Tropsch synthesis process.
- PTL : Power to Liquid via solid sorbent DAC and Fischer-Tropsch synthesis process.
- PTL: Power to Liquid process via MtJ process (not yet certified) .

3 The Bio SAF Fuel production units and costs (1/3)

1. Display Bio SAF feedstocks list
2. Configure the Quantity used for aviation
   Open the details of the Feedstock to configure the Global quantity and the Quantity used for aviation
3. Display SAF electricity
4. Display SAF production
   Display Number of plants
5. Display Electricity Green House Gas savings %
   OR
   Global Green House Gas savings %
6. Display Electricity Cost
7. Display Levelised Cost
   OR
   Minimum Selling Price



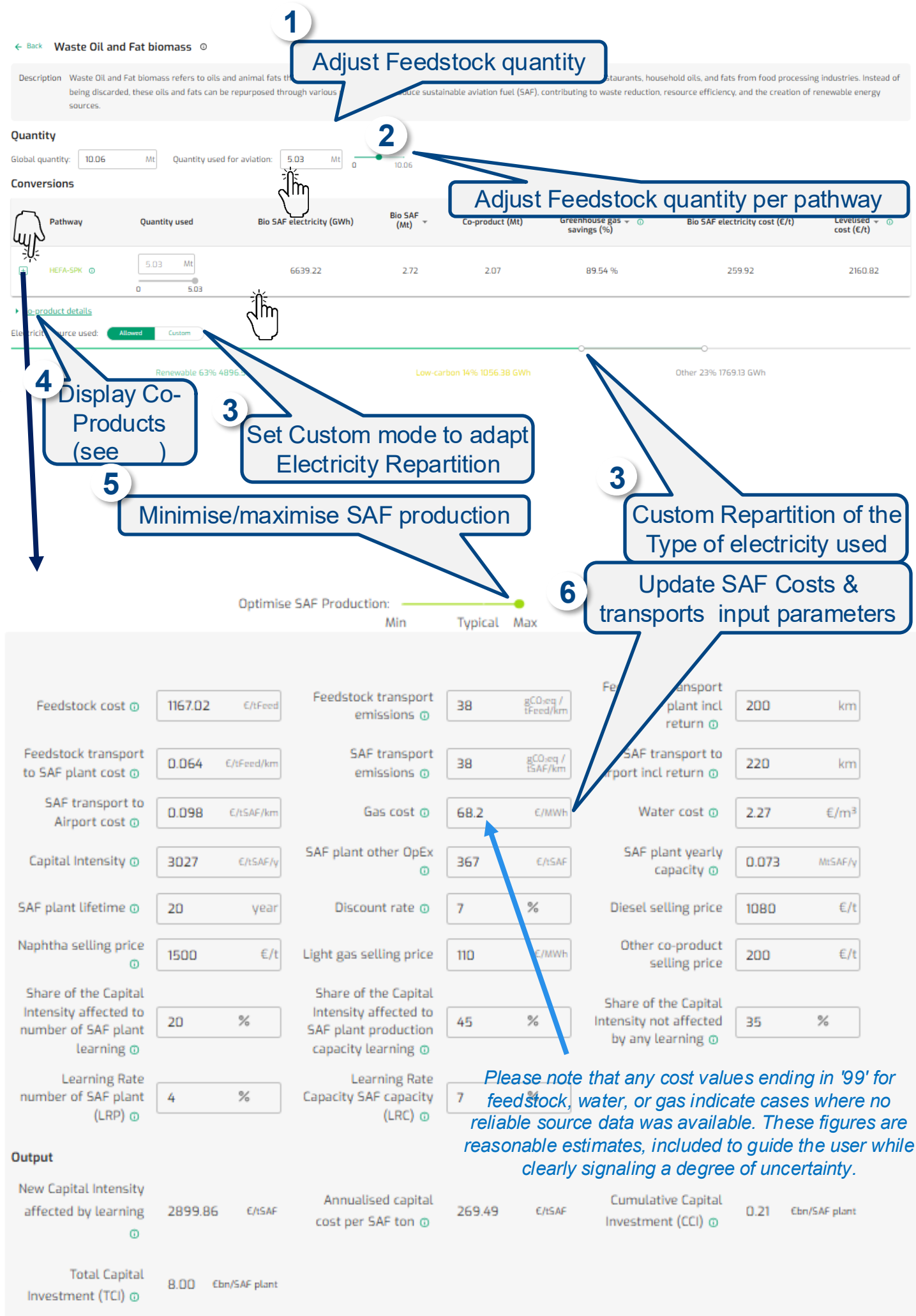
Open the details of the Feedstock (see next page)

2 Feedstock quantity used for aviation is 5% of total quantity by default

Example of TU Delft conversion pathways

3 The Bio SAF Fuel production units and costs (2/3)

Feedstock details



Please note that any cost values ending in '99' for feedstock, water, or gas indicate cases where no reliable source data was available. These figures are reasonable estimates, included to guide the user while clearly signaling a degree of uncertainty.

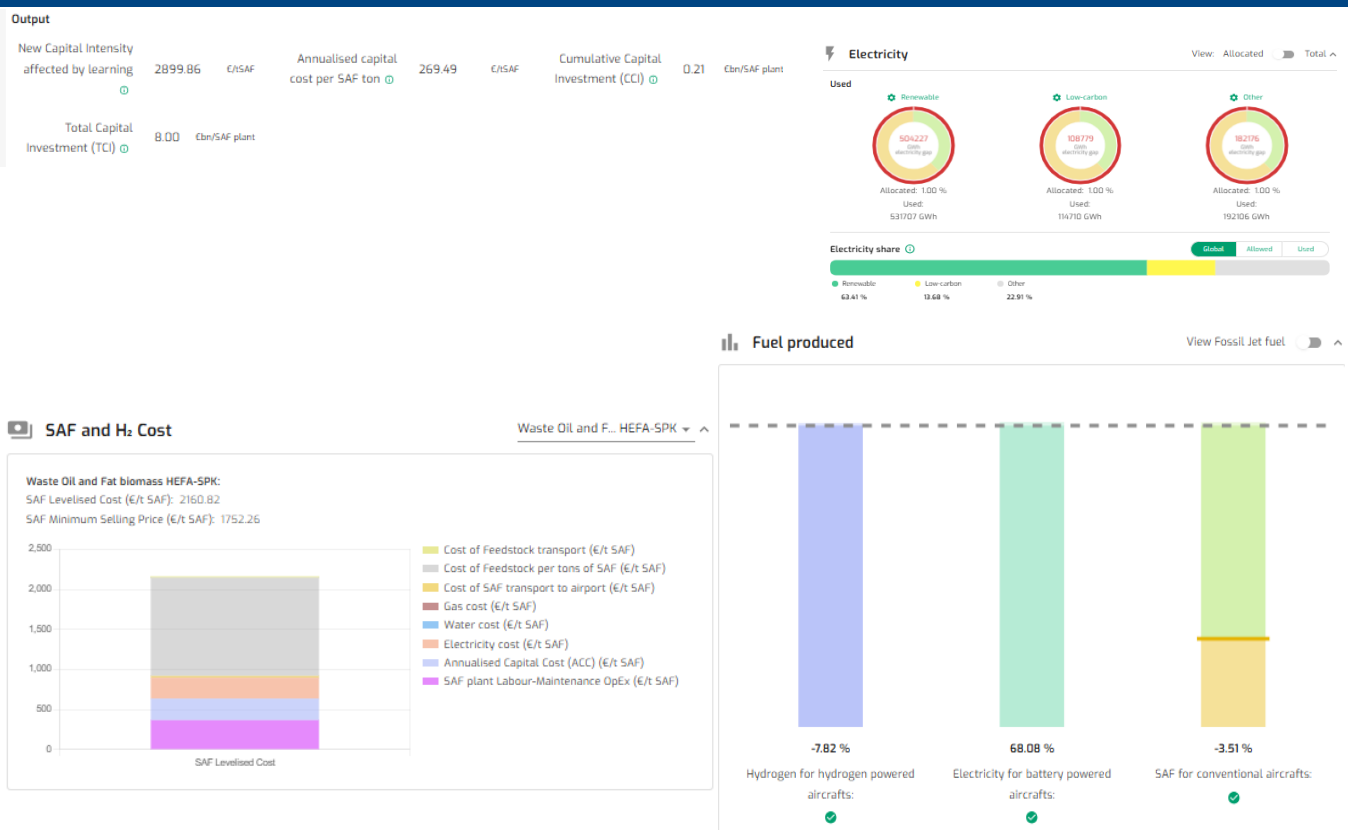
3 The Bio SAF Fuel production units and costs (3/3)

Default

Default Pathways per Feedstock
Default Electricity are Renewable, Low-Carbon & Other
Quantities values are prefilled for some Areas / States

Output

The Bio SAF Fuel production results are presented on the Fuel produced, electricity and SAF and H_2 charts.



Data

CONCAWE and Imperial College London data, FAO ,EUROCONTROL research, EUROSTAT, Fraunhofer Institute for Solar Energy Systems, ICCT, IEA, EEA, Project SkyPower, TU Delft, Trinity College of Dublin, ASTM standards.
The CONCAWE dataset was amended for manure feedstock in Greece. For more details on SAF pathways data, please also consult "About data" section on the site. Sewage feedstock were from EUROSTAT, amended with ICCT methodology by excluding volumes used for agriculture, composting.

Therefore only volumes used for incineration, landfilling, and other use considered eligible feedstock for SAF production.

4 Assess the SAF Coproducts production

← Back **Waste Oil and Fat biomass**

Description: Waste Oil and Fat biomass refers to oils and animal fats that are no longer suitable for their original purpose, including cooking oils used in restaurants, household oils, and fats from food processing industries. Instead of being discarded, these oils and fats can be repurposed through various processes to produce sustainable aviation fuel (SAF), contributing to waste reduction, resource efficiency, and the creation of renewable energy sources.

Quantity

Global quantity: 10.06 Mt — Quantity used for aviation: 5.03 Mt (0 – 10.06)

The coproducts results are updated when changing the Quantity of feedstocks used for aviation, as well as on the pathway repartition.

Conversions

Pathway	Quantity used	Bio SAF electricity (GWh)	Bio SAF (Mt)	Co-product (Mt)	Electricity Greenhouse gas savings (%)	Bio SAF electricity cost (€/t)	Bio SAF Levelised cost (€/t)
HEFA-SPK	5.03 Mt (0 – 5.03)	6639.22	2.72	2.07	90.84 %	236.30	2137.20

Co-product details

Co-product	Electricity (GWh)	Produced (Mt)	Electricity Cost (€/t)
Diesel	132.84	0.38	33.66
Naphta	475.02	0.73	63.08
Light gas	76.49	0.29	25.39
Other	398.53	0.66	58.14
Total	**1082.89**	**2.07**	**50.73**

1

SAF Coproducts: 4 coproducts

Default

Default Pathways per Feedstock
Default Electricity are Renewable, Low-Carbon & Other
Quantities values are prefilled for EU27, ECAC, US, China and World Areas / States

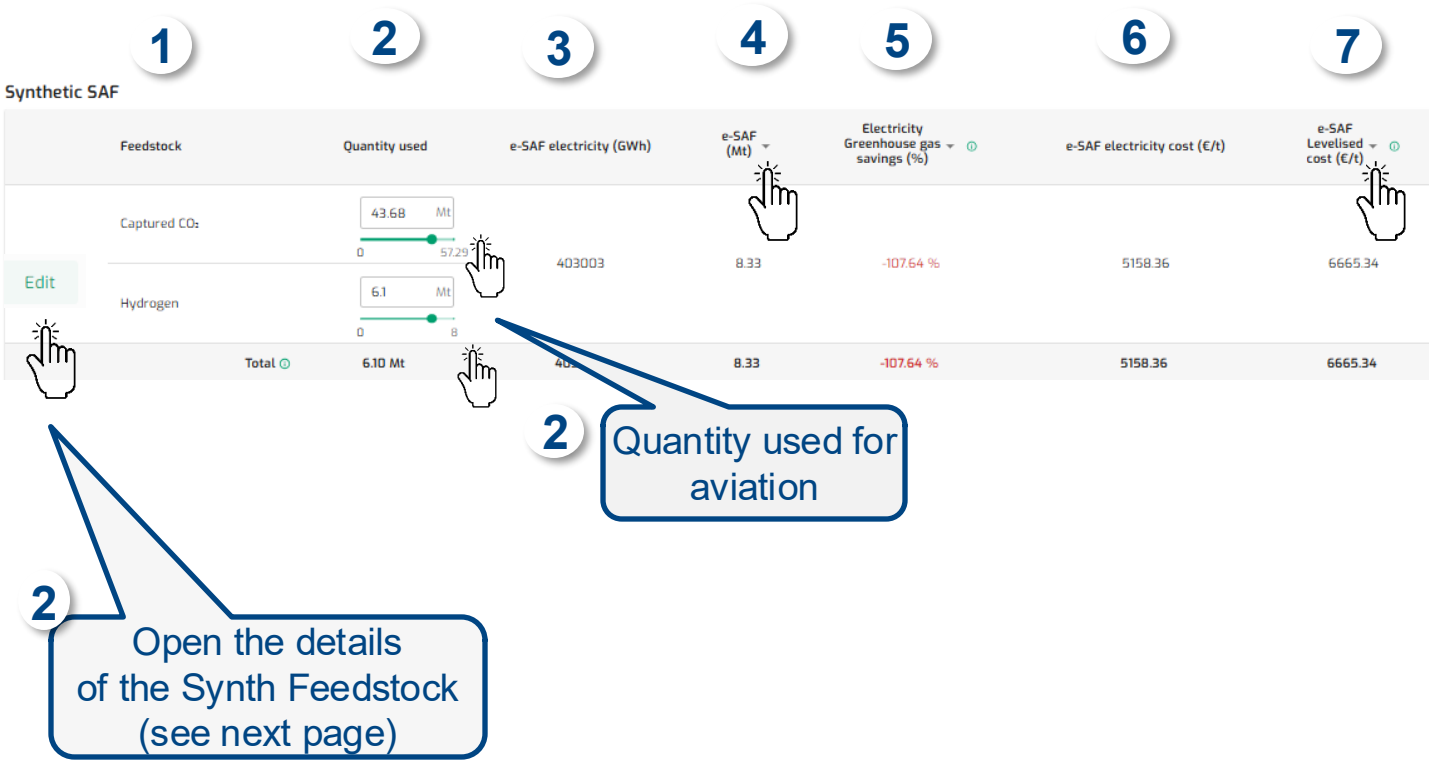
Data

CONCAWE and Imperial College London data, EUROCONTROL research, FAO, Fraunhofer Institute for Solar Energy Systems, IEA, EEA, TU Delft, Trinity College Of Dublin, ASTM standards. For more details on SAF pathways data, please also consult "About data" section on the site.

5 The synthetic SAF fuel production units and costs (1/3)

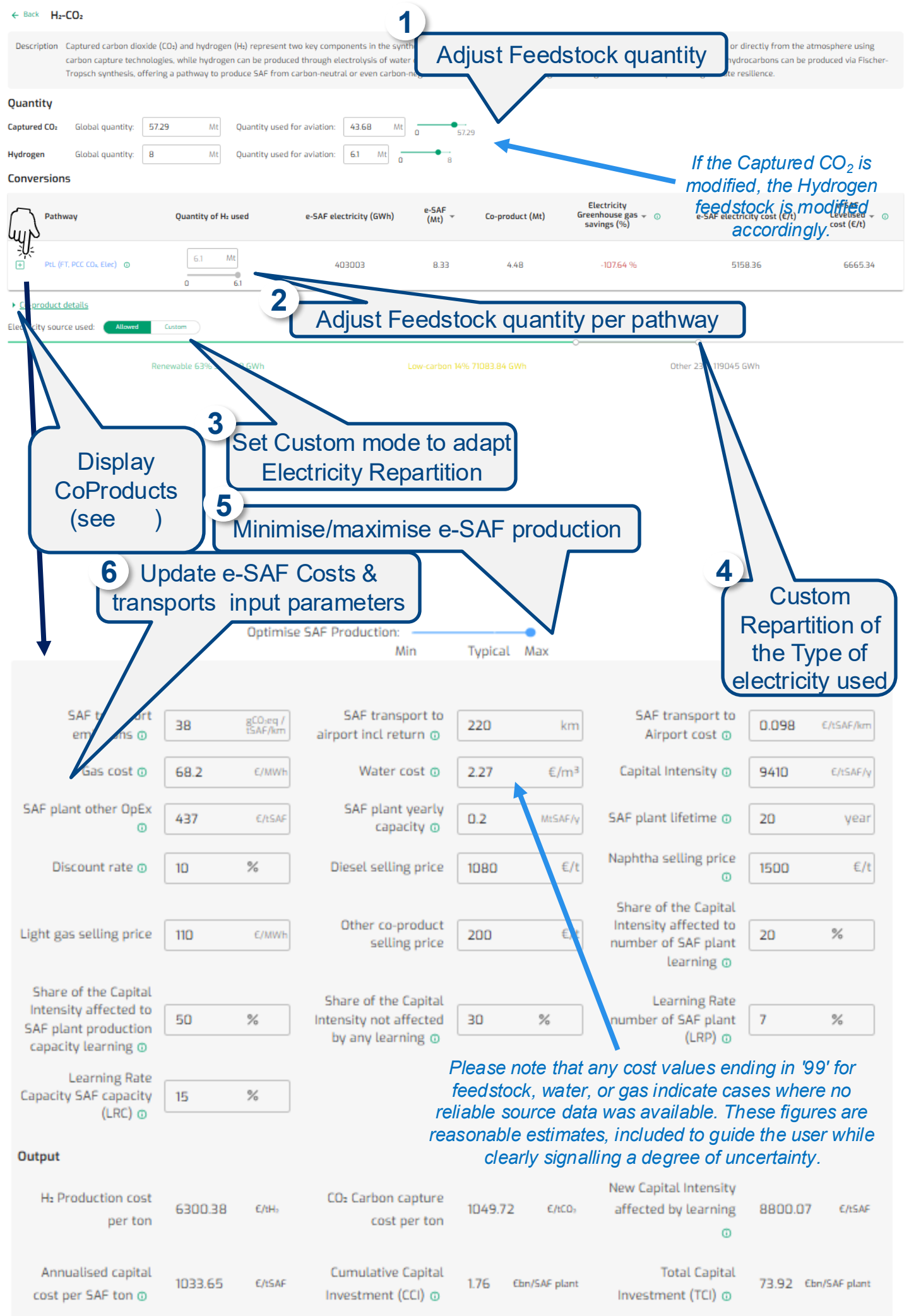
1. Display Synth SAF feedstocks list
2. Configure the Quantity used for aviation

   Open the details of the Feedstock to configure the Global quantity and the Quantity used for aviation
3. Display SAF electricity
4. Display SAF production **OR** Display Number of plants
5. Display Electricity Green House Gas savings % **OR** Global Green House Gas savings %
6. Display Electricity Cost
7. Display Levelised Cost **OR** Minimum Selling Price



5 The synthetic SAF fuel production units and costs (2/3)

Synth. Feedstock details



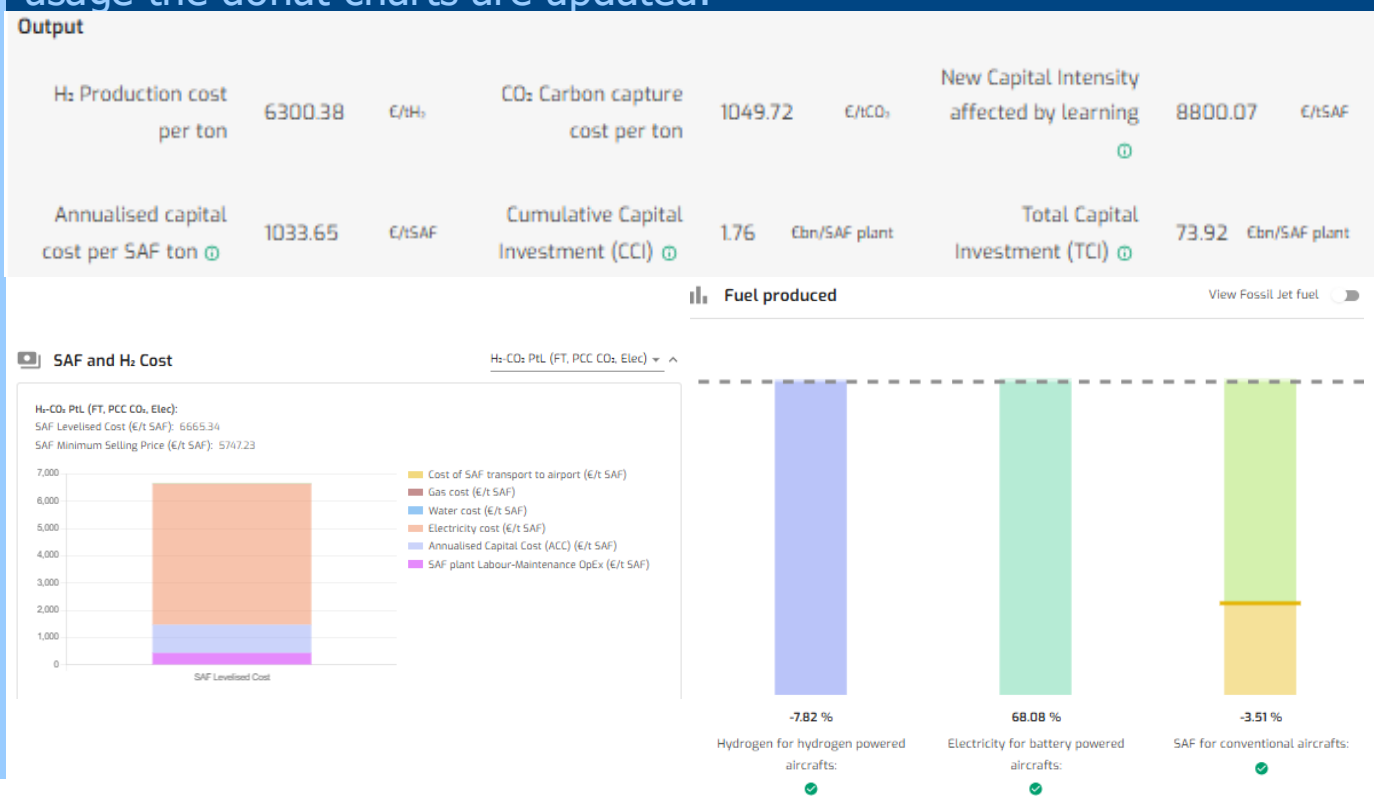
5 The synthetic SAF fuel production units and costs (3/3)

Default

Default Pathways is Power-to-liquid
Default Electricity are Renewable, Low-Carbon & Other
Quantities values are not prefilled

Output

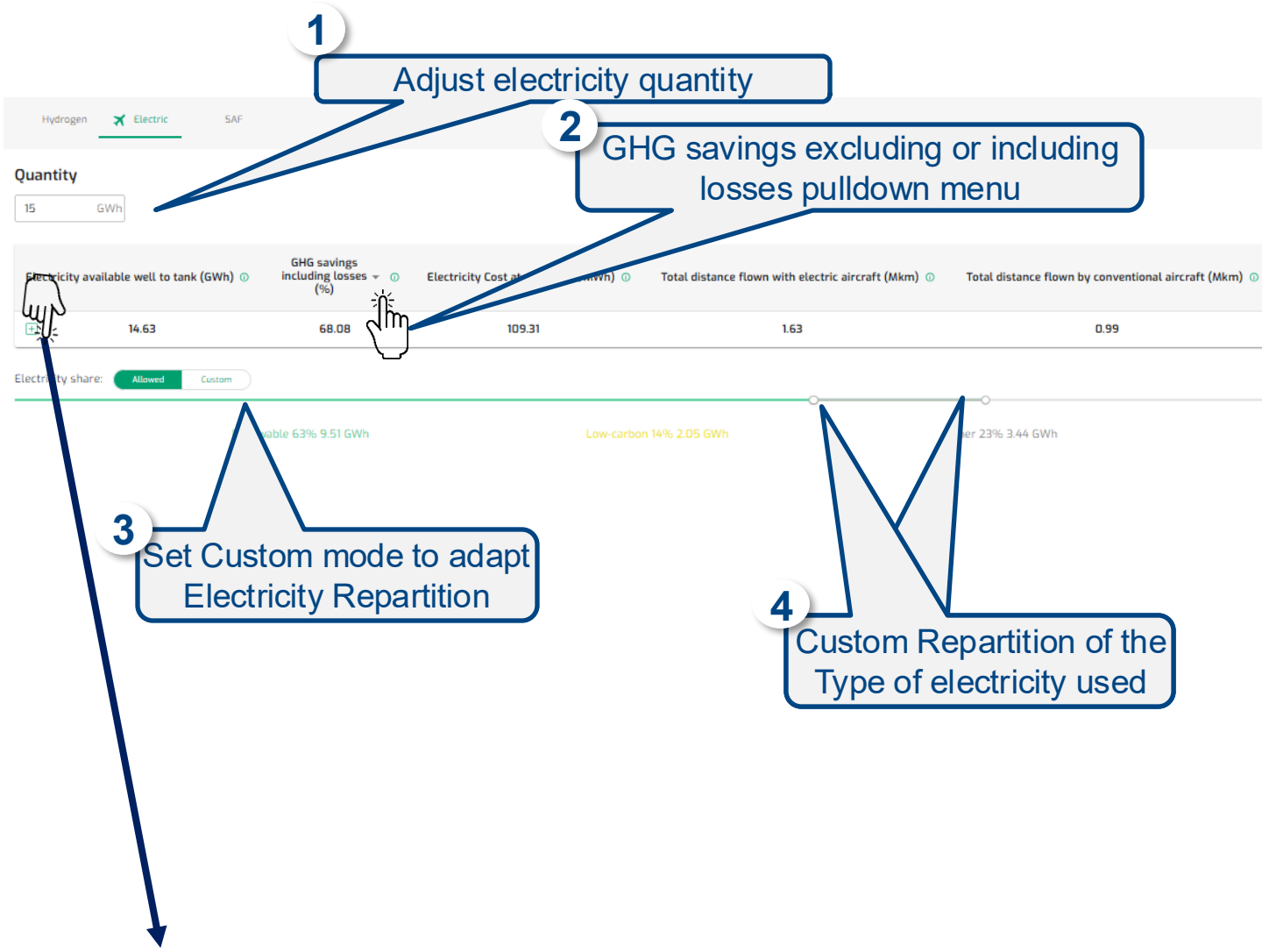
The Synthetic SAF Fuel production results are presented on the Fuel produced, SAF and H_2 Cost and electrcity charts. Depending on the repartition of the Type of electricity and the Quantity of feedstock usage the donut charts are updated.

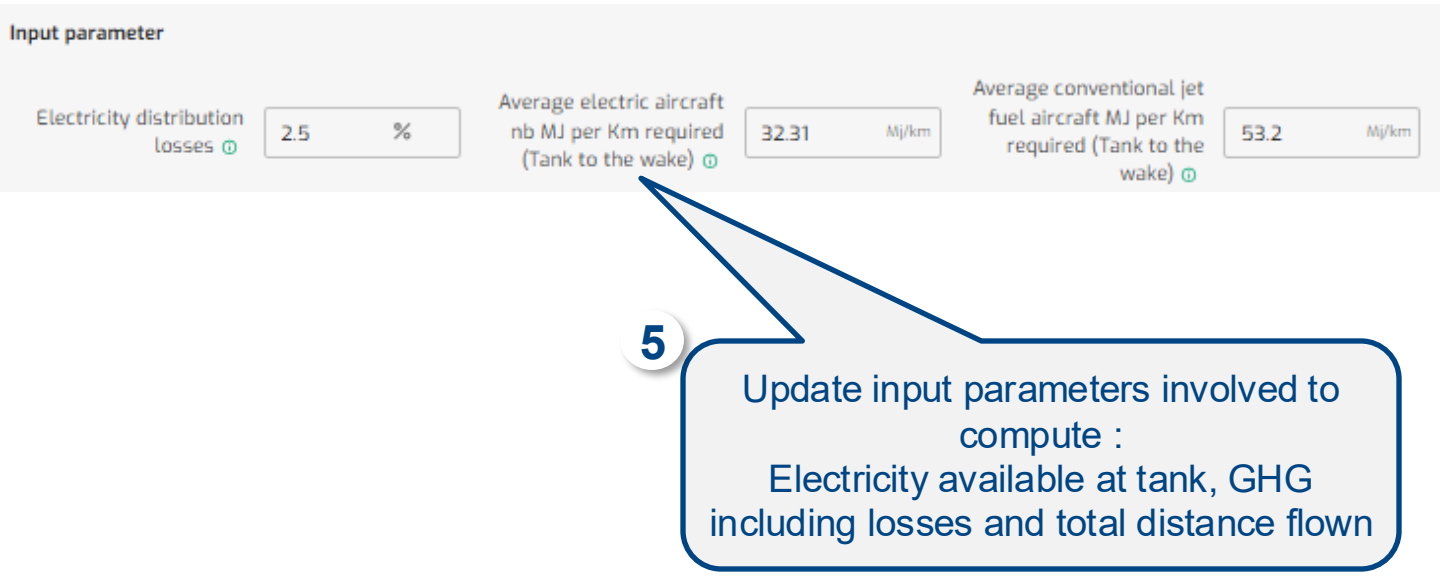


Data

CONCAWE and Imperial College London data (lower estimates), EUROCONTROL research, FAO, IEA, EEA, Project SkyPower , TU Delft, Trinity College of Dublin, ASTM standards. For more details on SAF pathways data, please also consult “About data” section on the site.

6 The Electric Aircraft electricity production (1/2)





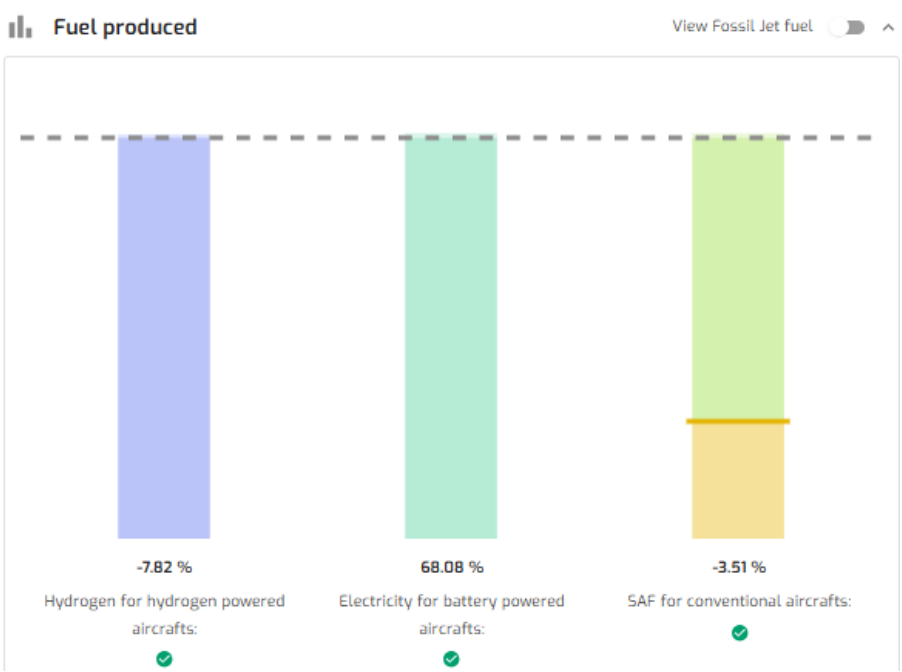
6 The Electric Aircraft electricity production (2/2)

Default

Default Electricity are Renewable, Low-Carbon & Other Quantities values are prefilled for some Areas / States

Output

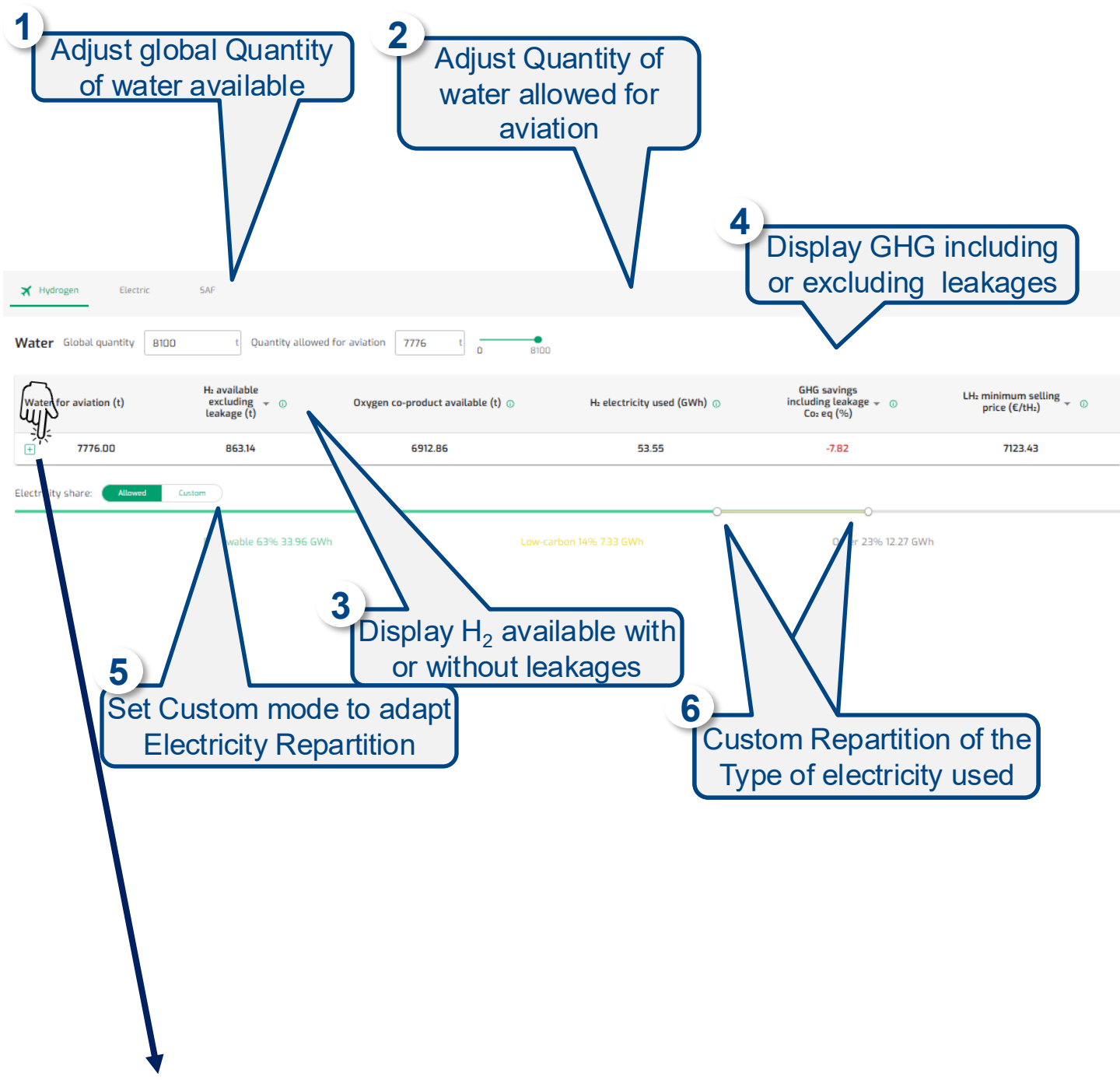
The Electric Aircraft electricity results are presented on the Fuel produced chart. Depending on the Type of electricity selected and the Quantity of electricity usage the donut charts are updated.

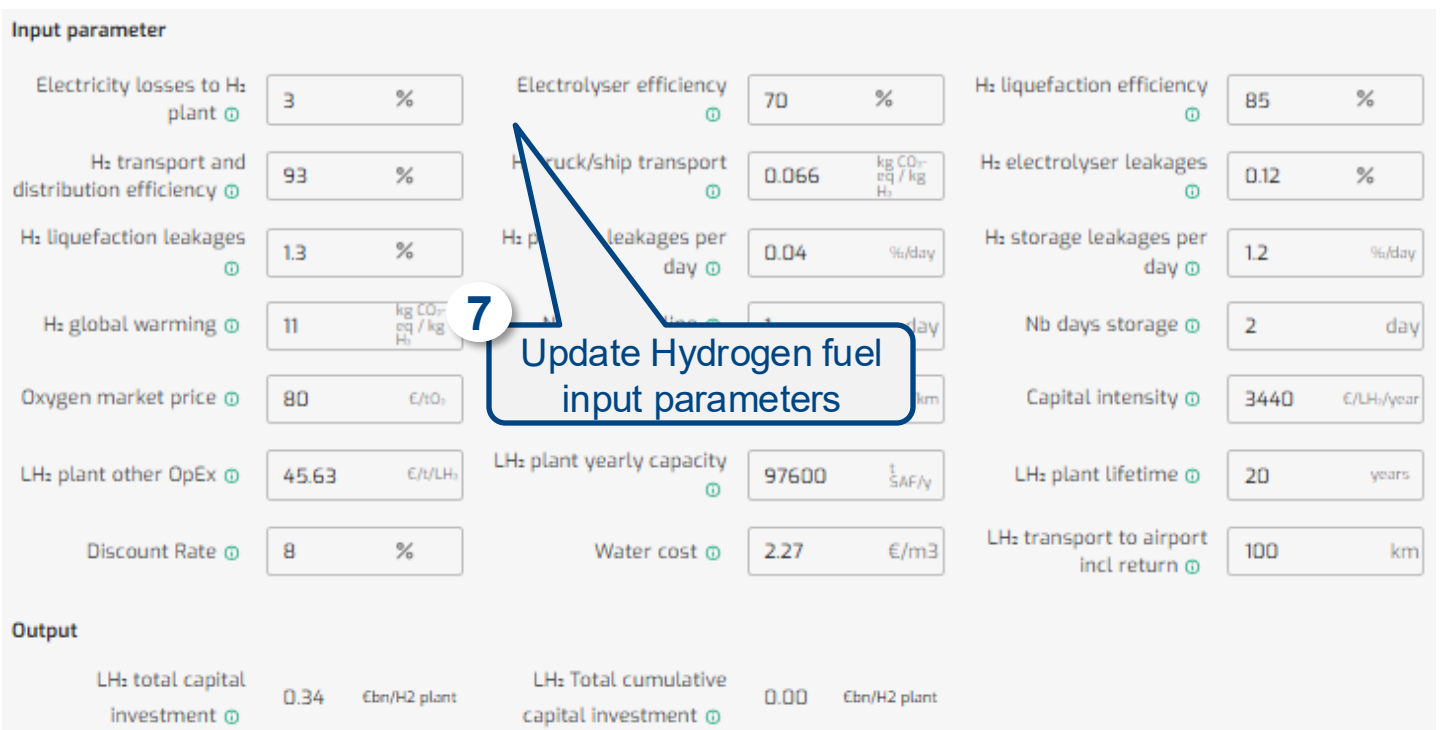


Data

EUROCONTROL Aviation Outlook (Long Term Forecast report), IEA, EEA.

7 The Hydrogen Fuel production (1/2)





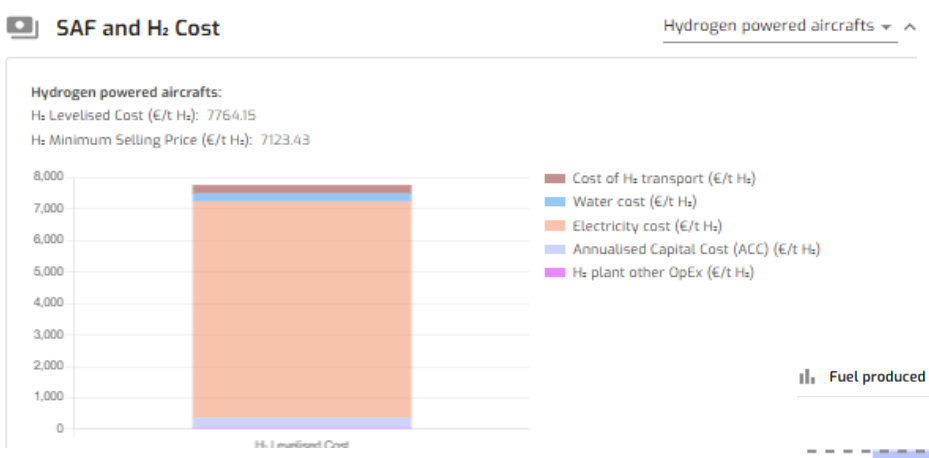
7 The Hydrogen Fuel production (2/2)

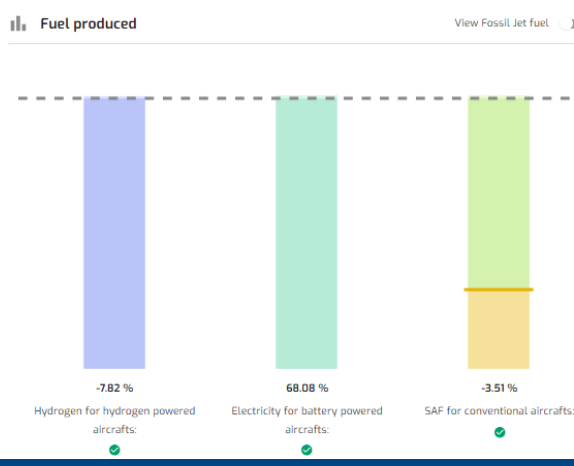
Default

Default Electricity are Renewable, Low-Carbon & Other
Quantities values are prefilled for some Areas / States
Conversion efficiency

Output

The Hydrogen Fuel production results are presented on the Fuel produced chart. Depending on the Type of electricity selected and the Quantity of electricity usage the donut charts are updated.





Data

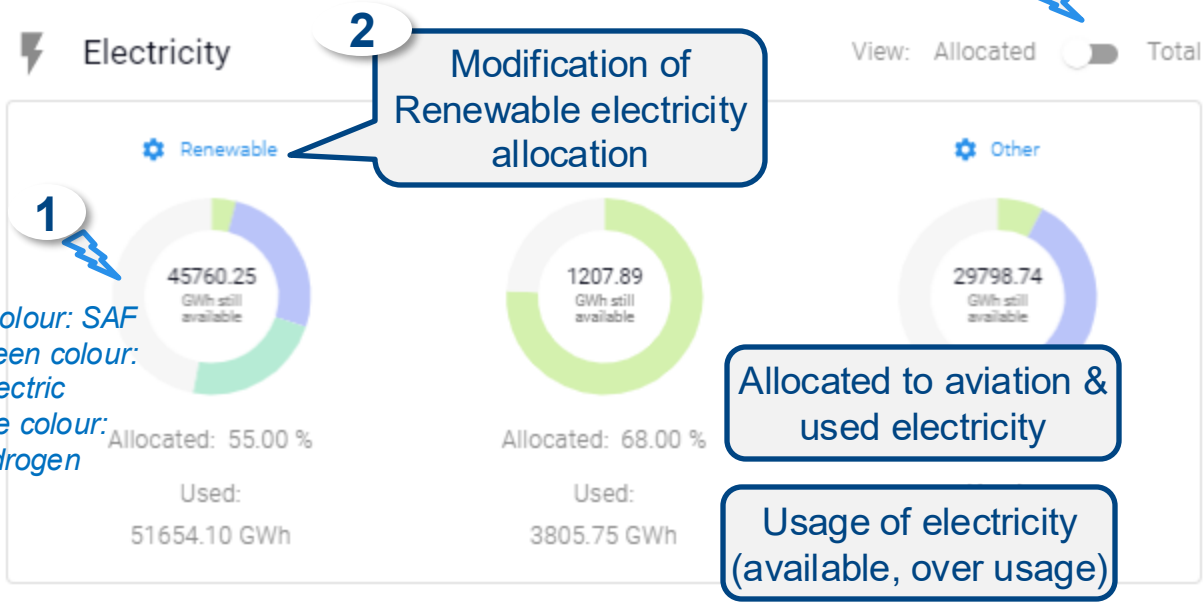
, EUROCONTROL research, EUROCONTROL Aviation Outlook (Long Term Forecast report), IEA, EEA, ASTM standards.

8 Assess the volume of Green electricity necessary for Fuel production (1/2)

1 View the Renewable electricity

2 Configure the Renewable electricity quantity & properties

The Allocated Electricity or Total Electricity can be seen by activating the toggle



2 Modification of Renewable electricity allocation

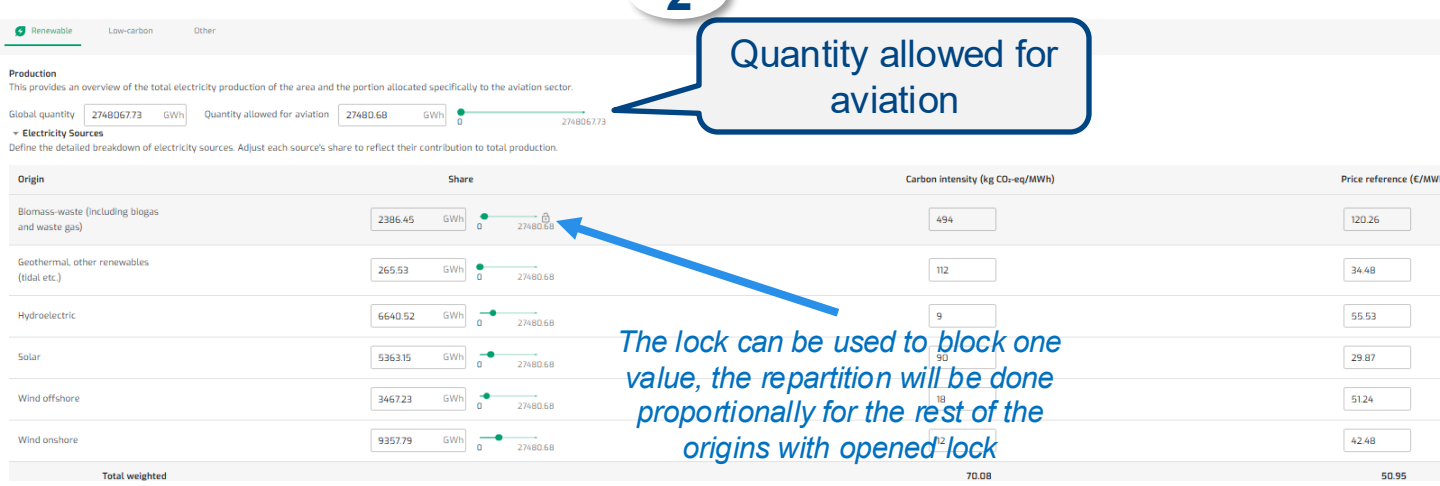
1

Green colour: SAF
Dark green colour: Electric
Purple colour: Hydrogen

Allocated to aviation & used electricity

Usage of electricity (available, over usage)

2 Quantity allowed for aviation



The lock can be used to block one value, the repartition will be done proportionally for the rest of the origins with opened lock

Origins of the Renewable electricity

Repartition of the different origins

Carbon intensity & price reference of the origin

8 Assess the volume of Green electricity necessary for Fuel production (2/2)

Default

Default Electricity are Renewable, Low-Carbon & Other
Quantities values are prefilled for some Areas/States
Share of origins is proportionally distributed between origins
Carbon intensity & price reference are prefilled for some Areas/States
Conversion efficiency prefilled and not editable

Output

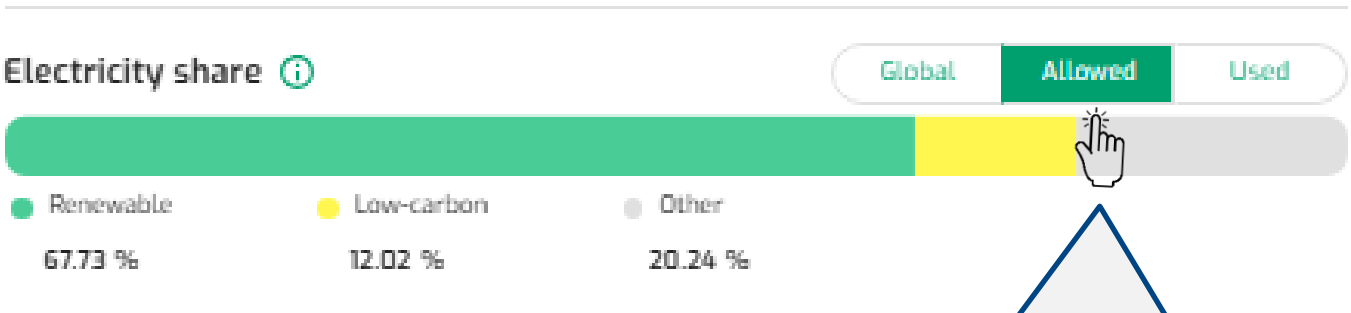
The Renewable electricity results are presented on the Electricity donut chart. The modification of the Renewable electricity quantities impacts the quantity available per Type of electricity for Hydrogen Fuel, Electric aircraft and SAF.

Data

EUROCONTROL research, EUROCONTROL Aviation Outlook (Long Term Forecast report), IEA, EEA, Lazard, Deutsche Bank economic research reports, European Commission - Cost of Energy 2020 report - prepared by TRINOMICS, Fraunhofer Institute for Solar Energy Systems, EIA, McKinsey.

9 Display global, allocated & used electricity

Electricity share board displays the electricity repartition percentages of renewable, low-carbon and other



The user can switch to :

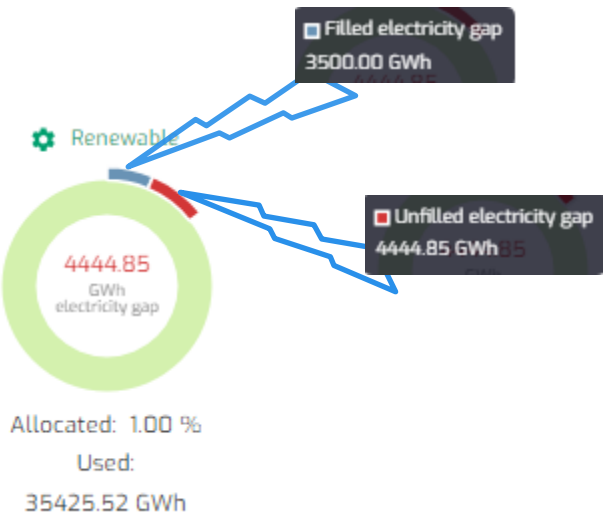
- **Global** :total electricity available
- **Allowed** : Electricity allowed for aviation
- **Used** : total electricity used for fuel production including unfilled and filled gap electricity

! **Used** electricity repartition is updated according to electricity repartition customization

10 Plan the Renewable electricity infrastructures to fill the Renewable electricity gap with costs (1/3)

When renewable electricity need goes beyond allocated electricity to aviation, the user can manage the electricity Gap to meet the needs.

Filled electricity gap is managed With the Electricity Gap Board, and Displayed in Blue in the Donut.
Unfilled electricity Gap is displayed In Red in the Donut.



1 Expand/Shrink the Electricity Gap board

2 Update Carbon Intensity and Price Reference for each renewable electricity gap

Origin *column displays :*

1. *Gap to Fill : the volume of electricity above the Quantity allowed for aviation which needs infrastructures planning.*
2. *Renewable production means, including imported electricity.*

3 Display renewable deployment costs

1

▾ Electricity Gap

Aviation's electricity demand exceeds the available allocation. Define additional sources or adjust allocation to cover the shortfall, ensuring that aviation's energy requirements are met without surpassing the production limits.

Origin	Share	Carbon intensity (kg CO_2-eq/MWh)	Price reference (€/MWh)	Additional electricity source units	Renewable deployment cost (€bn)
Gap to fill	0 GWh (0 – 504226.8)	70.08	50.95	-	-
Imported electricity	0 GWh (0 – 504226.8)	102	89.17	-	-
Biomass-waste (including biogas and waste gas)	0 GWh (0 – 504226.8)	253	92.6	-	-
Geothermal, other renewables (tidal etc.)	0 GWh (0 – 504226.8)	96	26.6	-	-
Hydroelectric	0 GWh (0 – 504226.8)	9	42.85	-	-
Solar	201690.72 GWh (0 – 504226.8)	66	27.03	261 636 985; 523.27 km²; η 30.00 %; 22.88 km x k m	56.51
Wind offshore	161352.57 GWh (0 – 504226.8)	15.43	44.6	2 047; 14 329.00 km²; 119.70 km x k m	120.77
Wind onshore	141183.5 GWh (0 – 504226.8)	10.29	34.87	2 779; 19 453.00 km²; 139.47 km x k m	52.80
	Total 504227 GWh	Total weighted 34.22	Total weighted 34.85		Total 230.09

1. **2.** **2**

10 Plan the Renewable electricity infrastructures to fill the Renewable electricity gap with costs (2/3)

1 Plan the Solar infrastructure and costs

Solar farm setup :

Panel power : The default peak power for a standard solar panel is typically around 300 to 400 watts per panel for residential and small commercial applications, however the default peak power evolve quickly.

Panel size : Surface area of a single solar panel is typically in the range of 1.6 to 2 square meters (m^2) depending on the panel's size and wattage

Orientation : The default orientation coefficient for photovoltaic (PV) panels adjusts energy estimates based on their tilt and azimuth. For well-optimized installations, the coefficient typically ranges from 0.9 to 1. Panels facing east or west may have a lower coefficient, while those with tracking systems may have a higher one.

Solar irradiance : Values are from Global Solar Atlas. Average theoricam potential Ground Horizontal Irradiance (no tils or orientation) and independant of temperature/elctrical factors. The user could take these factors into account and adjust the default value for photovoltaic panel efficiency (%).
Data behind the study - Tabular data (XLSX) and GIS raster layers (GeoTIFF)

Cost per watt peak: Solar PV is set to become the largest renewable energy source by 2029 according to IEA. Solar PV prices have dropped significantly over the past two decades due to technological advances, economies of scale, and increased global production, primarily from China. According to forecasts, the cost of solar PV is expected to continue declining .Globally, the total installation cost of solar PV projects would continue to decline in the next three decades. This would make solar PV highly competitive in many markets, with the average falling in the range of USD 340 to 834 per kilowatt (kW) by 2030 (Average € 0,524cts/MWh) and USD 165 to 481/kW by 2050 (Average € 0,288cts/MWh), compared to the average of USD 1 210/kW in 2018.
Source: IRENA FUTURE OF SOLAR PHOTOVOLTAIC Deployment, investment, technology, grid integration and socio-economic aspects

Solar and wind Output Data:

Total number of photovoltaic solar panels

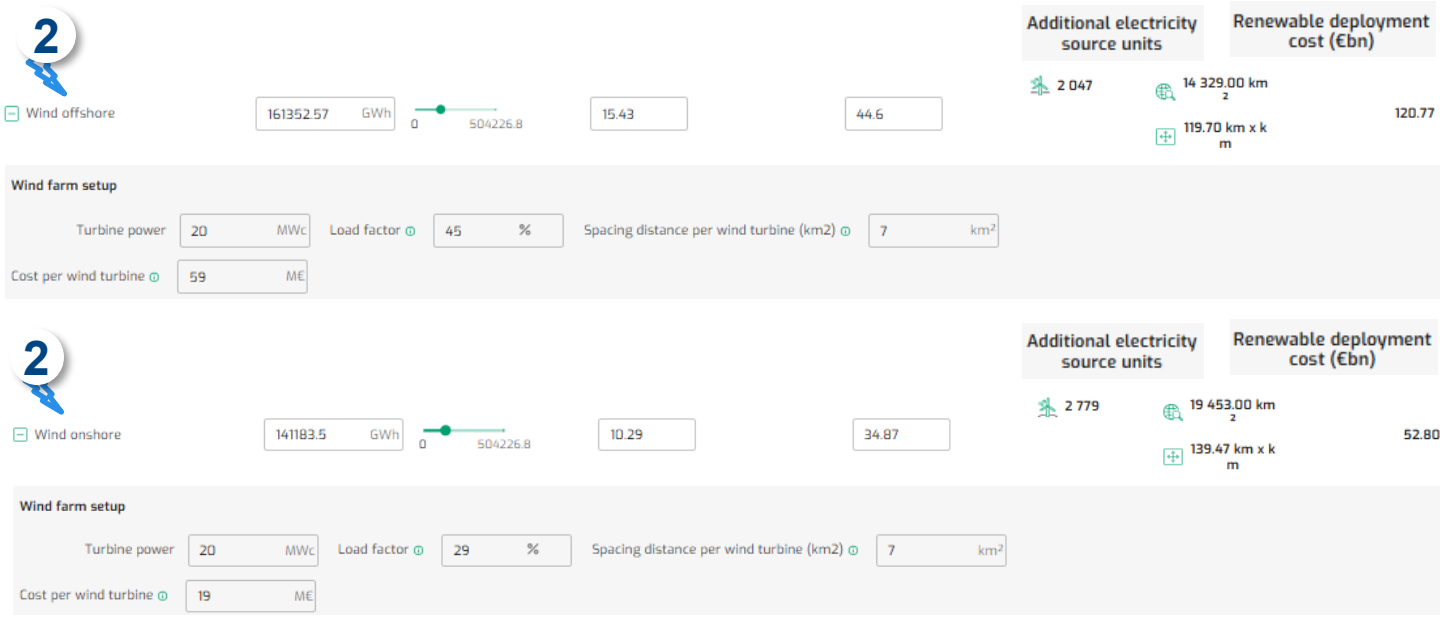
Total surface of the solar farm (no inter row spacing)

Total net square edge surface of the solar farm (no inter-row spacing)

Efficiency of the photovoltaic solar panels under standard test condition (STC) %

10 Plan the Renewable electricity infrastructures to fill the Renewable electricity gap with costs (3/3)

2 Plan the Wind offshore & onshore infrastructure and costs



Wind Input Data :

Turbine power : Refers to the maximum default power output of the turbine

Load factor :

The wind turbine load factor measures the actual electricity generated versus its maximum potential, expressed as a percentage. It depends on factors like location, wind consistency, and turbine technology. Onshore turbines have load factors of 20–35%, while offshore turbines range from 35–55% or higher.

Spacing distance per wind turbine (km2) :

Wind turbine spacing ensures efficiency and minimizes wake turbulence, with area allocation often measured in square kilometers. The general guideline is 5–10 rotor diameters between turbines in the wind direction and 3–5 in the crosswind direction. Proper spacing helps optimize performance and reduce energy loss.

Cost per wind turbine :

Many factors such as the location, water depth, foundation type, supply chain constraints may affect the cost. The cost per unit may appear to rise, but this is due to significant improvements in wind turbine technology. Turbines are becoming more powerful, increasing from 10 MW in 2010 to 30 MW by 2050. Their lifespan is also extending, from 20 years in 2025 to 30 years in 2050, and their efficiency is improving, with the load factor rising from 40% in 2025 to 50% in 2050. Despite these changes, the levelized cost of energy (LCOE) per MWh is expected to decrease by 70% between 2025 and 2050.

Cost per Megawatt peak includes:

- Turbine CapEx: Rotor, Nacell, Tower.
- Balance of System CapEx: Enginneering and development, Project management, Foundation, site access, Assembly and installation, Electrical infrastructure, Wind turbine transport.
- Financial CapEx: Construction financing, Insurance during construction, Contingency, Plant Commissioning, Wind turbine warranty

Not included:

- OpEx: Operation, maintenance and decomissioning.

Source: NREL 2022 Cost of Wind Energy Review December 2023

Additional assumption: Life duration 25 years 2025 to 30 Years 2050, 1% cost reduction every year

Exchange rate $ to € has been used, based on 10 years from 2014 and 2024, 1 EUR = 1,12 USD

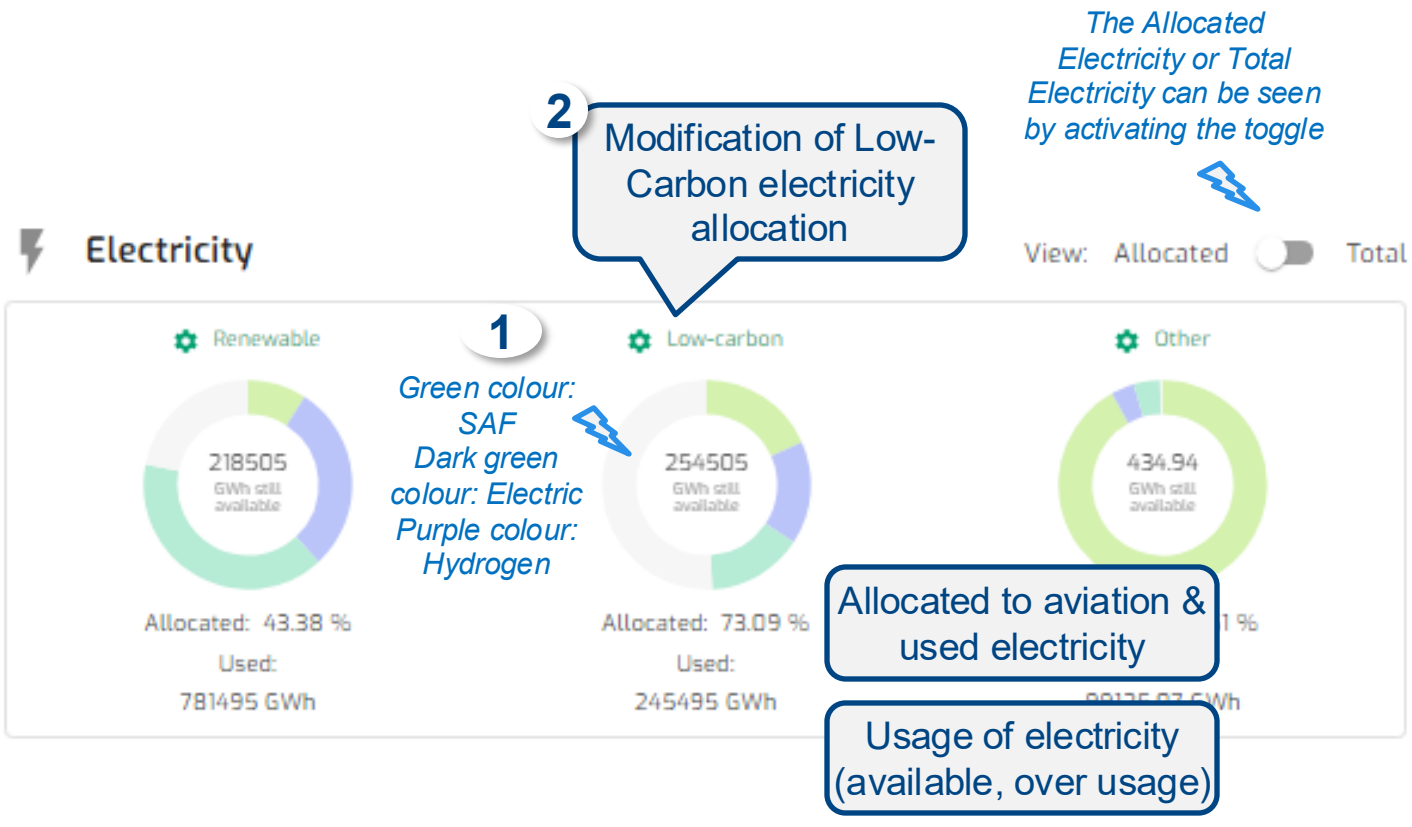
Wind Output Data:

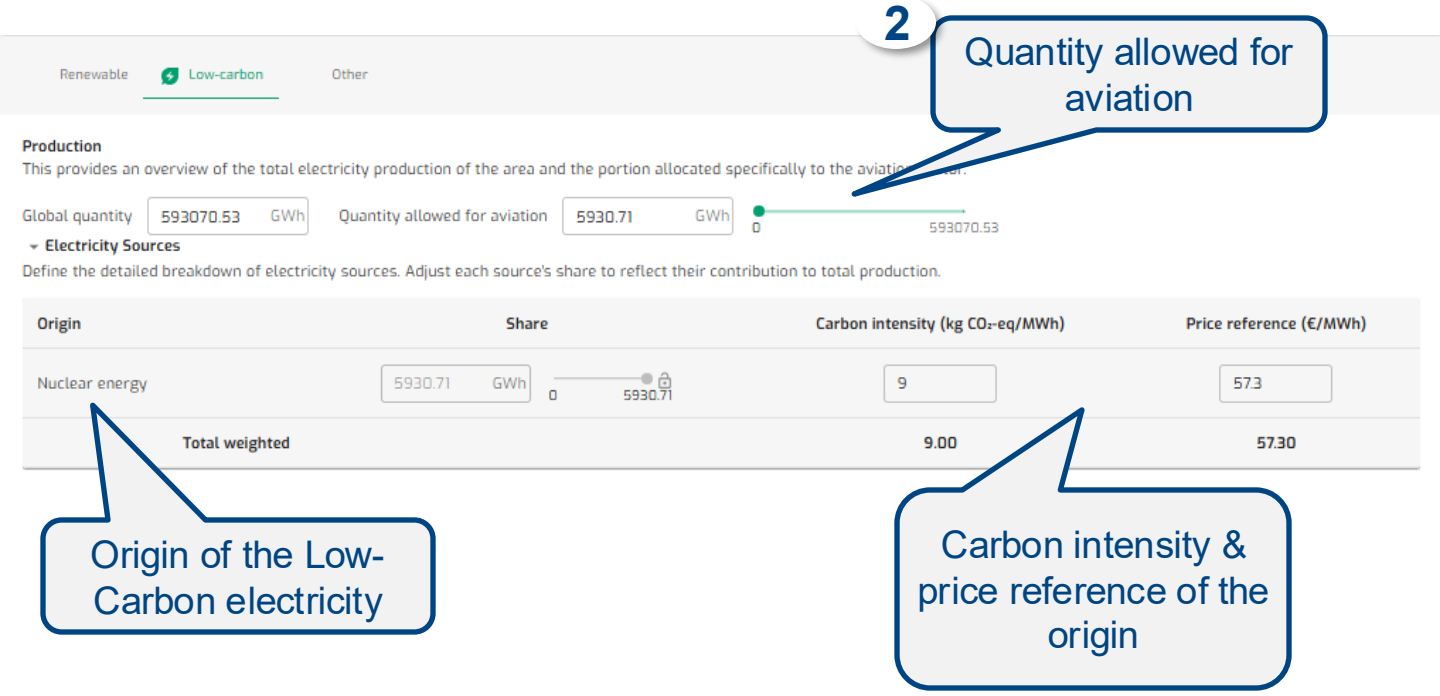
- Total number of offshore/onshore wind turbines
- Total net square edge surface of the wind farm (km x km)
- Total surface of the wind farm (km2)

11 Assess the Low-Carbon electricity necessary for Fuel production (1/2)

1 View the Low-Carbon electricity

2 Configure the Low-Carbon electricity quantity & properties





11 Assess the Low-Carbon electricity necessary for Fuel production (2/2)

Default

Default Electricity are Renewable, Low-Carbon & Other
Quantities values are prefilled for some Areas/States
Origin is Nuclear energy
Carbon intensity & price reference are prefilled for some Areas/States
Conversion efficiency prefilled and not editable

Output

The Low-Carbon electricity results are presented on the Electricity donut chart. The modification of the Low-Carbon electricity quantities impacts the quantity available per Type of electricity for Hydrogen Fuel, Electric aircraft and SAF.

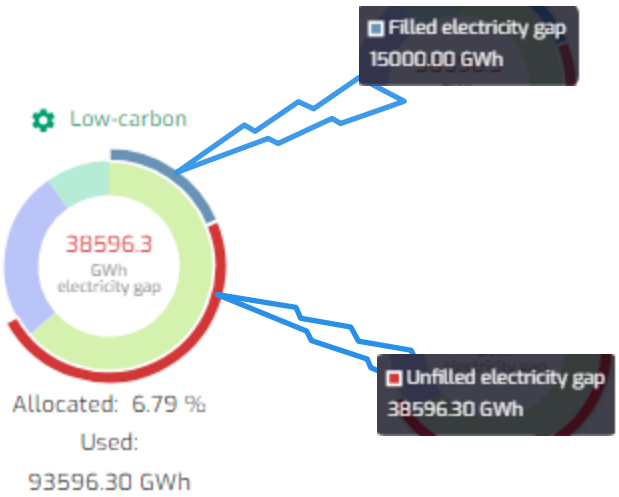
Data

CONCAWE and Imperial College London data, 2021 EU report on Energy and GHG emissions, EUROCONTROL research, EUROCONTROL Aviation Outlook (Long Term Forecast report), FAO, IEA, EEA, ASTM standards.
The 2021 EU report on Energy, Transport and GHG emissions data was amended to reflect national policy changes impacting low carbon production.

12 Plan the Low-Carbon electricity infrastructures to fill the Low-Carbon electricity gap (1/2)

When Low-Carbon electricity need goes beyond allocated electricity to aviation, the user can manage the electricity Gap to meet the needs.

Filled electricity gap is managed With the Electricity Gap Board, and Displayed in Blue in the Donut.
Unfilled electricity Gap is displayed In Red in the Donut.

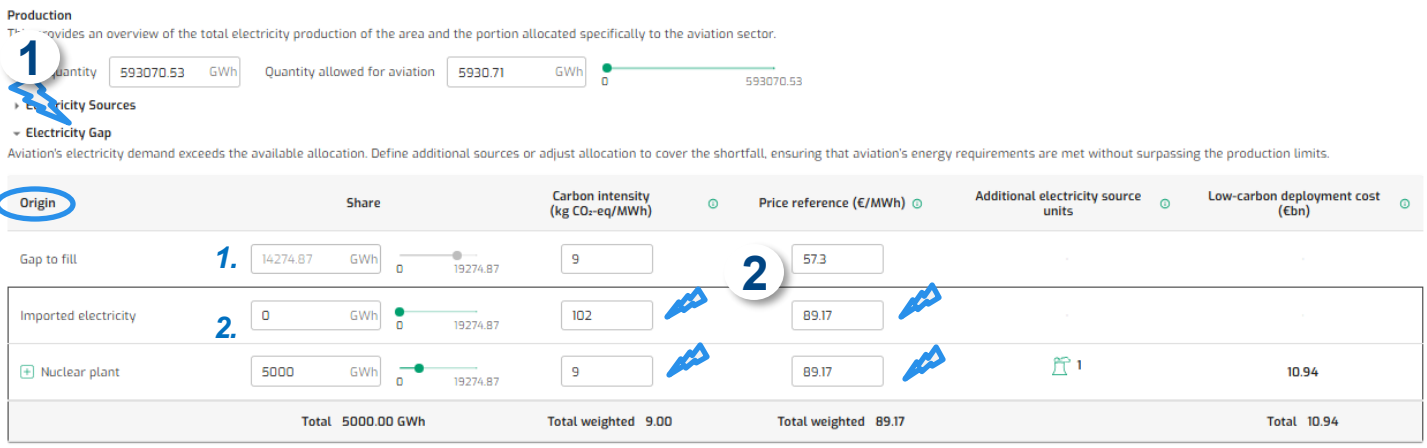


1 Expand/Shrink the Electricity Gap board

2 Update Carbon Intensity and Price Reference for each low-carbon electricity gap

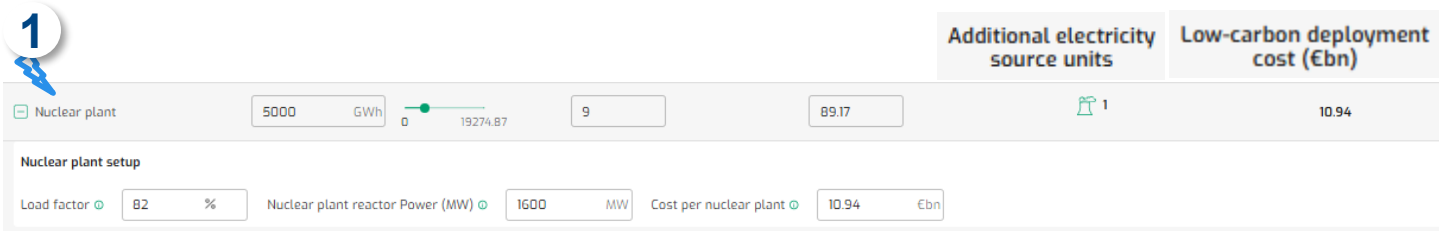
Origin *column displays :*

1. *Gap to Fill : the volume of electricity above the Quantity allowed for aviation which needs infrastructures planning.*
2. *Low-Carbon production means, including importing electricity.*



12 Plan the Low-Carbon electricity infrastructures to fill the Low-Carbon electricity gap (2/2)

1 Plan the Nuclear infrastructure



Nuclear Input Data :

Load factor : The load factor (sometimes called capacity factor) of a power plant is a measure of the actual output of a power plant relative to its maximum possible output over a period of time. It essentially indicates how efficiently a power plant is being utilised.

Nuclear plant reactor power (MW) :

Nuclear reactor electrical power output

Cost per nuclear plant :

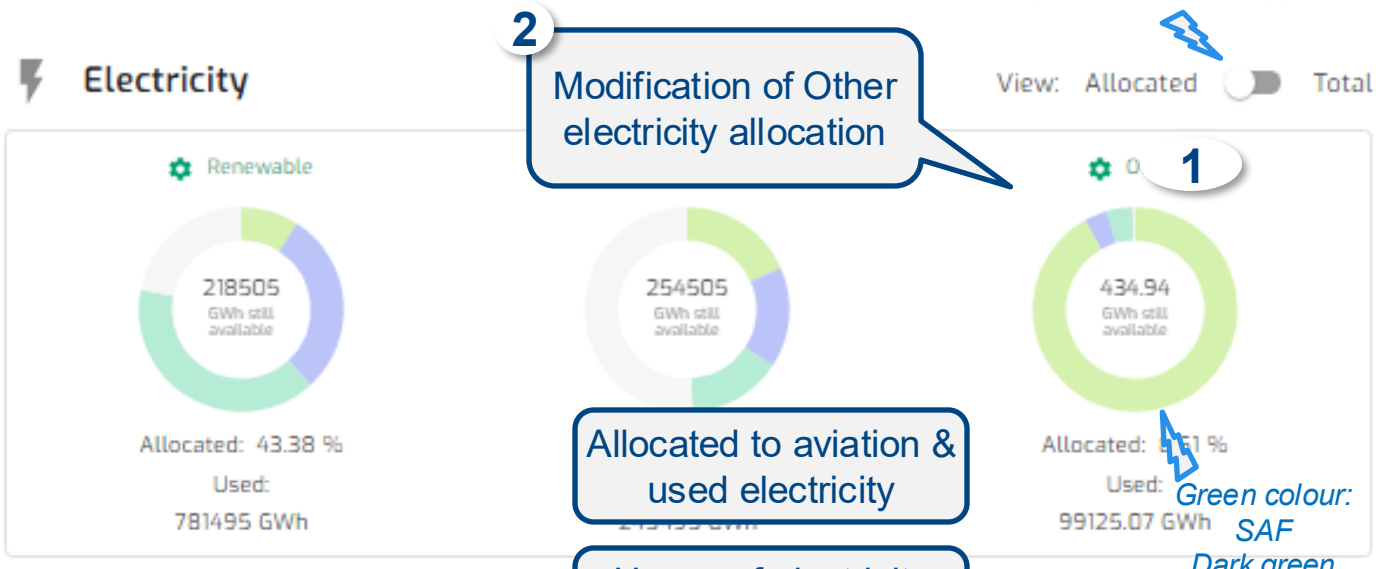
The construction cost of a power plant varies depending on factors like technology, location, and scale. Modern nuclear reactors can cost between €11 billion (Olkiluoto 3) and €19.1 billion (Flamanville). The U.S. Energy Information Administration estimates the initial capital cost of a new reactor at $5,339 per kW, or $5.3 billion for a 1000 MW reactor. However, additional costs from financing, long construction periods, and price increases can result in total costs being much higher than the initial estimates.

Nuclear Output Data :

Total number of nuclear reactors

13 Assess the Others energy category of electricity necessary for Fuel production (1/2)

1. View the Other electricity
2. Configure the Other electricity quantity & properties



The Allocated Electricity or Total Electricity can be seen by activating the toggle

2 Modification of Other electricity allocation

1

Allocated to aviation & used electricity

Usage of electricity (available, over usage)

Green colour: SAF
Dark green colour: Electric
Purple colour: Hydrogen

2 Quantity allowed for aviation

The lock can be used to block one value, the repartition will be done proportionally for the rest of the origins with opened lock

Origin of the Other electricity

Repartition of the different origins

Carbon intensity & price reference of the origin

13 Assess the Others energy category of electricity necessary for Fuel production (2/2)

Default

Default Electricity are Renewable, Low-Carbon & Other
Quantities values are prefilled for some Areas/States
Share of origins is proportionally distributed between origins
Carbon intensity & price reference are prefilled for some Areas/States
Conversion efficiency prefilled and not editable

Output

The Other electricity results are presented on the Electricity donut chart. The modification of the Other electricity quantities impacts the quantity available per Type of electricity for Hydrogen Fuel, Electric aircraft and SAF.

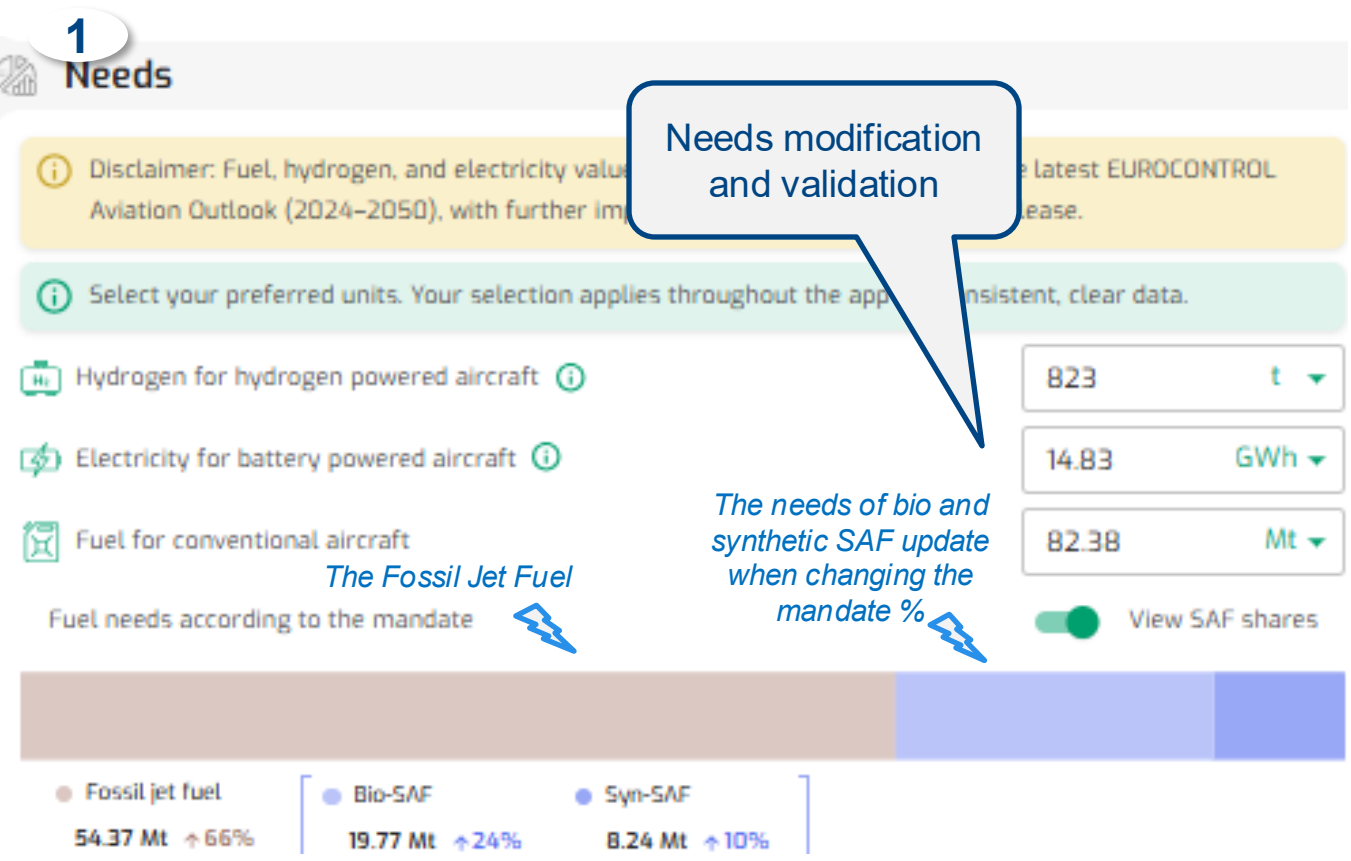
Data

2021 EU report on Energy and GHG emissions, EUROCONTROL research, EUROCONTROL Aviation Outlook (Long Term Forecast report), IEA, EEA, ASTM standards.

14 View needs & production chart (SAF, Electric Aircraft, Hydrogen Fuel) (1/2)

1 View the needs

2 View the Fuel produced



Different indicators on Fuel produced :
Dotted line: the needs
Coloured bar: Fuel produced
Light coloured bar : Overproduction
Red arrow: Fuel missing to fulfil needs

14 View needs & production chart (SAF, Electric Aircraft, Hydrogen Fuel) (2/2)

Default

Default Needs are Hydrogen, Electricity & Fuel
Needs values are prefilled for some Areas / States
Default Fuel produced chart are Hydrogen, Electricity & SAF

Output

The Fuel produced results are presented on the Fuel produced chart. The results presentation are compared to the needs in the settings page.

Data

CONCAWE and Imperial College London data (low scenario) , 2021 EU report on Energy and GHG emissions, EUROCONTROL research, EUROCONTROL Aviation Outlook (Long Term Forecast report), FAO, IEA, EEA, ASTM standards. Lazard, Deutsche Bank economic research reports, European Commission - Cost of Energy 2020 report - prepared by TRINOMICS, Fraunhofer Institute for Solar Energy Systems, EIA, McKinsey.

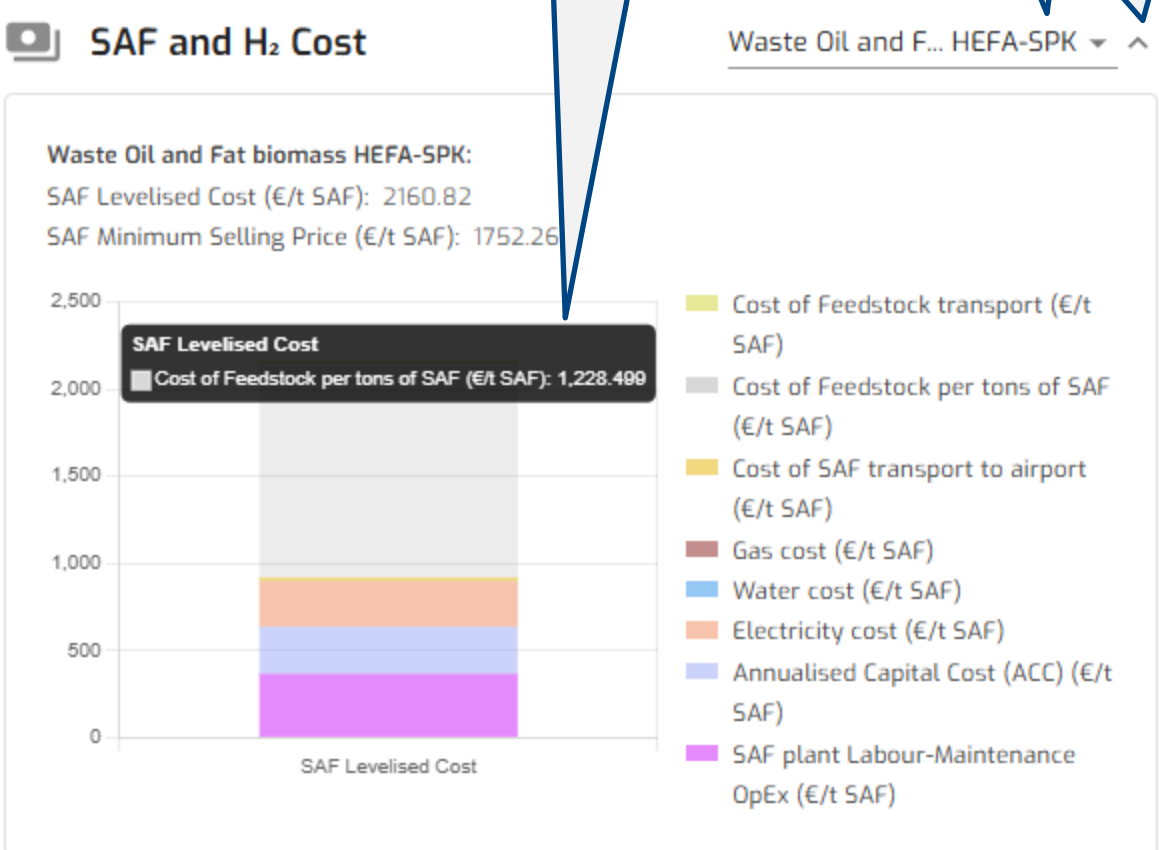
15 Graphical display of SAF and H_2 costs for each feedstock/pathway (1/2)

1 View the detailed SAF and H_2 structure of cost

1 Display detailed levelised, Minimum Selling Price and detailed cost structure

Select the feedstock and associated pathway in the list

Iconify, extend window



15 Graphical display of SAF and H_2 costs for each feedstock/pathway (2/2)

Example of the detailed cost assumptions taken for the HEFA-SPK conversion pathway of waste oil and fat biomass feedstock.

Each assumption can be modified to suit your specificities or to test different hypothesis.

Feedstock cost	1286.2 €/tFeed	Feedstock transport emissions	38 gCO_2eq / tFeed/km	Feedstock transport to SAF plant incl return	200 km
Feedstock transport to SAF plant cost	0.064 €/tFeed/km	SAF transport emissions	38 gCO_2eq / tSAF/km	SAF transport to airport incl return	220 km
SAF transport to Airport cost	0.098 €/tSAF/km	Gas cost	43.56 €/MWh	Water cost	2.72 €/m^3
Capital Intensity	3027 €/tSAF/y	SAF plant other OpEx	367 €/tSAF	SAF plant yearly capacity	0.073 MtSAF/y
SAF plant lifetime	20 year	Discount rate	7 %	Diesel selling price	1080 €/t
Naphtha selling price	1500 €/t	Light gas selling price	110 €/MWh	Other co-product selling price	200 €/t
Share of the Capital Intensity affected to number of SAF plant learning	20 %	Share of the Capital Intensity affected to SAF plant production capacity learning	45 %	Share of the Capital Intensity not affected by any learning	35 %
Learning Rate number of SAF plant (LRP)	4 %	Learning Rate Capacity SAF capacity (LRC)	7 %		

Output

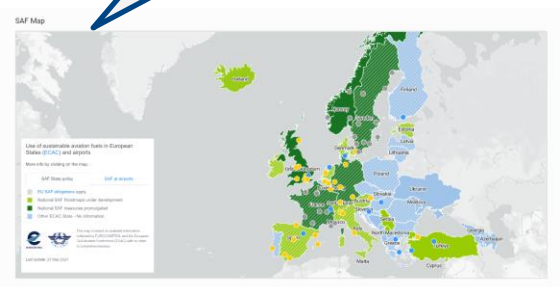
New Capital Intensity affected by learning	3027.20 €/tSAF	Annualised capital cost per SAF ton	281.32 €/tSAF	Cumulative Capital Investment (CCI)	0.22 €bn/SAF plant
Total Capital Investment (TCI)	0.22 €bn/SAF plant				

16 17 View the SAF map & SAF news

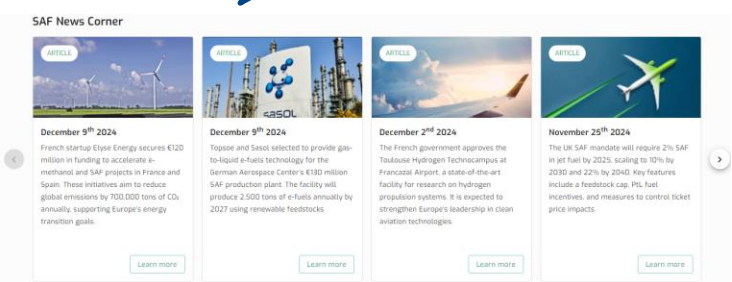
1 View the SAF map

2 View the SAF news Corner

1 Click on the SAF map to open the SAF map website



2 Browse the SAF News corner carousel



Default

SAF map
SAF news corner

Output

The SAF map is presented. The SAF news corner is presented.

Data

EUROCONTROL and ECAC research and stakeholders' inputs.

FuellingDecarb journey

EUROCONTROL

FuellingDecarb step-by-step

Settings	Click on Start to estimate, select the country/area and year
Needs	Define the needs for the country/area
Bio SAF	Change the global quantity of feedstock and minimise/maximise the SAF for a pathway. Global quantity of Bio SAF and synthetic SAF are set according to Refuel EU mandate.
e-SAF	Adjust the quantity of Hydrogen and CO_2 to produce synthetic SAF according to Refuel EU.
Electric & Hydrogen	Estimate the quantity used for Electric Aircraft and Hydrogen Fuel according to the needs.
Allocated Electricity	Change the Global quantity of Renewable Electricity to 1000 GWh and modify the origin shares
Fill the Electricity Gap	Plan new electricity infrastructures or import to fill the Renewable and Low-Carbon electricity gap.
Fuel production	Check if the configuration is meeting your defined needs and Green House Gas savings

The advantages of your journey

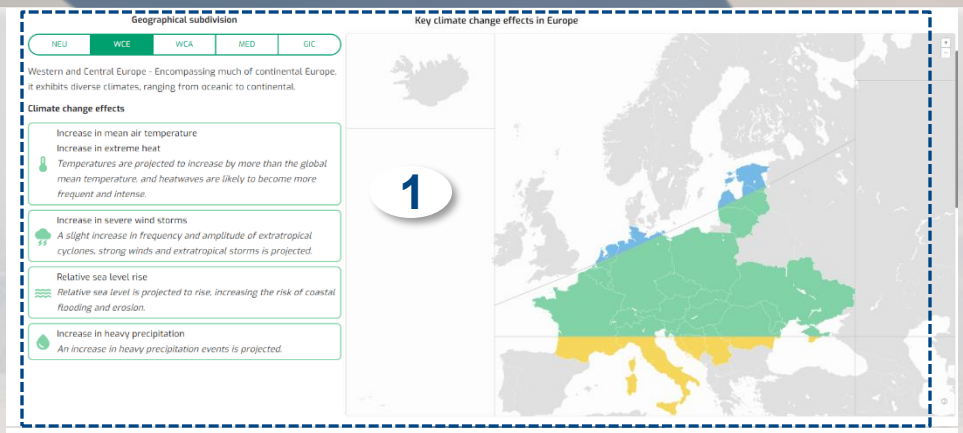
1. Simulate the production of SAF, Electricity and Hydrogen.
2. Use different sources of electricity to produce SAF, Electricity and Hydrogen.

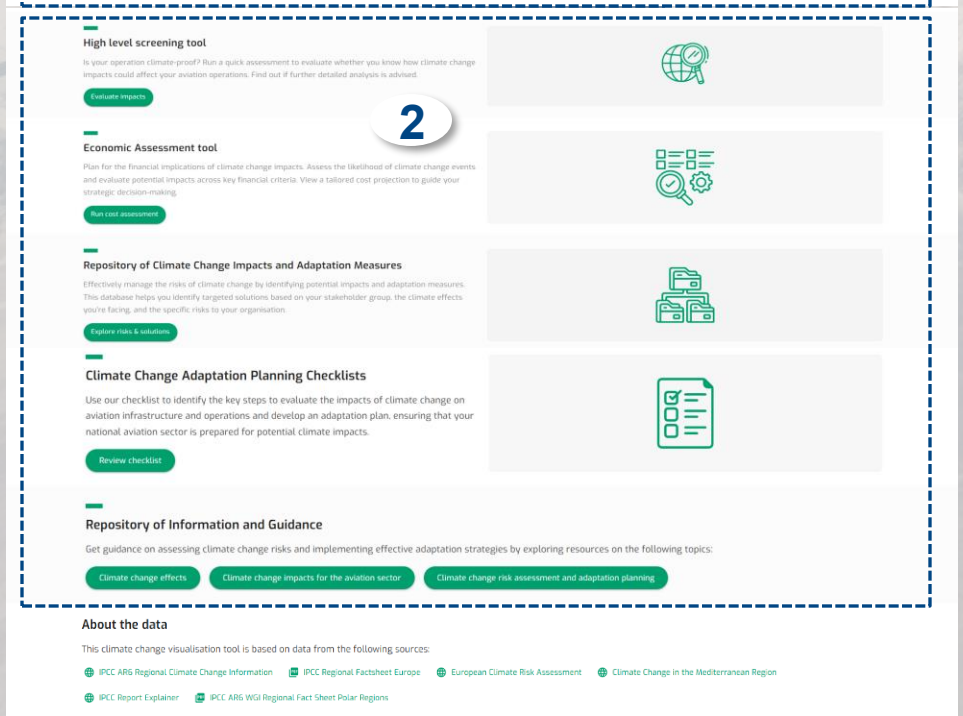
SUPPORTING EUROPEAN AVIATION

EUROCONTROL

ClimAdapt

Navigating the Climate Adaptation Challenge





1 Climate Change Effects map

2 High level screening tool

Economic Assessment tool

Repository of Climate Change Impacts and Adaptation Measures

Climate Change Adaptation Planning Checklist

Repository of Information and Guidance

ClimAdapt is your portal to information on climate change impacts and adaptation measures for your organisation.

- Find out how the climate will change around the European region.
- Initiate a location and organisation-based pre-screening assessment to support the initiation of a full climate risk assessment.
- Run a financial assessment and evaluate the potential costs of climate impacts.
- Use the checklist to plan a climate change risk assessment and adaptation strategy.
- Explore key climate impacts and adaptation measures by stakeholder, climate effect, or risk category.
- Get guidance on assessing climate change risks and implementing effective adaptation strategies from various sources.

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Functionalities

Climate Change effects	1	View Climate change effects per Climate zone or State
High level Pre-Screening tool	2	Run a climate change risk pre-screening assessment
High level Pre-Screening tool	3	View the pre-screening assessment report summary
Economic Assessment tool	4	Plan for the financial implications of climate change
Economic Assessment tool	5	View the economic assessment results
Repository of Impacts and Adaptation Measures	6	Search for potential climate impacts and targeted measures to reduce vulnerabilities
Adaptation Planning Checklists	7	Check the key steps for climate risk assessment and adaptation action
Repository of Information and Guidance	8	Get guidance on climate change risks and adaptation measures from various sources
About the Data	9	View ClimAdapt data sources

1 View Climate change effects per Climate zone or State

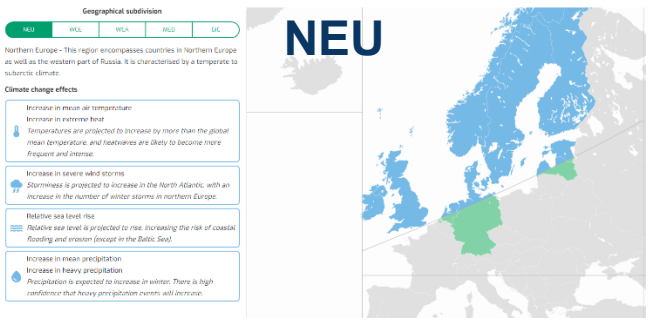
1 Select Geographical Subdivision

Default

No Geographical subdivision selected
Climate change effects is empty
Map displayed with all IPCC zone with colour codes

Output

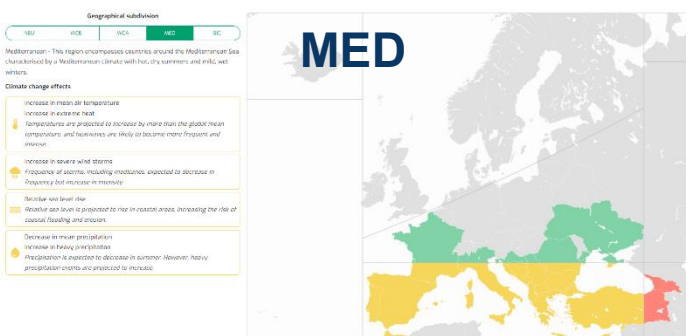
Selected IPCC geographical subdivision highlighted with related Climate change effects.



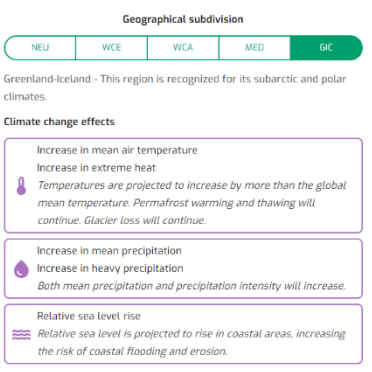
NEU

WCE

WCA



MED



GIC

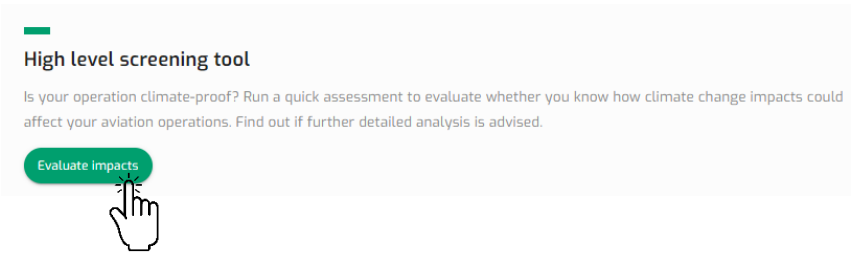
Data

Scientific sources the IPCC assessment reports.

2 Run a climate change risk pre-screening assessment

1

Click on Run new assessment

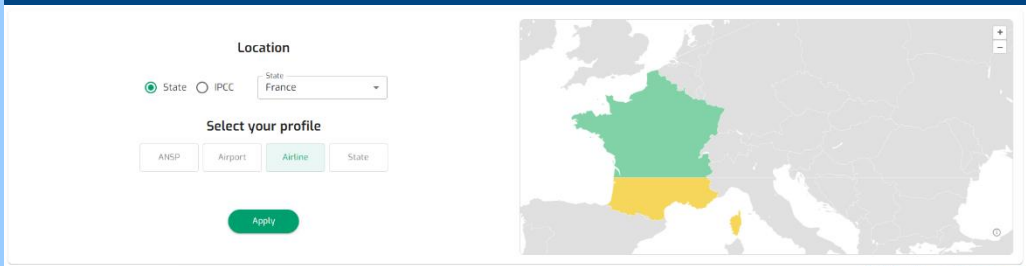


Default

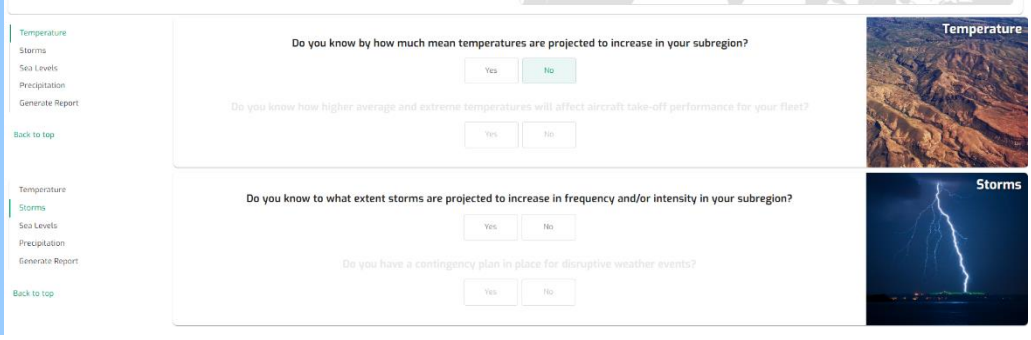
Default Location type State
No profile selected

Output

Selected State or IPCC geographical subdivision, and selected profile, impacts the questions presented for: Temperature, Storms, Sea levels and Precipitation.



State or IPCC selection



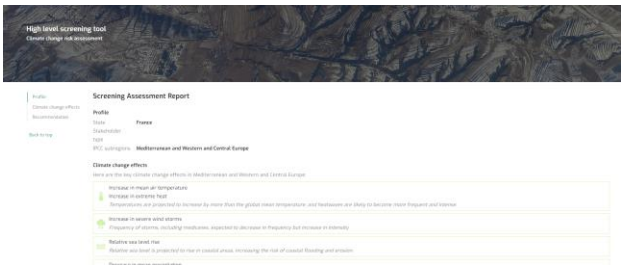
Questions related to the selection

Data

Questionnaire and methodology are designed by EUROCONTROL experts.

3 View the pre-screening assessment report summary

1 Scroll down to see the report summary



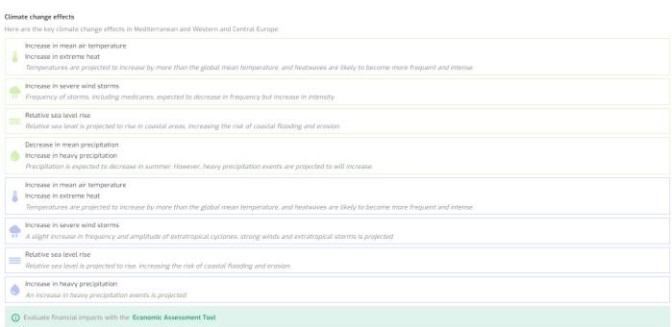
Default

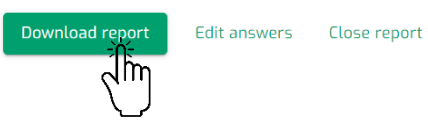
Results from the High-level pre-screening assessment

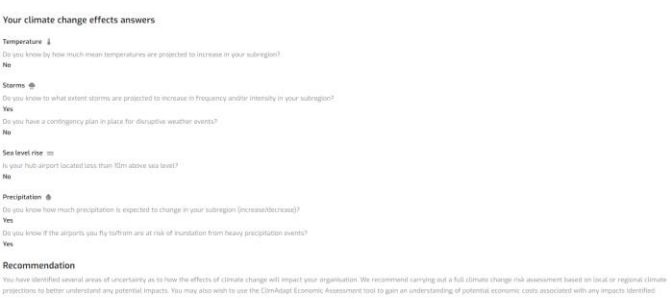
Output

The results of the high-level pre-screening assessment are presented: Screening Assessment Report, answers to climate change effects and impacts questions, and Recommendation for next steps.

Results of the last assessment can be downloaded.







4 Plan for the financial implications of climate change

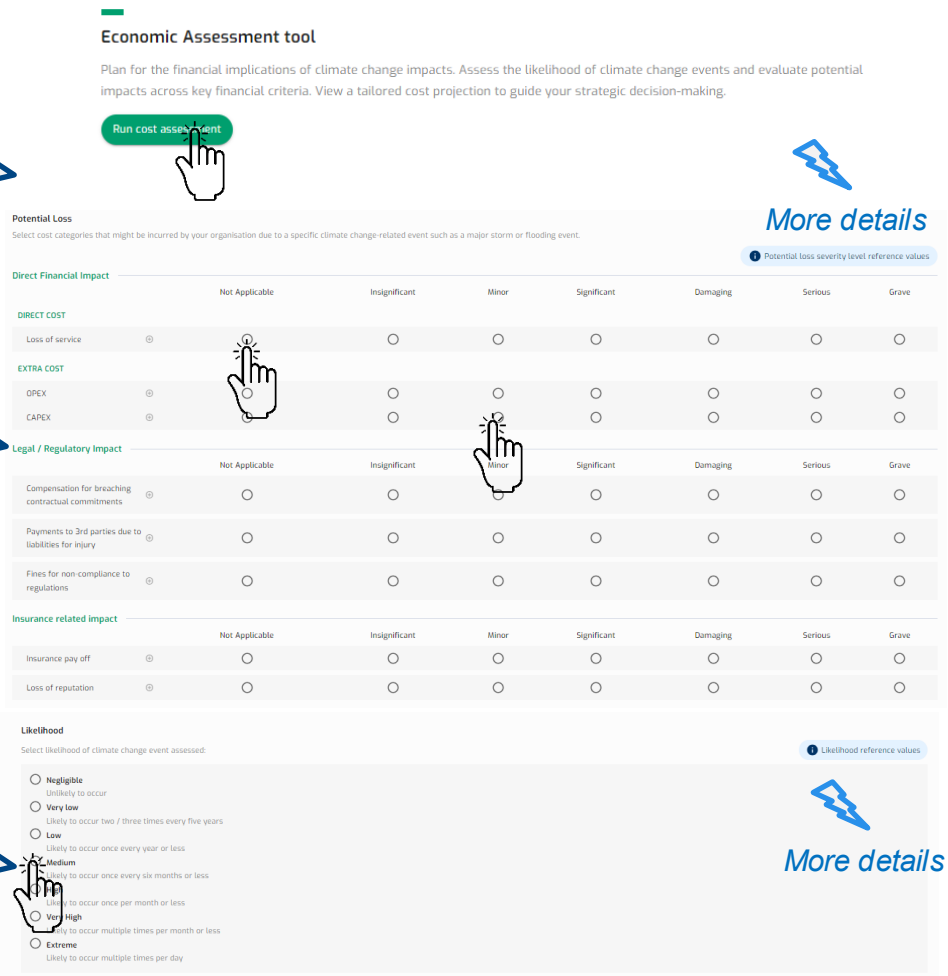
EUROCONTROL

1 Click on Run cost assessment

2 Choose the level of Potential Loss per impact

Definitions available by clicking on "+"

3 Choose the level of Likelihood

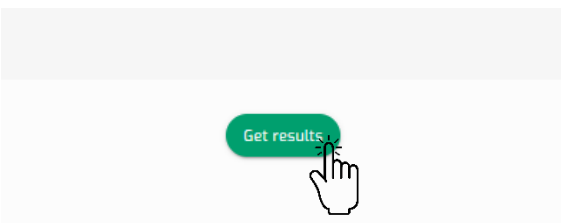


Default

No answers selected

Output

Selected levels impact the results.

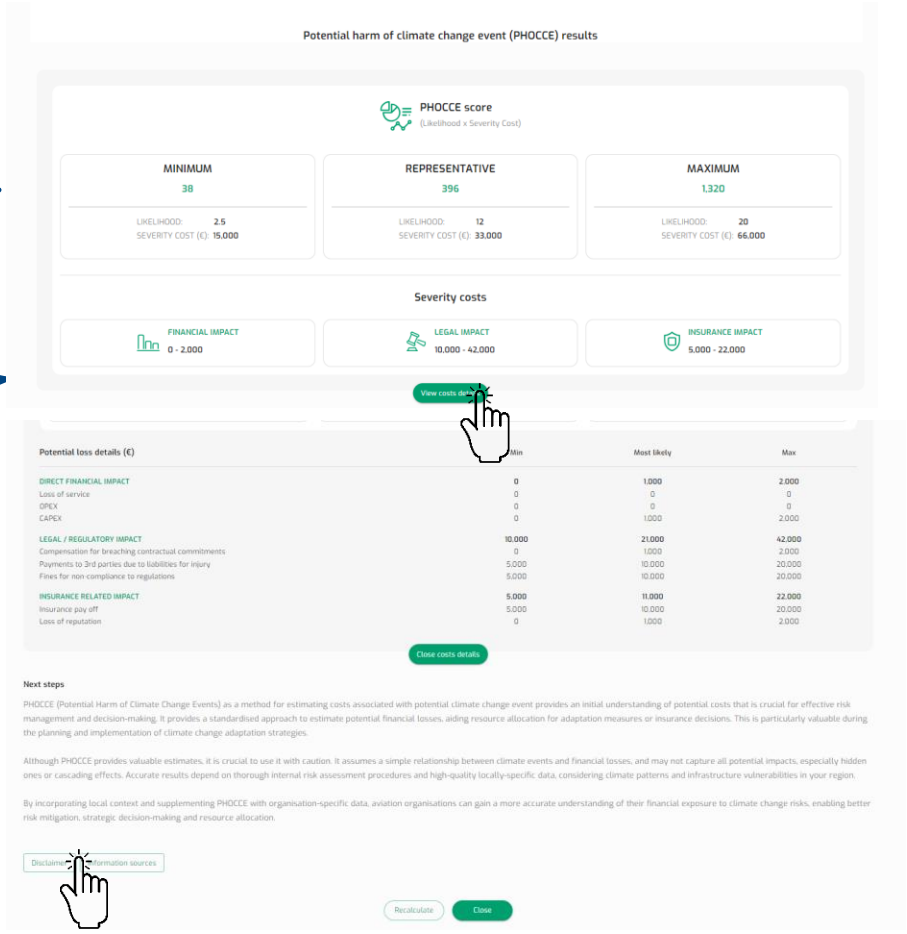


Data

These reference values were developed based on a range of industry and academic sources of information. For more details you can see the Repository of Information and Guidance (under development).

5 View the economic assessment results

1. Scroll down to see the results
2. Click on View costs details to see the details
3. Click on Disclaimer and Sources



Default

Results from the Economic assessment

Output

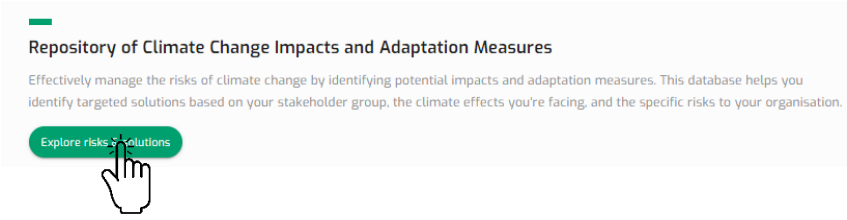
The results of the Economic assessment are presented: PHOCCE score, Severity costs, Potential loss details, Next steps, Disclaimer and Sources.

Results of the last assessment can be displayed.

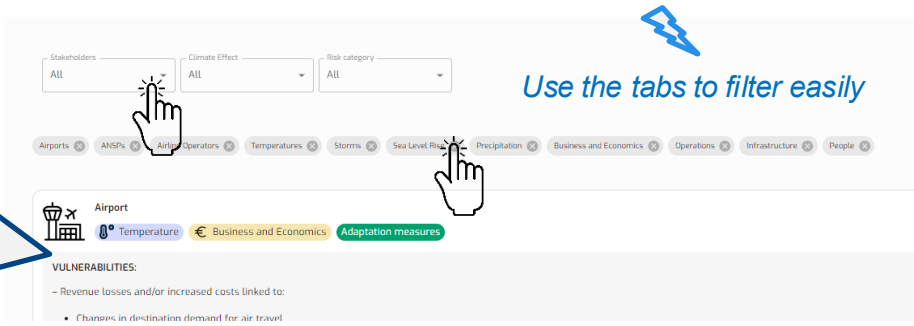
Recalculation is possible at the end of the results.

6 Search for potential climate impacts and targeted measures to reduce vulnerabilities

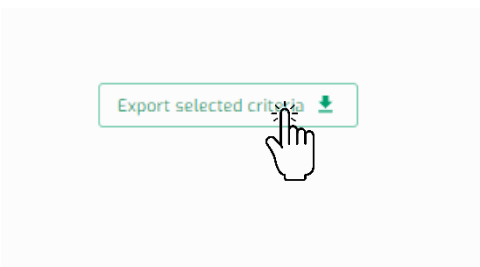
1 Click on Explore risks & solutions



2 Filter by Stakeholder, Climate effect and/or Risk category



3 Export the selection

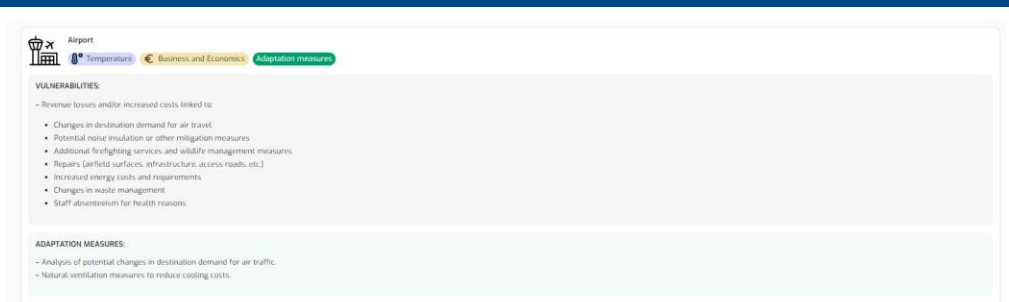


Default

All filters: Stakeholder, Climate Effect and Risk Category preselected

Output

Climate impacts results with vulnerabilities and adaptations measures.



Data

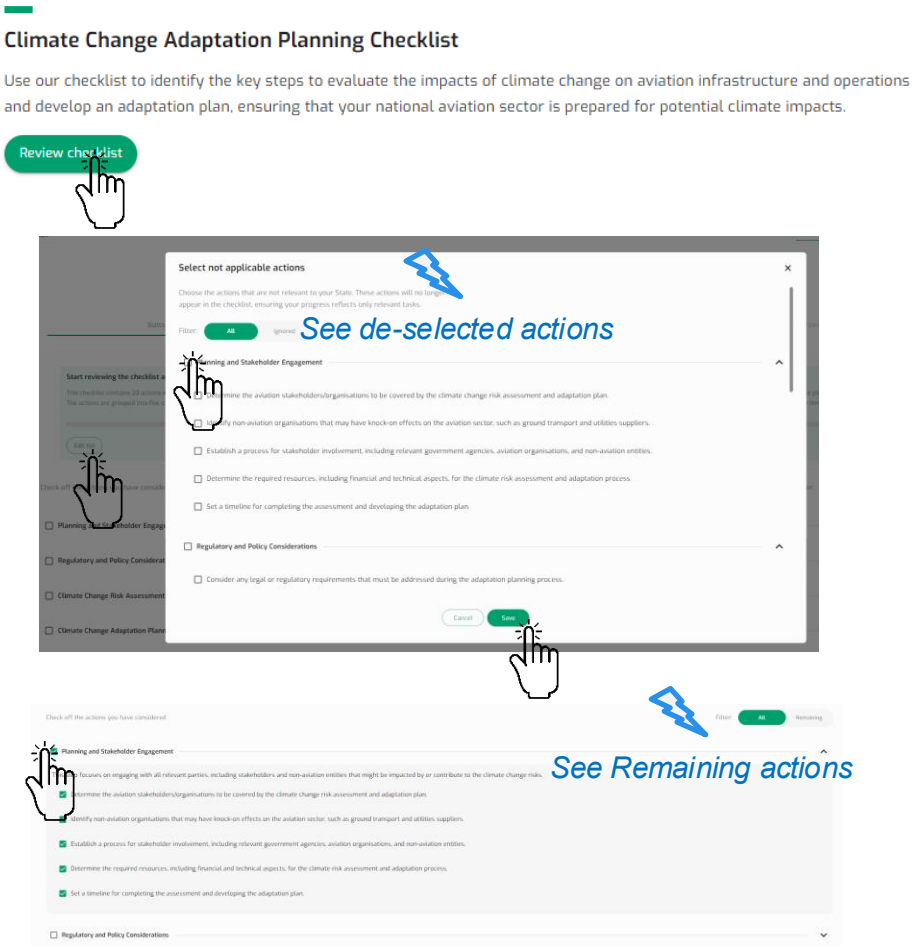
The information in this repository is based on ICAO Key Climate Change Vulnerabilities for Aviation Organisations, ICAO Key Climate Change Vulnerabilities for Aviation Organisations, ICAO Menu of Adaptation Options, EUROCONTROL Climate Change Risks for European Aviation 2021, EUROCONTROL Adapting Aviation to a Changing Climate 2018.

7 Check the key steps for climate risk assessment and adaptation action

1. Click on Review checklist

2. Edit the list of actions

3. Check off the actions considered

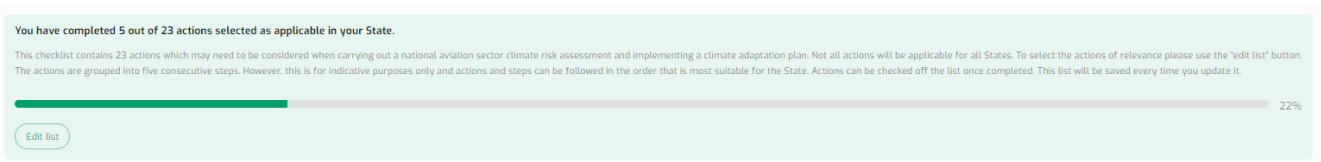


Default

No actions **preselected**

Output

Progress bar updated from the actions selected.



Data

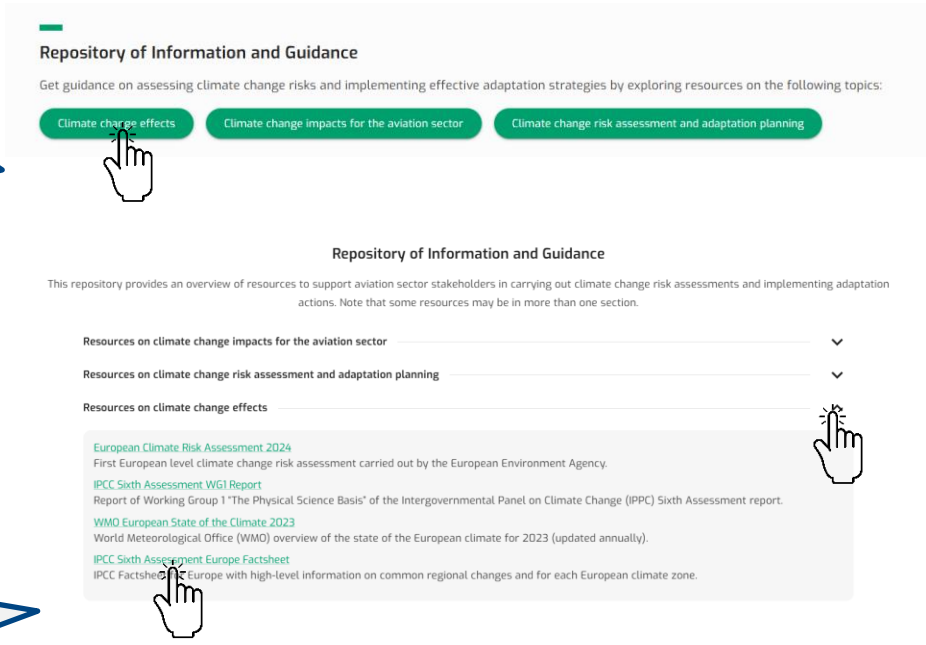
ICAO guidance : Climate Change: Climate Risk Assessment, Adaptation and Resilience

8 Get guidance on climate change risks and adaptation measures from various

1. Click on the section of the repository

2. Click on the section to hide it

3. Click on the link a new window opens



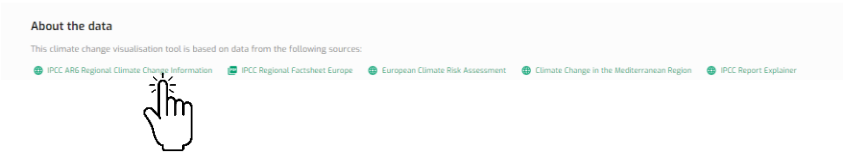
Default

No actions preselected

9 View ClimAdapt data sources

1

Click on the data sources

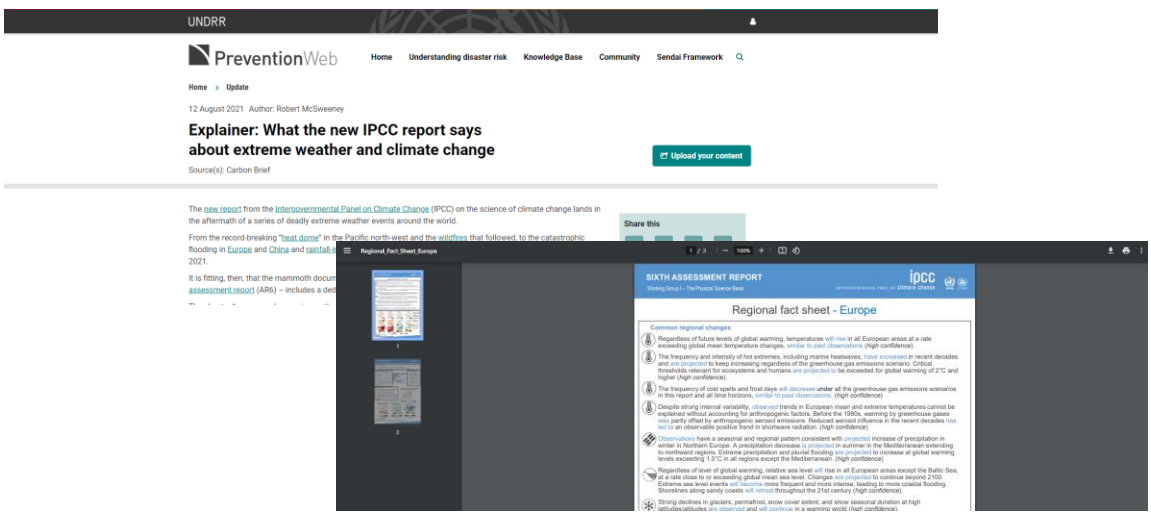


Default

Links

Output

The data sources links open in a new window.



ClimAdapt journey

EUROCONTROL

ClimAdapt step-by-step

Climate Change effects

High Level Pre-screening tool

Economic Assessment Tool

Repository of Impacts and Measures & Adaptation Checklist

About the Data

- Select your IPPC region and view climate change effects
- Select your State and organisation type and answer to the assessment questions to obtain your recommendation
- Select your potential loss severity levels and the likelihood values and obtain your results
- Search for the vulnerabilities and adaptation measures for your organisation type and identify the key steps to evaluate the impacts of climate change
- Check the additional data sources

The advantages of your journey

1. Understand the climate change effects projected in your region.
2. Assess your understanding of climate change effects and impacts for your organisation. Receive a recommendation to support a full climate change risk assessment.
3. Plan for the financial implications of climate change impacts.
4. Manage the risks of climate change and identify the key steps to evaluate the impacts.

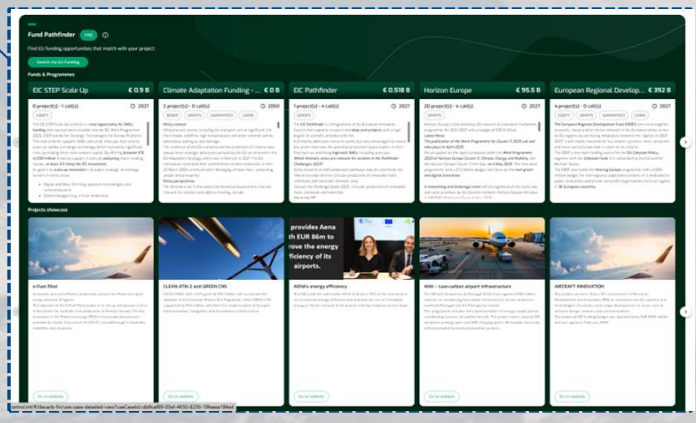
SUPPORTING EUROPEAN AVIATION

EUROCONTROL

DecarbFin

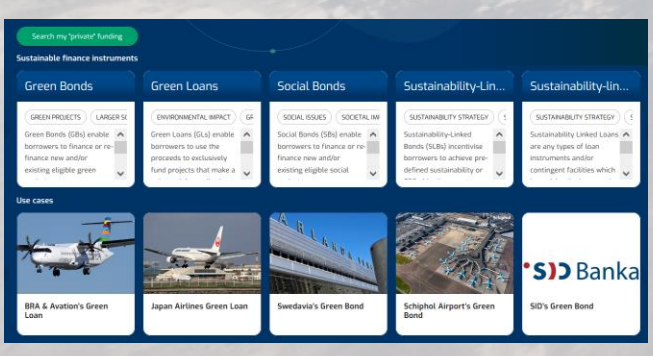
Fostering aviation access to sustainable finance

1 Fund-Pathfinder



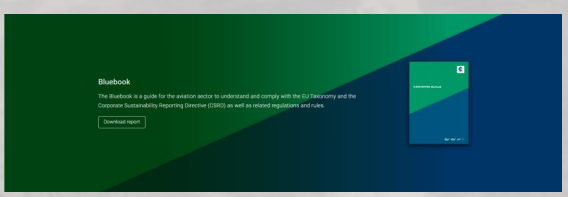
1

2 Funding Booster



2

3 BlueBook



3

As financing aviation decarbonisation proves challenging, due to limited access to sustainable finance and evolving regulatory landscape, DecarbFin provides you with tools and information necessary to facilitate your access to public and private sustainable funding opportunities. Check out also the Bluebook, a guide for enhanced ESG reporting and compliance with the EU Taxonomy and CSRD to help you navigate this complex regulatory and reporting landscape.

SUPPORTING EUROPEAN AVIATION

EUROCONTROL

Functionalities (1)

FAQ

1. View the DecarbFin FAQ

Fund-Pathfinder

Funds Overview

2. View the Funds & Programmes overview

Search My Funds

3. Filter My Funds and Calls

Funds In detail

4. View the Funds, the Programmes and the Calls' details

Projects Overview

5. View the Projects overview

SUPPORTING EUROPEAN AVIATION

EUROCONTROL

Functionalities (2)

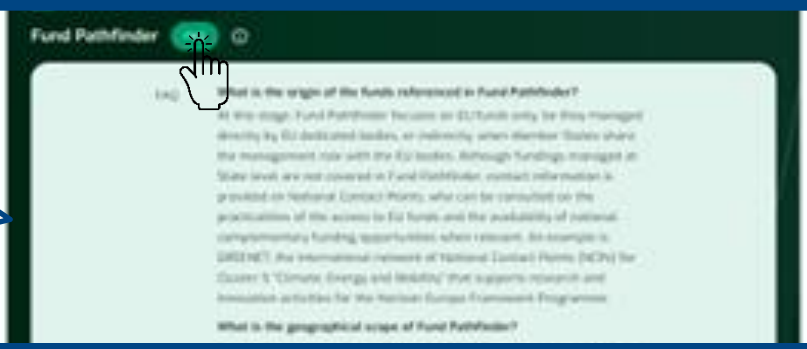
Funding Booster

Instruments Overview	6	View the Sustainable Finance instruments - Summary
Instruments Details	7	View the Sustainable Finance instruments - Details
Instruments Summary	8	View the Use Cases
Dictionary	9	View the Dictionary of Terms
Search Instruments	10	Search and Filter my “private” Sustainable Finance instruments
Essentials View	11	View the Essentials (ESG Frameworks, Roadmaps)
Dashboard	12	View the Sustainable Finance dashboard
Funding Basket	13	View the Basket
BlueBook	14	Download the Bluebook

1 View the DecarbFin FAQ

1

Click on FAQ

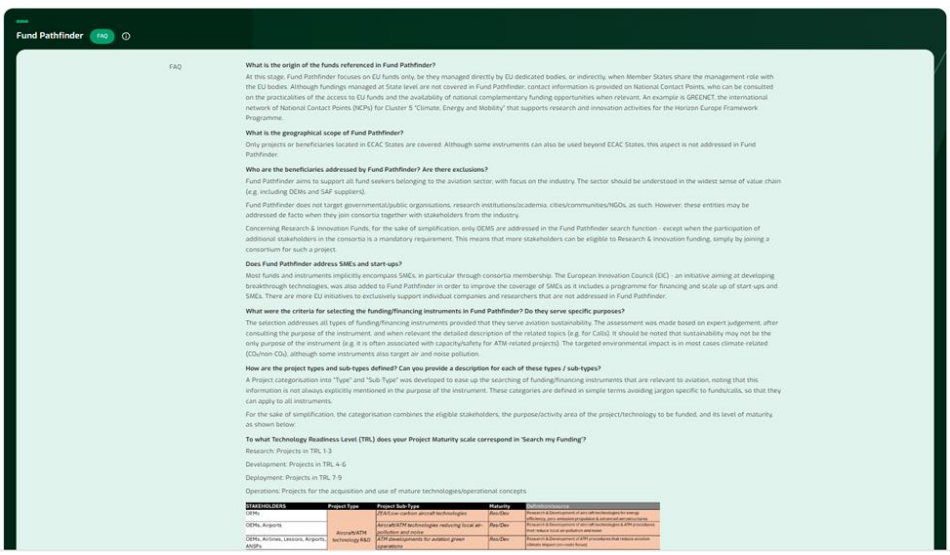


Default

FAQ for Fund Pathfinder

Output

The FAQ is presented for the Fund-Pathfinder.



Data

The FAQ summarises the scope of Fund Pathfinder under a list of given Q&A defining geographical scope, programme/fund scope, stakeholders addressed, funding options, project (sub-) types, and project maturity.

Definition

Beneficiaries: aviation stakeholders benefiting from the EU funding programmes included in Fund Pathfinder
Result type: search results that correspond to either a Fund, a Call, or both
Fund: a EU funding programme or financing instrument
Call: a specific funding opportunity (often a grant) for a given Fund/Programme, with a specific time window when applicants are invited to submit under their Call for Proposal
Technology Readiness Level (TRL): a method used to assess the maturity of a particular technology
Project type/sub-type: project categorisation according to eligible stakeholders, purpose of project and maturity level

2 View the Funds & Programmes overview

1

Click on the arrow to scroll

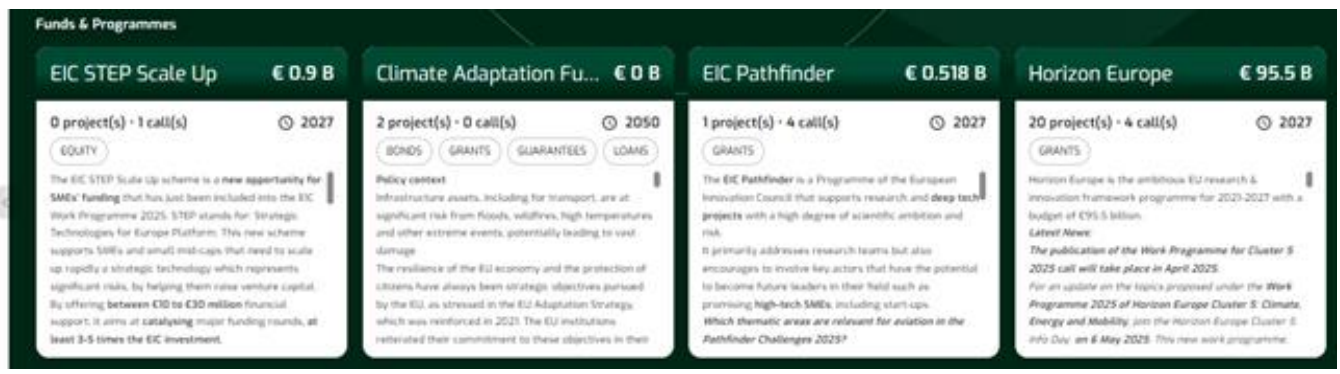
Default

All Currently available* Funds & Programmes

** With one exception: although completed and replaced by Horizon Europe, Horizon 2020 is displayed here as it has funded many aviation related projects of interest*

Output

The Funds & Programmes available are presented on the carrousel.



Data

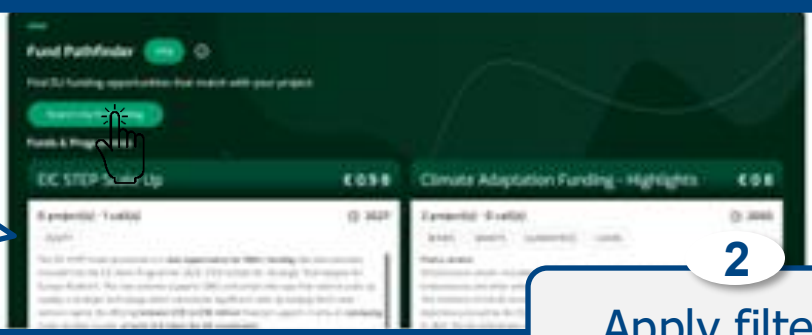
The source of information for the Funds & Programmes is the official EU (and EU relevant agencies) websites.

Definition

Funds / Programmes: financial resources allocated by the EU to projects & initiatives that support the EU strategic priorities, within its Member States and beyond in some cases. A sub-set of Funds selected for their relevance to aviation sustainability.
State: ECAC Member State in which the aviation beneficiary is located
Stakeholder: type of company/organisation in the aviation value chain

3 Filter My Funds and Calls

1 Click on Search my funding

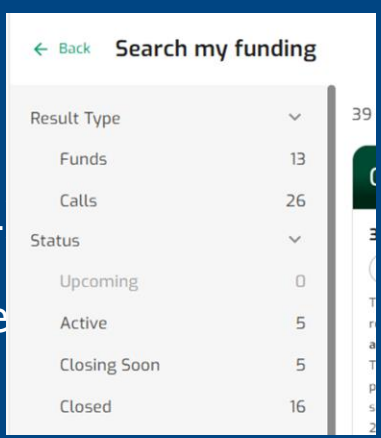


2 Apply filters

Two methods for searching

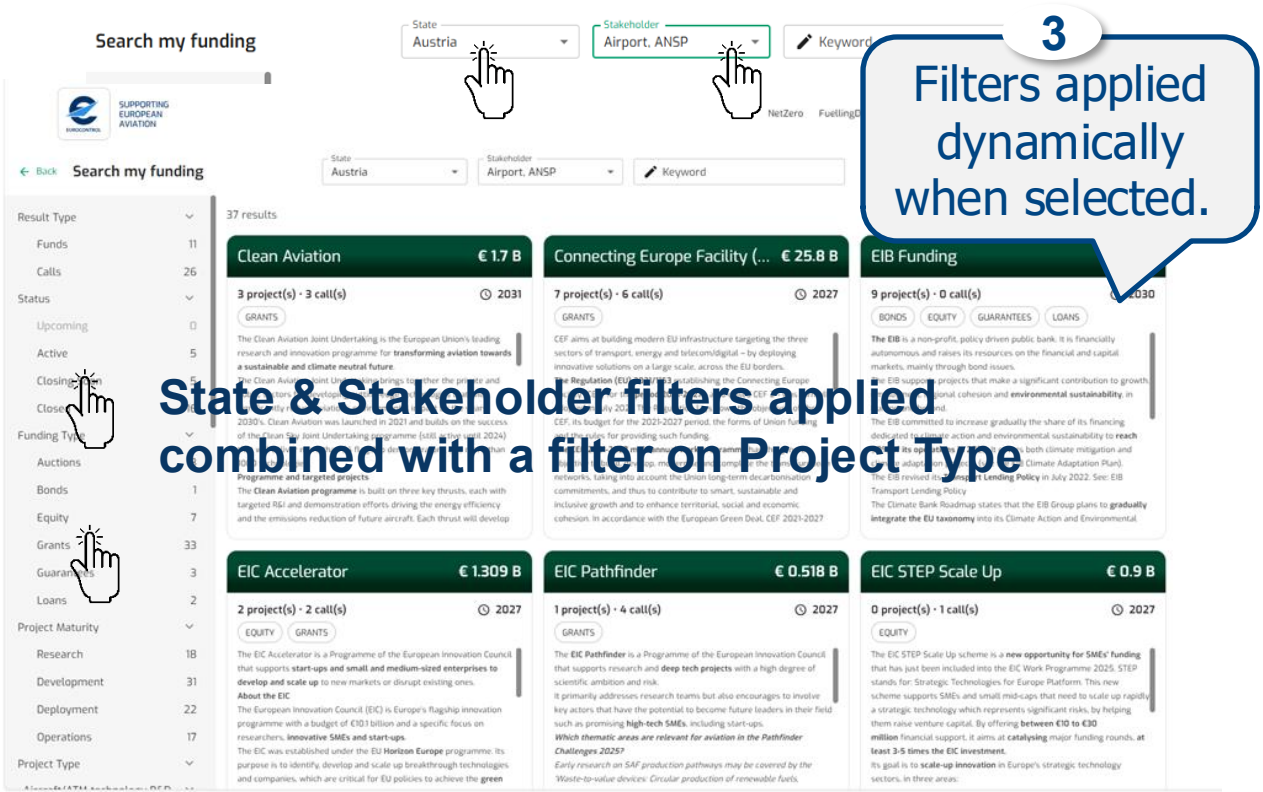
Query

- **Quick general query:** you may use the filters at the top of the page: State, Stakeholder, Keyword: you can select one State, one or multiple Stakeholders and optionally Keyword(s) .
- **Refined query for specific project types:** You may use the filters on the left hand-side, where all filtering combinations are possible: Result type (Fund/Call), Status (Active/Upcoming…), Funding Type (Grant, other…), Project maturity, Project Type (purpose). The search can combine filters at the top and the left of the page.



- ***Note on Result Type:*** *The query can be made on "Funds" or "Calls", or both combined. "Calls" are instantiations of "Funds" meaning that they are more focused and may only target a subset of the project types defined in the corresponding "Fund".*

Output



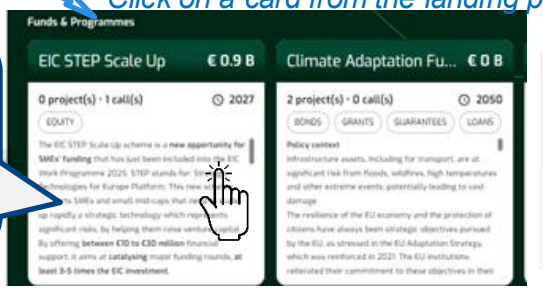
3 Filters applied dynamically when selected.

State & Stakeholder filters applied combined with a filter on Project Type

4 View the Funds, the Programmes and the Calls details

1 Click on a Fund or a Call card

Click on a card from the landing page or from Search my funding

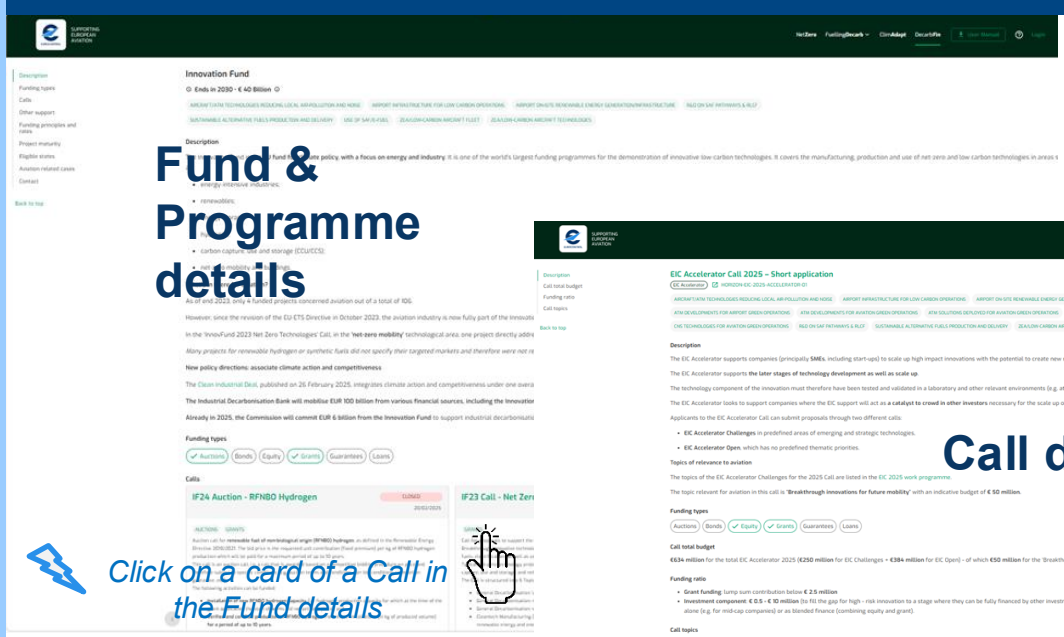


Default

Sections appearing in a Fund : Description, Funding types, Calls, Other support, Funding principles and rates, Project Maturity, Eligible States, Aviation related cases, References, Contact.
Sections appearing in a Call : Description, Funding types, Call total budget, Funding ratio, Call topics.

Output

The Funds & Programme or Calls details are displayed. The navigation is managed from the navigation index on the left-hand side.



Click on a card of a Call in the Fund details

Data

The information is sourced from the official EU websites and/or from the website of the specific programme/fund/call.

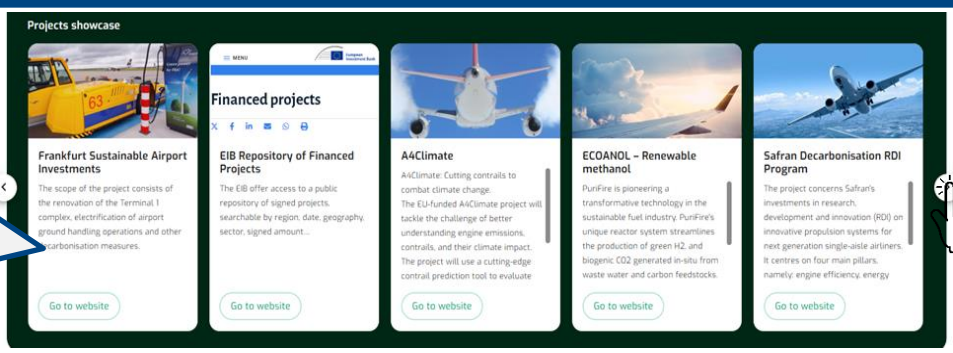
Definition

Funding type(s): type of funding resource (e.g. grant) or financing instrument (e.g. loan, bond, equity...)
Submission: process of providing all necessary documents before deadline when applying for an EU funding opportunity

5 View the Projects overview

1

Click on the arrow to scroll

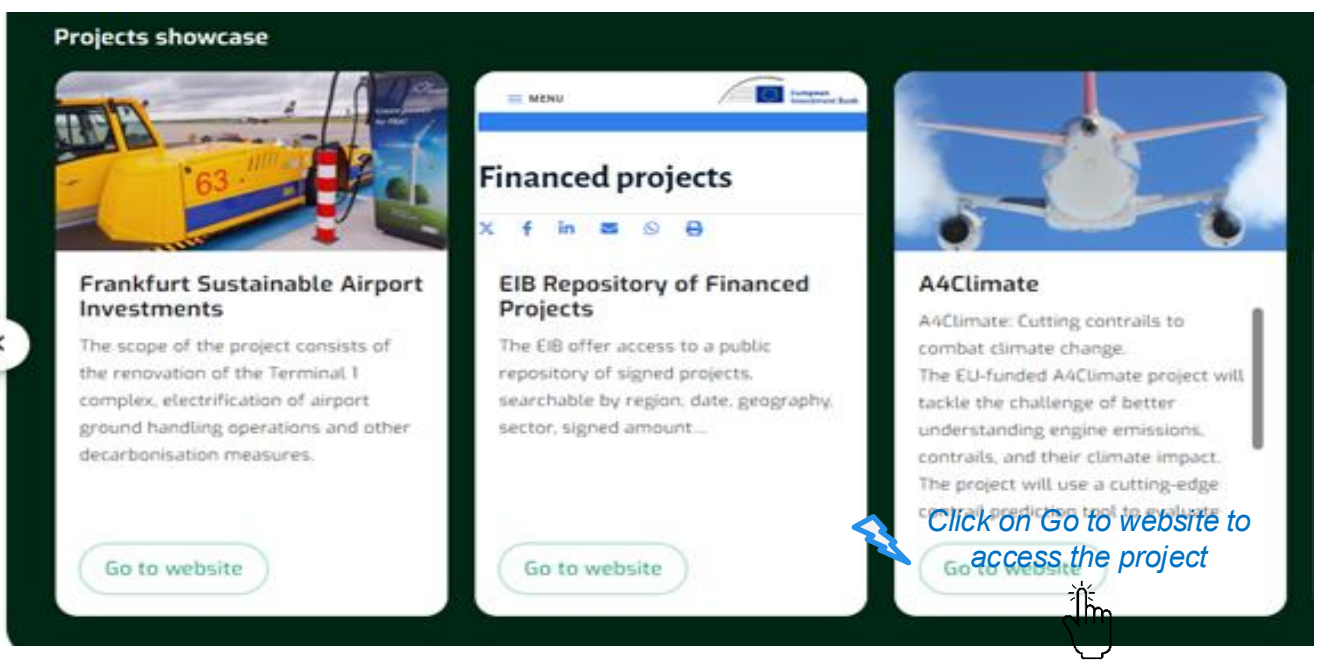


Default

Current or past Projects, publicly available, that have benefited from EU Funding and are relevant for aviation decarbonisation.

Output

The Projects are presented on the carrousel.



Data

All projects showcased and their descriptions are sourced from the official sites of the projects or from relevant EU websites.

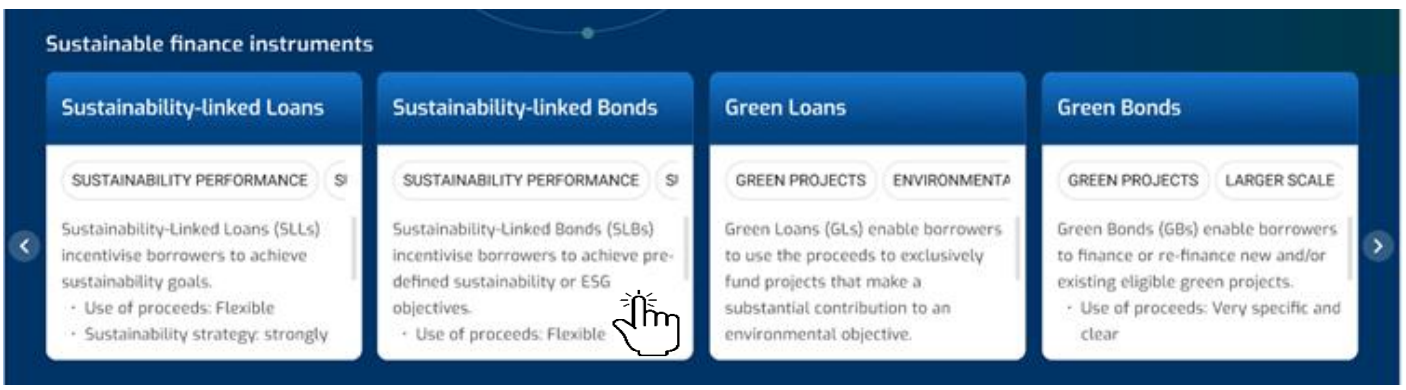
Definition

Projects showcase: A (non-exhaustive) selection of publicly disclosed projects, that have benefited from EU Funding and are relevant for aviation decarbonisation.

6 View the Sustainable finance instruments - Summary

Default

Sustainable finance instruments offered by the financial institutions: sustainability-linked loans, green bonds, sustainability-linked bonds, green loans, social bonds and venture capital.



Output

Carousel of the summary cards of sustainable finance instruments located in the landing page constitute a very structured summary of the full description of sustainable finance instruments

Data

Public data available in various websites with focus on ICMA resources. The selection of options is based on historic transactions pertaining to the aviation industry coupled with two extra alternatives for social and early-stage projects

Definitions

Please consult the Dictionary of terms function

Tip : By clicking on any of the cards in the carousel, a longer description of the sustainable finance instrument appears – please see next page

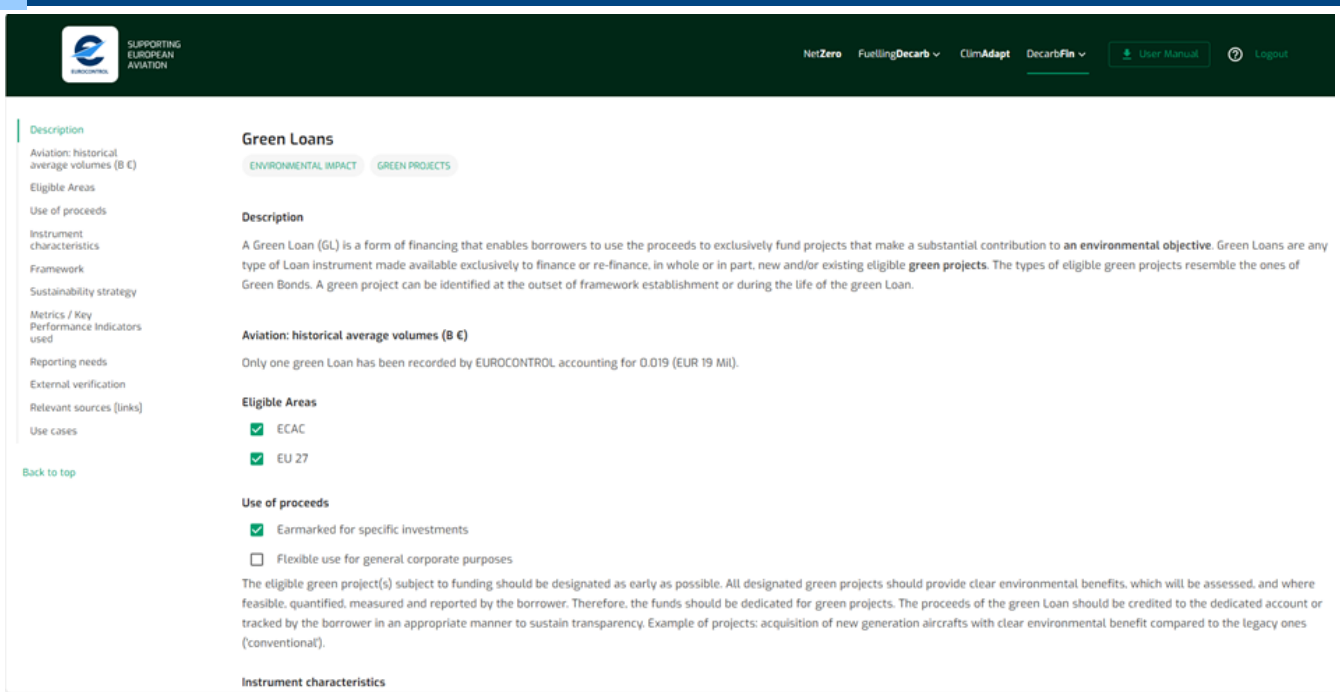
7 View the Sustainable finance instruments - Details

Default

View the Description of the instrument, the recorded range of aviation-related volumes, Areas of Eligibility, Potential Use of Proceeds, Instrument's Characteristics, Procedural Framework, Sustainability Strategy, Key Performance Indicators, Reporting Needs, External Verification Needs and Completed with the relevant (if any) Use Cases corresponding to that specific instrument.

Output

Sustainable finance instruments are presented in detail. The navigation can also be managed from the navigation menu on the left hand-side.



Data

All information is sourced from publicly accessible sources which are located at the bottom of the page.

Definitions

Please consult the Dictionary of terms function

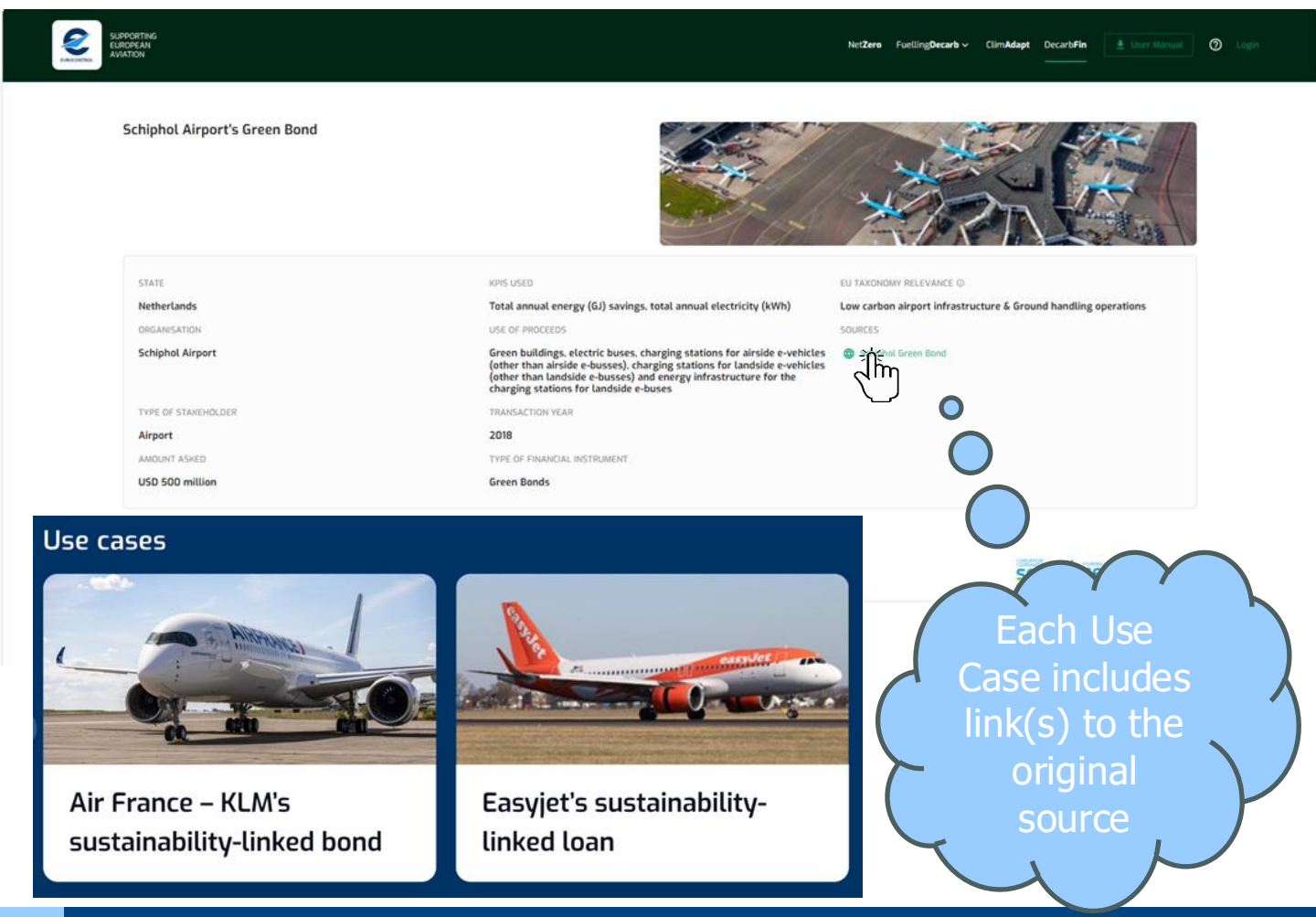
8 View the Use Cases

Default

A selection of diverse sustainable finance transactions or past Use Cases from the global aviation sector. They constitute financial deals between borrower companies active in aviation and financial institutions. These deals are subject to ESG-related financial conditions.

Output

Each Use Case outlines a single transaction with details on: State, type of stakeholder, organisation, amount asked, use of proceeds, KPIs used, EU Taxonomy relevance, transaction year and source.



Data

Public data mainly by press releases from involved parties or articles mainly at bank websites.

Definitions

Please consult the Dictionary of terms function

9 View the Dictionary of terms

Default

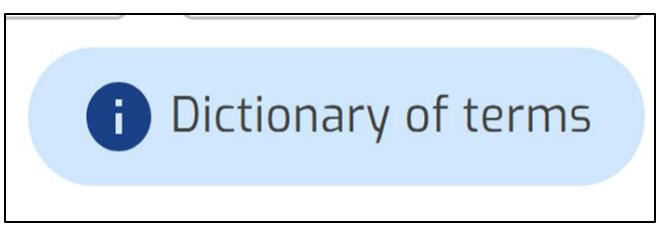
List of short explanations and definitions of terms appearing in the Funding Booster functionalities .

Output

Each term is categorised under the Funding Booster's functionality it belongs due to times of appearance. Each term is shortly explained with examples provided sometimes.

Data

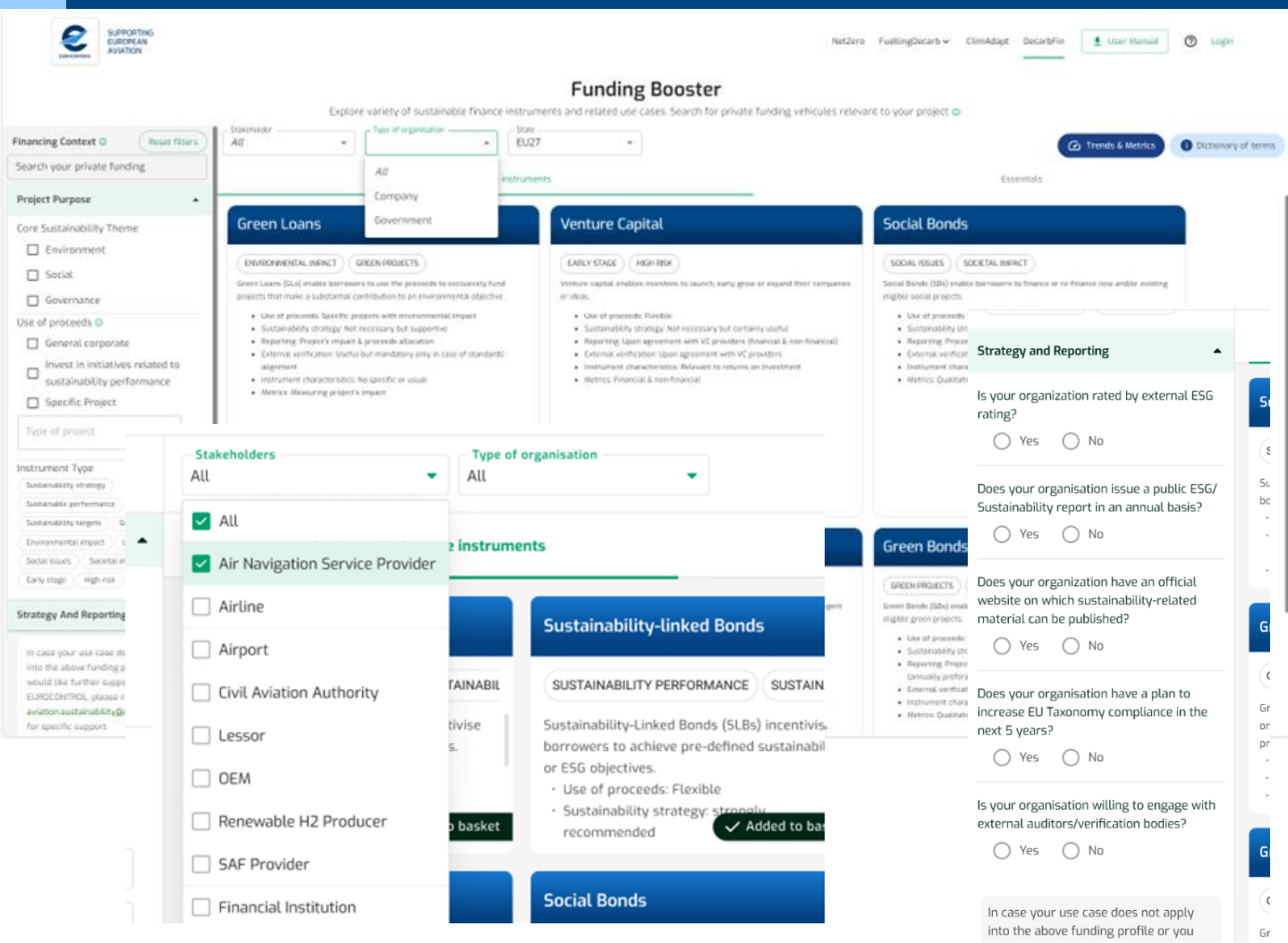
All information is based on internal ASU validated information/knowledge and/or public acknowledged websites.



10 Search my "private" funding and Filter my Sustainable Finance instruments

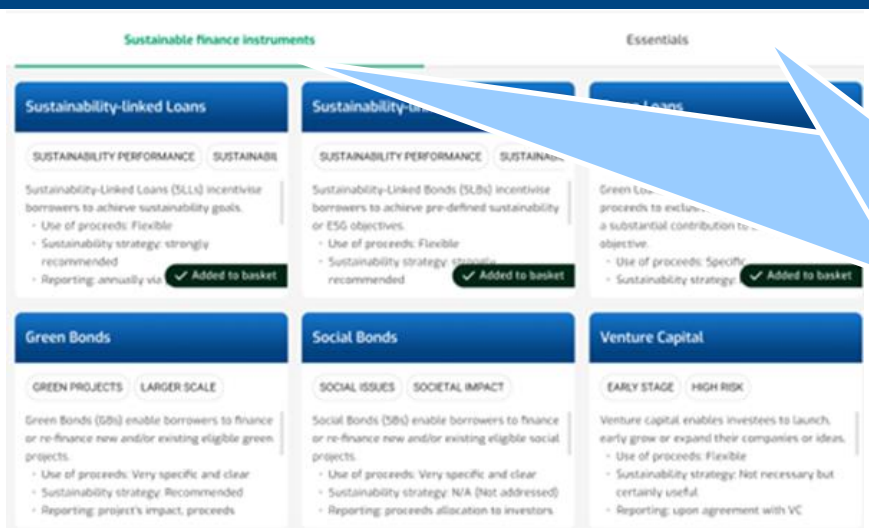
Query

- Type of stakeholder: definition of stakeholder type
- Project purpose: selection of the purpose of the proceeds (project – based or non-project based)
- Strategy and Reporting: profiling of sustainability strategy and reporting capabilities of the company



Output

List of search results pertaining to sustainable finance instruments



Two tabs: Sustainable finance instruments and Essentials: list of finance options and list of ESG frameworks and roadmaps respectively

11A View the Essentials

ESG Frameworks

Default

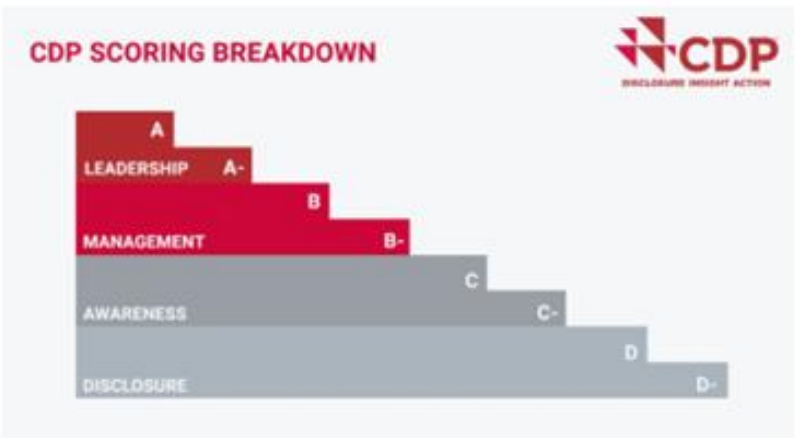
View the Purpose of the framework, its Focus Areas, some Key Highlights, categories of ESG metrics, Target Audience, relevance with Aviation Sector, Where to Report, Cost of Use, Target Users, Reporting Period, a short Conclusion.

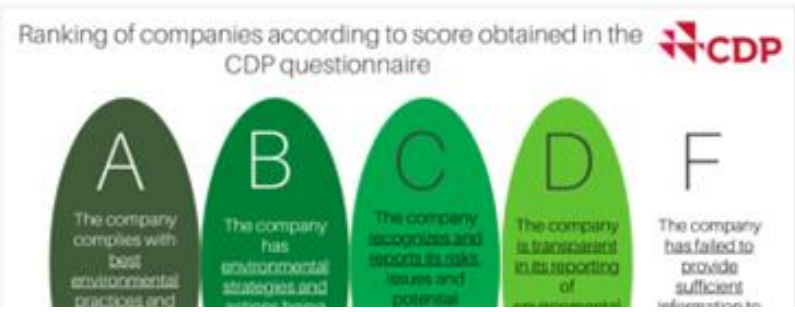
Output

Each ESG framework is presented in detail. The navigation can be also managed from the navigation menu on the left side.

- Forests:
  - Deforestation risk exposure
  - Forest product sourcing (palm oil, timber, cattle, soy)

Scoring: Yes





Data

All information is sourced from publicly accessible sources which are indicated at the bottom of the page. Some of them correspond to the official site of the ESG framework, where applicable (ie. CDP).

Definitions

Please consult the Dictionary of terms function.

11B View the Roadmaps

Aviation Sustainability Roadmaps

Default

View the Description of the roadmap, its Strategy Goals it entails, Main Features, Technological solutions put forward, Policy and Market Mechanisms, Investment and Financing, Operational and Infrastructure Changes, International Collaboration, and Timelines/Milestones under its decarbonisation pathways.

Output

Each roadmap is presented in detail. The navigation can be also managed from the navigation menu on the left side.

Data

All information is sourced from publicly accessible sources which are located at the bottom of the page. They correspond to the official site of the roadmap release (ie. ICAO, IATA, SBTi, etc.).

Definitions

Please consult the Dictionary of terms function.

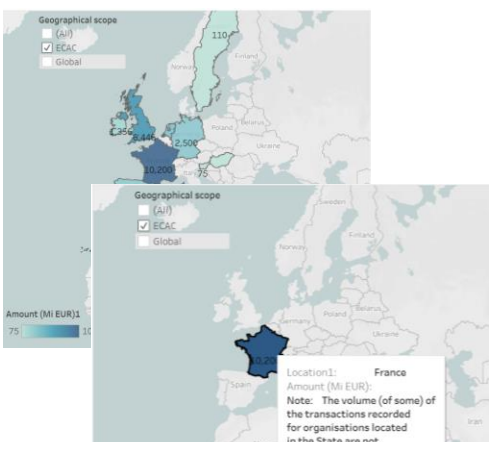
12 View the Sustainable Finance dashboard

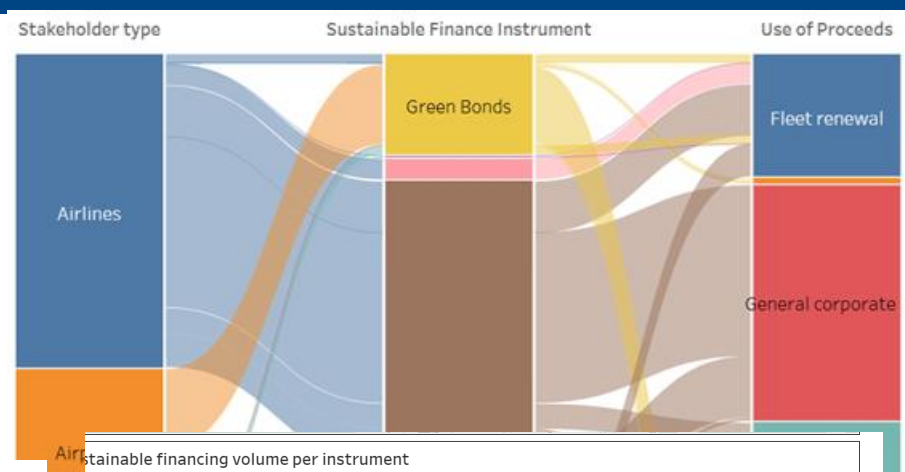
Default

- Volume transactions per State (ECAC & Global)
- Sustainable financing volume per instrument
- Sustainable financing volume per Key Performance Indicator
- Proceeds allocation per instrument and per stakeholder
- Key Performance Indicator used per stakeholder type

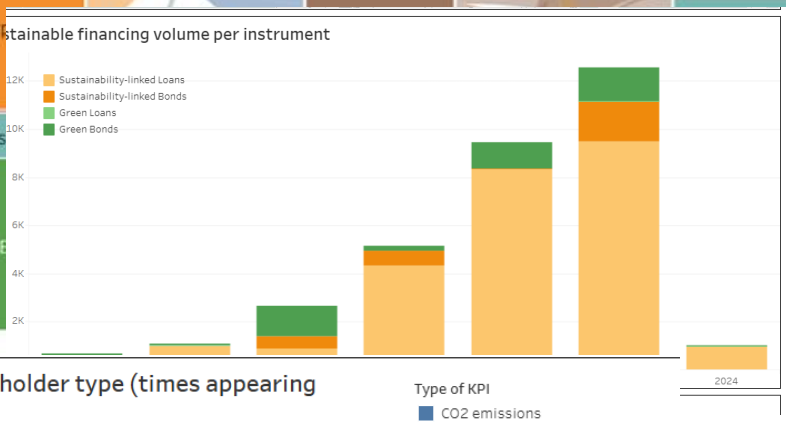
Output

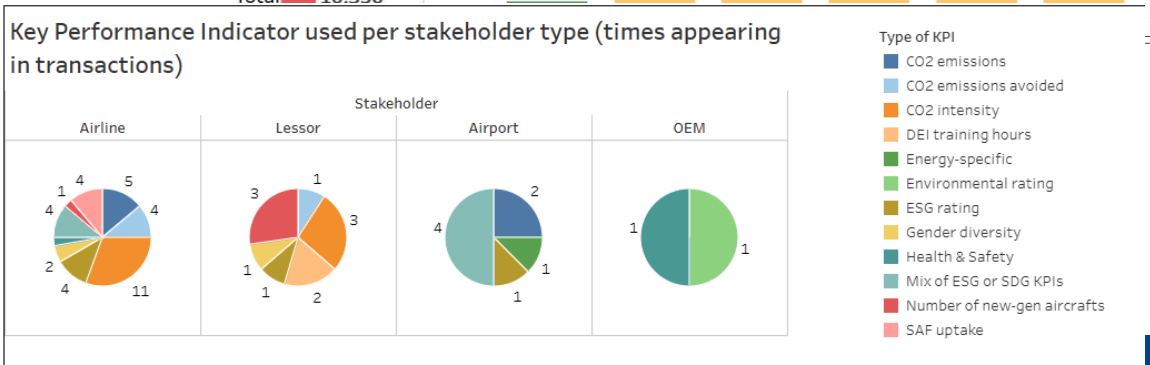
Key volumes per geography, over time and per instrument, per Environmental, Social or General context, per stakeholder type and use of proceeds and finally, indicators appearing in transactions.





Category	Subcategory	
Environmental	Total	19,466
	Environmental rating	8,000
	CO2 emissions	6,926
	SAF uptake	2,240
	Number of new-gen aircra..	1,520
	Energy specific	500
	CO2 emissions avoided	280
General	Total	12,600
	Undisclosed	7,280
	Mix of ESG or SDG KPIs	3,840
	ESG rating	1,480
Social	Total	10,356





Data

Public data (web).

Definitions

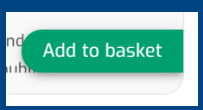
Please consult the Sustainable Finance dashboard for more information on how to read and interact with the visuals.

13 View the Funding Basket

Default

Funding Basket: a space to temporarily store selected information from Fund Pathfinder and Funding Booster and export to a word format

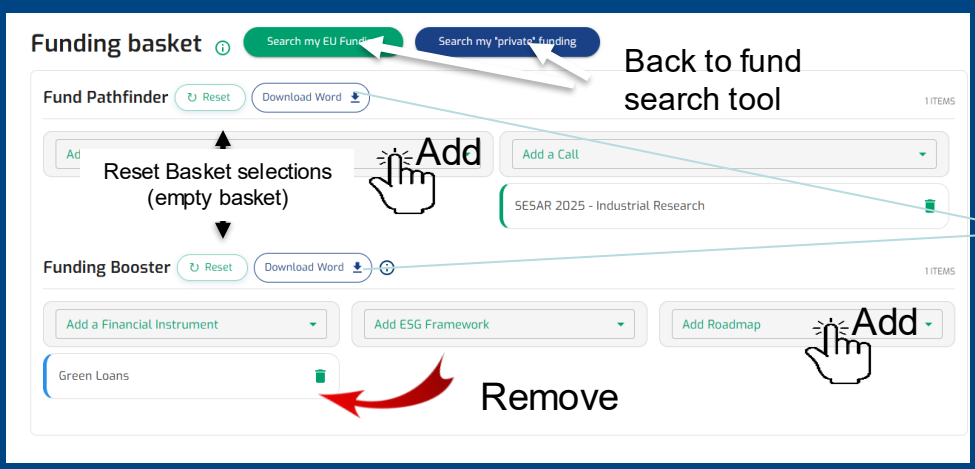
>>> To add an element in the Funding Basket you can click >>>



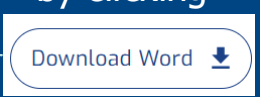
And to access the Basket space you click >>>

The basket view consists of:

- **A Fund Pathfinder (EU funding) and Funding Booster (private funding) space**: the user can select/add, view, and remove all the funds/calls and financial instruments previously selected. They can also add, view and remove ESG frameworks and Roadmaps.



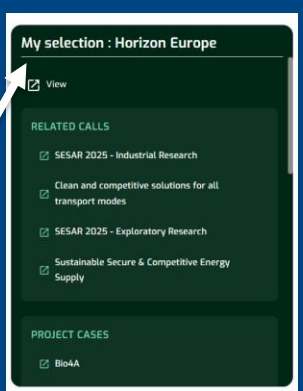
>>> Export your saved business case in word (doc.) by clicking



in both Fund Pathfinder and Funding Booster

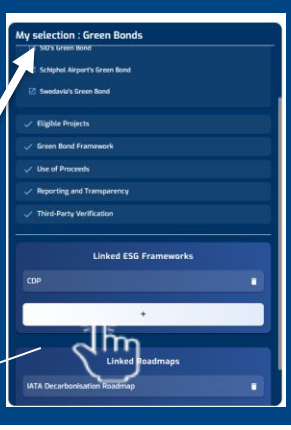
CASE BUILDER

Fund Pathfinder: user can view Selected EU Funds/Calls and relevant Project Cases



Funding Booster: selected finance instruments, and associated ESG frameworks and roadmaps

Click **(+)** to link an ESG framework or a roadmap



Output

- **Fund Pathfinder:** Sustainable business case including a selection of Funds and/or Calls including relevant EU funded project cases.
- **Funding Booster:** Sustainable business case defined by a single, selected financial instrument, and may include a linked ESG framework and/or a linked Roadmap

14 Download Bluebook

1

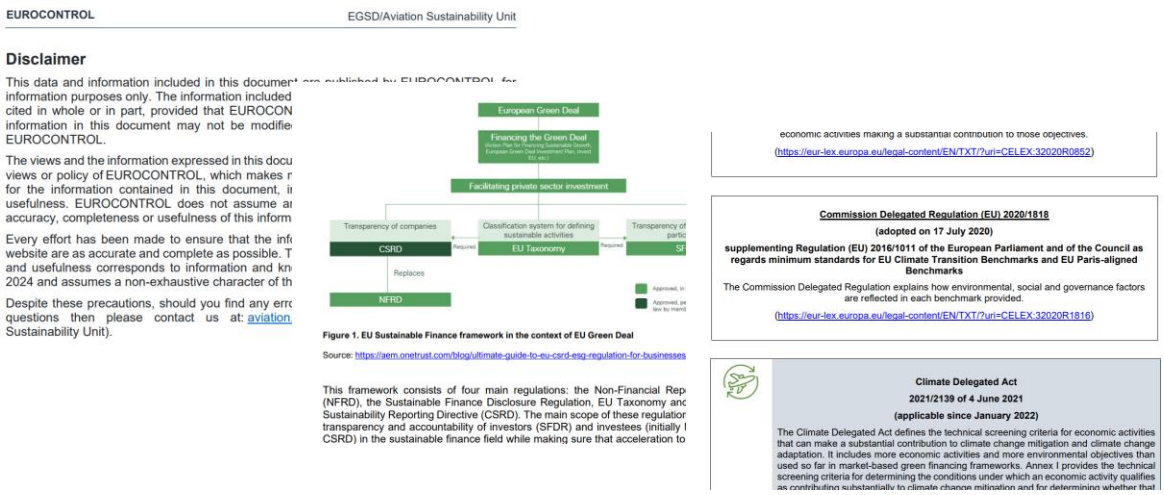
Click on Download report

Default

Bluebook

Output

The Bluebook is downloadable from the Landing page.



Data

The Bluebook summarises the EU Taxonomy and CSRD regulations using and quoting information provided by official EU regulatory websites, material produced by EFRAG, and other non-EU advisory services.

DecarbFin journey

DecarbFin step-by-step

Funds Overview	○ Check the Description of a Fund: Horizon Europe
Projects	○ Check a funded Project's website: BioSFera project
Search My Funds	○ Search for the available Funds with the criteria 'France' and 'ANSP' – Refine the search with the criteria 'Active Calls'
Calls Overview	○ Check all calls attached to a given Fund: Connecting Europe Facility
Search my financing	○ Search for Sustainable finance instruments: Sustainability-linked Loans
Find a Use Case	○ Check for past use cases/ transactions: Air France-KLM Sustainability-linked Loan
Dashboard	○ Become aware on latest sustainable finance trends & metrics
View the Basket	○ Save and export selected information
Bluebook	○ Download the Bluebook

The advantages of your journey

1. Quickly identify EU funding options that are relevant for your projects, with initial guidance to apply, with Fund Pathfinder.
2. Check success stories of past and ongoing, aviation sustainability-related, EU funded projects, as a source of inspiration.
3. With the Bluebook, better understand the EU Taxonomy and CSRD with aviation-specific insights to help you comply with these regulations.
4. Build a robust sustainability business case with the right EU fund(s), private financing instrument(s), and complement it with essential ESG frameworks and sustainability roadmaps.