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From Innovation to Certification: Embedding Sustainability in New SAF Technologies

IEA Seminar 3: Monitoring of SAF R&D, demonstration projects and production deployment

Esther Hegel

3 December 2025

Agenda

- 1** Introduction
- 2** SAF Sustainability Certification
- 3** R&D SAF Certification Guidance





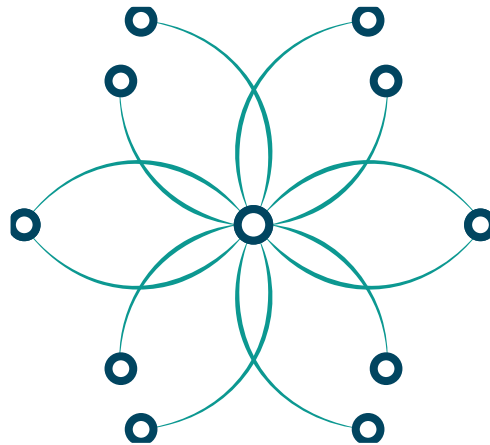
Introduction



RSB's holistic sustainability framework



RSB: Our mission



To advance the just and sustainable transition to a bio-based and circular economy in hard-to-abate sectors, in collaboration with global partners from industry, civil society, policymakers and academia.

Our activities



Certification

Comprehensive sustainability standard and certification for EU RED and CORSIA market access, and SAF book and claim



Programmes

Supporting sustainable SAF development through feedstock and GHG studies, policy advice and sustainability roadmaps



Community

Convening industry leaders to decide what sustainability looks like and create collaborations for impact



Supporting the sustainable transition

Sustainable Transition Projects (SAF)

- Brazil
- Ethiopia
- Europe
- India
- Japan
- South Africa
- Southeast Asia
- USA

Sector Sustainability Roadmaps

- APAC / PTX
- Brazil / SAF
- Ethiopia / SAF
- South Africa / SAF

Capacity-building

- RSB Academy

R&D projects

- European Union (Horizon Europe calls)

Regulatory certification (Energy-only)

- RSB ICAO CORSIA
- RSB EU RED

Voluntary markets

Book and claim

- SAF
- SMF
- Steel
- Materials

RSB Global certification

- Energy + materials

Impact claims

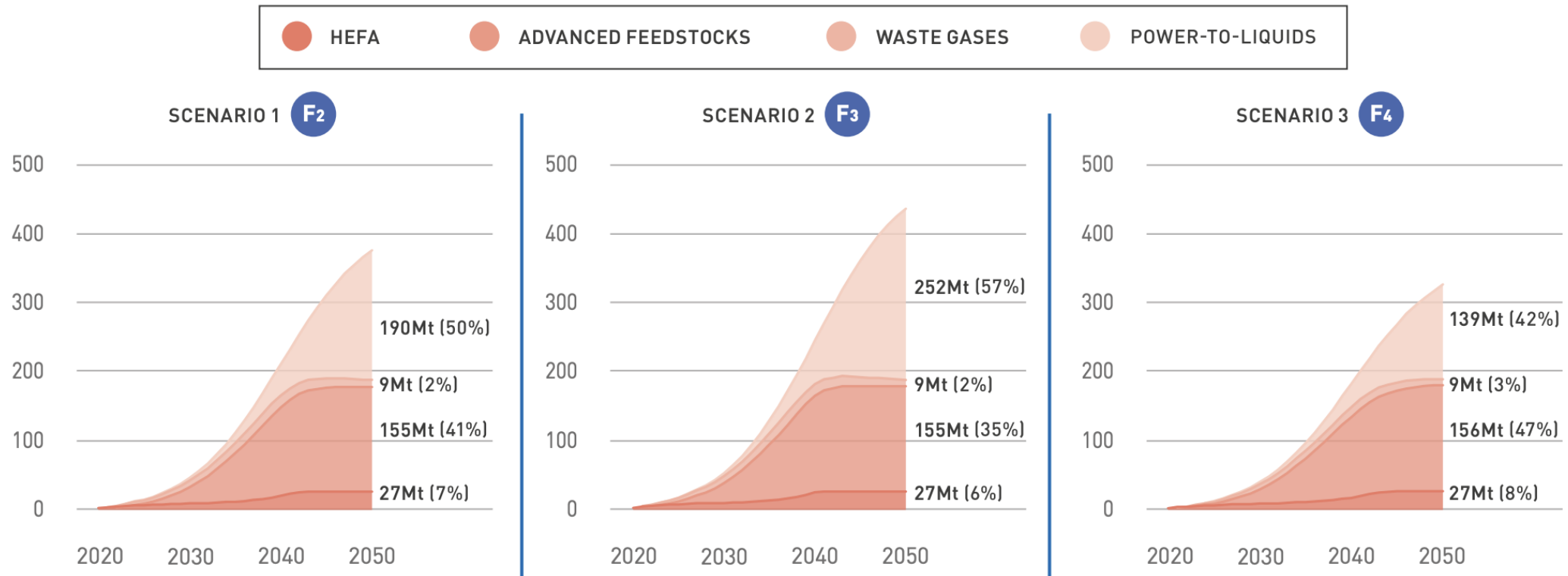
- Soil, Water



Each SAF Technology has its moment to shine!

Sources of sustainable aviation fuel, global 2020-2050

Production capacity by feedstock, Mt per year



Source: Waypoint 2050



Scaling SAF Requires Innovation

- SAF is recognised as a **cornerstone** for reducing aviation emissions and enabling carbon-neutral growth.
 - To date, **11** SAF production pathways are **ASTM-approved** to be blended and used with kerosene.
- **Scaling challenge:** Current feedstocks and technologies alone cannot meet future demand cost-effectively.



Novel pathways are critical, as they have the potential to:

- Unlock novel feedstocks
- Enable new and more efficient production routes.
- Improve cost-competitiveness and scalability.
- Diversify feedstocks to strengthen supply security.
- Enhance sustainability across the full life cycle.



Why Sustainability Certification matters



1. ASTM certification ensures technical performance, but sustainability certification is needed to **guarantee environmental and social integrity**.
2. **Certification is key for market access**, since only certified SAF can qualify under EU and global schemes, and only then deliver recognised climate benefits.
3. **Different regions apply different schemes** (e.g., EU RED / CORSIA), creating a complex and sometimes fragmented certification landscape.
4. **Sustainability must be integrated early**: Project developers and researchers should consider certification requirements already during R&D to ensure later compliance.

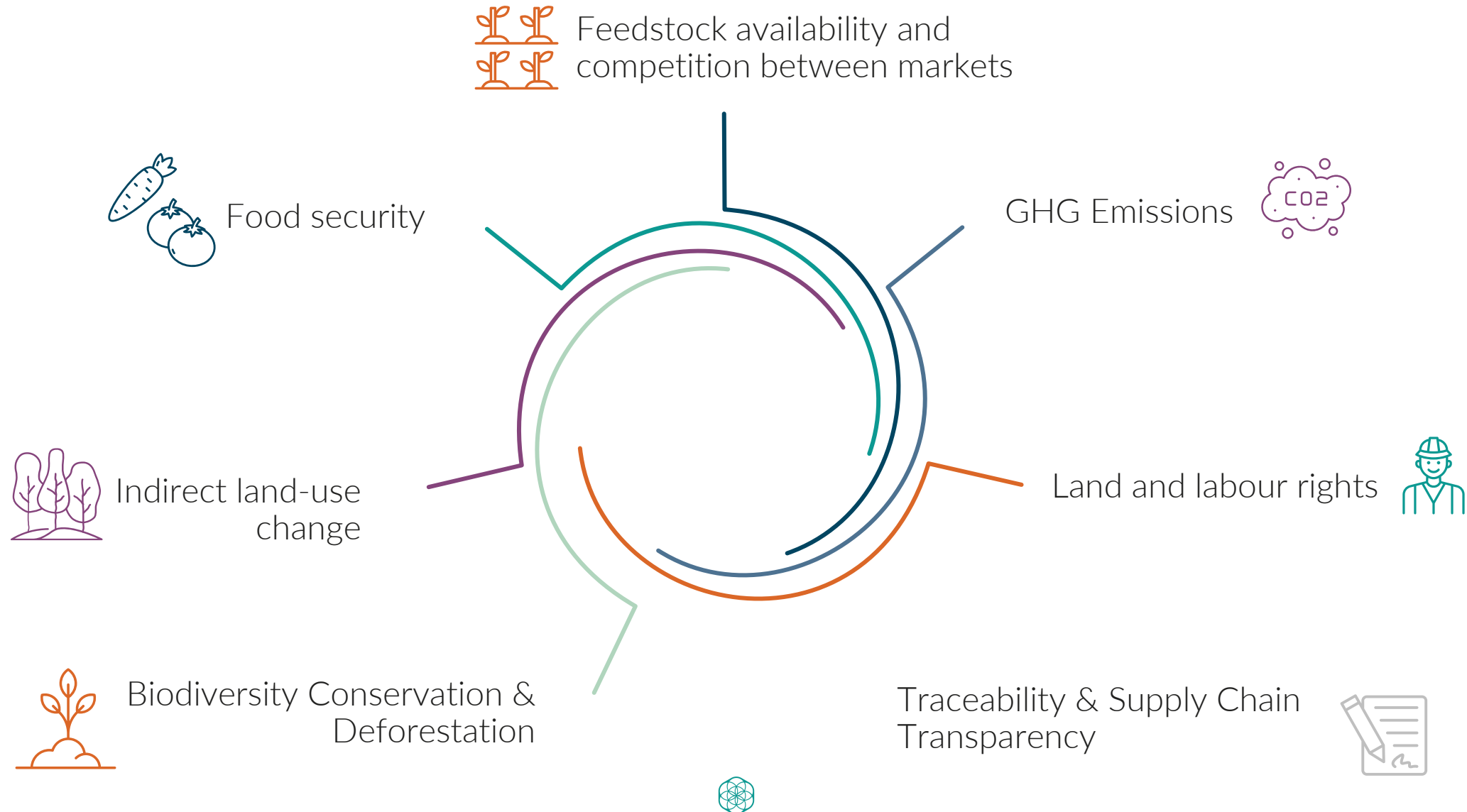




SAF Sustainability Certification



Key issues on SAF Sustainability



SAF Certification Schemes

	RSB Global Fuels & Advanced Products	RSB EU RED	RSB CORSIA
Sustainability requirements	RSB Principles and Criteria		
Type of claim	Voluntary	Regulatory; linked to EU RED targets	Regulatory; linked to ICAO CORSIA targets
Scope	Fuels and materials produced from biocircular feedstock	Renewable fuels and energy produced with bio-based feedstock and RCF/RFNBOs	SAF from bio-based feedstock and waste gases
Renewable input allocation	Across all outputs, based on energy or economic value. Flexible attribution options.	Across all outputs, based on energy value (LHV).	Across all outputs, based on energy value (LHV).
GHG reduction threshold	Fuel: 65% (after 2021) RCF/RFNBO: 70% Products: 10%	Fuel: 65% after 2021 RCF/RFNBO: 70%	10% LCA+ILUC
Fossil baseline	Fuel: 90g CO ₂ e/MJ Products: fossil comparator	Fuel: 94g CO ₂ e/MJ	Fuel: 89g CO ₂ e/MJ
Book & Claim allowed?	Yes	No	No



What is sustainability certification?

Management system	▪ Clear responsibilities of staff pertaining to all relevant RSB requirements (e.g. record keeping, GHG calculation, forwarding of sustainability documents) ▪ Yearly internal audit conducted and results kept for check by auditor ▪ Written commitment by Management to comply with relevant rules
Sustainability	▪ Meet the RSB 12 Principles and Criteria – Industrial and Agricultural sites ▪ Meet social, legal & rights-based, environmental and management practices for sustainable production in a bio-based supply chain
GHG emissions calculation	▪ Availability, completeness and correctness of GHG calculation ▪ Appropriate use of emission factors ▪ Correct indication of GHG emission value on sustainability documents (e.g., on Proof of Sustainability)
Traceability and chain of custody system	▪ Record of documentation (e.g. Proofs of Sustainability documents, delivery documents, contracts, weighbridge tickets, etc.) ▪ Fit-for-purpose traceability and mass balance system



SAF Feedstocks

Main SAF Feedstock Categories



Novel Feedstock Examples

Non-food oilseed crops:

- Camelina sativa
- Brassica carinata
- Pennycress
- Jatropha curcas
- Acrocomia aculeata

Arid-land crops
(e.g., Agave)

Perennial
lignocellulosic
energy crops
(e.g., Miscanthus)

Microalgae

...

Source: BP (April 2023), "How all sustainable aviation fuel (SAF) feedstocks and production technologies can play a role in decarbonizing aviation"



Is my feedstock pathway eligible?

EU RED / ReFuelEU

List-based, EU-policy driven



ICAO CORSIA

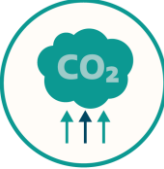
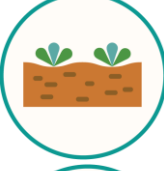
Criteria-based, global and LCA-driven

- **Positive lists in Annex IX:** Advanced SAF must use wastes and residues listed in Annex IX Part A, and certain oils/fats in Part B (e.g. UCO, tallow). Adding new feedstocks means getting them added to Annex IX via an EU process.
- **Food & feed crops excluded for SAF mandates:** Conventional crops can still be RED-compliant biofuels, but are not eligible SAF under ReFuelEU/UK SAF mandates.
- **Focus on “advanced” and e-SAF:** Strong policy push for Annex IX feedstocks plus RFNBOs (electricity + captured CO₂) and recycled carbon fuels.
- **New feedstocks:** Typically enter via studies + delegated acts that expand Annex IX (e.g. work on intermediate crops, new residues). Until listed, they don't count toward the mandate.

- **Two routes to eligibility:** (1) ICAO has set default LCA values for it (typically for crops) or (2) it appears on ICAO's positive list of wastes, residues and by-products.
- **Crops need ICAO default values:** Food and non-food crops can be used only after ICAO has calculated default LCA values.
- **Open positive list for wastes/residues:** ICAO maintains a growing list of wastes, residues and by-products (UCO, MSW, POME, non-standard coconuts, etc.), and countries can propose new materials to be added.
- **New feedstocks:** Can be added case-by-case when states/experts submit data and ICAO agrees default values or positive-list status—more flexible than Annex IX, but dependent on LCA work by ICAO



Sustainability themes 1

GHG	CORSIA SAF = 10% reduction EU RED SAF = 65% reduction	
Carbon stock	CORSIA and EU RED SAF should not be made from biomass obtained from land with high carbon stock.	
Water	Production of CORSIA SAF should maintain or enhance water quality and availability	
Soil	Production of CORSIA SAFs should maintain or enhance soil health.	
Air	Production of CORSIA SAF should minimise negative effects on air quality	
Conservation	Production of CORSIA SAF should maintain biodiversity, conservation value & ecosystem services.	



Sustainability themes 2

Waste & chemicals	Production of CORSIA SAF should promote responsible management of waste and the use of chemicals.	
Human rights	Production of CORSIA SAF should respect human and labour rights.	
Land-use rights	Production of CORSIA SAF should respect land rights and land use rights including indigenous and/or customary rights.	
Water-use rights	Production of CORSIA SAF should respect prior formal or customary water use rights.	
Local development	Production of CORSIA SAF should contribute to social and economic development.	
Food security	Production of CORSIA SAF should promote food security in food insecure regions.	





R&D SAF Certification Guidance



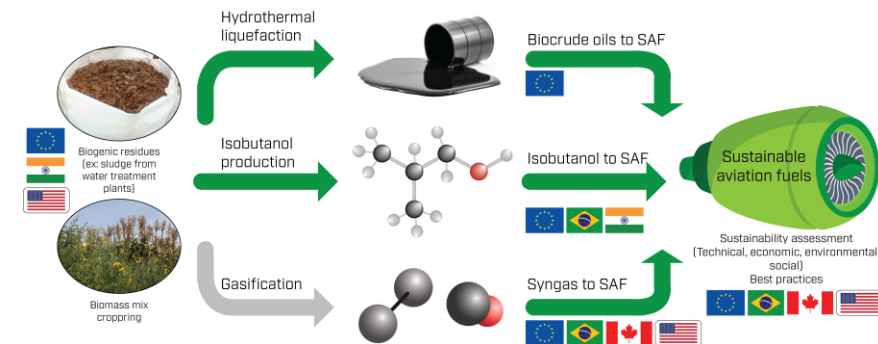
EU Project „ICARUS“

“Sustainability Certification Guidance for Novel SAF Pathways”

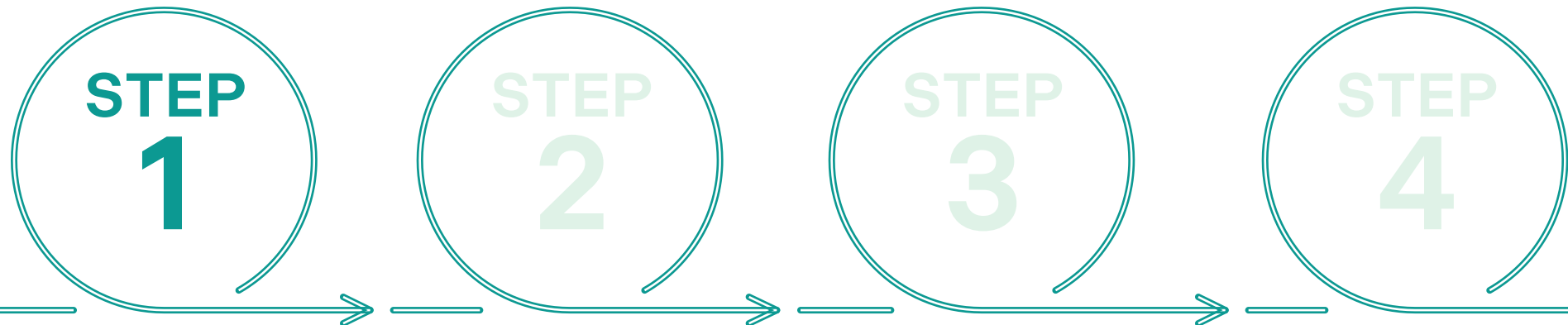


Aims to develop future best practices and concepts along the entire value chain for the three technological pathways selected in ICARUS for accelerating the scale-up of sustainable aviation biofuels production worldwide.

- **Goal:** Provide practical guidance to make sustainability certification transparent, usable, and integrated early in R&D for novel SAF pathways.
- **Audience:** Researchers, technology developers, and project partners working on new feedstocks and production routes.
- **Scope:** Explains certification basics, compares major schemes (CORSIA, EU RED, voluntary), and offers step-by-step guidance on criteria, LCA, chain-of-custody, and scheme-specific rules.
- **Watch recent webinar:** [Webinar: Sustainability Certification of Novel SAF Pathways RECORDING AND PRESENTATIONS AVAILABLE - ICARUS BIOJET](#)



R&D SAF Certification Guidance



Before Project Start
Feasibility Stage

Goal: Set up the project so it can *eventually* be certified.

- ✓ Check **feedstock eligibility** (RSB, EU RED, CORSIA).
- ✓ Confirm **ASTM pathway suitability / approvability** (is there an approved pathway? what is missing?).
- ✓ Conduct **screening LCA** and map potential GHG reduction.
- ✓ Choose target certification scheme + region (EU RED vs RSB vs CORSIA vs Others).
- ✓ Include sustainability architecture in **funding proposals**.

Outcome:

- “*Certification-ready design*” (the project is pointed toward a certifiable future).
- “*ASTM-approvable concept*” (the pathway is theoretically compatible with ASTM requirements).



R&D SAF Certification Guidance



Goal: Build the internal capability to achieve certification later.

- ✓ Consortium-wide sustainability training (e.g., RSB Academy).
- ✓ Align R&D teams on feedstock constraints, LCA rules, traceability basics.
- ✓ Identify data gaps early (land use, feedstock origin, energy inputs).

Outcome:

- “Teams understand how R&D decisions affect certifiability.



R&D SAF Certification Guidance



Goal: Generate the data needed for future certification and ASTM testing.

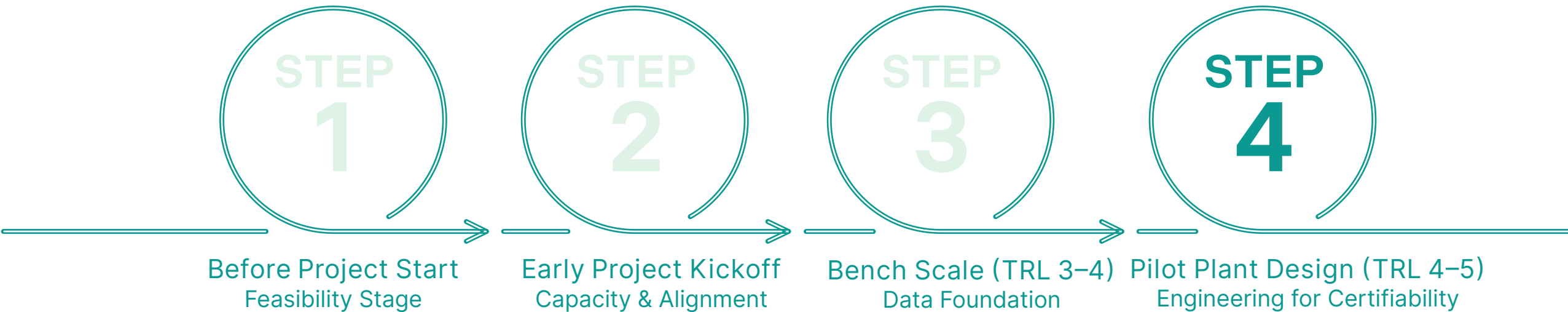
- ✓ Capture process yields, carbon flows, reagent inputs, waste streams.
- ✓ Draft a preliminary LCA aligned with RSB/CORSIA/EU RED.
- ✓ Begin documenting data in formats needed for future audits.

Outcome:

- *"Emerging certifiability"*
- Demonstrates pathway is advancing toward *ASTM-approved fuel data*.



R&D SAF Certification Guidance



Goal: Build compliance and traceability into the physical design.

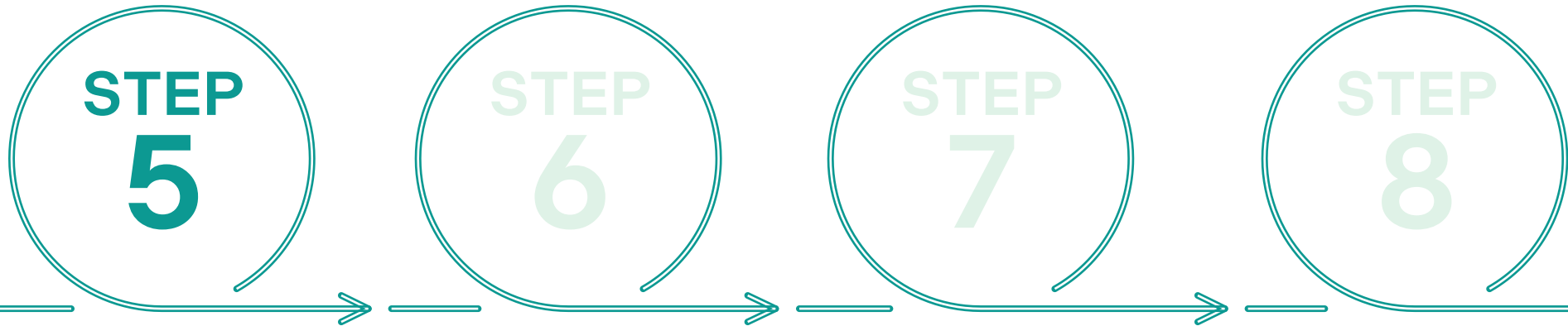
- ✓ Integrate chain-of-custody and mass-balance systems into P&IDs.
- ✓ Establish Quality Management System (ISO 9001 readiness).
- ✓ Engage sustainability schemes (e.g., RSB, ISCC) pre-design-freeze.
- ✓ Confirm the exact ASTM test methods required at pilot scale.

Outcome:

- Plant design supports traceability and GHG accounting.
- Clear roadmap to *ASTM-approved test material*.



R&D SAF Certification Guidance



Demonstration Scale (TRL 6)
Validation & Pre-Certification Review

Goal: Demonstrate the process, validate sustainability data, and prepare for certification.

- ✓ Produce first significant volumes for analysis (but not yet certifiable SAF).
- ✓ Perform full LCA aligned with the selected scheme.
- ✓ Complete QMS (ISO 9001) implementation.
- ✓ Conduct certification body pre-assessment / gap analysis.
- ✓ Verify ASTM testing plan (LCA, fuel properties, blending behaviour).

Outcome:

- “*Certifiable process*” (systems, documentation, and governance in place).
- “*ASTM-approvable fuel samples*” for LCT testing and pathway assessment.
- Pilot-level production creates market signalling: “*This pathway is real, scalable, and certification-aligned.*”

R&D SAF Certification Guidance



Goal: Produce the first SAF volumes under controlled and traceable conditions.

- ✓ Operate with full mass balance & sustainability documentation.
- ✓ Demonstrate stable yields and consistent carbon accounting.
- ✓ Collect the data package required for certification.
- ✓ Confirm supply-chain sustainability (feedstock → plant → fuel).

Outcome:

- Plant becomes “certification-ready” but not yet certified.
- ASTM qualification and sustainability audits can be scheduled.

R&D SAF Certification Guidance



Goal: Obtain formal sustainability certification once SAF is produced under auditable conditions.

- ✓ Produce traceable SAF volumes with complete mass balance and chain-of-custody.
- ✓ Finalize LCA with validated operational data.
- ✓ Provide verified feedstock documentation and sustainability evidence.
- ✓ Undergo desk-based and on-site audits by the certification body.
- ✓ Demonstrate that the fuel meets ASTM specifications and pathway approval (if applicable).

Outcome:

- SAF is *fully certified*—eligible for mandates, credits, book-and-claim, and commercial offtake.
- Certification is formally issued and communicated to airlines, fuel suppliers, and regulators.

R&D SAF Certification Guidance



Goal: Keep the certification valid through continuous compliance.

- ✓ Undergo annual audits (frequency = risk classification).
- ✓ Maintain mass balance & CoC documentation.
- ✓ Update GHG calculations and sustainability records.
- ✓ Review changes in suppliers, feedstocks, and processes.
- ✓ Renew certificate and update public information.

Outcome:

- Continuous certification → uninterrupted access to markets and incentives.



ICARUS Guidance Development Timeline

1. WEBINAR

September 2025

Main topics: Introduction to SAF certification, presentation of goal & scope of the ICARUS guidance, stakeholder feedback

2. WEBINAR

July 2026

Presentation & feedback of the final guidance document



Thank you for your attention!



Stay in contact:

Esther Hegel – esther.hegel@rsb.org

Technical Lead: Industrial Decarbonisation

