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# Towards a Sustainable Aviation Sector, A Perspective on Key R&D Areas

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Concawe
Environmental Science for European Refining

# Context: Importance of Sustainable Aviation to Ireland

- Ireland commands 60% of the global aviation leasing market.
  - 50 aircraft leasing companies and 14 of the world's top 15 lessors are based in Ireland [KPMG].
  - 140,000 jobs supported by the sector [Gov.ie].

- Ryanair is the second largest air operator certificate holder in the EU.
  - 444 aircraft registered in Ireland (2018).
  - Ryanair produced 9.9 mt $CO_2$ eq, making it an EU top-ten $CO_2$ producer (2018).

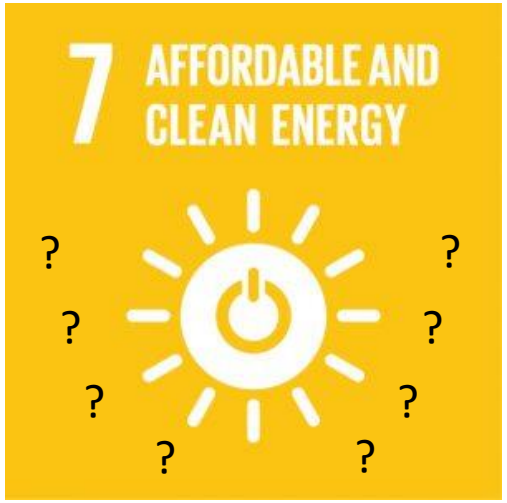
  - 2021: Ryanair announce €1.5m Sustainable Aviation Research Partnership with Trinity College Dublin.



https://www.tcd.ie/news_events/articles/trinity-and-ryanair-launch-sustainable-aviation-research-centre/

# Fundamentals: Sustainability

- *"The quality of being able to continue over a period of time"*.
- For Sustainable Aviation:
  - **Sustainability of Environment**
    - Reduction in aviation noise.
    - Reduction in $CO_2$ footprint.
    - Reduction in other pollutants.
  - **Sustainability of Profits & Investments**
    - In 2018, fuel costs (~21%) compete with labour costs (~22%) as the major operating costs for global airlines [IATA].
  - **Sustainability of Passenger Demand**
    - How secure is consumer confidence in actual sustainability of aviation?
    - Will consumers pay for Sustainable Aviation?
      - Where should the cost be placed?



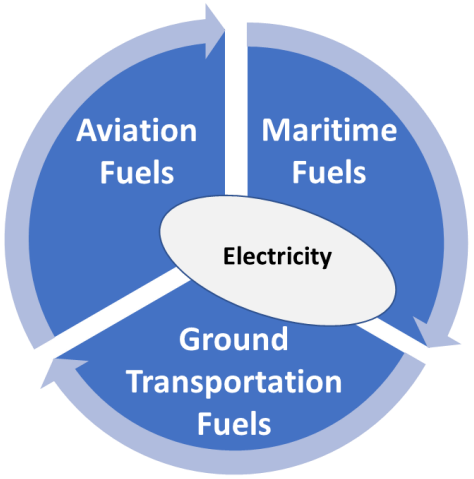


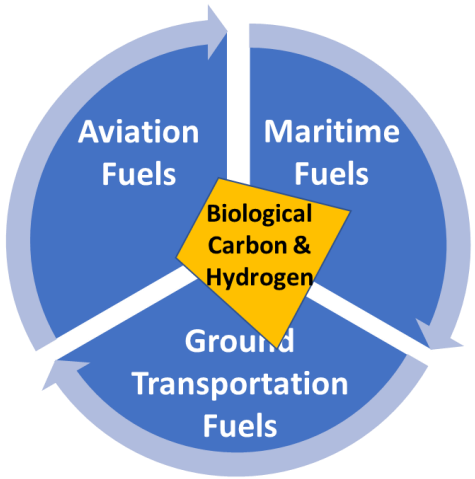
***Sustainable Aviation Fuel***
(SAF)

# Fundamentals: Liquid Transportation Fuels

**General Premises for 2030-2050**

- Liquid Transportation Fuels will remain very important for affordable transportation.
  - And essential for Sustainable Aviation.
- Crude-oil derived fuels will be increasingly displaced by biologically derived fuels and electricity.
  - Or possibly by electricity-derived fuels.

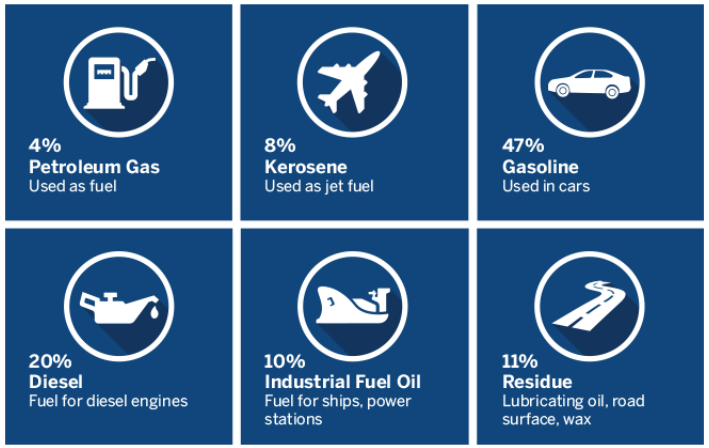



**Key Concepts**

- Existing Liquid Transportation Fuels are not distinct.
  - Ground Transportation/Aviation/Maritime Fuels are intrinsically coupled in a continuum of utility.
  - Fuel quality is matched to performance requirements.
  - For affordable deployment, existing energy infrastructure must be utilized.

Refined Crude Oil Products




https://www.cmegroup.com/education/whitepapers/discover-the-relationship-between-crude-oil-and-its-refined-products.html#

# Key Research & Development Areas for Sustainable Aviation

- Sustainable Aviation Fuel (SAF) is essential for Sustainable Aviation due to performance requirements.

1. Techno Economic Gap to Fossil Jet-A Must be Known & Reduced.
    - Need more and better Techno Economic Analysis early in SAF research, development and deployment cycle.

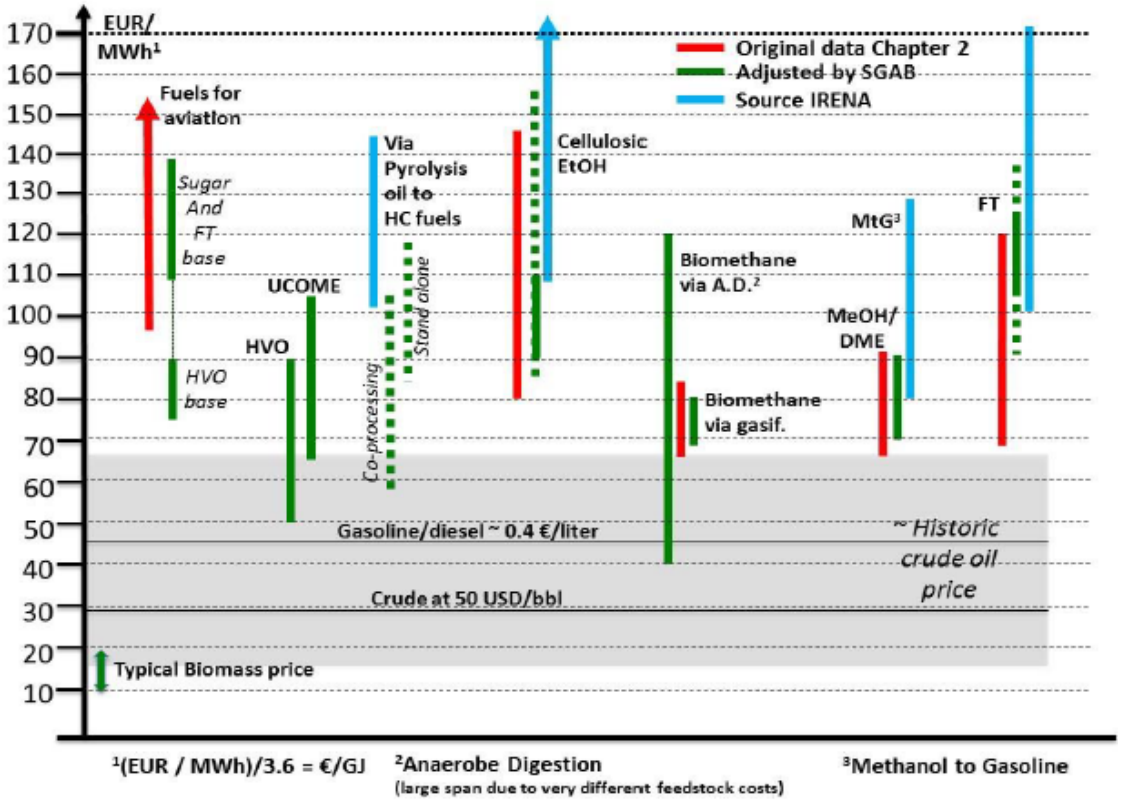



Figure 17 Summary of production cost data

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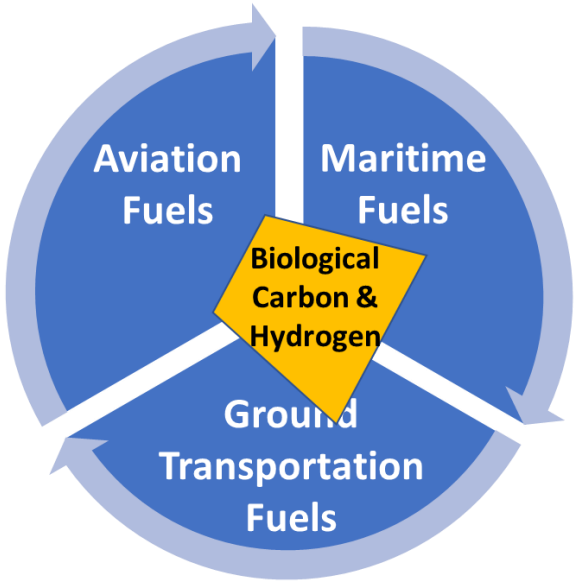
2. A "Fuels Continuum Holistic Approach" in R&D policy.
    - Match quality of biological feedstock to fuel quality requirements.
        - High grade feedstocks (oils) for high grades fuels (SAF).
        - Lower grade feedstocks for lower fuel quality requirements.



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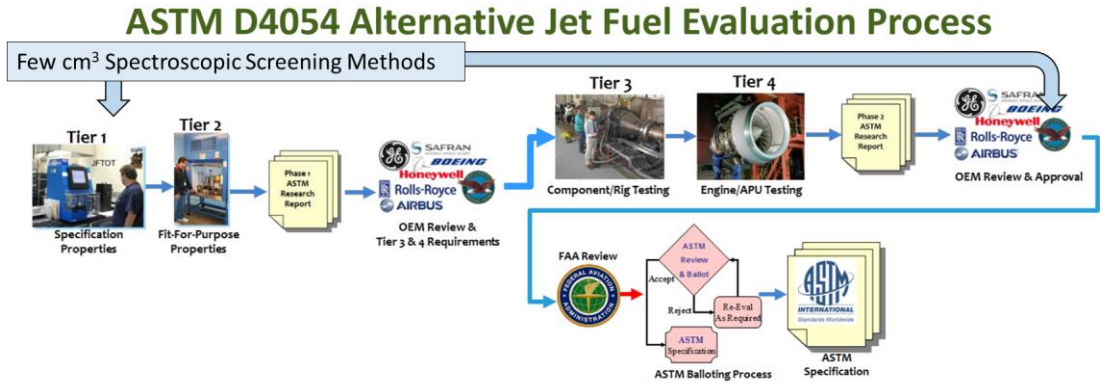
3. Measures to Increase SAF Supply and Competitiveness.
    - SAF is technically feasible, but not market feasible.
    - Improved certification methods requiring small volumes are needed.
        - SAF is certified to 50% usage with fossil Jet.
        - Safe usage of 100% SAF is believed to be likely but not proven.



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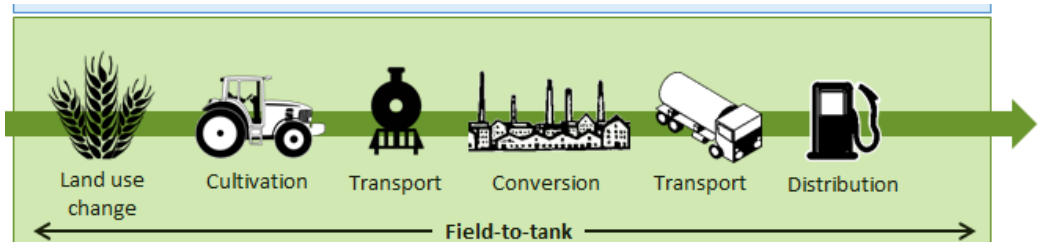
4. Elevate EU Competence and Knowledge-brokering on SAF.
    - Improved **rigor/specificity** of field-to-wake embodied GHG(eq) of SAF.
    - Concept of an **"EU SAF Clearing House"** can focus EU efforts.
        - Optimization of supply chains for lowest GHG(eq) possible.
        - Much more rapid revisions of fuel standards?



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5. Social Sciences Education and Persuasion of Public
- Reality of Sustainable Aviation & SAF are not widely known.
- Honestly & completely inform and educate the public on technological realities?
- e.g. SAF Fuel Share
    - International Energy Agency 0.1% of 2018.
    - European Aviation Safety Agency 0.004 % of 2017.
    - European Commission at 0.05% of 2017 for EU.

# Thank You for Your Attention

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