TARGETED USE OF SAF AT AIRPORTS - A COST-BENEFIT PERSPECTIVE

5th ECATS Conference 27-29 Jan 2026, Brussels

Leon Mueller (*presenting*), Shravana Kumar, Wolfgang Grimme, Sven Maertens, Roland Eichinger, Benedict Enderle, Christian Weder, Katrin Dahlmann, Volker Grewe
German Aerospace Center (DLR)
Institute of Air Transport, Institute of Atmospheric Physics, Institute of Combustion Technology

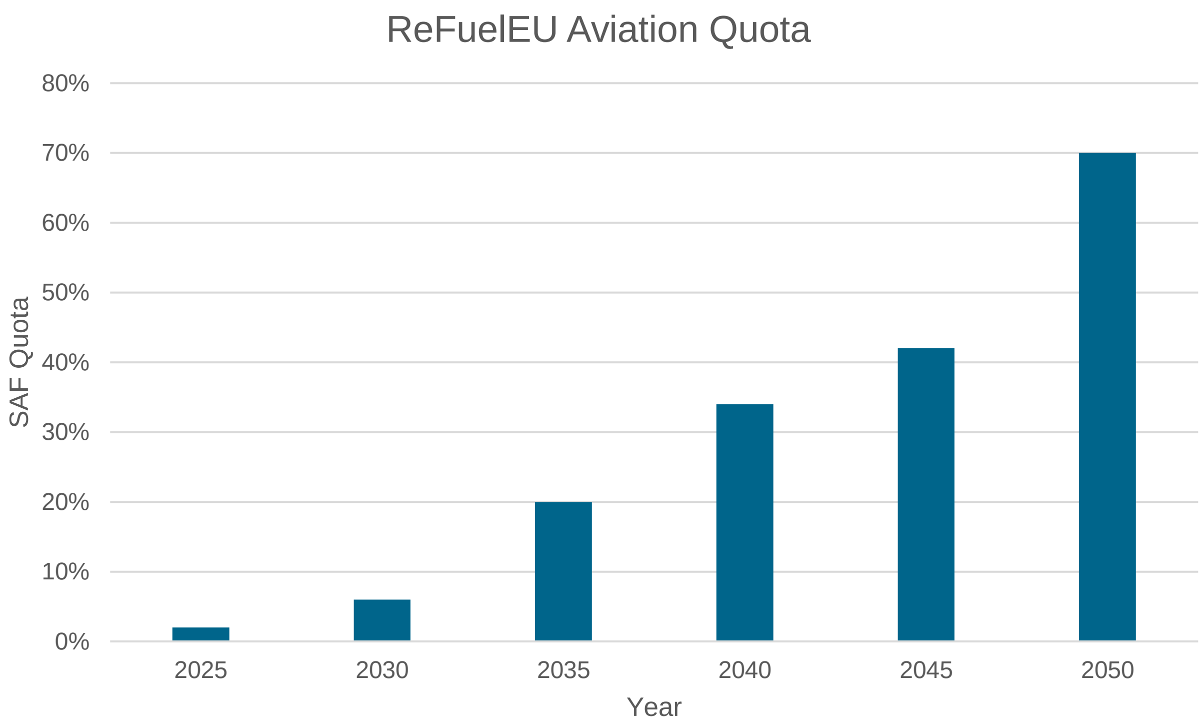
DLR

EU Project ALIGHT

- Holistic approach to decarbonize airport operations and flight activities
- Two key areas
  - Sustainable Aviation Fuels (SAF)
  - Smart Energy Systems
- 17 European partners, four airports
- Copenhagen Airport (CPH) as ALIGHT lighthouse

Introduction

- SAF is a key technology to reduce aviation‘s climate impact
- Required SAF Quota in the EU from 2025 (ReFuelEU Aviation)
- Current legislation is designed for uniform allocation of SAF across all flights
- However, climate benefits of SAF can differ between flights



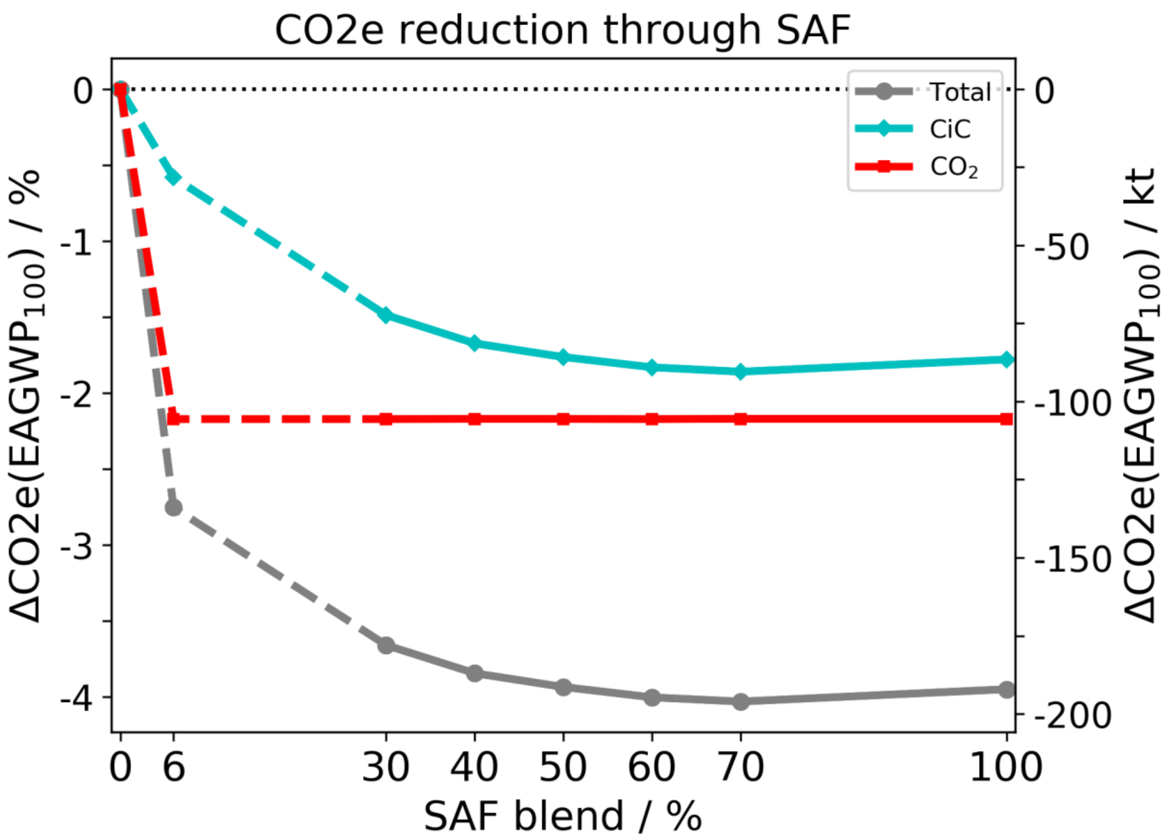
Does flight-specific allocation of SAF improve the cost-effectiveness of aviation climate mitigation?

Targeted allocation of SAF

- Increasing SAF blends are expected to significantly reduce the climate impact of aviation (Märkl et al., 2024)
- In the early phase of ReFuelEU Aviation, SAF availability is expected to be limited
- Targeted allocation of limited SAF can substantially enhance overall climate impact reductions (Quante et al. 2024; Quante et al. 2025; Teoh et al., 2022; Woeldgen et al., 2025)
- However, fuel segregation requires additional infrastructure investments (CAPEX) and increases operational costs (OPEX) and complexity (Woeldgen et al., 2025; Quante et al., 2024)

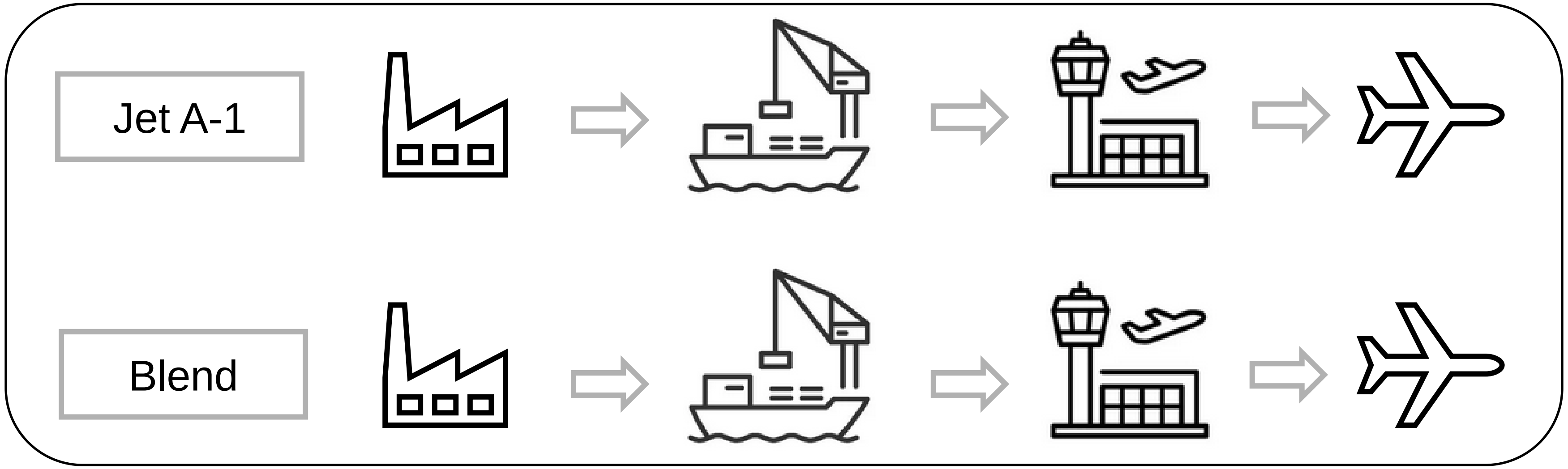
Study design – Traffic and emission inventories

- Scenario with a 6% SAF share at CPH, consistent with the 2030 ReFuelEU blending mandate
- Allocation of SAF to Dedicated Flights with the highest ratio of contrail-induced cloudiness (CIC) to fuel consumption (max. 50% blend)
- The analysis uses the 2019 CPH flight schedule as a baseline, excluding traffic growth to isolate SAF allocation effects



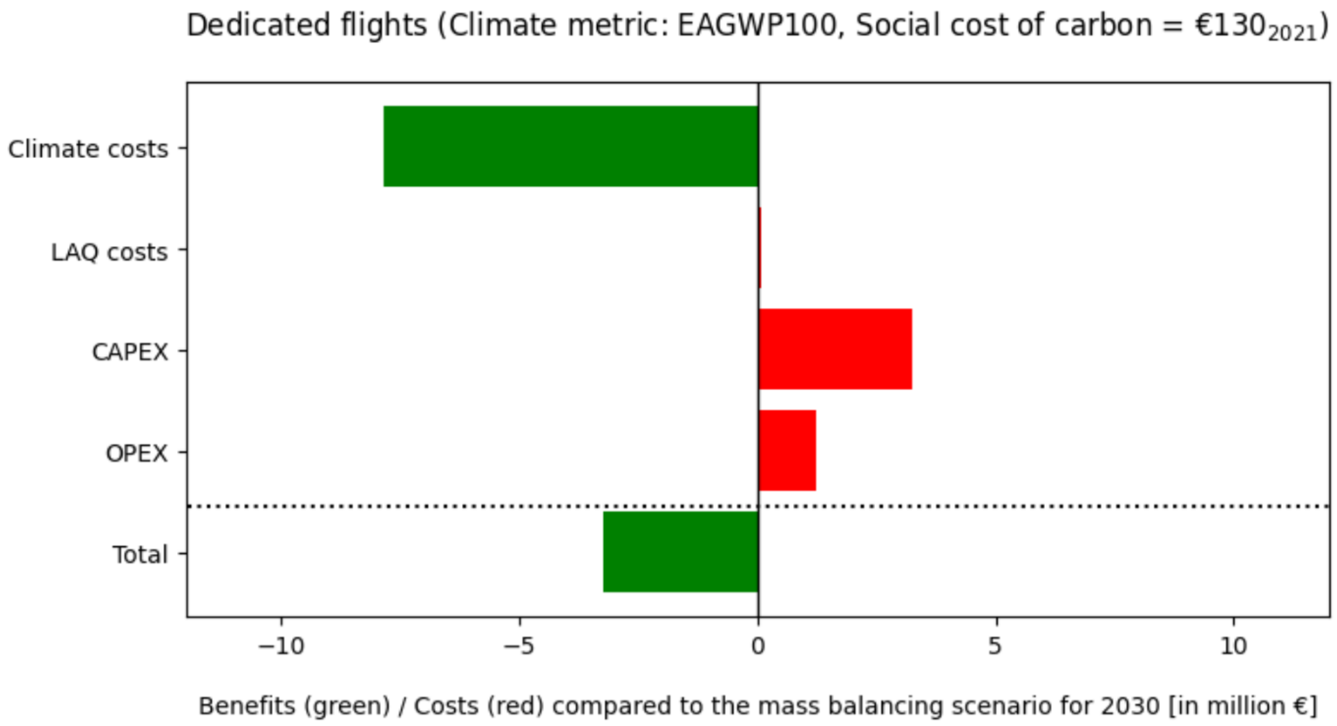
Study design – Economic parameters

- Targeted use of SAF is expected to influence climate and pollution social costs
- CAPEX and OPEX include additional costs for fuel distribution to CPH, airport infrastructure, and operations, based on stakeholder consultations

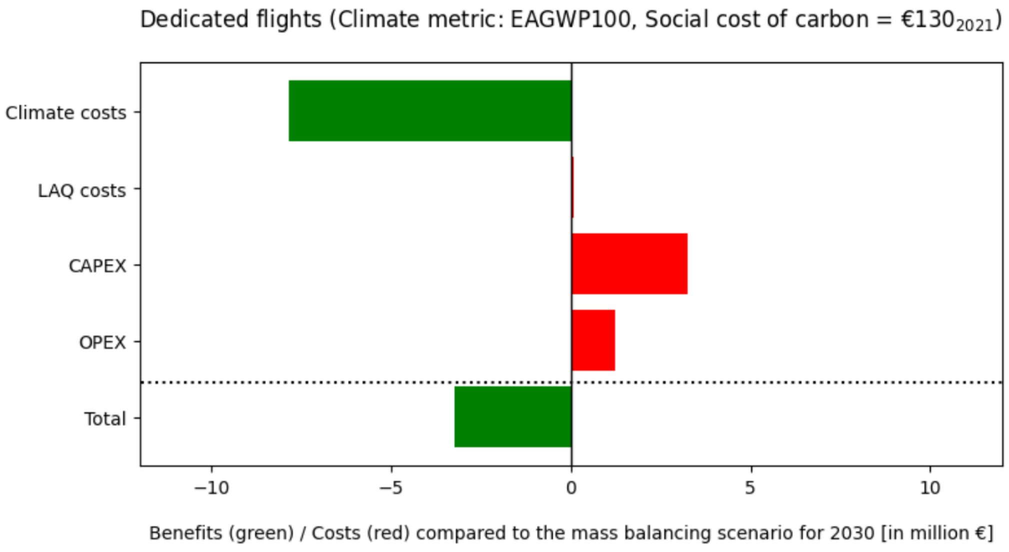


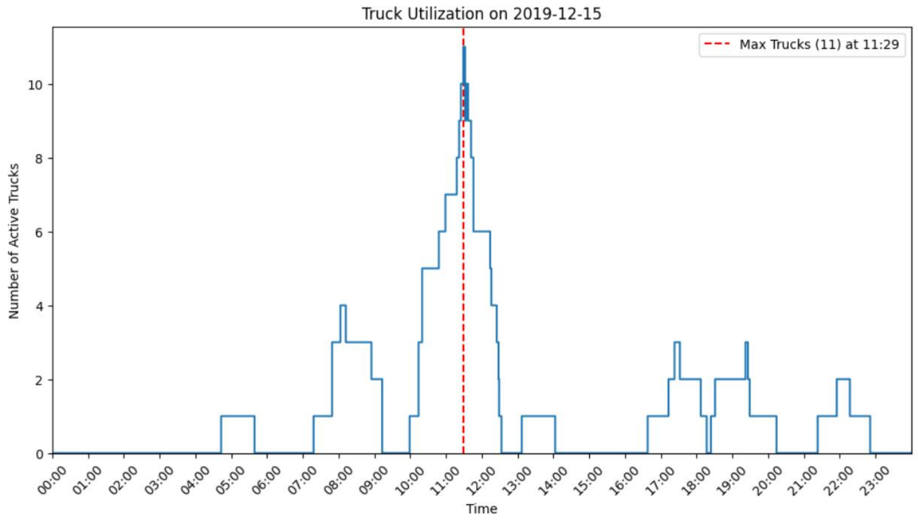
Results – Economic impacts

- Climate impact can be reduced by ~60 kt CO_2e (~€7.8 million)
- Additional costs are estimated at €4.3 million (depreciated CAPEX) and €1.2 million (OPEX)
- Net economic benefit of ~€2.2 million

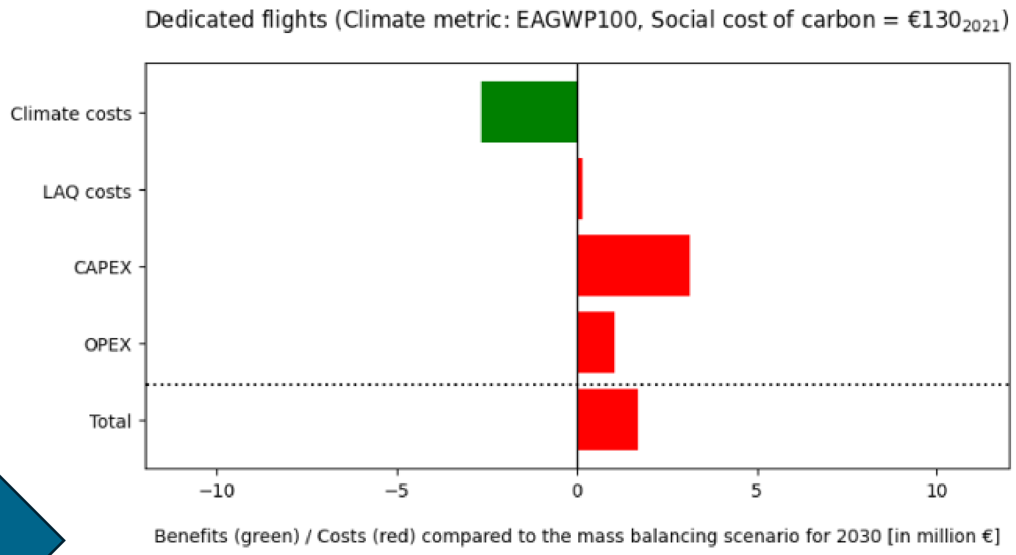


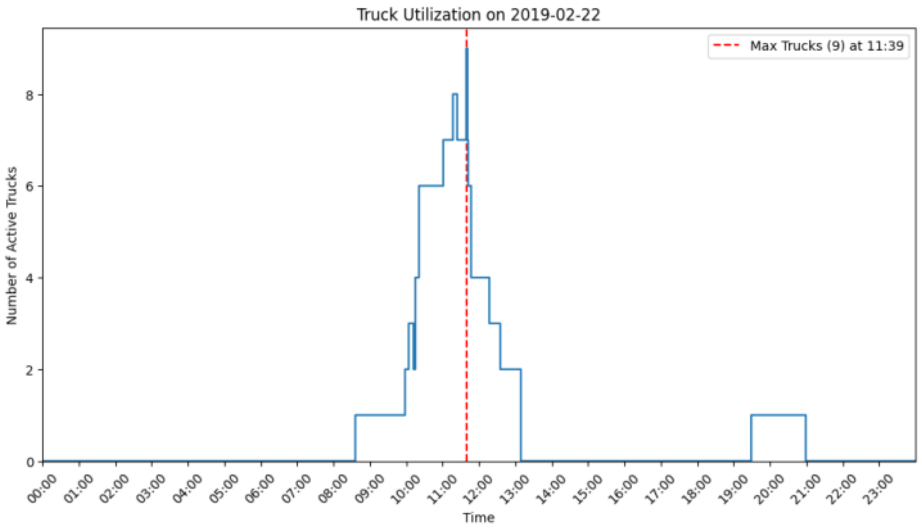
Results – Operational Impacts





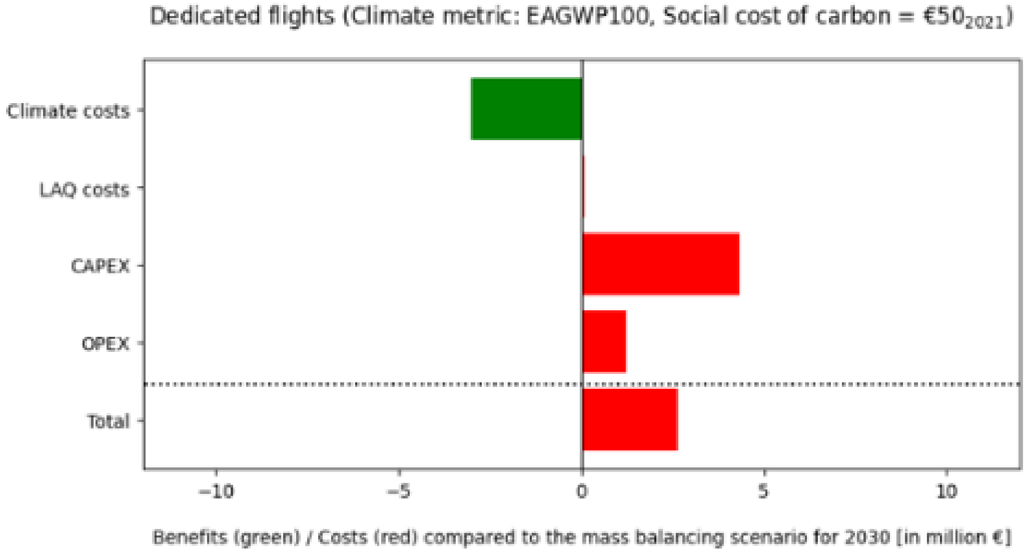
6’690 flights



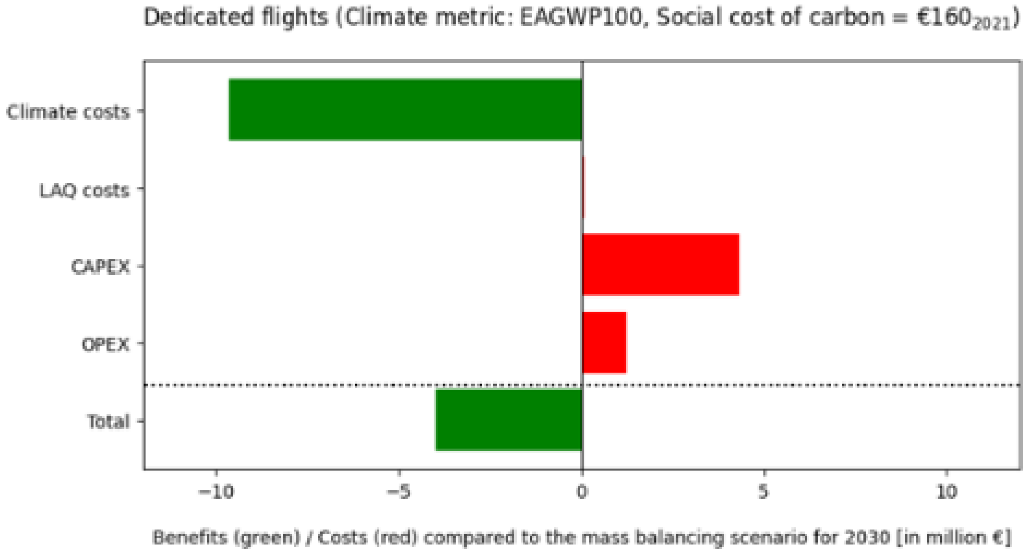


2’042 flights

Sensitivity Analysis – Social costs of carbon

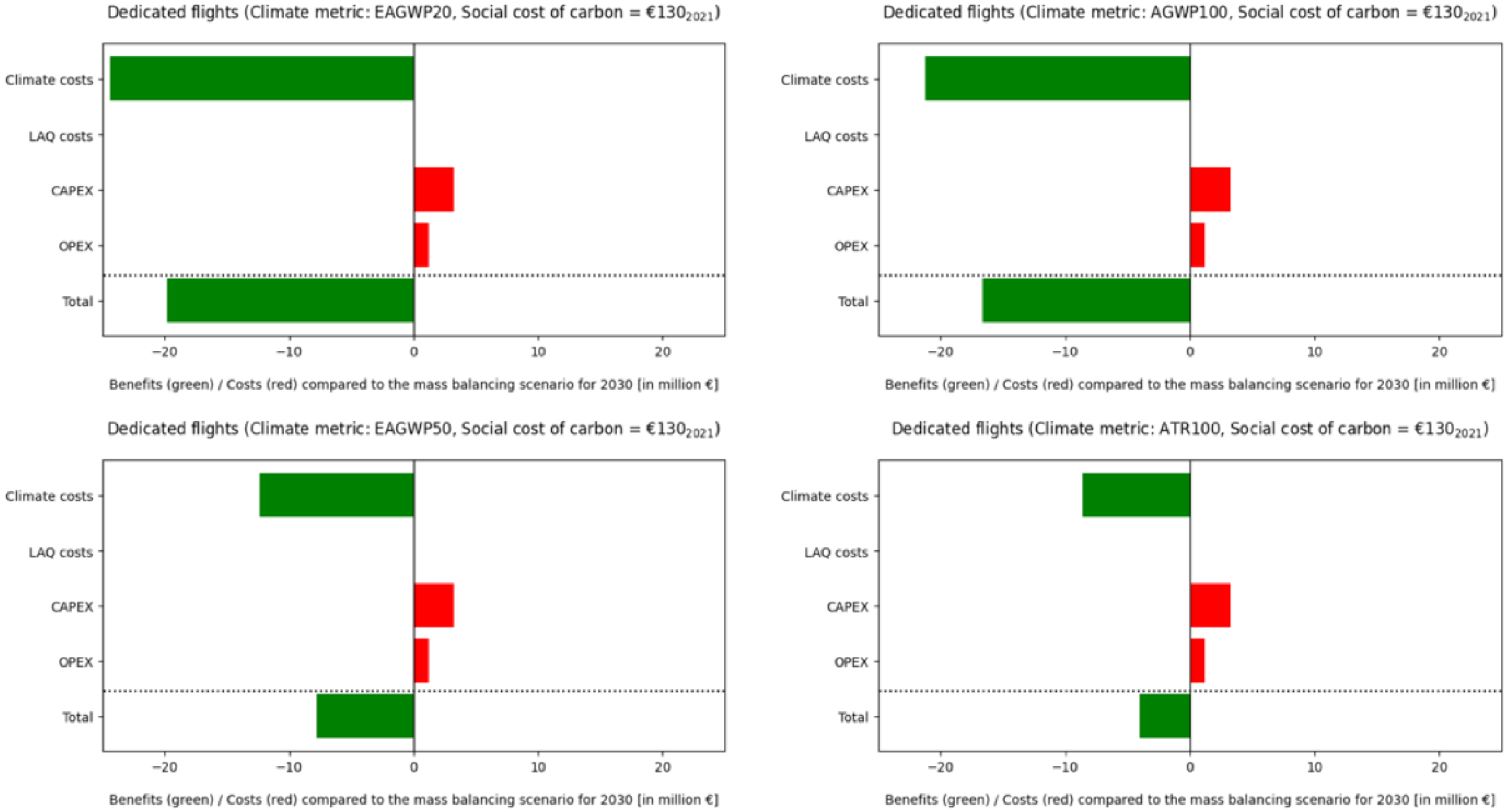


- Adjusting the social cost of carbon (SCC) directly affects climate-related costs
- Applying lower SCC reduces climate benefits to ~€3 million, making the investment economically not viable
- Higher SCC, in contrast, increase climate benefits by ~€1.8 million.



Leon Müller, Institute of Air Transport, German Aerospace Center (DLR), 28/01/2026

Sensitivity Analysis – Climate metrics and time horizons



Economic and policy implications

- From an economic perspective, allocating SAF to Dedicated Flights can be beneficial across several scenarios with varying assumptions on climate metrics, social cost of carbon and CAPEX/OPEX
- Individual stakeholders lack incentives to invest due to high CAPEX/OPEX and low utilization (airports) or higher fuel costs (airlines)
- Compensation and incentive mechanisms are needed to encourage stakeholder participation
- Environmental and economic benefits may decline if SAF availability increases