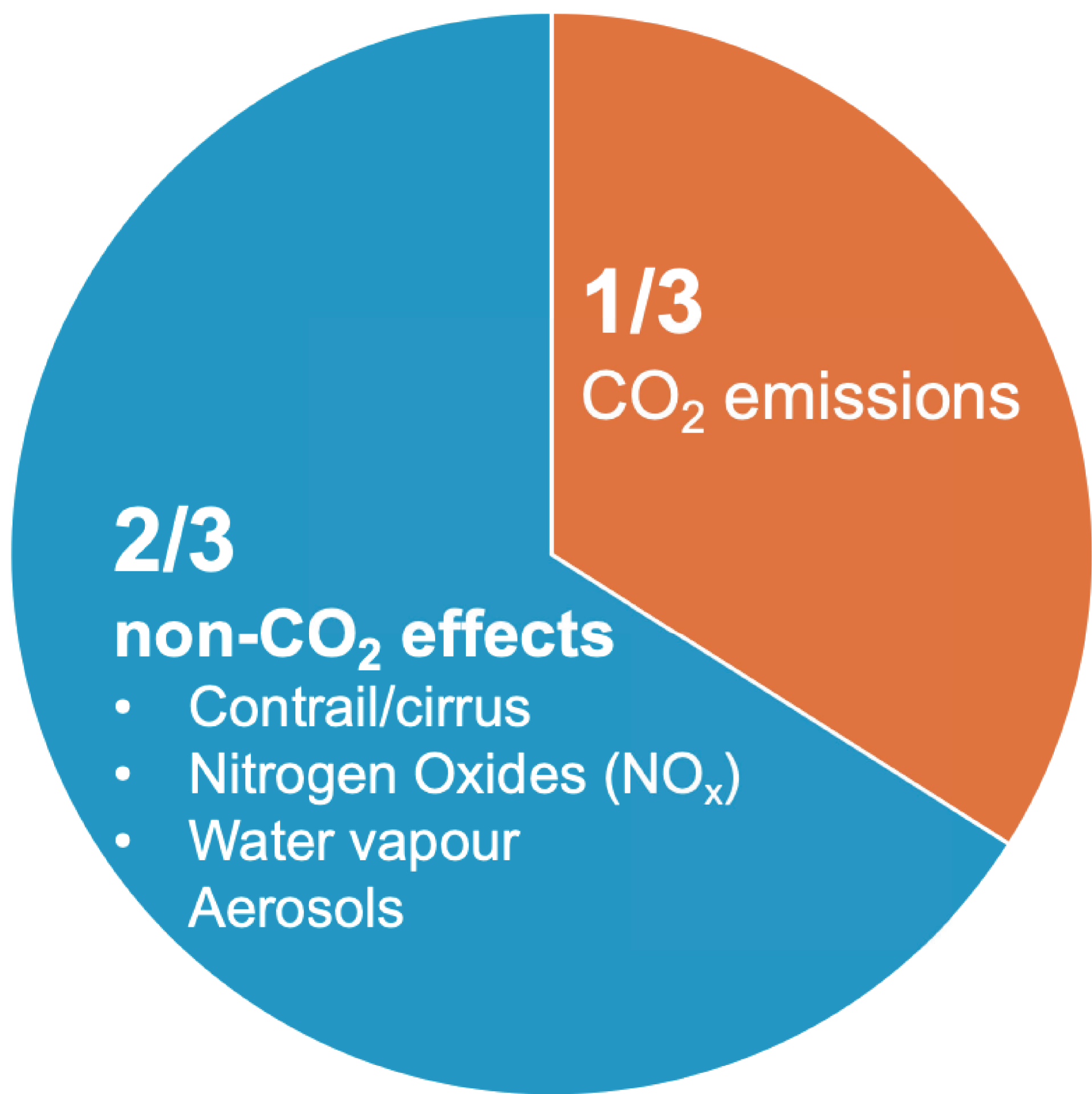


Climate optimized engine design by addressing non-CO₂ effects



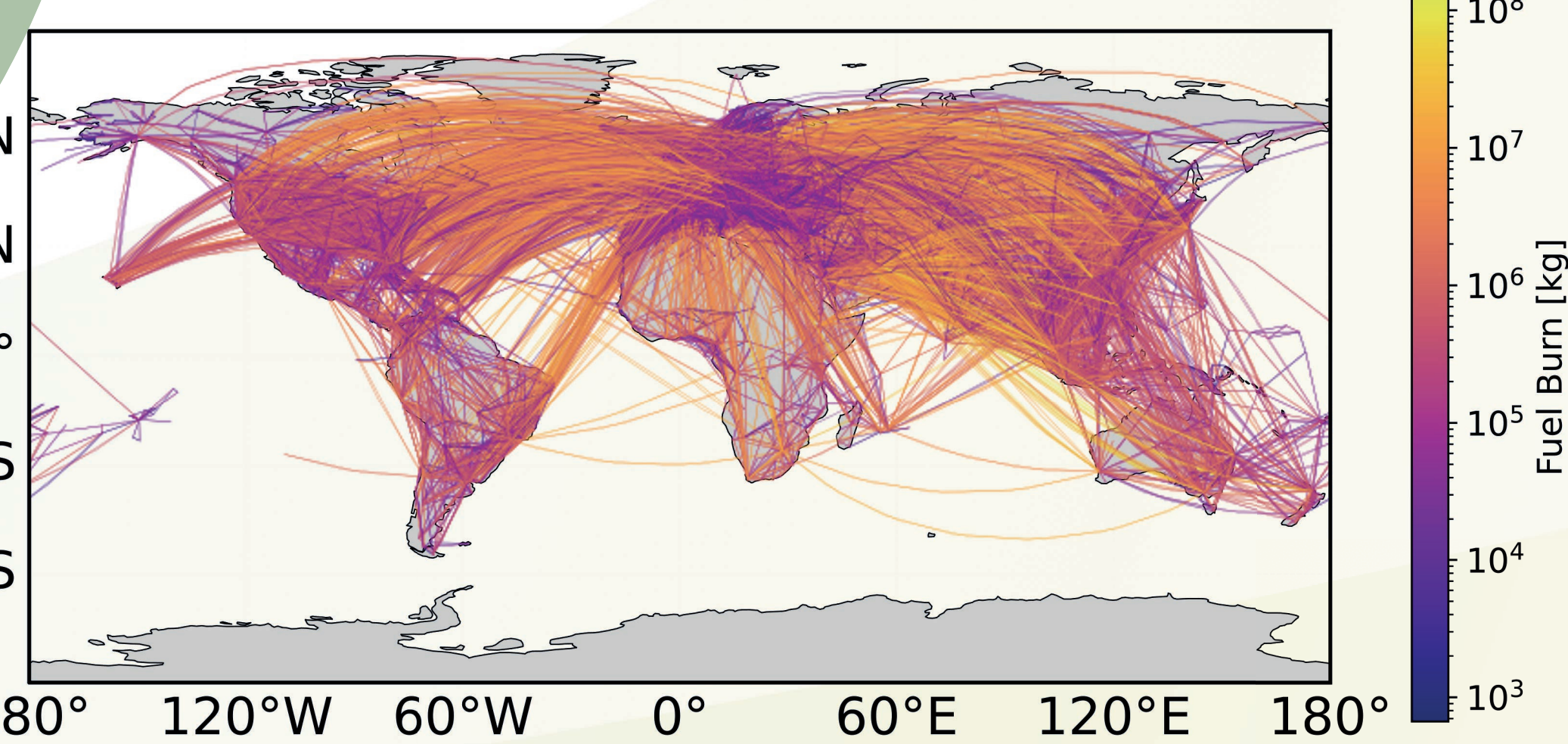
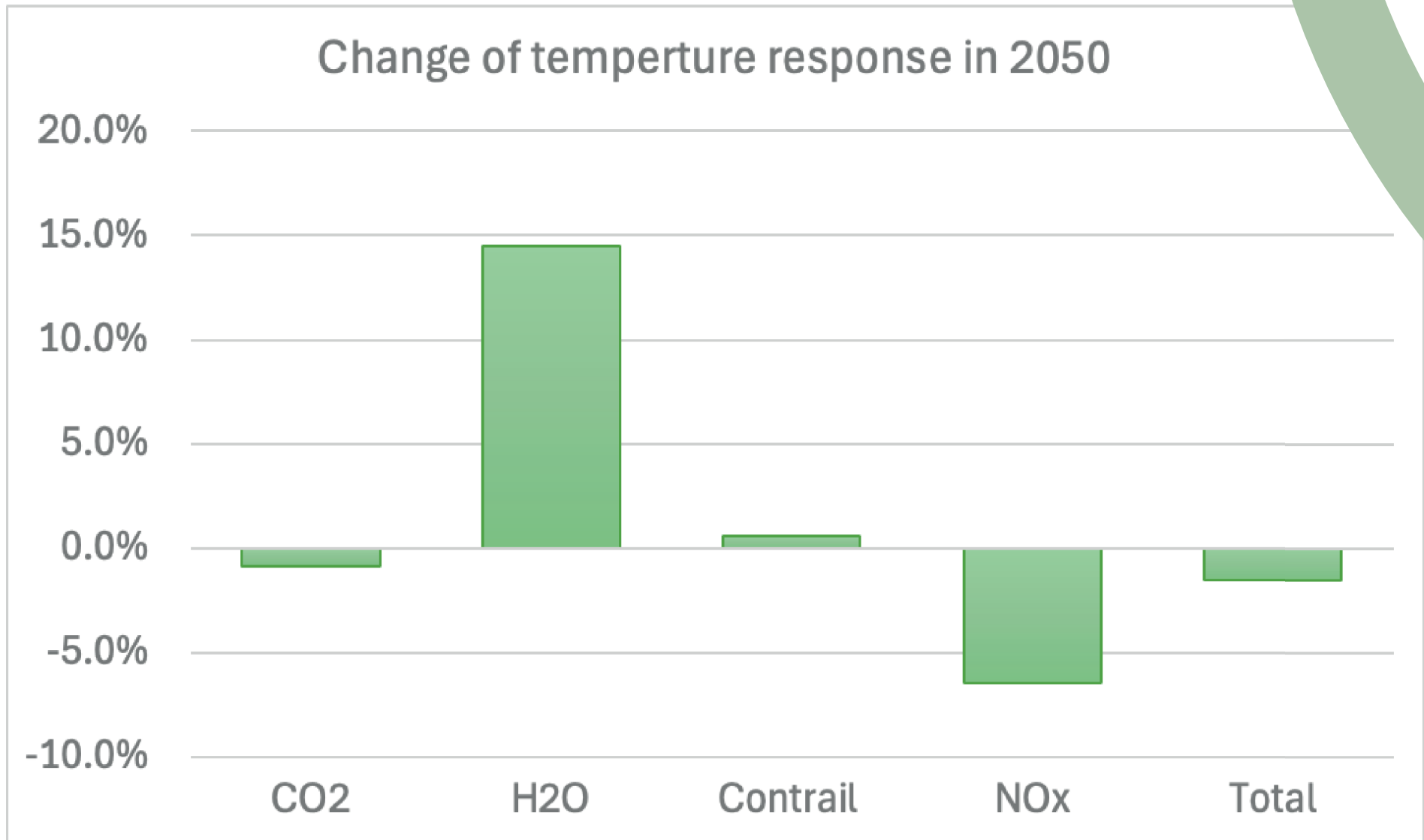
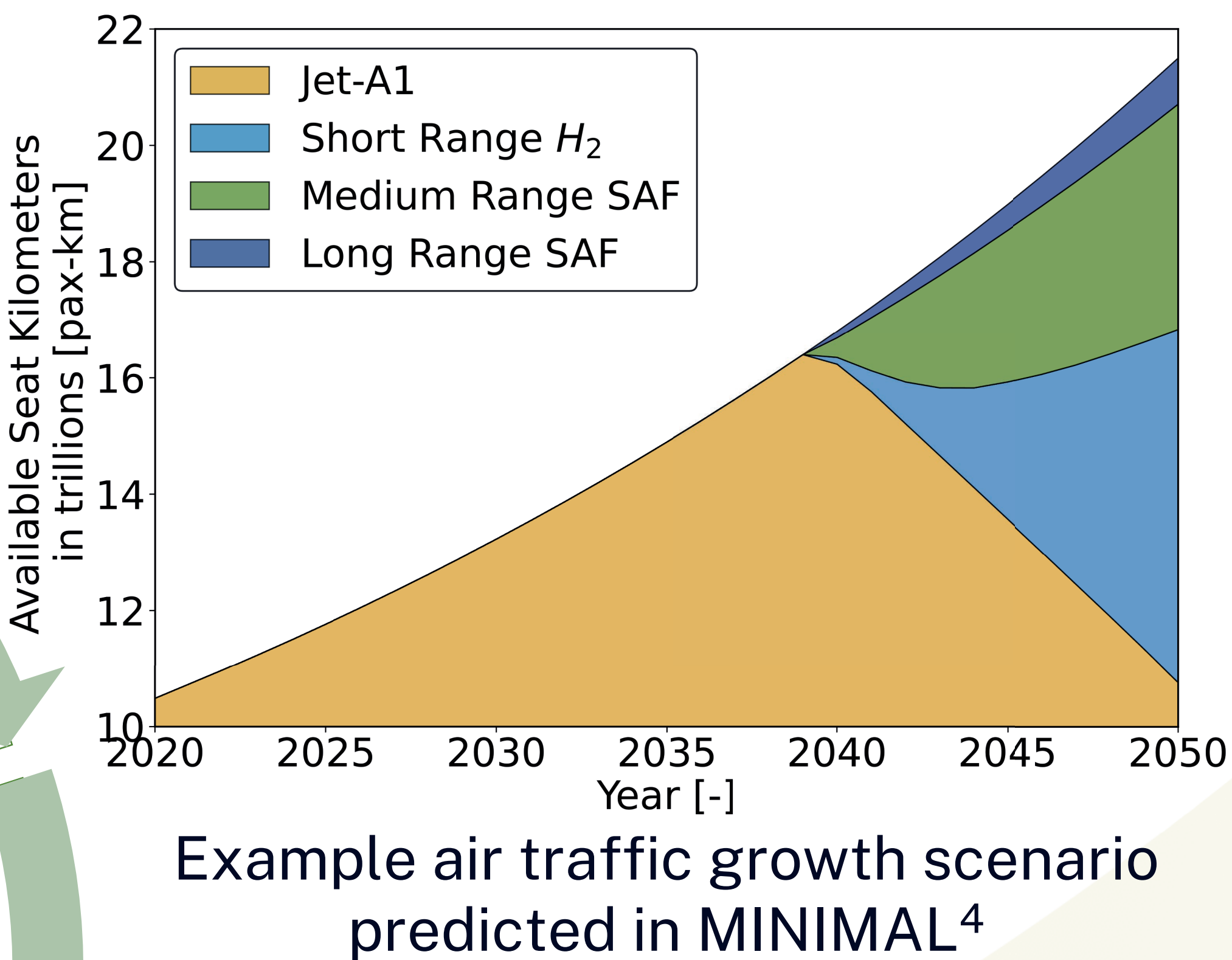
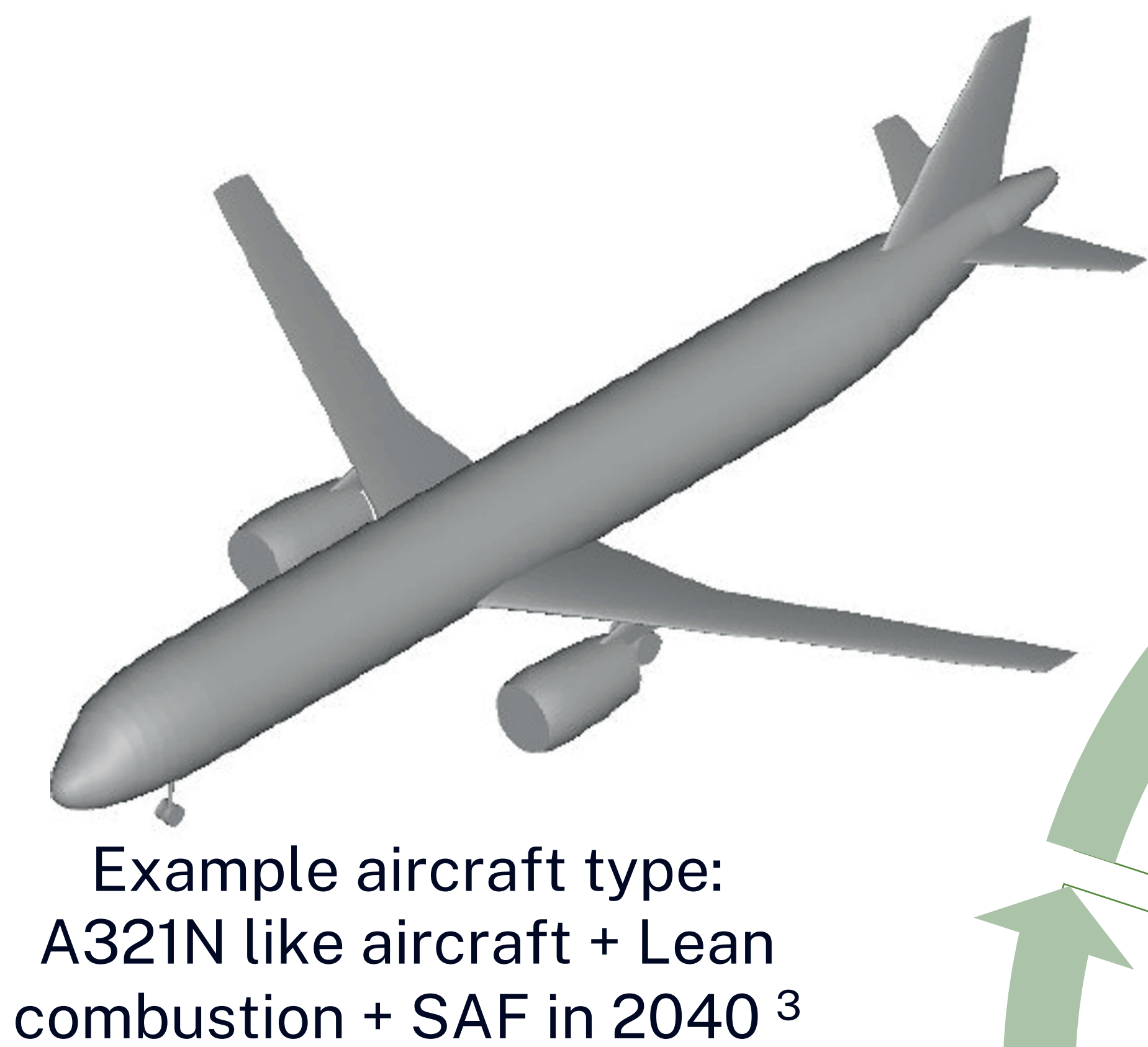
Various aircraft emissions contribute to aviation's climate impact.¹



- The state-of-the-art aircraft engine design is fuel efficiency-driven, not climate-impact.²
- MINIMAL aims to address both CO₂ and non-CO₂ effects in future climate optimized engine design.

MINIMAL projection: characteristics of medium range SAF fleet in 2050

Relevant Parameters	Values
Fleet fuel burn in 2050 [Tg] (HEFA-SPK)	53
Fleet averaged NO _x mass index [g/kg fuel]	8.4
Fleet averaged nvPM number index [# /kg fuel]	1.1e11



References

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3. Lin, et al., Engine design study for free double piston integrated composite cycle engine, under preparation, Aerospace, 2026.
4. Schaumeier, et al., Air traffic and fleet modelling for 2050, Deliverable 1.1 of the MINIMAL project, 2024.