



Flying, the multimodal way!

Environmental aspects,
multimodality and aviation



Environmental aspects, multimodality and aviation

Why is it important to consider and integrate **multimodal aspects** in future air transport planning?

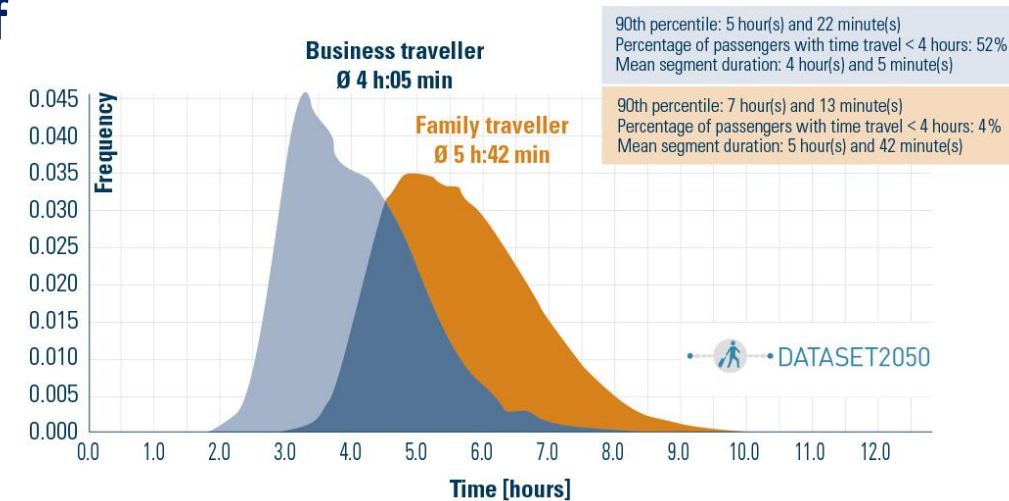
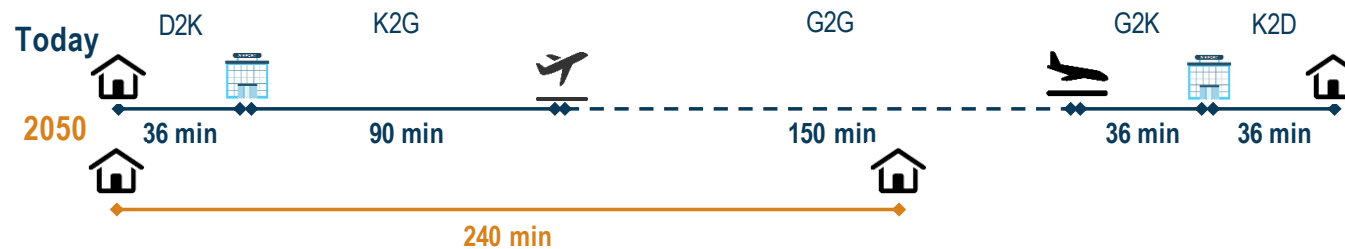
What is the role of **environmental factors** in future passenger behaviour?

The concept of intermodality / multimodality

- Multimodality and intermodality mostly used in the same way
 - (1) the capacity of travellers to use **alternative transport modes** to perform the same trip;
 - (2) the **consecutive use** of different means of transport for the same trip.

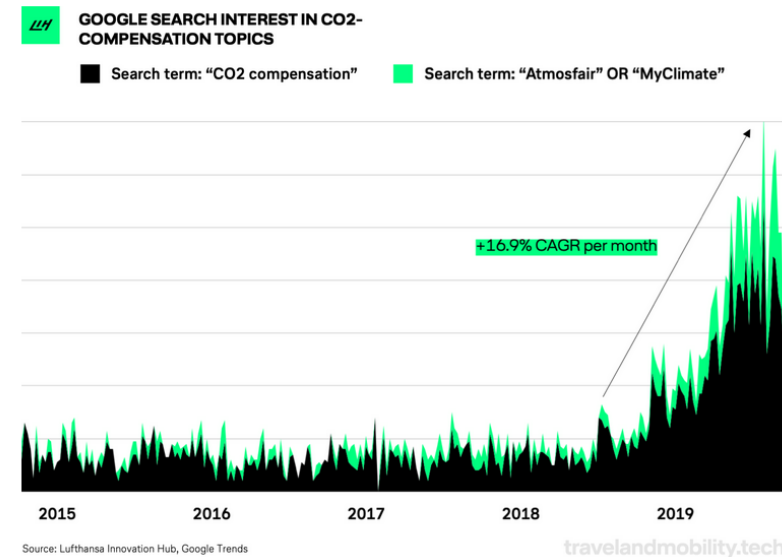
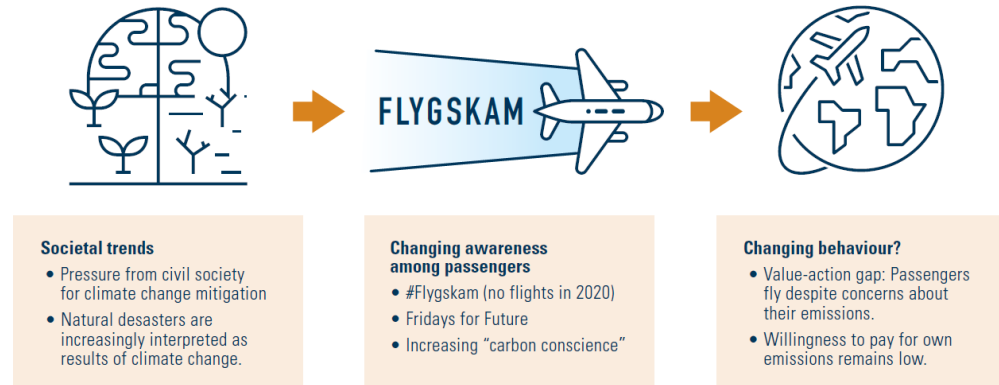


Passenger travel chain from door to door



Why do environmental aspects play an important role?

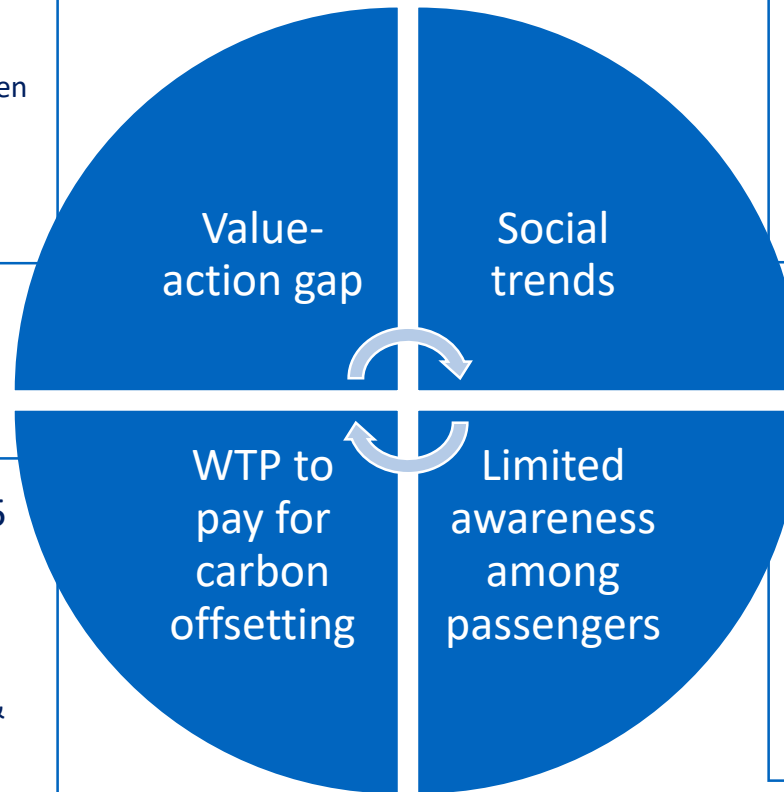
- Possible effects of **changing environmental awareness and regulations** on demand for air transport
 - Compensation
 - Substitution away from air
 - No air travel at all
 - No air travel on short-haul routes



Environmental considerations in transport

- Passengers fly despite concerns about the personal impact on climate change (Alcock et al., 2017; Cohen & Higham, 2011)
- Known as value-action gap (Büchs, 2017)

- Regional differences (WTP) is ~ 15 – 25 € per tonne of CO₂ (Fatihah & Rahim, 2017)
- Increase in income & age have positive influence on WTP (Fatihah & Rahim, 2017)

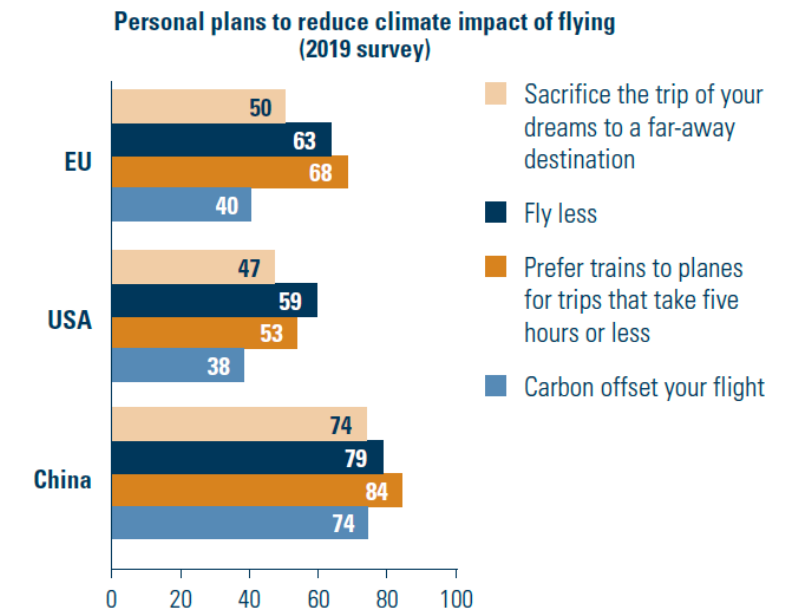
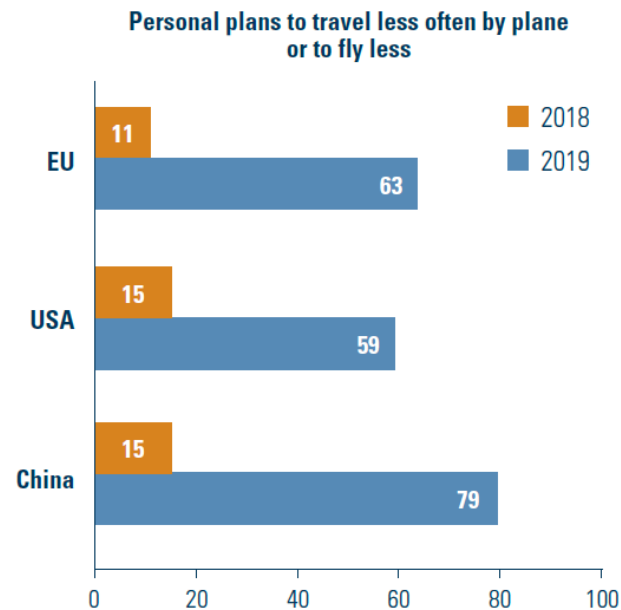


- #Flygskam; Swedish campaign "flygfritt 2020" (no flights in 2020)
- Fridays-for-future
- Pro-environment. election results
- Demand for stricter regulation

- Passengers often not aware of emissions from aviation (Fatihah & Rahim, 2017)
- Studies show that some passengers start to travel with a 'carbon conscience' (Cohen & Higham, 2011)

Source: Kluge, U. and Habersetzer, A., 2019, Air Transport Research Society Conference

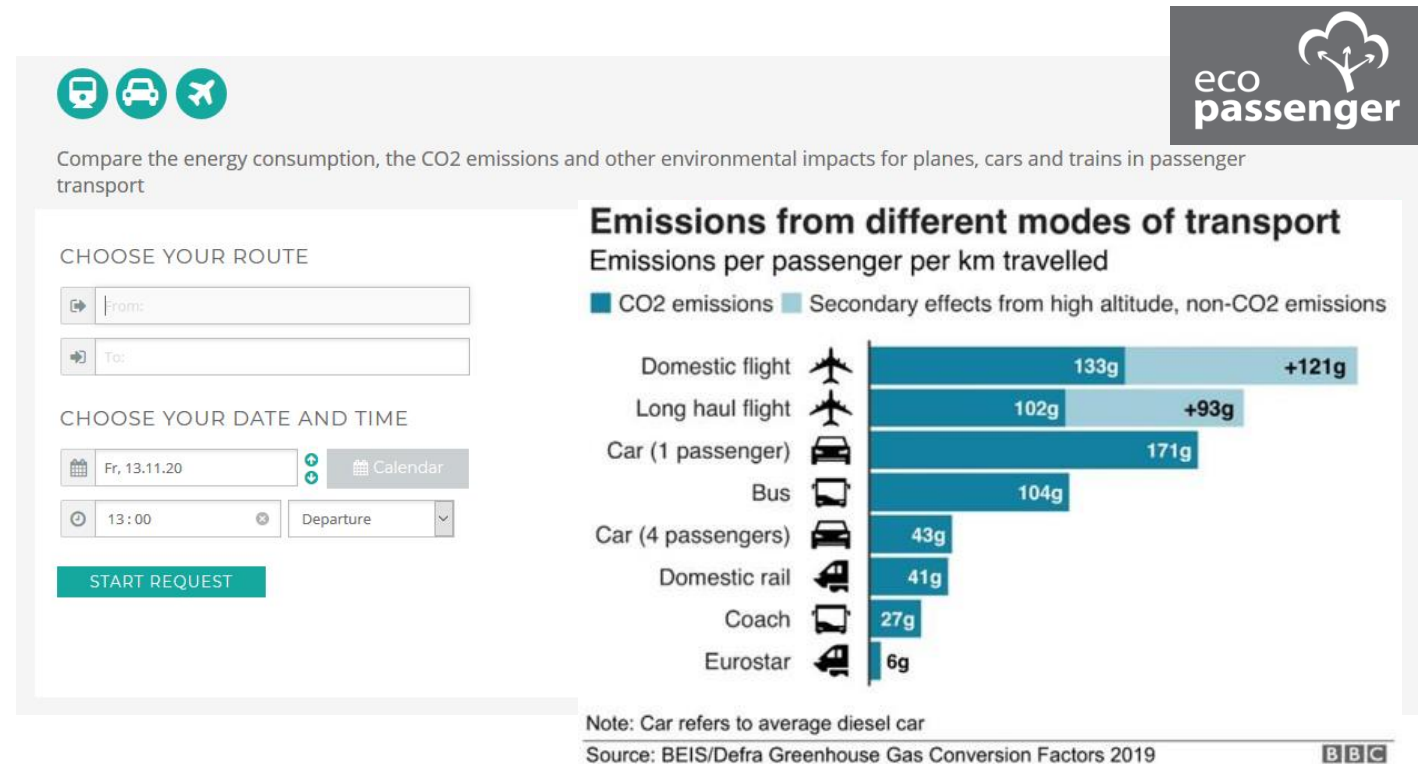
Passenger behaviour and mode choice



Source: Bauhaus Luftfahrt Yearbook 2019; EIB 1st and 2nd climate survey, <https://www.eib.org/en/surveys/index.htm>

Environmental incentives and regulation

- **Passengers**
 - **(Voluntary) compensation schemes**
 - **Overall carbon budget / allowance**
- **Operators**
 - **Offsetting**
 - **Emission trading**
 - **Carbon taxes**



Source: http://www.ecopassenger.org/bin/query.exe/en?L=vs_uic



Impact on the (future) aviation system

- Routes and stage length
 - Least CO₂ emissions options
- Aircraft types
 - Most efficient in terms of fuel consumption (per passenger)
- Future fleet composition
- Airport access mode choice
 - Pooling options, public transport

"I would purchase a flight that was the eco-friendliest (e.g., lowest carbon emissions) even if it were the most expensive option I could afford"
% who agree or agree strongly

The screenshot shows a flight search results page for the route MUC-LAX. It highlights three options: 'Günstigste Option' (448 €), 'Beste Option' (448 €), and 'Am wenigsten CO₂' (1.470 €). The 'Am wenigsten CO₂' option is circled in red. Below the options, a section titled '4.310 kg ist der durchschnittliche CO₂-Ausstoß auf dieser Strecke.' explains that the page shows CO₂ emissions to help users make informed decisions. A 3D airplane model is shown with labels for 'Flugzeugtyp', 'Airline-Rating', 'Direktflüge', 'Passagierauslastung', and 'Kabinenklasse'. The bottom section lists flight details for Virgin Atlantic and British Airways, including departure times, stops, and durations. A 'Zum Angebot' button is visible.



Source: <https://www.momondo.de/flight-search/MUC-LAX/2020-12-15/2020-12-22?sort=co2>

¹ Source: Foresight Factory | Base: 611-3225 online respondents per country aged 16-64 (24 global markets), 2018.

Potential effects on the ATM system

Environment

- Gate-to-gate **CO₂ emissions**
- Horizontal **en-route flight-efficiency** of the flown route
- Number of people exposed to significant **noise**

Cost efficiency

- Gate-to-gate ANS cost per flight

Operational efficiency

- Flight time per flight (minutes per flight)

Capacity

- Changing **fleet composition and aircraft mix**
 - Airside performance: gate / apron / taxi time / runway capacities
 - Landside performance: gate / terminal
 - Airspace performance: IFR movements, network throughput
- Predictability and punctuality
 - Advanced network operations planning

Modus project

Analyse how the **performance of the overall transport system** can be optimized by considering the entire **door-to-door journey** holistically and considering **air transport within an integrated, intermodal approach**, by

1. Identifying and assessing (future) **drivers for passenger demand and supply of mobility**, and how these affect passenger mode choice,
2. Applying and further advancing existing models to determine the **demand allocation** across different transport modes, especially air and rail, and the effects on the overall capacity of these modes, and
3. Developing and assessing **performance and connectivity indicators** which facilitate the identification of gaps and barriers in meeting high-level European (air) transport goals, and solutions to gaps can be addressed.



Modus consortium

Website: <https://modus-project.eu/>

Modus

Call: ATM Role in Intermodal Transport (H2020-SESAR-ER4-10-2019),
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Duration: June 2020 – November 2022

