Flying, the multimodal way!

Environmental aspects, multimodality and aviation



Annika Paul
Bauhaus Luftfahrt

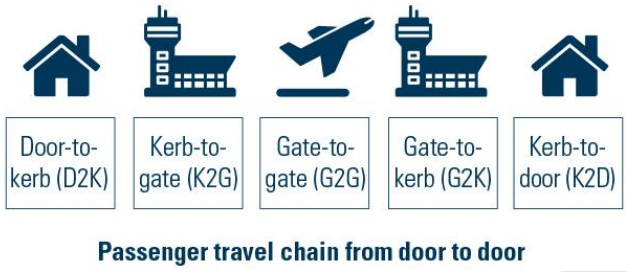
Environmental aspects, multimodality and aviation

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

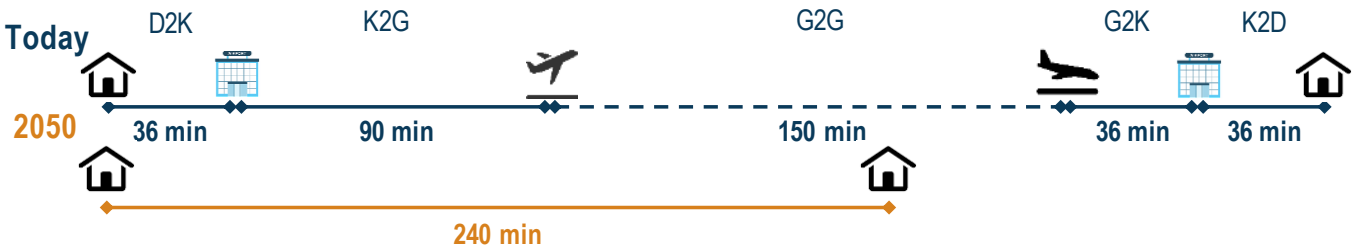
What is the role of **environmental factors** in future passenger behaviour?

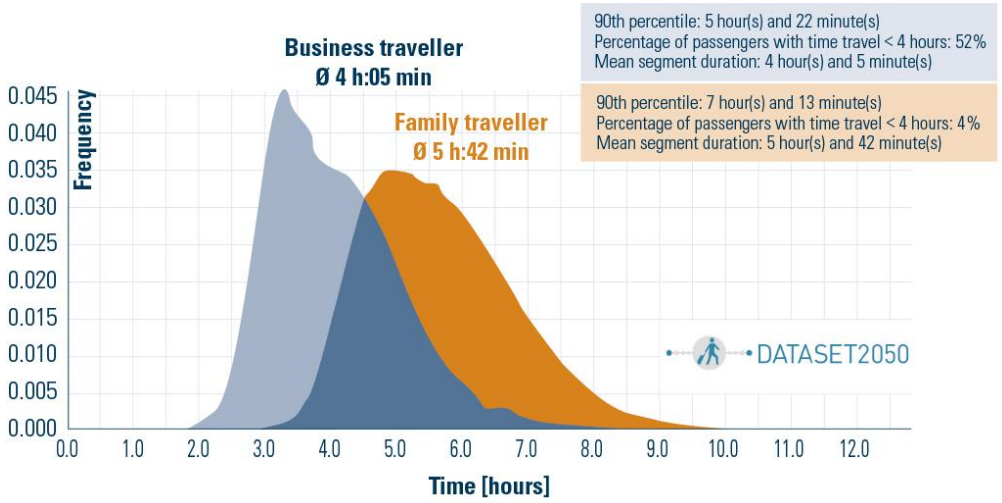
The concept of intermodality / multimodality

- 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.**



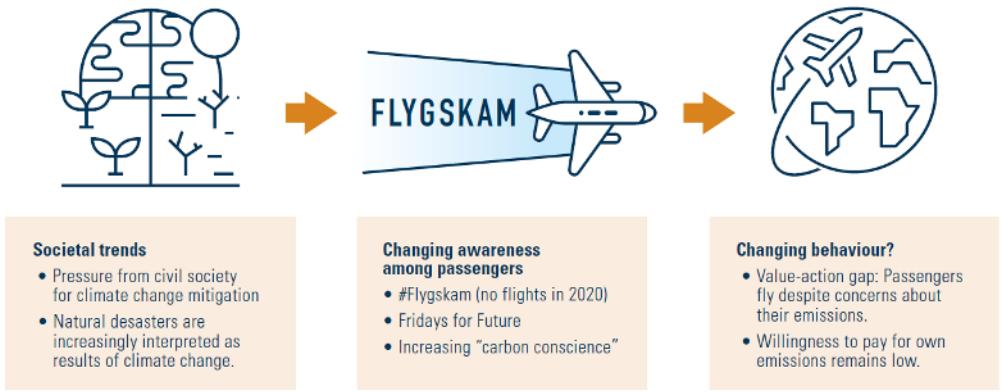
Passenger travel chain from door to door

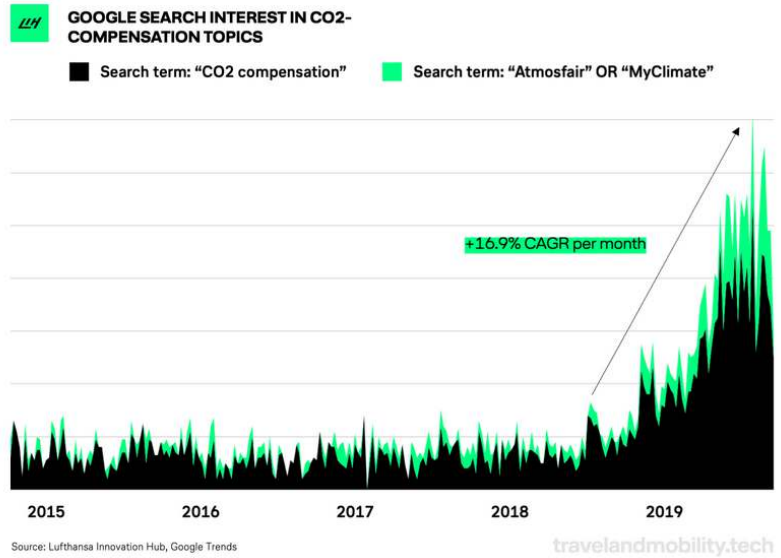




Why do environmental aspects play an important role?

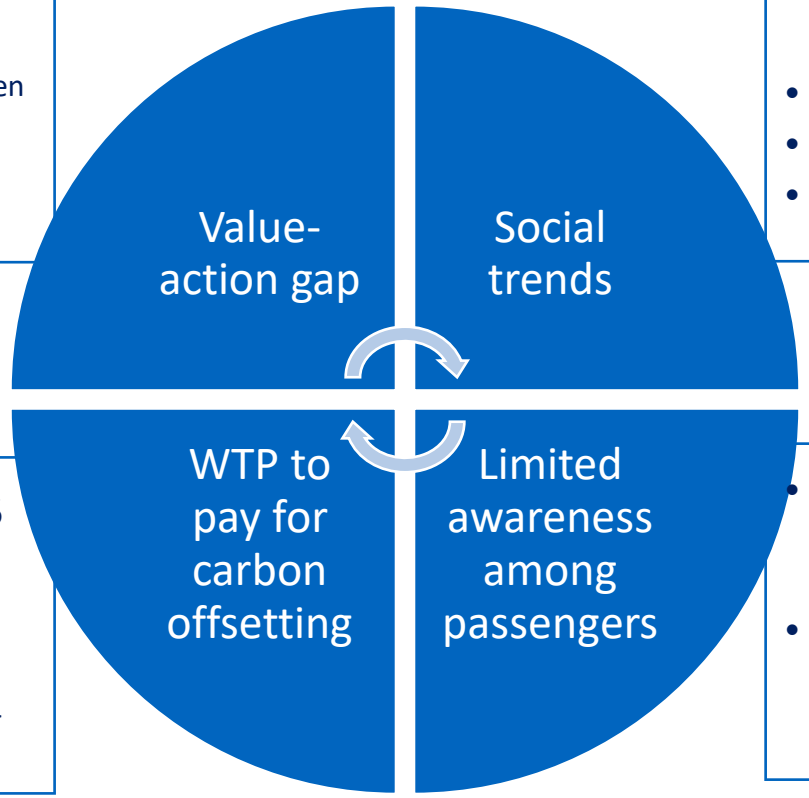
- Possible effects of **changing environmental awareness and regulations** on demand for air transport
  - **Compensation**
  - **Substitution away from air**
  - **No air travel at all**
  - **No air travel on short-haul routes**





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)



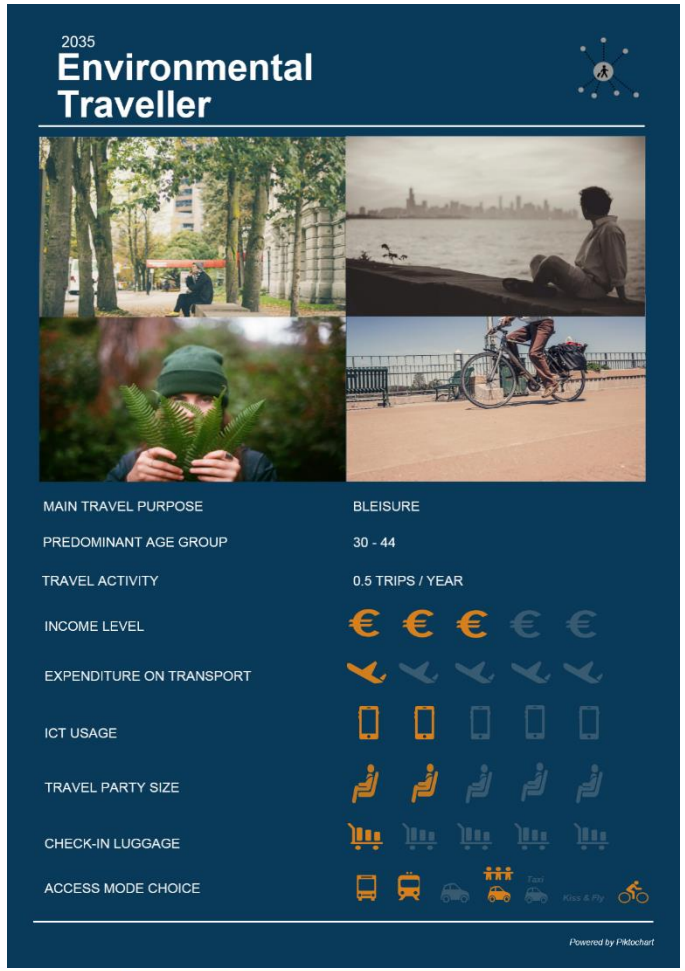
- #Flygskam; Swedish campaign "flygfritt 2020“ (no flights in 2020)
- Fridays-for-future
- Pro-environment. election results
- Demand for stricter regulation

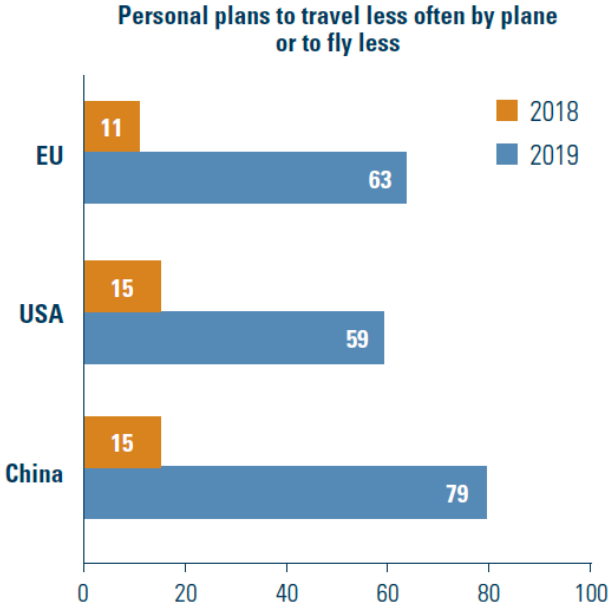
- Regional differences (WTP) is ~ 15 – 25 € per tonne of CO_2 (Fatihah & Rahim, 2017)
- Increase in income & age have positive influence on WTP (Fatihah & Rahim, 2017)

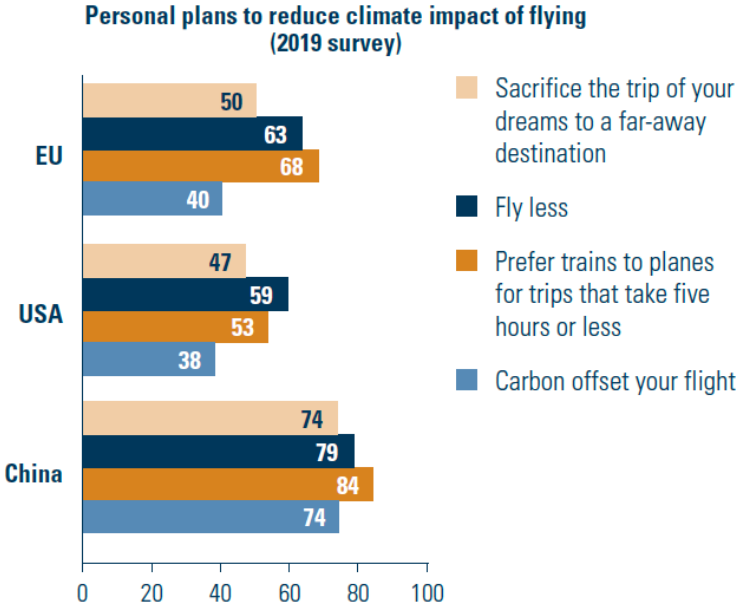
- Passengers often not aware of emissions from aviation (Fatihah & Rahim, 2017)
- Studies show that some passengers start to travel with a ‘carbon conscience’ (Cohen & Higham, 2011)

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

Passenger behaviour and mode choice



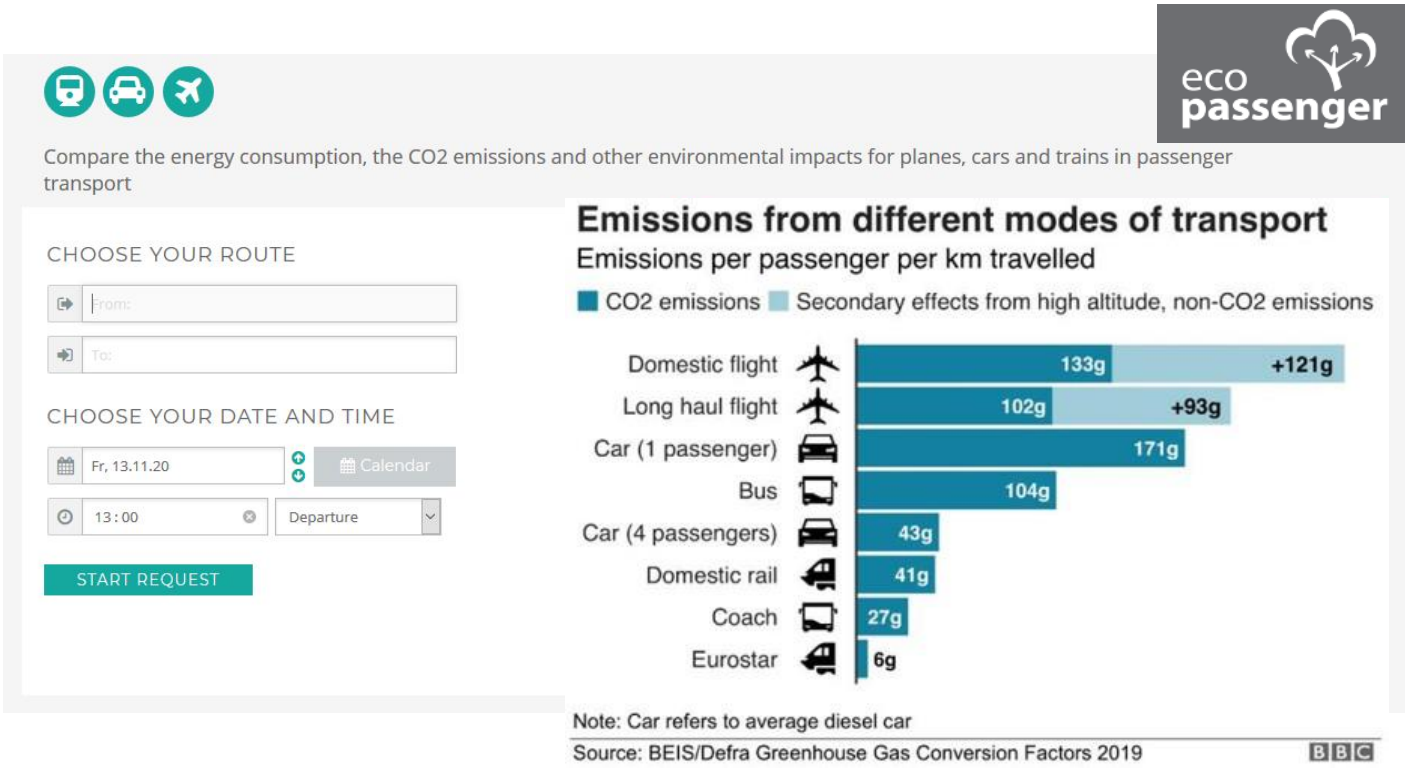




Source: *Bauhaus Luftfahrt Yearbook 2019; EIB 1st and 2nd climate survey, https://www.eib.org/en/surveys/index.htm*

Environmental incentives and regulation

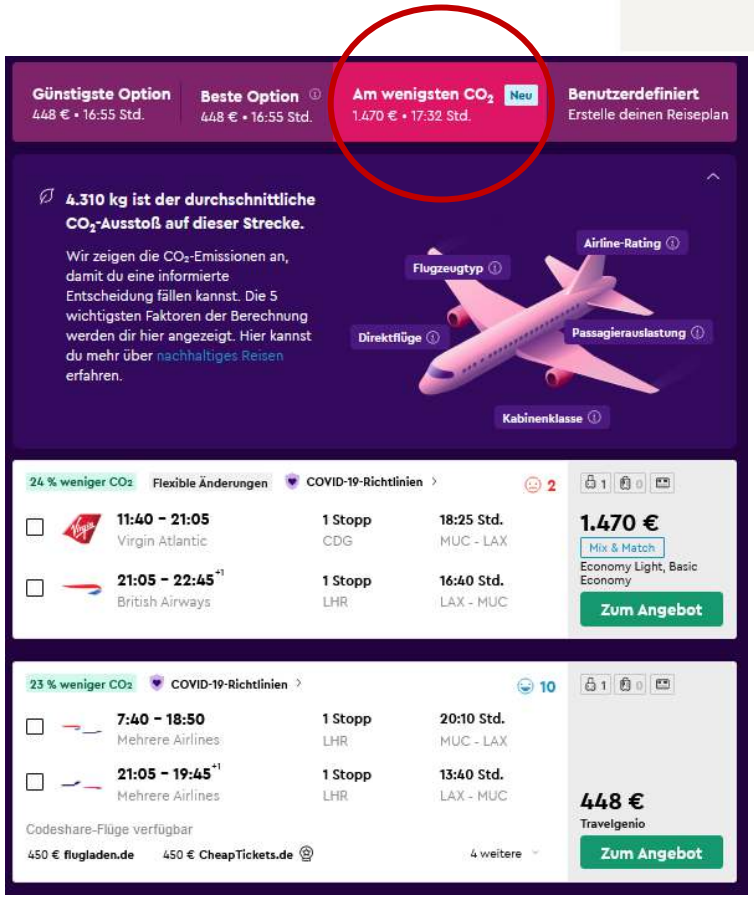
- Passengers
  - **(Voluntary) compensation schemes**
  - **Overall carbon budget / allowance**
- Operators
  - **Offsetting**
  - **Emission trading**
  - **Carbon taxes**



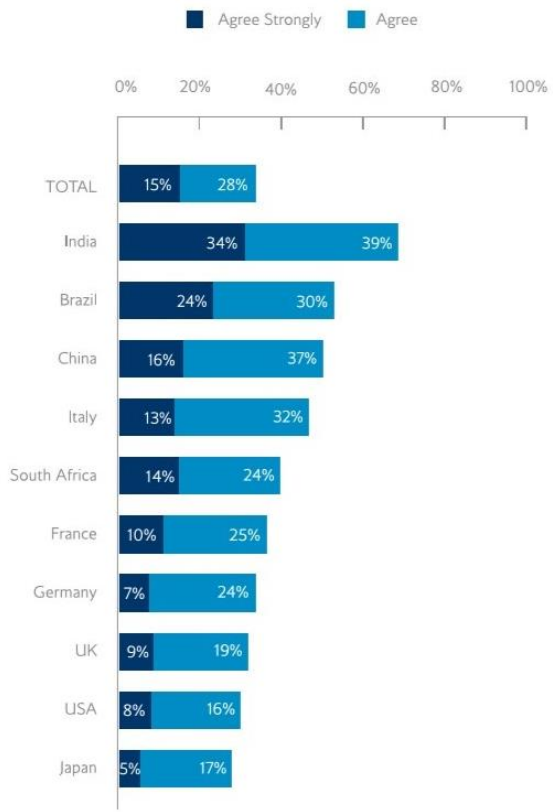
Source: http://www.ecopassenger.org/bin/query.exe/en?L=vs_uic

Impact on the (future) aviation system

- Routes and stage length
  - **Least CO_2 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



Source: https://www.momondo.de/flight-search/MUC-LAX/2020-12-15/2020-12-22?sort=co2_a

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

Potential effects on the ATM system

Environment

- Gate-to-gate **CO_2 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), Grant no. 891166
Duration: June 2020 – November 2022

SESAR JOINT UNDERTAKING

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