Minimum Travel Times between European Regions
–
An assessment of the ACARE 4h-Goal

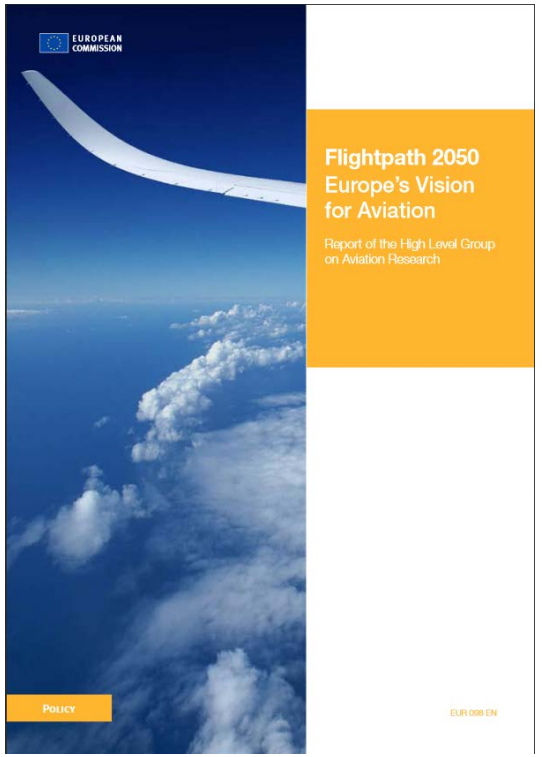
Hendrik Nieße
Wolfgang Grimme
Institute of Air Transport and Airport Research
German Aerospace Center (DLR)

Agenda

- Background
- Research Question
- Data and Methodology
- Results
- Interpretation
- Conclusion

Background

- ACARE = Advisory Council for Aviation Research and innovation in Europe
- Development of strategic roadmaps for the development of aeronautics and air transport in Europe
- Key areas: Environment, Safety, Security, Customer Orientation
- SRIA (Strategic Research and Innovation Agenda) supported by national and European Programs (e.g. Horizon 2020, JTI Clean Sky)
- Objectives adopted by European Commission for 2050 (Flightpath 2050)



Source: https://op.europa.eu/de/publication-detail/-/publication/296a9bd7-fef9-4ae8-82c4-a21ff48be673

Research Question

- In the Flightpath 2050 document, we find various objectives of what should have been achieved until 2050
- In the area “meeting societal & market needs” we find:

90% of travellers within Europe are able to complete their journey, door-to-door within 4 hours.

- This political statement triggers various scientific questions, among them:
  - To what extent is the objective achieved already today?
  - Is it economically efficient trying to achieve this objective?
  - What are the means contributing to the achievement of this objective?

Data and Methodology

Elements for the assessment of the current state of the ACARE-90%-objective

- European origin-destination passenger demand data matrix
- Flight schedules
- Train schedules (limited to air/rail codesharing)
- Ground access/egress times between NUTS regions and airports
- Assumptions on process times (MCT, time from airport arrival to flight departure / flight arrival until exit from airport)

Data and Methodology

- European origin-destination passenger demand data matrix
  - ETISplus project provides Europen origin-destination passenger demand matrix
  - Data for 2010 on NUTS3-level (NUTS2-level used in the analysis)
- Flight / train schedules
  - OAG flight schedules for May 2012, including rail segments
  - Shortest path search algorithm
- Ground access / egress times
  - Google Maps car travel times
  - Assumptions on access/egress times
- Transfer Times / Code Sharing vs. Interlining
  - Assumptions / sensitivity analysis 15, 30, 45, 60 min MCT
  - Transfers only between airlines that apply code sharing or all airlines

Data and Methodology

Shortest path search algorithm (modified Dijkstra) applied – search for minimum total travel time

$$tt_{min}\,(X,Y) = \min_{XY}\left(tt_{X,A} + at + tt_{A,B} + dt + tt_{B,Y}\right)$$

The minimum travel time between regions consists of the following elements:

- travel time from the point of origin to the departure airport ($tt_{X,A}$)
- the process time required from the arrival of the passenger at the departure airport to the scheduled time of departure (at)
- the flight time from the departure to the arrival airport ($tt_{X,A}$) – in case of a connecting flight, this element also contains the flight time of the first flight segment, the transfer time at the hub and the flight time of the second flight segment
- the process time required from the scheduled arrival time at the arrival airport to the point in time when the passenger leaves the arrival airport (at)
- travel time from the arrival airport to the destination point ($tt_{B,Y}$)

Data and Methodology

Scenarios tested:

Trip demand

- “ETISplus“: Modelled origin-destination trip demand from EU project ETISplus
- “Population product“: Theoretical situation, in which each EU citizen visits each other EU citizen

Air transport network

- Minimum connection times: 15, 30, 45, 60 minutes transfer time
- Permitted connections: Code share (only flights with same airline code) vs. interlining (all airlines)

⇒ 16 different combinations of trip demand, transfer times and permitted connections

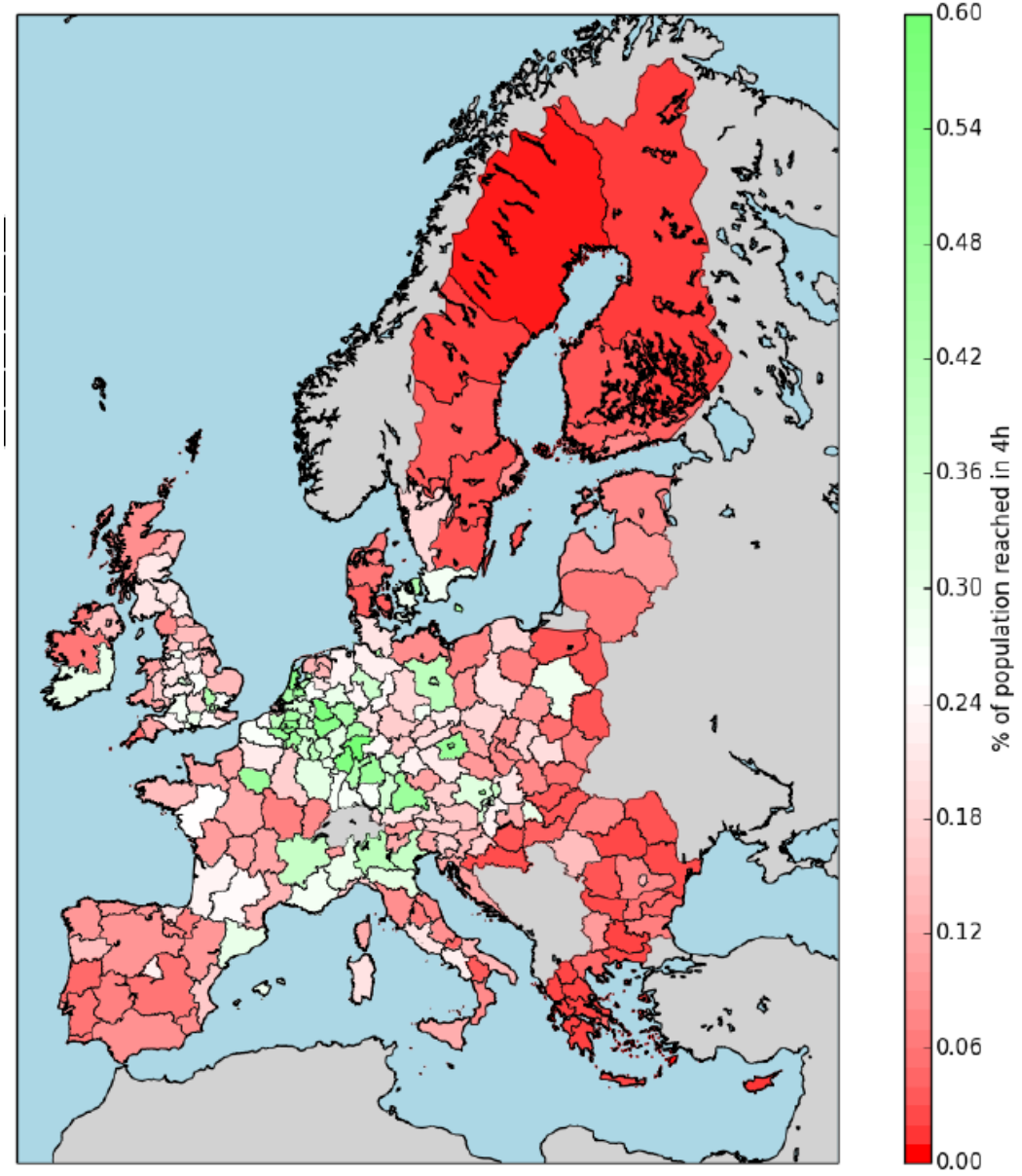
Results

trips data	air-air transfer modus	transfer time			
		15	30	45	60
ETIS-Plus	code share	97.09%	95.54%	93.51%	91.66%
	interlining	97.17%	95.64%	93.53%	91.67%
population product	code share	43.61%	33.84%	21.78%	13.12%
	interlining	44.43%	33.98%	21.79%	13.12%

Already today 91.7% of travellers can complete their journeys within 4 hours (with 60 min MCT in air transport)

Only 13.1% of trips would be completed within 4 hours if every EU citizen would try to reach each other EU citizen

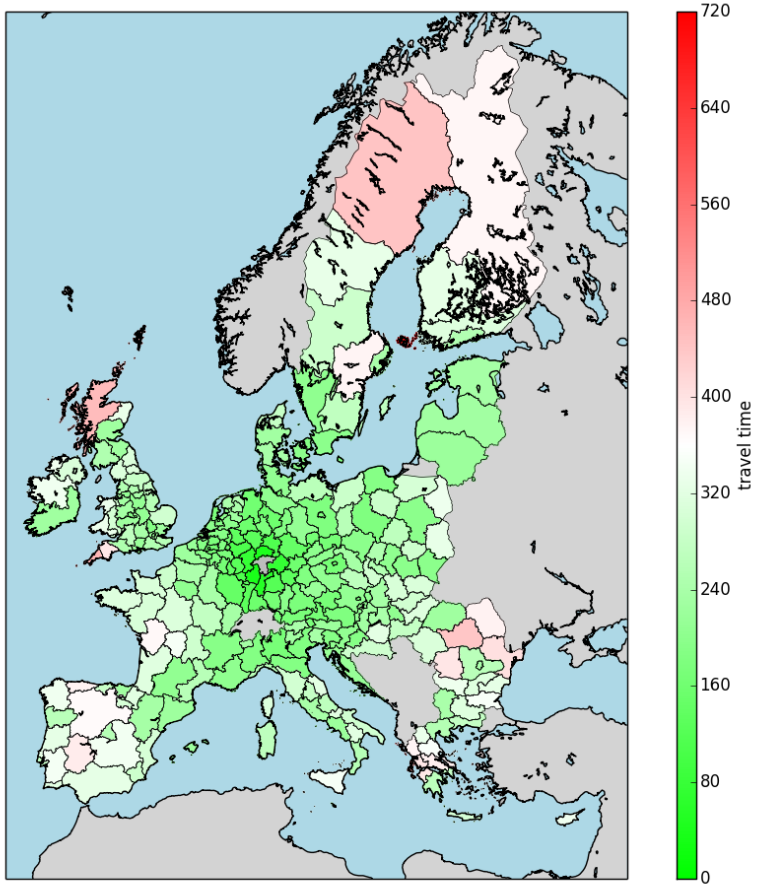
Reason for discrepancy: Most trips represented by ETISplus are on relatively short distances



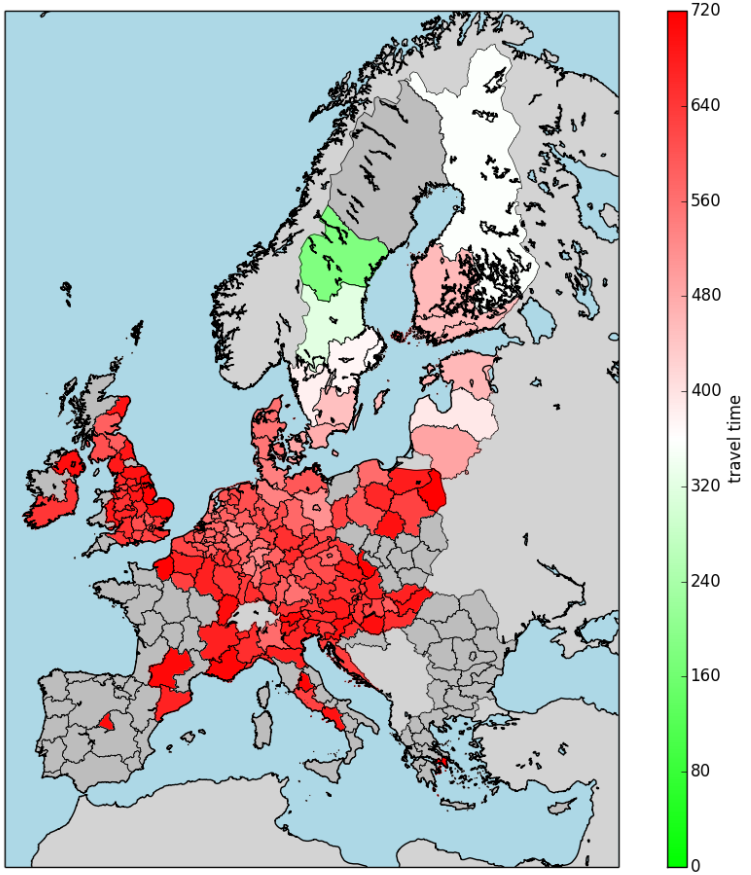
Source: Own illustration.

Results

The Flightpath2050 4-hour-goal in regional perspective



DE71 (Rhein-Main-Area)

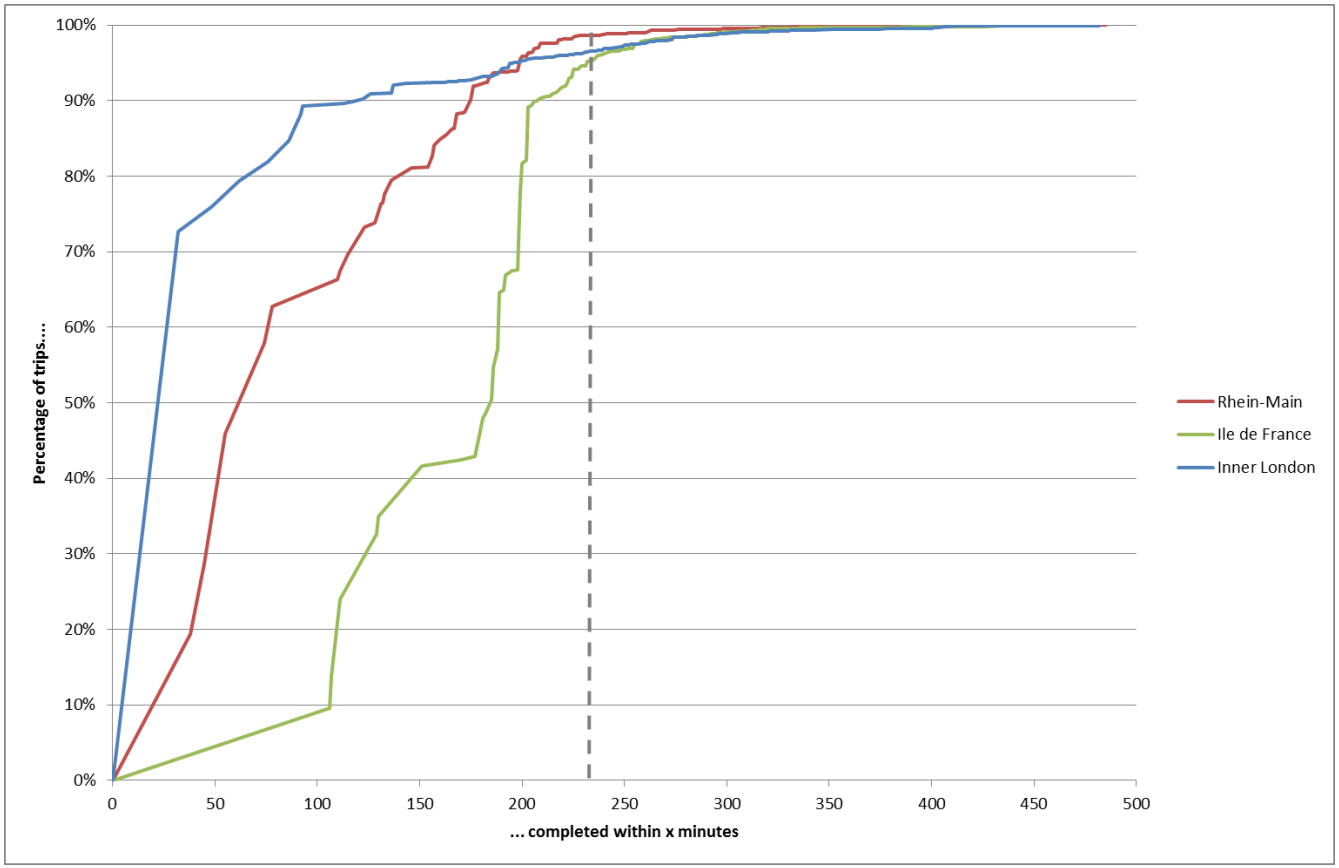


SE33 (Upper Norrland)

Source: Own illustrations.

Results

The Flightpath2050 4-hour-goal in regional perspective

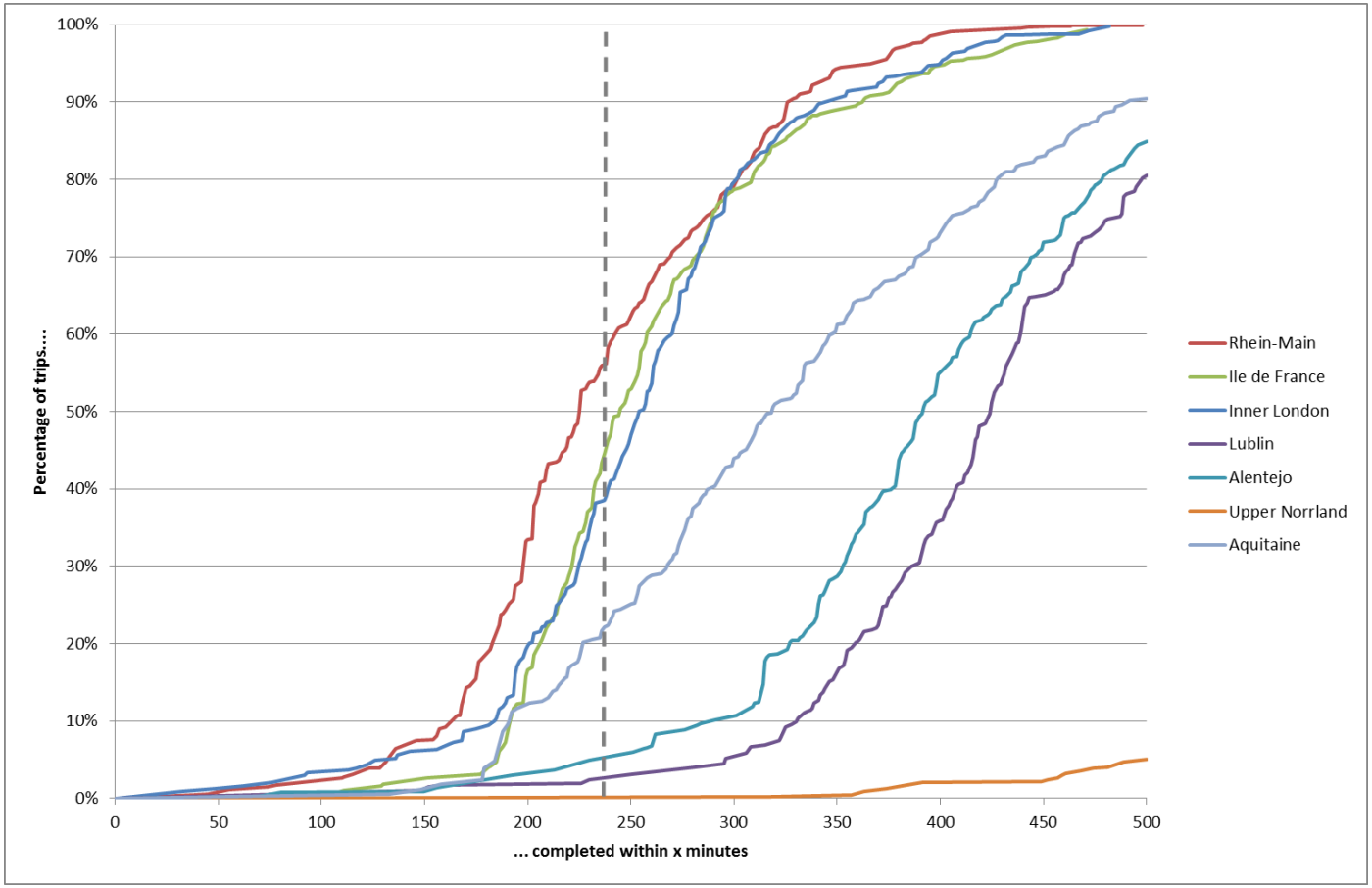


Source: Own illustration.

Cumulative distribution in scenario ETISplus / code share / 45min transfer

Results

The Flightpath2050 4-hour-goal in regional perspective

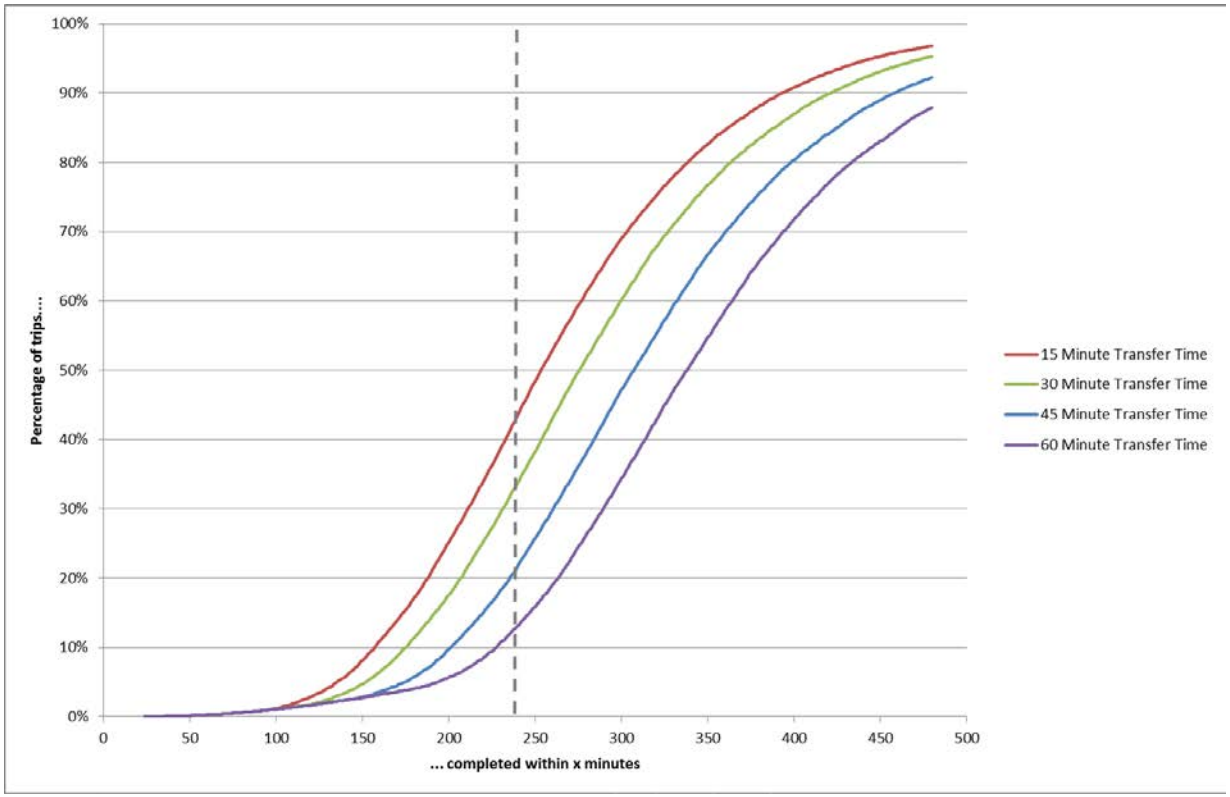


Source: Own illustration.

Cumulative distribution in scenario population product / code share / 45min transfer

Results

Factors contributing to the achievement of the 4-hour-goal: Reducing transfer times within and between modes



Source: Own illustration.

Cumulative distribution in scenario ETISplus / code share / 45min transfer

Interpretation

- Already today, more than 90% of the trips shown in the ETISplus database can be completed within 4 hours
- This is due to the fact that most trips are over short distances, which can be completed within 4 hours with car / rail modes
- But, if a theoretical situation in which every EU citizen should have the opportunity to visit every other EU is aspired, the goal has been achieved only to 13% (60minute MCT) or 22% (45min MCT)

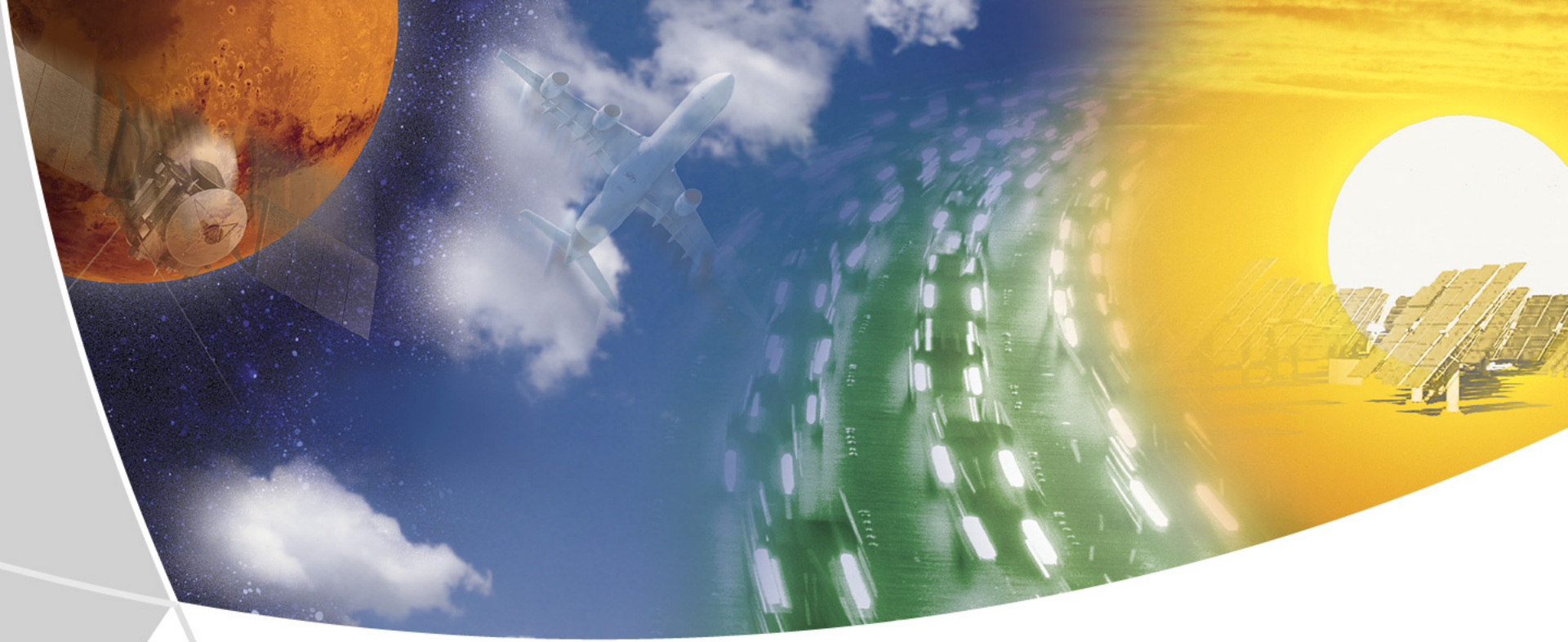
- We propose to re-phrase the Flightpath2050 goal, e.g.:

*90% of travellers within Europe are able to complete their **long-distance journey of over 200km (or 250km or 300km...)**, door to door, within 4 hours.*

Conclusion

Areas for further research:

- What is the economic rationality behind the reduction of travel times? – Comparison of costs and benefits
- How would transfer concepts for low cost carriers (“self-help hubbing”) change the accessibility of regions?
- How can reductions in airport process times (check-in deadline, minimum connection times) contribute to a reduction of door-to-door travel times – are they more cost efficient than expensive new infrastructure?
- How can conflicting goals of stakeholders be resolved (e.g. increase in non-aeronautical revenues with longer dwell times at terminals vs. short journey times)?
- What is the potential for small air transport (<19 seats) for the accessibility of remoter regions?



Mercie beaucoup pour
votre attention!

Thank you very much
for your attention!