

# ACARE WG1: Are we reaching our goals?

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# Moving the goalposts – but how much?

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How much have we progressed towards achieving the mobility goals set out in Vision 2020 and Flightpath 2050?

How have the boundary conditions changed since Flightpath 2050 was published in 2011?

- What gaps are there in these goals?
- How can they be improved in 2021?

Most ‘mobility’ goals pose a greater challenge on innovation than on pure technology development

- except for the aviation-specific ATM goals

Require cooperation and joint implementation by many stakeholders outside aviation

- very different business models and regulatory environments

Opportunities as well as challenges:

- some developments outside aviation may help achieve goals
- high degree of inertia - aviation cannot overcome it alone

# ACARE WP1 Flightpath 2050 goals

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1. ... informed mobility choices... affordable access to one another ...
  - *"Travellers can use continuous, secure and robust high-speed communications for added-value applications." (!)*
2. 90% of travellers ... door-to-door within 4 hours.
  - Passengers and freight able to transfer seamlessly between transport modes ...
3. Flights arrive within one minute of the planned arrival time regardless of weather
  - transport system is resilient [to] disruptive events
  - capable of automatically and dynamically reconfiguring the journey
  - Special mission flights can be completed in [most] weather... conditions ...
4. [ATM will] ... handle at least 25 million flights a year ... fixed-wing, rotorcraft ... manned, unmanned, autonomous
  - integrated into and interoperable with the overall air transport system
  - 24-hour efficient operation of airports.
5. A coherent ground infrastructure ... airports, vertiports and heliports
  - relevant servicing and connecting facilities [including] to other modes.



# Goals re-formulated

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Major difference in scope and ambition of Flightpath 2050 and Vision 2020 goals

- despite generally addressing related issues
- Flightpath 2050 goals more challenging and ambitious

Goals restructured into four clusters to rationalise analysis:

- Affordability of travel
- (Informed) mobility choice
- Mobility performance in an integrated intermodal transport system
- ATM & Airport capacity and service provision

# Goal cluster 1: Affordability of travel

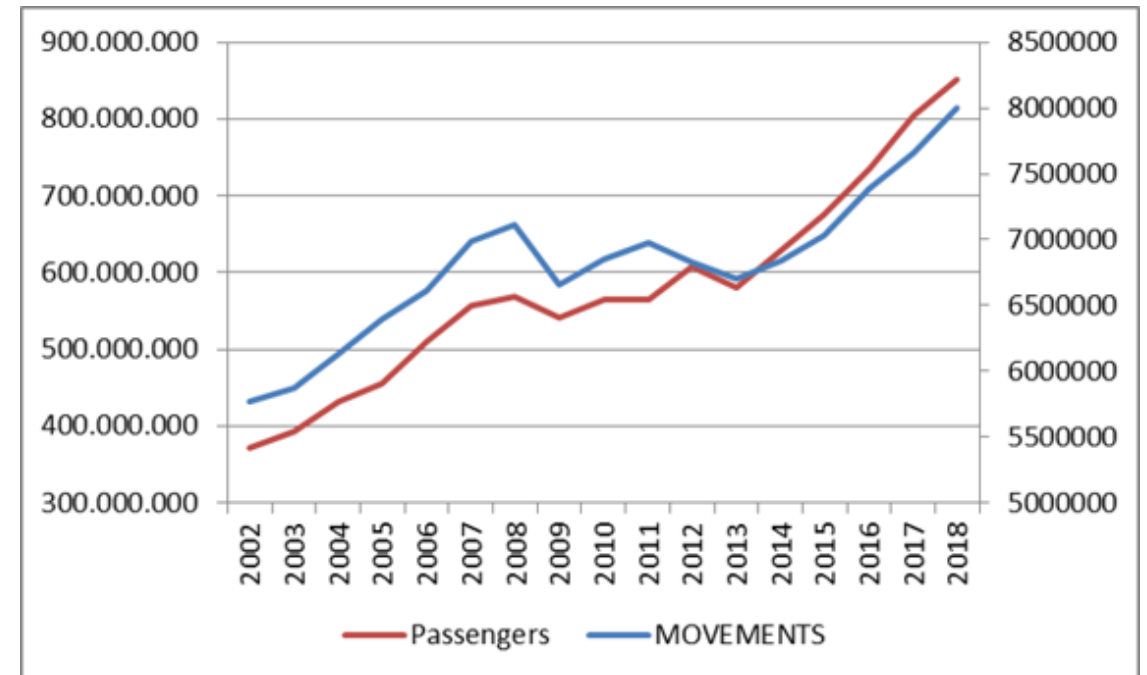
## Vision 2020:

"A steady and continuous fall in travel charges through substantial cuts in operating costs"

- Affordability is not really an issue any more
  - flights within Europe more than doubled between 2002 and 2018 (source: DLR)

## Flightpath 2050:

"European Citizens are able to ... have affordable access to one another"



# Goal cluster 1: Affordability of travel

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Many factors helped reduce direct operating cost/passenger

- rise of the low cost airlines
- adoption of their service model by many legacy airlines
- higher density cabin configurations - slim seats
- more efficient aircraft types (A320Neo, A220)
- stringent cost-cutting programmes by airlines

Aviation is now considered to be too cheap!

- increasing levels of taxation and fees
- too successful?



# Goal cluster 2: (Informed) mobility choice

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## Vision 2020:

- *"Passenger choice: the same choice of facilities that are available on other forms of transport including leg room, flexible seating and office facilities incorporating state of the art communications. A greater choice of flights from regional locations"*

## Flightpath 2050

- *"European Citizens are able to make informed mobility choices ... taking into account economy, speed and tailored level of service"*

- Three elements
  - Availability of mobility choices (including air travel)
  - Availability and ease of access
  - Availability of unbiased data

# Availability of mobility choices

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## Supply side of operations

- including regional spread

Twice the number of city pairs in Europe in 2018 compared with 2000 (33% more than 2010) (source: DLR)

- Significant decline in regional air services
  - rising fuel cost and economic crisis of 2008
    - major impact on regional airline business models
- Largely compensated by increase of point-to-point connections
  - small airports with low airport and handling charges
  - low cost airlines

"De-bundling" of fares increased choice (not necessarily service level!)

- introduction of the ancillary services revenue structure
- passengers only get what they paid for

Long-haul now has up to 5 different classes

- higher levels of passenger choice





# Availability and ease of access

Access to mobility information when planning & executing a journey

- easily on track
- huge amount of information available on the internet
- online travel planning tools and portals














Supported by the development of open APIs

- much greater accessibility to information

Call for the implementation of national access points for mobility information

- Commission delegated regulation (EU) 2017/1926

Flights from London, United Kingdom (all airports) to Paris, France (all airports)

 London, United Kingdom (all airports)	 Paris, France (all airports)
 Fri, August 6	 Mon, August 9
 easyJet	1h 20m Nonstop from NT\$2,235
 Air France	1h 15m Nonstop from NT\$3,366
 British Airways	1h 15m Nonstop from NT\$3,522
 Vueling	1h 15m Nonstop from NT\$3,617
 Brussels Airlines	19h 25m+ Connecting from NT\$5,859
 Air Europa	7h 50m+ Connecting from NT\$6,033
 Eurostar	2h 16m+ Train check price
 Other airlines	3h 55m+ Connecting from NT\$6,199
 <a href="#">Show flights</a>	

# Availability of unbiased data

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Unbiased information to compare different door-to-door mobility offerings

- environmental footprint
- on-time performance levels
- missed connections
- reliability of service

Largely insufficient achievement

- Ever increasing amount of related information e.g. social networks
  - No mechanism for collecting it
  - No mandate to make it available to travellers
- Metrics and statistics may exist for some parts of a journey
  - Unknown credibility
  - Not transport-wide
- Collection of door-to-door mobility-performance data not yet possible

# Goal cluster 3: Mobility performance

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## Vision 2020:

- 'Air freight services: a larger percentage (by value) of cargo travels by air because it is more competitive with land and sea transport and it is fully integrated into a seamless intermodal freight transport system.'
- "Time spent in airports: no more than 15 minutes in the airport before departure and after arrival for short-haul flights, and 30 minutes for long haul.'

## Flightpath 2050:

- '90% of travelers within Europe are able to complete their journey, door to door, within 4 hours.'
- "Passengers and freight are able to transfer seamlessly between transport modes to reach the final destination smoothly, predictably and on time.'
- "The transport system is resilient to disruptive events; it is capable of automatically and dynamically reconfiguring the journey within the network to meet the needs of the traveller if disruption occurs.'
- Travellers can use continuous, secure and robust high speed communications for added-value applications.'

- Three elements:
  - Passenger connectivity
  - 4-hour door-to-door journeys
  - Journey resilience

# Passenger connectivity

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Goal will already be reached in a few years' time

- Availability of connectivity by mobile devices has become the norm
  - EU-regulation to remove roaming charges was significant
- Massive roll-out of inflight internet broadband connectivity in recent years
  - will become the norm in the years to come
- 30% of the worldwide fleet had broadband Internet Wi-Fi at end 2018
  - Expected to rise to at least 19,000 aircraft by 2027
    - 100% of wide-body and 50% of narrow-body (source: Airbus)



# 4-hour door-to-door journeys

A bold move by aviation

- passenger-centred focus
- requires holistic multi-modal approach

90% of journeys within Europe  $\leq 7\frac{1}{2}$  hours door-to-door today

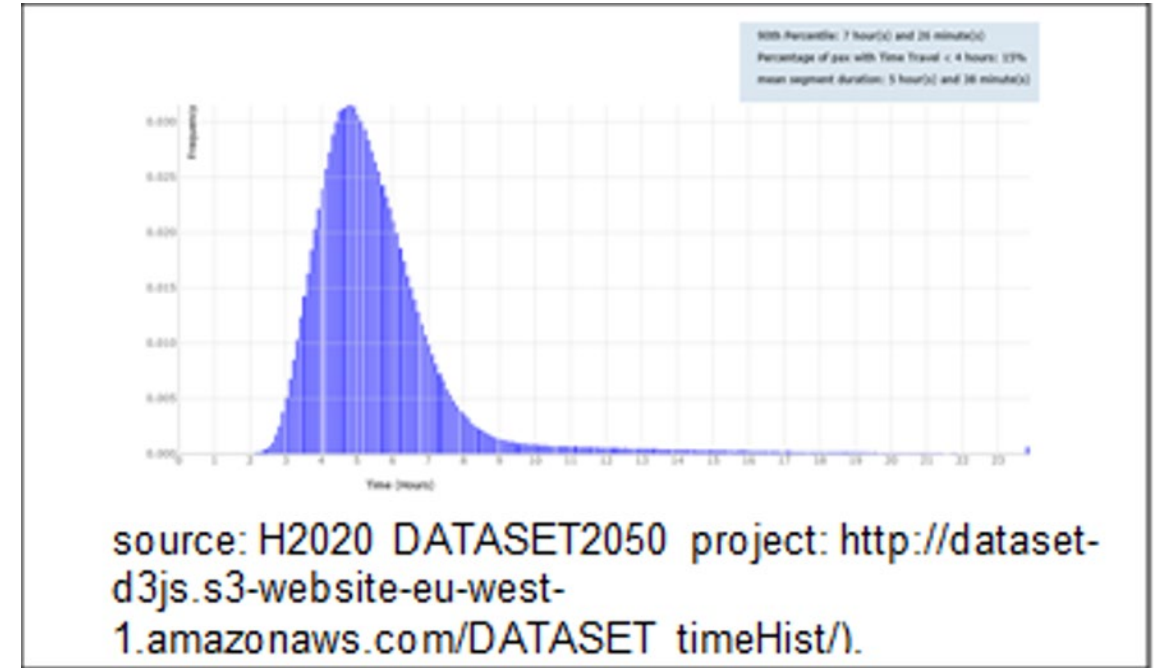
(source: DATASET 2050 project)

4 hours is "hard to achieve given sector lengths in Europe"

- heavily criticised by some members of the community
- Punctuality and predictivity levels are a problem

If not 4 hours, at least an integrated, seamless and predictable door-to-door journey

- Many developments support this - most from outside of aviation!



# 4-hour door-to-door journeys

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## Very positive developments

- on track to reach this goal

## Aviation is changing

- Acceptance of other stakeholders
- Introduction of reservation platforms such as IATA NDC/ One Order
- Airlines see future as "journey integrators", not "air transport providers"

## Intermodal journey planning and reservation is much easier

- Increased availability of information on the internet and on mobile apps
- Thanks to open APIs and regulation (EU) 2017/1926

## Customer-orientated mobility-as-a-service (MaaS) concept

- Currently popular in regional environments
- Can ultimately be fully European
- Single ticketing and whole-journey pricing embedded MaaS

# 4-hour door-to-door journeys

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New means of transport, new mobility and transport business models

- sharing models; UAM

UAM effect on door-to-door mobility performance will be great

- If it is socially accepted and sustainable

Increased efficiency of airport operations

- IATA and ACI industrial research projects that could eliminate queues for passengers
  - use of biometrics and digital IDs
  - more self-servicing/ kiosks
  - new security scanning equipment

Exchange of context-based passenger information between stakeholders

New door-to-door baggage concepts (e.g. PASSME project)

- eliminate bag drop and reclaim at airports

Joint vision of all the transport modes within the SETRIS project

- truly integrated transport system for sustainable and efficient logistics

# Journey resilience

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Passenger still in charge of managing journey, handling disruption, and loses out if an upstream transport operator fails to provide proper service

- Not "passenger-centred"!
- Need passenger rights for the entire door-to-door context

Real door-to-door journey support requires either

- Entity that pro-actively re-configures the journey for the passenger if necessary
  - need entire journey stored and available to track progress and identify disruptions - not yet available
- Journey information shared between stakeholders to manage connections – not GDPR-compliant

Activities ongoing to create GDPR-compliant data sharing framework and a European MaaS-system (e.g. 'TrulyMe' - IATA)

- hard to know if these could be the solution

Positive developments:

- Airlines handle disruption better using improved technology and connectivity
  - And passenger rights clearly state their responsibilities
- Information for alternative means of transport is more accessible for passengers
  - increased situational awareness of travel options



# Goal cluster 4: ATM & airport capacity and service provision

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## Vision 2020:

- "99% of all flights arriving and departing within 15 minutes of the published timetable, in all weather conditions."

## Two elements:

- ATM System capacity and service provision
- Aviation ground Infrastructure

## Flightpath 2050:

- "An air traffic management system is in place that provides a range of services to handle at least 25 million flights a year of all types of vehicles, (fixed-wing, rotorcraft) and systems (manned, unmanned, autonomous) that are integrated into and interoperable with the overall air transport system with 24-hour efficient operations of airports.
- "Flights arrive within one minute of the planned arrival time regardless of weather conditions.
- "Special mission flights can be completed in most weather and atmospheric conditions and operational environments.
- "A coherent ground infrastructure has been developed including airports, vertiports and heliports with the relevant servicing and connecting facilities to other modes as well."

# ATM system capacity and service provision

Major focus of political and public attention

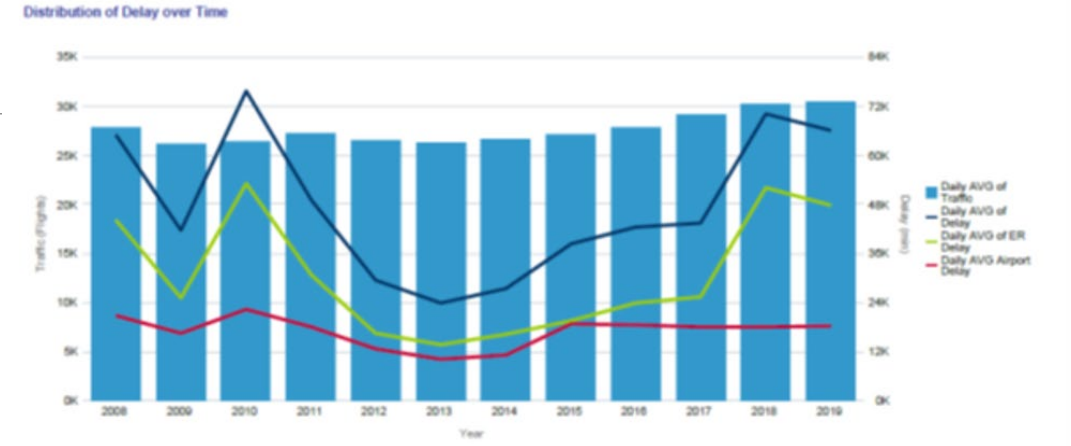
- Especially at times of high levels of delay
- high cost to airlines - passenger compensation

SES not implemented

- significant inefficiencies still not addressed

However, some very positive developments towards reduced cost, increased efficiencies and capacity enhancement

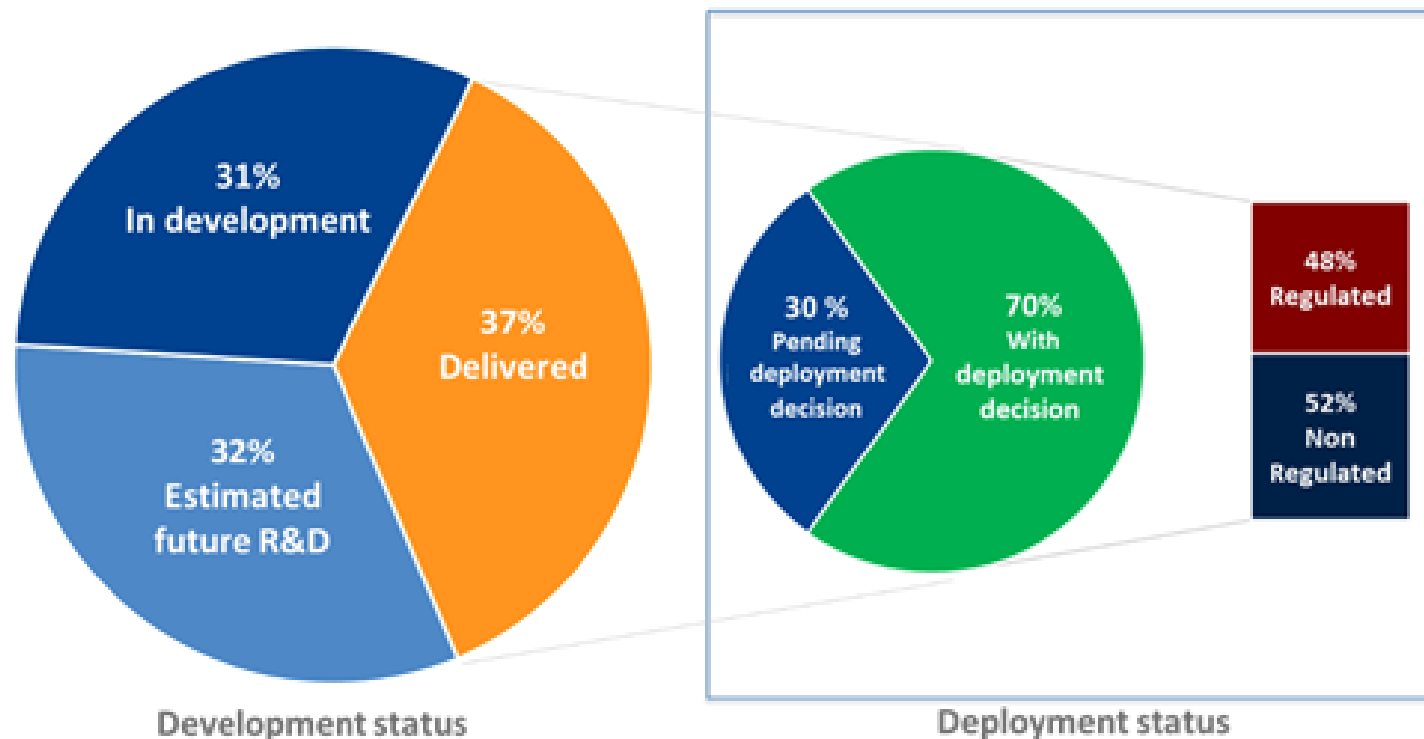
- pro-active and centrally coordinating role of the Network Manager
- free-route airspace
- controller-pilot-datalink communication (CPDLC) in upper airspace
- reduction of separation in terminal airspace
- time-based separation on approach
- more widespread and better Airport Collaborative Decision Making (A-CDM) at airports



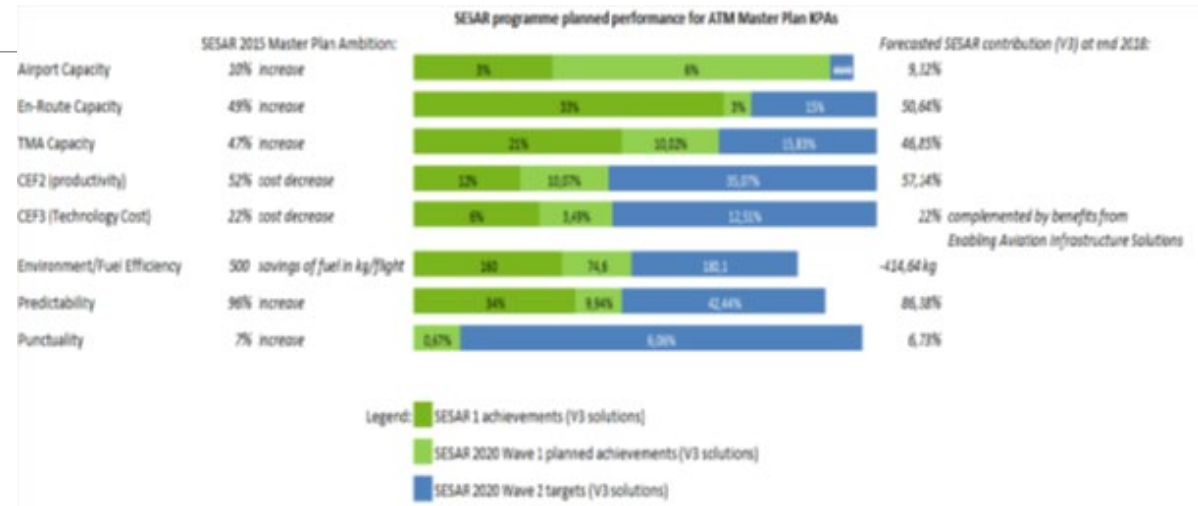
# ATM system capacity and service provision

SESAR will have delivered some 140 Solutions by 2024

- 115 ready for deployment (E-OCVM “V3” or TRL6).



# ATM system capacity and service provision



Contribution to ATM performance improvement and achievement of SES objectives

"SESAR has accelerated the pace of R&I maturity:

- in SESAR 1, a solution needed on average 10 years of development to be 'ready for deployment'
- in SESAR 2020, the average required time is 6 years." (source SESAR).

Development of the U-space concept and various R&D activities for integrating drones into civil airspace

# Aviation ground infrastructure

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Congestion creates delay, inefficiencies and lack of predictableness

- Capacity shortfall threatens many ACARE mobility goals

Progress is not satisfactory

EUROCONTROL "Challenges of Growth - 2018"

- 'By 2040 there will be 1.5m flights more in demand than can be accommodated, 8% of demand in Regulation and Growth. That is 160 million passengers unable to fly. The gap is spread across 17 States.'
- Delays 'would jump from 12 minutes to 20 minutes per flight in 2040. In particular, the number of flights delayed by 1-2 hours increases by a factor of 7, which means around 470,000 passengers each day delayed by 1-2 hours in 2040, compared to around 50,000 today.'

And this is if all airport expansion plans are realised!

- Often not performed on time or at all
- => the capacity shortfall will in fact most likely be even higher

# Changed political, social, technological, economic boundary conditions

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Many boundary conditions with relevance to the 'mobility' challenge have changed since flightpath 2050 was published in 2011.

# Changed political boundary conditions

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COP 21 decision to de-carbonise transport

New EC => changed priorities ('green deal') & research environment

Political push for electrification and zero-emission aviation by 2050

- Norway to introduce electrical regional aircraft

Improved accessibility of transport-related information

- Regulation (EU) 2017/1926: EU-wide multimodal travel information services

More political (in)stability/ protectionism/ nationalism

- effect on travel & transport demand, patterns and processes

Much more focus on "innovation" (higher TRLs / impact)

- reduced funds for exploratory research

Increased relevance of Sustainable Development Goals (SDG)



# Changed social/societal boundary conditions

## Increasing speed of societal change and (service) expectations

## Increased public pressure on aviation to reduce climate impact

- bad environmental reputation of aviation ("flight shaming")
- => higher tax levels and less acceptance of public support for the sector?

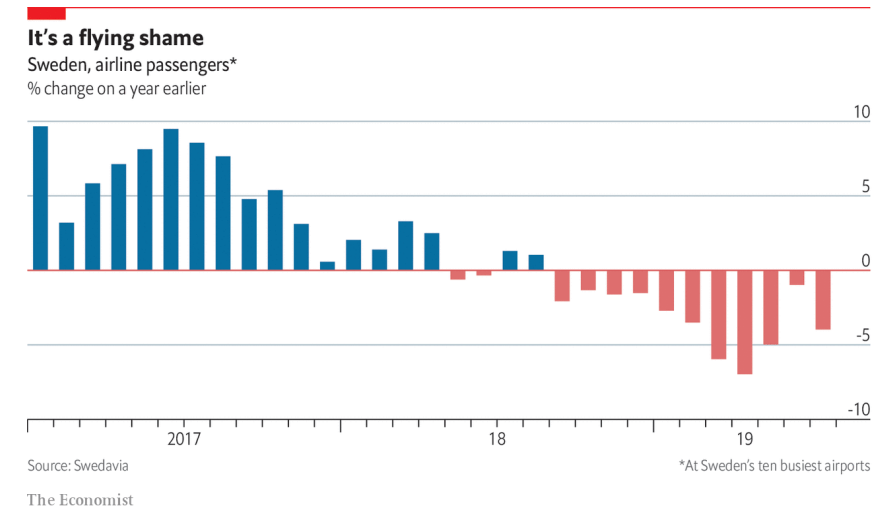
## Rise of "gig economy" supported by internet companies

- Uber, AirBnB

Much more Working-from-Home => less flying to meetings  
(Covid-19)

## Improved access to data

- => significantly "better informed" citizens





# Changed technical boundary conditions

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## Information and Communication Technology

- Cyber-security threats
  - to aircraft equipment, ATM system, airports, airlines, etc.
- Dynamic developments in
  - Computing infrastructure (incl. sensors, data sources)
  - Applications (AI, machine learning, IoT, AR/VR, etc.)
  - Data availability, management and analysis



## ATM concepts and technologies

- Free routes, sector-less ATM, remote tower services, U-space concept etc.

## Energy sources / propulsion

- Sustainable aviation fuels (SAF)
  - perhaps emission-free generation (PtL, solar jet fuel)
- Electrification / battery technology
  - Much better knowledge about the limitations of batteries in large aircraft
- Search for alternative solutions to reduce emissions (e.g. fuel cells/hydrogen)



# Changed technical boundary conditions

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## Passenger journey / experience

- In-flight internet access for passengers and use of mobile devices on aircraft
- "integrated transport platforms"
  - easier setup
  - APIs give opportunities for better stakeholder collaboration
- Rise of "self-service applications"
  - kiosks, web-based apps
- Digital identities / biometrics

## Vehicles

- Air-vehicle development
  - drones & vehicles for UAM
- Rapid progress in connected and automated transport in all modes of transport
  - automation/ autonomy, connectivity, 5G, etc.
- Regional electric / hybrid aircraft
- Quiet supersonic transport technology – United/Boom



# Conclusion

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The mobility system has evolved in the right direction

- increasing digital transformation makes cooperation between stakeholders even easier
- increasing strategic alignment of visions between transport modes
- passenger connectivity now is a given
- MaaS-model - a blueprint for realising aviation's mobility goals

Need more focus on carbon-neutral mobility systems - inside & outside aviation

- New opportunities for meeting 4-hour door-to-door goal when flights produce fewer emissions
- Probably starting with small 20-50 seater planes

A passenger-centred transport system must be

- socially inclusive and accepted
- Highly resilient and responsible for its failings
  - journey monitoring and reconfiguration
  - shared customer journey data - but GDPR-compliant

Aviation ground infrastructure need more work

- Reducing congestion and delays
- Enabling further mobility/ aviation growth
- More environmentally efficient operations

# New goals for multi-modal mobility

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Flightpath 2050 should be updated to reflect changed boundary conditions

- Goals for passenger connectivity are outdated
- Need to include future mobility models like UAM.
  - strong support if they provide a real, sustainable contribution to mobility goals

Possibility of joint mobility goals and visions (e.g. with ERRAC)

- High level of strategic convergence between transport modes

Need a strong commitment to the aviation elements of the SETRIS joint logistic vision document:

"A truly integrated transport system  
for sustainable & efficient logistics"

(and passenger-centred mobility!)