

FINAL  
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# Vision 2050

## Storyline

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# 1 Introduction

Royal Schiphol Groups' Vision 2050 is creating the world's most sustainable and high quality airports. Our Vision 2050 sets a new and aspirational goal for both our organization and the Dutch aviation industry as a whole. It provides a robust long-term ambition for our organization, despite the unprecedented covid-19 crisis we currently facing. The Vision 2050 concerns the balancing between a further strengthening of the Quality of Network, improving the Quality of Life - both locally and globally - and enhancing the Quality of Service.

Figure 1 Vision 2050



The Vision 2050 will be the starting point and guidance for our upcoming Business Plan and the new Master Plan. In addition, it serves as the point of reference for discussions with our partners and stakeholders. Against this background, we note that the Ministry of Infrastructure and Water Management published its new long-term ambition on aviation (Ontwerp Luchtvaartnota 2020-2050) in April 2020.

The Vision has been drafted based on the analysis of our current performance, thorough analyses of our future external environment and an extensive external and internal engagement process. From these building blocks, we derived our strategic points of departure/key believes that constitute the foundation of our new Vision 2050.

In this document, we firstly summarize our Vision 2050 storyline. Secondly, we explore the three Qualities on the basis of the analyses of the current performance, future trends and developments and strategic points of departure.

## 2 Our Vision 2050

If we live in 2050 and look at our performance and development over time, what would be our story? This chapter sketches a potential, desired future for the Royal Schiphol Group that represents our Vision looking back from 2050.

### Introduction

In 2050 we facilitate excellent connectivity and we operate high-quality airports, and we do so by improving the Quality of Life, both locally and globally. Amongst other things, we have played an important role in the transition towards a net-zero carbon emissions aviation<sup>1</sup> industry. We did so together with our partners inside and outside the aviation industry, while we maintained the highest safety standards. We recognized timely our responsibility towards society and future generations to tackle aviation's contribution to climate change. We believe our success in this will be crucial for the industry's license to grow and even its license to operate.

### Quality of Life

The decarbonisation of the aviation industry firstly entailed the transition of our airports to zero emissions and zero waste operations by 2030. With respect to sustainable airport operations, we have been leading by example throughout the course of time. Electrification of airside and landside transport systems, the application of circular building principles and the exploitation of our own windmills was just the start of the transition at the end of the '10s.

By mid-century, we have achieved a net-zero carbon emissions aviation sector. Airlines use sustainable aviation fuels (including synthetic fuels) at a very large scale, due to significant innovation efforts, government funding and a frontrunner role of the Netherlands and other European countries in the Sustainable Aviation Fuels industry. The costs of aviation for the environment are largely reflected in ticket price through a single global carbon pricing scheme (internalization of external costs), after a rather long transitional period with a hybrid regime of (voluntary) offsetting (such as CORSIA), fuel mandates, fuel taxes, aviation taxes and regional cap and trade systems such as ETS. Proceeds from carbon pricing have been used to facilitate the sustainability transition in the aviation industry.

Our airports are multimodal hubs. For travel to the large North-western European cities, high frequent, high speed train services are the dominant mode of transport. The first Hyperloop track is operational. Although still small in volume, the use of hybrid and electric aircraft on short-haul routes is quickly on the rise. Our airport infrastructure has been adapted for the transition towards electric and hydrogen flying. Consumers choose responsibly when travelling. And although many experts were highly sceptic about the stalled Single European

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<sup>1</sup> A net-zero emission aviation sector refers to a situation in which the aviation sector releases no CO<sub>2</sub> emissions, either because it does not produce any or because it captures the CO<sub>2</sub> it produces to use or store. In this situation, there should be almost no use of offsets from other sectors, which should be used only to compensate for remaining emissions from leakages at the carbon capture level or for uncontrollable end-of life emissions (Source: Energy Transitions Commission 2018).

Sky initiative in the early 2020s, European airspace modernization was eventually taken forward, resulting in a much more efficiently organized airspace.

The impact of aviation on the local living environment around our airports has been significantly reduced. Noise disturbance (Ernstig Gehinderden) was reduced by 75%-90% compared to 2020. Not only because of new generations of aircraft, ATC procedures, fleet renewal and clean landside access but also because of our moderate and controlled growth strategy in which annual noise emission reductions outpaced traffic growth. The concept has been followed up throughout the world. Investments in heavily noise-affected areas were made in order to reduce noise-hindrance. In addition, investments in local communities around our airports are still ongoing, as we believe that these local communities should participate in the benefits that aviation brings.

### Quality of Network

The strong focus on Quality of Life provided the opportunity to continue improving the Quality of Network. Due to the continuous, concrete and credible steps in improving the Quality of Life over the years, we were able to grow the capacity at our airports in a controlled manner. This allowed us to accommodate at least part of the ever-growing demand for international mobility and cargo. Because of the growing scarcity in airport capacity, we followed an airport system approach in order to use the scarce Dutch airport capacity as efficiently as possible. The new European Slot Regulation that was finally adopted in the early 2020s gave congested airports more possibilities to prioritize slot use based on socio-economic and environmental grounds. Average aircraft size has increased in response to capacity constraints.

In 2050, we still connect the Netherlands to over half of worldwide GDP with direct flights and have remained one of Europe's leading freight hubs. Schiphol belongs to the top connected European airports - "Connecting your world". As such, we are able to deliver the social and economic benefits of connectivity to Dutch society and sustain the Netherlands' position as one of the primary global economic regions. The role of Schiphol in the economy has evolved from a 'mainport' driving the growth of jobs, GDP and logistics, to an airport that is an essential element for the Netherlands to compete as a Global City Region. International connectivity is a necessary condition for the Dutch economy to prosper, alongside other factors such as the quality of human capital, quality of the living environment, landside infrastructure and stable institutions.

In 2050, the hub operation is a strong pillar for our excellent connectivity performance. The hub airline business model evolved over time. Other airline business concepts such as self-connect, low-cost hubbing and long-haul low-cost gained more importance. Urban air mobility and autonomous vehicles complement the travel options offered for the last mile. Air travel is a fully integrated part of a seamless, multimodal passenger journey, in which tech companies and platforms play a central role.

We realized a moderate and controlled growth path. After recovering from the unprecedented impacts of the covid-19 crisis in the early 2020s, we developed the connectivity of our airports in a step-wise manner, conditional on environmental gains. The maximum physical capacity of the Schiphol-location was reached in the late 2030s. The notion that this capacity 'cliff-edge' would be reached well before 2050, resulted in a strategy to use the capacity at Schiphol and our other airports as efficiently as possible. This was made possible through an adjusted slot regime as well as through various operational measures and non-

asset solutions. In addition, the timely anticipation of the cliff edge at Schiphol by all stakeholders provided enough time to assess the various options, including an island in the North Sea, an airport system approach, redesign of the current runway system and a stand-still. This facilitated the subsequent political decision-making process that supported the investments needed to sustain the socio-economic contribution of aviation to the Netherlands.

### Quality of Service

We offer an excellent Quality of Service. As a globally leading airport group, our Passenger Journey is seamless and we inspire via highly personalized and memorable experiences. Traveling via our airports is still as secure as ever before, but mandatory security touchpoints have largely disappeared. Our airports are a stress-free and healthy environment for everyone, not just to the frequent travellers. Although our efficient processes no longer require them to, passengers still enjoy spending time at our airports, where they can find a pleasant atmosphere and an experience that is customized to cater for their individual needs. In a world where the necessity of human interaction has almost completely disappeared and touchless technology is the standard, we distinguish ourselves through our people, who 'go the extra mile' to make passengers feel welcome and valued.

Meanwhile, our Airline Journey is still highly attractive because of the high value for money and efficiency they are offered at our airports. Through innovations, early adoption of new technologies and extensive use of data, our airport processes are largely self-running. We gradually evolved to autonomous operations in parts of the airport process (like ground support equipment movements), in which artificial intelligence and robotics play a central role.

Our vibrant Airport Ecosystem accelerates innovation and boosts the local business climate and knowledge economy. Our airports are a place where travellers, businesses, students and research institutions can connect, enabled by our smart and connected real estate. High passenger satisfaction levels form a solid foundation of healthy revenues from our commercial activities. In addition to further strengthening our 'traditional' business models, we are actively exploring and stepping into new business models and platforms, first and foremost in the area where physical airport infrastructure and digital travel solutions come together.

Our intensified international alliances and participations in various world regions are another backbone of our position as a financially healthy and resilient organisation. They provide us with the opportunity to add to the strength of RSG's financial position, creating the ability to finance our ambitions and reduce risk. In addition, our international activities bring significant learning opportunities across our group of airports and allow us to deliver better products and services.

### About this Vision document

The above text describes a desired future for our Vision 2050, with Quality of Network, Quality of Life and Quality of Service as the cornerstones of the Vision and safety and a robust organization being the essential enablers.

We believe that by building on the three qualities, the Vision 2050 will guide our organization and the entire aviation industry through the challenging period that lies ahead of us. A period in which we will push our limits and be a frontrunner, as we have done so many times before. All this so that we can continue to do what we do best: "Connecting your world". As such, the

Vision 2050 will provide a robust framework for the future and starting point for our new Business Plan and Masterplan.

We believe that to be able to develop a vision for the future, it is important to understand where we stand today and what might happen in the future. The foundation of our Vision 2050 is a detailed analysis of our current performance and of key trends and developments that are already emerging today and are to play an even more important role in the aviation industry of tomorrow.

Based on our extensive assessment of our current situation, key trends and developments (see Box 1), the formulation of key believes as well as the insights derived from internal and external engagement, we formulated our Vision 2050, as shown in Figure 1.

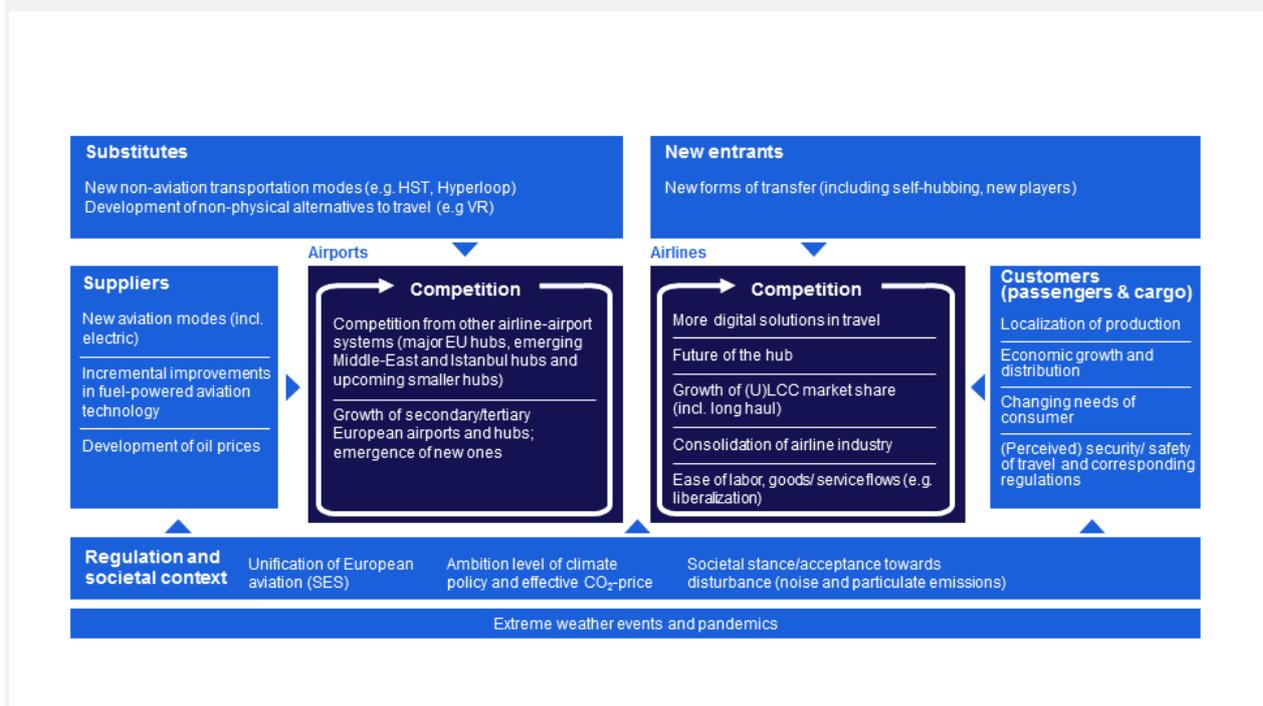
In the remainder of this document, we will elaborate the three Qualities and enablers. In addition, we will discuss our current performance, underlying trends/developments and strategic points of departure.

### Box 1: Key trends and developments

An important part of the underlying analyses that were carried out for the Vision 2050 entails a thorough analysis of the potential trends and developments that may affect our position and that of the aviation industry in general.

We identified 22 majors trends that are most likely to shape the airport business of the future. The trends relate on the one hand to the airport and airline business, including developments such as the digitization of the passenger and airline journey (including platformization), evolving airline business models, consolidation, competition from inside and outside the aviation industry (e.g. new transport modes) and aviation technology. On the other hand, the trends and developments relate to the broader society. Here, we find trends and developments such as the development and distribution of economic growth, global pandemics, the perceived security and safety of aviation, changing needs of consumers and the societal stance towards the environmental effects of aviation.

Figure 2 Major trends that could shape the airport business in the future

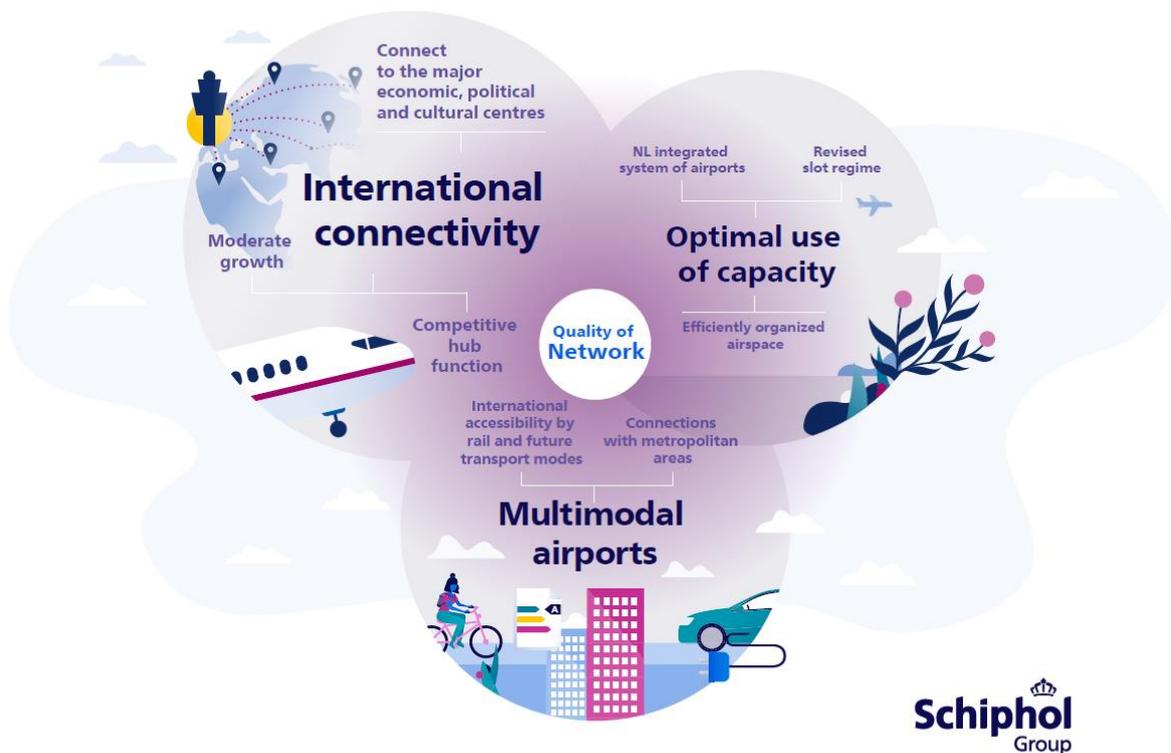


## 3 Quality of Network

### 3.1 Quality of Network: Outstanding connectivity

We will continue to develop our network in order to maintain outstanding connectivity to the major economic, political and cultural centres in the world. In this way, we “connect your world”.

Figure 3 Quality of Network



A moderate and controlled growth path is needed to connect the Netherlands directly to half of global GDP and to rank among the top connected European airports. Moderate growth will allow the hub at Schiphol – a key pillar for an excellent connectivity performance- to develop and to remain competitive. Given the shift of economic gravity towards the East, this includes the further strengthening of the Asia-Pacific connectivity.

To optimise the use of available capacity –which is likely to remain scarce in the future- Dutch airports should be operated in an integrated manner, through an airport system approach. In addition, we are incentivising and advocating the substitution of short-haul air traffic to sustainable landside modes like train. We will also advocate for a new European Slot Regulation with more possibilities to allocate slots at highly congested airports according to their socio-economic value to increase the optimal use of scarce capacity.

Furthermore, we advocate for regulations that ensure a minimum level of full-freighter operations at Schiphol, which are an essential part of the Quality of Network<sup>2</sup>.

Given the value we attach to quality of life and our concern for the living environment, we advocate a moderate path of growth that is below underlying market demand growth. As a consequence, airport capacity will become scarcer and this could potentially lead to higher costs for consumers as airline might increase ticket prices, the network may become somewhat less diverse, but is still sufficient for excellent connectivity and a strong hub position.

### 3.2 Key believes

The Quality of Network pillar of the Vision 2050 has been based on a number of strategic premises/ key believes, that were derived from an extensive analysis of our current and future environment (section 3.3 and 3.4):

- In a globalized world, connectivity by air is key for welfare and well-being.
- The demand for aviation will continue to grow in the Netherlands, in Europe and on other continents despite the impacts of the covid-19 crisis. We expect a gradual shift of the gravity of growth towards the emerging economies, in particular in Asia.
- Airport and airspace capacity in Europe and the Netherlands will become increasingly scarce, as capacity will not be able to keep pace with demand, due to physical limitations and environmental policies.
- The share of passengers travelling on point-to-point flights will increase gradually, but this will not render the hub-and-spoke model obsolete. In contrast, hubs will continue to play an essential role in connecting the vast majority of markets, and they will continue to generate a connectivity premium.
- A minimum level of full-freighter operations is essential for a strong cargo market place and the overall Quality of Network. Without a full-freighter network, Schiphol will become less attractive for freight forwarders. A strong cargo market place contributes again to the profitability of long-haul passenger-belly operations.
- Moderate capacity growth is a prerequisite for the hub at Schiphol to stay competitive and to connect the Netherlands directly to over half of worldwide GDP.
- New transport modes (e.g. Hyperloop, drones and unmanned aerial vehicles) and other modalities (e.g. high-speed trains and self-driving cars) will affect travel to and from airports, but aviation will remain the dominant mode of transport for medium-haul and long-haul distances.

### 3.3 Current performance Quality of Network

#### Connectivity is key

By facilitating connectivity, Royal Schiphol Group contributes to social and economic welfare in the Netherlands and beyond.

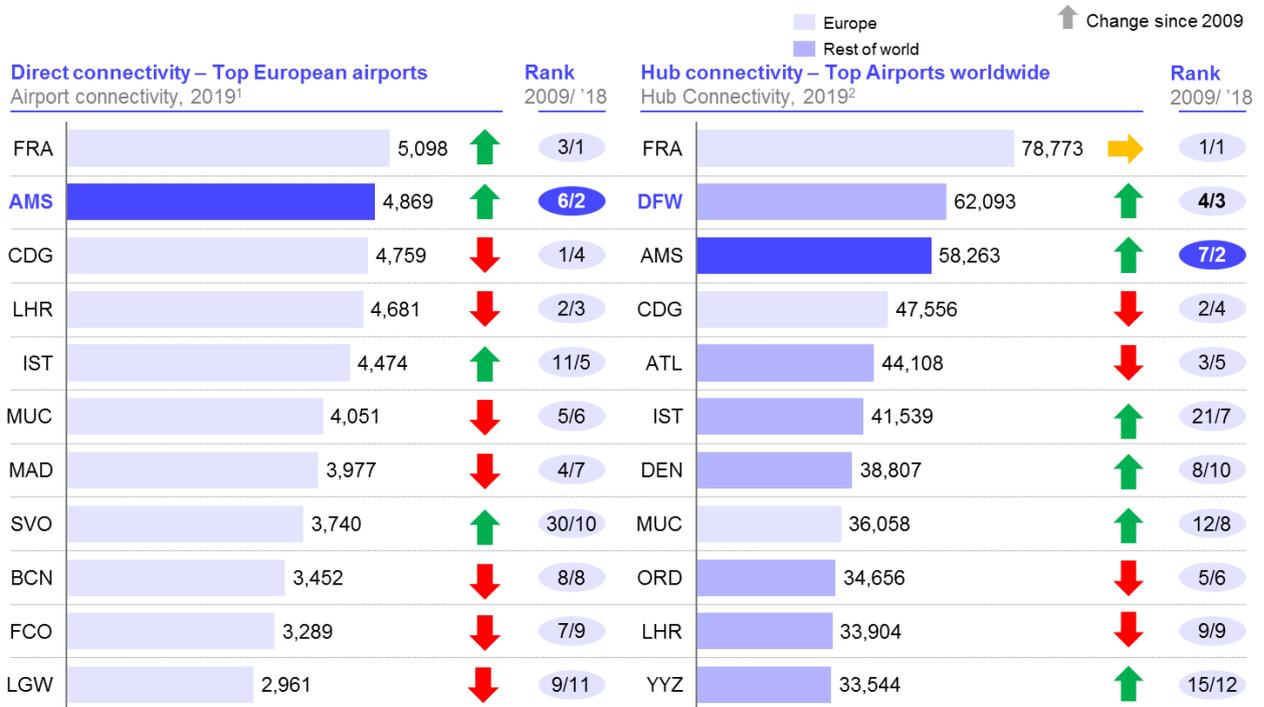
International connectivity is key to competitiveness in today's globalised society. Connectivity contributes to an attractive business climate and stimulates productivity and employment,

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<sup>2</sup> The roadmap towards realizing these and other targets for cargo has been elaborated in the Cargo Strategy.

while minimising travel costs for consumers and generating welfare benefits, as many social cost-benefit analyses on aviation have demonstrated.

Figure 4 Schiphol ranks second in terms of direct connectivity<sup>3</sup>



The connectivity at our airports contributes significantly to the open and internationally orientated Dutch economy, both at the national and regional level. We can look at this economic contribution through three lenses:

- Independent social-cost benefit analyses indicate a net positive welfare impact of connectivity growth on welfare in Dutch society. These analyses also take into account the direct and external costs of aviation growth (e.g. noise impacts, CO<sub>2</sub> emissions).
- Estimates on the economic contribution vary between 113 and 370 thousand jobs and €9-27 billion of Dutch GDP, depending on the year of study, Dutch airports taken into account and type of economic linkages considered.
- At the regional level, good connectivity by air opens up opportunities for knowledge exchange and innovation, increases productivity, sustains trade and stimulates tourism. For example, academic research has shown that a 10% growth in long-haul connections translates into a growth of 4% in headquarters located in European metropolitan areas, all other things being equal<sup>4</sup>. Furthermore, a 10% growth in connectivity is associated

<sup>3</sup> ACI EUROPE (2019). Airport Industry Connectivity Report.

<sup>4</sup> Bel & Fageda (2008), Getting there fast. Globalization, intercontinental flights and location of headquarters. Journal of Economic Geography.

with a 0.23%-0.5% growth in productivity<sup>5</sup> <sup>6</sup>. Moreover, one third of Dutch GDP depends on foreign markets, while business services –which heavily depend on international contacts- are the largest category in Dutch export services.

### The role of airports in the regional economy

Despite that connectivity clearly is key to competitiveness in today's globalized society, we note that the relationship between aviation and the economy in mature metropolitan regions has become more bi-directional. More than in the past, aviation connectivity is a necessary rather than a sufficient condition for large, mature metropolitan areas to thrive economically in a global context. Other factors such as human capital and quality of the living and working environment have become more important factors for the attractiveness of global city regions<sup>7</sup>, besides excellent international connectivity.

As such, in particular Schiphol's role in the economy has evolved from being the primary engine of job and GDP growth ('mainport'), to an essential and integrated element of the global competitiveness of the Dutch global city region, alongside other factors such as human capital (e.g. a highly educated labour market), and quality of living and working environment, strong institutions and excellent landside infrastructure. Box 3 describes the (envisioned) evolving role of Schiphol in the global, national and regional economy.

### Box 2: the evolving role of Schiphol in the global, national and regional economy

North-western Europe (the London-Paris-Frankfurt-Amsterdam area) is Europe's economic core. The Dutch urban system, and Amsterdam in particular, is well positioned in Europe's economic core partly because of the international connectivity provided at Schiphol. By improving the connectivity between the (major) cities in Northwest Europe by rail, a more coherent North-western European metropolitan system can be created. Improved fast and reliable train connections (HST) within this region will benefit its competitive power vis-à-vis other global city regions such as New York, London and Tokyo. Furthermore, it enables substitution from plane to train.

At a lower spatial scale, Schiphol is part of the spatial economic development of Amsterdam. The close proximity of the airport to the business centre (Zuidas) is a unique feature in international comparison. Locating the Amsterdam HST station in this corridor and extending the metro to the airport will further improve the accessibility and competitiveness of the region. It will make the airport corridor 'Enter NL'<sup>8</sup> a unique development opportunity as the international spatial-economic entrance to the Netherlands.

With its AirportCity, Schiphol contributes to the competitiveness of the Amsterdam metropolitan region by offering a unique environment for working, meeting and exchange. There is potential for further development of the AirportCity as a micro metropolis in itself, combined with a second terminal area.

#### Global supply chains and air cargo

European logistics, are also concentrated in North-western Europe with Noord Brabant and the north of Limburg as one of the main centres. Schiphol is an integrated part of this system.

The relevance of logistics for the economy of the metropolitan region seems to be diminishing. Air cargo and its related logistics are mainly of strategic importance to some Dutch economic sectors (e.g. High tech, perishables &

<sup>5</sup> In terms of GDP/capita. Source: InterVISTAS (2015). Economic impact of European airports. A critical catalyst to economic growth. Study prepared for ACI EUROPE; SEO (2015). Regional economic impact of airports. Final report; AitBihiOuali et al. (2020). Do changes in air transport affect productivity? Regional Science Policy & Practice (*forthcoming*).

<sup>6</sup> Within the context of economic growth in Europe, the contribution of connectivity to productivity is very important given. European countries' poor demographics (ageing of population). Source: Pearce (2019). Challenges for European air transport. Wings of Change, 19 November 2019.

<sup>7</sup> See for example, Van de Vijver et al. (2014). Air passenger transport and regional development: Cause and effect in Europe.

<sup>8</sup> [https://samenbouwenaanbereikbaarheid.nl/application/files/7515/4816/4824/ENTER\\_NL\\_Ambitie\\_en\\_urgentie.pdf](https://samenbouwenaanbereikbaarheid.nl/application/files/7515/4816/4824/ENTER_NL_Ambitie_en_urgentie.pdf)

flowers). Logistic parties and forwarders that serve these sectors also use other cargo airports in North-western Europe. Which airport they choose is a trade-off between transportation cost, available connections and amenities and services offered. In the Amsterdam region logistics are crowded out.

Yet, air cargo will remain of crucial importance to Schiphol. It fulfils a strategic role for the Netherlands. There is a risk of reducing space for logistics and level of full-freighter movements at Schiphol under a minimum threshold that is required for healthy air cargo market at Schiphol (which in itself is essential for Schiphol's long-haul connectivity). Hence, a minimum amount of space should be strategically reserved for these functions. A minimum level of full-freighter operations is essential for a strong cargo market place and the overall Quality of Network.

#### Tourism

Amsterdam has gained a strong position as a tourist destination and as a centre for business meetings and events. Yet, the city seems to have reached a point of saturation. The Dutch tourism sector has the ambition to spread visitors more equally over different parts of The Netherlands, and if possible, over different times of the year. Business meetings (and academic meetings) remain important to host in the Amsterdam area as they are integrated part of its knowledge economy. The advantage of the network of Schiphol for this segment is more apparent than for tourism, as is the proximity to the airport for a meeting or event.

### Connectivity performance of Royal Schiphol Group

We can be proud of the outstanding connectivity performance of our airports (Figure 4) up to March 2020 when the covid-19 crisis marginalized connectivity at Europe's airports. In 2019, Amsterdam Airport Schiphol occupied a second place among all European airports in terms of direct connectivity (increased from a sixth place in 2009), and we are ranked third globally in terms of hub connectivity (sixth place in 2009). Within Europe, Schiphol ranked as the third cargo airport in terms of volume. As a result, Schiphol connected the Netherlands directly to about 80% of Europe's GDP and to over 50% of the world's GDP (Figure 5). Yet, the 500k movement cap was negatively impacting the connectivity performance: Schiphol lost its first position in direct connectivity to Frankfurt in 2018.

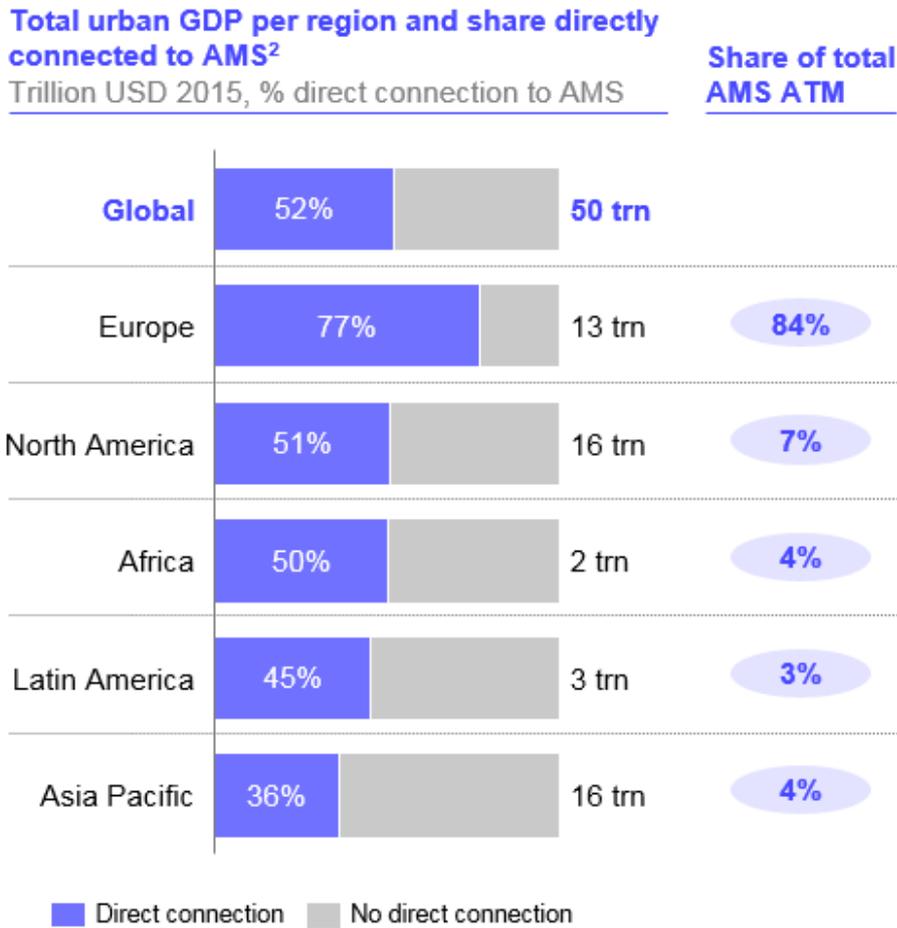
#### Box 3: Covid-19 and connectivity

The covid-19 crisis marginalised the connectivity of Europe's major airports in the 2<sup>nd</sup> quarter of 2020 to around 85% of the 2019 levels due to border closures, travel restrictions, quarantine measures and health risks. According to various industry and expert outlooks, we may expect a gradual recovery reaching 2019 traffic and connectivity levels again between 2021 and 2024.

The rate and timing of recovery is very uncertain, depending not only on the lifting of travel restrictions, but also on the depth and length of the economic recession, consumer confidence in air travel, the longer term impacts of videoconferencing and teleworking on business travel and the changes in the airline industry structure. Uncertainties also relate to the rate to which the aviation industry is able to decarbonize and achieve its sustainability ambitions.

For the longer term, it is expected that demand for air travel will continue to grow, although the industry may see changes in its structure and regulation that will have long-lasting impacts.

Figure 5 Schiphol directly connected to 52% of global GDP<sup>9</sup>



All the airlines contribute to the excellent connectivity at our airports. Yet, it is the hub operation of KLM and its SkyTeam partners that provides the Netherlands with a connectivity premium, due to the consolidation of transfer and local demand at the Schiphol hub. In particular, our long-haul network is much larger than would have been feasible based solely on the potential of Schiphol's home market of 12 million inhabitants within a 100km radius.

Without the hub operation, the network at Schiphol would be up to 40% less connected in terms of European and intercontinental frequencies, while at the same time the number of intercontinental destinations would decrease substantially as well<sup>10</sup>. Full loss of the hub function would result in annual welfare losses valued at up to €0.6-€1.1 billion per annum<sup>11</sup>. Airports that lose their hub function are not likely to regain their hub function<sup>12</sup>.

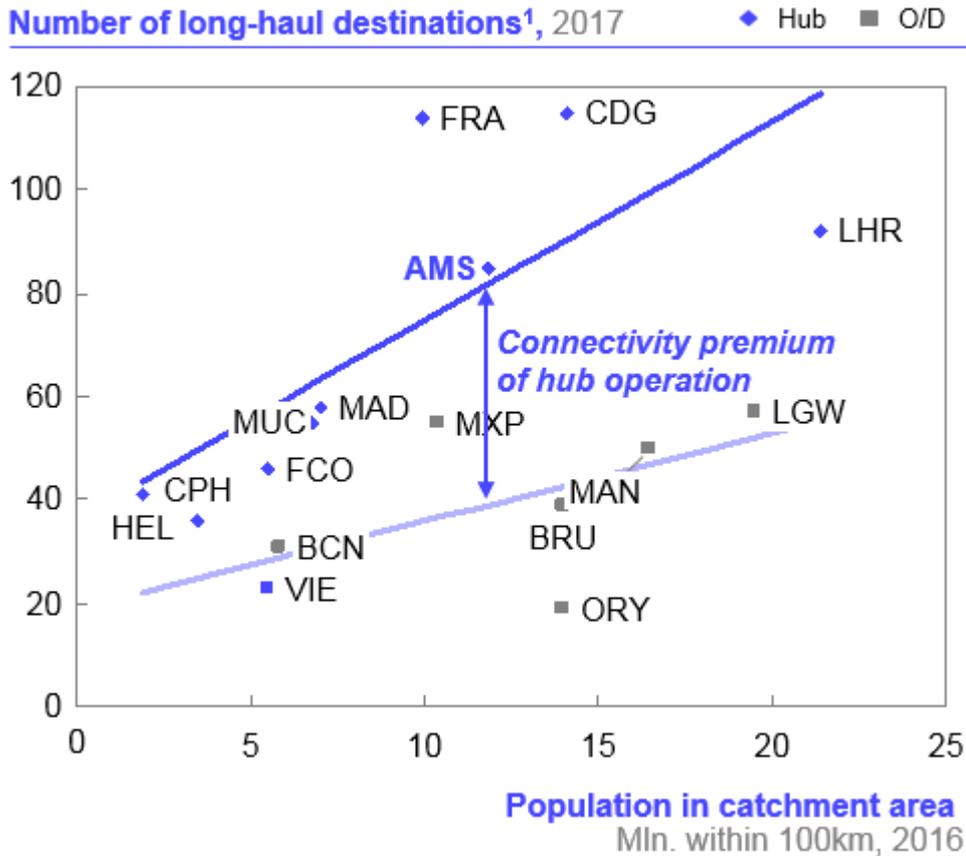
<sup>9</sup> Team analysis

<sup>10</sup> Estimates of number of routes lost range between a reduction of 16% to 30%. In particular long-haul routes will be affected. Source: SEO (2015). Economisch belang hubfunctie Schiphol

<sup>11</sup> SEO (2015). Economisch belang van de hubfunctie van Schiphol. SEO rapportnr. 2015-22; University of Bergamo/ICCSAI (2019). Measurement of quality of network from a welfare perspective.

<sup>12</sup> Redondi et al. (2012). De-hubbing of airports and their recovery patterns. Journal of Air Transport Management.

Figure 6 Hub function at Schiphol generates a connectivity premium<sup>13</sup>



### 3.4 Key trends and developments influencing Quality of Network

#### Economic growth and demand for aviation

GDP is a core driver of aviation growth. Expected worldwide GDP growth will potentially result in a doubling of the global demand for aviation over the next two decades<sup>14</sup>, with a shifting geographical focus of growth towards the emerging economies. Furthermore, economic growth will continue to be concentrated in a limited number of global city regions throughout the world, the 'command and control centres' of the global economy, facilitated by ongoing urbanization and a growing middle class.

Although there is much uncertainty regarding future air traffic volumes at Dutch airports, forecasts of the CPB/PBL WLO scenarios indicate that Dutch unrestricted aviation demand will increase to approximately 130 to 200 million passengers in 2050<sup>15</sup>. These passenger numbers would theoretically require between 800 thousand to 1.2 million air transport movements for all Dutch airports, according to the aforementioned WLO scenarios. These numbers concern

<sup>13</sup> OAG; SEO Airport Catchment Area Database; scheduled passenger flights only, to destinations >6 hours of flying time. Annualized data for 2017. Source: Team analysis.

<sup>14</sup> Airbus (2019). Global Market Forecast 2019-2038. Cities, airports and aircraft; Boeing (2019). Commercial market forecast 2019-2038.

<sup>15</sup> Significance & To70 (2019). Actualisatie AEOLUS 2018 en geactualiseerde luchtvaartprognoses. Rapport voor Ministerie van Infrastructuur en Waterstaat; CPB & PBL (2016). Mobiliteit Luchtvaart. Achtergronddocument. Toekomstverkenning 2030 en 2050.

the potential underlying, unrestricted aviation demand and not the demand that will actually be accommodated at the Dutch airports (the 'constrained demand'). It is unlikely that we can and want to accommodate all underlying demand growth. Despite the covid-19 crisis, many experts expect the growth of aviation demand to continue in the decades ahead.

Forecasted demand in various scenarios is much higher than today's passenger numbers. Yet, the annual demand growth needed to get there would fall well below the growth seen in the last two decades. Whether demand moves towards a low or high growth scenario will amongst other things depend on economic growth, demography, availability of (Dutch) airport and airspace capacity, the price of aviation (including the extent to which ticket prices reflect the external costs of aviation), regulation of incoming tourism flows, growth in aircraft size, social acceptance of flying and the availability of other modes of transport as substitutes for short haul aviation.

#### **Demand for air cargo**

Driven by economic growth and a rapidly growing cross-border e-commerce market in particular, demand for air cargo will continue to increase globally. We expect global cargo volumes to grow by 250% towards 2050, with an increasing share of cargo transported in the belly of passenger aircraft.

Schiphol currently is a major cargo hub and it is our ambition to sustain this position. In line with the global trend, we expect that growth in volumes will mainly be accommodated as belly cargo.

Nonetheless, we believe that full freighter cargo operations are key for a healthy cargo business at Schiphol as they provide us with the required capacity and flexibility to remain an attractive hub for all players in the air cargo value chain. In the wake of a prolonged period of capacity scarcity, finding the right balance between accommodating part of the increasing demand for passenger aircraft whilst maintaining sufficient full freighter movements will be essential. Furthermore, being an attractive cargo hub contributes to the profitability of passenger-belly operations on long-haul routes.

#### **Social-cultural trends and demand for aviation**

Within society, there is an increasing awareness regarding aviation's impact on climate change. The growing awareness translates into flight shame when potential travelers decide not to travel anymore or choose a different transport mode for environmental reasons.

Until recently, this had no or only limited impact on the demand for aviation. However, early 2019, Sweden has seen a decrease in aviation demand, of which at least part the reduction is said to be caused by growing environmental awareness or flight shame. Based on a survey among 6,000 respondents, a study by UBS<sup>16</sup> finds that a growing share of travelers in European countries reduced air travel in the previous year based on environmental grounds. The same study concludes that, although the demand for international mobility keeps growing,

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<sup>16</sup> UBS (2019). Consumers' climate awareness on the rise; assessing the impact on traffic and planes demand. UBS Global Research, 30 September 2019.

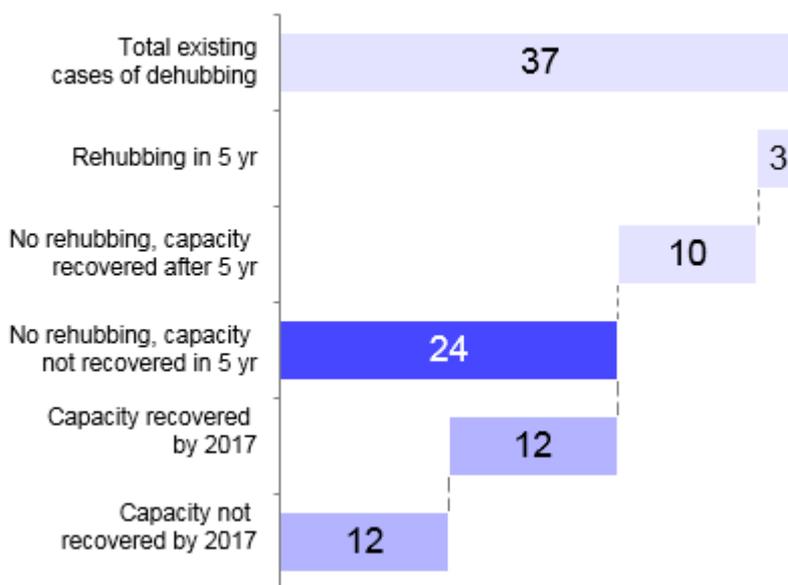
changing perception and flying habits may have a downward impact on the current growth outlooks for the aviation industry in the longer run.

**Future of the traditional hub model and growth of low-cost market share**

Hubs are likely to remain essential for connecting all the dots on the map in the long term: most of the world’s city pairs do not have enough origin destination demand to be connected with a direct flight. Hub airports – being the consolidation points where airlines aggregate these traffic flows and combine them with local demand - are essential to connect these places. With hub airports being there to stay, this also means that the local markets of these hub airports will continue to profit from the ‘connectivity premium’ that hubs generate, meaning that the local O/D market of a hub airport has significantly more direct connections at its disposal than would have been feasible in the absence of a hub operation.

**Figure 7 Most ‘dehubbed’ airports did not regain hub status<sup>17</sup>**

**Cases of airport dehubbing prior to 2009, number of airports (n=37)**



Case examples show that the loss of the hub status has a significant negative impact on the connectivity of these airports. Furthermore, only very few airports managed to regain a hub status after initial ‘dehubbing’ and growth rates are significantly lower than at airports that remained hubs<sup>18</sup> (Figure 7). The number of European and intercontinental frequencies at Schiphol could be reduced by 40% in a scenario of ‘dehubbing’<sup>19</sup>. These insights underline the importance of maintaining the hub function at Schiphol towards the future.

Various trends indicate the possibility of a very gradual (not radical) increase in the share of point-to-point travel, at the expense of the share of travel via hubs (indirect travel). These trends include the further growth of point-to-point carriers, increasing capacity constraints at

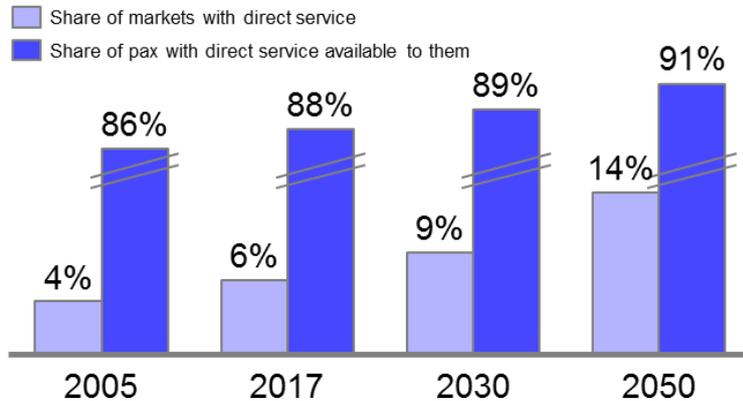
<sup>17</sup> Redondi et al. (2012). De-hubbing of airports and their recovery patterns. Journal of Air Transport Management.

<sup>18</sup> Redondi et al. (2012). De-hubbing of airports and their recovery patterns. Journal of Air Transport Management.

<sup>19</sup> SEO (2015). Economisch belang van de hubfunctie van Schiphol. SEO reportnr. 2015-22.

European hub airports, market growth and new aircraft technology. Nevertheless, hubs are likely to remain indispensable as nodes in the future worldwide aviation network (Figure 8).

**Figure 8 Share of airport-pair markets from/to European airports with direct service and share of passengers at European airports with direct service<sup>20</sup>**



Yet, we may expect competition for the transfer passenger to increase further, due to rise of new mega hubs (for example in the Middle East and Turkey), niche hubs (such as Dublin and Helsinki) and bypassing of the traditional major hubs with direct flights. It is not only the development of new hubs, but also the growing capacity constraints at the major hubs that may give room to the development of new competitors.

In addition, new hub concepts like self-connect and low-cost carriers engaging in quasi-hubbing activities as well as long-haul flights, facilitated by platforms and digitization, may deliver new opportunities for our airports (new routes, frequencies). According to research, the potential of self-hubbing is substantial: about two thirds of the potential fastest indirect connections between European airports involve airlines that currently do not have a cooperation agreement<sup>21</sup>. On the other hand, self-connect, low-cost hubbing and long-haul low-cost are also likely to increase competitive pressure in the transfer and OD markets.

The current competitive position of Schiphol as a hub is strong on various key success factors, but competition is likely to increase, in particular when capacity will remain scarce (Figure 9).

Although the quality of airport services is gaining importance as a factor determining the competitive position of a hub, most choice factors for transfer passengers (e.g. airfares) are beyond the direct control of the airport.

With respect to delivering direct connectivity, low-cost carriers play an increasingly important role within Europe. In 2017, low-cost carriers provided almost half of the scheduled seats in Europe and are slowly making their way into the long-haul and business segment (Figure 10). These developments provide opportunities for airports across Europe, but will also put pressure on the profitability of the hub operations of major carriers.

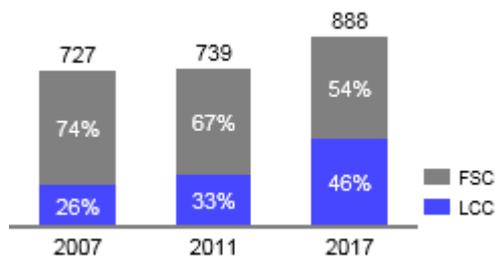
<sup>20</sup> Team analysis

<sup>21</sup> Cattaneo et al. (2018). Evolution of the European network and the implications for self-connection. Journal of Air Transport Management.

Figure 9 Comparison of Schiphol with selected European hub airports on key hub success factors<sup>22</sup> (ranking)

	Catchment area (*mln. inhabitants <100km)	GDP/capita (*€1000) (<100km)	Workforce employed in high-tech or knowledge intensive sectors	WEF 2019 global competitiveness score (country)	Peak-hour capacity (global; movements per hour)	MCT (mins.; main carrier)	ASQ score transfer quality	Airport charges level (total 2018; 1=lowest)
AMS	3	4	4	1	2	4	3	1
CDG	2	1	2	4	1	6	6	3
FRA	4	5	6	2	3	2	-	5
LHR	1	3	1	3	6	3	4	6
MAD	6	7	3	5	4	5	5	2
MUC	5	2	7	2	5	1	2	4
FCO	7	6	5	6	5	2	1	-

Figure 10 Share of low-cost carriers within Europe (million one-way seats)<sup>23</sup>



### The future of the Schiphol hub

Air France-KLM and partners have the largest operation at Schiphol and generate a connectivity premium by operating a global hub. Since the merger of Air France and KLM in 2003, Schiphol is part of the multi-hub system of Air France-KLM at Paris CDG and Schiphol.

Looking at the past 15 years, the multi-hub system of Air France-KLM developed successfully and Schiphol did well within this network. Generally speaking, both hubs serve large long-haul and short-haul markets directly. A specialisation mostly occurs in smaller markets, depending on geography and the size of the local origin-destination market.

Capacity constraints have proven to be a major driver of multi-hub development in other multi-hub airline networks, as well as the performance of hubs in general. Hence, moderate growth in peak-hour (or other) capacity will be a key factor for the future position of Schiphol as a hub. Moderate capacity growth gives the opportunity for the hub carrier to stay competitive in the highly contested transfer market and further develop its scale.

<sup>22</sup> SEO Airport Catchment Area Database v1.5; WEF (2019). The global competitiveness report; SEO (2018). Airport charges at Schiphol Airport; ACI World ASQ; Eurocontrol Airport Corner; Team analysis

<sup>23</sup> Team analysis

### New non-aviation modes and transport systems

New modalities (e.g. Hyperloop, drones and unmanned aerial vehicles) will pose challenges and opportunities for airports, both on airside and landside. While aviation will remain the dominant mode of transport for medium-haul and long-haul distances, there are promising alternatives for short haul flights, such as high speed rail and self-driving cars. Moreover, new technologies already affect landside access of the airport. Mobility platforms (such as Uber, Lyft, Car2Go) alter our passengers' first and last miles.

In the future, we expect to see the rise of autonomous vehicles (possibly in combination with car sharing) for short distances within urban areas. These new developments in transportation are complemented with additional policies and regulations from national and regional governments to move towards more robust and sustainable mobility systems. Such shifts and developments will have a substantial impact on RSG (spatial) planning activities.

Figure 11 The evolving transport system



## 4 Quality of Life

### 4.1 Quality of Life: We care about people and the planet

We focus on improving the quality of the living environment, both locally and globally.

We acknowledge our responsibilities towards our neighbours and all people who are involved in or affected by our operations, as well as future generations. Our focus on quality of life will ultimately reinforce the quality of network, as we believe it is essential for our license to grow and operate and contributes to an attractive international business and living climate.

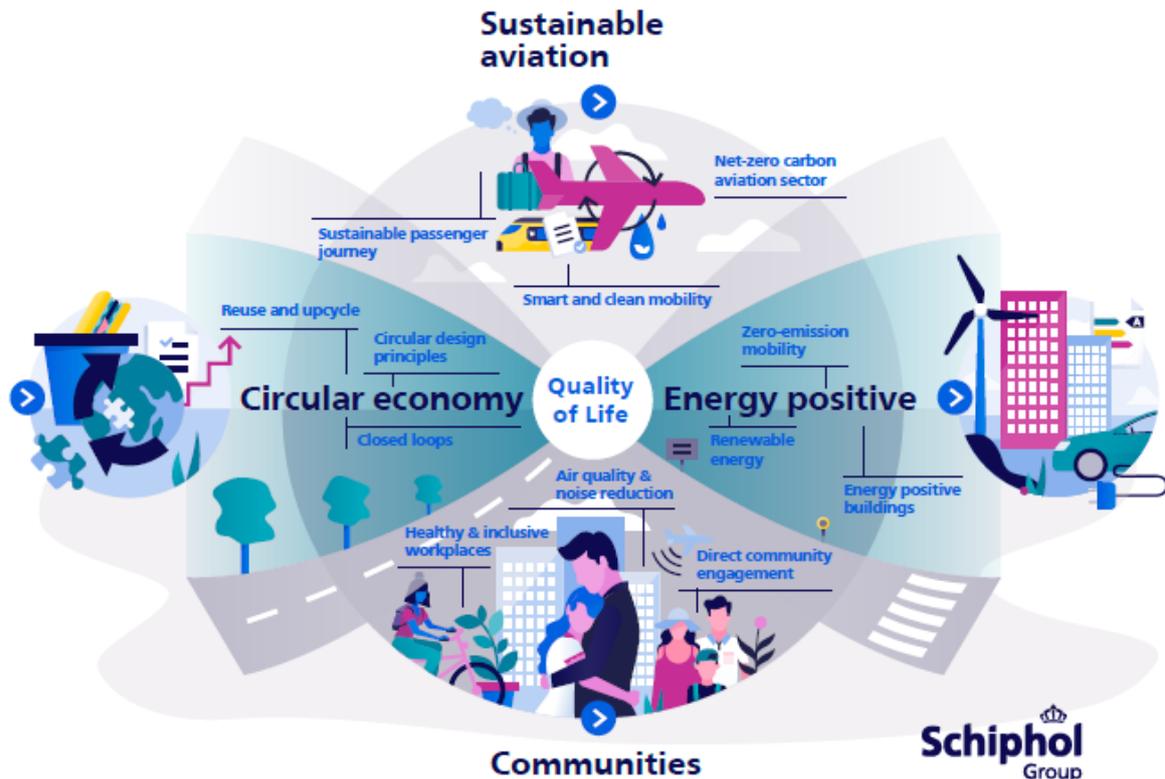
Our main targets are as follows: becoming energy positive, advocating sustainable aviation, implementing the principles of circular economy and securing a healthy living environment around our airports. We have already committed ourselves to zero emission and zero waste by 2030 for our own location. Our Sustainability Roadmap outlines our strategy towards realizing these targets.

We believe that the realisation of an aviation industry with net-zero emissions by mid-century is technically possible and economically feasible<sup>24</sup>. Joint efforts of governments, airports and airlines and other stakeholders will be key to success.

<sup>24</sup> Energy Transitions Commission (2018). Mission Possible. Reaching net-zero carbon emissions from harder-to-abate sectors by mid-century.

There is no silver bullet to decarbonize aviation. Decarbonizing the aviation industry will require joint and substantial efforts in various areas over a long period of time, including the following:

Figure 12 Quality of Life



- Demand management: this includes a shift to more sustainable rail alternatives and airspace modernization (Single European Sky) to reduce emissions per flight. It also concerns policy instruments to internalize the external costs of aviation: the environmental costs will need to be reflected in the price of flying. Hence, we support the strengthening of the ETS for aviation and the roll-out of CORSIA as a first step. We recommend the proceeds from these measures to be used for sustainability in the aviation industry.
- Energy efficiency gains: new aircraft and engine technology is needed to reduce the emissions per flight. This includes the development of (hybrid) electric aircraft, but also the radical fleet renewal. Innovation is key. We will actively facilitate the transition towards hybrid and electric flying at our system of airports.
- Decarbonization technologies: battery and hydrogen aircraft may play a role on the longer term for short distance air transport, with ranges and capacities gradually increasing. However, for the foreseeable future, aviation will rely on hydrocarbon fuels. The long-lead times in aircraft and engine development favor blending

conventional fuels with zero carbon fuels such as bio and synthetic. Fuel mandates can play a role here as they will stimulate the uptake of sustainable aviation fuels blended with conventional fuels.

On the long term, these measures will result in decarbonization of the aviation industry. For the short to medium term (as the aviation sector may not be able to cut emissions within its own sector fast enough), we believe it is essential to engage in additional high-quality offsetting.

## 4.2 Quality of Life: A healthy living environment

A controlled and moderated path of growth in relation to improvements in aircraft technology and new air traffic control procedures will generate reductions in noise hindrance, thereby contributing to a healthy living environment. Moreover, we will focus on solutions that will reduce local emissions, including nitrogen oxide (NOx) and fine and ultrafine particles.

This focus will represent a major pattern change. In the past, aircraft technology gains in terms of noise were used to redeem additional aviation growth. For the first time, however, part of the room for growth will be given back to society to allow for improvements in the local living environment. We will only grow as far as needed to fulfil our mission and maintain a viable hub operation.

Community engagement will also have a positive impact on non-acoustic noise factors. We will engage in dialogue and be transparent with policymakers and local stakeholders, while fulfilling an active role towards the general public. We would like to become more predictable (e.g. by announcing divergent runway use due to maintenance, weather conditions or other circumstances).

To improve quality of life in the surrounding communities, we aim to broaden the scope and scale of investments in local communities. For example, we will do this by buying and/or redeveloping houses in heavily noise affected areas. We will ensure that aviation will benefit the local communities both economically and socially.

## 4.3 Key believes

The Quality of Life pillar of the Vision 2050 has been based on a number of strategic premises/key believes, that were derived from an extensive analysis of our current and future environment (sections 4.4 and 4.5):

- Decarbonising aviation globally will become essential for retaining the aviation industry's license to grow, or even to operate. In addition, eventually achieving a net-zero carbon emissions aviation sector is the industry's responsibility towards society and future generations.
- We believe that a net-zero carbon emissions aviation industry is technically achievable and economically feasible by mid-century, through demand management measures, energy efficiency gains and decarbonization technologies.

- We believe that the external costs of aviation need to be internalized. Furthermore, offsetting has a role to play on the short to medium term.
- A net-zero carbon emissions aviation sector requires a joint efforts by all stakeholders over a long period of time.
- Technological innovation and operational measures for aircraft and engine technology will result in a continuous decrease in noise emissions and air pollution around our airports.

#### 4.4 Current performance Quality of Life

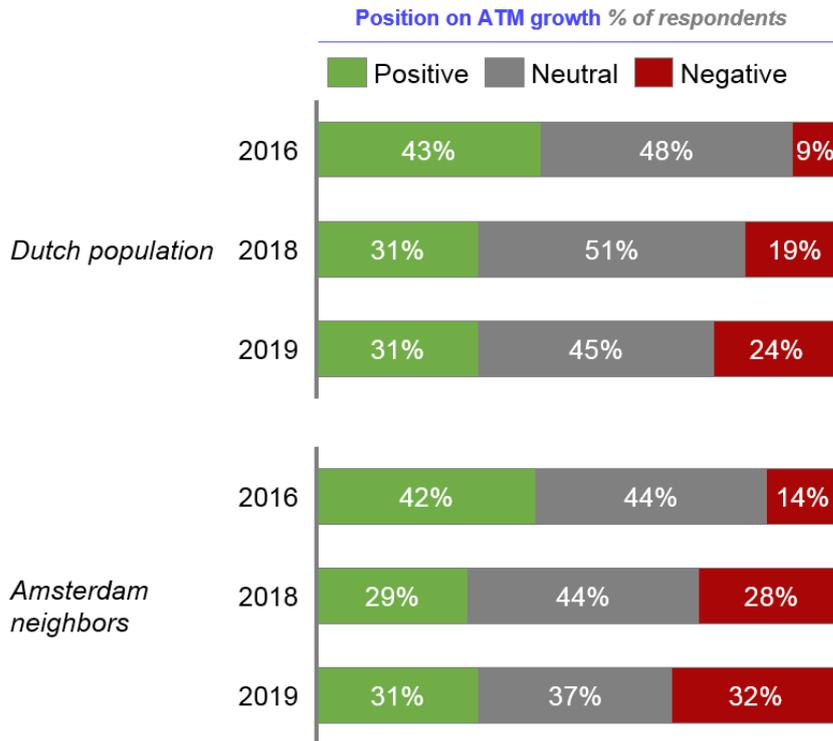
We have been acting on well-being and sustainability for a long time already. For example, for a sixth year in a row Schiphol retained 3+ status in the ACI carbon accreditation scheme. A key component of this status is that the airport's own activities are CO<sub>2</sub> neutral.

Ultimately, we will go beyond zero by realising an energy-positive airport. As we work to drive sustainability across our own operations, aiming to be zero emission and zero waste by 2030, we take a leadership role in the field of aviation sustainability. We stimulate cleaner and quieter fleet via our airport charges. We co-developed the joint action agenda 'Smart and Sustainable' and we were involved in drafting the 'Agreement on Sustainable Aviation'. At the European level, we actively push for a policy framework for scaling-up sustainable aviation fuels. By doing so, we set new standards and best practices for the industry.

The emissions caused by aviation and their impact on climate change have quickly entered the societal and political debate on aviation growth. Aviation has an impressive track record when it comes to innovation. Today's aircraft produce 80% less CO<sub>2</sub>-emissions per seat than the first jets in the 1950s. Unfortunately, this is not enough to cope with traffic growth. The aviation sector is responsible for 2% of all CO<sub>2</sub> emissions at the global level and for 7% of all emissions in the Netherlands. Although airport emissions account for only a minor share of the total, airlines and airports are in this together: the aviation sector will need to take its responsibility.

While the growth of air transport movements has been within the set local norms and rules during the past decade, the number of noise nuisance complaints relating to Schiphol reached a record high in 2018. Although the majority of Dutch people remain neutral or positive with regard to aviation growth in the Netherlands, the base of support for further growth in aviation has come under some pressure (Figure 13). Meanwhile, the number of passengers has reached a record high during the last years.

Figure 13 Public perception regarding further growth in air transport movements (ATM)<sup>25</sup>



## 4.5 Key trends and developments influencing Quality of Life

### Climate policy and carbon pricing

A key future development with respect to Quality of Life concerns (inter)national climate policy and the extent to which the environmental costs of aviation are reflected in the cost of flying. For years, the international aviation sector has recognised the need to become more sustainable, in order to reduce the impact of aviation on climate change. Various international policies are in place to mitigate emissions, including EU ETS for aviation and CORSIA (Figure 14). In addition, the major European airports have called upon the aviation industry to increase its efforts to achieve the goals of the Paris Agreement. European airport operators themselves have agreed to set the goal of net-zero emissions at airports by 2050.

<sup>25</sup> Stakeholder Reputation Insights (2019)

Figure 14 There are currently various climate policies in place, and some include part of the aviation value chain

Agreement / policy	Description	Part of value chain in scope			
		Aviation from/to EEA	Intra-EEA aviation	Domestic aviation	Airport operations <sup>3</sup>
<b>Paris climate agreement (2015)</b>	196 states agreed to reduce CO <sub>2</sub> emissions in order to <b>limit temperature increase to 1.5-2°C</b> . CO <sub>2</sub> reduction -49% by 2030 and 95% by 2050 vs 1990	X	X	✓	✓
<b>ICAO targets (2009)</b>	ICAO, a <b>UN agency</b> , agreed upon targets including 2%/yr increase in fuel efficiency, 50% aviation CO <sub>2</sub> reduction by 2050 vs 2005 and carbon neutral growth through offsetting after 2020 via CORSIA	✓	✓	✓	X
<b>EU ETS<sup>2</sup> (2005)</b>	EU-level <sup>1</sup> <b>CO<sub>2</sub> cap and trade system</b> emissions of EU countries. Currently only covers domestic and intra-EEA flights awaiting ICAO targets. Targets include ~28% aviation CO <sub>2</sub> emission reduction in 2035 compared to 2020 (2.2% reduction p.a.)	X	✓	✓	X
<b>Klimaatwet (2018)</b>	Dutch legislation to reduce national CO <sub>2</sub> emissions in line with Paris Agreement <sup>5</sup>	X	X	✓	✓

Global
EU
NL
✓ In scope
 X Not in scope
 X Currently not in scope but potentially included in future

1 Iceland, Liechtenstein and Norway also participate. 2 EU Emission Trading System.

3 Includes airside ground operations, buildings and landside infrastructure (i.e. excluding LTO). 5 Klimaatwet likely deduced from ICAO and EU ETS

The targets that these policies and initiatives set nevertheless fall short of net-zero emission aviation industry and are significantly less ambitious than the Paris Agreement. Hence, we believe that the aviation industry should achieve a serious reduction of its carbon footprint, ultimately towards net-zero carbon emissions.

#### Public opinion on noise and particulate emissions

Calculations of the amount of aircraft noise do not always correspond to measured noise levels and the perceptions of local residents. This has led to friction in the relationship between the aviation sector, government and local residents, and it has sparked discussions concerning the reliability of data and models. Schiphol has acknowledged the need to align calculations,

measurements and perceptions about noise nuisance. Additional measures have been taken to reduce the noise disturbance in the local area, and yet others are being developed.

The health effects of particulate emissions and ultrafine particles from aircraft and other vehicles are receiving even greater emphasis. Although preliminary research results have revealed potential health effects, it is still unclear whether these long-term effects are related to aviation.

#### Capacity crunch: growing scarcity in airport and airspace capacity

Since in the years to come aviation will continue to affect the local living environment and contribute to global climate change, it is likely that the realization of new airport capacity in the densely populated metropolitan areas in Western-Europe will become even more difficult than today.

This is in line with Eurocontrol's forecast<sup>26</sup> that airport capacity shortages in Europe will increase. According to Eurocontrol, by 2040 1.5 million flights cannot be accommodated at Europe's airports. About 16 airports in Europe will be operating at their maximum capacity by 2040. In other words, there will be an growing scarcity of airport and airspace capacity in Europe.

#### Technology and CO<sub>2</sub> emissions

The current 2% share of aviation in human-induced CO<sub>2</sub> emissions will increase as most other sectors are able to reduce their CO<sub>2</sub> emissions at a faster rate than aviation. Around 80% of aviation CO<sub>2</sub> emissions are emitted by flights of over 1,500 kilometres, for which there is no practical alternative mode of transport. In addition, aviation has non-CO<sub>2</sub> climate impacts from oxides of nitrogen (NO<sub>x</sub>), particle emissions, and effects on cloudiness that contribute to climate change<sup>27</sup>.

Aircraft and engine efficiency improved greatly over the past few decades, reducing significantly the CO<sub>2</sub>-emissions per flight. Increased fuel efficiency has been driven by technical improvements of the energy intensity of aircraft, more efficient airport operations and improvements in airspace efficiency. Over the past twenty years this has already delivered growth rates for carbon dioxide (CO<sub>2</sub>) emissions that are less than half the rate of air traffic growth overall. In other words, a decoupling between aviation growth and CO<sub>2</sub> growth has taken place.

The trend towards more efficient aircraft, engines and operations will continue. Yet, to achieve zero-emissions aviation in the long-term in line with the Paris agreement, substantial innovation is required, of which not all technologies may be sufficiently mature and/or scalable by 2050. In addition, airline fleet renewal will take time as well.

(Hybrid) electric and hydrogen aircraft could play a role on the longer term, starting with short distance air transport and ranges and payload gradually increasing (Figure 15). The use of sustainable aviation fuels such as bio- and synthetic kerosene are the most promising near-term improvements, as they can be blended with conventional fuels. The major challenge will be to secure a large-scale supply of cost-competitive sustainable aviation fuels.

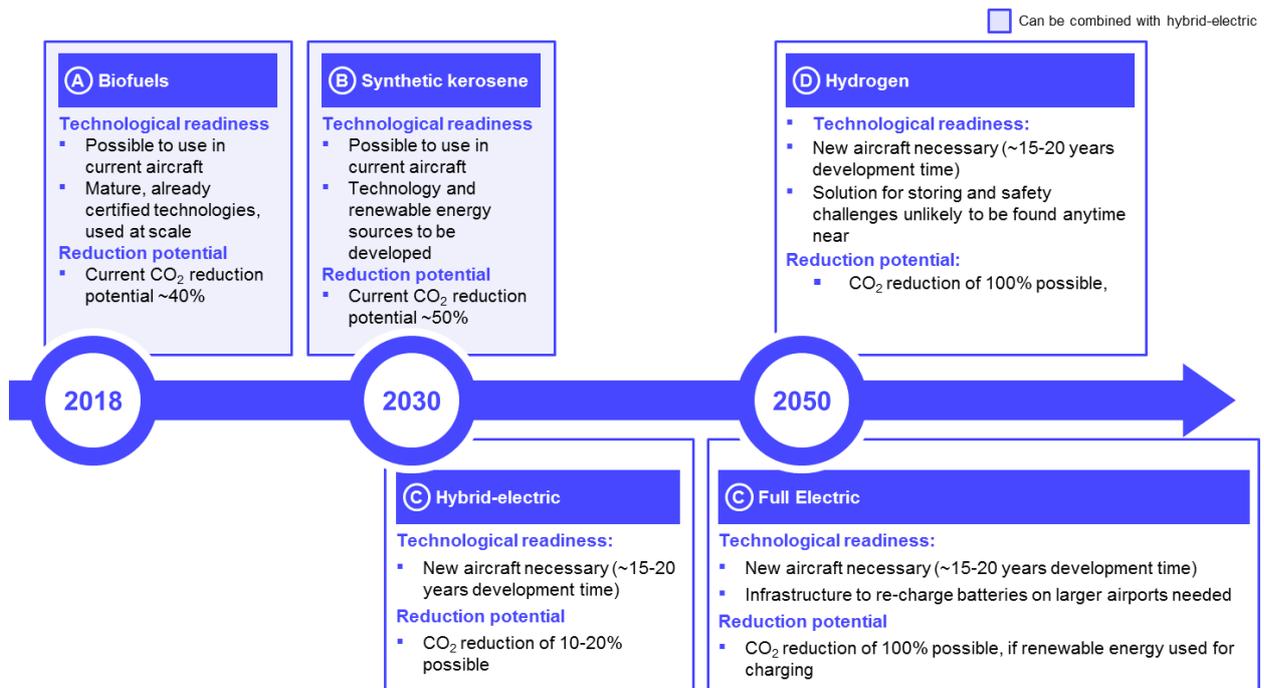
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<sup>26</sup> Eurocontrol (2018). Challenges of growth.

<sup>27</sup> But these impacts are subject to much greater scientific uncertainty.

Technological solutions need to be complemented by other measures to reach net-zero emissions by mid-century. Hence, the roadmap towards net-zero emissions will need to consist of other routes as well, including demand management measures and an appropriate policy framework (see section 4.1).

Figure 15 Bio and synthetic kerosene most promising near-term improvements for decarbonization



### Technology and noise emissions

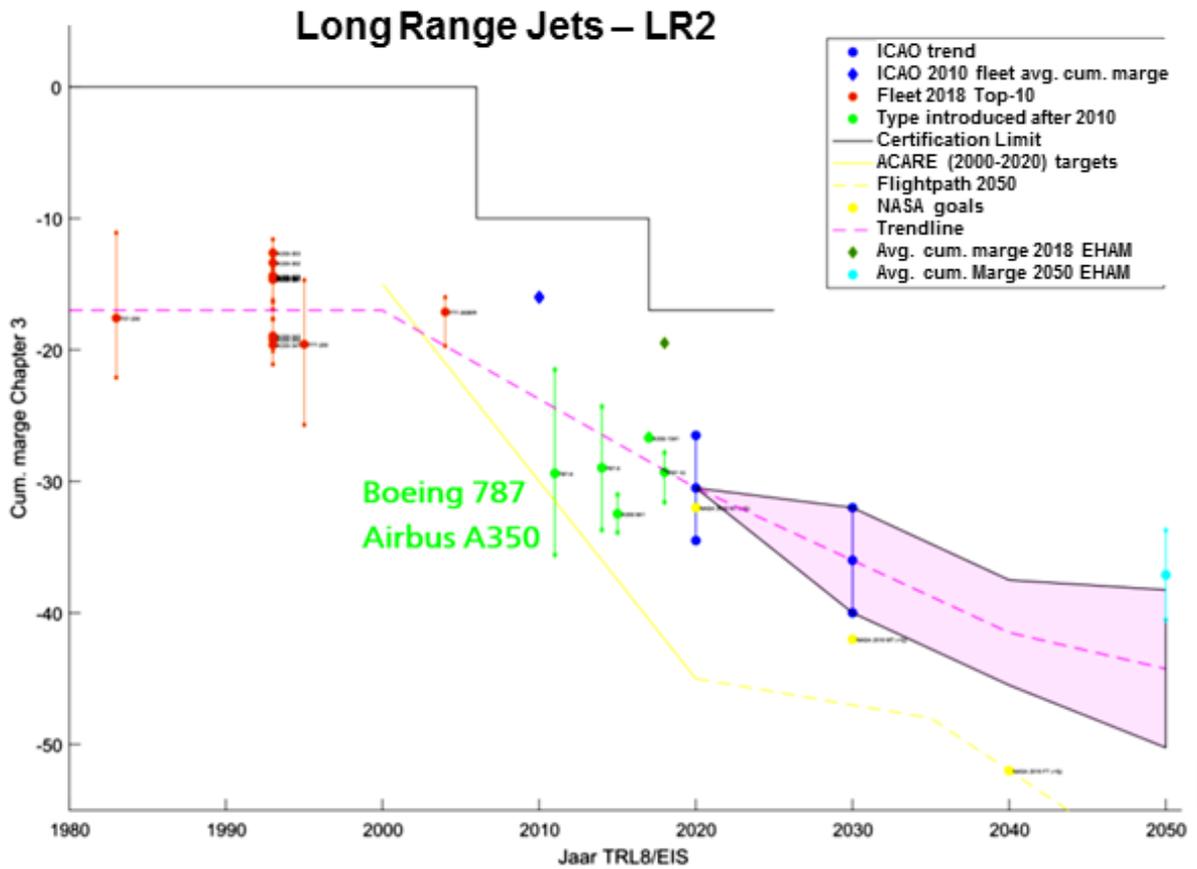
In the past decades, large scale aircraft development programmes on technology, engines, and airframe resulted in substantial improvements not only in flight performance and fuel efficiency but also in a reduction of aircraft noise emissions. Based on a study by NLR<sup>28</sup>, a further reduction of aircraft noise can be expected in the period up to 2050, as new generations of aircraft come into service at Schiphol Airport.

Figure 16 gives an indication for the reduction of certified noise emissions for long range aircraft (2 engines) as the Boeing 777 or Airbus A330. New types as the Boeing 787 and Airbus A350 show a substantial noise reduction, even better than the long term trend line. Further reductions can be expected towards 2050, resulting in a cumulative reduction of 60-75% per individual aircraft.

Other aircraft categories as the medium haul or regional aircraft show a similar improvement, whereas the long range aircraft equipped with 4 engines (Boeing 747 and Airbus A380) are supposed to phase out. No further development of four engine aircraft is foreseen.

<sup>28</sup> NLR (2019). Hoeveel stiller worden toekomstige vliegtuigen? Analyse vlootontwikkeling richting 2050.

Figure 16 Forecast of reduction in certified noise emissions for long range aircraft (2 engines) 2020-2050<sup>29</sup>

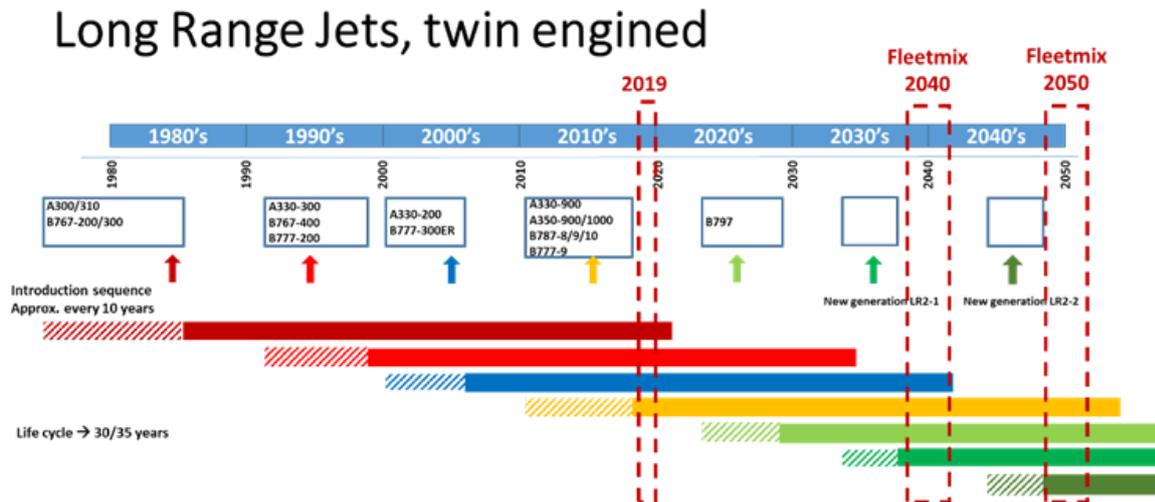


Typically, aircraft have a long life cycle of active operational service, for medium haul and regional aircraft between 20-25 years and for long range aircraft even between 30-35 years. For the latter category, a new generation of aircraft with improved performance enters into service almost every 10 years on average. Continuation of this trend will lead to a substantial fleet renewal among airlines operating flights to and from Schiphol Airport.

Around 2050, the current state-of-art aircraft types will almost be phased out and new generations will dominate the market, as shown in the figure below.

<sup>29</sup> NLR (2019). Hoeveel stiller worden toekomstige vliegtuigen? Analyse vlootontwikkeling richting 2050.

Figure 17 Fleetmix development at Schiphol Airport, 1980-2050<sup>30</sup>



Noise calculations show that, when combining Schiphol's runway system with fleet mix developments and aircraft technology improvements<sup>31</sup>, noise hindrance (EGH, Ernstig Gehinderden) could be reduced to 75%-90% compared to 2020 MER levels in a realistic fleet renewal/ optimistic fleet renewal scenario respectively. Even in case of pessimistic fleet renewal, noise hindrance could stay at around today's levels.

The optimistic scenario assumes a stimulated fleet renewal for each aircraft category, for example by enhanced differentiation of airport charges towards less noise-intensive categories and/or government regulation. The EGH calculations are based on the current methodology and do not assume any changes in dose-effect relationships.

## 5 Quality of Service

### 5.1 Quality of Service: Customers first

The level of airport services plays an important role in being the airport of first choice for both passengers and airlines, contributing to the quality of network by enhancing our competitiveness (Figure 18). Moreover, a high level of service is essential to maintaining our reputation as a major hub airport, and therefore our license to grow and operate.

<sup>30</sup> NLR (2019). Hoeveel stiller worden toekomstige vliegtuigen? Analyse vlootontwikkeling richting 2050.

<sup>31</sup> Assuming a hypothetical ATM scenario of 650 thousand aircraft movements in 2050 for calculation purposes only (in the context of the PlanMER and the Luchtvaartnota)

Figure 18 Quality of Service



Considering the ongoing growth in passenger numbers and intense hub competition, it will be essential to improve our quality of service. We are committed to offering efficient, seamless and touchless journeys, while creating personalized experiences that will distinguish us from our competitors. It is hereby essential to look at the passenger journey in its entirety. Our integrated Passenger journey strategy will therefore provide guidance. We distinct ourselves through our people, who add a human touch to otherwise hassle-free and automated processes.

Value for money and efficiency are central themes within our integrated Airline journey. We realize this through collaboration, innovation and the use of data-driven technology, including the integrated control of turnaround processes, integrated long-term planning and the establishment of total airport management, in collaboration with partners.

Moreover, we will pursue further improvement in the quality of service by offering smart, high-quality real estate and business services that enable travellers, businesses, students and research institutions to connect with each other. In this way, we boost the local business climate and knowledge economy. Although our real estate propositions are relatively mature and space is limited, we do see potential for further development, and in our new real estate strategy, we are keen to explore new concepts.

## 5.2 Key believes

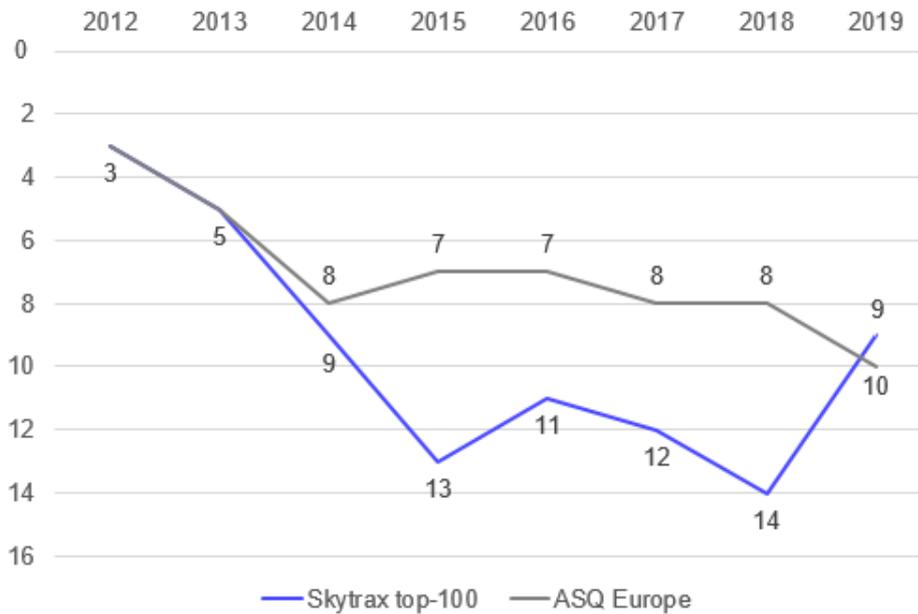
The Quality of Service pillar of the Vision 2050 has been based on a number of strategic premises / key believes, that were derived from an extensive analysis of our current and future environment (see paragraph 5.3 and 5.4):

- New players and technologies have and will continue to disrupt the way people travel and they will bring both new challenges and opportunities for airports.
- The service quality level at an airport will become an increasingly important choice factor for passengers.
- In time, it will be technically possible to fully automate nearly all airport processes, but the human touch will remain an essential part of a good service proposition.
- Global platforms will (continue to) play a central role in society and people's lives. For an airport, it will be essential to be fully connected to these platforms as they will to a large extent help to determine people's travel decisions.

## 5.3 Current performance Quality of Service

We want our airports to be preferred by both passengers, airlines and forwarders. The record-high passenger numbers in recent years indicate that for many we operate the airports of choice. However, the traffic growth brought new challenges, especially in delivering the quality of service to passengers and airlines that we stand for. In absolute terms, the quality level perceived by our passengers has remained stable, according to the Airline Service Quality (ASQ) ratings of ACI and our Net Promotor Score (NPS). However, other airports keep raising the bar, as some of them have succeeded in considerably improving their service levels. This resulted in a deterioration of our relative position in external service quality benchmarks, such as SkyTrax and ACI (Figure 19).

Figure 19 SkyTrax and ASQ ranking Amsterdam Airport Schiphol<sup>32</sup>



Customer surveys among our airlines indicate that they are generally satisfied with us, also when comparing our service level to that of other large airports. Nonetheless, there is still room for improvement, for example in 'on time performance'.

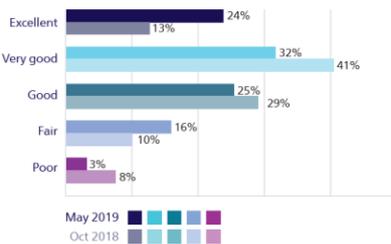
Figure 20 Evaluation of Schiphol by airline customers

April / May 2019

Respondents: 63, participating airlines 45

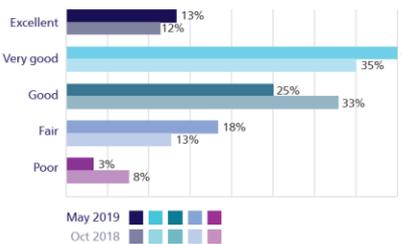
1 Opinion on Schiphol as an organization?

Average score: 64 out of 100

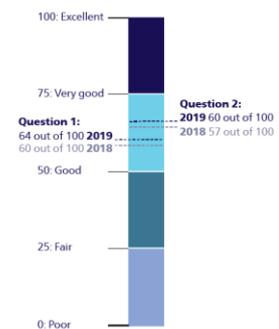


2 Opinion on Schiphol as an airport operator?

Average score: 60 out of 100



Explanation of average score



## 5.4 Key trends and developments influencing Quality of Service

### New technologies and digital solutions

<sup>32</sup> SkyTrax; ACI World ASQ

Innovative technologies and advanced use of data will continue to impact travellers and airports. Seamless travel solutions, artificial intelligence, and biometrics will smoothen door-to-door journeys and will positively impact the passenger experience by minimizing waiting time and reducing mandatory (security) touchpoints.

**Figure 21 Seamless flow**



Through the use and sharing of data, airports will be able to diversify and customize their service offerings to passengers, creating personalized travel experiences and new opportunities for revenue growth. Meanwhile, by leveraging on autonomous technologies and robotics, airports can improve the efficiency of airport processes and further reduce safety and security risks. Physical assets, whether it concerns real estate, airport terminals, cars or equipment (e.g. check-in desks) are going to be shared more often and be deployed more flexible and smarter, increasing their productivity and thus reducing their environmental footprint.

### **Health**

The global covid-19 pandemic will have long-term implications for the passenger, employee and airline processes at our airports. This does not only relate to compliance with and implementation of (inter)national health regulations and sanitary measures but also to providing confidence to our passengers regarding a healthy journey.

### **Changing needs of customers**

The needs of airport (retail) customers are changing, driven by broader societal trends. The increased availability of personal data and the use of advanced analytics has enabled many businesses to offer highly customized products and services to people. This development has also raised the expectation level of travellers, who expect highly relevant products and services and are sometimes no longer satisfied with 'traditional' airport retail offerings.

This trend is further strengthened by the experience-based economy of today, where customers expect more from a purchase than just a product or service; they expect to be

surprised and get an experience they will remember. Many airports are therefore starting to experiment with offering experiences that go beyond their traditional service offerings.

Another societal change is the increased focus on eco-friendliness and well-being. Although this trend can be observed globally, it seems a particularly visible among consumers in Europe, who look increasingly critical at the impact and footprint of businesses. In aviation, this trend is clearly visible through the emergence of 'flight shame', but also in new food & beverage concepts at airports, like the 'Waste Factory' (de Verspillingsfabriek) at Schiphol that makes soups out of vegetables that would otherwise be thrown away.

Figure 22 De Verspillingsfabriek



### New entrants in air travel

In the past decade, new digital players such as Uber have entered the (air) travel market. They offer new services, facilitate air travel concepts such as self-hubbing and create online travel platforms to the benefit of travellers. In particular, Mobility as a Service (Maas) concepts, where different modes of transportation are all offered through one service provider, are an area of interest to both start-ups and existing players. As the importance of global travel platforms in travel will increase, being fully connected to these platforms will be key for traditional players in the travel market, such as airports.

## 6 Enablers: safety and a robust organization

### 6.1 Safety first

Safety is our highest priority, and we aim for air travel to remain the safest means of transport. This key priority for our license to operate requires an open culture in which all safety

deviations can be reported, in which improvements are made in a timely fashion and in which everyone working in the sector is committed to following the highest standards.

As part of our shared commitment to improving overall industry safety standards, Schiphol Airport, Air Traffic Control, airlines, ground handlers and refuelling services have joined forces to create a joint sector Integral Safety Management System (ISMS). The group's shared goals are to control current safety risks, reduce future risks, and create opportunities for continuous safety improvements within the industry. With this integrated approach to collaboration on safety, the Netherlands is a global frontrunner in aviation safety.

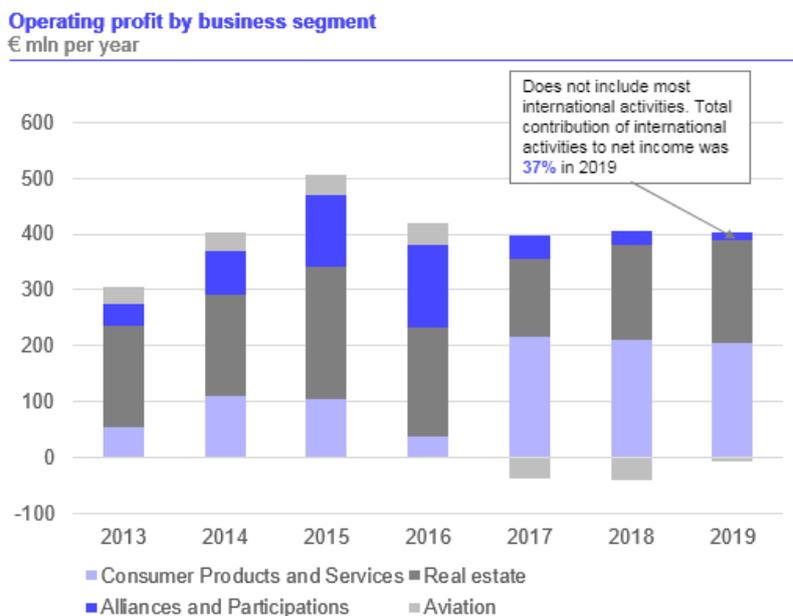
## 6.2 Robust organization

### Financially resilient

Over the past decade, we have proven to be a financially sound organisation that is able to create financial shareholder value on a structural basis. We mainly create this financial value through our non-aeronautical activities, as our aeronautical activities are regulated, and their revenues are cost and asset based. We managed to deliver a stable return to our shareholders over the last few years, despite the fact that average spend per passenger in retail decreased (but was compensated by increasing passenger numbers).

The COVID-19 pandemic has and will have, for a yet unknown period of time, an adverse effect on passenger demand for air travel at Royal Schiphol Group's airports. As there is no precedent for an outbreak at this scale and since it is unclear how the COVID-19 virus will develop, the scale of the impact of the COVID-19 outbreak on the Royal Schiphol Group's business, results of operations, prospects and financial condition is unpredictable.

Figure 23 Operating profit per business segment (million euro)



Hence, a prerequisite to the realisation of our vision is a robust organisation that is financially resilient and that employs happy people. Non-aeronautical revenues constitute a key element in our financial results, and therefore in the autonomy of the organisation. As happy passengers are more likely to spend money at an airport, we see a clear link to our quality of service ambitions. Improving our service proposition whilst continuing to offer value for money to our airlines, passengers and other businesses is key.

As the airport industry is changing faster than ever, we must be a robust and adaptive organization, so that we will remain a globally leading airport group. To do so, we need to be an attractive employer with a working environment that facilitates collaboration, development, ownership and, last but not least, fun. Our people are innovators that orchestrate safe and inspiring journeys for our customers. Finally, we believe that diversity, inclusion and vitality within our organization are important preconditions for success.

We perceive a worldwide trend in decreasing revenues from retail and parking (spend per passenger) that we are not immune to. For this reason, we must innovate, be creative and listen carefully to the needs and expectations of our passengers and provide them with customised offerings. We will actively explore new business models and particularly see opportunities in the area where physical airport infrastructure and digital airport and travel solutions come together.

#### **International alliances and participations**

Moreover, we see an opportunity in expanding our international alliances and participations as part of RSG as a robust organization.

On the one hand, international activities are important for the financial robustness of the Group. They provide the opportunity to enhance RSG's profitability potential via revenues from the international activities and to finance future investments. Furthermore, they reduce risk by further diversification of financial exposure.

On the other hand, international activities strengthen RSG as an airport operator. It allows us to provide better products and services, while enhancing the quality of the staff. In addition, they deliver significant learning opportunities over our group of airports, that operate in different settings. Finally, the international activities both drive and benefit from the Dutch trade agenda.

**Colophon**  
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