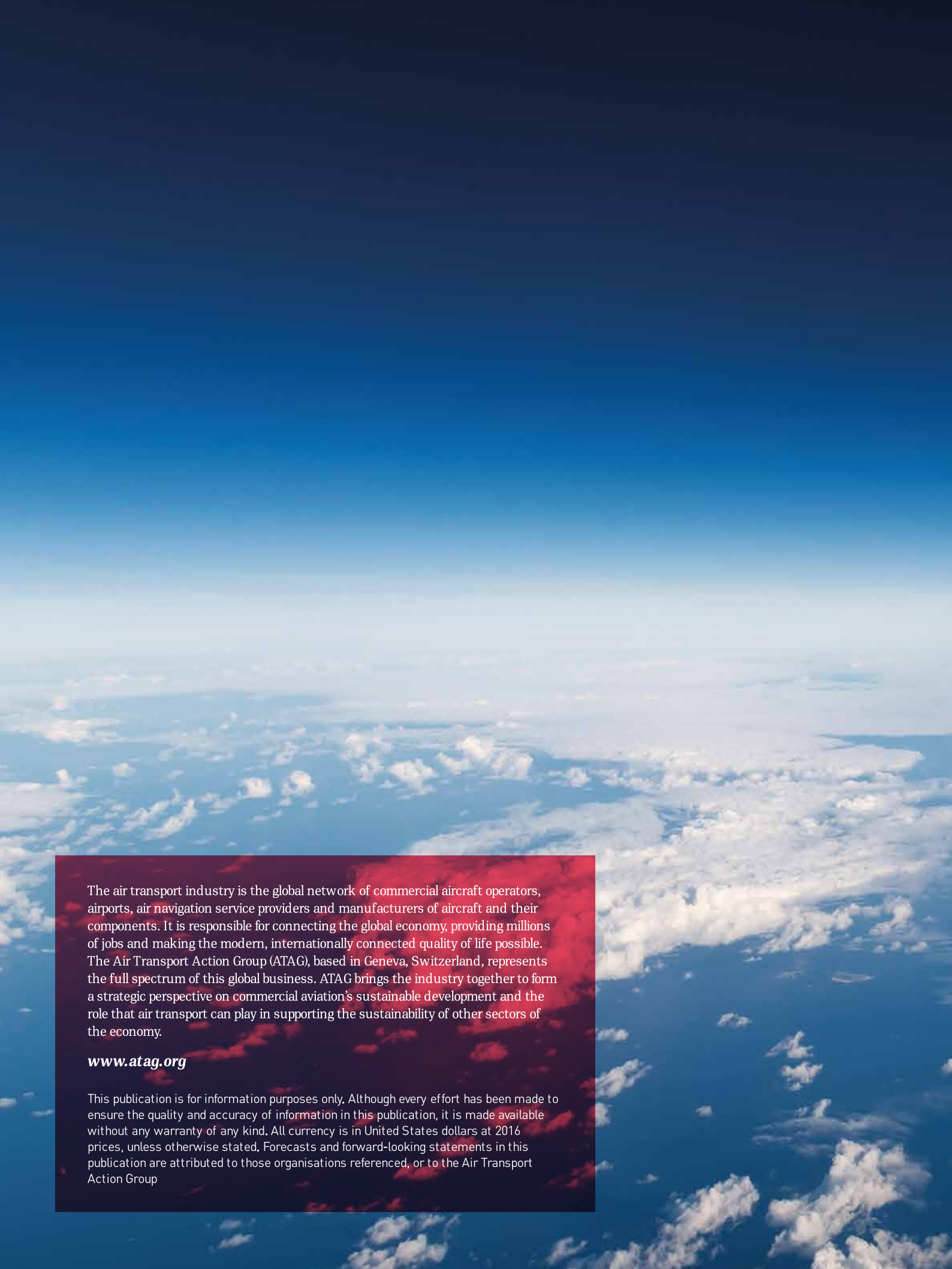
AVIATION BENEFITS BEYOND BORDERS

Powering global economic growth, employment, trade links, tourism and support for sustainable development through **air transport**

OCTOBER 2018

ATAG
AIR TRANSPORT ACTION GROUP



The air transport industry is the global network of commercial aircraft operators, airports, air navigation service providers and manufacturers of aircraft and their components. It is responsible for connecting the global economy, providing millions of jobs and making the modern, internationally connected quality of life possible. The Air Transport Action Group (ATAG), based in Geneva, Switzerland, represents the full spectrum of this global business. ATAG brings the industry together to form a strategic perspective on commercial aviation's sustainable development and the role that air transport can play in supporting the sustainability of other sectors of the economy.

www.atag.org

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INTRODUCTION

Open skies, open minds

Michael Gill
ATAG Executive Director
Geneva, October 2018

The preamble to the Chicago Convention – in many ways aviation's constitution – says that the "future development of international civil aviation can greatly help to create and preserve friendship and understanding among the nations and peoples of the world". Drafted in December 1944, the Convention also illustrates a sentiment that underpins the construction of the post-World War Two multilateral economic system: that by trading with one another, we are far less likely to fight one another. This pursuit of peace helped create the United Nations and other elements of our multilateral system and, although these institutions are never perfect, they have for the most part achieved that most basic aim: peace.

Air travel, too, played its own important role. If trading with others helps to break down barriers, then meeting and learning from each other surely goes even further. We have all gained so much from this international system of trade and travel over the past 70 years that it would be easy to forget how much it relies on cooperation and goodwill between countries.

Those of us within the aviation sector never forget – our global reach requires constant coordination. It's an extraordinary system. Over 10 million women and men are directly employed to ensure we build the best aircraft; load them with fuel, food, cargo and passengers; fly them in the most efficient way; guide them safely through the skies; and land them at airports all over the world. There are thousands, indeed millions, of moving parts all coming together to make that system work.

International cooperation is key to this. On a daily basis, we use standards and rules developed by collaborative efforts through expert industry committees and at the International Civil Aviation Organization to deliver a safe, secure and interoperable system. Through multilateral efforts, we have also led the way with a sector-wide climate change action plan, including the world's first market-based measure for any industry.

Although we are rightly often thought of as a technology-driven business, we are also aware of the people that we are responsible for transporting and the teams that make it all work. Bringing people together – both as employees and as customers – is how our sector helps to break down barriers and build understanding between people. At a time when the forces of protectionism threaten to drive people apart, it's good to know there is still an industry whose entire raison d'être is to do quite the opposite.

EXECUTIVE SUMMARY

Key facts and figures
from the world of air transport

65.5 million

Jobs supported by aviation worldwide[1]

$2.7 trillion

Aviation's global economic impact (including direct, indirect, induced and tourism catalytic)[8]

3.6%

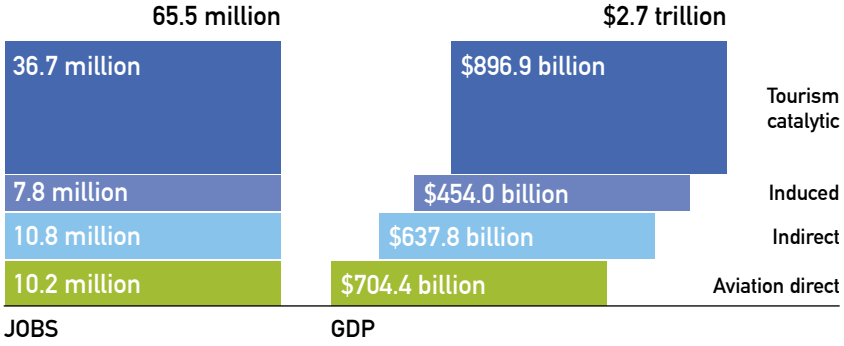
Global GDP supported by aviation[9]

4.4x

Aviation jobs are, on average, 4.4 times more productive than other jobs[12]. By opening markets and enabling knowledge transfer and other catalytic effects, aviation also makes jobs in other sectors more productive. Globally, each aviation job generates $108,700 in gross value added (GVA).

Beyond the industry

Aviation's global employment and GDP impact[2]



DIRECT JOBS

525,000
Airport operators[3]
(operations, planning, engineering)

5.6 million
Other on-airport[4]
(retail, car rental, government agencies such as customs and immigration, freight forwarders, some catering)

2.7 million
Airlines[5]
(flight and cabin crews, executives, ground services, check-in, training and maintenance staff)

1.2 million
Civil aerospace[6]
(engineers and designers of civil aircraft, engines and components)

233,000
Air navigation service providers[7]
(air traffic controllers, executives)

20th

If aviation were a country, it would rank 20th in size by GDP (similar to Switzerland or Argentina)[11]

All employment and GDP figures are for 2016, unless otherwise stated, to give a single set of data for one year. Where available, traffic and financial statistics data are for 2017.

These figures represent the benefits that aviation activities deliver to the global economy. They do not include other economic benefits of aviation, such as the jobs or economic activity generated when companies or whole industries exist because air travel makes them possible. They also do not include the intrinsic value that the speed and connectivity of air travel provides or domestic tourism and trade. Including these would increase the employment and global economic impact numbers several-fold[10].

The figures in *Aviation: Benefits Beyond Borders* should be viewed as a snapshot of the aviation sector in 2016-2018 and not as part of a trend. Differences in data sources mean the reports are not directly comparable.

45,091

Routes served globally, 2017[13]

(of these, 20,032 unique city pairs are served)

4.1 billion

Passengers carried by airlines, 2017[14]

(in 2018, 4.4 billion passengers are forecast)

41.9 million

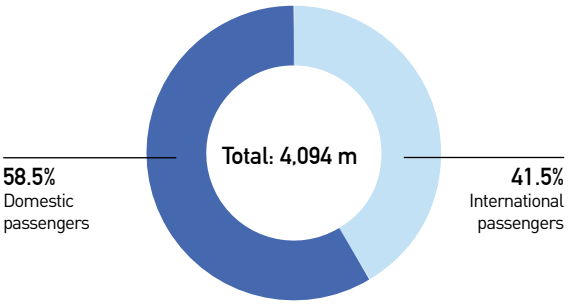
Scheduled commercial flights worldwide, 2017[15]

7.75 trillion

Passenger kilometres, 2017[16]

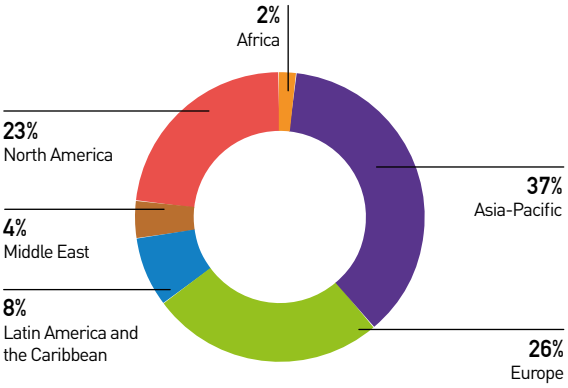
Going places

Global passenger split, international/domestic, millions[17]



Asia-Pacific in front

Regional passenger traffic split[18]



1,303

Commercial airlines[19]

170

Air navigation service providers[22]

3,759

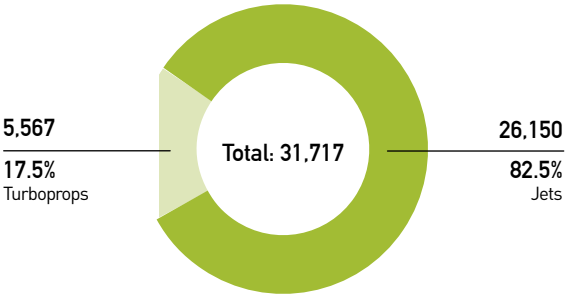
Airports with scheduled commercial flights[20]
(it is estimated there are 41,820 airfields in the world, including military and general aviation aerodromes[21])

31,717

Commercial aircraft in service[23]

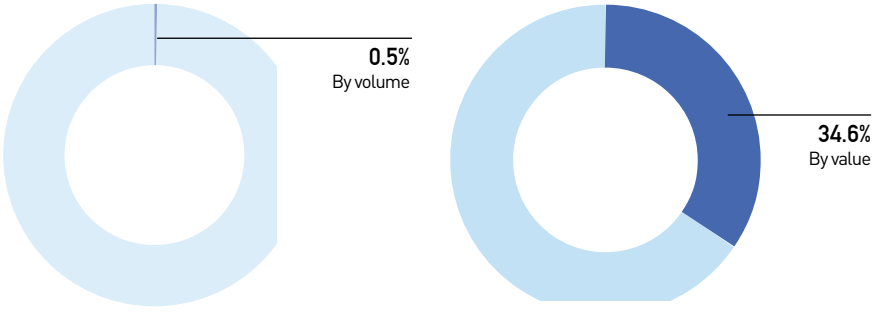
Jetting off

Aircraft in commercial service, by type, 2017[24]



High value, time sensitive

Proportion of global trade transported by air[26]



35%

Air transport carries around 35% of world trade by value and less than 1% by volume[25]

61.9 million

Tonnes of freight handled by air, 2017[27]

57%

Percentage of international tourists who travel by air[30], 2017

$6 trillion

Value of cargo handled by air, 2017[28] (in 2018, it is expected $6.8 trillion will be carried)

81%

Average aircraft occupancy[39], much higher than other forms of transport[40]

255 billion

Scheduled freight tonne kilometres, 2017[29]

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341 billion

Litres of jet fuel used by commercial operators, 2017 (90 billion gallons, or around 275 million tonnes of jet fuel)[31]. This is roughly 10% of global liquid fuel use.

$149 billion

Amount the world's airlines paid for fuel, 2017[32]

859 million

Tonnes of carbon dioxide (CO_2) emitted by airlines, 2017[33]. This is 2% of the global human emissions of around 40 billion tonnes[34]. Around 80% of aviation CO_2 is emitted from flights over 1,500 kilometres in length.

14 million

Litres of neat sustainable aviation fuel used by commercial flights, 2017. This was blended with traditional fuel in over 52,000 flights from four international airports (Los Angeles, Bergen, Oslo and Stockholm)[35]. As this new source of fuel takes off, we will see this figure rise substantially.

Follow developments at *www.enviro.aero/SAF*

ENVIRONMENTAL PROGRESS

The air transport industry has made significant progress in reducing its environmental impact:

- CO_2 emissions per seat kilometre ▼ 80% since first jet aircraft.
- Perceived noise ▼ 75% since first jets.
- Currently surpassing the first goal, with an average annual fuel efficiency of 2.1% achieved across the fleet between 2009 and 2016[36].
- Over ten billion tonnes of CO_2 avoided since 1990 through a combination of new technology, operational efficiencies and infrastructural improvements, including airlines spending $1 trillion on over 12,200 new aircraft since 2009[37].
- The industry has invested in new technology, better operations and improved infrastructure.
- Civil aerospace spends $15 billion per year on efficiency-related research and development.
- Deployment of sustainable aviation fuels could reduce CO_2 emissions as much as 80% compared with traditional fuel. It is expected that a million commercial flights will have taken place using a blend of alternative fuel by the end of 2020[38].
- Air traffic management modernisation, including the introduction of new technologies and procedures, is increasing capacity, shortening routes, improving efficiency and reducing delays, saving millions of tonnes of CO_2.
- Following a historic agreement in 2016, the industry is working with governments to implement the world's first sector-wide market-based measure for offsetting the growth in international aviation CO_2 post-2020.

CLIMATE TARGETS

- **Improve 1.5%**
  Aviation will improve its fleet fuel efficiency by an average of 1.5% per annum between 2009 and 2020, a figure the industry is exceeding.
- **Stabilise**
  From 2020, net carbon emissions from aviation will be capped through carbon-neutral growth.
- **Reduce 50%**
  By 2050, net aviation carbon emissions will be half of what they were in 2005.

EXECUTIVE SUMMARY

This report provides a global view of a truly global industry. Oxford Economics analysed the economic and social benefits of aviation at a national level in 63 countries and used the results of that assessment to build the most comprehensive global picture of air transport's many benefits. Working with partners across the industry, the Air Transport Action Group (ATAG) has expanded the analysis to build a unique view of the air transport system, which creates and supports jobs, trade, connectivity, tourism, vital lifelines for many remote communities and rapid disaster response.

Every day in 2018...

- **12 million passengers**
- **120,000 flights**
- **$18.8 billion worth of goods carried**[45]

Air transport is a major contributor to global economic prosperity

Aviation provides the only rapid worldwide transportation network, which makes it essential for global business and tourism. It plays a vital role in facilitating economic growth, particularly in developing countries.

Airlines transport over four billion passengers annually, with revenue passenger kilometres totalling nearly eight trillion in 2017.

Air transport facilitates world trade. It helps countries contribute to the global economy by increasing access to international markets and allowing the globalisation of production. Nearly 62 million tonnes of freight were carried by air in 2017.

The total value of goods transported by air, $6 trillion, represents 35% of all international trade.

Aviation is indispensable for tourism, a major engine of economic growth, particularly in developing economies. Globally, 57% of international tourists travel by air.

Connectivity contributes to improved productivity by encouraging investment and innovation, improving business operations and efficiency, and allowing companies to attract high-quality employees.

Aviation's global economic impact (direct, indirect, induced and tourism catalytic) is estimated at $2.7 trillion, equivalent to 3.6% of world gross domestic product (GDP).

These figures do not include other economic benefits of aviation, such as the jobs or economic activity that occur when companies or industries exist because air travel makes them possible, the intrinsic value that the speed and connectivity of air travel provides, or domestic tourism and trade. Including these would increase the employment and global economic impact numbers several-fold[46].

Around 1,300 airlines operate a total fleet of over 31,000 aircraft. They serve almost 4,000 airports through a route network of several million kilometres managed by 170 air navigation service providers.

Air transport is a major global employer

The air transport industry supports a total of 65.5 million jobs globally.

It provides 10.2 million direct jobs. Airlines, air navigation service providers and airports directly employ nearly 3.5 million people, and the civil aerospace sector, which manufactures aircraft systems, frames and engines, employs 1.2 million people. A further 5.6 million people work in other on-airport positions.

There are 10.8 million indirect jobs generated through the purchases of goods and services from companies in the air transport industry supply chain.

Industry employees support 7.8 million induced jobs through the spending of wages.

Aviation-enabled tourism generates around 36.7 million jobs globally.

Air transport invests substantially in vital infrastructure

Unlike other transport modes, the air transport industry pays for a vast majority of its infrastructure costs (runways, airport terminals, air traffic control), rather than being financed through taxation and public investment or subsidy (as is typically the case for road and railways).

In 2016, airports invested nearly $64 billion in construction projects, creating jobs and building new infrastructure.

The benefits to society of research and development spending by the aerospace industry are estimated to be much higher than in manufacturing as a whole. Every $100 million of spending on research eventually generates additional GDP benefits of $70 million, year after year.

Air transport provides significant social benefits

Air transport contributes to sustainable development. By facilitating tourism and trade, it generates economic growth, provides jobs, improves living standards, alleviates poverty and increases revenues from taxes.

The increase in cross-border travel is a reflection of the closer relationships developing between countries, both between individuals and at state level. In the same way, eased restrictions on the movement of goods and people across borders facilitate the development of social and economic networks that will have long-lasting effects. This improved flow of people and goods

Landing zone

Top 10 airports by total passengers, millions, 2017[41]

Rank	Airport	Passengers 2017	Change
1	Atlanta Hartsfield (ATL)	103.9 million	▼0.3%
2	Beijing Capital (PEK)	95.8 million	▲1.5%
3	Dubai (DXB)	88.2 million	▲5.5%
4	Tokyo Haneda (HND)	85.4 million	▲6.5%
5	Los Angeles (LAX)	84.6 million	▲4.5%
6	Chicago O'Hare (ORD)	79.8 million	▲2.4%
7	London Heathrow (LHR)	78 million	▲3.0%
8	Hong Kong (HKG)	72.7 million	▲3.4%
9	Shanghai Pudong (PVG)	70 million	▲6.1%
10	Paris Charles de Gaulle (CDG)	69.5 million	▲5.4%

Passport, please

Top 10 airports by international passengers, millions, 2017[42]

Rank	Airport	International passengers 2017	Change
1	Dubai (DXB)	87.7 million	▲5.6%
2	London Heathrow (LHR)	73.2 million	▲3.0%
3	Hong Kong (HKG)	72.5 million	▲3.4%
4	Amsterdam (AMS)	68.4 million	▲7.7%
5	Paris Charles de Gaulle (CDG)	63.7 million	▲5.5%
6	Singapore Changi (SIN)	61.6 million	▲5.9%
7	Incheon (ICN)	61.5 million	▲7.6%
8	Frankfurt (FRA)	57.1 million	▲6.4%
9	Bangkok Suvarnabhumi (BKK)	48.8 million	▲7.8%
10	Taipei (TPE)	44.5 million	▲6.2%

benefits the host and the originating countries, encouraging increased social and economic integration.

Air transport offers a vital lifeline to communities that lack adequate road or rail networks. For many remote communities and small islands, access to the rest of the world and to essential services, such as health care, is often only possible by air.

Aviation's speed and reliability are perhaps most immediately apparent in the delivery of urgently needed assistance during emergencies caused by natural disaster, famine and war. Air services are particularly important in situations where physical access is problematic.

Air transport is working to mitigate its environmental impact

Airline operations produced 859 million tonnes of carbon dioxide (CO_2) in 2017, just under 2% of the total human carbon emissions of around 40 billion tonnes.

The aviation industry agreed in 2008 to the world's first set of sector-specific climate change targets. The industry is already delivering on the first target to continue to improve fleet fuel efficiency by 1.5% per year until 2020. From 2020, aviation will cap its net carbon emissions while continuing to grow to meet the needs of passengers and economies. By 2050, the industry has committed to reduce its net carbon footprint to half of what it was in 2005.

Companies across the sector are collaborating to reduce emissions using a four-pillar strategy of new technology, efficient operations, improved infrastructure and market-based measures to fill the remaining emissions gap.

Modern jet aircraft are 75% quieter than the models that first entered service, and each new generation of aircraft continues this downward trend.

By 2020, it is expected that a million passenger flights operating partially on sustainable aviation biofuels will have taken place. It is also expected that shifting to alternative aviation fuels could reduce CO_2 as much as 80% compared with traditional jet fuel.

Changes in trade policies will have a dent on future global benefits of aviation

Forecasts suggest that in 2036 aviation could see over 7.7 billion passengers and support 97.8 million jobs and $5.7 trillion in economic activity.

However, if growth were to slow due to restrictive trade, immigration and political factors, the total number of jobs supported by the air transport sector (including air transport–supported tourism) could be 12 million lower by 2036 than the base forecasts. In this scenario, the contribution of the air transport sector to world GDP would be $820 billion (2016 prices) lower, with an additional $390 billion lost through lower tourism activity.

Long haulage

Top 10 airports by cargo tonnes, 2017[43]

Rank	Airport	Tonnes of Cargo 2017	Change
1	Hong Kong (HKG)	5.0 million	▲9.4%
2	Memphis (MEM)	4.3 million	▲0.3%
3	Shanghai Pudong (PVG)	3.8 million	▲11.2%
4	Incheon (ICN)	2.9 million	▲7.6%
5	Anchorage (ANC)*	2.7 million	▲6.7%
6	Dubai (DXB)	2.6 million	▲2.4%
7	Louisville (SDF)	2.6 million	▲6.8%
8	Tokyo Narita (NRT)	2.3 million	▲7.9%
9	Taipei (TPE)	2.3 million	▲8.2%
10	Paris Charles de Gaulle (CDG)	2.2 million	▲2.8%

** Includes transit freight*

High frequency

Top 10 busiest airport pair routes, 2017[44]

Rank	Airport pair	Annual flights
1	Jeju ↔ Seoul Gimpo	64,991
2	Melbourne ↔ Sydney	54,519
3	Mumbai ↔ Delhi	47,462
4	Fukuoka ↔ Tokyo Haneda	42,835
5	Rio de Janeiro ↔ Sao Paulo Congonhas	39,325
6	Sapporo ↔ Tokyo Haneda	38,389
7	Los Angeles ↔ San Francisco	34,765
8	Brisbane ↔ Sydney	33,765
9	Cape Town ↔ Johannesburg	31,914
10	Beijing ↔ Shanghai	30,029

Preparing for the worst, hoping for the best

In the wake of a disaster such as an earthquake or flooding, airports in or near the affected area quickly become vital staging points for the flow of relief supplies. Preparation of airports is vital to ensure that assistance reaches the disaster victims quickly.

Deutsche Post DHL Group, making available its expertise in logistics, partnered with the United Nations Development Programme to prepare airport personnel and local disaster managers for the logistical challenge of a disaster response.

In Get Airports Ready for Disaster (GARD) workshops, DHL air freight experts help improve local processes for dispatching and processing large volumes of incoming relief workers and supplies.

More than 40 airports and 1,000 participants around the world have been trained, and the programme continues to grow.

A workshop was held in Manila in the Philippines for Davao International Airport Authority, the National Disaster Risk Management Council, government officials, representatives of the military and other humanitarian response experts. The country lies on the 'Pacific Ring of Fire', which makes it susceptible to earthquakes, typhoons and other types of disasters.

The airport's surge capacity for goods and passengers was assessed and possible bottlenecks identified; measures were then developed to quickly increase airport capacity and avoid such logjams in the event of a disaster. The customised disaster-response plan, drafted during the workshop, takes into account the conditions specific to the airport, such as architecture and geography. For this reason, the workshops always take place directly at the airport.

A network of more than 35 airlines and 80-plus international non-profits work through Airlink, which has responded to many rapid-onset disasters, including typhoon Haiyan in the Philippines and the 2011 tsunami in Japan. Airlink has transported more than 1,300 tonnes of cargo and over 4,000 passengers at a value of more than $6,000,000 in support of a range of humanitarian initiatives.

A GLOBAL INDUSTRY, DRIVING SUSTAINABLE DEVELOPMENT

Aviation's global **economic, social and environmental** profile in 2016

DRIVING SUSTAINABLE DEVELOPMENT

Aviation plays a critical role in sustainable development. Although the core economic, social and environmental elements of sustainability have long been understood, the United Nations 2030 Agenda for Sustainable Development set 17 more specific sustainable development goals (SDGs) that the world should aim to achieve by 2030. A number of these goals are based on improving the living conditions and economic prosperity of people all over the globe. The SDGs are backed up by around 170 statistical indicators.

To realise these ambitious goals, the international community must work towards shared economic growth, creating jobs and boosting economic activity worldwide. Aviation, as a global transport sector, is playing an instrumental role in supporting this task and is committed to finding additional ways to contribute.

Throughout this document, you will see a number of icons which relate to the SDGs shown here. This shows how aviation can help achieve the goals.

The sustainable development goals

1: NO POVERTY	End poverty in all its forms everywhere
2: ZERO HUNGER	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3: GOOD HEALTH AND WELL-BEING	Ensure healthy lives and promote well-being for all at all ages
4: QUALITY EDUCATION	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5: GENDER EQUALITY	Achieve gender equality and empower all women and girls
6: CLEAN WATER AND SANITATION	Ensure availability and sustainable management of water and sanitation for all
7: AFFORDABLE AND CLEAN ENERGY	Ensure access to affordable, reliable, sustainable and modern energy for all
8: DECENT WORK AND ECONOMIC GROWTH	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9: INDUSTRY, INNOVATION AND INFRASTRUCTURE	Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation
10: REDUCED INEQUALITIES	Reduce inequality within and among countries
11: SUSTAINABLE CITIES AND COMMUNITIES	Make cities and human settlements inclusive, safe, resilient and sustainable
12: RESPONSIBLE CONSUMPTION AND PRODUCTION	Ensure sustainable consumption and production patterns
13: CLIMATE ACTION	Take urgent action to combat climate change and its impacts
14: LIFE BELOW WATER	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15: LIFE ON LAND	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
16: PEACE, JUSTICE AND STRONG INSTITUTIONS	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17: PARTNERSHIPS FOR THE GOALS	Strengthen the means of implementation and revitalise the global partnership for sustainable development

ENABLING ECONOMIC GROWTH

Direct impacts

The industry itself is a source of considerable economic activity, creating jobs that directly serve passengers at airlines, airports and air navigation service providers (ASNPs). These include check-in, baggage handling, on-site retail, cargo and catering facilities. However, aviation also directly enables high-skill jobs in the manufacturing sector with those companies that produce aircraft, engines and other vital technologies.

The world's 1,303 airlines collectively transported four billion passengers to 3,759 airports all over the globe in 2017 and carried nearly 62 million tonnes worth of freight. To enable this activity, the industry generates 10.2 million direct jobs and adds $704 billion to global gross domestic product (GDP). To put that into context, that is equivalent to 0.9% of global GDP, or larger than both the automobile manufacturing sector and the pharmaceutical manufacturing industry[47].

The air transport industry provides an estimated 10.2 million jobs worldwide:

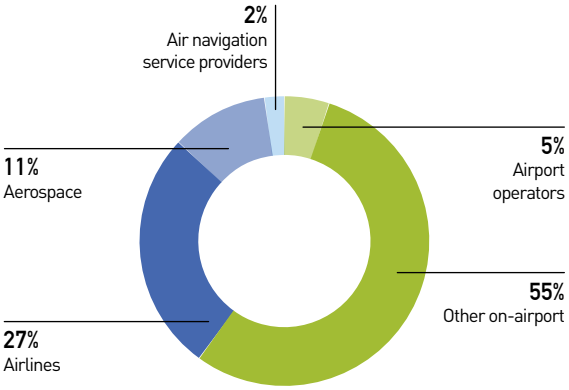
- **The airport sector accounts for 6.12 million jobs** (60% of the total). Of these, 525,000 positions are with airport operators (such as airport management, maintenance and operations). On-site employment (for example, at retail outlets, restaurants, hotels, government agencies) creates an extra 5.6 million jobs, or 55% of the total.
- **2.7 million jobs (27%) are provided by airlines** (for example, flight crew, check-in staff, maintenance crew, reservations and head office staff).
- **In the manufacturing sector, 1.2 million jobs (11%) are supported,** employing people in the building of civil aircraft and their associated parts, such as engines, electronic systems and components.
- **Air navigation service providers employ an additional 233,000 people (2%).**

Growth in traffic at airports also brings growth in the direct jobs generated. A common rule-of-thumb calculation is for every million passengers an airport handles around a thousand jobs are created on-airport[49]. This impact reduces slightly as airports grow (presumably due to efficiencies of scale), and this only relates to direct jobs at an airport and not the wider employment and economic benefits of connectivity growth across the economy (or even in indirect and induced employment).

The role of many parts of the industry is well known, but there are a number of players who are not quite so visible. Ground handlers provide contract services for airlines, often when the airline has a limited number of flights into an airport and employing its own staff would not make sense. These can be check-in, gate agent, dispatch, fuelling and cleaning services for airlines. It is estimated that the world's four largest independent

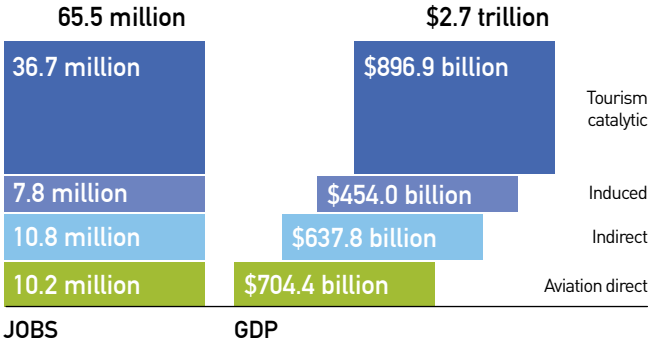
What we do

Direct employment in air transport by segment[48]



Beyond the industry

Aviation's global employment and GDP impact



ground handling companies, Swissport, Dnata, Menzies and Worldwide Flight Services, employ 162,000 staff between them[53]. Many airports and airlines also employ their own ground handling teams.

The economic impact of the aviation industry does, however, go further than just its direct impacts. The consequential economic benefits of both additional jobs and GDP should also be considered. These benefits demonstrate at least partially the breadth of air transport's economic reach.

Indirect impacts

These include employment and activities of suppliers to the air transport industry – for example, aviation fuel suppliers; construction companies that build airport facilities; suppliers of sub-components used in aircraft; suppliers of products such as radars and satellite-based navigation systems to the air traffic management industry; manufacturers of goods sold in airport retail outlets; and a wide variety of activities in the business services sector (such as call centres, information technology and accountancy).

Nearly 11 million indirect jobs globally are supported through the purchase of goods and services by companies in the air transport industry. This supply chain activity contributes approximately $638 billion to global GDP.

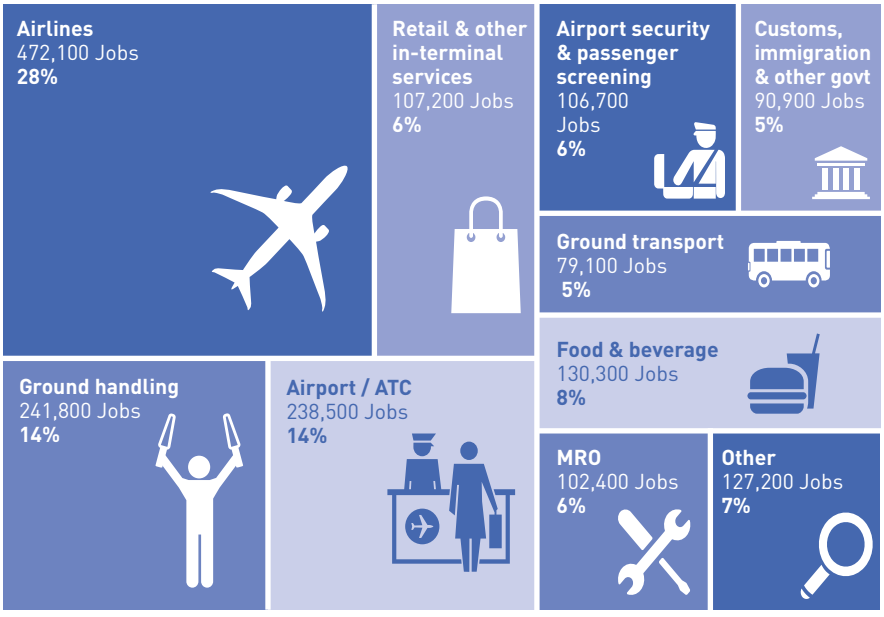
Induced impacts

The spending of those directly or indirectly employed in the air transport sector supports additional jobs in industries such as retail outlets, companies producing consumer goods and a range of service industries (such as banks, telecommunication providers and restaurants). Worldwide, nearly eight million induced jobs are supported through employees in the air transport industry (whether direct or indirect) using their incomes to purchase goods and services for their consumption.

The induced contribution to global economic activity is estimated at $454 billion.

On the ground

Overview of the types of jobs at a typical European airport[51]



Growing in tandem

How growth in passenger numbers helps support growth in direct employment[50]

Airport size	Each 1,000 passenger movements generates
0 – 1 million passengers	+1.2 jobs
1 – 10 million passengers	+0.95 jobs
Over 10 million passengers	+0.85 jobs

Supporting wider economic development

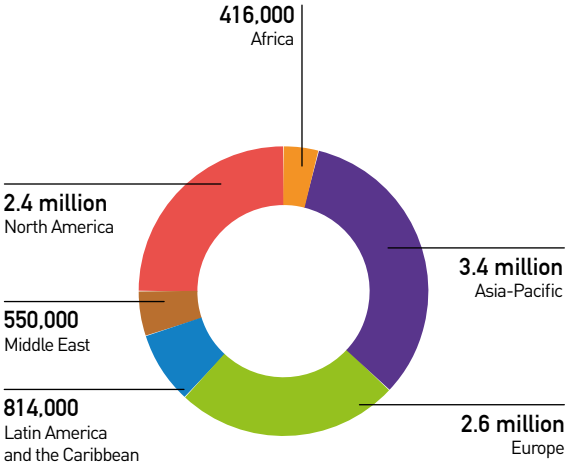
Although this report has explored the direct, indirect and induced impacts of the global aviation industry, there is far more to air transport's economic impact. Many other industries rely on effective air links to function.

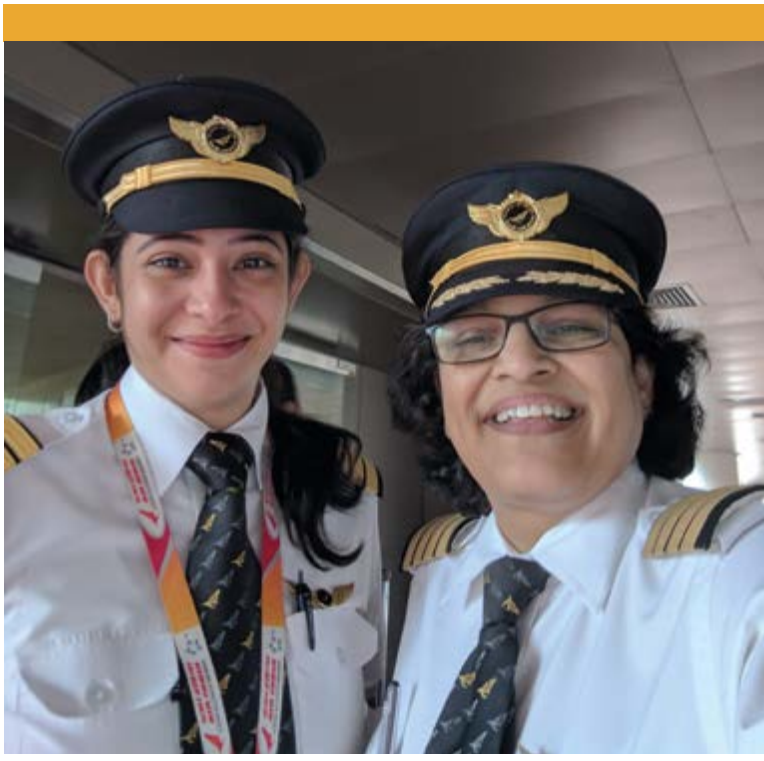
- One of the industries that relies most heavily on aviation is tourism. Without the connectivity provided by flight, many countries that rely on a steady inflow of tourists (particularly developing countries in regions remote from their source tourism markets) would not be able to enjoy their present levels of economic growth.
- World trade in a vast range of commodities and services is facilitated by air travel, increasing countries' access to international markets and allowing the globalisation of production.
- Countries also need connectivity to fully participate in the worldwide economy, encouraging higher productivity, investment and innovation. Connectivity helps businesses operate efficiently and attract high-quality employees.
- Air transport plays an especially pivotal role in 'just-in-time' global manufacturing production and in speeding fresh produce from agricultural communities in developing economies to markets in the industrialised world.
- Airports play an increasingly important role in supporting the communities they serve through direct and indirect employment, diverse economic activity and the catalytic economic benefit they bring to local, regional and national economies.

Other than for tourism, the exact economic impact of these wider benefits is difficult to determine given the complexity of the global economy. Tourism's effects are easily assessed. Since reliable data exists, its flow-on impacts and the economic links between the two industries are able to be explored.

Where we work

Direct employment by air transport by region, millions[52]





Aviation supports tourism

10%+ **Tourism supports over 10% of the global economy and nearly 300 million jobs.**

Tourism represents a significant contribution to the worldwide economy, providing employment and boosting global economic activity. In 2016, tourism supported 292 million jobs and made up 10.2% of world GDP, a total of $7.6 trillion[54]. For example, these employment figures include the people who work for the world's 90,000 accredited travel agencies[55].

According to the World Travel & Tourism Council, the sector's recent strong short-term growth will continue into the future, with average annual growth of 3.9% expected up until 2027[56]. If these predictions prove correct, by 2027 tourism should account for 11% of global GDP and provide 380 million jobs globally.

Tourism's growth, which is above the average of wider economic growth, is dependent on travel, particularly air transport. In 2017, 57% of international tourists travelled to their destination by air[58]. These tourists spent approximately $719 billion in 2017, a 7.2% increase on the year before[59]. For developing countries in particular, air links provide a vital economic lifeline to communities. In Africa, including direct, indirect and induced impacts, an estimated 4.9 million people are employed in areas supported by the steady influx of overseas visitors, most of whom arrive in the region by air. In addition, these arrivals by air supported an estimated $35.9 billion contribution to GDP in African economies in 2016[60].

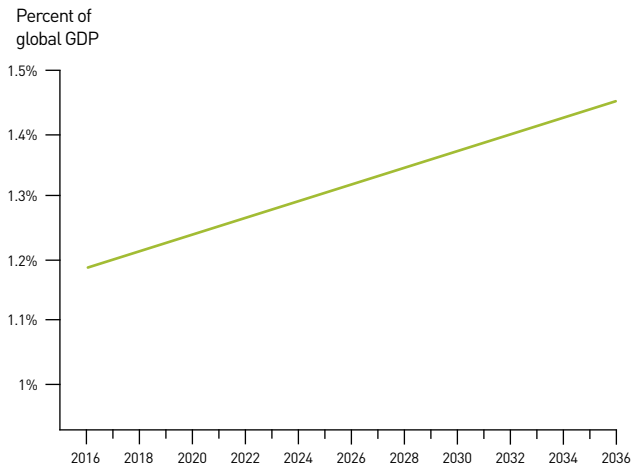
For small island states, the economic input provided by international tourists is invaluable. These countries, many of which are in remote parts of the world, enjoy tourism-induced economic boosts which would not be available without air links.

The contribution of air transport to tourism employment and GDP:

- **Direct:** An estimated 15.6 million direct jobs in tourism globally are supported by the spending of foreign visitors arriving by air. This includes jobs in industries such as hotels, restaurants, visitor attractions, local transport and car rental, but it excludes air transport industry jobs.
- **Indirect:** A further 14.1 million indirect jobs in industries supplying the tourism industry are supported by visitors arriving by air.
- **Induced:** These direct and indirect tourism jobs supported by air transport generate a further seven million jobs in other parts of the economy through employees spending their earnings on other goods and services.

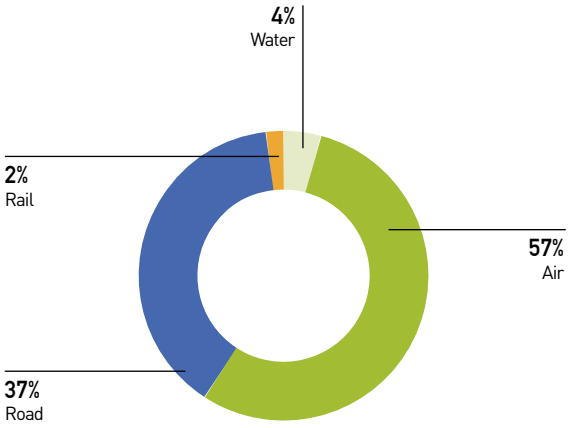
Onwards and upwards

Contribution to global GDP from international tourism facilitated by aviation, 2016-2036[57]



Getting you there

Travel modes of international tourists, 2017[61]



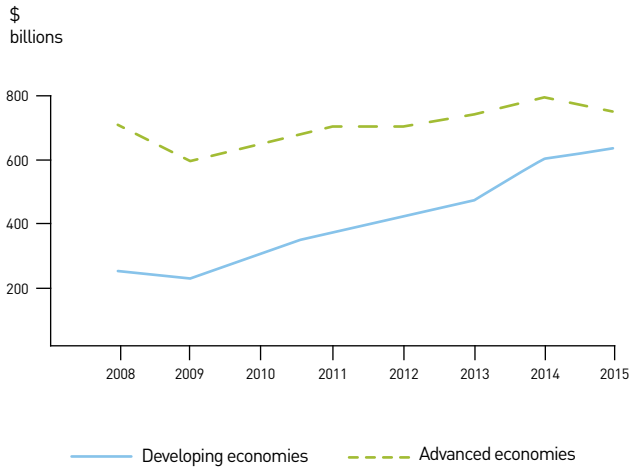
When these factors are viewed together, air transport supports over 36.7 million jobs within the tourism sector, contributing $897 billion a year to global GDP[62].

Travel and tourism competitiveness rankings are improving, especially in developing countries and most notably in Asia-Pacific[63]. The trends show that tourism from, and between, developing economies is growing steadily; however, as incomes rise in emerging economies and airfares fall, one of the obstacles to international travel remains restrictive visa regimes, even for tourism purposes. The good news is that the trend shows countries are realising the unnecessary barrier that these entry procedures place on their own tourism sector, curtailing economic opportunities, job creation and tolerance.

According to UN World Tourism Organization data, in 2016 destinations worldwide required 58% of the world's population to obtain a visa prior to departure[64], a significant improvement from 2008, when 77% of the world's population was made to apply for a traditional visa. In recent years, around 85% of countries have, at least partially, reduced the need for traditional visa processes.

Coming together

Convergence of international tourism expenditure[65]



A driver of global trade

The international trade of goods and services is one of the key drivers of global economic growth and development. The ability of people and businesses to trade with others all over the world is one of the key features of our modern, globalised society. Alongside the internet and other transport modes, air transport is a vital enabler of the global economy.

$6.0 trillion worth of goods was transported internationally by air in 2017.

The World Trade Organization (WTO) has been working towards the goals of the SDGs through supporting trade links in developing countries via the 'Aid-for-Trade' initiative. This programme, which works alongside the 'teach-a-man-to-fish' strategy of international development, has made good progress over the past decade. A joint Organisation for Economic Co-operation and Development (OECD)-WTO study indicated that $1 invested in aid for trade is, on average,

associated with an increase of nearly $8 in exports from developing countries[66]. To truly realise the potential of this initiative, research suggests that recipients and donor countries need to ease often restrictive regulatory arrangements in air transport[67].

Air transport is, of course, not the only means of transporting goods over long distances, with shipping and trucking making up a larger proportion. For time-sensitive global industries, however, such as those that require components produced in multiple parts of the world, air freight is the best way to ensure that production lines run smoothly and efficiently.

In the past few years, driven by advances in internet commerce, a whole new sector of rapid delivery 'e-commerce' businesses have been established and are thriving entirely based on the ability to move goods to consumers safely and quickly. Express cargo carriers, such as DHL, UPS and FedEx, have benefited from the rise of e-commerce, and the value of air transport in this sector was once again highlighted in 2016, when online retailer Amazon branched out its business and began operating 40 Boeing 767 freighters[68].

The pharmaceutical industry is one sector that relies heavily on air transport to move drugs and vaccines across long distances under strictly regulated storage conditions. In some cases, it is the perishable nature of the goods that requires swift transportation. In other situations, such as vaccines, it is the necessity of getting the products to the people who need them as quickly as possible[69].

The specialist nature of air freight is highlighted by comparison with other modes of transport. While air freight accounts for less than 1% of the tonnage, it makes up around 35% of the value of international trade.

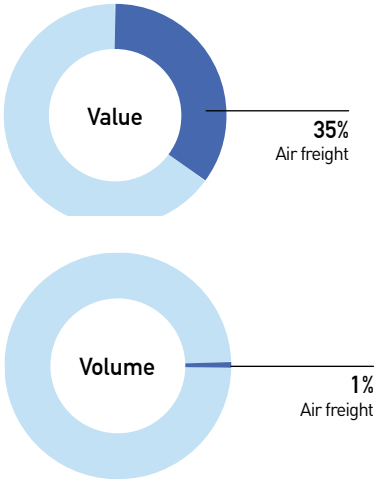
Bringing business partners together

The sharp increase in the level of telecommunication technology available has made meetings between business partners easier to undertake without travelling long distances in person. However, while these types of virtual meetings are useful in some situations, in many cases professionals feel that face-to-face meetings are far more productive. And, of course, larger-scale conferences are almost impossible without physically gathering in one place.

The personal relationships built up between representatives of companies are often considered to be an important part of business. A survey of 2,000 business people worldwide found that nearly half of those surveyed felt that they had lost a contract or client due to not having enough face-to-face meetings[72]. It also found that 81% said face-to-face meetings are better for building long-term trust and ensuring strong client relationships[73].

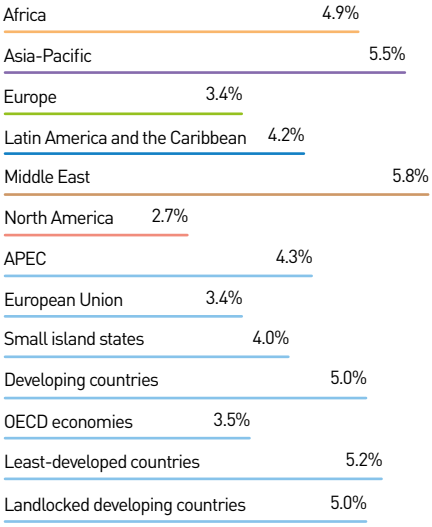
Small volumes, big values

Air freight by volume and by value, 2015[70]



Sustaining growth

Projected average annual growth rate for international air traffic by region, 2016–2036[71]



This overwhelming preference was attributed to a number of factors, such as the perception that face-to-face meeting participants built longer, more meaningful relationships and had improved ability to 'read' another person.

Fronting up the cash

When you look at the array of air transport infrastructure around the world, such as airport terminals, runways and air traffic management, it is easy to forget that the vast majority is financed by its users: passengers and airlines. The aviation industry on the whole pays for its infrastructure, rather than relying on government investment or subsidies. This is in stark contrast to other modes of transport, such as rail and road.

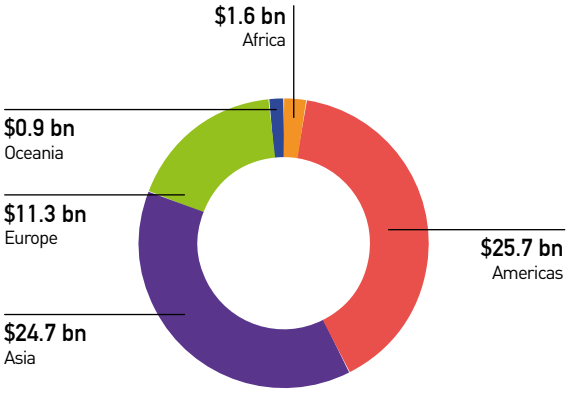
The investments made by the industry in developing its infrastructure, particularly on-airport, lead to further benefits for local communities, often providing skilled labour for construction as well as long-term regional benefits from improved surface access and employment. Nearly $64 billion was invested in airport infrastructure in 2016, with most investment taking place in Asia and the Americas[74].

To give a sense of the potential magnitude of the increase in passenger numbers from airport infrastructure investment, Oxford Economics compared the per capita airport infrastructure investment in 50 countries between 2007 and 2016 with the increase in air arrivals relative to each country's population in the same period[76]. This analysis found that an increase in airport infrastructure investment of $100 per capita over the nine-year period is associated with nearly 50 more air arrivals per capita, on average[77]. These additional passengers would have spent money on goods and services, forged friendships and cultural connections, and done business, all of which would have stimulated economic activity and jobs.

Of course, there is a wide spectrum of experiences depending on the country. Singapore, Croatia, Spain, and South Korea experienced much greater increases in air arrivals between 2007 and 2016 than their level of airport infrastructure investment would suggest. The United States, Canada, and the United Kingdom experienced lower increases in air arrivals than their level of airport infrastructure spending would suggest – possibly indicating the need for investment to replace outdated infrastructure. Some countries even saw declines in air arrivals relative to the size of their populations, typically because of political instability, as in Egypt's case.

Building the future

Airport infrastructure investment by region, 2016[75]



The variety of experiences in different countries suggests that airport infrastructure investment is not by itself sufficient to increase passenger numbers and drive an increase in tourism, trade and foreign direct investment. However, infrastructure investment can be a necessary condition to capitalise on latent demand that is being hindered by inadequate capacity.

Operational costs in aviation are funded through user charges (on passengers and airlines) and airport commercial revenue. User charges are generally included in the price of the airline ticket or paid separately by passengers.

When investing in modern aircraft and airport construction to meet industry growth, it is vital that air traffic management (ATM) is also upgraded and modernised to cater to increasing demand. Investment is needed to increase capacity and avoid congestion and delays.

Paying our own way

One criticism sometimes levelled at aviation is that it does not pay tax on international jet fuel and that this equates to a 'subsidy'. However, when one considers that the costs of airport and ATM infrastructure are paid for predominantly by the industry, the criticism is not a representative comparison with other modes of transport. In fact, when you consider the very real subsidies that other modes receive, often coupled with the high fares they charge passengers, air transport compares favourably as a cost-effective sector.

The road sector enjoys a high level of public investment in its infrastructure, even though road users in many locations pay fuel duties, vehicle excise charges and, in some cases, congestion charges and tolls. The rail sector, too, is often a beneficiary of high levels of public investment by national or regional governments. In Europe, for example, rail is heavily subsidised. According to the European Commission, rail subsidies in Europe totalled roughly $49.4 (€47) billion in 2016[78]. Meanwhile, aviation subsidies (primarily for public-service obligation routes to remote communities and small islands) were in the order of $110 (€105) million across the EU[79].

In developing economies, some air transport infrastructure is financed through World Bank project loans. In 2017, this amounted to $1.03 billion in investment, only 2.2% of the World Bank's $46.7 billion transport portfolio (which itself is less than a fifth of the $280 billion the World Bank invested that year)[80].

The 45 projects funded included the Pacific Aviation Investment Programme to help Pacific Island states improve operational capabilities and safety; airport development in Jordan, Croatia, Tunisia, Russian Federation and Shangrao, China; airport safety improvement in Goma, Democratic Republic of Congo; ATM modernisation in Africa; and advisory services across the developing world[81].

There is significant scope for international financing to help improve connectivity, particularly for remote regions. Governments could ensure that air transport is part of their mobility planning for both urban and rural access and could access funding from multilateral institutions.

It is the role of countries to ensure that improvements in ATM infrastructure are properly financed. As there are long lead times for procuring new equipment, such as air traffic control centres and the latest surveillance equipment, ATM investment needs long-term planning. Many air navigation service providers (ANSPs) have difficulty acquiring funding to modernise infrastructure, as most are government-owned and compete with other government departments, such as health, education and defence, in the budget process. The Civil Air Navigation Services Organisation (CANSO), which represents ANSPs, is therefore calling for countries to separate responsibility for providing air navigation services from their regulatory function and allow ANSPs to operate as normal businesses and seek funds from investors.

Stimulus for greater productivity

Arguably, the largest economic benefit of increased connectivity comes through its impact on the long-term performance of the wider economy by enhancing the overall level of productivity. A rise in productivity in firms outside the aviation sector comes through two main channels: the effects on domestic firms of increased access to foreign markets and increased foreign competition in the home market and the freer movement of investment capital and workers between countries.

Improved connectivity

- **opens new markets, boosts exports and increases competition** and choice in the home market from foreign-based producers, encouraging firms to specialise in areas where they possess a comparative advantage;
- **drives down costs and prices** for firms that have a comparative advantage (such as innovative products and services), benefitting domestic consumers in the process;
- **opens domestic markets,** which can also be an important driver for reducing unit production costs, either by forcing domestic firms to adopt best international practices in production and management methods or by encouraging innovation; and
- **benefits domestic customers through competition** by reducing the markup over cost that firms charge their customers, especially where domestic firms have hitherto enjoyed some shelter from competition.

Improved connectivity can further enhance an economy's performance by making it easier for firms to invest outside their home country, which is known as foreign direct investment. This necessarily entails some movement of staff, whether for technical know-how, management oversight, or servicing and meeting customers. Increased connectivity also allows firms to exploit the speed and reliability of air transport to ship components between plants in distant locations, without the need to hold expensive stocks of inventory as a buffer.

Less tangibly, but just as important, improved connectivity increases passenger traffic and trade. This, in turn, can lead to a more favourable environment in which foreign firms can operate – greater links to the outside world often drive a more conducive global business environment.

How aviation affects productivity

Quantifying the impact that improved air links have on a country's GDP is a difficult task. There are many factors to this calculation, and the complexity makes any assertion, at best, an estimate. However, there are some broad indicators that can be used to make an informed determination.

The International Air Transport Association (IATA) has developed a connectivity indicator that measures the degree of integration a nation has within the global air transport network. Using it, IATA has linked connectivity to economic performance to make a conservative estimate of the value of the sector to national economies.

The most recent research suggests that a 10% improvement in global connectivity (relative to GDP) results in a 0.5% increase in long-run GDP per capita. Oxford Economics estimates that rapidly rising global connectivity over the past two decades boosted global GDP by $200 billion in 2014, a number that continues to grow.

Analysis shows a strong positive relationship between higher connectivity to the global network – as a proportion of GDP – and labour productivity. Developing and transitional economies typically have low connectivity relative to their GDP and relatively low labour productivity. At the top right of the chart on page 22 are the developed Asian, North American and European economies with high levels of connectivity and labour productivity[82].

A driver of innovation

Since the dawn of air travel, aviation has been at the forefront of technological innovation, researching and developing disruptive, ground-breaking technology with each new generation of aircraft. There are many motivations for this drive in technological advancement. Not only do more efficient aircraft, engines and air navigation systems have a positive environmental impact through reduced fuel use and associated emissions but they also lower fuel costs for airlines in the long term, making air travel more affordable.

Aviation's focus on technological innovation has other benefits for society. It encourages research at universities and results in a highly skilled section of a country's workforce. The benefits to society of research and development spending by the aerospace industry are estimated to be much higher than in manufacturing as a whole – every $100 million of investment into research eventually generates an additional $70 million in GDP year after year[84].

Aerospace also drives the development of technologies that can be used in other sectors. The aviation sector was one of the pioneers in the use of additive layer manufacturing (also known as 3D printing). Many components of next-generation aircraft will be made using this technique. Composite materials, such as carbon fibre and ceramic composites, also owe much of their development to aviation research and development – and make up significant proportions of the finished product of modern, lightweight aircraft, such as the Boeing 787 and Airbus A350 XWB.

In economic impact, the aerospace sector plays a substantial role in the regions where it is based. According to the Aerospace and Defence Industries Association of Europe, civil aeronautics in Europe created a $123 (€117) billion turnover, with $7.35 (€7) billion invested directly by the industry in research in 2016[85]. Exports from European civil aerospace manufacturers totalled $85 (€81) billion in the same year. In the United States, total civil aerospace exports amounted to a $123 billion contribution to the national economy[86].

Affordability of air travel

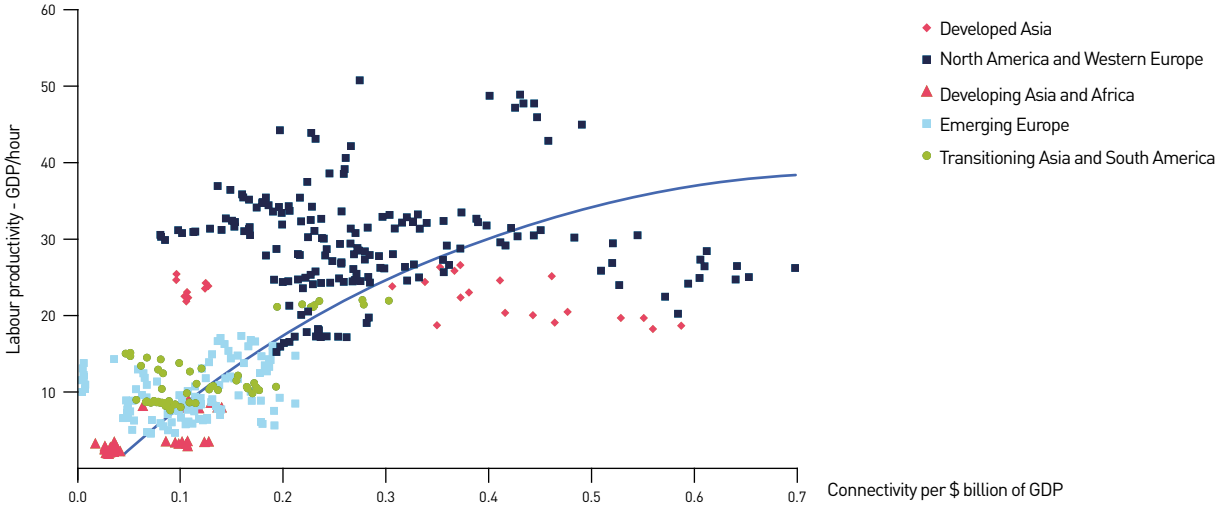
A key driver in the growth of passenger traffic has been the steady decrease in the real price of air travel – by 89% since jet aircraft first flew in 1950. Indeed, since 1970 the real price of air travel has been reduced more than 70% through the deregulation of the aviation market in the 1980s, the development of more fuel efficient aerospace technologies and the introduction of low-cost carriers. It is now more affordable for more of the population to travel by air.

In the United States, for example, the price for a return flight from Boston to Los Angeles fell 90% between 1941 and 2017, while the flight time is nine hours (and 11 stops) shorter[87].

This decrease in cost has led to an increase in the accessibility of air travel – the democratisation away from a pursuit just for the wealthy to a part of normal, middle-class life, especially in the developed world. It is estimated that 88% of Americans have flown at least once in their lives[88], with around half flying at least once per year. Statistics in the United Kingdom show similar results[89]. But flying is also becoming increasingly accessible in the developing world, with low-cost carriers opening up business and leisure travel to more and more citizens.

Working connections

Connectivity and labour productivity (excludes Cyprus, Hong Kong, Malta, Singapore), 2012[83]



The impact of taxes

Tax revenues are vital to finance social and economic programmes administered by the state. Globally, in 2016 airlines paid governments $117 billion in tax ($123 billion in 2017)[91].

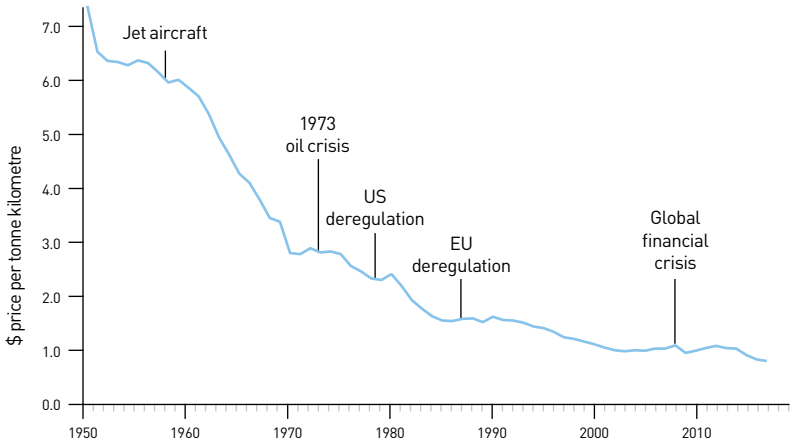
On top of this are billions of dollars in income taxes paid by industry employees and corporate taxes contributed by manufacturers and airports.

However, a tax that is levied on individual consumers or firms represents a market distortion. There are jurisdictions where providers and users of aviation infrastructure face a significant tax burden. This, in turn, may lead to a loss in competitiveness and opportunities for air service development aimed at enhancing connectivity and trade. Inefficient and burdensome tax measures that increase the cost of air travel will have a negative effect on demand and will hamper economic growth.

In compliance with the International Civil Aviation Organization (ICAO) Policies on Charges and Taxation, taxes on international air transport services should only be levied in a justifiable, equitable and non-discriminatory manner.

A good deal

Evolution of the average price of air travel ($ per revenue tonne kilometre), in real terms[90]



SUPPORTING SOCIAL DEVELOPMENT

Sustainable development is not just about working towards economic progress in an environmentally sustainable way. A significant aspect of this concept is improving the lives of people in ways other than financial prosperity. These socially based ambitions are an important part of the Sustainable Development Goals and are supported in many ways by civil aviation.

For many people all over the globe, the ability to travel to any other country is an invaluable asset, relied on to visit friends and relatives, move abroad for work and study or, of course, go on holiday. Without air transport, being able to travel and experience new countries and cultures would be far more difficult – and certainly impossible in such a short time span. And when the most acute crises happen, air transport can literally make the difference between life and death.

Ensuring well-being: visiting friends and relatives

The third sustainable development goal, which relates to well-being, is about more than just physical health. Families in the 21st century are a prime example of how globalisation has changed the modern world. Many families are now spread all over the world as people move for employment opportunities, university education or simply for lifestyle. This has resulted in far greater cross-border ties between individuals and countries.

According to the UN's International Labour Organization, there were 150.3 million migrant workers globally in 2013[92]. Almost half of these (48.5%) were concentrated in North America and Europe. It is estimated that migrant workers make up 4.4% of all workers globally. One in six workers in high-income countries travelled there from another country.

Many of the host countries of migrant workers, particularly in Europe, have ageing populations. This makes the international labour market essential for their long-term economic well-being, supporting those of pensionable age.

A prime example of how cross-border ties have strengthened is the geopolitics of the European Union, where the free movement of people and goods has been enabled by the Schengen Agreement of 1985. Although recent political developments have dented confidence in this arrangement, it remains one of the cornerstones of European integration. Naturally, many of the EU's citizens are able to travel across national borders by modes of transport other than air travel, such as rail, road, or even by foot. However, in many cases, flying is the quickest, most secure and most cost-efficient means of travelling between European nations. Almost every intra-European flight can be completed in less than three hours, allowing individuals and businesses to connect seamlessly and consolidating personal ties and business relationships.

Connecting you, wherever you are

There are nearly 3,800 airports globally, the best known of which handle millions of passengers in major cities. However, perhaps some of the most important airports are not very well known at all, except to the small communities they help connect to the outside world. Half of these airports rely on regional-sized aircraft due to capacity constraints and 36% are limited to turboprop aircraft[93]. In the Arctic, across vast stretches of wilderness and on small island states all across the world, air services can provide connections to regional centres and the rest of the world that otherwise would not be available and without the need for expensive and challenging road infrastructure development.

Studies have shown that access to air services not only helps remote communities with vital lifeline needs but also economically, with a 1% increase in air passengers resulting in a 0.12% increase in per capita income in communities supported by essential air services in the United States[94]. US government support for otherwise un-economic air routes has a considerable benefit for 160 communities, far beyond the cost of the subsidy to the government. In Europe, support is provided to various 'public-service obligation' routes. In Australia, the Remote Air Services Subsidy helps connect 257 communities (including 86 indigenous settlements) across a vast continent – some as small as six people, others up to 200 residents[95]. In Malaysia, the Rural Air Service programme supports 49 routes on the island of Borneo to help promote national connectivity and provide support for remote communities[96].

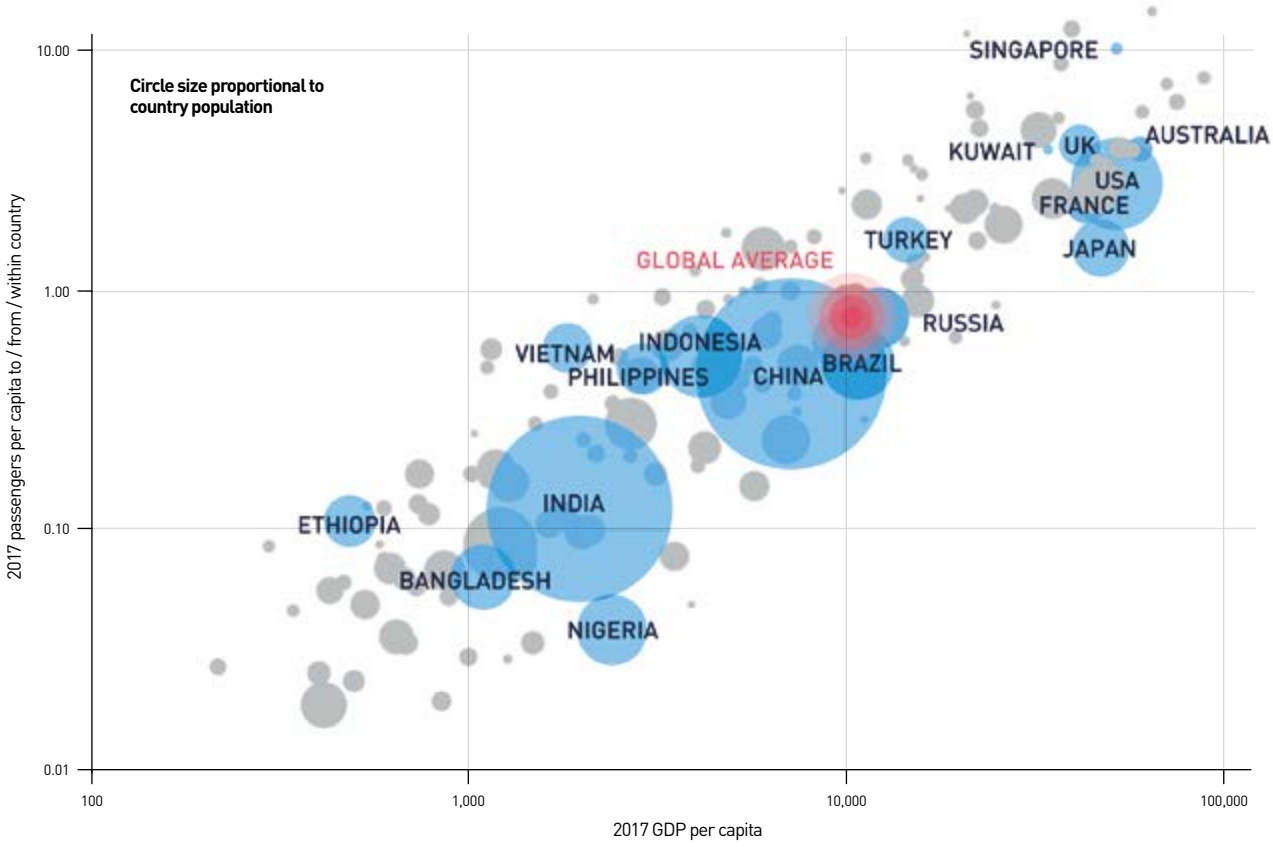
In studies of regional economies in Sweden, Indonesia and Brazil, a 10% increase in airport connectivity was shown to support an increase in foreign direct investment of 4.7%, up to a 0.5% increase in regional GDP, up to a 0.7% increase in local wages and up to a 0.9% increase in employment. In some regions, these impacts were shown to be significantly higher: an 8% increase in foreign direct investment; a 5% increase in tourism and a 6% increase in regional GDP[97].

To take advantage of efficiencies of scale, some airports work in 'networks' to connect less-busy regions with higher-traffic hubs. Globally, around 1,000 airports (with fewer than one million passengers per annum) are in these network structures and collectively serve over 278 million passengers annually[98]. Indeed, small airports and airlines act as catalysts in feeding traffic into hub airports for onward journeys to other major national and international destinations. Smaller airports within a network generate traffic that ensures the sustainability of larger airports, resulting in improved load factors and optimal aircraft utilisation by airlines.

New technology that has come on stream in the past couple of years will enable some remote and seasonal airports to remain open and viable. Digitalisation of air traffic control towers means that tower services can be conducted remotely without any loss of service or reduction in safety[99]. This technology is cheaper than building an expensive tower, as all that is needed are a series of cameras on masts. And remote towers are labour cost-effective as well; there are economies of scale with air traffic controllers in one centre controlling towers at multiple airports.

Who's travelling?

The global propensity to travel, 2017[100]



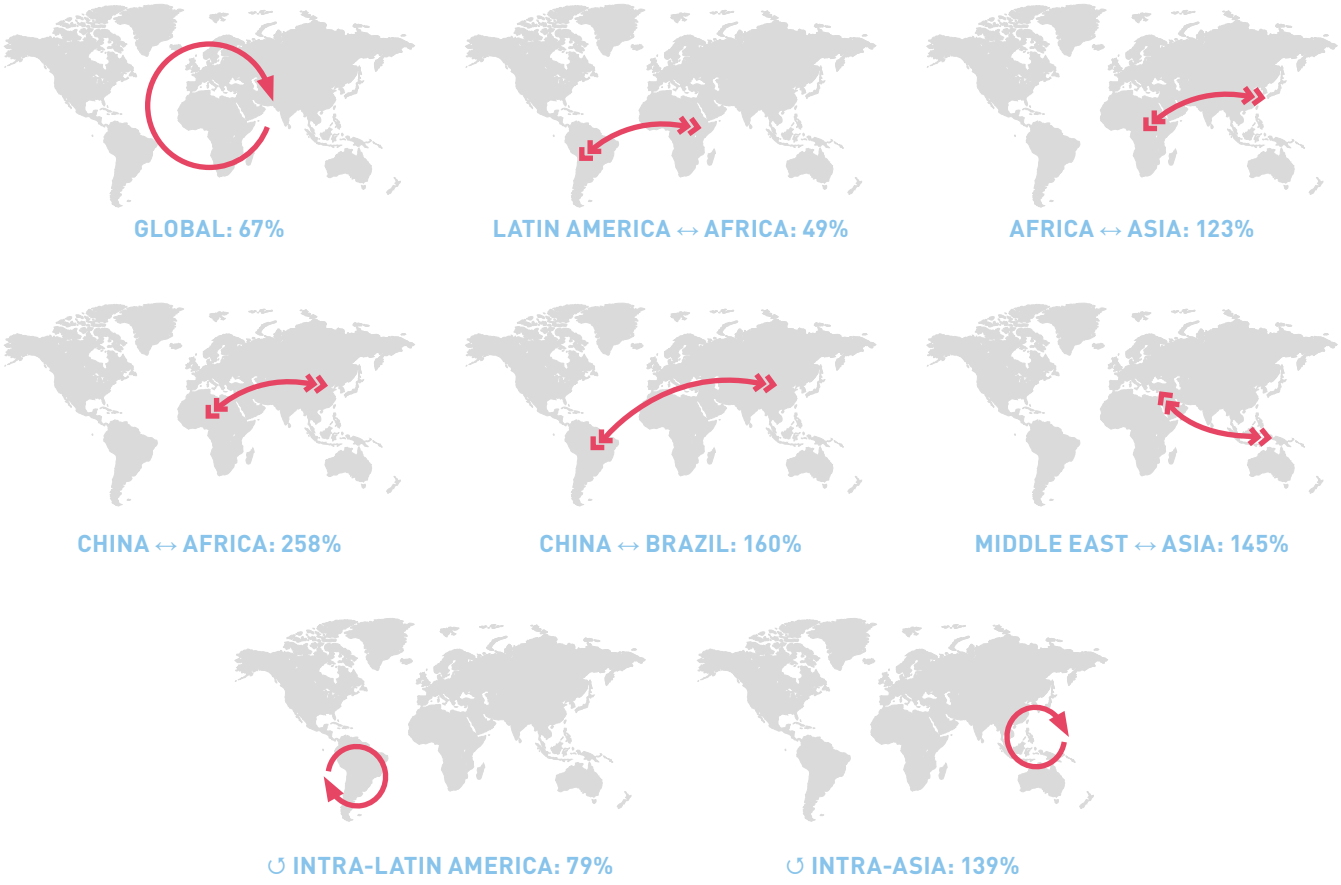
It is not surprising that the greatest increase in propensity to travel between 2017 and 2036 will be in developing economies: India (269% increase), China (224%), Lebanon (192%), Indonesia (188%) and Thailand (178%)[101]. Data also show that the rate of growth in some so-called south-south routes is increasing at a much higher rate than the global average. The last decade has seen substantially more traffic between China and Africa, for example. In addition, half of the top 20 countries for passenger traffic are now developing or emerging economies[102].

Leapfrogging development issues

There are other ways that air transport can bring about rapid change in development for remote communities and emerging markets. Airfields can provide access to areas where road construction proves too challenging or expensive, and the latest air traffic management technology is enabling developing countries to leapfrog to the latest cost-effective technologies. These countries can avoid installing expensive radar systems and install more sophisticated 'ADS-B' coverage systems or even to simply buy surveillance 'as a service' from a satellite-based supplier rather than building costly ground-based infrastructure. They can also take advantage of remote tower technology and digitalisation to open or maintain remote airports without having to build or upgrade costly air traffic control towers.

The growth is out there

Passenger growth between select developing and emerging regions, 2007-2017[103]



Supporting families back home

According to the United Nations (UN), there were an estimated 258 million international migrants in 2017[104], of which around 150 million are classed as migrant workers who move abroad for employment purposes[105]. These international migrants are estimated to have collectively contributed $429 billion in remittances in 2016[106].

Remittances, where someone working abroad sends part of their earnings to family back home, are sometimes viewed negatively, signalling weakness in a national economy and associated with a 'brain drain' in talent. However, the system of remittances can form a larger source of funding than overseas development aid and a more stable revenue source than private debt[107], and the continuity of remittances is supported by the maintenance of family and cultural ties – aided by air transport links. This source of overseas income can play a significant role in some nations. For example, remittances account for roughly 30% of Nepal's GDP and for around 20% of Honduras's GDP[108].

The World Bank estimates that, after a slowdown in 2015 and 2016, global remittances will rebound in 2017/2018. Not only do these funds help alleviate poverty in less-developed countries but they also help achieve the SDGs more widely[110].

Quality education

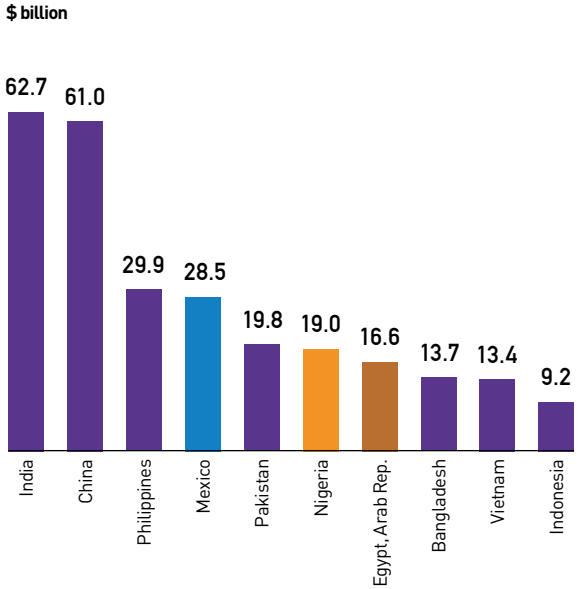
Ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all is a stand-alone sustainable development goal. To access higher-quality education for many means travelling to another country, sometimes in another region of the globe. Without air transport, these opportunities simply would not be feasible, particularly for shorter-term university exchange programmes, such as the European Erasmus system.

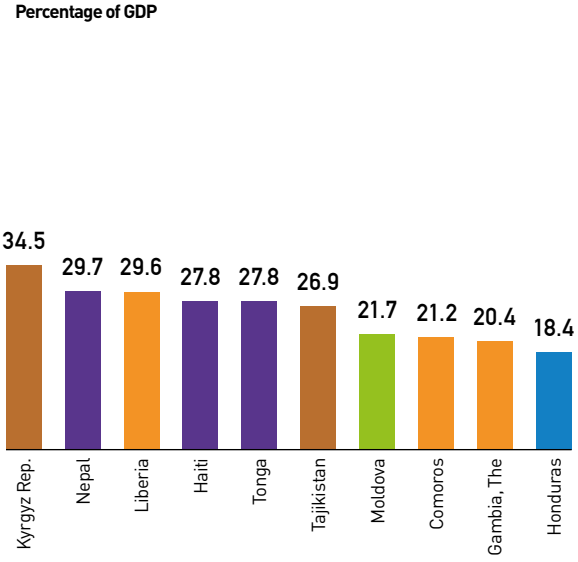
Sub-goals of the SDG include the aim of expanding global scholarships and, by 2030, substantially increasing the number of youth and adults who have relevant skills, including technical and vocational skills, for employment and entrepreneurship. Air transport connectivity can make these ambitions far more likely to be realised.

For students from developing countries, the opportunity to travel to established universities for higher education is invaluable. Not only does this help the individual's personal improvement but it also creates benefits for their home country, as students return armed with knowledge to contribute to their home economy and with strengthened links to the global economy[111].

Supporting those at home

Top remittance-receiving countries, 2016[109]





Not only does aviation help foster educational connectivity for students but it has also been shown to increase scientific collaboration, particularly when more affordable airfares enter a market. Analysis of data from 1991–2012 shows that the entry of a low-cost carrier into a route increased scientific collaboration by 30%[115]. Moreover, the quality of the scientific output increased, as researchers were able to collaborate more effectively face-to-face: "Cheaper air travel, by counterbalancing how geographic distance constrains collaboration choices at stages when face-to-face interactions cannot be substituted for remote interactions, may have a significant effect on the generation and recombination of scientific knowledge."

Highly skilled workforce

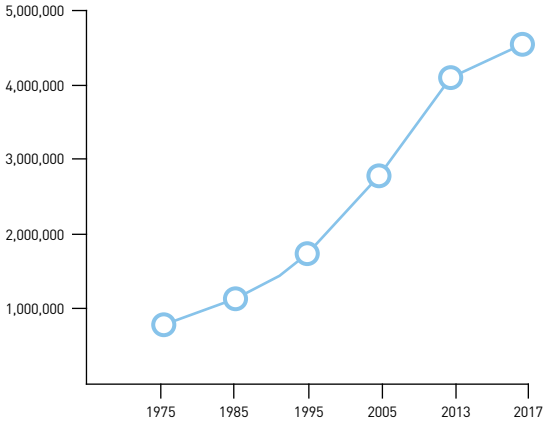
Jobs in air transport cover a wide range of activities and skills. These include

- skilled work by technicians building and maintaining aircraft;
- diverse technical engineering jobs, from aircraft and engine design to component production;
- air traffic control and airspace design planning;
- logistics for airlines and airports;
- complex information and communication technology systems that link aircraft, airports and air traffic management to ensure efficiency of operations;
- systems on board aircraft and in areas such as baggage handling systems design;
- service industry jobs, such as chefs in catering companies;
- satellite systems providing communications, surveillance and tracking of aircraft and air navigation services;
- creative positions in design and marketing;
- customer services occupations in airline ticketing, check-in, cabin crew and retail;
- manual labour on airfields;
- occupations as air traffic controllers and pilots;
- jobs as emergency response personnel at airports; and
- leadership, management and executive roles.

As this list indicates, many roles in the air transport sector require highly qualified workers and a significant amount of training. Value added per employee in the air transport sector (direct employees, excluding non-airside activity at airports) generates 4.4 times as much value added per employee as jobs in the economy overall – indicating a more productive workforce. This is particularly true for the large populations of Asia-Pacific, Africa and Latin America.

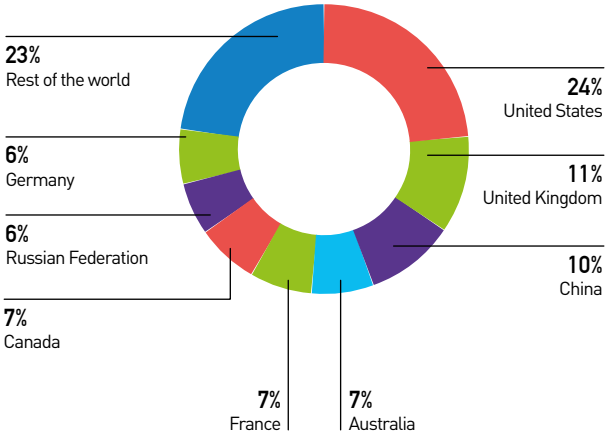
Learning overseas

Growth in students studying abroad, 1975-2017[112]



Soft power, hard learning

Global top destinations for international students, 2017[113]



In addition, growth in the aerospace sector is helping to drive innovation and skills development in countries that have not normally been associated with aircraft manufacturing. This is just one of many examples of air transport–related companies investing in developing countries.

According to analysis for Airports Council International (ACI) Europe, the total direct employment at European airports received an estimated $76.8 billion (€68.5 billion) in income (wages, salaries, bonuses and other remuneration), or an average of $45,310 (€40,400) per job. This figure is considerably higher than the average income in the overall economy. In all countries, the average income of direct airport employment was higher than the national average. This reflects the large number of highly skilled positions that are supported by airport activity.

In the United States, the average wage for an airline employee in 2016 was roughly $89,000, which is significantly higher than the average national private-sector wage of $59,000[116]. Globally, in 2016 airlines paid their employees $159 billion in wages ($171 billion in 2017)[117].

Gender imbalance

Global statistics on gender equality within the air transport sector are scarce; however, anecdotal evidence suggests that aviation still tends to be a male-dominated industry. Statistics for Europe show that women make up 41% of employees, although technical positions will likely skew towards men[118]. A global survey of gender equality in flight crews shows that, despite the first commercial pilot's licence being granted to a woman in 1934[119], women still only make up around 5.5% of pilots worldwide[120].

Some countries are showing signs of a move in the right direction: India[121], Iceland, Finland, Thailand, Sri Lanka and Slovenia all have greater than 10% female pilots[122]. But perhaps the most promising sign is in the next generation. Female student pilots now make up more than 10% of their classes in the US, the Netherlands, Japan, Belgium, Switzerland, India, Canada, Norway, the United Arab Emirates, Spain, Panama, Indonesia and Sweden. Standing out of the crowd is Singapore, where 23.3% of student pilots are women[123].

On the manufacturing side of the industry, women tend to have a slightly higher representation, making up 24% of the workforce in the United States (this includes defence manufacturing, whereas most of the statistics in this report are limited to civil aviation). Within this group, women make up 15% of engineering jobs, 16% of engineering executive roles and 24% of executive positions[125].

In airport operational roles and ground handling in Europe, women make up 25.8% of employees, although in the lower age bracket (those under 30) over 32% of staff are women[126]. A sample survey of air navigation service providers conducted in 2017 found that 25% of air traffic controllers were women[127].

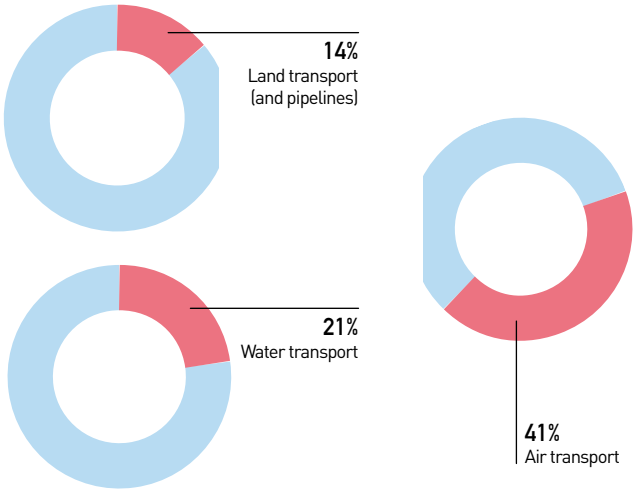
Flying in to study

Global top ten countries of origin for international students, 2013[114]

Rank	Origin	Students
1	China	694,400
2	India	189,500
3	South Korea	123,700
4	Germany	117,600
5	Saudi Arabia	62,500
6	France	62,400
7	United States	58,100
8	Malaysia	55,600
9	Vietnam	53,800
10	Iran	51,600

Gender balanced?

Air transport has more work to do getting women into the business, EU28, 2017[124]



In airline executive roles, the gender gap is as great as in technical positions, with women making up just 3% of the top 100 airline chief executive officers (v. 12% of CEOs in the wider economy); 8% of chief financial officers (v. 19%); and 3% of chief operating officers (v. 9%). In human resources, airlines outperform the wider economy, with women constituting 32% of HR directors (v. 23%)[128].

Aviation passengers seem to be fairly balanced in gender, with the United Kingdom and the United States reporting around a 50% split (although Heathrow Airport in particular has a higher male passenger count, at 54%, presumably due to business traffic still skewing male)[129]. Unfortunately, there are few other statistics available on passenger gender split globally.

Good health and well-being

The United Nations' third SDG, 'good health and well-being', is a crucial element of sustainable development. Although not directly linked to improving physical heath, air transport, with its ability to provide speedy and safe transport of people and cargo to places that are often in remote areas of the world, has a part to play.

A prime example of how aviation plays a role in public health is the ability to transport vaccinations. Not only are these vital medical supplies time sensitive, making other modes of transport unviable over long distances, but their temperatures must also be carefully regulated, something in which cargo airlines are very experienced. In 2012, for example, UPS transported over 375,000 influenza vaccines in prefilled syringes over 15,000 kilometres from Kentucky to Laos, across the borders of five countries, the whole time maintaining them at a steady temperature range of 3–7°C[130].

Aviation also has a crucial role to play in pandemic response. When a viral outbreak occurs, it is vital that the air transport sector acts quickly to work with governments and international institutions to ensure that the virus does not travel further. Recent examples of this collaborative effort are the Ebola and Zika outbreaks in West Africa and South America, respectively. Whereas a natural reaction by many would suggest halting all travel from these regions, often this is not the best response. Many aid organisations and the World Health Organization recommend that connectivity remain in place, although with appropriate health controls on passengers.

IATA and ACI participate alongside other partners in the World Health Organization Travel and Transport Task Force, which is chaired by the UN aviation agency, ICAO, to provide information and global coordination to the travel and tourism sector. IATA and ACI work with their networks of regional and area managers to monitor pandemic-related restrictions in countries around the world, ensuring their member airlines and airports are aware of the situation and avoid any risky activities. The IATA medical advisor also cooperates with a number of influential national public health authorities to help them make recommendations compatible with aviation industry operations[131].

Providing vital aid

One of the more ambitious of the UN's SDGs is the campaign to achieve 'zero hunger'. To achieve this goal requires the creation of the conditions for food security across the world. This is a long-term challenge, and, in the meantime, some parts of the world will continue to need support from the international community. Aviation's unique ability to combine speed with flexibility makes it a vital conduit for immediate response to natural and man-made emergencies.

The World Food Programme (WFP), in partnership with the UN Humanitarian Air Service, is tasked with getting food to those in the midst of war, civil conflict and natural disasters. Because many of these zones are inaccessible by road, air transport is the only option. In 2015, almost 6,000 tonnes of food and non-food commodities were delivered by air to relieve victims of floods, conflict and disease. In 2016, nearly 300,000 passengers, mostly aid workers, were airlifted to the areas of the world most in need of assistance[132].

The industry, too, has a vital role to play in responding to disaster. In 2010, Airlink was established to help coordinate responses to emergencies by the air transport industry. Today, Airlink provides a vital link between more than 35 commercial and charter airlines and 80-plus international non-profit aid organisations which have been pre-qualified and vetted to ensure the right aid gets to the right people. When disaster strikes, there is no need to form relationships to coordinate a response – they exist already. Since 2010, Airlink and its airline partners have transported over 4,000 passengers and 1,500 tonnes of cargo in support of a broad range of humanitarian initiatives[133].

Helping to end trafficking

The trafficking of persons remains an issue the world must tackle. Abuse can include forced labour, sexual exploitation and organ removal, and it takes place internationally and domestically. A fifth of all victims are trafficked trans-regionally, many times using air transport services[134]. The United Nations reports an estimated 63,251 victims of human trafficking were identified between 2012 and 2014[135]. It is thought that 71% of human trafficking victims are female and 28% are children. This does not generally include people who are vulnerable to human smugglers and end up in servitude as a result of 'debts' owed to criminals. Estimates show up to 40 million people are victims of modern slavery, which includes forced labour and forced marriage[136]. There is also growing evidence that terrorists are using human trafficking to fund their activities, which can exploit the connectivity created by civil aviation and tourism.

The industry is backing action to help relevant staff identify the signs of trafficking on board aircraft and at airports and to report suspicions to law enforcement. IATA and ACI have adopted resolutions to ensure airlines and airports are made aware of the issue and have prescribed actions they can take to reduce its possibility[137]. ICAO has worked with the Office of the United Nations High Commissioner for Human Rights to develop guidance material on the training of cabin crew[138]. However, for any training of cabin crew, ground staff, operations centre teams and flight crew to be effective, clear channels of communication with law enforcement are essential. The industry stands ready to help but needs government authorities to also provide effective solutions.

Halting the illegal trade in wildlife has also been an area of joint action between industry and governments, with over 55 airlines joining IATA in working with the United for Wildlife Transport Taskforce alongside other aviation stakeholders, such as ACI, Heathrow Airport and regional airline associations[139]. The USAID ROUTES Partnership has played an important role in providing resources and tools to the aviation sector to help combat the illegal wildlife trade, including training materials on how to spot signs of wildlife trafficking[140]. As with the trafficking of persons, the responsibility lies with the appropriate law enforcement agency, so the industry is working hard to ensure appropriate reporting mechanisms are available for staff to report suspicions to law enforcement.

ENVIRONMENTAL RESPONSIBILITY

The undoubted economic and social benefits of aviation are clear, with the growth of the sector being important for all countries, developed and developing. However, these benefits also come with an environmental cost. For aviation to grow sustainably, it is vital that the industry balances the advantages of growth in air travel with the responsibility to pursue climate change action.

This responsibility is something that the global aviation sector takes seriously, and it ties in with a number of the SDGs.

Aviation accounts for roughly 2% of man-made CO_2 emissions through the burning of 341 billion litres of jet fuel, which in 2017 produced 859 million tonnes of CO_2. These emissions are equivalent to the annual emissions of a country such as Germany[141].

Aviation is an efficient means of long-distance (intercity, interregional, and international) transport, operating in many places more efficiently than alternatives, such as road and even rail. For some travel, there is simply no practical alternative to flying – around 80% of aviation emissions are produced from flights greater than 1,500 kilometres. The challenge for aviation is to further reduce emissions while retaining the benefits of air transport.

To meet this challenge, in 2008 industry leaders announced a climate action plan based on three global goals, which the entire sector has committed to:

1. **Achieve a 1.5% average annual fuel efficiency improvement** from 2009 to 2020 (a goal which is already being surpassed, with an average improvement of 2.1% per year).
2. **Stabilise net CO_2 emissions at 2020** levels through carbon-neutral growth.
3. **Reduce net emissions to 50%** of what they were in 2005 by 2050.

To meet these goals, the industry has put in place a collective strategy that takes account of all means of reducing emissions. The industry has been implementing many of these measures for years. In fact, per passenger a flight taken today will produce around half of the CO_2 produced by the same flight in 1990.

Technology

Aviation has always had a focus on efficiency. Fuel makes up the main operating cost for airlines, so in this sense economic and environmental motivations are intertwined. Since the first jets began flying, technology-driven efficiency has improved 80% with the introduction of new models of aircraft and engines. Aircraft and engine manufacturers spend an estimated $15 billion each year on research and development, representing a major investment in the sustainable future of air travel[142].

Thanks to new aircraft, absolute emissions from US airlines dropped 3% between 2000 and 2016, while traffic rose 24%. In Europe, several factors, including new technology and air traffic management efficiency, contributed to holding aviation emissions in 2014 at around the same as 2005 levels, despite 25% growth in passenger traffic[143]. On average, each new generation of aircraft is roughly 15% to 20% more efficient than the previous generation.

The last decade has seen the development or introduction of entirely new aircraft types, such as the Airbus A380, A350 XWB and A220 family and the Boeing 787 Dreamliner. These were joined by new versions of existing aircraft, such as the Embraer E2, 737MAX, A320neo, A330neo and Boeing 747-8. These are powered by next-generation jet engines made by manufacturers such as CFM International, Pratt & Whitney, GE Aviation and Rolls-Royce, and all have produced impressive fuel savings.

In addition, in-service aircraft models are subject to continuous performance improvements. These include highly efficient turbo-prop aircraft, such as the ATR72-600 and Bombardier's Q400 series.

By 2020, it is expected that other fuel-efficient aircraft will enter service, including Boeing's 777X.

In addition to the latest propulsion technology, additional technological features have been included to maximise fuel efficiency. Improved aerodynamics, new manufacturing techniques and composite materials play a prominent role in determining how much fuel is burned on any given flight.

Carbon fibre composites are being increasingly used to build parts of aircraft, particularly the wings, which improves fuel efficiency through decreasing weight and enabling advanced aerodynamics. Some engine manufacturers have taken advantage of another new material, ceramic-matrix composites for use in jet engines. This allows the engines to operate at a higher temperature than conventional engines, resulting in better fuel efficiency. Like the composites used to make wings, this material is lighter than traditional metal alloys, and that further cuts fuel use.

Sustainable aviation fuels

The development of sustainable aviation fuels (SAF) represents considerable potential for securing the sustainable development of air travel. Sustainable aviation fuels (sometimes referred to as 'biofuels') are almost chemically identical to traditional jet fuel and meet the rigid jet fuel specifications. But rather than being made from fossil fuels, they are synthesised from other, sustainable 'feedstocks'. These feedstocks can take the form of plant matter, municipal waste or even used cooking oil.

Sustainability criteria are key to aviation's position on alternative fuels. The industry took careful note of the negative impacts seen when the first generation of biofuels were deployed in road transport and is determined not to repeat those mistakes.

To qualify as a sustainable aviation fuel, a biofuel must be demonstrably less carbon intensive over its life cycle than a fossil-based fuel and must fulfil certain sustainability criteria, including that its feedstock should improve food security in food-insecure regions. Various certification schemes for alternative fuels have been established around the world to provide independent assurance that the fuel produced meets a rigorous standard for sustainability.

Many recent innovative alternative fuels have been produced using sources such as waste, microalgae, saltwater tolerant plants that grow where food crops cannot, rotation crops that enhance soil nutrients off season, and nicotine-free tobacco.

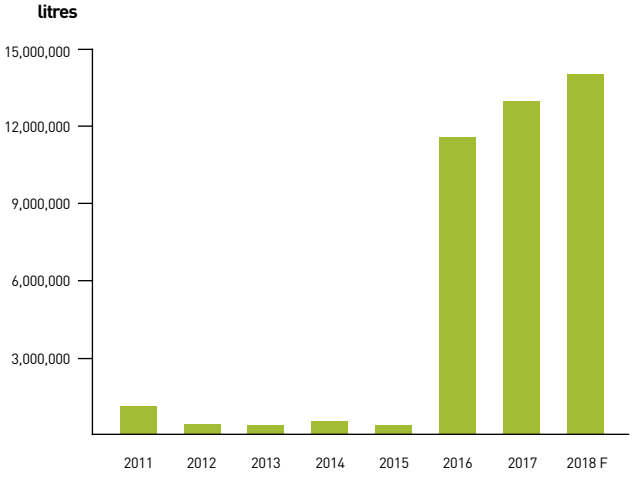
One of the main advantages of sustainable aviation fuels is the diversity of their feedstocks. The fuels must all meet rigorous jet fuel specifications following the production process, but producers are able to utilise whatever feedstock is abundant in a particular region of the world, be that forestry waste in Norway, agricultural residues in the US or municipal waste around the world.

SAF can be up to 80% less carbon intensive over their life cycle compared with fossil-based fuels. The challenge for this new energy industry is to produce these fuels to a sufficient quantity to make them commercially viable. This requires significant investment from industry and governments alike. However, impressive progress has already been made in this fledgling sector, particularly in the last five years.

Since the use of SAF was approved in 2011, over 150,000 flights have taken place with an alternative-traditional fuel blend[144]. By 2020, this number is expected to increase to a million. As of publication, sustainable alternative fuels are routinely being deployed by airlines and their partners at four international airports, and there are plans for deployment from additional airports in the near future. This is also a particularly significant step as far as the supply method is concerned. SAF is being incorporated into airport hydrant systems, which means that airlines do not need to alter their normal refuelling process.

Onwards and upwards

Production ramp-up in sustainable aviation fuel will continue, annual estimates[145]



In 2017 alone, over 52,000 flights took off on a blend of sustainable and traditional jet fuels. These used 14 million litres of neat sustainable aviation fuel. This currently accounts for just 0.004% of the total fuel used in aviation, although as more airports and commercial-scale production projects come on line, this number will increase substantially.

A number of airlines have signed significant forward purchase agreements for the use of sustainable aviation fuels, helping to kick-start this nascent industry. For updates about the deployment of sustainable aviation fuel around the world, check www.enviro.aero/SAF.

Operations

The operations pillar of the industry's strategy deals with how aircraft are run once they are in service to ensure that all flights maximise fuel efficiency. Many efficiency gains come from cutting all unnecessary, non-flight–critical weight. Numerous airlines have invested heavily in features such as lightweight seats and cabin trolleys or Kevlar cargo containers, which have the added benefit of being stronger and lighter than conventional counterparts[146]. It has also become increasingly common for flight crews to be issued with tablet computers in place of paper-based flight manuals, which can weigh up to 20 kilograms[147]. While on their own these savings are not huge, when added together they account for significant CO_2 savings. By installing lighter but stronger seats, one airline reduced CO_2 across its fleet by 21,000 tonnes.

Wingtip technology is another operational improvement that has led to major fuel and emissions savings for airlines. Most new aircraft have these features included at the point of production, and many airlines have invested heavily in having their aircraft retrofitted with wingtip technology. These additions to the tips of the wings reduce drag and fuel consumption and have lowered fleet-wide CO_2 emissions by over 80 million tonnes since 2000[148].

Modifying how an aircraft climbs to cruising altitude and descends on approach can also reduce emissions. Through continuous descent and climb operations, airlines all over the world have been cutting fuel use and the associated emissions. Rather than following the traditional 'staggered' or 'stepped' procedure, aircraft are now climbing and approaching more smoothly, dispensing with the need to use additional engine power to level off at multiple altitudes during these phases of flight. By introducing continuous descent techniques across 15 airports in the United Kingdom, airlines cut CO_2 emissions by 20,000 tonnes in nine years[149].

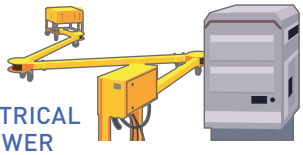
LIGHTWEIGHT CABIN EQUIPMENT

SLIMLINE SEATS = LOWER WEIGHT

TABLET COMPUTERS REPLACING PILOT MANUALS

TAXIING ON ONE ENGINE

CONTINOUS DESCENT AND CLIMB OPERATIONS



FIXED ELECTRICAL GROUND POWER

RETROFITTING WINGLETS

Through a process called airport collaborative decision-making (A-CDM), airports, ANSPs, and airlines work together to optimise flights by sharing information on potential inefficiencies and delays on the runway and in the air, which saves airlines from wasting unnecessary time in the air[150]. By working together to flag delays early, all parties involved in a flight get crucial arrival and departure information at the same time, allowing them to adjust their schedules and resources as the latest information comes to hand. A process known as air traffic flow management allows airlines and airports to work with ATM to manage air traffic to ensure the available capacity is used efficiently. This works best when multiple nations cooperate regionally. For example, if one airspace sector in a region is congested, its neighbouring sector might be able to take some traffic.

Taxiing is also a prime opportunity for cutting emissions. Many ways in which an airline can avoid using aircraft engines on the ground have been explored. The most common is the use of fixed electrical ground power at airports, whereby the aircraft is plugged into the airport's electricity to run pre-flight systems[151]. Many airlines have also begun to only use one engine during taxiing. Taking this concept further, new technologies have been developed that power the aircraft entirely while it taxis to the runway[152].

Even the airline's choice of aircraft to operate a certain route provides efficiency gains. Turbo-prop aircraft on some short-haul routes can produce up to 40% less CO_2 than equivalent jets.

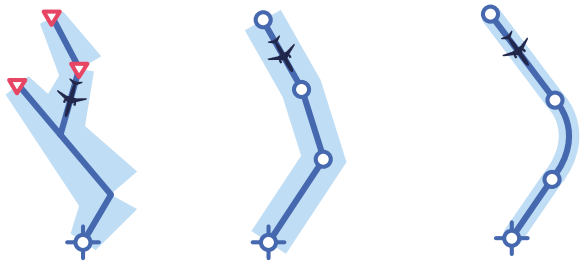
Infrastructure

The infrastructure pillar of the strategy relates mainly to improving navigational systems and procedures, ensuring that aircraft are guided through the air as efficiently as possible. In many regions of the world, mid-20th-century technology is still being used to direct air traffic, with aircraft needing to zigzag between ground-based radar posts throughout their journey. However, this situation is rapidly changing.

By using an array of new satellite-based navigational technologies and procedures collectively referred to as 'performance-based navigation', aircraft can follow optimised, more direct routes with greater accuracy and efficiency. Cutting out unnecessary travel time can save fuel, lessen CO_2 emissions and enable ATM to utilise the extra airspace to cater to increasing traffic and reduce congestion and delays. Rather than being 'controlled' between radar stations, aircraft can now fly to their destinations efficiently.

Smoother and more efficient

An example of how performance based-navigation can help cut flight time, CO_2 emissions and noise impact



1. Traditionally, aircraft have been guided into airports through a series of ground-based navigational aids, almost literally flying from one to the next.

2. Performance-based navigation uses 'waypoints' to indicate approach paths — these are identified points on a map, coordinated with a mix of satellite and ground-based technology.

3. Required navigation performance (RNP) then takes the technology to its optimum stage — providing pilots a precise box in which to guide the aircraft past geographic obstacles (like mountains) for a very accurate landing.

Another procedure that is enabling aircraft to improve efficiency and reduce emissions is called 'free route airspace'. Traditionally, aircraft have flown along fixed routes, like motorways in the sky. Free route airspace allows aircraft to plan more efficient, more direct routes with stable trajectories, saving flying time and fuel and reducing emissions. This procedure requires cooperation among the countries over which an aircraft flies, good examples of which are being experienced in Europe.

For the potential of new navigational technology to be realised, the industry needs the engagement and cooperation of governments and international institutions. Airspace is governed by sovereign states, meaning that any reform needs governmental buy-in. But aviation transcends national boundaries. Therefore, airspace should be organised and air navigation services delivered in line with operational requirements rather than national borders. This would mean that airspace would be controlled over multiple countries.

The greater harmonisation of airspace allows aircraft to navigate seamlessly across national borders on the most efficient routes. In some regions, such as the Middle East, large areas of airspace are reserved for the military, which means civil aircraft must fly around these areas, adding time, fuel burn and emissions. CANSO and its members are therefore working with governments in those regions to free up this airspace when it is not required for military purposes and to reduce the size of restricted areas and allow for more direct commercial routes.

In Europe, a collaborative project is underway called Single European Sky ATM Research (SESAR), which is part of the vision to consolidate European airspace into a single zone. Once in place, the Single European Sky will enable far more efficient routing for civil aircraft. The €2.1 billion investment in the SESAR programme is being put forward by the European Union, Eurocontrol and the industry. It is hoped that the project will deliver a 12% reduction in environmental impact alone through savings of between 8 and 14 minutes of flight time, 300–500 kilograms of fuel, and 948–1,575 kilograms of CO_2 per flight[153].

A similar upgrade is underway in the United States. Once fully implemented, the Next Generation Air Transportation System (NextGen), like SESAR, will result in significant emissions reductions. The NextGen project is being undertaken by the US Federal Aviation Administration (FAA) and aims to simplify US airspace by rolling out PBN and other satellite-based technologies known as Automatic Dependent Surveillance-Broadcast (ADS-B) and collaborative air traffic management technologies[154].

Reacting to changing weather conditions is another way flights can be made more efficient. In the US, a new NASA weather software programme is helping US airlines improve efficiency by allowing flexible routing. It allows pilots to react to changing weather conditions and alter their routes accordingly rather than simply follow a predetermined flight path[155].

Market-based measures

Encouraging progress has been made on the first three pillars of the industry's environmental strategy. However, to achieve the goal of carbon-neutral growth from 2020 other measures need to be taken. This is why the industry has called on the world's governments, represented at the International Civil Aviation Organization (ICAO), to put in place a global market-based measure for aviation.

At the 2016 ICAO Assembly, the world's governments agreed to implement the first global carbon emissions mechanism for any single industrial sector. The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) is being implemented in phases, with aircraft operators being tasked with monitoring and reporting emissions starting on 1 January 2019. Operators based in countries that have volunteered to take part in the early phases of CORSIA's offsetting obligations will need to offset the growth in their international aviation CO_2 emissions after 2020. From 2027, participation becomes mandatory for most countries. Based on the 73 volunteer nations confirmed at the time of printing, over 80% of the growth in international aviation CO_2 will be offset through CORSIA.

ATAG has been working to ensure operators and governments are ready for the incoming CORSIA requirements. In addition, the industry is looking for government support in some areas outside aviation's control, including

- undertaking air traffic management investment and reform;
- pursuing ongoing research into new technology, operations and sustainable aviation fuels;
- improving intermodal transport planning; and
- putting in place smart policy frameworks to help accelerate the availability of sustainable aviation fuels[156].

On the ground

Airports, too, are playing their part in improving infrastructure. They work to reduce their environmental footprint through the sustainable management of waste, water, energy, noise, local air quality and emissions. Airport planning and design also takes into consideration environmental aspects to maximise efficiency with the minimal possible impact on the environment.

The Airport Carbon Accreditation Programme, launched by ACI Europe in 2009 and later expanded to all regions, recognises airports at four ascending levels of certification: mapping, reduction, optimisation and neutrality. There are currently 242 airports in 67 countries, covering nearly 44% of worldwide passengers, accredited to one of these levels. Over 202,000 tonnes of CO_2 were reduced in the 2016–2017 year, a 3.5% reduction[157].

Airport energy-efficiency gains have been made via a number of initiatives, such as LED lighting, electrical ground support equipment and solar energy. Over 100 airports worldwide utilise solar power[158]. Cochin Airport in India is fully powered by solar energy, and Galapagos Airport uses only renewable energy sources.

Airports have also been increasing their rate of waste recycling and diversion from landfill and even using waste to produce energy. In addition, a number have begun implementing the 'circular economy' concept through innovative business models where products are designed to last longer, minimising the use of primary materials and reducing waste production[159].

Airports also play an important role in collaborative projects involving various stakeholders operating at their sites. These include the provision of fixed electrical ground power and preconditioned air to aircraft and the installation of charging points for electric vehicles used by ground handlers or passengers.

End of service

An aircraft will typically remain in service for 20–25 years. During that time, it will fly on average 40,274,144 kilometres – over 1,000 times around the world – with some long-haul aircraft at several airlines flying over 100 million kilometres[160]. Once an aircraft reaches the end of its service life, it can be recycled to ensure safe disposal and to take advantage of the many high-quality components and materials of which it is made. An estimated 85% to 90% of today's aircraft (by weight) can be recycled.

All airframe and engine manufacturers support the responsible management of aircraft and engines after their end of service. Many of these, including Boeing, Airbus, Bombardier, Embraer, Safran and Rolls-Royce, are members of the Aircraft Fleet Recycling Association (AFRA)[161], an association of 72 companies that collaborate to promote responsible environmental management in the disposal and recycling of aircraft. AFRA accredits companies to a best practices standard requiring rigorous on-site auditing. These organisations recycle over 150 aircraft and 30,000 tonnes of aluminium a year and put serviceable spare parts back into service.

Manufacturers are also ensuring that new aircraft are designed not only for a long, safe and efficient life but also for end-of-service opportunities. Newer materials, such as composites, are increasingly being recycled for commercial applications in electronics and auto parts. With innovative technology and economic solutions continuing to emerge, maintaining current recycle rates is anticipated. Interior components containing flame retardants required for passenger safety present a technology challenge to recycling. This will continue as a focus of research and development by AFRA and civil aerospace manufacturers.

Noise

Modern jet aircraft are 75% quieter than the first models, and each new generation continues this downward trend. While each new model has reduced its noise footprint significantly, the number of aircraft movements has grown and the sensitivity of people living under flight paths to perceived noise has also increased.

However, statistics in the US show that between 1975 and 2016 the number of people exposed to significant noise levels fell 94%, while enplanements rose 325%[162]. In Europe, the population exposed to noise from aircraft fell 2% between 2005 and 2014[163]. This trend is being replicated around the world. Aircraft are getting quieter, airports and air traffic controllers are working to provide operational noise mitigation measures, and local governments are working with the aviation industry to more appropriately zone areas around airports. In fact, land-use planning is an important mechanism to avoid incompatible and noise-sensitive areas around airports. In this regard, ACI passed a resolution in 2017 calling upon its members to work with their local communities and authorities to ensure that incompatible land uses are not permitted in noise-affected areas.

Counter-intuitively, efforts to improve airspace efficiency can also lead to a higher number of noise complaints, even where the numbers of people exposed to noise have reduced. The implementation of performance-based navigation has, in some cases, led to an increased perception of noise by communities because flight paths have changed. In cases like these, it is important for governments and the industry to engage with communities on issues of noise and to determine how new technologies and airspace changes; land-use planning; or other methods, such as insulating houses, can be used to address concerns.

It is also important to note that aviation is not the only source of noise in the transport sector and that, in many cases, negative noise impacts on communities stem far more regularly from the road and rail sectors. A report by the European Environment Agency shows that road traffic is responsible for the vast majority of noise in Europe, exposing more than 103 million people to levels above 55dB. Rail is the second-highest cause of noise, with nearly 20 million people exposed, and airport noise comes in fourth, with four million people affected[164].

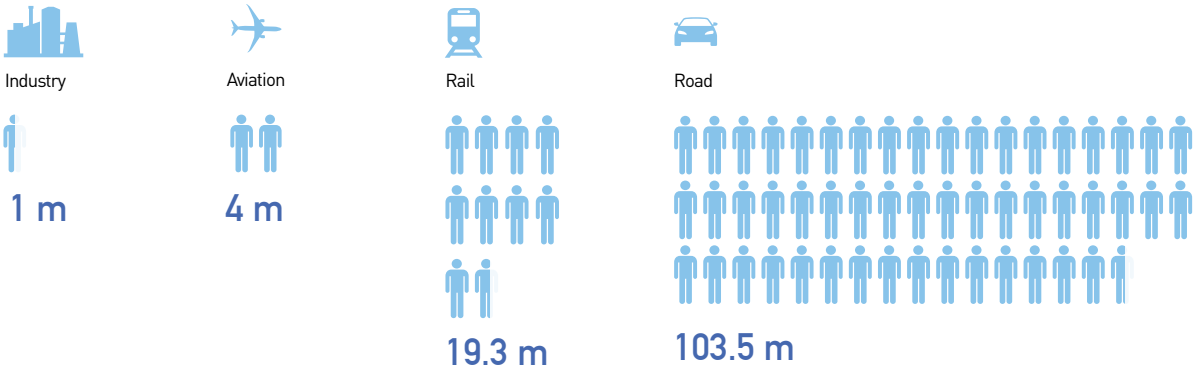
Climate adaptation

While the aviation industry is prioritising fuel efficiency to try and reduce its climate change impact, there are a number of ways in which a changing climate could impact air transport operations. It should be remembered that aviation is a resilient industry, used to dealing with operational challenges from weather events and even the closure of airspace due to volcanic ash. Many of these climate impacts are dealt with as part of normal daily network planning, but some may lead to more systematic changes.

- Weather changes, including increased storminess (resulting in more diversions or flight cancellations); more turbulence; increased snowfall and snow or frost in places that have not traditionally experienced it; or a trend towards hotter weather, which can impact the takeoff performance characteristics of aircraft.
- Infrastructure impacts, including rising sea levels, which may impact airport and other ground infrastructure, and increased rainfall, flooding and storm surges, which can also cause issues for ground infrastructure, such as airports and air traffic control facilities. A recent ACI resolution has recommended to all members the need to plan ahead for climate change adaptation measures[166].
- Market dynamics, including the less-understood consequences of possible alterations in destination choices by travellers as a result of changing weather patterns. Increasing temperatures may make some destinations less attractive during summer months if they start getting too hot, and other destinations may increase in popularity.

Planes, trains and automobiles

Population exposed to noise above 55dB in Europe, 2017 (in millions)[165]



REGIONAL AND GROUP ANALYSIS

- Africa
- Asia-Pacific
- Europe
- Latin America and the Caribbean
- Middle East
- North America
- APEC economies
- European Union
- Small island states
- Developing countries
- OECD countries
- Least-developed countries
- Landlocked developing countries

AFRICA[167]

Air transport supports 6.2 million jobs and $55.8 billion in African economic activity[168]. That is 1.8% of all employment and 2.6% of all GDP in African countries in 2016.

Every person directly employed in the aviation sector and in tourism made possible by aviation supported another 14.8 jobs elsewhere in Africa. Similarly, $5.40 of economic activity was supported elsewhere in Africa for every $1 of gross value added directly created by the air transport sector.

The aviation sector in Africa directly employed over 415,000 people in 2016. A sub-sectoral analysis of these workers suggests that:

- **146,400 of them (35% of the total) were employed by airlines or handling agents** as, for example, flight crew, check-in staff, maintenance crew, or head office staff;
- **33,200 (8%) had jobs with airport operators** in, for example, airport management, maintenance, and security;
- **192,800 (46.5%) worked on-site in airports** at, for example, retail outlets, restaurants, and hotels;
- **28,600 (7%) were employed in the manufacture of civil aircraft** (including systems, components, airframes, and engines); and
- **14,500 (3.5%) worked for air navigation service providers** in, for example, air traffic control and engineering.

Airlines, airport operators, retailers and other on-site businesses at airports and air navigation service providers and civil aircraft manufacturers also contribute to GDP in Africa. In 2016, the operations of these businesses directly generated a $10.3 billion contribution to GDP.

The aviation sector's spending with suppliers is estimated to have supported a further 601,000 jobs and a $6.8 billion gross value added contribution to GDP. In addition, wage payments to staff – by the aviation sector and businesses in the aviation sector's supply chain – supported 248,000 more jobs and a $2.8 billion gross value added contribution to GDP.

The aviation sector also facilitates a substantial amount of tourism in Africa. This stimulates still more economic activity, as tourists spend their money with restaurants, hotels, retailers, tour operators, and other providers of consumer goods and services. In 2016, spending by foreign visitors who flew to African countries supported an estimated 4.9 million jobs and a $35.9 billion contribution to GDP.

In total, accounting for the sector's direct impact, its supply chain impact, its wage expenditure impact, and the impact of tourism made possible by air transport, the aviation sector supported an estimated 6.2 million jobs and a $55.8 billion contribution to GDP in Africa in 2016.

Air travel in Africa is expected to continue to grow at about 4.9% per year over the next two decades[178]. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in Africa will have grown to support 9.8 million jobs (60% more than in 2016) and a $159 billion contribution to GDP (a 184% increase).

As the economy across much of the continent improves, governments in Africa must alter their historical view of aviation as a specialised or elite sector and begin to see it as a strategic asset. High taxes and charges, inadequate infrastructure, capacity and skills gaps, and, most notably, a lack of connectivity across the continent have created a less than ideal growth environment.

Since 2014, there has been a renewed drive by African leaders and policymakers to improve Africa's socio-economic prospects through improving connectivity across the continent. Research shows that if 12 key markets in Africa had open air services with each other, an additional $1.3 billion would be added to the GDP of those countries, creating an additional 155,000 jobs, saving travel times and making air travel more convenient and affordable for travellers[179].

In January 2018, African Union heads of state launched the Single African Air Transport Market, and its implementation is now being rolled out across the continent, with 26 countries so far joining the initiative and up to 40 expected by the end of 2018. This project, along with the Continental Free Trade Area in Africa and the visa facilitation initiative, are three African Union Agenda 2063 flagship projects that will accelerate aviation growth across the continent and have the potential to provide better than forecast economic growth. However, this project relies on effective implementation from governments, working with the industry, to succeed.

98 million passengers[169]

236 billion RPKs[171]

161 airlines[173]

36 air navigation service providers[176]

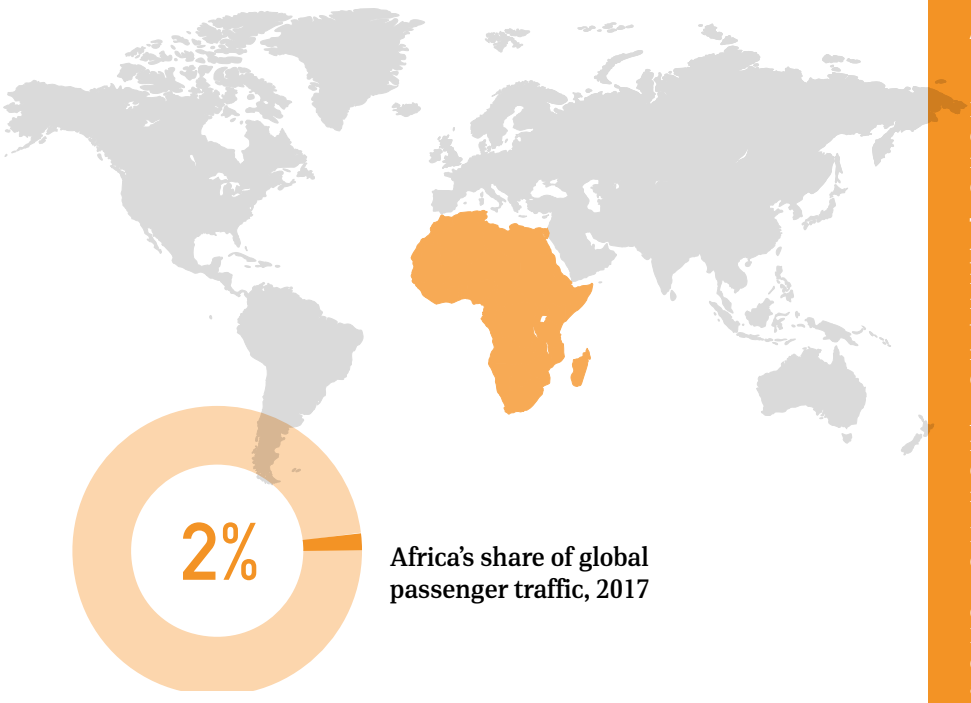
968,000 tonnes of freight[175]

1,130,000 flights[170]

349 commercial airports[172]

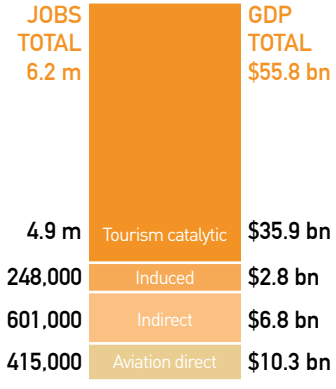
1,277 aircraft in service[174]

68% average regional load factor[177]

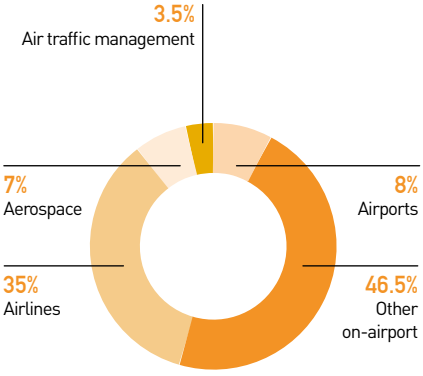


Africa's share of global passenger traffic, 2017

Total jobs and GDP supported by air transport in Africa



Direct jobs generated by air transport in Africa



Aviation is a catalyst for Rwanda's development

Rwanda has recognised air transport as the key enabler of its development and a vehicle to position itself to become a regional service, tourism and conference hub.

To achieve economic and social development as part of its Vision 2020, the landlocked country has invested heavily in its national carrier, airport infrastructure and capacity building to connect the country to markets overseas, ensure access for business professionals and investors, and create employment.

A vibrant aviation sector also facilitates tourism in the country, which is its first foreign exchange earner. Rwanda received over 1.3 million tourists in 2015, earning $318 million.

Rwanda's airports have over the years had a consistent annual passenger traffic growth rate of 13%, indicating the need to consider the expansion of airport facilities. The Strategic Transport Master Plan includes investments into the construction of a new international airport and the expansion and rehabilitation of Kigali International Airport and two regional airports. The overall investment in aviation infrastructure is estimated at $789 million for 2019-2030.

In recent years, the national carrier, RwandAir, has become one of Africa's fastest-growing airlines. With the steady growth of its fleet and expansion of its route network, including to the Middle East, India and Europe, it is being positioned as a strategic national asset with which to serve and open Rwanda to business, tourism and conferences.

To meet the growing demand for a skilled workforce, Akagera Air School, a helicopter flying school based in Kigali, will expand to fixed wing pilot training in 2018 with the hope of increasing the number of locally born pilots from around 20% of the country's flight crew today. Akagera Air School also plans to later open aircraft mechanical and service crew departments.

No opportunity is missed to promote the local economy through aviation. RwandAir advances the Made in Rwanda initiative by offering local beverages and snacks on its flights. It has partnered with local roastery Question Coffee to serve Rwandan specialty coffee, a partnership which supports smallholder women farmers in Rwanda and promotes the product beyond the country's borders.

ASIA-PACIFIC[180]

Air transport supports 30.2 million jobs and $684 billion in Asia-Pacific economic activity. That is 1.6% of all employment and 2.7% of all GDP in Asia-Pacific countries in 2016.

Every person directly employed in the aviation sector and in tourism made possible by aviation supported another nine jobs elsewhere in the Asia-Pacific region. Similarly, $4.60 of economic activity was supported elsewhere in Asia-Pacific for every $1 of gross value added directly created by the air transport sector.

The aviation sector in the Asia-Pacific region directly employed nearly 3 million people in 2016. A sub-sectoral analysis of these workers suggests that:

- **1 million of them (30% of the total) were employed by airlines** or handling agents as, for example, flight crew, check-in staff, maintenance crew, or head office staff;
- **179,000 (5.5%) had jobs with airport operators** in, for example, airport management, maintenance, and security;
- **1.9 million (57.5%) worked on-site in airports** at, for example, retail outlets, restaurants, and hotels;
- **177,000 (5%) were employed in the manufacture of civil aircraft** (including systems, components, airframes, and engines); and
- **62,000 (2%) worked for air navigation service providers** in, for example, air traffic control and engineering.

Airlines, airport operators, retailers and other on-site businesses at airports and air navigation service providers and civil aircraft manufacturers also contribute to GDP in Asia-Pacific countries. In 2016, the operations of these businesses directly generated a $149 billion contribution to GDP.

The aviation sector's spending with suppliers is estimated to have supported a further 3.1 million jobs and a $120 billion gross value added contribution to GDP. In addition, wage payments to staff – by the aviation sector and businesses in the aviation sector's supply chain – supported 3.3 million more jobs and a $128 billion gross value added contribution to GDP.

The aviation sector also facilitates a substantial amount of tourism in the Asia-Pacific region. This stimulates still more economic activity, as tourists spend their money with restaurants, hotels, retailers, tour operators, and other providers of consumer goods and services. In 2016, spending by foreign visitors who flew to Asia-Pacific countries supported an estimated 20.5 million jobs and a $288 billion contribution to GDP.

In total, accounting for the sector's direct impact, its supply chain impact, its wage expenditure impact, and the impact of tourism made possible by air transport, the aviation sector supported an estimated 30.2 million jobs and a $684 billion contribution to GDP in the Asia-Pacific region in 2016.

Air travel in Asia-Pacific is expected to continue to grow at about 5.5% per year over the next two decades. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in Asia-Pacific countries will have grown to support 44 million jobs (46% more than in 2016) and a $1.7 trillion contribution to GDP (a 151% increase).

To support the anticipated increase in travel demand, airports and airspace modernisation must keep pace with the projected rapid traffic growth. Some of the major airports in the region are already experiencing congestion and delays. Given the significant capital investments required, governments must play a proactive role in coordinating infrastructure planning and development, with appropriate levels of cross-industry consultation key to ensure the capital expenditure will meet the long-term requirements of the industry. Also important is appropriate land-use planning by local and national authorities for areas around airport development.

Ensuring the availability of qualified personnel, including pilots, engineers and mechanics, is another challenge for Asia-Pacific as the industry grows.

1.5 billion passengers

2.7 trillion RPKs

331 airlines

44 air navigation service providers

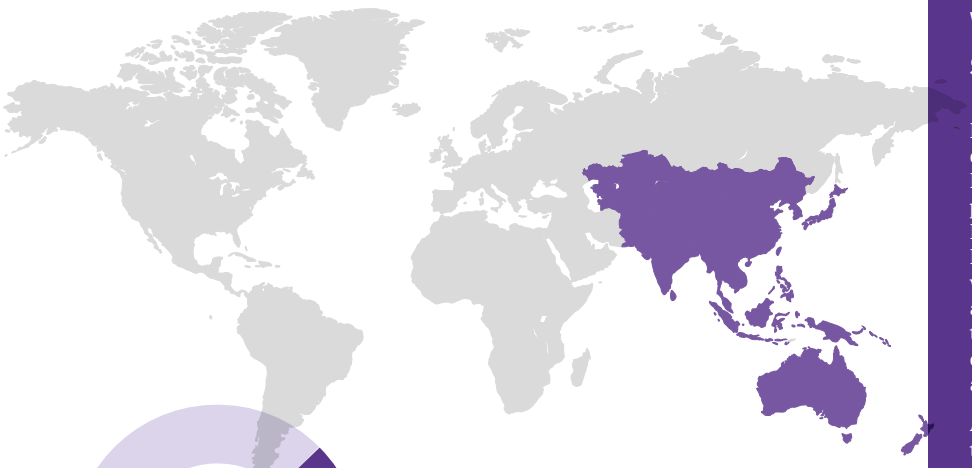
22.2 million tonnes of freight

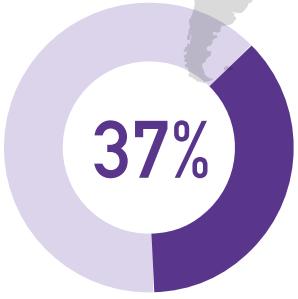
11,817,000 flights

1,273 commercial airports

8,455 aircraft in service

80% average regional load factor





Asia-Pacific's share of global passenger traffic, 2017

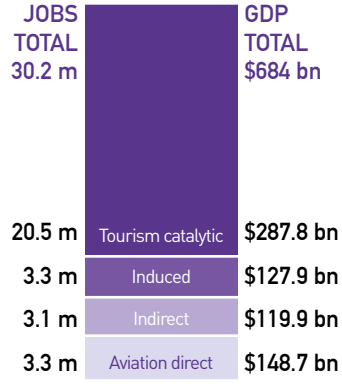
Women conquer the skies

India has a long history of strong women in the cockpit. It was a red-letter day when Urmila K. Parikh became the first Indian woman to get a private pilot's licence in 1932. Some 25 years later, Durba Banerjee became the first female pilot of Indian Airlines. This would not have happened without breaking through gender stereotypes and stigmas. When Durba first applied with the then Central Aviation Ministry to become a commercial pilot, she had been offered the post of a flight attendant instead.

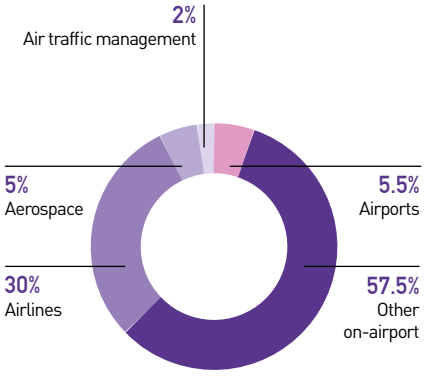
A flight from Kolkata to Silchar in 1985 was the world's first with an all-women crew, and Air India celebrated International Women's Day in 2017 when Captain Kshamata Bajpai commanded the first round-the-world flight with an all-women cockpit and cabin crew. International Women's Day 2018 saw a number of airlines around the globe demonstrate the role women have on the flight deck, with Ethiopian Airlines, SpiceJet, British Airways, Air Canada, Royal Jordanian, Brussels Airlines and Emirates amongst those running all-female crew flights. Although these were special flights, they demonstrate to women and girls around the world the career possibilities in the industry.

Commercial aviation in India is witnessing a phenomenal boom, with more women passionately striving to become a part of the airline industry. A fifth of students enrolling for a commercial flying licence in India are women, and of 10,000 commercial pilots in India some 1,200 are women across all Indian airlines, including Air India, Vistara, SpiceJet, Jet Airways and GoAir. At 12%, this is considerably above the 5.5% global average worldwide and amongst the highest number of women commercial pilots in the world.

Total jobs and GDP supported by air transport in Asia-Pacific



Direct jobs generated by air transport in Asia-Pacific



EUROPE[181]

Air transport supports 12.2 million jobs and $823 billion in European economic activity. That is 3.3% of all employment and 4.1% of all GDP in European countries in 2016.

Every person directly employed in the aviation sector and in tourism made possible by aviation supported another 4.7 jobs elsewhere in Europe. Similarly, $4.30 of economic activity was supported elsewhere in Europe for every $1 of gross value added directly created by the air transport sector.

The aviation sector in Europe directly employed an estimated 2.6 million people in 2016. A sub-sectoral analysis of these workers suggests that:

- **519,000 of them (20% of the total) were employed by airlines or handling agents** as, for example, flight crew, check-in staff, maintenance crew, or head office staff;
- **166,000 (6.5%) had jobs with airport operators** in, for example, airport management, maintenance, and security;
- **1.5 million (57.5%) worked on-site in airports** at, for example, retail outlets, restaurants, and hotels;
- **341,000 (13%) were employed in the manufacture of civil aircraft** (including systems, components, airframes, and engines); and
- **77,000 (3%) worked for air navigation service providers** in, for example, air traffic control and engineering.

Airlines, airport operators, retailers and other on-site businesses at airports and air navigation service providers and civil aircraft manufacturers also contribute to GDP in Europe. In 2016, the operations of these businesses directly generated a $193 billion contribution to GDP.

The aviation sector's spending with suppliers is estimated to have supported a further 3 million jobs and a $226 billion gross value added contribution to GDP. In addition, wage payments to staff – by the aviation sector and businesses in the aviation sector's supply chain – supported nearly 1.5 million more jobs and a $111 billion gross value added contribution to GDP.

The aviation sector also facilitates a substantial amount of tourism in Europe. This stimulates still more economic activity, as tourists spend their money with restaurants, hotels, retailers, tour operators, and other providers of consumer goods and services. In 2016, spending by foreign visitors who flew to European countries supported an estimated 5.1 million jobs and a $293 billion contribution to GDP.

In total, accounting for the sector's direct impact, its supply chain impact, its wage expenditure impact, and the impact of tourism made possible by air transport, the aviation sector supported an estimated 12.2 million jobs and an $823 billion contribution to GDP in Europe in 2016.

Air travel in Europe is expected to continue to grow at about 3.4% per year over the next two decades. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in Europe will have grown to support 18 million jobs (49% more than in 2016) and a $1.6 trillion contribution to GDP (a 90% increase).

Europe, particularly Western Europe, is one of the most established regions of the world for air transport activity. However, emerging economies in the east are contributing to the overall growth in the region, with employment in the European aviation industry expected to grow 2% per annum to 2034. This growth and the restrictions on development across much of Europe are leading to capacity shortfalls.

As part of its Challenges of Growth series, in 2018 Eurocontrol released a report forecasting air traffic in Europe in 2040 and the difficulty meeting projected demand[182]. The forgone economic impact associated with this unmet demand is estimated to be $103 billion (€88.1 billion) in GDP, including direct activity at airports, indirect and induced impacts, and the lost tourism, trade and investment due to low-connectivity growth. Furthermore, the majority of this loss is in the general economy, not the airports or aviation sector.

The European industry is one of the most heavily regulated in the world in terms of social rights, consumer protection and the environment.

1 billion passengers

1.95 trillion RPKs

363 airlines

44 air navigation service providers

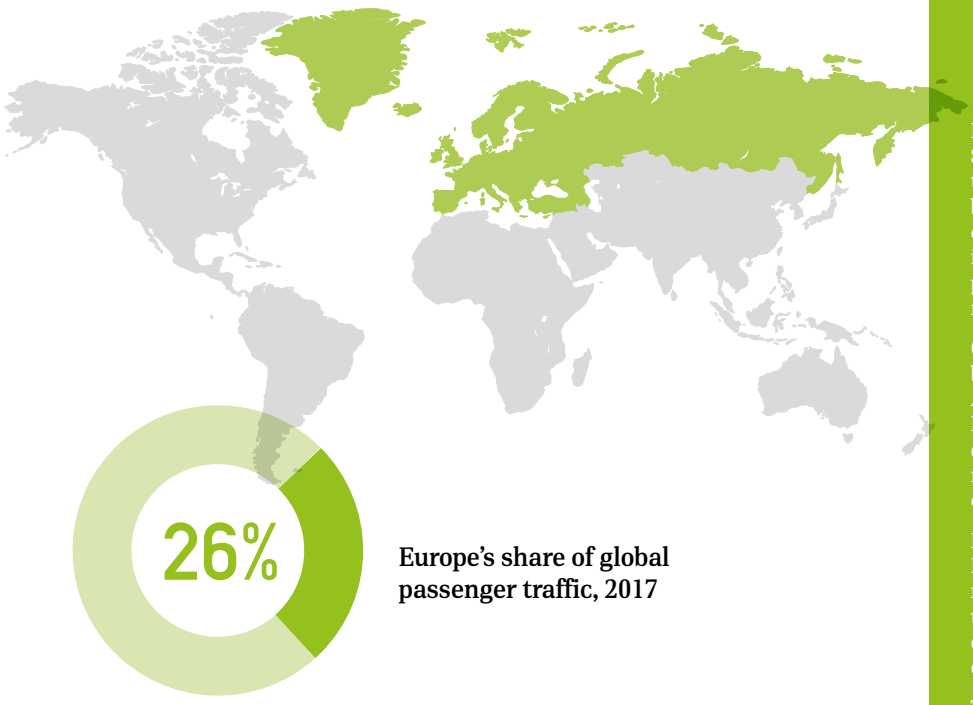
10.1 million tonnes of freight

8,544,000 flights

671 commercial airports

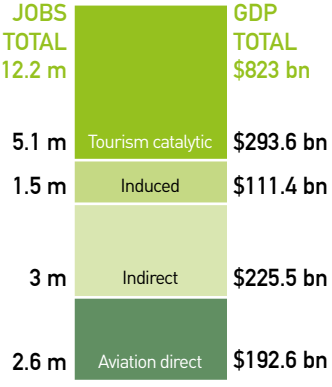
6,934 aircraft in service

82% average regional load factor

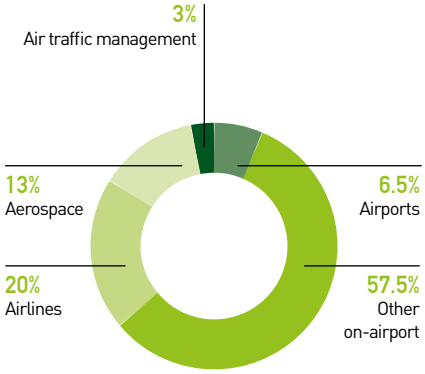


Europe's share of global passenger traffic, 2017

Total jobs and GDP supported by air transport in Europe



Direct jobs generated by air transport in Europe



Investing in green energy

Public transport at and around Amsterdam's Schiphol Airport has become greener thanks to the introduction of 100 electrically powered buses. Together, they comprise the biggest zero-emissions bus fleet in Europe, which will further increase to 258 buses by 2021. The new fleet is part of Schiphol's efforts to become climate-neutral by 2040.

Other airports around the world have joined in by acquiring electric ground vehicles. Brussels Airport will receive an all-electric fleet in 2019. By switching twenty diesel-operated buses to electric, Los Angeles International Airport will reduce carbon dioxide emissions from 308 tonnes of greenhouse gases per year to zero.

In another effort to become greener, Schiphol, Rotterdam, Eindhoven and Lelystad airports are now powered by sustainable energy, supplied by the Dutch company Eneco. Together, the airports consume around 200 GWh, comparable to the consumption of 60,000 households.

The operator of the four airports, Royal Schiphol Group, worked with Eneco to open a new wind farm which partially covers the need for the airports' green energy. By January 2020, all the power for the airport company will come from newly constructed Dutch wind farms. Until these have been built, the power will come from existing sustainable energy sources in the Netherlands.

The decision to use new wind farms means that Schiphol will not be drawing power from the existing sustainable energy network but rather promote its expansion.

Cochin International Airport, located in southern India, is the first airport in the world to run completely on solar power. It started by installing 400 solar panels on its rooftop as a small pilot project in 2013. Two years later, more than 46,000 solar panels tapping the power of sunlight made the airport totally self-sufficient in meeting its energy needs.

LATIN AMERICA AND THE CARIBBEAN[183]

Air transport supports 7.2 million jobs and $156 billion in Latin America and the Caribbean economic activity. That is 2.8% of all employment and 3.3% of all GDP in Latin American and Caribbean countries in 2016.

Every person directly employed in the aviation sector and in tourism made possible by aviation supported another 8.8 jobs elsewhere in Latin America and the Caribbean. Similarly, $4.70 of economic activity was supported elsewhere in Latin America and the Caribbean for every $1 of gross value added directly created by the air transport sector.

The aviation sector in Latin America and the Caribbean directly employed an estimated 813,800 people in 2016. A sub-sectoral analysis of these workers suggests that:

- **272,900 of them (33.5% of the total) were employed by airlines or handling agents** as, for example, flight crew, check-in staff, maintenance crew, or head office staff;
- **28,500 (3.5%) had jobs with airport operators** in, for example, airport management, maintenance, and security;
- **401,800 (49.5%) worked on-site in airports** at, for example, retail outlets, restaurants, and hotels;
- **76,600 (9.5%) were employed in the manufacture of civil aircraft** (including systems, components, airframes, and engines); and
- **34,000 (4%) worked for air navigation service providers** in, for example, air traffic control and engineering.

Airlines, airport operators, retailers and other on-site businesses at airports and air navigation service providers and civil aircraft manufacturers also contribute to GDP in Latin America and the Caribbean. In 2016, the operations of these businesses directly generated a $33.2 billion contribution to GDP.

The aviation sector's spending with suppliers is estimated to have supported a further 1.8 million jobs and a $36.9 billion gross value added contribution to GDP. In addition, wage payments to staff – by the aviation sector and businesses in the aviation sector's supply chain – supported 1 million more jobs and a $21.5 billion gross value added contribution to GDP.

The aviation sector also facilitates a substantial amount of tourism in Latin America and the Caribbean. This stimulates still more economic activity, as tourists spend their money with restaurants, hotels, retailers, tour operators, and other providers of consumer goods and services. In 2016, spending by foreign visitors who flew to Latin America and the Caribbean countries supported an estimated 3.6 million jobs and a $64.7 billion contribution to GDP.

In total, accounting for the sector's direct impact, its supply chain impact, its wage expenditure impact, and the impact of tourism made possible by air transport, the aviation sector supported an estimated 7.2 million jobs and a $156 billion contribution to GDP in Latin America and the Caribbean countries in 2016.

Air travel in Latin America and the Caribbean is expected to continue to grow at about 4.2% per year over the next two decades. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in Latin America and the Caribbean will have grown to support 11 million jobs (54% more than in 2016) and a $353 billion contribution to GDP (a 126% increase).

Latin America continues to benefit and grow from liberalised agreements on cross-border ownership that enabled pan-regional brands to emerge and lower prices in the region. However, further openness between jurisdictions would allow greater flexibility in aircraft utilisation.

Continued infrastructure investment will need to be made to alleviate congestion in major markets, a critical priority in some areas. Investment must occur in a sustainable manner, as previous concession projects have led to excess government profits at the expense of the wider industry and passengers.

With over 100 different taxes and fees imposed on air passengers in the region, it is one of the more heavily taxed in the world. Many of these taxes are not allocated to cover costs of aviation-related services and infrastructure but, rather, to increase government revenue. Latin America is also the region with the most expensive jet fuel in the world, making operations in the region less competitive.

Training and recruiting an aviation-related labour force in the region is also challenging. Airlines need to train more than 2,800 pilots every year, 800 more than current capacity allows. The region will also have to recruit and train more than 110,000 maintenance technicians and cabin crew during the next 20 years.

316 million passengers

589 billion RPKs

181 airlines

30 air navigation service providers

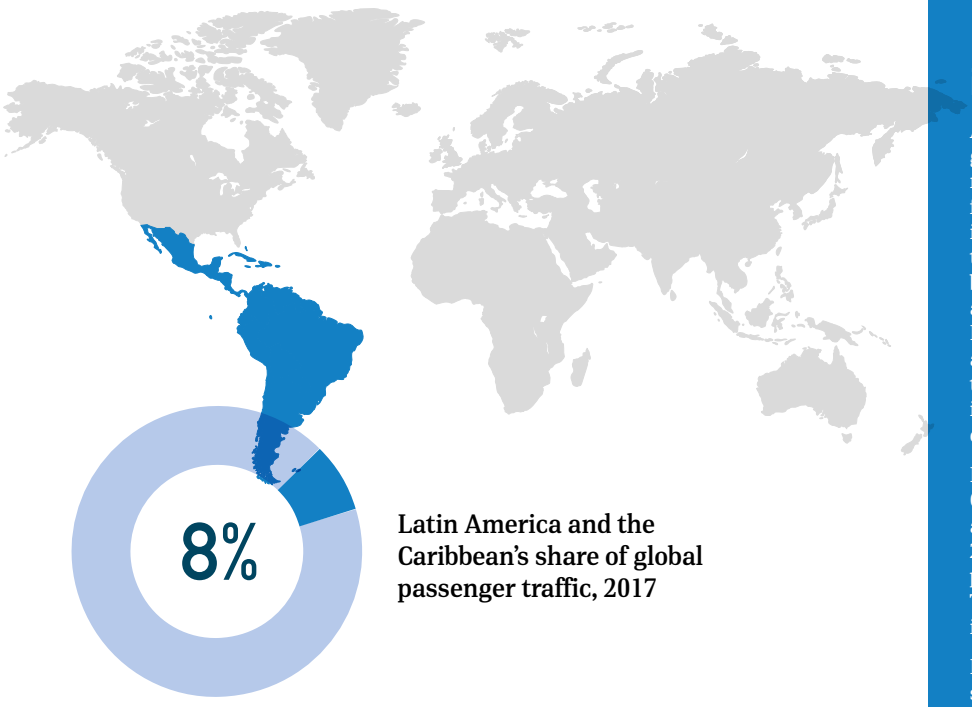
2.1 million tonnes of freight

3,134,000 flights

489 commercial airports

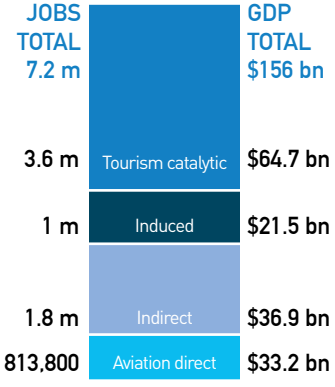
1,925 aircraft in service

80% average regional load factor

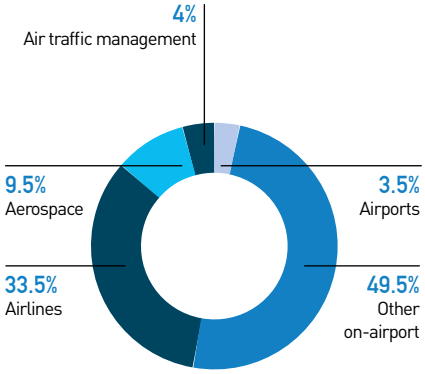


Latin America and the Caribbean's share of global passenger traffic, 2017

Total jobs and GDP supported by air transport in Latin America and the Caribbean



Direct jobs generated by air transport in Latin America and the Caribbean



Bringing tourists to remote island states

Air connectivity is a critical element to economic growth and development for the small island nations of the Caribbean. Additional air services, frequencies and traffic volumes contribute to increased employment opportunities and benefit the wider economy through catalytic effects – benefits created by, rather than within aviation – according to the Caribbean Development Bank. In the Caribbean, the relationship between aviation and economic growth is mainly through the facilitation of travel to support the tourism industry, which is the region's primary income earner and supports various other businesses.

Estimates from the World Tourism & Travel Council show that the total contribution of travel and tourism to Caribbean GDP was $57.1 billion in 2017 (15.2% of GDP). It is forecast to rise by 3.6% per annum to $84 billion by 2028 (17.8% of GDP). Travel and tourism directly generated 758,000 jobs in 2017 (4.3% of total employment).

In recognition of this significant value added, several Caribbean governments have taken steps to increase connectivity and airlift into their respective territories.

For residents of Micronesia, the "Island Hopper", a United Airlines flight that leaves Honolulu for Guam four times a week, is a lifeline. It brings cargo, mail, food, medical supplies, family members, business people and important tourism dollars to the remote islands far faster and more regularly and reliably than supply ships. The flight spans five hours from Honolulu to Majuro (crossing the International Dateline on the way), then 90 minutes to the army airfield in Kwajalein, one hour on to Kosrae, another hour to Pohnpei, one more hour to Chuuk and finally another two hours to Guam.

A large part of the islands' economies has depended on the Island Hopper for 50 years, notably the tourism industry. Chuuk Lagoon is one of the world's best scuba diving destinations, but without the regular flight tourism in Chuuk would not exist. Some of the islands it stops at are so remote the airline carries a mechanic on board to ensure the service maintains its reliability.

MIDDLE EAST[184]

Air transport supports 2.4 million jobs and $130 billion in Middle East economic activity. That is 3.3% of all employment and 4.4% of all GDP in Middle Eastern countries in 2016.

Every person directly employed in the aviation sector and in tourism made possible by aviation supported another 4.3 jobs elsewhere in the Middle East. Similarly, $3.90 of economic activity was supported elsewhere in the Middle East for every $1 of gross value added directly created by the air transport sector.

The aviation sector in the Middle East directly employed an estimated 553,700 people in 2016. A sub-sectoral analysis of these workers suggests that:

- **192,900 of them (35% of the total) were employed by airlines or handling agents** as, for example, flight crew, check-in staff, maintenance crew, or head office staff;
- **24,800 (5%) had jobs with airport operators** in, for example, airport management, maintenance, and security;
- **326,700 (58%) worked on-site in airports** at, for example, retail outlets, restaurants, and hotels;
- **4,400 (1%) were employed in the manufacture of civil aircraft** (including systems, components, airframes, and engines); and
- **4,900 (1%) worked for air navigation service providers** in, for example, air traffic control and engineering.

Airlines, airport operators, retailers and other on-site businesses at airports and air navigation service providers and civil aircraft manufacturers also contribute to GDP in the Middle East. In 2016, the operations of these businesses directly generated a $32.9 billion contribution to GDP.

The aviation sector's spending with suppliers is estimated to have supported a further 389,500 jobs and a $20.9 billion gross value added contribution to GDP. In addition, wage payments to staff – by the aviation sector and businesses in the aviation sector's supply chain – supported 183,400 more jobs and a $9.8 billion gross value added contribution to GDP.

The aviation sector also facilitates a substantial amount of tourism in the Middle East. This stimulates still more economic activity, as tourists spend their money with restaurants, hotels, retailers, tour operators, and other providers of consumer goods and services. In 2016, spending by foreign visitors who flew to Middle Eastern countries supported an estimated 1.3 million jobs and a $66.1 billion contribution to GDP.

In total, accounting for the sector's direct impact, its supply chain impact, its wage expenditure impact, and the impact of tourism made possible by air transport, the aviation sector supported an estimated 2.4 million jobs and a $130 billion contribution to GDP in the Middle East in 2016.

Air travel in the Middle East is expected to continue to grow at about 5.8% per year over the next two decades. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in Middle Eastern countries will have grown to support 4.3 million jobs (78% more than in 2016) and a $345 billion contribution to GDP (a 166% increase).

The Middle East continues to consolidate its position as a hub region connecting the European and Asia-Pacific markets.

Airlines from this region are some of the most ambitious in the world, with the likes of Emirates, Etihad and Qatar boasting modern fleets. However, significant investment is required in infrastructure, as is political commitment to market liberalisation. The Middle East is home to some of the world's largest hub airports, but with traffic expected to increase dramatically in the coming decades capacity, in the air and on the ground, urgently needs addressing.

According to a 2015 assessment, the average flight in the region is delayed by 29 minutes (and this could reach 59 minutes by 2025 without action) due to air traffic control capacity and staffing issues. That assessment also concludes that the benefits of investment in air traffic management could be over $16 billion over the next ten years[185].

172 million passengers

320 billion RPKs

87 airlines

14 air navigation service providers

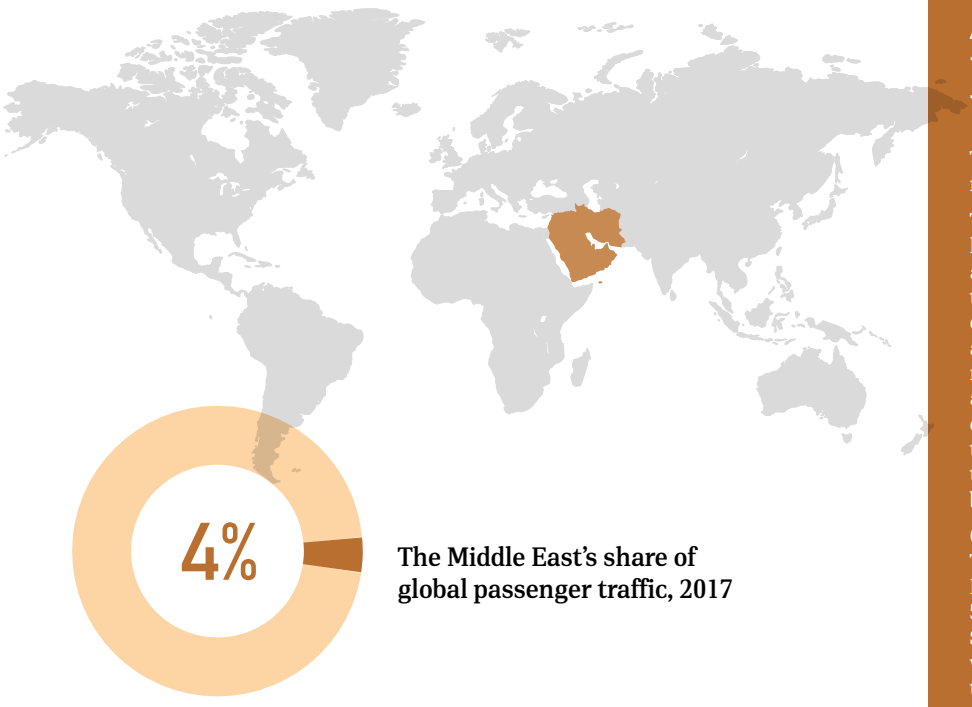
7.2 million tonnes of freight

1,198,000 flights

98 commercial airports

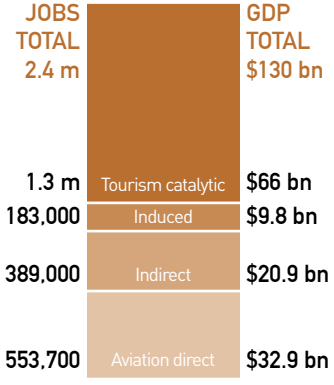
1,466 aircraft in service

75% average regional load factor

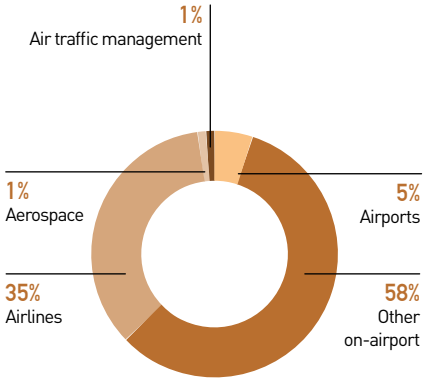


The Middle East's share of global passenger traffic, 2017

Total jobs and GDP supported by air transport in the Middle East



Direct jobs generated by air transport in the Middle East



Airlines and airports join forces to combat wildlife trafficking

The aviation industry has taken on a leadership role in the fight against wildlife trafficking.

The illegal trade of wildlife is the fourth most lucrative black market in the world – worth around $20 billion a year and impacting more than 7,000 species of animals and plants. Criminal organisations involved in wildlife trafficking are often directly connected to other trafficking networks, including the smuggling of narcotics, arms and people, and exploit the increasing connectivity of global air transportation to traffic the endangered species. The air cargo industry is therefore one of the key aviation sectors acting to break the supply chain from source to consumer.

One of the initiatives is the United for Wildlife Transport Taskforce Buckingham Palace Declaration, which IATA, along with around 50 of its member airlines and ACI, has signed. Signatories have committed to raise awareness of wildlife trafficking among passengers, train staff to help spot trafficked species, establish a system to share information on illegal wildlife trade and improve cooperation between transport bodies and regulatory and enforcement organisations.

Airlines and airports devote resources for extensive passenger awareness campaigns to educate potential buyers of illegal wildlife products, including exhibits at Dubai, Johannesburg and Kuala Lumpur International Airports, on-board videos and feature-length articles in in-flight magazines.

Two Emirates A380s have even taken to the skies with special liveries featuring wildlife threatened by poaching and the illegal wildlife trade to communicate the need for urgent action.

Airlines are further rolling out training programmes to improve the capacity of their cargo and customer-facing staff to be on the alert for suspicious signs relating to illegal wildlife transportation and to detect and report them.

Etihad Airways developed its own online module designed to inform its employees of the business risks associated with the illegal wildlife trade and ways to prevent them. Among others, Kenya Airways, Singapore Airlines, Turkish Airlines and LAM Mozambique, together with airports, train cabin crew, ground handlers, cargo processors, and staff from regional airports to help detect and stop smugglers carrying ivory, rhino horn, and other wildlife products.

NORTH AMERICA[186]

Air transport supports 7.3 million jobs and $844 billion in North American economic activity. That is 4.3% of all employment and 4.2% of all GDP in the United States and Canada in 2016.

Every person directly employed in the aviation sector and in tourism made possible by aviation supported another three jobs elsewhere in North America. Similarly, $2.90 of economic activity was supported elsewhere in North America for every $1 of gross value added directly created by the air transport sector.

The aviation sector in North America directly employed an estimated 2.4 million people in 2016. A sub-sectoral analysis of these workers suggests that:

- **553,800 of them (22.5% of the total) were employed by airlines or handling agents** as, for example, flight crew, check-in staff, maintenance crew, or head office staff;
- **93,000 (4%) had jobs with airport operators** in, for example, airport management, maintenance, and security;
- **1.2 million (50.5%) worked on-site in airports** at, for example, retail outlets, restaurants, and hotels;
- **525,000 (21.5%) were employed in the manufacture of civil aircraft** (including systems, components, airframes, and engines); and
- **39,700 (1.5%) worked for air navigation service providers** in, for example, air traffic control and engineering.

Airlines, airport operators, retailers and other on-site businesses at airports and air navigation service providers and civil aircraft manufacturers also contribute to GDP in North America. In 2016, the operations of these businesses directly generated a $286 billion contribution to GDP.

The aviation sector's spending with suppliers is estimated to have supported a further 1.9 million jobs and a $228 billion gross value added contribution to GDP. In addition, wage payments to staff – by the aviation sector and businesses in the aviation sector's supply chain – supported 1.5 million more jobs and a $181 billion gross value added contribution to GDP.

The aviation sector also facilitates a substantial amount of tourism in North America. This stimulates still more economic activity, as tourists spend their money with restaurants, hotels, retailers, tour operators, and other providers of consumer goods and services. In 2016, spending by foreign visitors who flew to North American countries supported an estimated 1.5 million jobs and a $150 billion contribution to GDP.

In total, accounting for the sector's direct impact, its supply chain impact, its wage expenditure impact, and the impact of tourism made possible by air transport, the aviation sector supported an estimated 7.3 million jobs and an $844 billion contribution to GDP in North America in 2016.

Air travel in North America is expected to continue to grow at about 2.7% per year over the next two decades. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in North America will have grown to support 10.4 million jobs (42% more than in 2016) and a $1.5 trillion contribution to GDP (an 80% increase).

In the United States, the focus needs to be on the implementation of the NextGen air traffic control system, which will move air traffic management in some of the busiest skies in the world from ground-based radar to satellite navigation. Some of the planned programmes are already in place, but more needs to be done. Once fully implemented, NextGen is expected by the Federal Aviation Administration (FAA) to deliver $134 billion in direct airline, industry, and passenger benefits by 2030. The efficiency savings especially could be vast. CO_2 emissions are forecast to be reduced by 52.6 million tonnes by 2030.

Note: In the United States, the FAA collects economic impact data with which these numbers are aligned. The FAA assessment further evaluates the much wider economic activity that is supported by air transport, including general aviation and the domestic tourism markets, which this report does not include. Accordingly, with these wider catalytic impacts included, the total number of jobs supported by civil aviation in the US alone is around 10.6 million, with a contribution to GDP of around $910 billion at 2016 prices[187].

939 million passengers

1.9 trillion RPKs

180 airlines

2 air navigation service providers

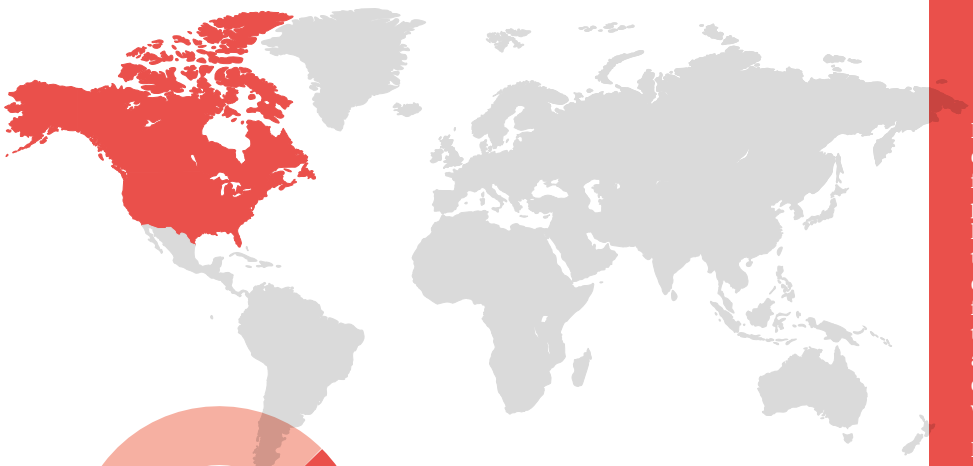
19.2 million tonnes of freight[167]

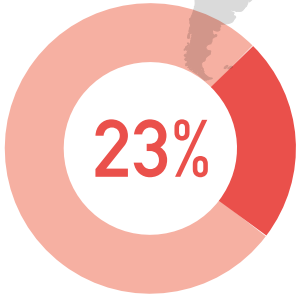
10,179,000 flights

879 commercial airports

8,347 aircraft in service

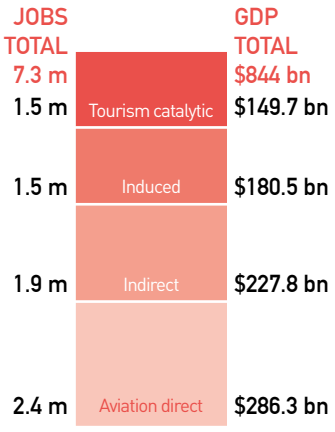
83% average regional load factor



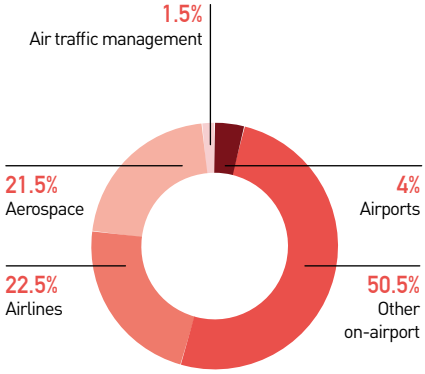


North America's share of global passenger traffic, 2017

Total jobs and GDP supported by air transport in North America



Direct jobs generated by air transport in North America



Business aviation's niches

Business aviation, widely recognised as an effective business tool for companies requiring fast and secure flight services, plays a less-publicised but vital role in emergencies, humanitarian support and relief efforts around the world. Its flexibility allows it to mobilise on short notice, provide aircraft types suited for specific missions and operate into airports that are inaccessible to others. Other missions are uniquely tailored to business aviation's capabilities, such as the transport of persons with highly contagious diseases.

Phoenix Air Group, a US company, is the only business operator worldwide with the capability to transport patients with a highly infectious disease in an intensive care unit.

A cooperative effort between the US Centers for Disease Control, Department of Defense and Phoenix Air in 2007 led to the development of the Airborne Biological Containment System, a customised, negative-pressure isolation unit designed and certified to be used in the company's modified Gulfstream G-III aircraft. The unit isolates the contagious patient from the flight crew and medical professionals on board while allowing for the provision of intensive care.

In August 2014, at the height of the Ebola epidemic in western Africa, the US Department of State turned to Phoenix Air for assistance, as two American aid workers had contracted Ebola in Liberia and were near death. Phoenix Air deployed one of its specially equipped aircraft and flew them to a hospital in Atlanta, where both ultimately recovered. During the outbreak, Phoenix Air used its containment unit to transport 41 patients to hospitals in the US and Europe.

The success led to the development of a multi-patient transport unit, the Biological Containment System, which has the capacity to transport four highly contagious patients and six medical attendants inside a B747-400 cargo aircraft or military transport.

APEC ECONOMIES[188]

Air transport supports 32.9 million jobs and $1.7 trillion across Asia-Pacific Economic Cooperation (APEC) economies. That is 2.2% of all employment and 3.7% of all GDP in the APEC countries in 2016.

2.4 billion
passengers[189]

59%
share of passenger traffic

1,925
airports

481
airlines

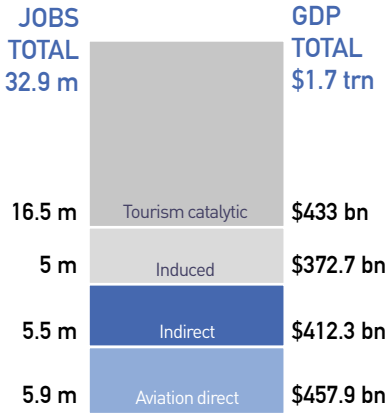
17,112
aircraft in service

Every person directly employed in the aviation sector and in tourism made possible by aviation supported another 5.5 jobs elsewhere in the APEC economies. Similarly, $3.70 of economic activity was supported elsewhere in the APEC economies for every $1 of gross value added directly created by the air transport sector.

The aviation sector in APEC economies directly employed nearly six million people in 2016 in the following sub-sectors:

- **Airlines: 1.6 million** (27.3% of the total)
- **Airport operators: 331,700** (5.6%)
- **Other on-airport: 3.1 million** (52.1%)
- **Civil aerospace: 776,600** (13%)
- **Air navigation service providers: 115,200** (1.9%)

Total jobs and GDP supported by air transport in the APEC economies



Airlines, airport operators, retailers and other on-site businesses at airports and air navigation service providers and civil aircraft manufacturers also contribute to GDP in APEC economies. In 2016, the operations of these businesses directly generated a $458 billion contribution to GDP.

The aviation sector's spending with suppliers is estimated to have supported a further 5.5 million jobs and a $412 billion gross value added contribution to GDP. In addition, wage payments to staff – by the aviation sector and businesses in the aviation sector's supply chain – supported five million more jobs and a $373 billion gross value added contribution to GDP.

In total, accounting for the sector's direct impact, its supply chain impact, its wage expenditure impact, and the impact of tourism made possible by air transport, the aviation sector supported an estimated 32.9 million jobs and a $1.7 trillion contribution to GDP in APEC economies in 2016.

Air travel in the APEC economies is expected to continue to grow at about 4.3% per year over the next two decades. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in APEC economies will have grown to support 50 million jobs (52% more than in 2016) and a $3.5 trillion contribution to GDP (a 106% increase).

EUROPEAN UNION[190]

Air transport supports 9.4 million jobs and $691 (€624) billion in European Union economic activity. That is 4.1% of all employment and 4.2% of all GDP in European Union countries (EU28) in 2016.

811 million passengers

20% share of passenger traffic

431 airports

224 airlines

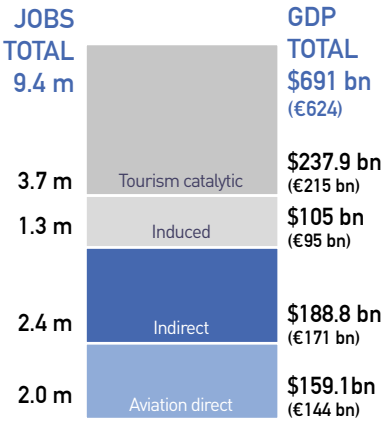
5,025 aircraft in service

Every person directly employed in the aviation sector and in tourism made possible by aviation supported another 4.8 jobs elsewhere in the European Union. Similarly, $4.30 of economic activity was supported elsewhere in the European Union for every $1 of gross value added directly created by the air transport sector.

The aviation sector in the European Union directly employed two million people in 2016 in the following sub-sectors:

- **Airlines: 371,300** (18.8% of the total)
- **Airport operators: 122,800** (6.2%)
- **Other on-airport: 1.2 million** (59.2%)
- **Civil aerospace: 267,900** (13.6%)
- **Air navigation service providers: 43,700** (2.2%)

Total jobs and GDP supported by air transport in the EU28 economies



Airlines, airport operators, retailers and other on-site businesses at airports and air navigation service providers and civil aircraft manufacturers also contribute to GDP in the European Union. In 2016, the operations of these businesses directly generated a $159 billion contribution to GDP.

The aviation sector's spending with suppliers is estimated to have supported a further 2.4 million jobs and a $189 billion gross value added contribution to GDP. In addition, wage payments to staff – by the aviation sector and businesses in the aviation sector's supply chain – supported 1.3 million more jobs and a $105 billion gross value added contribution to GDP.

In total, accounting for the sector's direct impact, its supply chain impact, its wage expenditure impact, and the impact of tourism made possible by air transport, the aviation sector supported an estimated 9.4 million jobs and a $691 billion contribution to GDP in the European Union in 2016.

Air travel in the 28 European Union countries is expected to continue to grow at about 3.4% per year over the next two decades. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in the European Union will have grown to support 14 million jobs (48% more than in 2016) and a $1.3 trillion contribution to GDP (86% increase).

Note: These numbers include the United Kingdom, which is due to withdraw from EU membership in 2019.

SMALL ISLAND STATES[191]

Air transport supports 1.8 million jobs and $32.1 billion in small island states economic activity. That is 10.2% of all employment and 13.9% of all GDP in the small island states in 2016.

37 million
passengers[196]

0.9%
share of passenger traffic

210
airports

52
airlines

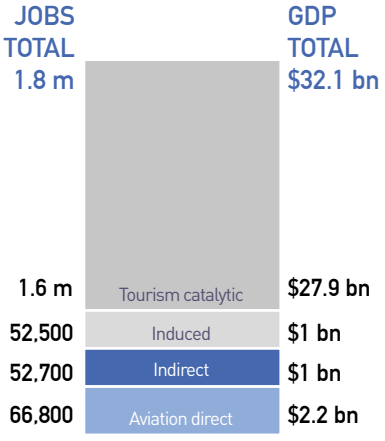
275
aircraft in service

Every person directly employed in the aviation sector and in tourism made possible by aviation supported another 26.3 jobs elsewhere in the small island states. Similarly, $14.60 of economic activity was supported elsewhere in the small island states for every $1 of gross value added directly created by the air transport sector.

The aviation sector in small island states directly employed an estimated 66,800 people in 2016 in the following sub-sectors:

- **Airlines: 11,500** (17.3% of the total)
- **Airport operators: 8,700** (13%)
- **Other on-airport: 44,300** (66.3%)
- **Air navigation service providers: 2,300** (3.5%)

Total jobs and GDP supported by air transport in small island state economies



Airlines, airport operators, retailers and other on-site businesses at airports and air navigation service providers and civil aircraft manufacturers also contribute to GDP in small island states. In 2016, the operations of these businesses directly generated a $2.2 billion contribution to GDP.

The aviation sector's spending with suppliers is estimated to have supported a further 52,700 jobs and a $1 billion gross value added contribution to GDP. In addition, wage payments to staff – by the aviation sector and businesses in the aviation sector's supply chain – supported 52,500 more jobs and another $1 billion gross value added contribution to GDP.

The aviation sector also facilitates a substantial amount of tourism in small island states. This stimulates still more economic activity, as tourists spend their money with restaurants, hotels, retailers, tour operators, and other providers of consumer goods and services. In 2016, spending by foreign visitors who flew to small island states supported an estimated 1.6 million jobs and a $27.9 billion contribution to GDP.

In total, accounting for the sector's direct impact, its supply chain impact, its wage expenditure impact, and the impact of tourism made possible by air transport, the aviation sector supported an estimated 1.8 million jobs and a $32.1 billion contribution to GDP in small island states in 2016.

Air travel in small island states is expected to continue to grow at about 4% per year over the next two decades. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in small island states will have grown to support 2.4 million jobs (39% more than in 2016) and a $74 billion contribution to GDP (a 129% increase).

DEVELOPING COUNTRIES[192]

Air transport supports 46 million jobs and $626 billion in economic activity in developing countries. That is 1.8% of all employment and 2.2% of all GDP in developing countries in 2016.

1.7 billion passengers

42% share of passenger traffic

1,901 airports

727 airlines

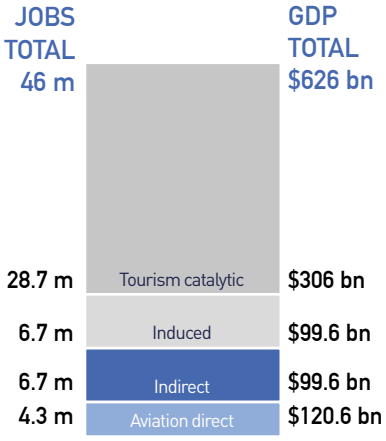
11,098 aircraft in service

Every person directly employed in the aviation sector and in tourism made possible by aviation supported another 10.8 jobs elsewhere in developing countries. Similarly, $5.20 of economic activity was supported elsewhere in developing countries for every $1 of gross value added directly created by the air transport sector.

The aviation sector in developing countries directly employed an estimated 4.3 million people in 2016 in the following sub-sectors:

- **Airlines: 1.4 million** (33.8% of the total)
- **Airport operators: 348,300** (8.1%)
- **Other on-airport: 2.1 million** (48.3%)
- **Civil aerospace: 286,300** (6.7%)
- **Air navigation service providers: 132,600** (3.1%)

Total jobs and GDP supported by air transport in developing economies



Airlines, airport operators, retailers and other on-site businesses at airports and air navigation service providers and civil aircraft manufacturers also contribute to GDP in developing countries. In 2016, the operations of these businesses directly generated a $121 billion contribution to GDP.

The aviation sector's spending with suppliers is estimated to have supported a further 6.7 million jobs and a nearly $100 billion gross value added contribution to GDP. In addition, wage payments to staff – by the aviation sector and businesses in the aviation sector's supply chain – supported another 6.7 million jobs and a further $100 billion gross value added contribution to GDP.

In total, accounting for the sector's direct impact, its supply chain impact, its wage expenditure impact, and the impact of tourism made possible by air transport, the aviation sector supported an estimated 46 million jobs and a $626 billion contribution to GDP in developing countries in 2016.

Air travel in developing countries is expected to continue to grow at about 5% per year over the next two decades. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in developing countries will have grown to support 64.5 million jobs (39% more than in 2016) and a $1.6 trillion contribution to GDP (a 157% increase).

OECD COUNTRIES[193]

Air transport supports 24 million jobs and $2.1 trillion in economic activity in OECD countries. That is 4.1% of all employment and 4.4% of all GDP in OECD countries in 2016.

2.2 billion
passengers[200]

53%
share of passenger traffic

1,751
airports

510
airlines

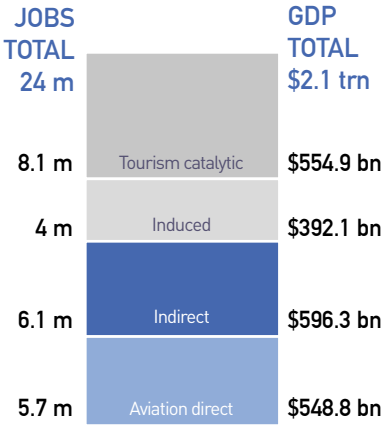
16,378
aircraft in service

Every person directly employed in the aviation sector and in tourism made possible by aviation supported another 4.2 jobs elsewhere in OECD countries. Similarly, $3.80 of economic activity was supported elsewhere in OECD countries for every $1 of gross value added directly created by the air transport sector.

The aviation sector in OECD countries directly employed nearly 5.7 million people in 2016 in the following sub-sectors:

- **Airlines: 1.3 million** (22.1% of the total)
- **Airport operators: 257,800** (4.5%)
- **Other on-airport: 3.2 million** (56.1%)
- **Civil aerospace: 870,400** (15.4%)
- **Air navigation service providers: 109,000** (1.9%)

Total jobs and GDP supported by air transport in the OECD economies



Airlines, airport operators, retailers and other on-site businesses at airports and air navigation service providers and civil aircraft manufacturers also contribute to GDP in OECD countries. In 2016, the operations of these businesses directly generated a $549 billion contribution to GDP.

The aviation sector's spending with suppliers is estimated to have supported a further 6.1 million jobs and a $596 billion gross value added contribution to GDP. In addition, wage payments to staff – by the aviation sector and businesses in the aviation sector's supply chain – supported 4 million more jobs and a $392 billion gross value added contribution to GDP.

In total, accounting for the sector's direct impact, its supply chain impact, its wage expenditure impact, and the impact of tourism made possible by air transport, the aviation sector supported an estimated 24 million jobs and a $2.1 trillion contribution to GDP in OECD countries in 2016.

Air travel in OECD countries is expected to continue to grow at about 3.5% per year over the next two decades. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in OECD countries will have grown to support 37 million jobs (54% more than in 2016) and a $4 trillion contribution to GDP (a 91% increase).

LEAST-DEVELOPED COUNTRIES[194]

Air transport supports nearly six million jobs and $31.5 billion in economic activity across LDCs. That is 2.1% of all employment and 3.4% of all GDP in LDCs in 2016.

47 million
passengers[202]

1%
share of passenger traffic

280
airports

116
airlines

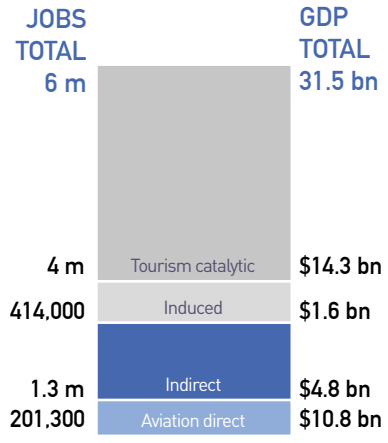
520
aircraft in service

Every person directly employed in the aviation sector and in tourism made possible by aviation supported another 29.6 jobs elsewhere in least-developed countries (LDCs). Similarly, $2.90 of economic activity was supported elsewhere in LDCs for every $1 of gross value added directly created by the air transport sector.

The aviation sector in least developed countries directly employed an estimated 201,300 people in 2016 in the following sub-sectors:

- **Airlines: 140,400** (69.7% of the total)
- **Airport operators: 16,900** (8.4%)
- **Other on-airport: 41,500** (20.6%)
- **Air navigation service providers: 2,500** (1.3%)

Total jobs and GDP supported by air transport in the LDCs economies



Airlines, airport operators, retailers and other on-site businesses at airports and air navigation service providers and civil aircraft manufacturers also contribute to GDP in LDCs. In 2016, the operations of these businesses directly generated a $10.8 billion contribution to GDP.

The aviation sector's spending with suppliers is estimated to have supported a further 1.3 million jobs and a $4.8 billion gross value added contribution to GDP. In addition, wage payments to staff – by the aviation sector and businesses in the aviation sector's supply chain – supported 413,900 more jobs and a $1.6 billion gross value added contribution to GDP.

In total, accounting for the sector's direct impact, its supply chain impact, its wage expenditure impact, and the impact of tourism made possible by air transport, the aviation sector supported nearly 6 million jobs and a $31.5 billion contribution to GDP in LDCs in 2016.

Air travel in LDCs is expected to continue to grow at about 5.2% per year over the next two decades. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in LDCs will have grown to support 8.7 million jobs (46% more than in 2016) and a $88.2 billion contribution to GDP (a 180% increase).

LANDLOCKED DEVELOPING COUNTRIES[195]

Air transport supports 2.7 million jobs and $20.9 billion in economic activity for LLDCs. That is 1.9% of all employment and 3.2% of all GDP in LLDCs in 2016.

42.7 million
passengers[204]

1%
share of passenger traffic

171
airports

97
airlines

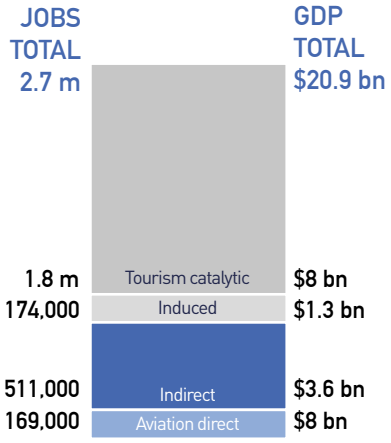
494
aircraft in service

Every person directly employed in the aviation sector and in tourism made possible by aviation supported another 16 jobs elsewhere in landlocked developing countries (LLDCs). Similarly, $2.60 of economic activity was supported elsewhere in LLDCs for every $1 of gross value added directly created by the air transport sector.

The aviation sector in LLDCs directly employed an estimated 169,100 people in 2016 in the following sub-sectors:

- **Airlines: 105,400** (62.3% of the total)
- **Airport operators: 14,900** (8.8%)
- **Other on-airport: 46,500** (27.5%)
- **Air navigation service providers: 2,200** (1.3%)

Total jobs and GDP supported by air transport in the LLDCs economies



Airlines, airport operators, retailers and other on-site businesses at airports and air navigation service providers and civil aircraft manufacturers also contribute to GDP in LLDCs. In 2016, the operations of these businesses directly generated an $8 billion contribution to GDP.

The aviation sector's spending with suppliers is estimated to have supported a further 511,000 jobs and a $3.6 billion gross value-added contribution to GDP. In addition, wage payments to staff – by the aviation sector and businesses in the aviation sector's supply chain—supported 174,000 more jobs and a $1.3 billion gross value added contribution to GDP.

In total, accounting for the sector's direct impact, its supply chain impact, its wage expenditure impact, and the impact of tourism made possible by air transport, the aviation sector supported an estimated 2.7 million jobs and a $20.9 billion contribution to GDP in LLDCs in 2016.

Air travel in LLDCs is expected to continue to grow at about 5% per year over the next two decades. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in LLDCs will have grown to support 3.6 million jobs (33% more than in 2016) and a $54.7 billion contribution to GDP (a 162% increase).

NATIONAL ANALYSIS

A country-by-country look at aviation's benefits

HOW TO USE THIS SECTION

Airlines: commercial airlines based in the country[196]

Airports: commercial airports in the country[197]

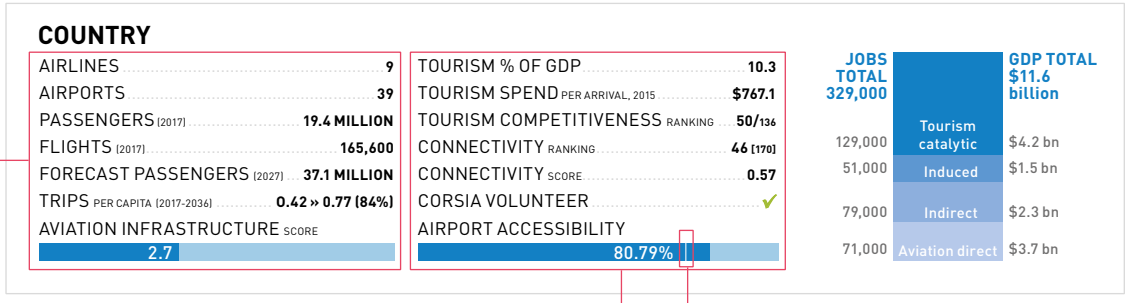
Passengers (2017): number of passengers departing airports in the country[198]

Flights (2017): number of flights operated from airports in the country [199]

Forecast passengers (2027): IATA Economics forecast[200], based on origin passengers only (no connecting passengers as contained in other passenger numbers in this report)

Trips per capita: propensity to travel based on average trips per capita in 2017 and forecast for 2036 and the percentage growth expected in that period[201]

Aviation infrastructure score: 1–7 score from the *World Economic Forum Travel and Tourism Competitiveness Report 2017*[202], based on the quality of the aviation infrastructure, the quantity of air traffic services (available seat kilometres and flights per capita), the number of operating airlines and the number of airports per capita



line represents global average (74.41%)

Tourism % of GDP: 2017 figures from the World Travel & Tourism Council[203], including direct, indirect and induced contributions of the tourism sector[204]

Tourism spend: 2015 figures from the UN World Tourism Organization *Yearbook of Tourism Statistics* and World Travel & Tourism Council for dollars spent on average by each arriving foreign tourist

Tourism competitiveness: World Economic Forum *Travel and Tourism Competitiveness Report 2017*[205]

Connectivity ranking: ICAO Air Transport Bureau 2016 analysis ranking each country based on the number of countries and territories that can be easily reached from it by air, with the actual number of countries or territories that can be reached direct or with one stop in square brackets ([ ])

Connectivity score: ICAO Air Transport Bureau and World Bank analysis looking at the ease of international connectivity, weighted by the number of stops the average international passenger ticket would need. The lower the score, the easier the international connectivity from that country

CORSIA volunteer: countries that have volunteered for the first phases of ICAO's CORSIA at the time of printing (see www.enviro.aero/CORSIA for an updated list)

Airport accessibility: ICAO iStars Database percentage of a country's population within 100 kilometres of either an international airport or of a domestic airport with at least one regular connection to an international airport, the global average for all countries being 74.41% [206]

National figures for employment and GDP supported by aviation, with analysis provided by Oxford Economics for those countries where reliable data are available and estimations are possible at the national level. Estimates are conducted based on national statistics, industry financial statements, and indicators such as airport employment, airport passenger traffic and airline passenger numbers.

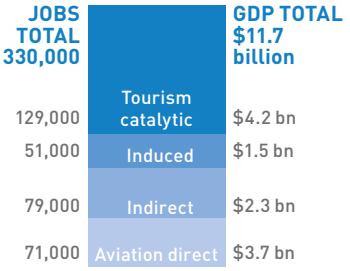
For countries that are not included below, not enough data are available for a reliable country-specific analysis.

The country figures shown will not necessarily equal the regional totals expressed elsewhere in the report. In part, this is because individual country figures are computed using country-specific multipliers, whereas regional figures are computed using region-specific multipliers. The former are smaller than the latter because of the effects of 'leakage' spending that occurs outside the country or region as a result of imports. A country will have more leakage than a region, since some imports will occur only within the region to which the country belongs.

ARGENTINA

AIRLINES	9
AIRPORTS	39
PASSENGERS (2017)	19.4 MILLION
FLIGHTS (2017)	165,600
FORECAST PASSENGERS (2027)	37.1 MILLION
TRIPS PER CAPITA (2017-2036)	0.42 » 0.77 (84%)
AVIATION INFRASTRUCTURE SCORE	2.7

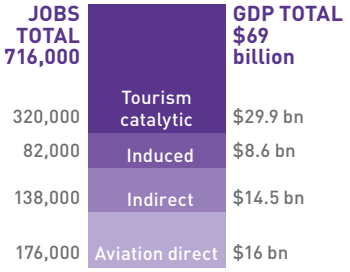
TOURISM % OF GDP	10.3
TOURISM SPEND PER ARRIVAL, 2015	$767.1
TOURISM COMPETITIVENESS RANKING	50/136
CONNECTIVITY RANKING	46= [170]
CONNECTIVITY SCORE	0.57
AIRPORT ACCESSIBILITY	80.79%



AUSTRALIA

AIRLINES	27
AIRPORTS	155
PASSENGERS (2017)	82.5 MILLION
FLIGHTS (2017)	729,200
FORECAST PASSENGERS (2027)	122.4 MILLION
TRIPS PER CAPITA (2017-2036)	3.08 » 4.62 (50%)
AVIATION INFRASTRUCTURE SCORE	2.2

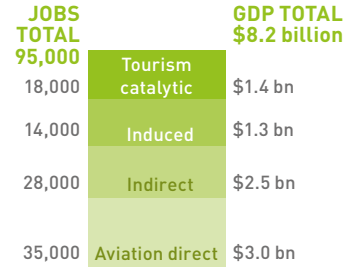
TOURISM % OF GDP	11.0
TOURISM SPEND PER ARRIVAL, 2015	$3,878.3
TOURISM COMPETITIVENESS RANKING	7/136
CONNECTIVITY RANKING	37 [179]
CONNECTIVITY SCORE	0.56
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	89.55%



AUSTRIA

AIRLINES	5
AIRPORTS	6
PASSENGERS (2017)	13.8 MILLION
FLIGHTS (2017)	133,900
FORECAST PASSENGERS (2027)	27.5 MILLION
TRIPS PER CAPITA (2017-2036)	1.32 » 2.25 (70%)
AVIATION INFRASTRUCTURE SCORE	3.9

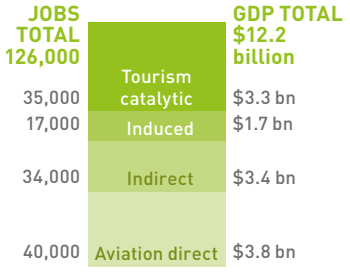
TOURISM % OF GDP	14.8
TOURISM SPEND PER ARRIVAL, 2015	$681.8
TOURISM COMPETITIVENESS RANKING	12/136
CONNECTIVITY RANKING	21 [191]
CONNECTIVITY SCORE	0.29
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	99.72%



BELGIUM

AIRLINES	5
AIRPORTS	5
PASSENGERS (2017)	16.2 MILLION
FLIGHTS (2017)	128,200
FORECAST PASSENGERS (2027)	32.8 MILLION
TRIPS PER CAPITA (2017-2036)	1.32 » 2.22 (68%)
AVIATION INFRASTRUCTURE SCORE	3.7

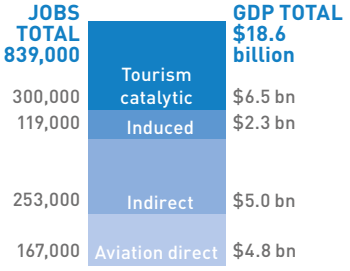
TOURISM % OF GDP	5.6
TOURISM SPEND PER ARRIVAL, 2015	$1,432.5
TOURISM COMPETITIVENESS RANKING	21/136
CONNECTIVITY RANKING	18= [192]
CONNECTIVITY SCORE	0.17
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	100%



BRAZIL

AIRLINES	14
AIRPORTS	105
PASSENGERS (2017)	100.5 MILLION
FLIGHTS (2017)	844,300
FORECAST PASSENGERS (2027)	131.6 MILLION
TRIPS PER CAPITA (2017-2036)	0.43 » 0.96 (124%)
AVIATION INFRASTRUCTURE SCORE	3.7

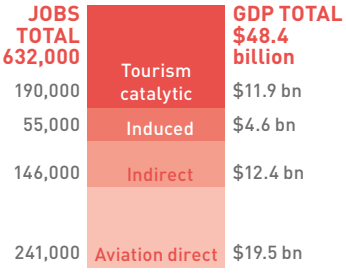
TOURISM % OF GDP	7.9
TOURISM SPEND PER ARRIVAL, 2015	$926.8
TOURISM COMPETITIVENESS RANKING	27/136
CONNECTIVITY RANKING	25 [188]
CONNECTIVITY SCORE	0.77
AIRPORT ACCESSIBILITY	72.65%



CANADA

AIRLINES	48
AIRPORTS	238
PASSENGERS (2017)	78.3 MILLION
FLIGHTS (2017)	1,127,300
FORECAST PASSENGERS (2027)	116.8 MILLION
TRIPS PER CAPITA (2017-2036)	1.76 » 2.37 (35%)
AVIATION INFRASTRUCTURE SCORE	6.8

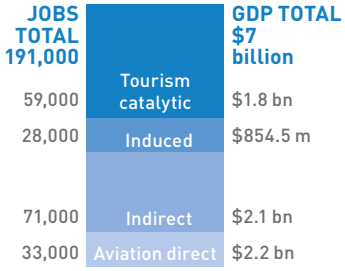
TOURISM % OF GDP	6.5
TOURISM SPEND PER ARRIVAL, 2015	$921.0
TOURISM COMPETITIVENESS RANKING	9/136
CONNECTIVITY RANKING	8 [204]
CONNECTIVITY SCORE	0.52
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	91.65%



CHILE

AIRLINES	8
AIRPORTS	19
PASSENGERS (2017)	16.6 MILLION
FLIGHTS (2017)	119,300
FORECAST PASSENGERS (2027)	26 MILLION
TRIPS PER CAPITA (2017-2036)	0.83 » 1.80 (116%)
AVIATION INFRASTRUCTURE SCORE	2.7

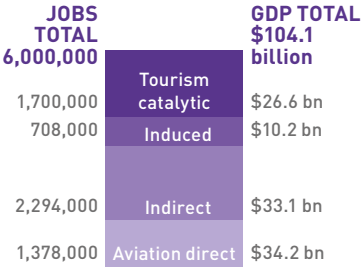
TOURISM % OF GDP	10.4
TOURISM SPEND PER ARRIVAL, 2015	$537.8
TOURISM COMPETITIVENESS RANKING	48/136
CONNECTIVITY RANKING	84= [141]
CONNECTIVITY SCORE	0.54
AIRPORT ACCESSIBILITY	83%



CHINA

AIRLINES	50
AIRPORTS	227
PASSENGERS (2017)	556.1 MILLION
FLIGHTS (2017)	4,348,300
FORECAST PASSENGERS (2027)	1.037 BILLION
TRIPS PER CAPITA (2017-2036)	0.41 » 1.33 (224%)
AVIATION INFRASTRUCTURE SCORE	4.3

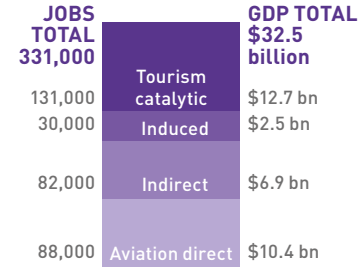
TOURISM % OF GDP	11.0
TOURISM SPEND PER ARRIVAL, 2015	$2,005.9
TOURISM COMPETITIVENESS RANKING	15/136
CONNECTIVITY RANKING	3= [207]
CONNECTIVITY SCORE	0.28
AIRPORT ACCESSIBILITY	73.37%



HONG KONG SAR

AIRLINES	6
AIRPORTS	1
PASSENGERS (2017)	35.4 MILLION
FLIGHTS (2017)	179,200
FORECAST PASSENGERS (2027)	80.3 MILLION
TRIPS PER CAPITA (2017-2036)	3.32 » 7.57 (128%)
AVIATION INFRASTRUCTURE SCORE	5.5

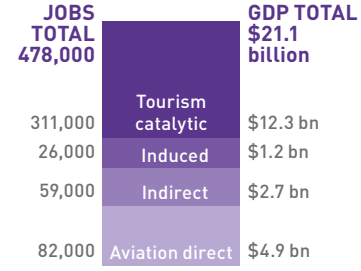
TOURISM % OF GDP	16.7
TOURISM SPEND PER ARRIVAL, 2015	$1,354.6
TOURISM COMPETITIVENESS RANKING	11/136
CONNECTIVITY RANKING	12= [197]
CONNECTIVITY SCORE	0.13
AIRPORT ACCESSIBILITY	100%



CHINESE TAIPEI

AIRLINES	6
AIRPORTS	12
PASSENGERS (2017)	34 MILLION
FLIGHTS (2017)	210,700
FORECAST PASSENGERS (2027)	79.7 MILLION
TRIPS PER CAPITA (2017-2036)	1.02 » 2.42 (137%)
AVIATION INFRASTRUCTURE SCORE	3,5

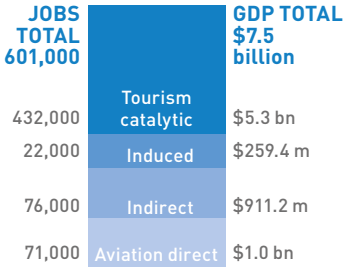
TOURISM % OF GDP	4.3
TOURISM SPEND PER ARRIVAL, 2015	$1,378.1
TOURISM COMPETITIVENESS RANKING	30/136
CONNECTIVITY RANKING	45 [171]
CONNECTIVITY SCORE	0.12



COLOMBIA

AIRLINES	16
AIRPORTS	48
PASSENGERS (2017)	29.8 MILLION
FLIGHTS (2017)	281,400
FORECAST PASSENGERS (2027)	46.2 MILLION
TRIPS PER CAPITA (2017-2036)	0.55 » 1.14 (107%)
AVIATION INFRASTRUCTURE SCORE	2.8

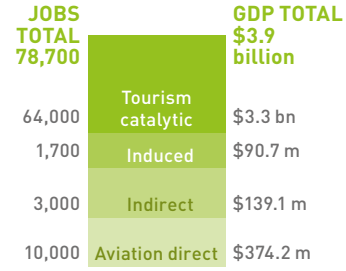
TOURISM % OF GDP	5.8
TOURISM SPEND PER ARRIVAL, 2015	$1,425.5
TOURISM COMPETITIVENESS RANKING	62/136
CONNECTIVITY RANKING	59 [161]
CONNECTIVITY SCORE	0.66
AIRPORT ACCESSIBILITY	91.34%



CYPRUS

AIRLINES	2
AIRPORTS	3
PASSENGERS (2017)	5.8 MILLION
FLIGHTS (2017)	43,400
FORECAST PASSENGERS (2027)	14.3 MILLION
TRIPS PER CAPITA (2017-2036)	6.41 » 11.12 (74%)
AVIATION INFRASTRUCTURE SCORE	3.1

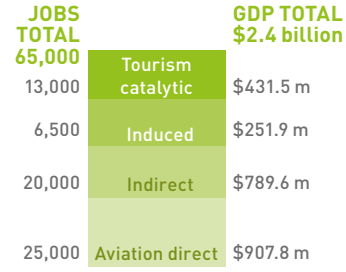
TOURISM % OF GDP	22.3
TOURISM SPEND PER ARRIVAL, 2015	$935.3
TOURISM COMPETITIVENESS RANKING	52/136
CONNECTIVITY RANKING	75= [148]
CONNECTIVITY SCORE	0.20
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	100%



CZECH REPUBLIC

AIRLINES	4
AIRPORTS	5
PASSENGERS (2017)	7.7 MILLION
FLIGHTS (2017)	64,200
FORECAST PASSENGERS (2027)	19 MILLION
TRIPS PER CAPITA (2017-2036)	0.87 » 2.07 (136%)
AVIATION INFRASTRUCTURE SCORE	3.1

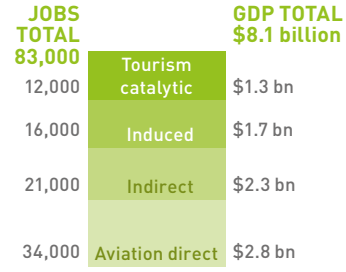
TOURISM % OF GDP	7.8
TOURISM SPEND PER ARRIVAL, 2015	$542.5
TOURISM COMPETITIVENESS RANKING	39/136
CONNECTIVITY RANKING	35= [180]
CONNECTIVITY SCORE	0.28
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	99.11%



DENMARK

AIRLINES	9
AIRPORTS	9
PASSENGERS (2017)	16.6 MILLION
FLIGHTS (2017)	156,600
FORECAST PASSENGERS (2027)	30.4 MILLION
TRIPS PER CAPITA (2017-2036)	2.71 » 4.35 (60%)
AVIATION INFRASTRUCTURE SCORE	3.5

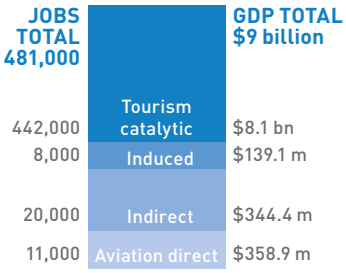
TOURISM % OF GDP	7.7
TOURISM SPEND PER ARRIVAL, 2015	$641.2
TOURISM COMPETITIVENESS RANKING	31/136
CONNECTIVITY RANKING	26= [187]
CONNECTIVITY SCORE	0.29
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	99.98%



DOMINICAN REPUBLIC

AIRLINES	3
AIRPORTS	7
PASSENGERS (2017)	6.5 MILLION
FLIGHTS (2017)	44,500
FORECAST PASSENGERS (2027)	18.4 MILLION
TRIPS PER CAPITA (2017-2036)	0.48 » 0.79 (66%)
AVIATION INFRASTRUCTURE SCORE	2.8

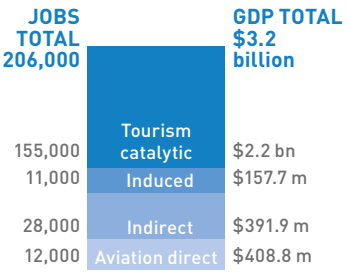
TOURISM % OF GDP	17.2
TOURISM SPEND PER ARRIVAL, 2015	$1,092.2
TOURISM COMPETITIVENESS RANKING	76/136
CONNECTIVITY RANKING	82 [142]
CONNECTIVITY SCORE	0.41
AIRPORT ACCESSIBILITY	100%



ECUADOR

AIRLINES	7
AIRPORTS	13
PASSENGERS (2017)	5.5 MILLION
FLIGHTS (2017)	50,300
FORECAST PASSENGERS (2027)	10.3 MILLION
TRIPS PER CAPITA (2017-2036)	0.33 » 0.59 (76%)
AVIATION INFRASTRUCTURE SCORE	2.5

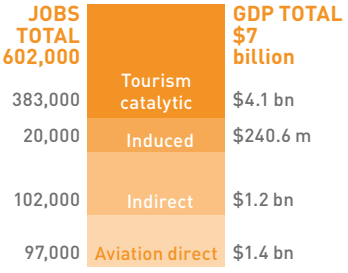
TOURISM % OF GDP	5.4
TOURISM SPEND PER ARRIVAL, 2015	$1,004.5
TOURISM COMPETITIVENESS RANKING	57/136
CONNECTIVITY RANKING	121 [118]
CONNECTIVITY SCORE	0.75
AIRPORT ACCESSIBILITY	82.27%



EGYPT

AIRLINES	14
AIRPORTS	10
PASSENGERS (2017)	12 MILLION
FLIGHTS (2017)	105,300
FORECAST PASSENGERS (2027)	32.4 MILLION
TRIPS PER CAPITA (2017-2036)	0.15 » 0.29 (85%)
AVIATION INFRASTRUCTURE SCORE	2.9

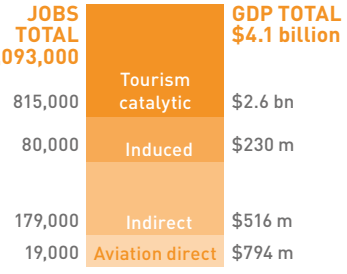
TOURISM % OF GDP	11.0
TOURISM SPEND PER ARRIVAL, 2015	$663.6
TOURISM COMPETITIVENESS RANKING	74/136
CONNECTIVITY RANKING	32= [181]
CONNECTIVITY SCORE	0.21
AIRPORT ACCESSIBILITY	87.9%



ETHIOPIA

AIRLINES	4
AIRPORTS	19
PASSENGERS (2017)	6.1 MILLION
FLIGHTS (2017)	58,700
FORECAST PASSENGERS (2027)	7.7 MILLION
TRIPS PER CAPITA (2017-2036)	0.03 » 0.07 (162%)
AVIATION INFRASTRUCTURE SCORE	2.0

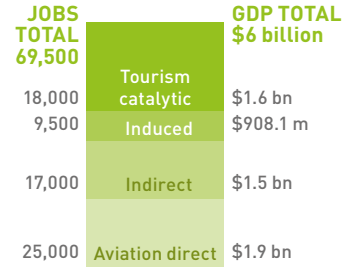
TOURISM % OF GDP	6.8
TOURISM SPEND PER ARRIVAL, 2015	$457.1
TOURISM COMPETITIVENESS RANKING	116/136
CONNECTIVITY RANKING	49 [168]
CONNECTIVITY SCORE	0.31
AIRPORT ACCESSIBILITY	63.37%



FINLAND

AIRLINES	4
AIRPORTS	17
PASSENGERS (2017)	10.6 MILLION
FLIGHTS (2017)	108,600
FORECAST PASSENGERS (2027)	15.7 MILLION
TRIPS PER CAPITA (2017-2036)	1.52 » 2.52 (66%)
AVIATION INFRASTRUCTURE SCORE	4.0

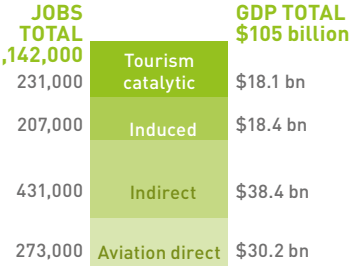
TOURISM % OF GDP	8.3
TOURISM SPEND PER ARRIVAL, 2015	$976.1
TOURISM COMPETITIVENESS RANKING	33/136
CONNECTIVITY RANKING	30 [183]
CONNECTIVITY SCORE	0.39
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	92.34%



FRANCE

AIRLINES	20
AIRPORTS	56
PASSENGERS (2017)	88.9 MILLION
FLIGHTS (2017)	706,800
FORECAST PASSENGERS (2027)	160.4 MILLION
TRIPS PER CAPITA (2017-2036)	1.26 » 1.99 (58%)
AVIATION INFRASTRUCTURE SCORE	4.9

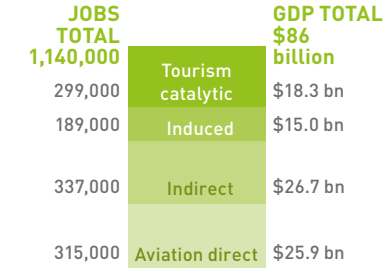
TOURISM % OF GDP	8.9
TOURISM SPEND PER ARRIVAL, 2015	$543.7
TOURISM COMPETITIVENESS RANKING	2/136
CONNECTIVITY RANKING	3= [207]
CONNECTIVITY SCORE	0.24
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	97.92%



GERMANY

AIRLINES	23
AIRPORTS	27
PASSENGERS (2017)	116.2 MILLION
FLIGHTS (2017)	929,900
FORECAST PASSENGERS (2027)	212.9 MILLION
TRIPS PER CAPITA (2017-2036)	1.29 » 2.27 (76%)
AVIATION INFRASTRUCTURE SCORE	4.9

TOURISM % OF GDP	10.7
TOURISM SPEND PER ARRIVAL, 2015	$1,054.2
TOURISM COMPETITIVENESS RANKING	3/136
CONNECTIVITY RANKING	3= [207]
CONNECTIVITY SCORE	0.26
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	100%



GREECE

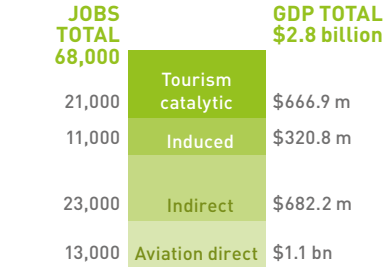
AIRLINES	9
AIRPORTS	39
PASSENGERS (2017)	25.1 MILLION
FLIGHTS (2017)	205,654
FORECAST PASSENGERS (2027)	46 MILLION
TRIPS PER CAPITA (2017-2036)	2.95 » 5.11 (73%)
AVIATION INFRASTRUCTURE SCORE	4.3

TOURISM % OF GDP	19.7
TOURISM SPEND PER ARRIVAL, 2015	$664.1
TOURISM COMPETITIVENESS RANKING	24/136
CONNECTIVITY RANKING	40= [176]
CONNECTIVITY SCORE	0.23
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	99.99%

HUNGARY

AIRLINES	5
AIRPORTS	2
PASSENGERS (2017)	6.6 MILLION
FLIGHTS (2017)	46,000
FORECAST PASSENGERS (2027)	15.2 MILLION
TRIPS PER CAPITA (2017-2036)	0.76 » 1.96 (159%)
AVIATION INFRASTRUCTURE SCORE	3.0

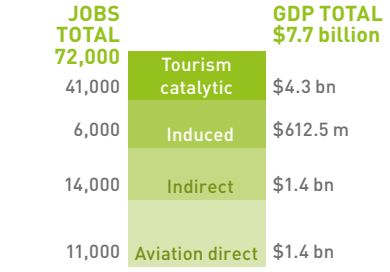
TOURISM % OF GDP	8.0
TOURISM SPEND PER ARRIVAL, 2015	$373.3
TOURISM COMPETITIVENESS RANKING	49/136
CONNECTIVITY RANKING	46= [170]
CONNECTIVITY SCORE	0.25
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	89.34%



ICELAND

AIRLINES	6
AIRPORTS	8
PASSENGERS (2017)	4.5 MILLION
FLIGHTS (2017)	34,800
FORECAST PASSENGERS (2027)	7.9 MILLION
TRIPS PER CAPITA (2017-2036)	12.28 » 20.28 (65%)
AVIATION INFRASTRUCTURE SCORE	4.7

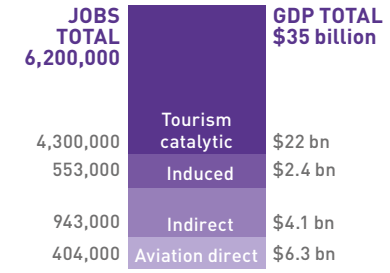
TOURISM % OF GDP	34.6
TOURISM SPEND PER ARRIVAL, 2015	$1,254.4
TOURISM COMPETITIVENESS RANKING	25/136
CONNECTIVITY RANKING	91= [137]
CONNECTIVITY SCORE	0.17
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	95.23%



INDIA

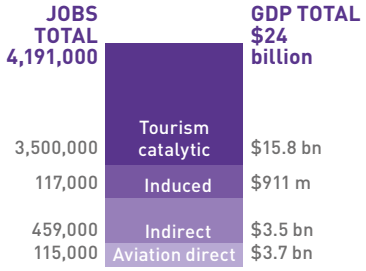
AIRLINES	13
AIRPORTS	88
PASSENGERS (2017)	141.1 MILLION
FLIGHTS (2017)	1,070,900
FORECAST PASSENGERS (2027)	199.4 MILLION
TRIPS PER CAPITA (2017-2036)	0.10 » 0.38 (270%)
AVIATION INFRASTRUCTURE SCORE	3.9

TOURISM % OF GDP	9.4
TOURISM SPEND PER ARRIVAL, 2015	$2,617.7
TOURISM COMPETITIVENESS RANKING	40/136
CONNECTIVITY RANKING	18= [192]
CONNECTIVITY SCORE	0.54
AIRPORT ACCESSIBILITY	57.32%



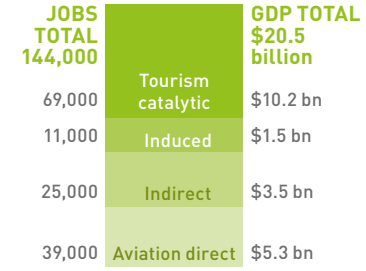
INDONESIA

AIRLINES	27	TOURISM % OF GDP	5.8
AIRPORTS	112	TOURISM SPEND PER ARRIVAL, 2015	$1,034.0
PASSENGERS (2017)	121.8 MILLION	TOURISM COMPETITIVENESS RANKING	42/136
FLIGHTS (2017)	1,008,800	CONNECTIVITY RANKING	55= [164]
FORECAST PASSENGERS (2027)	239.7 MILLION	CONNECTIVITY SCORE	0.35
TRIPS PER CAPITA (2017-2036)	0.48 » 1.39 (188%)	CORSIA VOLUNTEER	✓
AVIATION INFRASTRUCTURE SCORE		AIRPORT ACCESSIBILITY	
3.8		78.93%	



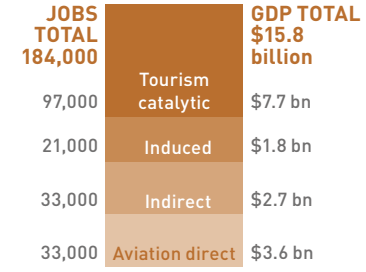
IRELAND

AIRLINES	7	TOURISM % OF GDP	5.9
AIRPORTS	6	TOURISM SPEND PER ARRIVAL, 2015	$503.0
PASSENGERS (2017)	17 MILLION	TOURISM COMPETITIVENESS RANKING	23/136
FLIGHTS (2017)	124,600	CONNECTIVITY RANKING	29 [184]
FORECAST PASSENGERS (2027)	40.7 MILLION	CONNECTIVITY SCORE	0.19
TRIPS PER CAPITA (2017-2036)	3.70 » 5.82 (57%)	CORSIA VOLUNTEER	✓
AVIATION INFRASTRUCTURE SCORE		AIRPORT ACCESSIBILITY	
4.2		100%	



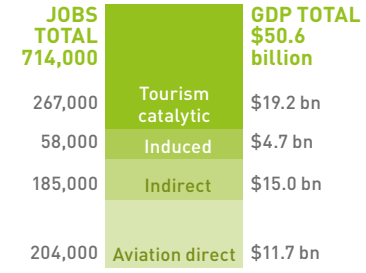
ISRAEL

AIRLINES	6	TOURISM % OF GDP	6.0
AIRPORTS	5	TOURISM SPEND PER ARRIVAL, 2015	$1,916.2
PASSENGERS (2017)	9.5 MILLION	TOURISM COMPETITIVENESS RANKING	61/136
FLIGHTS (2017)	66,800	CONNECTIVITY RANKING	28 [185]
FORECAST PASSENGERS (2027)	22.2 MILLION	CONNECTIVITY SCORE	0.39
TRIPS PER CAPITA (2017-2036)	1.20 » 1.99 (65%)	CORSIA VOLUNTEER	✓
AVIATION INFRASTRUCTURE SCORE		AIRPORT ACCESSIBILITY	
3.2		99.55%	



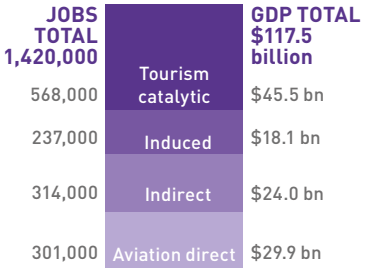
ITALY

AIRLINES	12	TOURISM % OF GDP	13
AIRPORTS	39	TOURISM SPEND PER ARRIVAL, 2015	$777.6
PASSENGERS (2017)	86.8 MILLION	TOURISM COMPETITIVENESS RANKING	8/136
FLIGHTS (2017)	645,000	CONNECTIVITY RANKING	12= [197]
FORECAST PASSENGERS (2027)	158.4 MILLION	CONNECTIVITY SCORE	0.27
TRIPS PER CAPITA (2017-2036)	1.58 » 2.60 (64%)	CORSIA VOLUNTEER	✓
AVIATION INFRASTRUCTURE SCORE		AIRPORT ACCESSIBILITY	
4.4		98.51%	



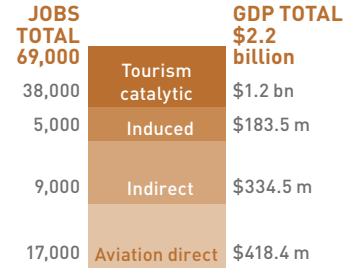
JAPAN

AIRLINES	22	TOURISM % OF GDP	6.8
AIRPORTS	78	TOURISM SPEND PER ARRIVAL, 2015	$1,265.8
PASSENGERS (2017)	146.4 MILLION	TOURISM COMPETITIVENESS RANKING	4/136
FLIGHTS (2017)	1,194,800	CONNECTIVITY RANKING	9 [202]
FORECAST PASSENGERS (2027)	216.6 MILLION	CONNECTIVITY SCORE	0.27
TRIPS PER CAPITA (2017-2036)	1.11 » 1.88 (70%)	CORSIA VOLUNTEER	✓
AVIATION INFRASTRUCTURE SCORE		AIRPORT ACCESSIBILITY	
4.6		98.78%	



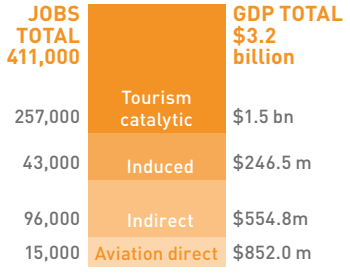
JORDAN

AIRLINES	6	TOURISM % OF GDP	18.7
AIRPORTS	2	TOURISM SPEND PER ARRIVAL, 2015	$1,080.8
PASSENGERS (2017)	3.6 MILLION	TOURISM COMPETITIVENESS RANKING	75/136
FLIGHTS (2017)	34,700	CONNECTIVITY RANKING	49= [168]
FORECAST PASSENGERS (2027)	9.2 MILLION	CONNECTIVITY SCORE	0.34
TRIPS PER CAPITA (2017-2036)	0.41 » 0.89 (117%)		
AVIATION INFRASTRUCTURE SCORE		AIRPORT ACCESSIBILITY	
2.6		98.53%	



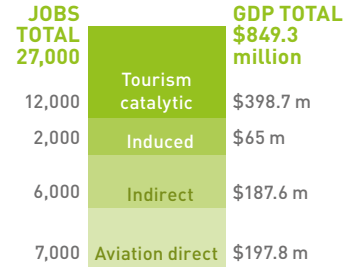
KENYA

AIRLINES	23	TOURISM % OF GDP	9.7
AIRPORTS	16	TOURISM SPEND PER ARRIVAL, 2015	$649.0
PASSENGERS (2017)	4.7 MILLION	TOURISM COMPETITIVENESS RANKING	80/136
FLIGHTS (2017)	82,200	CONNECTIVITY RANKING	42 [174]
FORECAST PASSENGERS (2027)	40.4 MILLION	CONNECTIVITY SCORE	0.53
TRIPS PER CAPITA (2017-2036)	0.07 » 0.13 (91%)	CORSIA VOLUNTEER	✓
AVIATION INFRASTRUCTURE SCORE		AIRPORT ACCESSIBILITY	
2.5		69.81%	



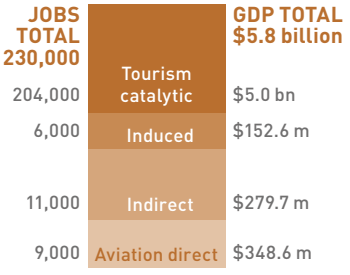
LATVIA

AIRLINES	4	TOURISM % OF GDP	9.2
AIRPORTS	2	TOURISM SPEND PER ARRIVAL, 2015	$442.6
PASSENGERS (2017)	2.8 MILLION	TOURISM COMPETITIVENESS RANKING	54/136
FLIGHTS (2017)	33,600	CONNECTIVITY RANKING	68 [154]
FORECAST PASSENGERS (2027)	5.4 MILLION	CONNECTIVITY SCORE	0.26
TRIPS PER CAPITA (2017-2036)	1.20 » 3.26 (173%)	CORSIA VOLUNTEER	✓
AVIATION INFRASTRUCTURE SCORE		AIRPORT ACCESSIBILITY	
3.1		77.02%	



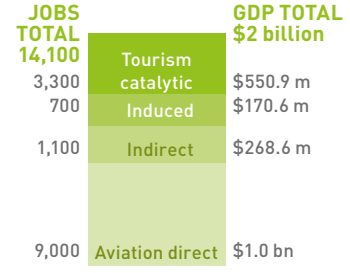
LEBANON

AIRLINES	2	TOURISM % OF GDP	18.4
AIRPORTS	1	TOURISM SPEND PER ARRIVAL, 2015	$4,517.5
PASSENGERS (2017)	3.9 MILLION	TOURISM COMPETITIVENESS RANKING	96/136
FLIGHTS (2017)	31,100	CONNECTIVITY RANKING	49= [168]
FORECAST PASSENGERS (2027)	11 MILLION	CONNECTIVITY SCORE	0.39
TRIPS PER CAPITA (2017-2036)	0.81 » 2.36 (192%)		
AVIATION INFRASTRUCTURE SCORE		AIRPORT ACCESSIBILITY	
2.4		98.29%	



LUXEMBOURG

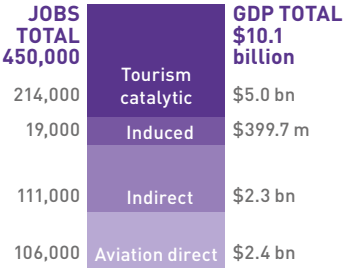
AIRLINES	3	TOURISM % OF GDP	4.3
AIRPORTS	1	TOURISM SPEND PER ARRIVAL, 2015	$3,943.3
PASSENGERS (2017)	1.8 MILLION	TOURISM COMPETITIVENESS RANKING	28/136
FLIGHTS (2017)	23,900	CONNECTIVITY RANKING	55= [164]
FORECAST PASSENGERS (2027)	3.2 MILLION	CONNECTIVITY SCORE	0.32
TRIPS PER CAPITA (2017-2036)	3.42 » 4.85 (42%)	CORSIA VOLUNTEER	✓
AVIATION INFRASTRUCTURE SCORE		AIRPORT ACCESSIBILITY	
3.6		100%	



MALAYSIA

AIRLINES	11
AIRPORTS	34
PASSENGERS (2017)	51.9 MILLION
FLIGHTS (2017)	431,600
FORECAST PASSENGERS (2027)	106.3 MILLION
TRIPS PER CAPITA (2017-2036)	1.34 » 3.42 (155%)
AVIATION INFRASTRUCTURE SCORE	4.5

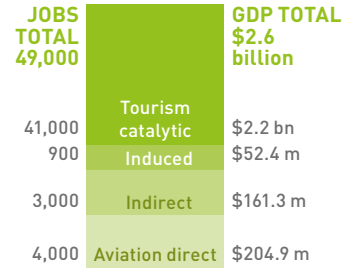
TOURISM % OF GDP	13.4
TOURISM SPEND PER ARRIVAL, 2015	$684.1
TOURISM COMPETITIVENESS RANKING	26/136
CONNECTIVITY RANKING	43= [173]
CONNECTIVITY SCORE	0.23
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	98.13%



MALTA

AIRLINES	5
AIRPORTS	1
PASSENGERS (2017)	2.9 MILLION
FLIGHTS (2017)	19,800
FORECAST PASSENGERS (2027)	6.7 MILLION
TRIPS PER CAPITA (2017-2036)	8.02 » 14.51 (81%)
AVIATION INFRASTRUCTURE SCORE	3.9

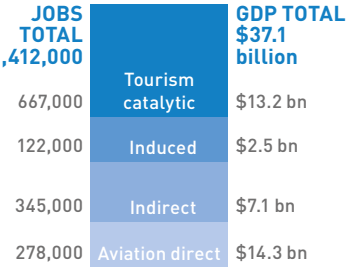
TOURISM % OF GDP	27.1
TOURISM SPEND PER ARRIVAL, 2015	$769.3
TOURISM COMPETITIVENESS RANKING	36/136
CONNECTIVITY RANKING	61= [157]
CONNECTIVITY SCORE	0.19
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	100%



MEXICO

AIRLINES	22
AIRPORTS	62
PASSENGERS (2017)	66.7 MILLION
FLIGHTS (2017)	629,000
FORECAST PASSENGERS (2027)	110.6 MILLION
TRIPS PER CAPITA (2017-2036)	0.42 » 0.74 (77%)
AVIATION INFRASTRUCTURE SCORE	3.7

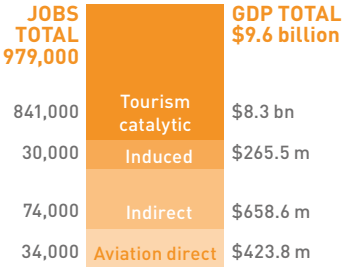
TOURISM % OF GDP	16
TOURISM SPEND PER ARRIVAL, 2015	$552.6
TOURISM COMPETITIVENESS RANKING	22/136
CONNECTIVITY RANKING	66= [155]
CONNECTIVITY SCORE	0.50
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	91.57%



MOROCCO

AIRLINES	4
AIRPORTS	17
PASSENGERS (2017)	9.9 MILLION
FLIGHTS (2017)	81,300
FORECAST PASSENGERS (2027)	21 MILLION
TRIPS PER CAPITA (2017-2036)	0.27 » 0.50 (87%)
AVIATION INFRASTRUCTURE SCORE	2.8

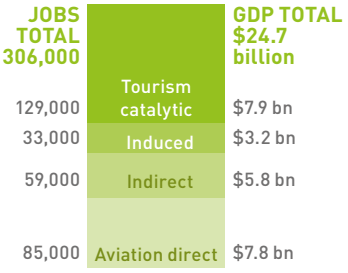
TOURISM % OF GDP	18.6
TOURISM SPEND PER ARRIVAL, 2015	$575.1
TOURISM COMPETITIVENESS RANKING	65/136
CONNECTIVITY RANKING	32= [181]
CONNECTIVITY SCORE	0.21
AIRPORT ACCESSIBILITY	91.85%



NETHERLANDS

AIRLINES	8
AIRPORTS	5
PASSENGERS (2017)	35.7 MILLION
FLIGHTS (2017)	258,500
FORECAST PASSENGERS (2027)	47.3 MILLION
TRIPS PER CAPITA (2017-2036)	1.55 » 2.62 (70%)
AVIATION INFRASTRUCTURE SCORE	5.0

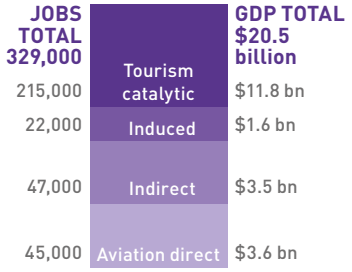
TOURISM % OF GDP	5.2
TOURISM SPEND PER ARRIVAL, 2015	$880.3
TOURISM COMPETITIVENESS RANKING	17/136
CONNECTIVITY RANKING	6= [205]
CONNECTIVITY SCORE	0.17
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	100%



NEW ZEALAND

AIRLINES	9
AIRPORTS	27
PASSENGERS (2017)	19.9 MILLION
FLIGHTS (2017)	238,000
FORECAST PASSENGERS (2027)	30 MILLION
TRIPS PER CAPITA (2017-2036)	3.56 » 5.28 (48%)
AVIATION INFRASTRUCTURE SCORE	4.7

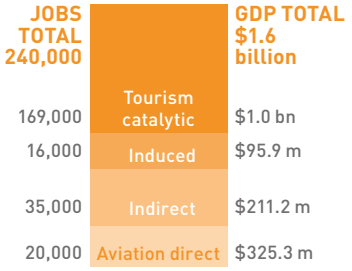
TOURISM % OF GDP	17.9
TOURISM SPEND PER ARRIVAL, 2015	$2,977.8
TOURISM COMPETITIVENESS RANKING	16/136
CONNECTIVITY RANKING	70= [153]
CONNECTIVITY SCORE	0.52
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	99.73%



NIGERIA

AIRLINES	13
AIRPORTS	20
PASSENGERS (2017)	5.4 MILLION
FLIGHTS (2017)	59,500
FORECAST PASSENGERS (2027)	12.9 MILLION
TRIPS PER CAPITA (2017-2036)	0.03 » 0.04 (56%)
AVIATION INFRASTRUCTURE SCORE	2.0

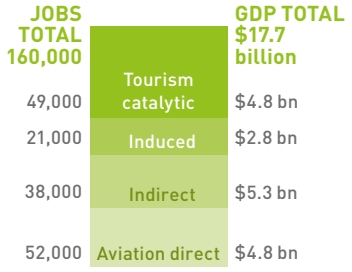
TOURISM % OF GDP	5.1
TOURISM SPEND PER ARRIVAL, 2015	$321.8
TOURISM COMPETITIVENESS RANKING	129/136
CONNECTIVITY RANKING	31 [182]
CONNECTIVITY SCORE	0.66
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	68.87%



NORWAY

AIRLINES	5
AIRPORTS	48
PASSENGERS (2017)	27.9 MILLION
FLIGHTS (2017)	327,823
FORECAST PASSENGERS (2027)	46.6 MILLION
TRIPS PER CAPITA (2017-2036)	4.69 » 6.41 (37%)
AVIATION INFRASTRUCTURE SCORE	5.3

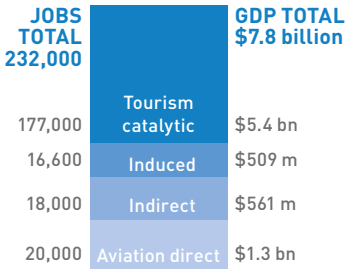
TOURISM % OF GDP	9.0
TOURISM SPEND PER ARRIVAL, 2015	$923.7
TOURISM COMPETITIVENESS RANKING	18/136
CONNECTIVITY RANKING	35 [180]
CONNECTIVITY SCORE	0.40
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	99.23%



PANAMA

AIRLINES	5
AIRPORTS	18
PASSENGERS (2017)	8.4 MILLION
FLIGHTS (2017)	79,900
FORECAST PASSENGERS (2027)	8.8 MILLION
TRIPS PER CAPITA (2017-2036)	0.58 » 1.10 (91%)
AVIATION INFRASTRUCTURE SCORE	4.7

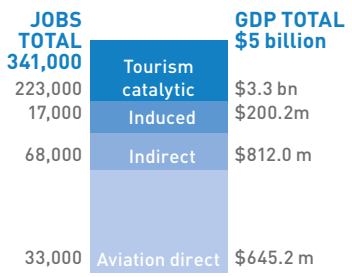
TOURISM % OF GDP	14.5
TOURISM SPEND PER ARRIVAL, 2015	$1,968.7
TOURISM COMPETITIVENESS RANKING	35/136
CONNECTIVITY RANKING	61= [157]
CONNECTIVITY SCORE	0.31
AIRPORT ACCESSIBILITY	83.24%



PERU

AIRLINES	10
AIRPORTS	25
PASSENGERS (2017)	16.3 MILLION
FLIGHTS (2017)	141,500
FORECAST PASSENGERS (2027)	30.3 MILLION
TRIPS PER CAPITA (2017-2036)	041 » 0.86 (110%)
AVIATION INFRASTRUCTURE SCORE	2.5

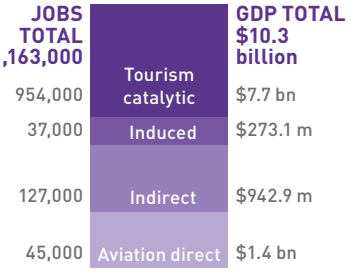
TOURISM % OF GDP	9.8
TOURISM SPEND PER ARRIVAL, 2015	$960.7
TOURISM COMPETITIVENESS RANKING	51/136
CONNECTIVITY RANKING	95= [135]
CONNECTIVITY SCORE	0.63
AIRPORT ACCESSIBILITY	62%



PHILIPPINES

AIRLINES	12
AIRPORTS	45
PASSENGERS (2017)	38.6 MILLION
FLIGHTS (2017)	286,222
FORECAST PASSENGERS (2027)	88.3 MILLION
TRIPS PER CAPITA (2017-2036)	0.34 » 0.88 (155%)
AVIATION INFRASTRUCTURE SCORE	2.7

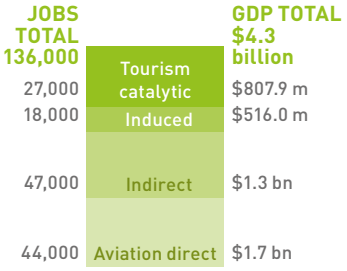
TOURISM % OF GDP	21.1
TOURISM SPEND PER ARRIVAL, 2015	$984.3
TOURISM COMPETITIVENESS RANKING	79/136
CONNECTIVITY RANKING	26= [187]
CONNECTIVITY SCORE	0.29
AIRPORT ACCESSIBILITY	93.62%



POLAND

AIRLINES	7
AIRPORTS	14
PASSENGERS (2017)	18.4 MILLION
FLIGHTS (2017)	160,800
FORECAST PASSENGERS (2027)	36.4 MILLION
TRIPS PER CAPITA (2017-2036)	0.48 » 1.19 (150%)
AVIATION INFRASTRUCTURE SCORE	2.6

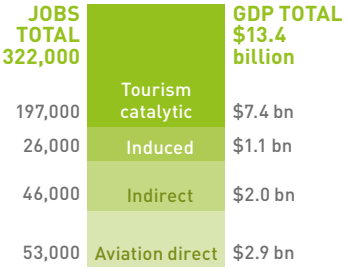
TOURISM % OF GDP	4.5
TOURISM SPEND PER ARRIVAL, 2015	$581.5
TOURISM COMPETITIVENESS RANKING	46/136
CONNECTIVITY RANKING	38 [178]
CONNECTIVITY SCORE	0.23
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	95.21%



PORTUGAL

AIRLINES	9
AIRPORTS	19
PASSENGERS (2017)	25.3 MILLION
FLIGHTS (2017)	201,300
FORECAST PASSENGERS (2027)	41.4 MILLION
TRIPS PER CAPITA (2017-2036)	2.57 » 4.44 (73%)
AVIATION INFRASTRUCTURE SCORE	3.9

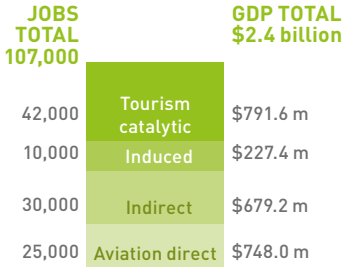
TOURISM % OF GDP	17.3
TOURISM SPEND PER ARRIVAL, 2015	$1,252.9
TOURISM COMPETITIVENESS RANKING	14/136
CONNECTIVITY RANKING	32= [181]
CONNECTIVITY SCORE	0.18
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	84.49%



ROMANIA

AIRLINES	5
AIRPORTS	11
PASSENGERS (2017)	10.1 MILLION
FLIGHTS (2017)	84,900
FORECAST PASSENGERS (2027)	20.6 MILLION
TRIPS PER CAPITA (2017-2036)	0.56 » 1.50 (169%)
AVIATION INFRASTRUCTURE SCORE	2.4

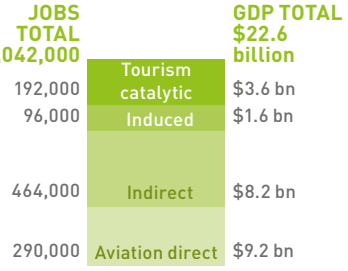
TOURISM % OF GDP	5.3
TOURISM SPEND PER ARRIVAL, 2015	$766.1
TOURISM COMPETITIVENESS RANKING	68/136
CONNECTIVITY RANKING	40= [146]
CONNECTIVITY SCORE	0.23
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	94.84%



RUSSIA

AIRLINES	51
AIRPORTS	153
PASSENGERS (2017)	77.2 MILLION
FLIGHTS (2017)	706,100
FORECAST PASSENGERS (2027)	119 MILLION
TRIPS PER CAPITA (2017-2036)	0.56 » 1.16 (109%)
AVIATION INFRASTRUCTURE SCORE	4.5

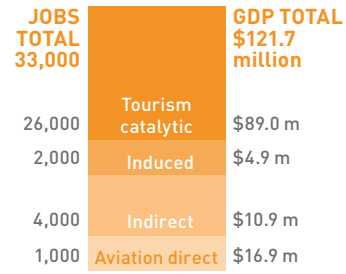
TOURISM % OF GDP	4.8
TOURISM SPEND PER ARRIVAL, 2015	$270.0
TOURISM COMPETITIVENESS RANKING	43/136
CONNECTIVITY RANKING	18 [192]
CONNECTIVITY SCORE	0.33
AIRPORT ACCESSIBILITY	69.36%



RWANDA

AIRLINES	1
AIRPORTS	2
PASSENGERS (2017)	603,000
FLIGHTS (2017)	8,800
FORECAST PASSENGERS (2027)	1.5 MILLION
TRIPS PER CAPITA (2017-2036)	0.03 » 0.06 (91%)
AVIATION INFRASTRUCTURE SCORE	1.9

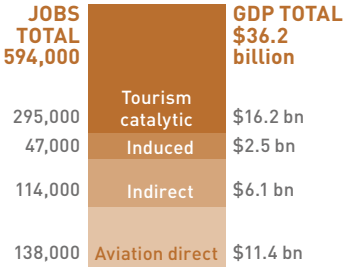
TOURISM % OF GDP	12.7
TOURISM SPEND PER ARRIVAL, 2015	$322.0
TOURISM COMPETITIVENESS RANKING	97/136
CONNECTIVITY RANKING	82 [142]
CONNECTIVITY SCORE	0.53
AIRPORT ACCESSIBILITY	99.78%



SAUDI ARABIA

AIRLINES	6
AIRPORTS	25
PASSENGERS (2017)	43.2 MILLION
FLIGHTS (2017)	321,900
FORECAST PASSENGERS (2027)	96.3 MILLION
TRIPS PER CAPITA (2017-2036)	1.10 » 1.96 (79%)
AVIATION INFRASTRUCTURE SCORE	3.7

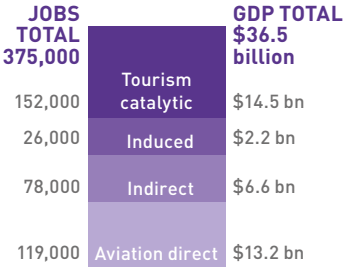
TOURISM % OF GDP	9.4
TOURISM SPEND PER ARRIVAL, 2015	$562.9
TOURISM COMPETITIVENESS RANKING	63/136
CONNECTIVITY RANKING	39 [177]
CONNECTIVITY SCORE	0.34
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	63.82%



SINGAPORE

AIRLINES	5
AIRPORTS	1
PASSENGERS (2017)	31 MILLION
FLIGHTS (2017)	177,700
FORECAST PASSENGERS (2027)	79.4 MILLION
TRIPS PER CAPITA (2017-2036)	3.66 » 8.33 (128%)
AVIATION INFRASTRUCTURE SCORE	5.3

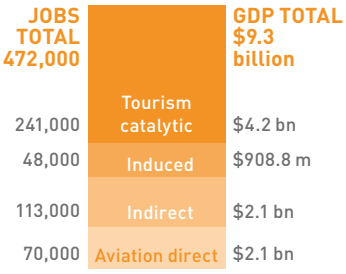
TOURISM % OF GDP	10.2
TOURISM SPEND PER ARRIVAL, 2015	$1,389.3
TOURISM COMPETITIVENESS RANKING	13/136
CONNECTIVITY RANKING	16 [195]
CONNECTIVITY SCORE	0.16
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	100%



SOUTH AFRICA

AIRLINES	7
AIRPORTS	29
PASSENGERS (2017)	20.4 MILLION
FLIGHTS (2017)	223,100
FORECAST PASSENGERS (2027)	35.6 MILLION
TRIPS PER CAPITA (2017-2036)	0.33 » 0.59 (77%)
AVIATION INFRASTRUCTURE SCORE	3.4

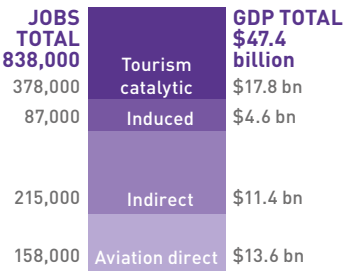
TOURISM % OF GDP	8.9
TOURISM SPEND PER ARRIVAL, 2015	$924.9
TOURISM COMPETITIVENESS RANKING	53/136
CONNECTIVITY RANKING	14= [196]
CONNECTIVITY SCORE	0.64
AIRPORT ACCESSIBILITY	80.98%



SOUTH KOREA

AIRLINES	12
AIRPORTS	15
PASSENGERS (2017)	64.8 MILLION
FLIGHTS (2017)	368,200
FORECAST PASSENGERS (2027)	127.6 MILLION
TRIPS PER CAPITA (2017-2036)	1.22 » 2.35 (93%)
AVIATION INFRASTRUCTURE SCORE	4.3

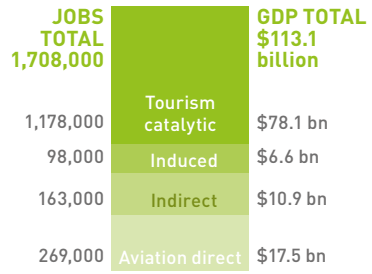
TOURISM % OF GDP	4.7
TOURISM SPEND PER ARRIVAL, 2015	$2,739.5
TOURISM COMPETITIVENESS RANKING	19/136
CONNECTIVITY RANKING	17 [193]
CONNECTIVITY SCORE	0.15
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	99.8%



SPAIN

AIRLINES	23
AIRPORTS	40
PASSENGERS (2017)	121.2 MILLION
FLIGHTS (2017)	859,700
FORECAST PASSENGERS (2027)	233 MILLION
TRIPS PER CAPITA (2017-2036)	2.96 » 4.85 (64%)
AVIATION INFRASTRUCTURE SCORE	5.0

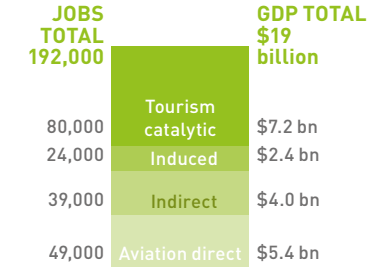
TOURISM % OF GDP	14.9
TOURISM SPEND PER ARRIVAL, 2015	$824.1
TOURISM COMPETITIVENESS RANKING	1/136
CONNECTIVITY RANKING	11 [198]
CONNECTIVITY SCORE	0.18
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	94.92%



SWEDEN

AIRLINES	8
AIRPORTS	37
PASSENGERS (2017)	22.8 MILLION
FLIGHTS (2017)	235,700
FORECAST PASSENGERS (2027)	39.7 MILLION
TRIPS PER CAPITA (2017-2036)	2.25 » 3.40 (51%)
AVIATION INFRASTRUCTURE SCORE	4.6

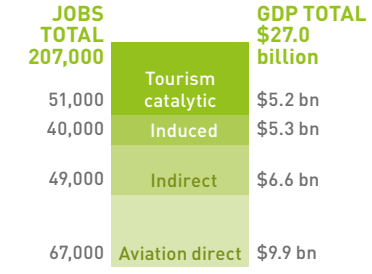
TOURISM % OF GDP	9.5
TOURISM SPEND PER ARRIVAL, 2015	$1,076.0
TOURISM COMPETITIVENESS RANKING	20/136
CONNECTIVITY RANKING	22= [189]
CONNECTIVITY SCORE	0.36
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	98.99%



SWITZERLAND

AIRLINES	7
AIRPORTS	6
PASSENGERS (2017)	27.4 MILLION
FLIGHTS (2017)	222,200
FORECAST PASSENGERS (2027)	54.7 MILLION
TRIPS PER CAPITA (2017-2036)	2.91 » 4.53 (55%)
AVIATION INFRASTRUCTURE SCORE	4.9

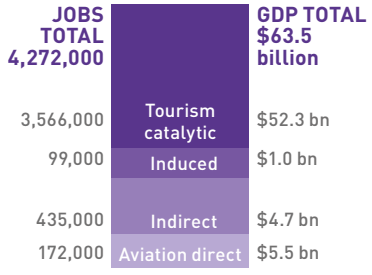
TOURISM % OF GDP	9.1
TOURISM SPEND PER ARRIVAL, 2015	$1,758.4
TOURISM COMPETITIVENESS RANKING	10/136
CONNECTIVITY RANKING	10 [199]
CONNECTIVITY SCORE	0.24
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	100%



THAILAND

AIRLINES	16
AIRPORTS	32
PASSENGERS (2017)	75.4 MILLION
FLIGHTS (2017)	494,600
FORECAST PASSENGERS (2027)	139.5 MILLION
TRIPS PER CAPITA (2017-2036)	0.84 » 2.34 (178%)
AVIATION INFRASTRUCTURE SCORE	4.6

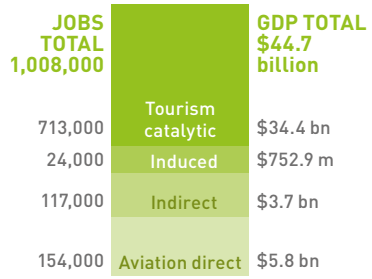
TOURISM % OF GDP	21.2
TOURISM SPEND PER ARRIVAL, 2015	$1,072.4
TOURISM COMPETITIVENESS RANKING	34/136
CONNECTIVITY RANKING	22= [189]
CONNECTIVITY SCORE	0.27
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	88.04%



TURKEY

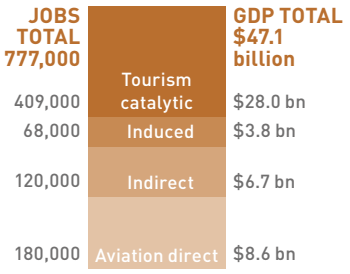
AIRLINES	11
AIRPORTS	51
PASSENGERS (2017)	82.8 MILLION
FLIGHTS (2017)	591,200
FORECAST PASSENGERS (2027)	121.1 MILLION
TRIPS PER CAPITA (2017-2036)	1.03 » 2.48 (141%)
AVIATION INFRASTRUCTURE SCORE	4.7

TOURISM % OF GDP	11.6
TOURISM SPEND PER ARRIVAL, 2015	$674.2
TOURISM COMPETITIVENESS RANKING	44/136
CONNECTIVITY RANKING	14= [196]
CONNECTIVITY SCORE	0.27
CORSIA VOLUNTEER	✓
AIRPORT ACCESSIBILITY	91.34%



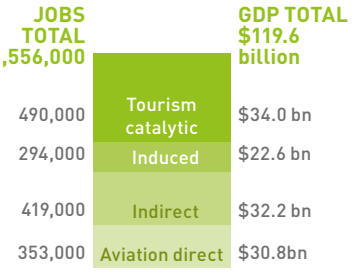
UNITED ARAB EMIRATES

AIRLINES	13	TOURISM % OF GDP	11.3
AIRPORTS	6	TOURISM SPEND PER ARRIVAL, 2015	$1,129.4
PASSENGERS (2017)	59.1 MILLION	TOURISM COMPETITIVENESS RANKING	29/136
FLIGHTS (2017)	309,640	CONNECTIVITY RANKING	6= [205]
FORECAST PASSENGERS (2027)	99.9 MILLION	CONNECTIVITY SCORE	0.14
TRIPS PER CAPITA (2017-2036)	2.58 » 5.85 (127%)	CORSIA VOLUNTEER	✓
AVIATION INFRASTRUCTURE SCORE		AIRPORT ACCESSIBILITY	
5.8		82.68%	



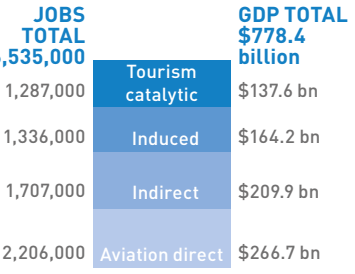
UNITED KINGDOM

AIRLINES	24	TOURISM % OF GDP	10.5
AIRPORTS	65	TOURISM SPEND PER ARRIVAL, 2015	$1,320.2
PASSENGERS (2017)	142.4 MILLION	TOURISM COMPETITIVENESS RANKING	5/136
FLIGHTS (2017)	1,095,100	CONNECTIVITY RANKING	2 [215]
FORECAST PASSENGERS (2027)	275.2 MILLION	CONNECTIVITY SCORE	0.17
TRIPS PER CAPITA (2017-2036)	2.18 » 3.52 (61%)	CORSIA VOLUNTEER	✓
AVIATION INFRASTRUCTURE SCORE		AIRPORT ACCESSIBILITY	
5.2		99.59%	



UNITED STATES

AIRLINES	132	TOURISM % OF GDP	7.7
AIRPORTS	640	TOURISM SPEND PER ARRIVAL, 2015	$2,638.7
PASSENGERS (2017)	860.3 MILLION	TOURISM COMPETITIVENESS RANKING	6/136
FLIGHTS (2017)	9,051,200	CONNECTIVITY RANKING	1 [218]
FORECAST PASSENGERS (2027)	1.012 BILLION	CONNECTIVITY SCORE	0.6
TRIPS PER CAPITA (2017-2036)	1.85 » 2.45 (33%)	CORSIA VOLUNTEER	✓
AVIATION INFRASTRUCTURE SCORE		AIRPORT ACCESSIBILITY	
6.0		92.27%	



Note: In the United States, the FAA collects economic impact data with which these numbers are aligned. The FAA assessment further evaluates the much wider economic activity that is supported by air transport, including general aviation and the domestic tourism markets, which this report does not include. Accordingly, with these wider catalytic impacts included, the total number of jobs supported by civil aviation in the US alone is around 10.6 million, with a contribution to GDP of around $910 billion at 2016 prices[207].


MILES

A GROWTH INDUSTRY

An assessment of the **next 20 years** in aviation

FORECAST

Foretelling what will happen in the future is never an easy task. However, we can look to past trends and to other economic indicators to get a reasonable understanding of how we should be planning for the future. Air traffic has traditionally doubled every 15 years, and despite various geopolitical shocks to the system this trend has held steady.

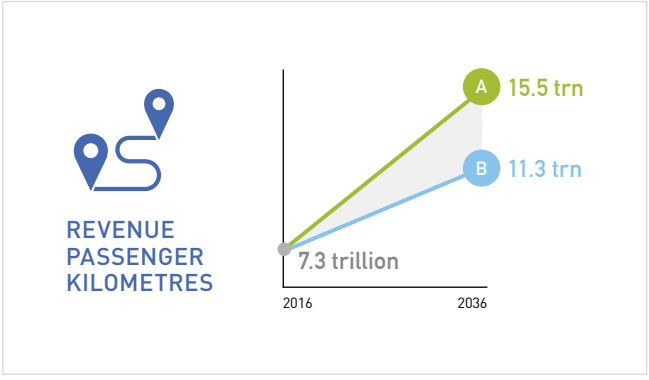
These forecasts are based on the air transport sector growing at the predicted rate. However, looking ahead 20 years is naturally fraught with uncertainty. Unexpected political and economic events could throw these predictions off course.

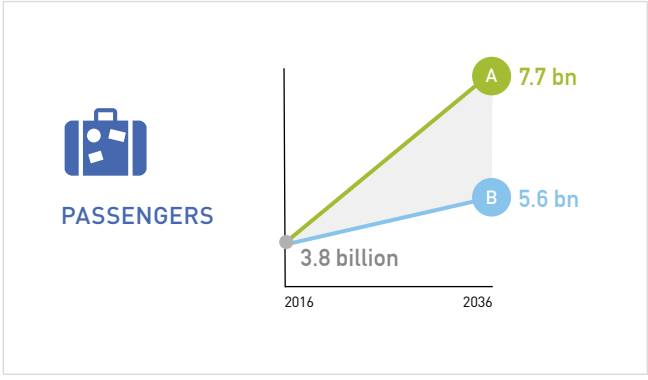
The question is how could the economic contribution of air transport be impacted if demand, for one reason or another, is reduced? To account for unforeseen fluctuations in activity, Oxford Economics undertook a sensitivity analysis. By changing key assumptions driving the results, a sensitivity analysis can assess a range of potential alternative economic outcomes.

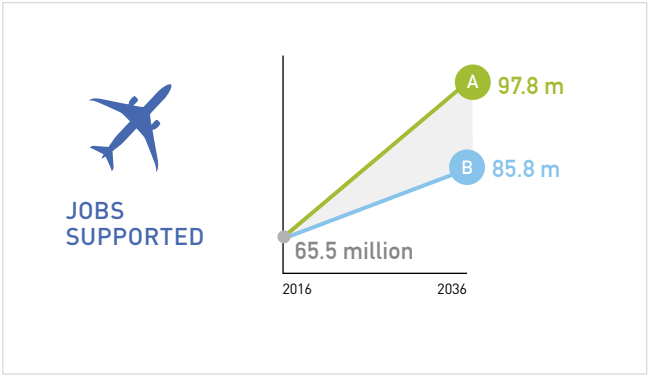
Oxford Economics has provided two scenarios for consideration on how aviation connectivity (and associated support for economic and employment trends) will evolve in the next 20 years.

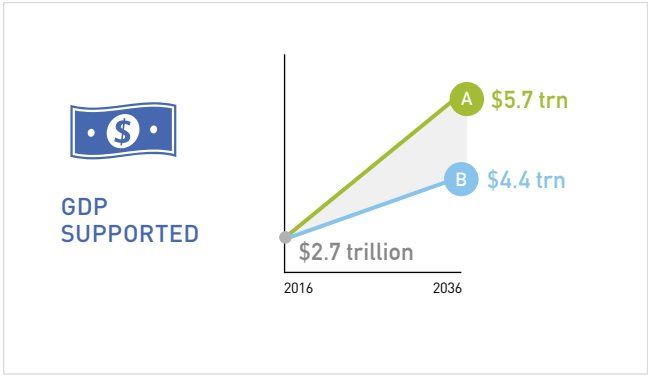
Onwards and upwards

Growing support for connectivity, employment and economic activity, 2016–2036[208]









A
THE 'OPEN SKIES' LIBERALISED SCENARIO

7.7 bn Passengers 2036

97.8 m Jobs supported 2036

15.5 trn Revenue passenger kilometres 2036

$5.7 trn Economic impact 2036

Analysis based on recognised industry forecasts suggests that demand for air transport will increase an average of 4.3% per annum over the next 20 years[209]. That implies that demand for air travel will increase by a factor of 2.3 over the period.

If this growth path is achieved, then in 2036 the air transport industry will contribute:

- 15.5 million direct jobs and $1.5 trillion of GDP to the world economy;
- 46.4 million jobs and $3.8 trillion in GDP, including indirect and induced contributions; and
- 97.8 million jobs and $5.7 trillion in GDP once the impacts of global tourism are taken into account[210].

Enabling factors for this scenario to take place:

- Near-term economic optimism continues to rise.
- Increased business investment helps to support near-term aggregate demand and long-term supply growth.
- Trade between nations continues to grow.
- Flight freedoms are not restricted and are even improved.
- Technological progress continues to reinforce the downward trend in air fares.

The likely scenario obviously sits somewhere between these options. Either way, the long-term trend of aviation innovation for efficiency will continue.

B
THE GLOBAL FRAGMENTATION SCENARIO

5.6 bn Passengers 2036

85.8 m Jobs supported 2036

11.3 trn Revenue passenger kilometres 2036

$4.4 trn Economic impact 2036

Should moves towards a more protectionist and fragmented world continue, there will likely be an impact on air traffic growth, particularly international travel and air freight. Analysis by IATA and Oxford Economics produced a forecast that explores the impact of this scenario. The result is a reduction in the growth of aviation activity, with an average annual growth rate in revenue passenger kilometres of 2.6% for the next 20 years. This implies that demand for air travel will increase by a factor of 1.7 over the period.

If this more pessimistic scenario materialises, then in 2036 the air transport industry will contribute:

- 13.5 million direct jobs and $1.2 trillion of GDP to the world economy (1.9 million fewer jobs and $320 billion less GDP than in the open skies scenario);
- 39.9 million jobs and $3 trillion in GDP, including indirect and induced contributions (6.5 million fewer jobs and $820 billion less GDP); and
- 85.8 million jobs and $4.4 trillion in GDP once the impacts of global tourism are taken into account (12 million fewer jobs and $1.2 trillion less GDP)[211].

Such a scenario could materialise following some or all of these events:

- A significant shift in global trade policy and multilateral, regional and bilateral agreements, with retaliatory tariffs established in response.
- The UK's withdrawal from the European Union without a free trade deal.
- A trade slowdown that undermines the global recovery.
- No further liberalisation in air markets and even more restrictive policies.
- A slowdown in migration due to a tightening of immigration policies.
- A limiting of the ability of monetary authorities to combat the downturn in demand by relaxing monetary policy.
- Debt accumulates to weigh on consumer spending and business investment.

DEVELOPING A SUSTAINABLE FUTURE

The aviation industry is expected to grow significantly in the coming decades, with more demand from passengers forecast to 2036 and beyond. And the industry is confident that this growth can be reconciled with its environmental responsibilities.

Aviation has adopted the world's first global carbon mechanism for any industrial sector: the ICAO Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). As of publication, 73 nations have signed up to the initial voluntary phases of this scheme, meaning around 80% of the post-2020 growth of international aviation will be offset. From 2027, the scheme becomes mandatory and will help towards achieving the industry's goal of carbon-neutral growth in the midterm.

However, it is the industry's long-term goal of cutting overall emissions by 2050 to half of what they were in 2005 that remains the major focus. To achieve this goal, the sector will need to continue to be a world leader in technological innovation.

Operational and infrastructural improvements can also yield significant gains and have already done so. But the most significant savings in emissions will be achieved through new aircraft technology and sustainable aviation fuels.

These fuels can be up to 80% less carbon intensive over their life cycle, and work is already well underway to commercialise them. One million commercial flights are expected to have taken place on these fuels by 2020, and a number of influential businesses within the industry have shown an encouraging level of commitment to further developing this new energy source. However, more systematic uptake will be needed for these fuels to deliver the CO_2 reductions needed. Governments must prioritise the use of these new forms of energy for long-haul air transport.

A number of technology research organisations are exploring new, disruptive aircraft designs, which will literally change the shape of aviation. Each of these conceptual designs has advantages and feasibility barriers to overcome.

For short- and medium-haul aircraft, electric propulsion is becoming more of a feasible option as battery technology develops. Developments on both sides of the Atlantic point to this technology being ready in the coming decade and to the possibility that regional, jet-sized electric aircraft could be in service by 2030. This technology, though, is not expected to be feasible for long routes with mission times in excess of a couple of hours.

Electricity is also a viable option for urban air mobility, with multiple projects underway to reduce ground-based traffic congestion with airborne taxi and package delivery services. This is an area that is developing rapidly.

For any of these concepts to become a reality, investment and dedication are essential. It is something that the industry is committed to and pursuing in collaboration with research institutes and governments.

STRUT-BRACED WING AIRCRAFT

ALL-ELECTRIC AIRCRAFT

CALCULATING THE BENEFITS OF AVIATION

This report looks at how the air transport industry contributes to social and economic development at different levels. The first four pillars below are included in this analysis. They do not include other economic benefits of aviation, such as the jobs or economic activity generated when companies or whole industries exist because air travel makes them possible (noted under 'other catalytic'). They also do not include the intrinsic value that the speed and connectivity of air travel provides or domestic tourism and trade. Including these would increase the employment and global economic impact numbers several-fold[46].

DIRECT
(within the industry)

Airlines
Passenger
Air cargo
Airline ticketing
General aviation
flight crew, check-in staff, maintenance crew, reservations and head office staff

Airports
Airport management
maintenance, operations, security, rescue fire

Airport on-site
Retail
Restaurants
Hotels
Car rental
Freight services
Catering
Ground handling
Aircraft maintenance
Office parks
Government
customs, immigration, security, police

Air navigation service providers
Management, air traffic controllers

Civil aerospace
Airframe
Engine
Components
Engineers, designers, construction teams

INDIRECT
(industry supply chain)

Off-site
Fuel suppliers
Food and beverage
Construction
Transport providers

Manufacturing
Computer components
Retail goods

Services
Accounting firms
Lawyers
Call centres
IT systems

INDUCED
(spending of direct and indirect employees)

Food and beverage
Recreation & leisure
Transport
Housing
Taxes
Clothing
Furniture
Services
Telecommunications

TOURISM CATALYTIC
(spending by the 57% of tourists that travel by air)

Hotels
Entertainment
Restaurants
Museums
Attractions
Tour operators
Retail
Car rental

OTHER CATALYTIC
(the benefits of air transport to other sectors and businesses in the economy)

Global trade
Labour supply
Productivity of other businesses
Education access
Healthcare
Family ties
Connectivity
Lifelines to remote communities and small island states
Investment
Remittances
Research / innovation

(these impacts are not included in the numbers presented in this study)

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[3] Airports Council International (ACI) figures. Most of those employed by airport operators work on-site at airports, but a small number may work off-site. To avoid double counting, the airport operator employees are subtracted from the overall on-airport employees figure. Also, on a country-by-country basis, the figures for airport operators may include activities that other countries do not. For example, airport operators in the United Kingdom are obliged to provide security services at their facilities, whereas in the United States that service is provided by the government (and, therefore, those employees appear in the 'other on-airport' category). In New Zealand, airport operators provide the rescue fire service, whereas in Australia that service is provided by the ANSP. A number of countries have one company fulfilling both airport and ANSP functions. This is a conservative approach that likely underestimates overall employment.

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[6] Oxford Economics, ATAG and aerospace industry associations research.

[7] International Civil Aviation Organization (ICAO) and Civil Air Navigation Services Organisation (CANSO) figures. To avoid double counting, 40% of ANSP employees are subtracted from other on-site airport employment, a conservative estimate of the ratio of ANSP employment on-airport (in control towers, etc.) vs. off-airport (head office, research and training centres and en route control centres).

[8] Oxford Economics.

[9] Oxford Economics.

[10] Previous studies have indicated this additional benefit could mean aviation supports as much as 8% of global GDP.

[11] Oxford Economics.

[12] Oxford Economics.

[13] International Air Transport Association (IATA) Economics / SRS Analyser. A 'route' is a flight between one airport and another, bi-directionally. Therefore, LHR–GVA and GVA–LHR are both counted. The basis for this number has been revised since the last edition of the report to remove aircraft under 19 seats and airport pairs with fewer than one flight per week. The full equivalent is 54,913 routes. City pairs are routes between different cities, counted only once. Therefore, all flights between all London airports and Geneva in both directions are counted as one city pair.

[14] ICAO and IATA Economics. Includes all scheduled and charter airline traffic. Does not include business aviation or non-scheduled traffic.

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[19] Commercial airlines with an IATA and/or ICAO code. From the Flight Fleets Analyzer, part of Flight Global: bit.ly/2AvCDtE.

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[32] IATA Economics.

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[36] ATAG/IATA analysis.

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[38] IATA Environment analysis. 2,500 special commercial flights using sustainable alternative fuel took place before 2016, after which regular commercial flights started from Oslo and Los Angeles Airports.

[39] IATA Economics, BIS.

[40] There are no reliable global figures published for other modes of transport. The European Union used to publish occupancy by other forms of public transport but discontinued this several years ago. At that time, trains tended to be on average 35–40% full (with vastly higher occupancy for commuter routes at peak hours). However, commuter trains tend to operate on a very different business model, so air travel is more comparable with high-speed and long-distance rail. In China, studies have shown that long-haul rail services can have as low as 20% occupancy (Yao et al., *Study on High-Speed Rail Pricing Strategy*, 2013). Even then, passengers on long-distance trains often embark or disembark at intermediate stations, which can skew the results. European coach trips tend to be around 60% full, and personal cars across Europe (and in many other 'developed' countries) average 1.45 passengers per vehicle (around 30% occupancy). This figure is declining. European Environment Agency and EuroStat data.

[41] ACI. Airports count passengers twice – on arrival and departure – so global passenger movement figures are twice that of passenger movement data provided by airlines (and used in the rest of this report).

[42] ACI.

[43] ACI.

[44] Official Airline Guide (OAG): www.oag.com.

[45] IATA Economics.

[46] Previous studies have indicated this additional benefit could mean aviation supports as much as 8% of global GDP.

[47] Oxford Economics analysis.

[48] Oxford Economics.

[49] ACI Europe and Intervistas, *Economic Impact of European Airports*, 2015: bit.ly/2aRbVxb. In Europe, the direct employment generated by increased traffic was studied in different bands of airport size, and it was found that, for airports with fewer than one million passengers, each increase of 1,000 passenger movements increases direct employment on-airport by 1.2 jobs. The employment generated by each additional 1,000 traffic units for small airports is greater than that for large airports. Furthermore, connecting passengers have a marginally smaller (3%) direct employment impact than origin/destination passengers. This may reflect the fact that connecting passengers do not consume certain services at airports, such as car parking, car rental and other ground transportation. Passengers flying on low-cost carriers (LCCs), have a smaller direct employment impact (20% less) than other types of traffic. This may be due to the lower staffing levels at LCCs, reduced auxiliary services (such as in-flight catering and airport lounges), and reduced LCC passenger spending on commercial offerings. It should be noted that these ratios do not attempt to find relationships between passenger numbers and the impact on total employment – in particular the impact upon catalytic impact. For example, connecting passengers may require a lower proportion of direct workers, but if connecting passengers support the operation of routes that would otherwise not be viable, this leads to an increase in traffic, which would not be factored into this ratio. Similarly, although LCC passengers also require fewer direct workers, LCC traffic has been for many airports and areas the major provider of growth in recent years. In such cases, this traffic has contributed to the catalytic impact of airports, which is again not captured in the ratios. Airports generally count each passenger twice (on arrival and departure), whereas most passenger/traffic numbers cited in this report count each passenger departure (i.e., once).

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[57] Oxford Economics.

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[59] IATA Economics.

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	Global jobs	Global GVA $ billion
2016	65,512,000	$2,693
2017	67,127,650	$2,841
2018	68,743,300	$2,989
2019	70,358,950	$3,137
2020	71,974,600	$3,286
2021	73,590,250	$3,434
2022	75,205,900	$3,582
2023	76,821,550	$3,730
2024	78,437,200	$3,878
2025	80,052,850	$4,026
2026	81,668,500	$4,175
2027	83,284,150	$4,323
2028	84,899,800	$4,471
2029	86,515,450	$4,619
2030	88,131,100	$4,767
2031	89,746,750	$4,915
2032	91,362,400	$5,063
2033	92,978,050	$5,212
2034	94,593,700	$5,360
2035	96,209,350	$5,508
2036	97,825,000	$5,656

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[168] There has been a significant reduction in African GDP contribution since the previous report due mainly to exchange rate fluctuations between multiple African currencies and the US dollar.

[169] Throughout the regional section, this figure is provided by IATA Economics / PaxIS.

[170] Throughout the regional section, this figure is provided by IATA Economics / SRS Analyser.

[171] Throughout the regional section, this figure is provided by IATA Economics / PaxIS.

[172] Throughout the regional section, this figure is provided by IATA Economics / SRS Analyser and includes airports with at least one commercial flight scheduled per week.

[173] Throughout the regional section, this figure is from Flight Fleets Analyzer from FlightGlobal and includes operating commercial airlines with an IATA and/or ICAO code.

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[181] Europe includes the following countries and territories: Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Greenland, Hungary, Iceland, Ireland, Italy, Kosovo, Latvia, Lithuania, Luxembourg, Macedonia (FYROM), Malta, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and United Kingdom. For the member countries of the European Union, see that section on page 53.

[182] Eurocontrol, *Challenges of Growth* 2018: *bit.ly/2vccnQ1*.

[183] Latin America and the Caribbean includes the following countries: Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay and Venezuela. Please note that for the *Aviation: Benefits Beyond Borders* study released in 2012, Mexico was included in North America, whereas for this analysis it is included in Latin America and the Caribbean.

[184] The Middle East includes the following countries: Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, United Arab Emirates and Republic of Yemen.

[185] NATS, *Economic benefits of improvements to Middle East Air Traffic Control*: bit.ly/2n3wxHr.

[186] North America includes Canada and the United States of America. Note that for some ICAO and IATA statistics, Mexico is included in North America.

[187] US Department of Transportation Federal Aviation Administration, *The Economic Impact of Civil Aviation on the U.S. Economy: Economic Impact of Civil Aviation by State 2017.* The currency value stated in the FAA report is in 2014 prices, adjusted by Oxford Economics to 2016 prices in this report. bit.ly/2vvVsY9.

[188] APEC economies include the following: Australia, Brunei, Canada, Chile, China, Chinese Taipei, Hong Kong SAR, Indonesia, Japan, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, Philippines, Russia, Singapore, South Korea, Thailand, United States and Vietnam.

[189] IATA PaxIS. Passenger numbers in APEC, EU28, developing countries, small island states, LDCs, LLDCs and the OECD do not include charter traffic.

[190] European Union member countries as of 2013 include the following: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden and United Kingdom.

[191] Small island states in this analysis are the members of the Alliance of Small Island States (AOSIS), excluding Singapore but including the following: Antigua and Barbuda, Bahamas, Barbados, Belize, Cape Verde, Comoros, Cook Islands, Cuba, Dominica, Dominican Republic, Fiji, Federated States of Micronesia, Grenada, Guinea-Bissau, Guyana, Haiti, Jamaica, Kiribati, Maldives, Marshall Islands, Mauritius, Nauru, Niue, Palau, Papua New Guinea, Samoa, Seychelles, São Tomé and Príncipe, Solomon Islands, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Timor-Leste, Tonga, Trinidad and Tobago, Tuvalu and Vanuatu. For more information, see www.aosis.info.

[192] Developing countries are all countries defined as low, lower-middle or upper-middle income by the World Bank and include the following: Afghanistan, Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Azerbaijan, Bahrain, Bangladesh, Belarus, Belize, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Chile, China, Colombia, Comoros, Costa Rica, Côte d'Ivoire, Democratic Republic of Congo, Democratic Republic of Timor-Leste, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Ethiopia, Fiji, Gabon, Georgia, Ghana, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, India, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Kiribati, Kosovo, Kuwait, Kyrgyz Republic, Lao People's Democratic Republic, Lebanon, Lesotho, Liberia, Libya, Lithuania, Macedonia, Madagascar, Malawi, Malaysia, Maldives, Mali, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, North Korea, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Republic of Congo, Republic of Yemen, Romania, Russia, Rwanda, Samoa, São Tomé and Príncipe, Senegal, Serbia, Seychelles, Sierra Leone, Solomon Islands, South Africa, Sri Lanka, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Sudan, Suriname, Swaziland, Syrian Arab Republic, Tajikistan, Tanzania, Thailand, The Gambia, Togo, Tonga, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, Uruguay, Uzbekistan, Vanuatu, Venezuela, Vietnam, Zambia and Zimbabwe.

[193] Members of the Organisation for Economic Co-operation and Development (OECD) include the following: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States. www.oecd.org.

[194] Least-developed countries (LDCs) as accepted by the UN include the following: Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, Lao People's Democratic Republic, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, São Tomé and Príncipe, Senegal, Sierra Leone, Solomon Islands, Somalia, South Sudan, Sudan, Timor-Leste, Togo, Tuvalu, Uganda, United Republic of Tanzania, Vanuatu, Yemen and Zambia. www.unctad.org.

[195] Landlocked developing countries (LLDCs) as informally accepted by the UN on geographical grounds include the following: Afghanistan, Armenia, Azerbaijan, Bhutan, Bolivia (Plurinational State of), Botswana, Burkina Faso, Burundi, Central African Republic, Chad, Ethiopia, Kazakhstan, Kyrgyzstan, Lao People's Democratic Republic, Lesotho, Macedonia, Malawi, Mali, Mongolia, Nepal, Niger, Paraguay, Republic of Moldova, Rwanda, South Sudan, Swaziland, Tajikistan, Turkmenistan, Uganda, Uzbekistan, Zambia and Zimbabwe. Of these countries, 17 are landlocked least-developed countries. www.unctad.org.

[196] As listed in the Flight Fleets Analyzer from FlightGlobal.

[197] IATA Economics / SRS Analyser, includes airports with at least one scheduled commercial flight per week.

[198] IATA Economics / PaxIS.

[199] IATA Economics / SRS Analyser.

[200] IATA Economics, *20 Year Forecast*: bit.ly/2vhLQB1.

[201] Airbus, Sabre, HIS, *Airbus Global Market Forecast* 2018: bit.ly/2n60VB9.

[202] World Economic Forum, *Travel and Tourism Competitiveness Report* 2017: bit.ly/2LLzb3m.

[203] World Travel & Tourism Council (WTTC), *Economic Impact 2018 Country Reports*: bit.ly/2LQfTtS.

[204] The aviation figures in the rest of this report are produced using the same modelling by Oxford Economics but include aviation-specific inputs not included in the WTTC figures. The WTTC figures also include non-aviation–supported tourism.

[205] World Economic Forum *Travel and Tourism Competitiveness Report* 2017: bit.ly/2LLzb3m.

[206] ICAO iStars Database Air Transport Accessibility Index: bit.ly/2OBXXRe.

[207] US Department of Transportation Federal Aviation Administration, T*he Economic Impact of Civil Aviation on the U.S. Economy: Economic Impact of Civil Aviation by State* 2017. The currency value stated in the FAA report is in 2014 prices, adjusted by Oxford Economics to 2016 prices in this report. bit.ly/2vvVsY9.

[208] Scenarios provided by Oxford Economics and IATA Economics analysis. Intermediate economic impact based on gross value added (GVA), provided by IATA Economics.

[209] Several of the world's largest aircraft manufacturers, including Airbus, Boeing, Bombardier and Embraer, use 'revenue passenger kilometres' (i.e., one RPK unit equals one kilometre travelled by a revenue-paying passenger) to calculate the future demand for air transport. Oxford Economics derived a conservative global growth rate as the weighted average of each of the lowest regional growth rates taken from the forecasting reports of Airbus, Boeing and Embraer. As such, it is not the global traffic forecast of any one of the three manufacturers. It represents a conservative estimate and is consistent with the regional analyses in this report. Furthermore, the jobs and GDP forecasts in this report also take into account similar forecasting for the tourism sector and the aerospace manufacturing sector – they are not based on RPK traffic growth alone.

[210] All in 2016 prices.

[211] All in 2016 prices.

[212] Gross value added (GVA) is the difference between the revenue a firm or industry generates less the bought-in costs needed to produce that revenue. GVA summed across all firms and industries in an economy is equal to GDP, after minor adjustments for taxes and subsidies. GDP is the most commonly used metric for an economy's size and is often used to measure economic growth or to indicate when an economy has entered or exited a recession.

[213] Where a given country-specific input-output table was unavailable, a proxy input-output table was chosen based on geographical proximity and economy size.

[214] OECD, *Inter-Country Input-Output (ICIO) Tables*, 2016 edition.

METHODOLOGY

Oxford Economics analysed six key aviation sectors

ATAG commissioned Oxford Economics to estimate the aviation sector's global economic impact in the 2016 calendar year and how it might evolve over the next two decades. This follows Oxford Economics' analyses of the aviation sector's economic footprint for previous editions of *Aviation: Benefits Beyond Borders*, including those published in 2008, 2012, 2014, and 2016, and for previous similar publications reaching back to 1991.

The number of jobs and gross value added (GVA) created or supported by aviation are assessed for six key sub-sectors: airlines, airport operators, providers of goods and services on-site at airports (such as retailers and hoteliers), civil aircraft manufacturers, air navigation service providers, and tourism activity that air travel makes possible.

The analysis was for 63 countries and 13 major regions or groups

Oxford Economics analysed aviation's economic impact in each of 63 countries that together account for 94% of global GDP in these 13 regions or groups: Africa, Asia-Pacific, Europe, Latin America and the Caribbean, Middle East, North America, European Union, APEC economies, small island states, developing countries, OECD countries, least-developed countries (LDCs), and landlocked developing countries (LLDCs).

Regional and group estimates are created by scaling up individual country results. The scaling is based on the passenger revenue, revenue passenger kilometres, or airport passenger numbers represented by the individual countries in the dataset relative to the countries represented in an entire region or group.

Three core economic impact channels were estimated

The analysis considers three channels of spending that are in all standard economic impact studies.

- The **first** is the direct channel, which is the operational spending that airlines, airports, civil aircraft manufacturers, airport operators and air navigation service providers undertake to generate profits and employ people at their operational sites.
- The **second** is the indirect channel – the aviation sector's procurement of inputs of goods and services from other businesses in the economy. This spending supports additional jobs and gross value added contributions along the sector's supply chains[212].
- The **third** is the induced channel, comprising wage payments to staff in the aviation sector and the supply chain. Some or all of those wages are subsequently spent in the consumer economy, which supports further economic activity and jobs in retail and leisure outlets and their supply chains.

Indirect and induced impacts are estimated at the country level using multipliers that Oxford Economics calculated from 54 input-output tables sourced from the OECD and official national statistical websites[213]. At the regional or group level, these impacts are estimated using regional or group multipliers that account for the substantial cross-border economic activity spurred by the aviation sector. For this edition of *Aviation: Benefits Beyond Borders*, Oxford Economics updated the regional multipliers using the latest OECD Inter-Country Input-Output Tables[214].

In addition to these standard impact channels, Oxford Economics explores the economic impact arising from tourists who arrive by air and spend money on goods and services.

The estimates are based on comprehensive data sources

Building on the extensive data collection efforts undertaken for the previous edition of *Aviation: Benefits Beyond Borders*, Oxford Economics collected over 100 new data points from national statistics agencies and Eurostat to improve estimates of employment and gross value added in the airline and civil aircraft manufacturing sectors. The newly collected data accounts for 75% of the country-level gross value added in the airline sector in 2016 and for 81% of gross value added at the country level for the civil aircraft manufacturing sector.

Airports Council International (ACI) generously provided detailed data on jobs, revenues, and costs from its 2016 Airport Economics Survey. This survey asked 919 airports around the world about their 2016 financial year. The respondents accounted for 78% of all airport traffic in 2016.

Oxford Economics also made use of detailed employment and financial data published by the Civil Air Navigation Services Organisation (CANSO), a trade body whose members help manage 85% of the world's air traffic.

Finally, Oxford Economics used its own estimates of tourism impacts, based on national statistics and International Monetary Fund (IMF) balance of payments data on tourist expenditures, to assess the number of jobs and gross value added supported by tourists who travel to their destinations by air.

Where new data were unavailable, Oxford Economics leveraged data collected on the aviation sector by the International Air Transport Association (IATA) and ACI in 2009–2010.

Forecasts to 2036

At the regional or group level, Oxford Economics forecast gross value added for airlines, airport operators, airport on-site businesses, and air navigation service providers using the lower of the revenue passenger kilometre forecasts in each region or group published by Boeing, Embraer, and Airbus. Employment in these aviation sub-sectors is forecast the same way, with an allowance for productivity increases. A sensitivity analysis is conducted to give a sense of how results would change if revenue passenger kilometres don't meet the manufacturers' forecasts.

The forecasts for tourism come from Oxford Economics Tourism Economics database, while the forecasts for civil aircraft manufacturing come from Oxford Economics industry model.

ACKNOWLEDGEMENTS

This report was prepared by Oxford Economics for ATAG with the assistance of the following people and organisations:

Leslie Riegle and David Hyde, **Aerospace Industries Association *(www.aia-aerospace.org)***

Kevin Goddard and Audrey Guittard, **Airbus *(www.airbus.com)***

Nancy Young, **Airlines for America *(www.airlines.org)***

Emma Wilson, **Airlines for Australia and New Zealand *(www.a4anz.com)***

Chris Zweigenthal, **Airlines Association of Southern Africa *(www.aasa.za.net)***

David Whitely, Michael Rossell, Patrick Lucas, Anita Berthier, Aram Karagueuzian, Michael Simard, Marina Bylinsky, Philippe Villard, Jeeyoon Jung and Juliana Scavuzzi, **Airports Council International *(www.aci.aero / www.aci-europe.org)***

Jon Conway, **Airport Services Association *(www.asaworld.aero)***

Solene Flahaut and Joachim Voisin, **ATR Aircraft *(www.atr-aircraft.com)***

Andrew Herdman and Kareen Khoo, **Association of Asia Pacific Airlines *(www.aapairlines.org)***

Sean Newsum, Paul McElroy, Jan Hogrefe, David Franson and Romana Nesporova, **Boeing *(www.boeing.com)***

Quentin Browell, **Civil Air Navigation Services Organisation *(www.canso.org)***

Montserrat Barriga and Paula Bangle, **European Regions Airline Association *(www.eraa.org)***

Andrea Navares, James Wiltshire, Adefunke Adeyemi, Oracio Marquez, Albert Tjeong and Amitabh Khosla, **International Air Transport Association *(www.iata.org)***

Henry Gourdji, Sainarayan Ananthanarayan, Behzad Taghipour and Antonin Combes, **International Civil Aviation Organization *(www.icao.int)***

Luis Felipe de Oliveira, Nicole Lorca and Juan Sarmiento, **Latin American and Caribbean Air Transport Association *(www.alta.aero)***

Ian Saxon, **Oxford Economics *(www.oef.com)***

Jon Hart, **Rolls-Royce *(www.rolls-royce.com)***

Design by **Simplicity *(www.simplicity.com.es)***

Proofing by **Howard Brandt**

Printing by **Atar Roto Presse**

Paper by **Antalis:** Cocoon Preprint, 100% recycled, FSC-certified @ 120 g/m2 and 300 g/m2

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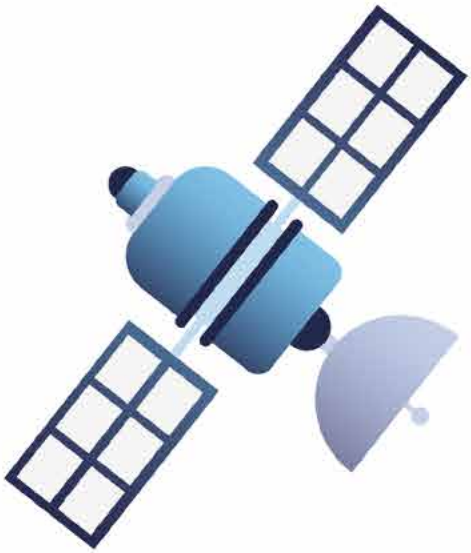

33 Route de l'Aeroport
1215 Geneva 15 Airport
Switzerland

+41 22 770 2672

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