Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company’s public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
The nature of airports

Chapter Outline

1.1 Introduction 3
1.2 The role of airports within the air transport system 4
  1.2.1 Common airport characteristics 4
  1.2.2 Traffic development 5
1.3 The social, environmental, economic, and political impact of airports 8
  1.3.1 Economic and social effects 8
  1.3.2 Environmental impact and mitigations 10
  1.3.3 Aviation and airport policy 11
  Feature 1.1 Airport products and services 11
1.4 Summary 14
References 15

1.1 Introduction

Airports are complex systems, providing infrastructure and services for the operations of aircraft and handling of passengers and cargo. This requires an adequate airfield, including a runway, aircraft parking apron, and terminal facilities for passengers, cargo, general aviation, and aircraft maintenance as well as supporting fixtures for access circulation/car parking, utilities, and other nonaeronautical use facilities. All of them are multifaceted in nature, while the commonality is that they have long lead times to plan and develop and are costly to build and maintain.

This very nature of the airport business is a major determinant of the financial performance. Another equally important factor is the demand side. Airports have developed in response to the overall traffic growth, providing infrastructure and services to their airline customers. The success of aviation and the significant growth rates associated with that is causing an equally significant problem in terms of lacking infrastructure on the ground and in the air.

Various countries strongly support the industry on the whole, in order to participate in its benefits, for example, economic development and generation of employment. The population in other countries, however, is more critical regarding the environmental effects—especially when living in the vicinity of an airport.
1.2 The role of airports within the air transport system

1.2.1 Common airport characteristics

Since each flight begins at an airport, airports share many similarities in terms of general function and operations. Nevertheless, their nature has changed over time, making them rather different in a number of aspects.

From an operational point of view, the airport is the physical site at which a modal transfer is made from the air mode to land modes. This makes it an essential part of the air transport system, where interaction with airlines and other users takes place (Ashford et al., 2013).

More practically speaking, airports are one or more runways and complementary facilities for aircraft, such as taxiways, apron area, aircraft stands, etc. and associated terminals and facilities for passenger and freight handling (Doganis, 1992; Kazda and Caves, 2007).

Within this airport system, the typical role of an airport operator is to provide and maintain all necessary infrastructure as well as essential services. These core activities regularly include passenger search and perimeter security, firefighting, and cleaning and maintenance of passenger areas. The operator also allocates space and resources, both between airlines (i.e., check-in counters, departure lounges) and concessionaires. Additional services are usually provided by airlines or handling agents (passenger check-in, baggage handling, aircraft maintenance) and control authorities (customs, immigration, air traffic control).

International standards for airport design are published by the International Civil Aviation Organization (ICAO, 2016), in Annex 14, dealing with Aerodrome Design and Operations. This is a comprehensive document covering standards and recommended practices for aerodrome physical characteristics, obstacle restrictions, visual aids, electrical systems, aerodrome services, and maintenance. Moreover, standard operating procedures employed by airport operators, airlines, pilots, air traffic control organizations, as well as the companies that provide important services such as ground handling and refueling, cover all parts of an airport’s operations on the airfield, on the apron, at gates and in maintenance areas (Young and Wells, 2011).

Nowadays, airports are high-utilization assets, in use 365 days a year, many providing a complete range of essential services to a broad customer base. At the same time, the airport business is very capital intensive as substantial investment is needed to accommodate traffic growth and remain competitive.

Despite the common characteristics, primarily from the operating perspective, no two airports are the same. While there are commonalities amongst the various operational and commercial approaches employed by different airports, they are different on a significant number of issues. These include but are not limited to:

- regional location,
- size/traffic volume,
- traffic mix/business models of the main airline customers,
- their own business model,
• ownership model and structure,
• financing/capital structure, and
• type of economic regulation, etc.

These notable differences are partially driven by their individual historical development in parallel to traffic growth and are, to a certain extent, addressing the challenges arising from these, in turn.

1.2.2 Traffic development

As evidenced by the partial statistics on commercial aviation’s long-term development in Table 1.1, it is a continuing success story and has been resilient vis-à-vis oil and/or Gulf crises, other acts of war and terrorist attacks, severe acute respiratory syndrome (SARS) and the like as well as economic recessions. During the second decade of this century, air transportation is performed by approximately 1,000 scheduled airlines with 25,000 aircraft in use, 170 air navigation services, and more than 4,000 airports (Fonseca de Almeida, 2014). According to ICAO (2017), 3.8 billion passengers and 52.6m tons of cargo were handled in 2016.

Table 1.1 Long-term development of international and domestic scheduled services

| Year | PAX (m) | PAX km (m) | Seat-km available (m) | PAX load factor % | Freight ton-km (m) | Mail ton-km (m) | Total ton-km performed (m) | Total ton-km avail. (m) | Weight load factor % |
|------|---------|------------|-----------------------|-------------------|-------------------|---------------|--------------------------|------------------------|---------------------|
| 1976 | 576     | 763,762    | 1,269,815             | 60                | 21,541            | 3,030         | 93,266                   | 169,590                | 55                  |
| 1986 | 960     | 1,452,055  | 2,234,730             | 65                | 43,190            | 4,545         | 178,803                  | 299,840                | 60                  |
| 1996 | 1,391   | 2,431,695  | 3,563,774             | 68                | 89,199            | 5,797         | 317,154                  | 527,187                | 60                  |
| 2006 | 2,129   | 3,963,363  | 5,227,076             | 76                | 152,305           | 4,530         | 519,609                  | 821,096                | 63                  |
| 2016 | 3,796   | 7,124,350  | 8,870,293             | 80                | 204,895           | 6,764         | 872,361                  | 1,304,827              | 67                  |

Source: Compiled by author from International Civil Aviation Organization (ICAO), 2010. ICAO Database—Air Transport Statistics. ICAO, Montreal; International Civil Aviation Organization (ICAO), 2017. Annual Report of the Council—Air Transport Statistics. ICAO, Montreal.

In general, commercial airports have developed in response to the fast growth of the world’s airline industry, which in turn is significantly correlated with the annual growth of the gross domestic product (GDP). It is essential to bear this in mind for the rest of the book, since the airport business is fundamentally driven by the numbers or traffic volume.

Airport operations and management are an important part of the air transport value chain. Many other industries would be pleased to cope with the problems associated with the lasting growth (and, in a few regions, maturity) of aviation. Some of the ensuing issues, however, are far from being solved and may pose a severe threat. Lacking infrastructure on the ground and in the air results in capacity constraints in general and congested hub airports in particular.

Traffic growth, however, has actually developed significantly differently across the regions. Fig. 1.1 displays the regional passenger structure based on ICAO data.
A clear trend of airport passengers in relative terms with regard to Asia becomes visible, while North America falls behind and Europe remains relatively stable. The underlying traffic shift is also reflected by the long-term volumes in passengers, aircraft movements and cargo handled.

In spite of worldwide economic uncertainty and political instability in many countries, airports accommodated almost 7.7 billion passengers in 2016. As the passengers are being counted at both the departing and arriving airport, the numbers are about double those of ICAO and the International Air Transport Association (IATA).

While the total passenger number has almost tripled since 1996, the regional distribution during this period is rather different—with direct implications for the affected airports. The demand for transportation in general, and for air transportation in particular, is primarily dependent on the status and growth of the economy, growth of the population, disposable income per capita and the resulting propensity to travel. The effects of different market maturity and the shift of the center of economic growth from North America (NAM) and Europe (EUR) toward Asia-Pacific (ASP) is illustrated by Fig. 1.2.

![Figure 1.1](image1.png)  
Figure 1.1 Evolution of regional passenger shares for the period 1996—2016.  
Source: Author based on ICAO data.

A clear trend of airport passengers in relative terms with regard to Asia becomes visible, while North America falls behind and Europe remains relatively stable. The underlying traffic shift is also reflected by the long-term volumes in passengers, aircraft movements and cargo handled.

In spite of worldwide economic uncertainty and political instability in many countries, airports accommodated almost 7.7 billion passengers in 2016. As the passengers are being counted at both the departing and arriving airport, the numbers are about double those of ICAO and the International Air Transport Association (IATA).

While the total passenger number has almost tripled since 1996, the regional distribution during this period is rather different—with direct implications for the affected airports. The demand for transportation in general, and for air transportation in particular, is primarily dependent on the status and growth of the economy, growth of the population, disposable income per capita and the resulting propensity to travel. The effects of different market maturity and the shift of the center of economic growth from North America (NAM) and Europe (EUR) toward Asia-Pacific (ASP) is illustrated by Fig. 1.2.

![Figure 1.2](image2.png)  
Figure 1.2 Regional passenger growth for the period 1997—2016.  
Note: Scheduled traffic.  
Source: Author based on ICAO data.

Although the Middle East (MEA) exhibits the highest overall growth rate for the period under scrutiny, it needs to be noted that this is due to the rather low traffic volume in base year 1996. Latin America-Caribbean (LAC) and Africa (AFR) have grown at par with and slightly higher than global average, respectively.
In addition to the long-term development of the passenger segment, Fig. 1.3 illustrates the development of the freight market during the last decade. After significant growth, volumes appear to stagnate after the effects of the most recent global financial crisis had been made up for in 2010. Roughly two-thirds of air cargo are accommodated by the belly hold of passenger aircraft.

![Freight market development](image)

**Figure 1.3** Freight tons performed during the period 2006—16.
*Source: Author based on ICAO data.*

After inspecting historical data and identifying an overall trend, the future outlook needs to be analyzed in order to fully comprehend the fundamentals driving the airport business. Table 1.2 displays the expected compound annual growth rate (CAGR) or mean annual growth rate of the passenger sector over the specified period.

| Year       | Africa (%) | Asia-Pacific (%) | Europe (%) | Latin America (%) | Middle East (%) | North America (%) | World (%) |
|------------|------------|------------------|------------|-------------------|-----------------|------------------|-----------|
| Δ2017–36\(^a\) | 5.9        | 4.6              | 2.3        | 4.2               | 5.0             | 2.3              | 3.6       |
| Δ2015–40\(^b\) | 4.2        | 6.2              | 3.7        | 4.6               | 7.7             | 2.8              | 4.9       |

*CAGR, Compound annual growth rate.
*Source: Compiled by author from \(^a\)International Air Transport Association (IATA), 2017. 2036 Forecast Reveals Air Passengers Will Nearly Double to 7.8 Billion. IATA, Montreal, Press Release 55; \(^b\)Airports Council International (ACI), 2016. World Airport Traffic Forecasts. ACI World, Montreal.*

Based on rounded 4 billion travelers expected to have flown in 2017, IATA projected this figure almost to double to 7.8 billion in 2036. This is equivalent to a CAGR of 3.6% on average. Other traffic projections, for example, Airbus (2017) or Boeing (2017) foresee healthy growth rates in a corridor between 4% and 5%, more toward the higher end regarding the short to medium range and toward the lower end for the longer term. Airports Council International (ACI, 2016) is forecasting an even higher rate of 4.9% for passengers (and 2.3% for air cargo as well as 2.5% for aircraft movements) in the long term up to 2040. Based on the regional trend described above, this scenario results in a tremendous change in passenger market shares, as displayed in Fig. 1.4.
The uneven regional growth rates (cf. Fig. 1.2) are set to continue, primarily due to market maturity and GDP growth. While this will provide superior growth perspectives to airports in the Asia-Pacific region, the overall outlook is very positive across the board. Regardless of the slightly different projections, volumes will more or less double during the next 20 years. Against this background, IATA is expecting that almost all of the world’s top 100 airports require major infrastructure expansion during this period. Moreover, there could be 100 more slot coordinated airports within 10 years’ time already. That is in addition to the 189 Level 3 and 122 Level 2 airports (with some peak congestion) as of November 2017. All regions are concerned by this challenge, although Europe is in the limelight of this infrastructure shortage (Garcia, 2018; Gittens, 2018; Clark et al., 2018). In order to accommodate for this growth scenario, adequate infrastructure is required both in the air and on the ground—substantially beyond current plans to expand capacity. Otherwise, Eurocontrol (2018) is afraid that according to their most likely scenario, there will be around 1.5 million flights more in demand than can be accommodated by 2040, and 166 million passengers will be unable to fly. It also means that the number of airports operating near capacity during most of the day, as it is the case at London Heathrow (LHR), for example, will rise from six in summer 2016 to then sixteen.

Figure 1.4 Forecast of regional passenger shares in 2040. Source: Author based on ACI and ICAO data.

The social, environmental, economic, and political impact of airports

1.3.1 Economic and social effects

Although airports are difficult neighbors due to their environmental impact which will be analyzed in Section 1.3.2, they are an important economic factor for the cities and regions they serve. In addition to providing access to the global air transport system thus supporting connectivity, they also generate direct, indirect, and induced economic activities and employment (McGraw, 2017).

The direct effects may be measured in employment and income resulting from the local airport operations, including the operator itself, other service providers,
agencies, and the airlines. While indirect impacts refer to employment and economic activities linked to supplying the air transport industry, induced effects comprise employment and activity supported by the spending of air transport employees, for example, suppliers of goods and services purchased by employees. Usually, their combined effect is being measured by the economic multiplier. The multiplier concept incorporates the spendings of direct employees as well as employees of supplying companies. Finally, airports also support attracting and sustaining business development outside of air transport. These spin-off effects primarily materializing in the tourism and travel and trade industries are termed to be the catalytic impact (ACI Europe, 2015; Air Transport Action Group, ATAG, 2018).

In their most recent study on the benefits of aviation, the ATAG (2018) reports the overall economic impact of aviation to have been around USD 2.7tn in 2016, supporting 3.6% of the global GDP, with 65.5 million jobs dependent on aviation and 10.2 million thereof directly in aviation on a global scale. Furthermore, they estimated direct employment to have been 525,000 with airport operators and another 5.6 million with a retail and car rental company or government agencies such as customs on-airport.

According to ACI (2017), the 2015 data concerning its airports revealed a ratio of 12 for total employees on the airport site versus employees of the airport operator and a rule-of-thumb industry benchmark of eight airport employees per 10,000 passengers on average. Significant regional variations need to be noted though for both, since the employment structure is affected by different operational, managerial and ownership models. These differences also apply to the total income of USD 151.8bn generated by ACI airports globally.

For Europe alone, InterVISTAS (2015) has quantified the overall economic impact of airports in terms of 12,343,900 total jobs and GDP of EUR 674.5bn or 4.1% of the regional GDP, including catalytic effects. Another local example is the impressive overall total economic impact of aviation on the Dubai economy in 2013, which is estimated to be USD 26.7bn, comprising a “core” impact of USD 16.5bn and “tourism” benefits of USD 10.2bn. This is equivalent to 26.7% of Dubai’s total GDP and was sufficient to support 416,500 jobs or 21% of the Dubai’s total employment (Oxford Economics, 2014).

It needs to be noted, however, that other industries certainly do generate employment, attract additional businesses (including air traffic/airports) and prompt multiplier effects as well. Also, impact studies are descriptive in nature and less qualified as a basis for decision-making than cost–benefit analyses. The latter address the question whether or not a project or sector is beneficial and also account for environmental implications—revealing favorable results for air transport in general (Jorge-Calderón, 2014).

Still, airports are now integrated into their region’s socioeconomic engine with considerable economic and social benefits. These have frequently been capitalized on by politics, specifically where airports are in government ownership. Quite often, however, the positive effects are overshadowed by the undisputed negative environmental impact, especially on residential areas in the vicinity of airports—while the value of commercial property in aviation dependent use is enhanced (Cohen and Brown, 2017).
1.3.2 Environmental impact and mitigations

In recent years, airport planning and development increasingly tend to be a controversial issue. Airports have to deal with numerous local issues regarding noise, air quality, waste management, and other environmental concerns, as well as the policies resulting from these matters.

Eurocontrol (2017) explains the various environmental topics connected to aviation. With air transportation serving the growing needs for the traveling public, aviation, at the same time, encumbers costs or detriments onto society and nature. These main adversities, harming the environment, are identified as aircraft noise, air pollution, climate change, third party risks, and aviation emissions. Aircraft noise is a fundamental harm to people living close to the airport, complaining about noise disturbances, especially during nighttime periods. The “balanced approach” presents a means to undertake noise management procedures at airports and implicates the reduction of noise at the source, land-use planning and management measures, noise mitigation procedures, and operational restrictions. The most remarkable aviation emissions responsible for local air pollution are oxides of nitrogen and carbon monoxide.

The encroachment of the environment often induces environmentalists and public campaigners to protest against airports, because of possible airport expansion projects or because of the two basic aviation disturbances of noise and gas emissions. These groups have the ability and power to bring about very damaging repercussions to airports, which can lead to night curfews being enforced at airports. One example of the growing public campaigns and citizens’ initiatives is the Monday demonstrations inside the terminal of the Frankfurt Airport in 2014 against the airport and its generation of noise. Being a good neighbor, however, is vital to get planning approval for potential expansion projects. Noise insulation of neighboring houses, technological advances such as new aircraft engine technology as well as renewable energies are further mitigations—usually implying financial burdens for the industry.

New aircraft engine technology enables the airports’ surrounding area to be less harmed by aircraft noise, invoking fewer noise complaints. Renewable energies are further technological advances airports can make use of, in order to be part of the move of “going green.” Due to the large area that airport infrastructure demands, regenerative energy sources, like solar energy devices, can be mounted either to the spacious rooftops or onto the airport’s open land masses. Additionally, airports can possibly opt for installing wind turbines and use them as regenerative energy sources. Such endeavors also would favor the social and environmental influences of airports, as sustainability on the one hand fabricates a positive image of the airport for the public, and simultaneously is welcomed by environmentalists (Federal Aviation Authority, FAA, 2018a,b; Pagliarello, 2018).

Two initiatives support the efforts of “going green”: ACI’s “Carbon Accreditation Programme” and Eurocontrol’s “Collaborative Environmental Management Specification” (CEM). The former was successfully implemented in Europe a number of years ago and went global in November 2014. The program certifies airports at
four different levels of accreditation covering all stages of carbon management: mapping, reduction, optimization, and neutrality. As of spring 2018, more than 200 airports in more than 60 countries across all regions have actually reached the fourth stage of carbon neutrality. The CEM, on the other hand, was only launched in 2014 and is limited to Europe, but includes aircraft operators, air navigation service providers, and trade associations in addition to airport operators. Its objective is to facilitate the already existing activities of these core operational stakeholders by increasing their awareness of the various interdependencies. This, in turn, is to support sustainable airport development as an essential element for improving air transport movements capacity and flight efficiency (Bates, 2017; Eurocontrol, 2014).

### 1.3.3 Aviation and airport policy

Due to their significant importance for the economic development of a region and/or an entire country, airports have frequently been subject to political activities. A prime example for the instrumental character of airport development—actually aviation on the whole—is the new Dubai World Central Al Maktoum Airport, but also the expansion projects of neighboring Abu Dhabi (and to a certain extent also Doha), where these investments are perceived to be a token of preparing the economies for the post–oil future. Similarly, the BRIC countries have an overriding interest in developing their airports’ system, as ground infrastructure may not be comparable to North America or Europe. But governments of the developed nations also follow a similar agenda in supporting the competitiveness of their economies.

In Europe, the European Commission (EC)—in its capacity as an economic regulator and competition authority—has come up with several Directives and Regulations to create a level playing field for airlines and a more efficient use of scarce capacities to the benefit of the traveling public. Additional comprehensive measures were adopted to address the capacity shortage at Europe’s airports and improve the quality of services offered to passengers under the umbrella of the “Better Airports Package” (EC, 2011). More recently, the EC (2015) introduced their “New Aviation Strategy for Europe,” which is supposed to foster innovation and generate growth for European business, while letting passengers benefit from increasing connectivity and safer, cleaner as well as cheaper flights. (Additional aspects of aviation/airport policy will be considered in Feature 5.1.)

---

**Feature 1.1 Airport products and services**

From a commercial perspective, the two main groups of airport users are the airlines, representing the primary customers (B2B) and the travelers or consumers using the dedicated facilities (B2C). For the airlines, airports are instrumental for offering their product by providing the required infrastructure to operate aircraft and service their customers being passengers and cargo shippers. These genuine airline customers are airport users or consumers at the
same time. This also holds true for meters and greeters as well as employees. The airline business requires adequate airport access as well as facilities and services at competitive fees and charges, plus a growth perspective for future development.

In order to address the airlines’ demand for adequate capacity and facilities to operate their business, airports provide the required infrastructure and offer a range of services. These represent the main sources of their revenue. At most airports aeronautical charges include the categories summarized by Table 1.3.

**Table 1.3 Aeronautical services and charges**

| Products/Services                        | Airport charges | Driver                                      |
|-----------------------------------------|-----------------|---------------------------------------------|
| Landing facilities (runways, taxiways, etc.) | Landing         | Aircraft weight (MTOW/MAW)                 |
| Navigation aids (landing systems and respective services) | Terminal navigation | Aircraft weight (or included in landing charges) |
| Air bridges                             | Air bridge      | Included in landing charges or per aircraft movement |
| Terminal (plus check-in/immigration facilities) | Passenger    | Departing passengers                       |
| Security control                        | Security        | Included in passenger charges or per passenger |
| Aircraft parking                        | Parking         | Duration (hourly rate or for 24 h after grace period) or aircraft weight |
| Ground services (various)               | Ground handling| Specific activity                           |

*MTOW/MAW*, Max. takeoff/authorized weight.

*Source*: Compiled by author from various sources.

Furthermore, a number of airports impose peak charges and/or noise surcharges (or discounts, as applicable), as a constituent of the landing charges. More rarely, additional charges fall due for aircraft emissions and the usage of centralized infrastructure, such as baggage sorters and underground fueling system. Ground handling services are not necessarily provided by the airport operator but frequently by third parties. The latter case will then generate commercial income based on a concession fee paid by the handling agent. Also fuel charges are usually not collected by the airport but levied by the fuel companies. Government taxes bypass the airport operator in general.
While Chapter 3, Measuring the financial position, will give an example of a table of charges and Chapter 10, Regulatory regime, will add pricing aspects, it is worthwhile stating two relevant principles stipulated by ICAO’s (2012) “Policies on Charges for Airports and Air Navigation Services”: First, the “user pays principle,” which means to say that users should bear the full and fair cost for the provision of required infrastructure; second, airport charges are essentially cost based (LeighFisher, 2017).

The airlines’ customers—the passengers consuming at the airport—have a different perspective. Today’s savvy travelers increasingly expect both air carriers and airports to understand their preferences and provide personalized offers, advice, and guidance for their door-to-door journeys. Empowered consumers will be loyal to those addressing their needs for information, control, and individual service. This, for sure, includes easy access to and processing at the airport for boarding their flight (Ascend, 2014). In order to address this demand, airports provide the required infrastructure and offer a wide range of services and amenities. The latter are frequently provided by third parties instead of the airport operators themselves. For running their businesses on the airport premises, these concessionaires have to pay a percentage fee on their turnover on top of a fixed rental fee. The major services are summarized by Table 1.4, representing sources of commercial income for the airport operator generated on the landside, primarily driven by passenger volumes.

**Table 1.4** Nonaeronautical services and fees

| Products/services | Fees |
|-------------------|------|
| Duty free shops, retail outlets, gastronomy, F&B, foreign exchange | Concession fee (plus fixed rent) |
| Rental cars, taxi cabs | Concession fee |
| Car parking | Concession fee (or direct income) |
| Hotels | Concession fee (or ground rent) |
| Conference centers | Concession fee (or direct income) |
| Special services (medical, wheelchair assistance; prayer rooms) | Concession fee (or direct income; occasionally free of extra charge) |
| Public lounges (shower rooms) | Concession fee (or direct income) |
| Baggage store | Concession fee (or direct income) |
| Animal pension | Concession fee (or direct income) |
| Miscellaneous (airport tours, visitors’ area) | Concession fee (or direct income) |

*F&B*. Food and beverage.

*Source*: Compiled by author from various sources.

It needs to be noted that airport employees also make use of several services and contribute to the generation of commercial revenue. The same applies to (Continued)
Feature 1.1 (cont’d)

authorities and airlines renting floor space for operations and back offices, parking facilities, as well as associated utilities. Major characteristics of concession contracts will be introduced in Chapter 3, Measuring the financial position.

As with any other business, meeting customer needs and expectations is key to operating an airport successfully. This appears to be mandatory, as Copenhagen Economics (CE, 2012) confirmed by Oxera (2017) found that:

- airlines are flexible enough to extensively practice opening and closing of routes (churn), and
- consumers have full market transparency using internet-based search engines and a wide range of options, both in terms of flights and airports.

These findings apply primarily to small <10 million passengers per annum (mppa) and medium sized airports, while larger ones >40 mppa are affected more by competition for transfer passengers. In general, airports are competing for any additional traffic in terms of passengers and cargo, particularly for:

- passengers in a shared local market,
- connecting passengers, and
- airline services on new and existing routes (Oxera, 2017).

Although the focus of this research was on Europe, it can be concluded from the wide-spread granting of commercial incentives to airlines across regions that airport competition has become a worldwide phenomenon in the meantime. Various enticements have actually developed into a major tool of airport marketing, in addition to putting their products to the shop-window at the different “Routes Conferences.” Feature 10.1 will discuss the competitive situation in the sector in more detail.

1.4 Summary

This chapter presented the historic development of global air transportation. As it is their main function to accommodate traffic, airports have advanced in response to it. Traffic volume and structure, however, are not under full control of airport management but subject to overall economic, political and regional developments. An overview of airports’ social, environmental, economic, and political impact was given. Environmental concerns as well as changing customer demands and consumer behavior pose new problems in the digital age. Addressing these is an ongoing and costly endeavor.

This chapter’s feature introduced to airport products and services. Basically, two main types can be differentiated. While products and services delivered directly to
airlines (primarily on the airside) generate aeronautical revenue, commercial or nonaeronautical revenue results from activities on the landside of the airport where passengers consume.

References

Airbus, 2017. Global Market Forecast 2017–2036. Airbus S.A.S, Blagnac Cedex.
Airports Council International (ACI), 2016. World Airport Traffic Forecasts. ACI World, Montreal.
Airports Council International (ACI), 2017. 2017 ACI Airport Economics Report. ACI World, Montreal.
Airports Council International (ACI) Europe, 2015. The Impact of an Airport. ACI Europe, Brussels.
Air Transport Action Group (ATAG), 2018. Aviation Benefits Beyond Borders. ATAG, Geneva.
Ascend, 2014. Smoothing the airport experience. <http://www.ascendforairlines.com/white-paper/smoothing-airport-experience> (accessed 01.12.14.).
Ashford, N., Stanton, M., Moore, C., Coutu, P., Beasley, J., 2013. Airport Operations, third ed. McGraw Hill, New York.
Bates, J., 2017. Ambitions, goals and challenges. Airport World 22 (6), 38–40.
Boeing, 2017. Current Market Outlook 2017–2036. Boeing Commercial Airplanes, Seattle, WA.
Clark, O., Harper, L., Kaminski-Morrow, D., 2018. The fight for slots. Flight Airline Bus. 34 (4), 30–33.
Cohen, J., Brown, M., 2017. The effect of international airports on commercial property values: Case studies of Toronto, Ontario, Canada and Vancouver, BC, Canada. In: Bitzan, J., Peoples, J. (Eds.), The Economics of Airport Operations. Emerald Publishing, Bingley, 313–333.
Copenhagen Economics (CE), 2012. Airport Competition in Europe. Copenhagen Economics, Copenhagen.
Doganis, R., 1992. The Airport Business. Routledge, London (reprinted 1996).
Eurocontrol, 2014. Specification for Collaborative Environmental Management (CEM). Eurocontrol, Brussels.
Eurocontrol, 2017. Environmental issues for aviation. <https://www.eurocontrol.int/articles/environmental-issues-aviation> (accessed 13.03.17.).
Eurocontrol, 2018. Challenges of Growth—European Aviation in 2040. Eurocontrol, Brussels.
European Commission (EC), 2011. Airport Package. COM (2011) 823 final. EC, Brussels.
European Commission (EC), 2015. An Aviation Strategy for Europe. COM (2015) 598 final. EC, Brussels.
Federal Aviation Authority (FAA), 2018a. Environment and energy research & development. <https://www.faa.gov/about/office_org/headquarters_offices/apl/research/> (accessed 17.07.18.).
Federal Aviation Authority (FAA), 2018b. Airport environmental programs. <https://www.faa.gov/airports/environmental/> (accessed 17.07.18.).
Fonseca de Almeida, L., 2014. A Future Perfect? Trends and Challenges for the Aviation Industry. 14th Airline marketing workshop, 20 February, ICAO, Athens.
Garcia, M., 2018. NEXTT generation. Passenger Terminal World 24, March 2018, 46–54.
Gittens, A., 2018. View from the top. Airport World 23 (1), 11–12.
International Air Transport Association (IATA), 2017. 2036 Forecast Reveals Air Passengers Will Nearly Double to 7.8 Billion. IATA, Montreal, Press Release 55.
International Civil Aviation Organization (ICAO), 2010. ICAO Database—Air Transport Statistics. ICAO, Montreal.
International Civil Aviation Organization (ICAO), 2012. ICAO’s Policies on Charges for Airports and Air Navigation Services, ninth ed. ICAO, Montreal, Doc 9082.
International Civil Aviation Organization (ICAO), 2016. seventh ed. Annex 14 to the Convention on International Civil Aviation, vol. I. ICAO, Montreal, Aerodrome design and operations.
International Civil Aviation Organization (ICAO), 2017. Annual Report of the Council—Air Transport Statistics. ICAO, Montreal.
InterVISTAS, 2015. Economic Impact of European Airports—A Critical Catalyst to Economic Growth. Intervistas, Bath.
Jorge-Calderón, D., 2014. Aviation Investment—Economic Appraisal for Airports, Air Traffic Management Airlines and Aeronautics. Ashgate, Farnham.
Kazda, A., Caves, R., 2007. Airport Design and Operation, second ed. Emerald Group Publishing, Bingley.
LeighFisher, 2017. Review of Airport Charges 2017. LeighFisher Ltd, London.
McGraw, M., 2017. The heterogeneous impact of airports on population and employment growth in cities. In: Bitzan, J., Peoples, J. (Eds.), The Economics of Airport Operations. Emerald Publishing, Bingley, 261–312.
Oxera, 2017. The Continuing Development of Airport Competition in Europe. Oxera Consulting LLP, Oxford.
Oxford Economics, 2014. Quantifying the Economic Impact of Aviation in Dubai. Oxford Economics, Oxford.
Pagliarello, M., 2018. The evolving challenge of noise. Int. Airport Rev. 22 (1), 26–29.
Young, S., Wells, A., 2011. Airport Planning & Management, sixth ed. McGraw-Hill, New York.