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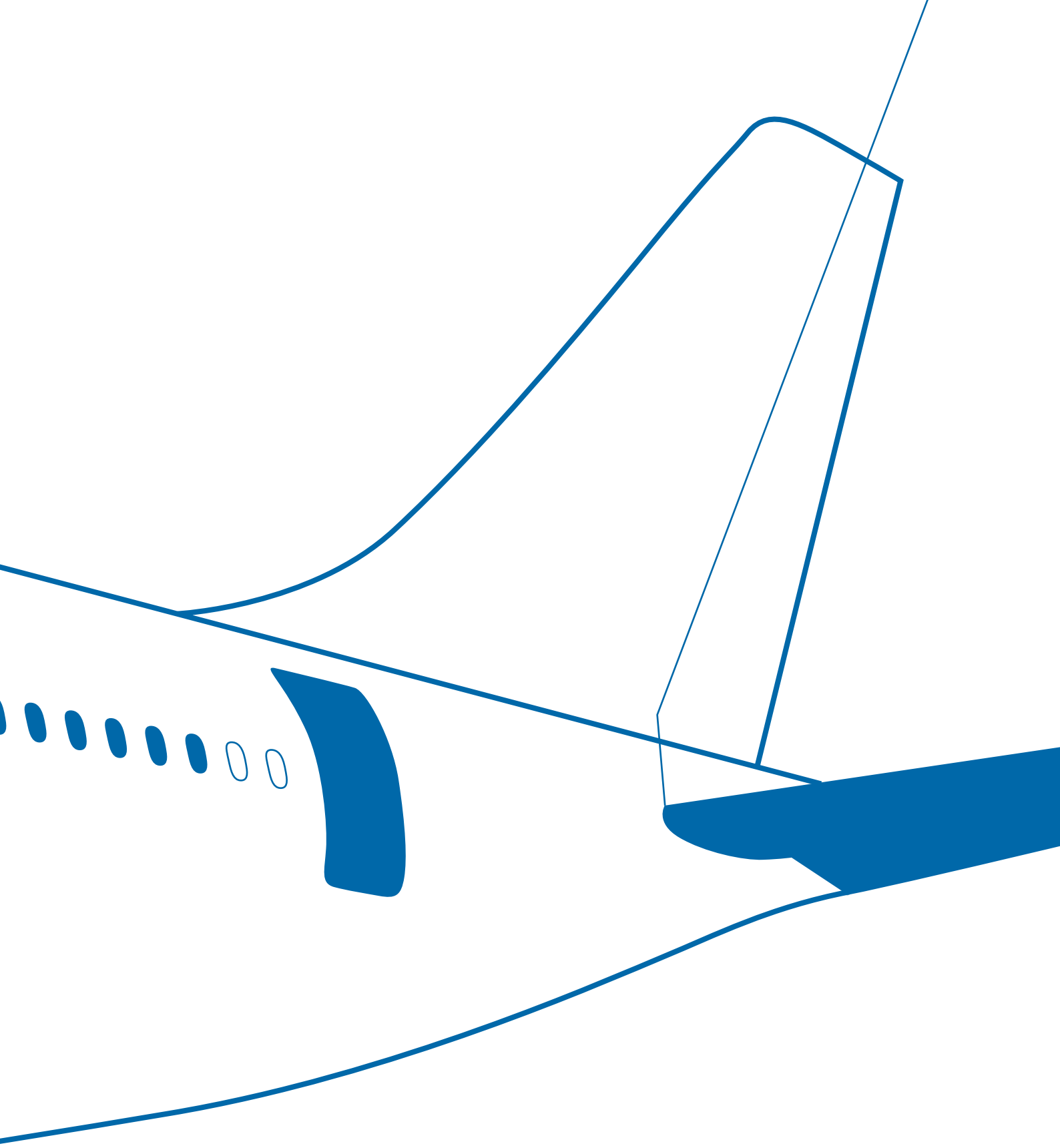
Central Transport Hub

Building Poland's New Transfer Airport



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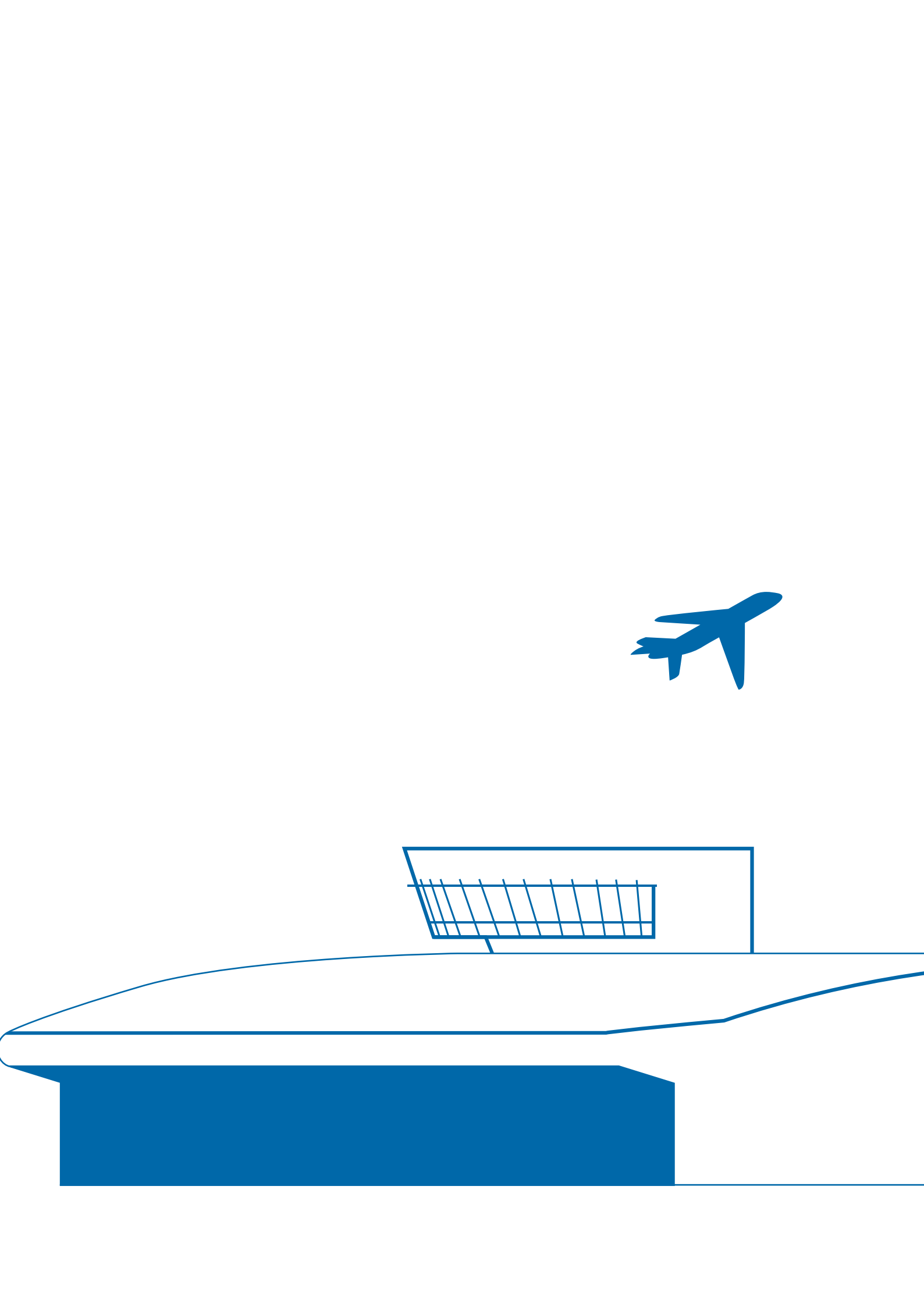


Executive summary

Worldwide, in 2018 4.3 billion people travelled on scheduled flights, a 6.5% increase from the year before. According to the industry organization IATA, in 2019 this number may rise by a further 6%, to 4.6 billion passengers. Every year air travel increases its role in the growth of business and tourism. It also exerts a substantial influence on investments and migration. **The Polish aviation industry is still modest, however, constituting a bit over 1% of global air traffic.**

Air transport also plays a crucial role in the carriage of goods, representing up to 35% of global trade value. Aircraft carry high-value, low-weight cargo, such as computer chips, as well as, more and more often, e-commerce packages. These are goods with the highest influence on creating added value in the economy. However, Poland is still in the periphery when it comes to air cargo transport.

Both kinds of air transport–passenger and cargo–are concentrated at hub airports. Cities and countries where such hubs are located gain tangible benefits: economic, social and political. There are currently no major hub airports in Poland or Central & Eastern Europe. Warsaw Chopin Airport, the largest airport in this part of the continent, does not rank among the top 30 European airports by passengers per year. Thus passengers travelling from Poland (especially in case of intercontinental flights) must fly with transfers. The main hubs handling traffic from Poland are Frankfurt and Munich, London Heathrow, Paris Charles de Gaulle, Amsterdam, Moscow Sheremetyevo, Dubai, and Doha.

Despite the lack of a significant hub in Poland, in 2016 the Polish aviation industry created 40,500 jobs in companies related to the industry. Together, they created PLN 7.1 billion in added value. **The aviation industry is one of the most efficient sectors of the Polish economy.** One person employed in passenger air traffic produces PLN 600,000 of added value, six times the average for Polish workers. Polish airports contribute up to 5% of GDP, twice the average for the European Union, which is 2.6% of GDP.

However, due to the fast growth of local demand for air transport (much faster than the European average), the lack of regional hubs, and increasing congestion of Western European airports, **Poland has the potential to join the group of countries with their own large transfer hub.** This won't be possible, however, without a significant expansion of airport infrastructure, as the current infrastructure is not able to fulfil that role.

The Central Transport Hub (CTH; Polish: Centralny Port Komunikacyjny or CPK), a flagship infrastructure project of the Law & Justice (PiS) government, is a project that on one hand is supposed to increase the capacity of air traffic from central Poland, as required to promote growth. It should also enhance the country's prestige, as with a transfer hub Poland will be able to participate more effectively in global trade and tourism. There is no doubt, however, that **decisions regarding the method of airport expansion in Central Poland are undertaken with delay, currently under time pressure,** as the capacity of Warsaw Chopin Airport will be exhausted in the early 2020s.

The authors of this report do not contemplate the issue of whether CTH should be created, assuming that such a decision has already been made. This is indicated by the political will of the current government, creation of a special-purpose vehicle company (SPV), and initiation of the required legal procedures. However, due to the importance of such a project and the ambitious schedule of works, it seems necessary to perform a quick but comprehensive analysis of the risks related to construction and management of CTH.

Construction of a new airport is a moderately challenging task when it comes to technology. The real challenge lies in constructing a hub that will gain significant, at least continental importance. Thanks to its advantageous geographical location, Poland has a chance to take over a substantial part of transfer traffic between Europe, North America, and Asia. Construction of CTH is additionally made easier by the availability of a development site, as well as existing rail and road infrastructure that can be easily expanded. Another advantage is the good condition of LOT Polish Airlines, by far the largest and fastest-growing airline in this part of Europe. LOT is a natural candidate for the primary carrier at the airport.

CTH development plans must be realistic, however. **Even with the most optimistic forecasts, the new transfer airport will be a midsize hub,** comparable to the Oslo and Munich airports. Over-scaling of the project may lead to significant inflation of its costs and complexity. At the same time, a plan that is too modest can be equally dangerous, making it necessary to expand the airport soon after its completion.

Even the largest hubs service mostly local traffic. **CTH's success will thus be determined by the airport's accessibility to the largest possible number of passengers from central Poland, as well as the country's economic situation.** On the other hand, attracting transfer traffic could leverage the beneficial impact of CTH on the Polish economy. It can also serve as a buffer in case of a crisis, as even in the event of an economic slowdown of Poland CTH may still be used by passengers from other countries not planning to visit Poland, generating value for the Polish economy.

Plans related to CTH construction also need to take into account the observed aviation industry trends that will shape the air traffic structure in the upcoming years. They should also realistically gauge the growth possibilities of LOT, as the condition of the national carrier will be critical for the success of the new airport. **Due to the politicization of the project, there exists a danger of making over--ambitious growth projections for the Polish carrier, as it probably won't make it into the top 10 European airlines.** CTH should be constructed primarily for LOT, but at the same time take into account market realities, and the scale of operation of the Polish airline and its competitors. It's especially important to develop CTH also as a cargo hub; at present air cargo traffic bypasses Poland.

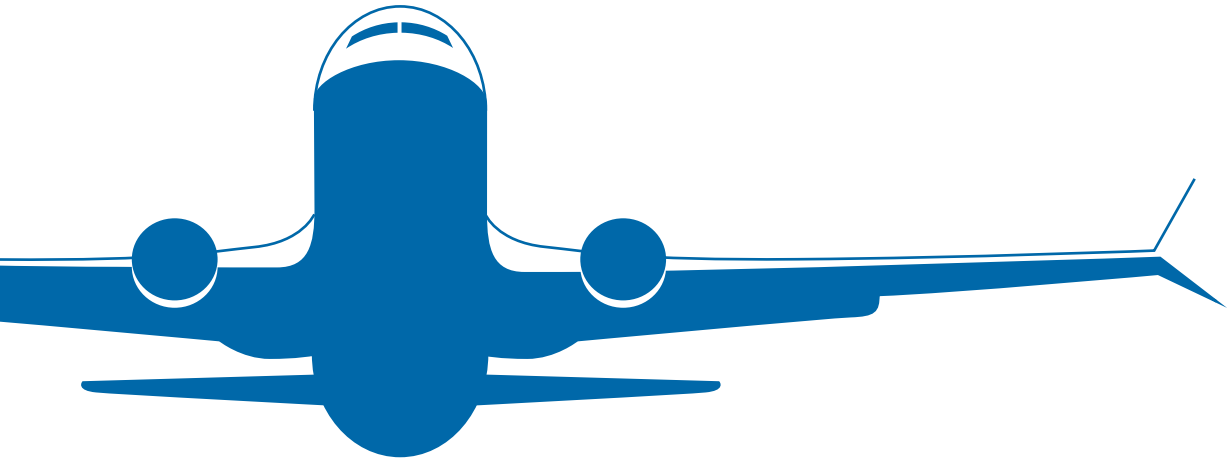
CTH construction is based on a special act of 2018, which should be regarded as a positive approach, as experiences from other countries show that such complicated projects require special, streamlined regulations. However, the special-purpose vehicle created by the act must make critical decisions regarding the model of CTH construction financing and further airport management. Poland is not able to finance construction of the airport itself using EU funds (unlike rail and road projects), but it should be easy to raise funds from the market, as high returns on investment characterize airports of such scale. From this perspective, the most beneficial way of engaging private investors would be a public-private partnership in the project finance model. Choice of a specific investor is strategic, however. **On the one hand, the most attractive partners when it comes to financing, knowhow, and potential subsequent airport management are industry investors associated with airport groups,** especially from Southeast

and East Asia (excluding Chinese entities). On the other hand, airport construction may be financed by investment funds specializing in infrastructure projects.

The general CTH plan, as well as the architectural design of the airport, also poses strategic challenges. The long-term prospects for airport traffic show very high growth stability, doubling every 20 years. The profile of air traffic is also changing. The most critical problems include predicting the profile of local traffic (including possibly forgoing short-distance air transport), use of new technologies (biometrics, AI), ecology and project maintenance costs, new hybrid business models of airlines, new preferences of passengers for airport shopping, transportation to airports etc. The special-purpose vehicle should look to external entities (such as companies experienced in airport planning) for support in the search for answers to these challenges. An airport constructed in the 2020s should be able to support the market needs at least until the end of the 2030s.

The goal of this report is primarily to identify challenges related to CTH construction and to initiate a broad, depoliticized debate concerning the method of constructing this airport for it to function correctly and generate benefits on the local, national and EU level. In the authors' view, the idea of CTH development has a deep market rationale, but it entails many risks that can lead to failure of the whole initiative. Poland has no experience in such large projects, and there is not much time left for decisions. Thus it is necessary to make decisions consciously, even if this requires modification of the original schedule. Mistakes made in the planning stage may be too difficult and costly to correct later.

CTH's success will thus be determined by the airport's accessibility to the largest possible number of passengers from central Poland, as well as the country's economic situation.



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Warsaw, April 2019

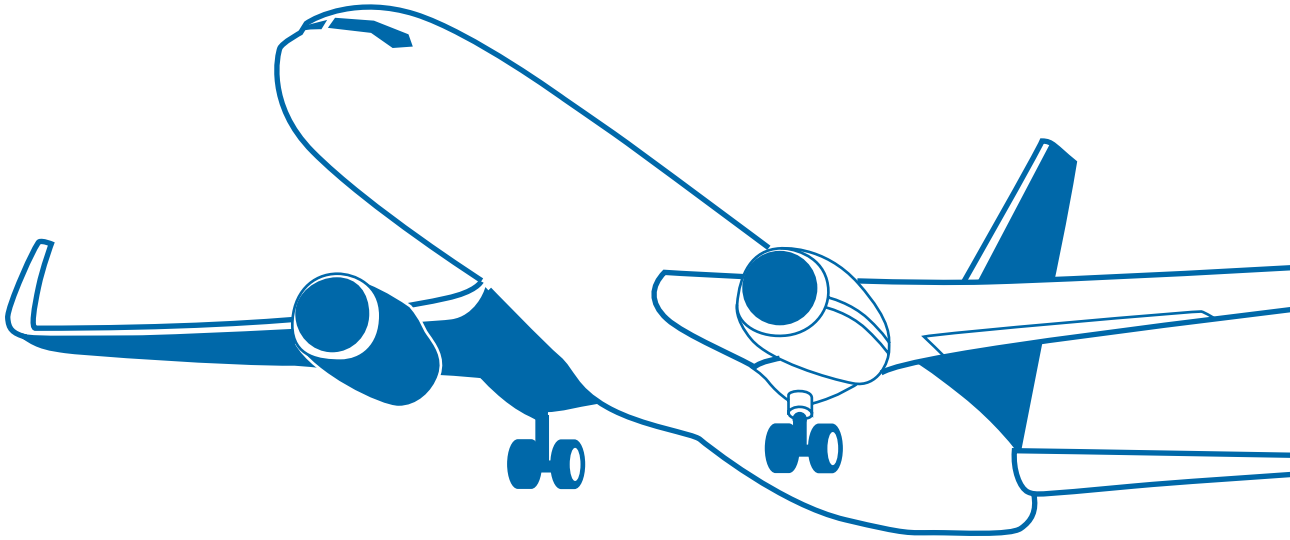
Contents

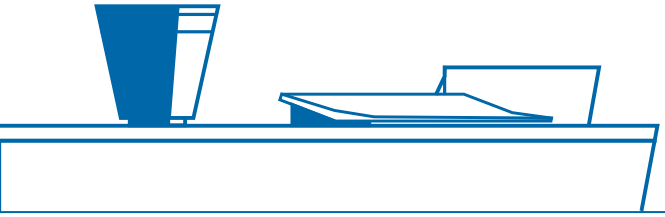
Key data

4.3 bn	**1.1 bn**	**0.05 bn**	airline passengers in 2018
107.4 mn (Atlanta, 2018)	**80.1 mn** (Londyn-Heathrow, 2018)	**17.8 mn** (Warsaw Chopin Airport, 2018)	passengers per year at the busiest airports
5.1 mn tonnes (Hong Kong, 2017)	**2.2 mn tonnes** (Paryż CDG, 2017)	**0.08 mn tonnes** (Warszawa Lotnisko Chopina, 2017)	cargo per year at the busiest cargo airports

160 million passengers

in Europe who will not be able to use air transport in 2040 due to infrastructure overcrowding (capacity gap)





46.7%

Warsaw Chopin and Modlin airports' share of air traffic in Poland (2017)

60%

LOT share of scheduled flights at Warsaw Chopin Airport (April 2019)

28,000 people

people employed by companies related to the aviation industry in Poland (2016)

PLN 11.4 billion

added value created by companies related to the aviation industry in Poland plus indirectly by the industry (2016)

PLN 600,000

added value per employee in passenger air transport in Poland

0.7%

aviation industry's share of Polish GDP (including indirect effects)

5.0%

estimated total contribution of Polish airport operations to GDP

3.2%

estimated contribution of CTH construction to Polish GDP during construction

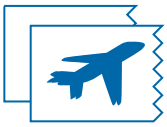
4.5%

estimated sustained contribution of CTH launch to Polish GDP

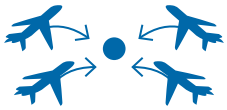
Definitions

Centralny Port Komunikacyjny (CTH, Central Transport Hub) – a planned project encompassing construction of a new hub airport in the municipality of Baranów on the western edge of the Mazovian voivodeship, as well as a new rail and road node.

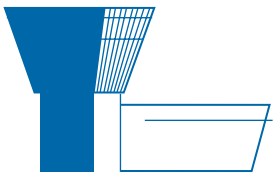
Charter airline – an air carrier offering flights not available for individual public purchase. A charter airline may sell tickets to travel agencies or lease aircraft to individual clients.



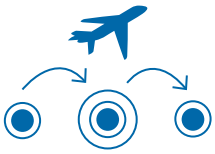
Code-share – a type of trade agreement between two airlines allowing them both to sell tickets for the same flight regardless of which airline services it physically. Code-share should be distinguished from a joint-venture agreement, where carriers practically act as a single company on routes covered by the deal, sharing costs and income. Looser forms of airline cooperation also exist, such as special prorate agreement (SPA) and interline, allowing the sale of tickets for connections served by other companies with unique, more attractive conditions.



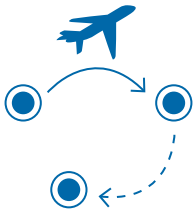
Connection wave – a specially developed flight schedule of a full-service airline, directing aircraft from various directions to a hub at the same time. Such a plan leads to concentration of operations in a short period, but also enables more convenient and shorter connections for passengers. MCT (minimum connecting time) defines the shortest possible time between the arrival of a passenger and his or her departure on another flight from the same airport.



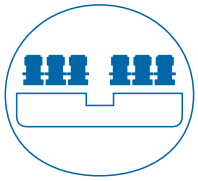
Hub, hub airport – an airport allowing passengers to change flights without leaving the airside zone (no need to pass border control, but additional security check is possible).



Legacy airline, full-service carrier (FSC) – an air carrier offering transport services including the possibility of purchasing connecting flight tickets with a changeover at a hub airport, usually offering tickets with additional services included in the price, as well as business-class tickets.

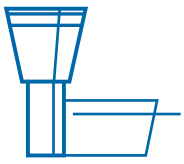


Low-cost carrier (LCC) – an air carrier offering transport services from point A to B, with or without minimal possibilities for reservation of tickets with transfers to point C on one ticket. Usually the carrier sells tickets without additional services, such as baggage transport or in-flight meals, which passengers must purchase separately.

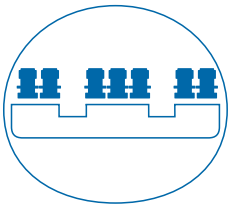


Narrow-body aircraft – an aircraft with a narrow fuselage cross-section and one passenger aisle, with six or fewer seats abreast. Maximum capacity of 240 passengers in case of Airbus A321neo.

Point-to-point flight – air connection between airports A and B, without the possibility of continuing the journey to airport C as part of the same reservation.



Regional airport – an airport where passengers do not change flights (e.g., they have separate tickets for subsequent trips, without a guarantee of onward travel, for example in case of a delay of the first flight). This includes all airports in Poland other than Warsaw Chopin Airport.



Wide-body aircraft – an aircraft with a wide fuselage cross-section and two passenger aisles, usually with seven or more seats abreast in economy class. Used mostly for long-distance flights (example: Boeing 787 Dreamliner).

Market description

Air traffic in Poland

In 2018, around 46 million passengers travelled through Polish airports. This was 15% more than in 2017 and four times the number from 2005, the first full year of Poland's membership in the European Union. Excluding the crisis year of 2009, the number of passengers in Poland has been growing steadily, at a rate much higher than the EU average, stemming from the still low mobility factor of Poles[1], leading to considerable market growth potential. Low-cost carriers play a significant role in generating air traffic growth in Poland. In 2018 such carriers had a 55.9% share in the total number of passengers (enplaning and deplaning) in Poland.

The growth of low-cost carriers in Poland became possible after joining the European Union and related liberalization of the aviation market. According to EU regulations, European Union carriers[2] can freely operate flights between all member states. Thanks to this, low-cost carriers can offer flights between countries

1. The average number of flights per person per year. In Poland, the mobility factor barely exceeds 1, while in Western Europe it ranges from 2 to even greater than 3.
2. To qualify as an EU carrier, an airline must be a) registered in an EU member state, b) owned mostly by EU entities and c) under the effective control of EU owners.

Air traffic growth win the last 15 years concerns mainly regional airports.

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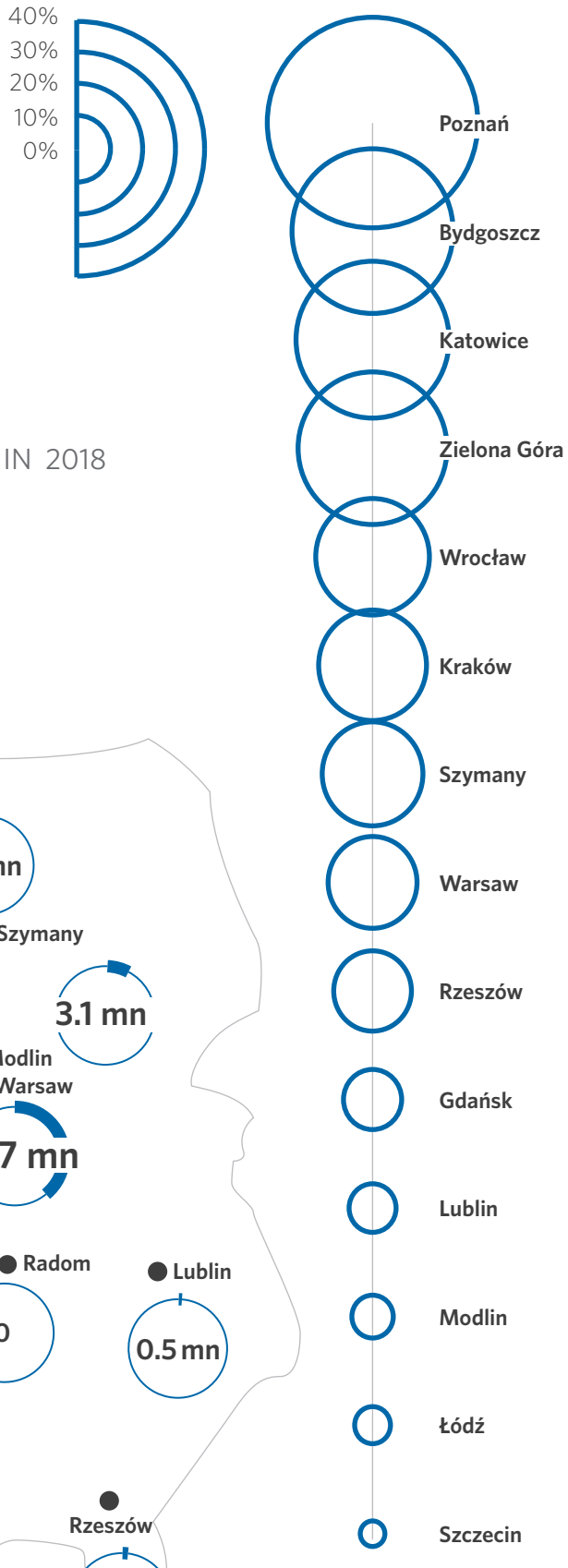
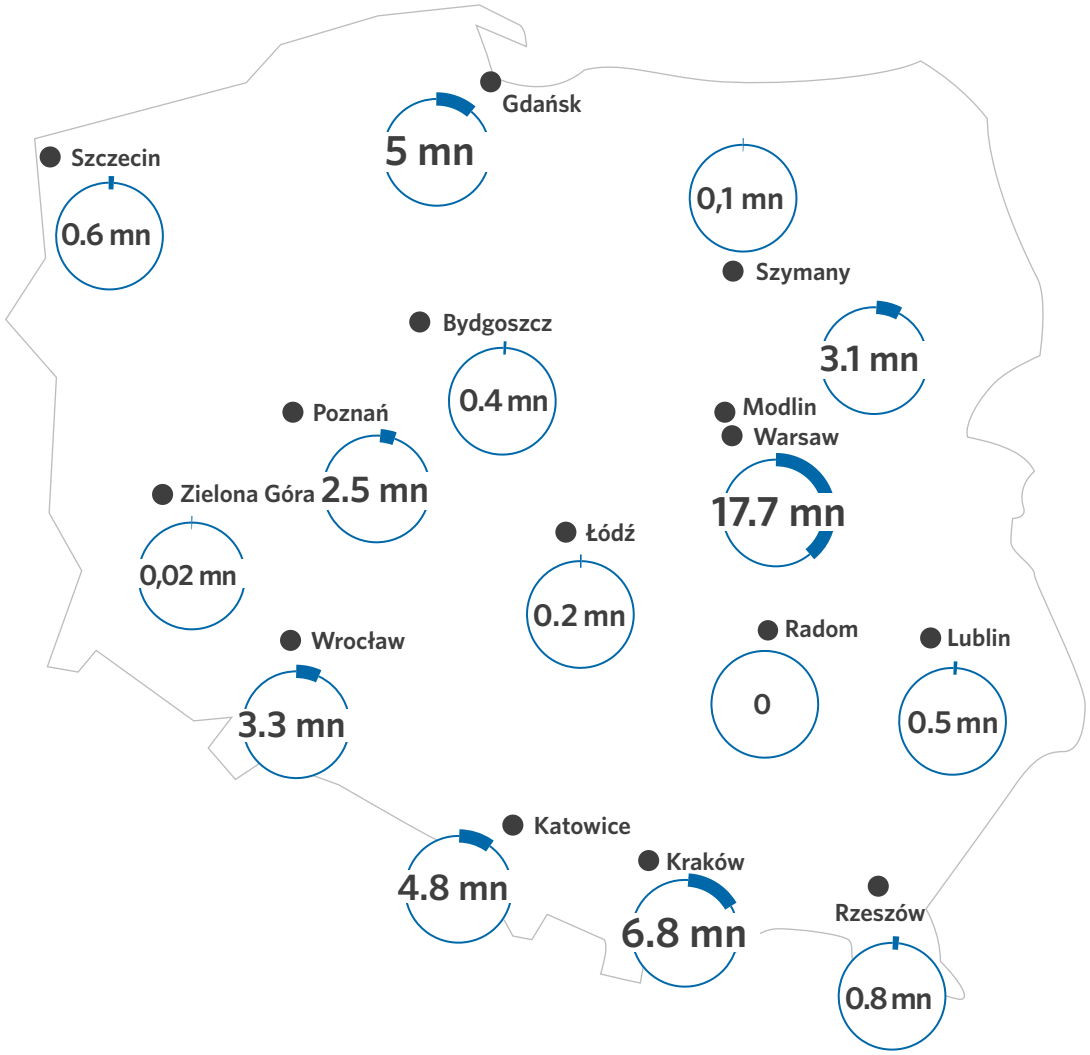


AIR TRAFFIC IN POLAND IN 2018



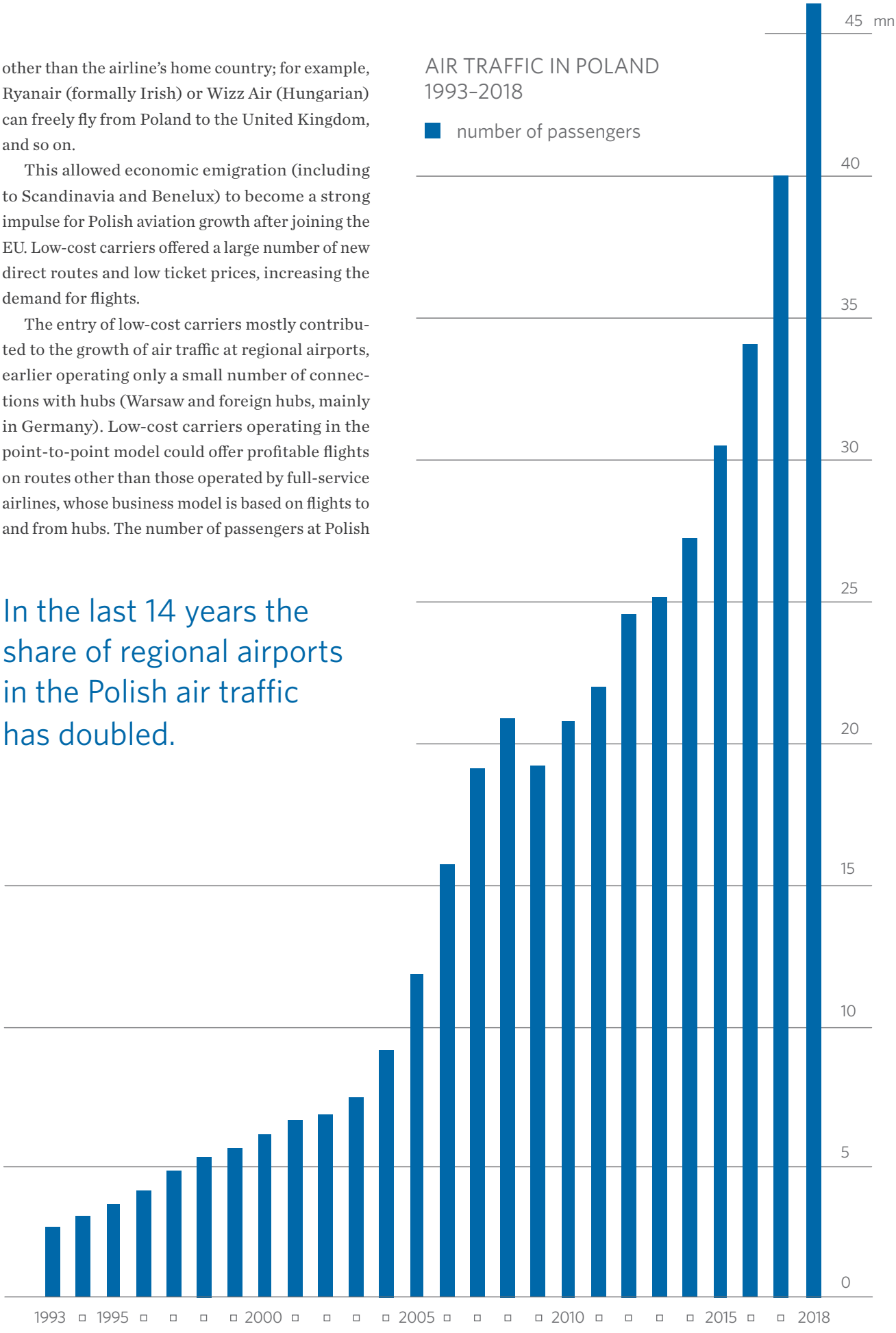
Source: CAA.

other than the airline's home country; for example, Ryanair (formally Irish) or Wizz Air (Hungarian) can freely fly from Poland to the United Kingdom, and so on.

This allowed economic emigration (including to Scandinavia and Benelux) to become a strong impulse for Polish aviation growth after joining the EU. Low-cost carriers offered a large number of new direct routes and low ticket prices, increasing the demand for flights.

The entry of low-cost carriers mostly contributed to the growth of air traffic at regional airports, earlier operating only a small number of connections with hubs (Warsaw and foreign hubs, mainly in Germany). Low-cost carriers operating in the point-to-point model could offer profitable flights on routes other than those operated by full-service airlines, whose business model is based on flights to and from hubs. The number of passengers at Polish

In the last 14 years the share of regional airports in the Polish air traffic has doubled.



Source: CAA.

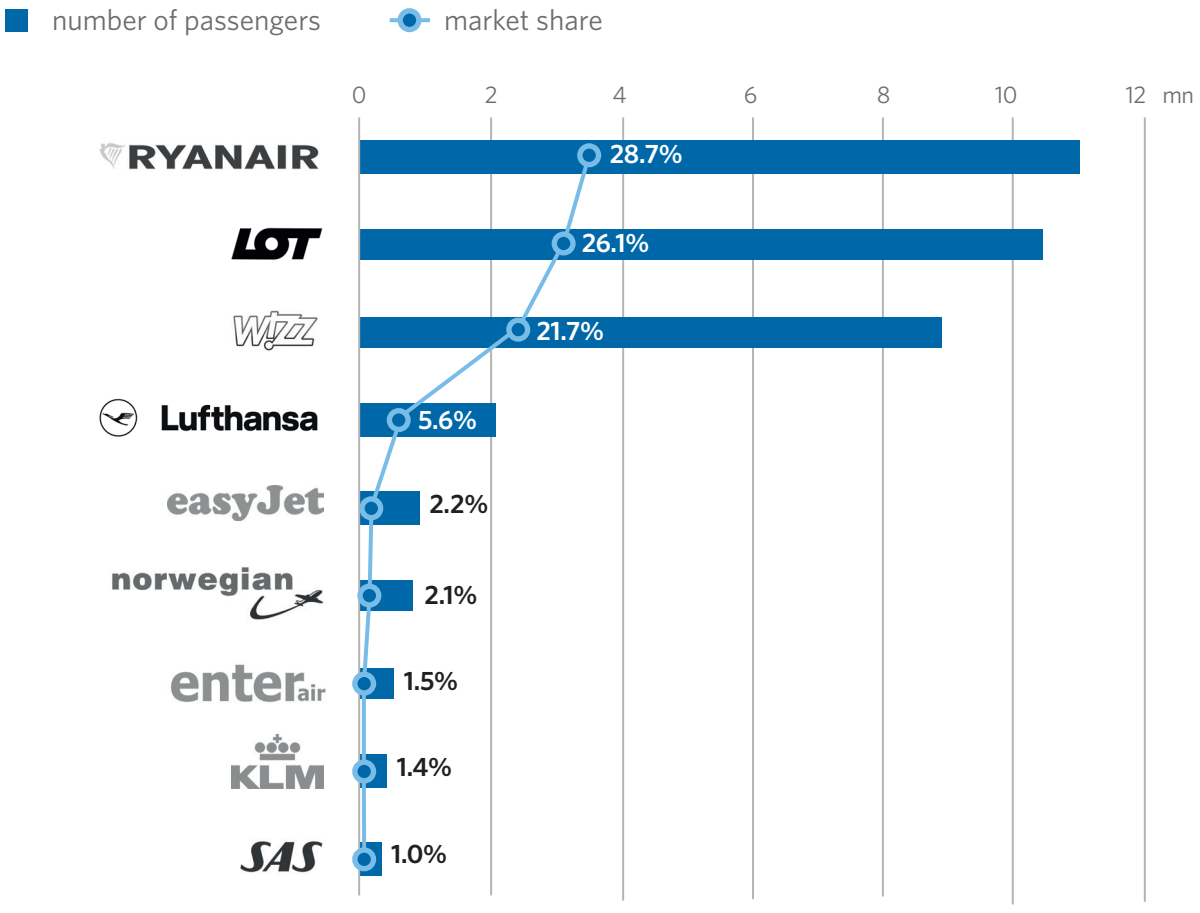
regional airports (including Modlin airport, serving Warsaw) doubled from 31.1% in 2004 to 60.6% in 2017.

Expansion of low-cost carriers in Poland coincided with the crisis of LOT Polish Airlines. In 2013, the flag carrier lost the position of Polish market leader in terms of the number of passengers served, to Ryanair. LCC expansion was also one of the main reasons for this crisis. Since then the Polish carrier has become profitable again, but it did not regain the lost market share. It still serves fewer passengers than its Irish rival, but remains ahead of Wizz Air.

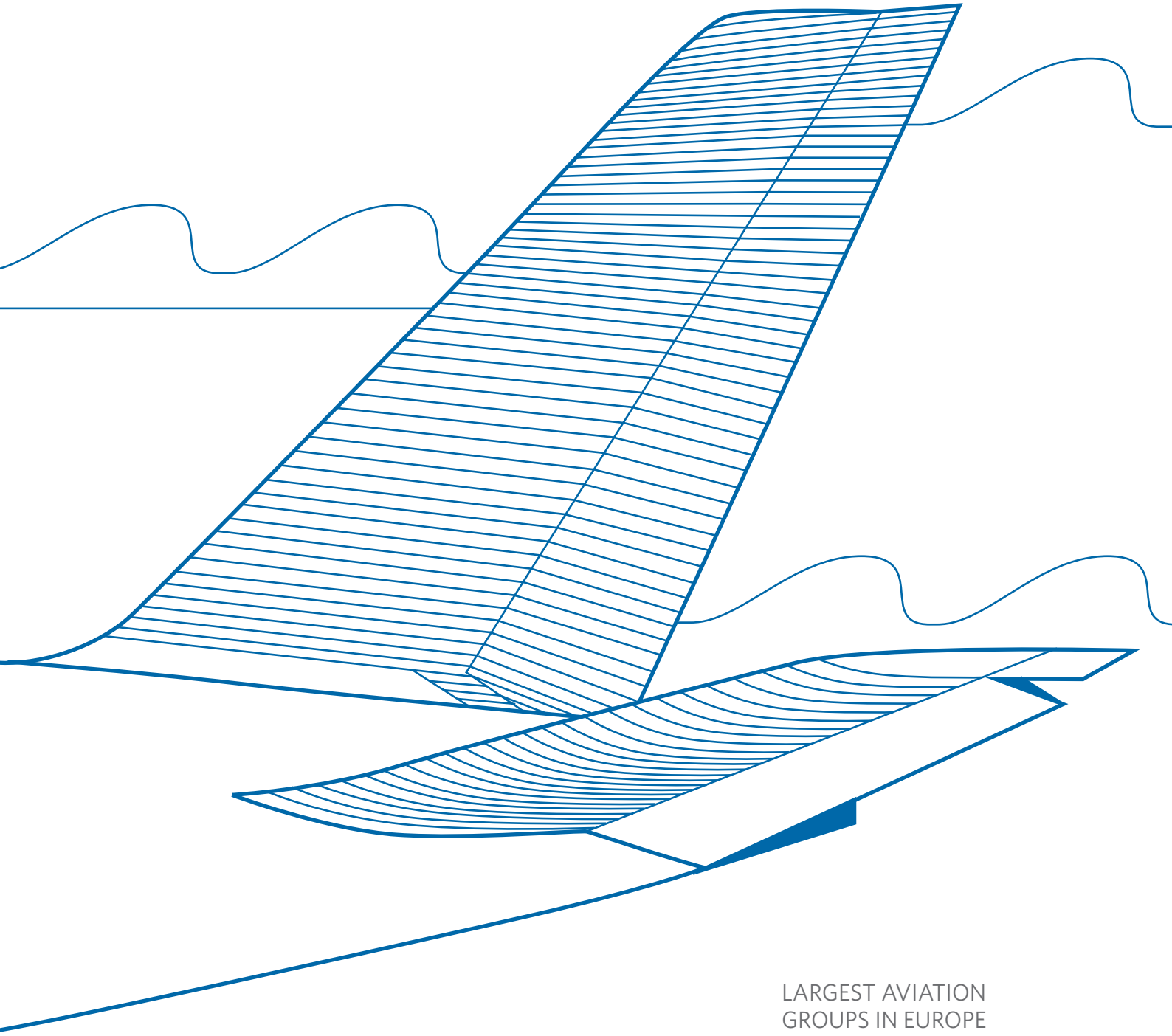
However, LOT has maintained its special significance for Poland, as it is the only full-service flag carrier with an extensive network of long-haul connections. Flights of this kind are the most profitable ones and generate significant economic benefits for the country, helping create new jobs and improving the country's appeal to investors. Operating a hub in Warsaw increases the accessibility of Poland for fundamental political and trade partners, and contributes to the growth of transit traffic. Because of that, if the already small hub in Poland were to disappear or decrease in scale, it would undoubtedly negatively impact the entire economy.

Poland and the entire large Central & Eastern Europe region remain outside the area of direct influence of the three largest aviation groups, operating their bases at the main Western European airports, as well as subsidiaries in most countries in that region. This could change in the event of further market consolidation and acquisition of LOT or another regional airline by one of the large aviation companies. Currently, the largest carriers treat this region only as a source of passengers "exported" to hubs in Western Europe, Russia, Turkey or the Middle East, where they transfer to long-distance flights.

LARGEST CARRIERS ON THE POLISH MARKET IN 2018



Source: CAA.



A strip from Scandinavia through Poland to Greece remains outside the direct influence of the main European aviation groups.

LARGEST AVIATION GROUPS IN EUROPE

Lufthansa

3.44 mn number of seats offered per week

1.75	mn	Lufthansa
0.67	mn	Eurowings
0.44	mn	Swiss
0.33	mn	Austrian Airlines
0.25	mn	Brussels Airlines

IAG INTERNATIONAL AIRLINES GROUP

2.71 mn

1.17 mn	British Airways
0.65 mn	Vueling
0.61 mn	Iberia
0.28 mn	Aer Lingus

AIRFRANCE KLM

2.05 mn

1.09 mn	Air France
0.78 mn	KLM
0.18 mn	Transavia

TURKISH AIRLINES

1.61 mn

1.61 mn	Turkish Airlines

AEROFLOT Russian Airlines

1.27 mn

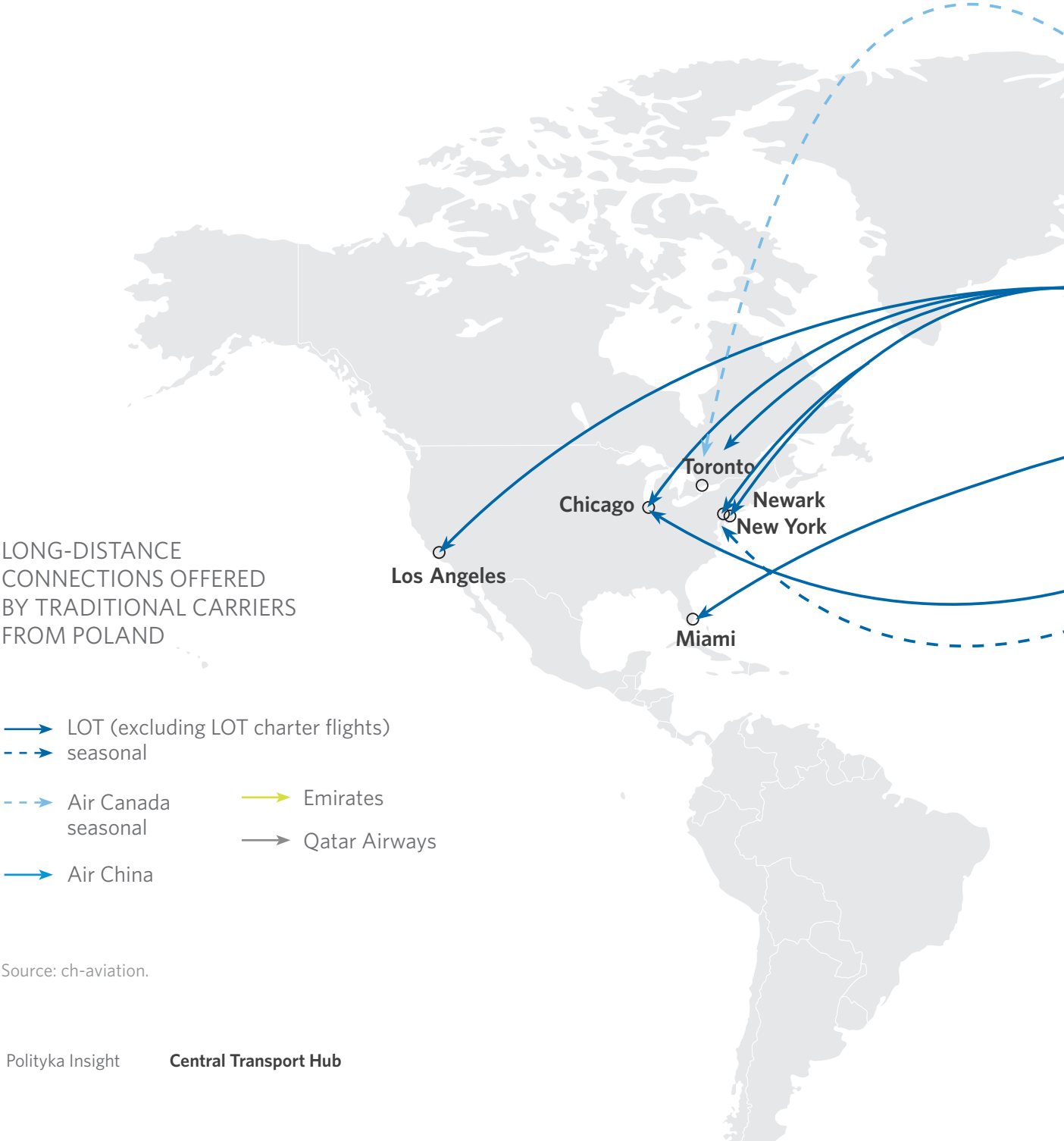
1.09 mn	Aeroflot
0.16 mn	Pobeda
0.02 mn	Rossiya

number of seats offered per week

Source: ch-aviation.

LOT is the largest airline in Central & Eastern Europe. It offers six times more flights from Warsaw each week than Ryanair from its largest Polish airports (Modlin and Kraków).

As a full-service carrier with a hub in Warsaw, LOT is much more focused on the operation of that airport, treating other airports in Poland as feeder installations (except for single flights, mostly to Israel and Ukraine). Despite causing negative emotions in the regions, this structure of the connection network is the only sensible one in the case of hub construction, and it will not change significantly in the future. Low-cost carriers, on the other hand, are diversifying their operations and do not offer as many flights from even their most important airports as full-service carriers from hubs.



LONG-DISTANCE CONNECTIONS OFFERED BY TRADITIONAL CARRIERS FROM POLAND

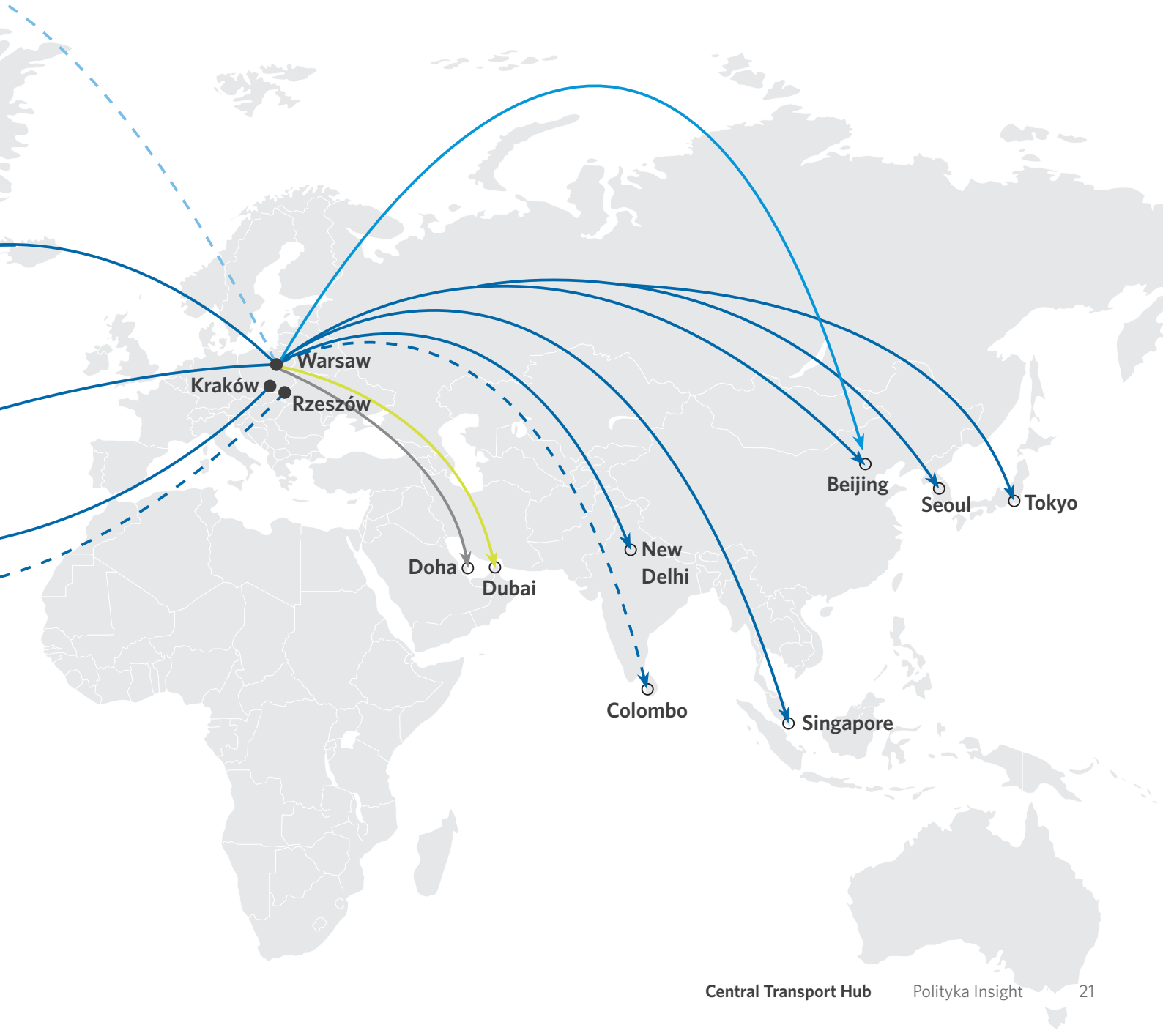
- LOT (excluding LOT charter flights)
- LOT seasonal
- Air Canada seasonal
- Air China
- Emirates
- Qatar Airways

Source: ch-aviation.

The dynamic growth of aviation in Poland, especially outside Warsaw, has caused investment pressure at airports. The vast majority of Polish airports still use infrastructure built several decades ago, or even before World War II, as in the case of Warsaw Chopin Airport (Sipiński, Cybulak, Placha 2016). Even the new airports in Szczytno, Radom, and Modlin were created by converting earlier airfields. Only the Lublin airport was constructed basically from scratch as a greenfield project (although at the site of a former sport airfield).

The development possibilities of existing airports, such as construction of new runways, are often limited due to lack of free space or errors in location. Development of new terminals, increasing capacity, is a less significant problem due to smaller space requirements. Kraków airport (Poland's second-largest) is an exception here, as a nearby military base occupies the space required for terminal expansion.

The last large development drive at Polish airports, significantly increasing their capacity, took place in connection with the 2012 UEFA European Football Championship and shortly thereafter. Further development projects related to Polish airports will be required in the 2020s. Regional airports do not currently have capacity problems, unlike airports serving central Poland, which are currently at nearly full capacity and without expansion or construction of new airports won't be able to handle growing air traffic.



LARGEST CARRIERS IN CENTRAL & EASTERN EUROPE AND NORTHERN EUROPE

Airline	Country	Base
LOT	**Poland**	Warsaw
Norwegian	**Norway**	Oslo and numerous others
SAS	**Denmark/ Sweden/ Norway**	Copenhagen, Stockholm, Oslo
Finnair	**Finland**	Helsinki
Ukraine International Airlines	**Ukraine**	Kiev Boryspil
airBaltic	**Latvia**	Riga, Tallinn, Vilnius
Aegean Airlines	**Greece**	Athens
Blue Air	**Romania**	Bucharest
CSA Czech Airlines	**Czech Republic**	Prague
Tarom	**Romania**	Bucharest

Relations with large groups	Seat availability per week (approximately)
Trade alliance with Lufthansa Group	**250,000** (including Estonian virtual carrier Regional Jet/Nordica, where LOT has shares)
Independent low-cost airline, 4.6% of shares owned by IAG	**920,000** (excluding Argentina branch)
Trade alliance with Lufthansa Group	**810,000**
Joint venture with IAG	**340,000**
Loose trade cooperation with Air France-KLM	**170,000**
Independent low-cost carrier, no long-distance ambitions	**110,000**
Trade alliance with Air France-KLM	**110,000**
Independent carrier	**100,000**
Loose trade cooperation with Air France-KLM	**90,000**
Trade alliance with Air France-KLM	**80,000**

Air traffic in central Poland – detailed analysis

Two large airports currently serve central Poland: the state-owned Chopin Airport in Warsaw (formerly known as Okęcie) and the municipal and state-owned Warsaw--Modlin in Nowy Dwór Mazowiecki. The municipal airport in Łódź supports these installations, but is mostly a local airfield, without greater appeal to passengers from outside Łódź, who choose to fly from Warsaw primarily due to the better offer of flights. This report does not include a more detailed analysis of the situation of the Łódź airport.

There is also an additional airport in central Poland, the state-owned Radom, but currently it does not serve any scheduled flights. Its new owner, Polish Airports State Enterprise (PPL), plans to expand it and allow it to function as a secondary airport for Warsaw, taking over charter and low-cost flights from Chopin Airport. A study of the advisability of current investments in the Radom airport is beyond the scope of this report. The peripheries of the region are also served by Bydgoszcz, Lublin, and Szymany airports.

AIRPORTS IN CENTRAL POLAND

	NUMBER OF PASSENGERS IN 2018	OWNERSHIP STRUCTURE
Warsaw Main LOT transfer airport, Wizz Air base, serving flights of other traditional lines, charter and cargo.	**17.8 mn**	**100%** Polish Airports State Enterprise (PPL)
Modlin Low-cost airport used by Ryanair.	**3.0 mn**	**42.3%** Mazovian Voivodeship **28.5%** Military Property Agency **25.2%** PPL **4.0%** Nowy Dwór Mazowiecki
Łódź Low-cost airport used by Ryanair, served by Lufthansa.	**0.2 mn**	**95.65%** City of Łódź **4.35%** Łódź Voivodeship **<0.01%** Polish and Łódź flying clubs
Radom No-traffic airport, planned expansion as a low-cost and charter replacement for traffic moved from Chopin Airport.	**0**	**100%** Polish Airports State Enterprise (PPL)

In 2018 the two main Warsaw agglomeration airports served 20.8 million passengers in total, constituting 45.5% of all passengers using Polish airports. Łódź airport handled 221,000 passengers and was one of the smallest active airports in Poland, only ahead of Szymany, Zielona Góra-Babimost and Radom (passenger number data from the Civil Aviation Authority).

Chopin Airport handles the vast majority of air traffic in the Warsaw region; in 2018 it served 17.8 million passengers, and Modlin only 3.1 million. LOT remains the main airline serving Chopin Airport; in April 2019 it offered over 1,100 scheduled departures weekly (69.5% of all departures from the airport) and 128,000 weekly seats (60.5%). LOT is also the only airline offering one-ticket transfers through the Warsaw airport. Currently about half of LOT passengers only transfer in Warsaw, which, taking into account the share of the flag carrier in airport traffic, means that almost 30% of travellers in Warsaw are transit passengers, brought to Poland thanks to LOT's connection network and flight offers.

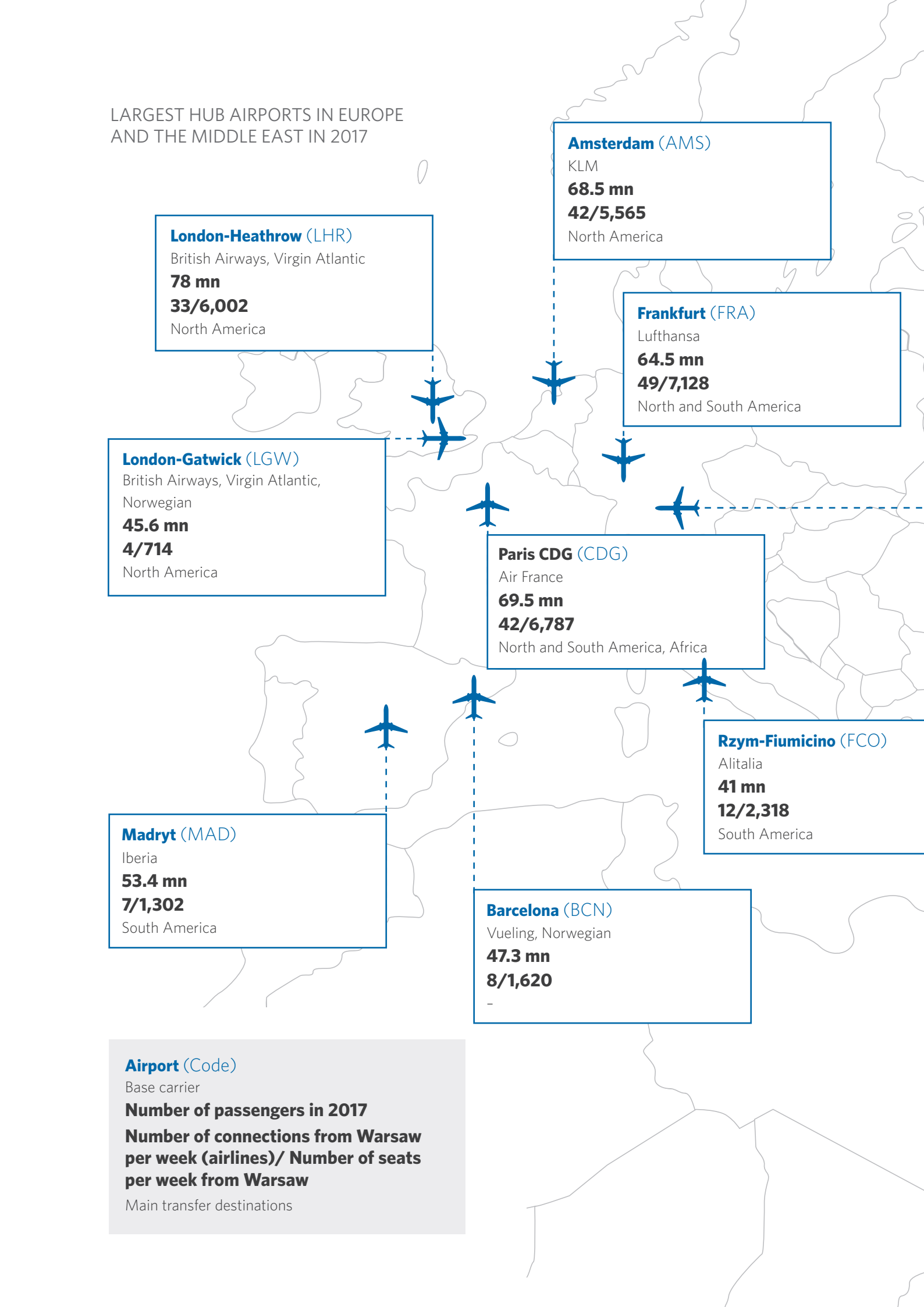
Agreements with other airlines allow LOT to also offer transfer tickets for other hubs on different continents.

Besides LOT, Chopin Airport is also served by numerous full-service carriers offering feeder flights to their hubs, where passengers from Warsaw can transfer to other flights. Seat supply data clearly show that the most critical transfer hubs for Warsaw passengers are in Germany (Frankfurt and Munich), served by Lufthansa. LOT, often contrary to its own interests, plays a role of feeder carrier for these hubs due to its membership in Star Alliance. Other significant transfer hubs are Paris, London, Amsterdam (the latter two are also important destinations due to economic migration), Moscow and Doha. Despite the smaller number of flights, Dubai also plays a significant role due to the large Emirates route network in Asia, Africa, and Australia, as well as competitive prices offered by the airline.

LOT CONNECTIONS OFFER USING GLOBAL HUBS

partner airline	hub	connections description
United	**Chicago-O'Hare**	17 domestic routes in USA
ANA	**Tokyo Narita**	3 domestic routes in Japan
Aeroflot	**Moscow Sheremetyevo**	4 domestic routes in Russia
Air Canada	**Toronto**	9 domestic routes in Canada
Singapore Airlines	**Singapore**	16 routes: 6 to Australia, 2 to Vietnam, 8 European
Turkish Airlines	**Istanbul Ataturk**	3 routes: one in Turkey, two in the Middle East

LARGEST HUB AIRPORTS IN EUROPE AND THE MIDDLE EAST IN 2017



Amsterdam (AMS)
KLM
68.5 mn
42/5,565
North America

London-Heathrow (LHR)
British Airways, Virgin Atlantic
78 mn
33/6,002
North America

Frankfurt (FRA)
Lufthansa
64.5 mn
49/7,128
North and South America

London-Gatwick (LGW)
British Airways, Virgin Atlantic, Norwegian
45.6 mn
4/714
North America

Paris CDG (CDG)
Air France
69.5 mn
42/6,787
North and South America, Africa

Rzym-Fiumicino (FCO)
Alitalia
41 mn
12/2,318
South America

Madryt (MAD)
Iberia
53.4 mn
7/1,302
South America

Barcelona (BCN)
Vueling, Norwegian
47.3 mn
8/1,620
–

Airport (Code)
Base carrier
Number of passengers in 2017
Number of connections from Warsaw per week (airlines)/ Number of seats per week from Warsaw
Main transfer destinations

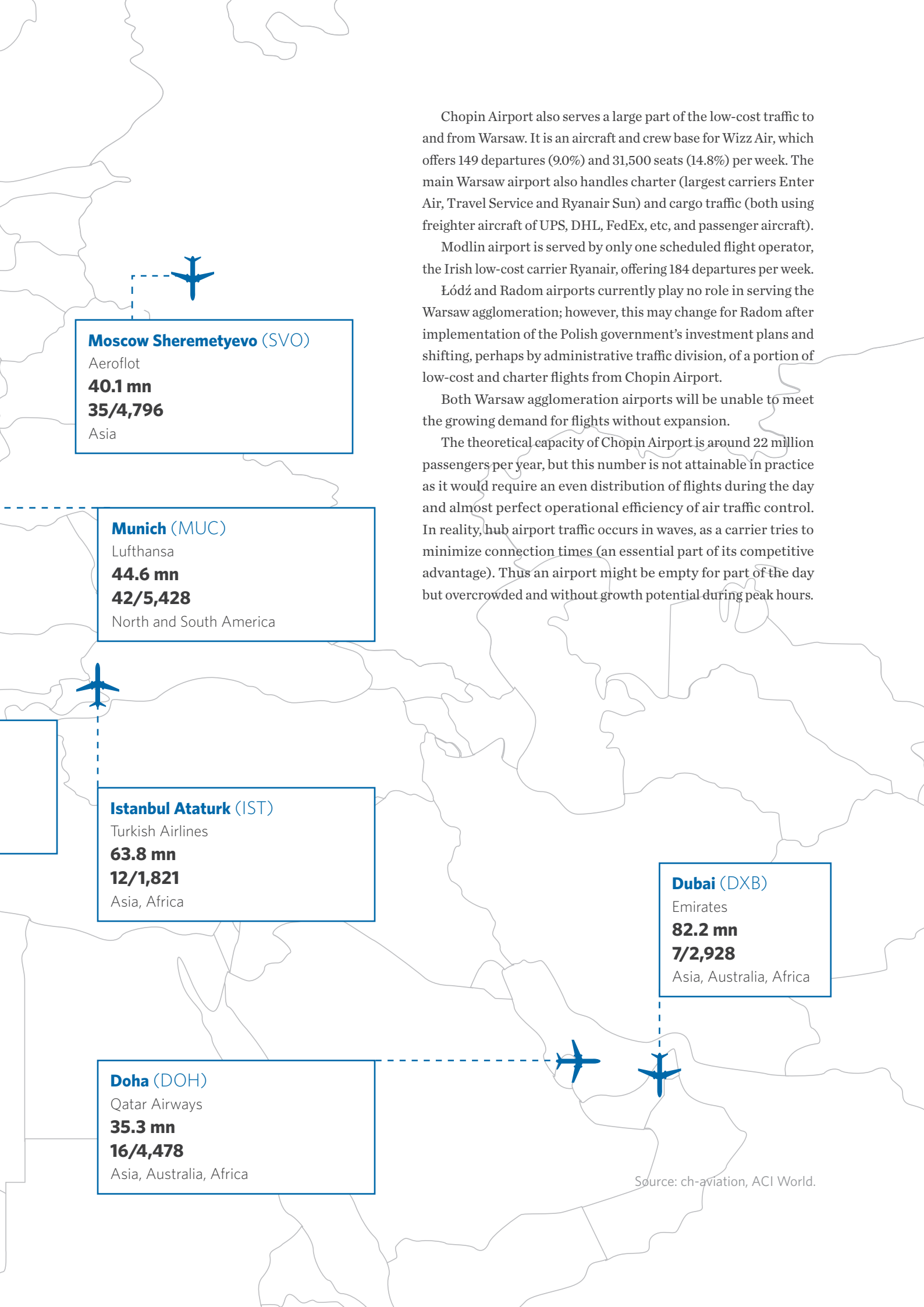
Chopin Airport also serves a large part of the low-cost traffic to and from Warsaw. It is an aircraft and crew base for Wizz Air, which offers 149 departures (9.0%) and 31,500 seats (14.8%) per week. The main Warsaw airport also handles charter (largest carriers Enter Air, Travel Service and Ryanair Sun) and cargo traffic (both using freighter aircraft of UPS, DHL, FedEx, etc, and passenger aircraft).

Modlin airport is served by only one scheduled flight operator, the Irish low-cost carrier Ryanair, offering 184 departures per week.

Łódź and Radom airports currently play no role in serving the Warsaw agglomeration; however, this may change for Radom after implementation of the Polish government's investment plans and shifting, perhaps by administrative traffic division, of a portion of low-cost and charter flights from Chopin Airport.

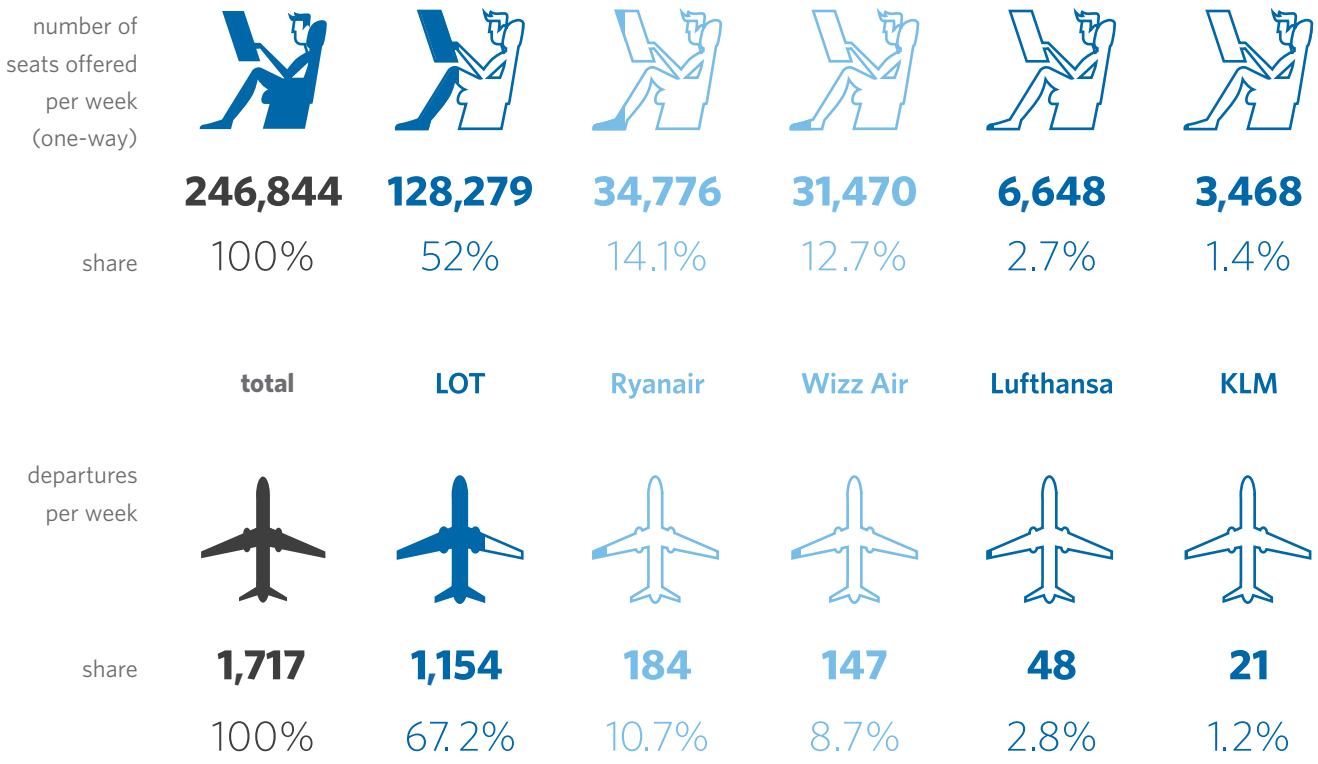
Both Warsaw agglomeration airports will be unable to meet the growing demand for flights without expansion.

The theoretical capacity of Chopin Airport is around 22 million passengers per year, but this number is not attainable in practice as it would require an even distribution of flights during the day and almost perfect operational efficiency of air traffic control. In reality, hub airport traffic occurs in waves, as a carrier tries to minimize connection times (an essential part of its competitive advantage). Thus an airport might be empty for part of the day but overcrowded and without growth potential during peak hours.



Source: ch-aviation, ACI World.

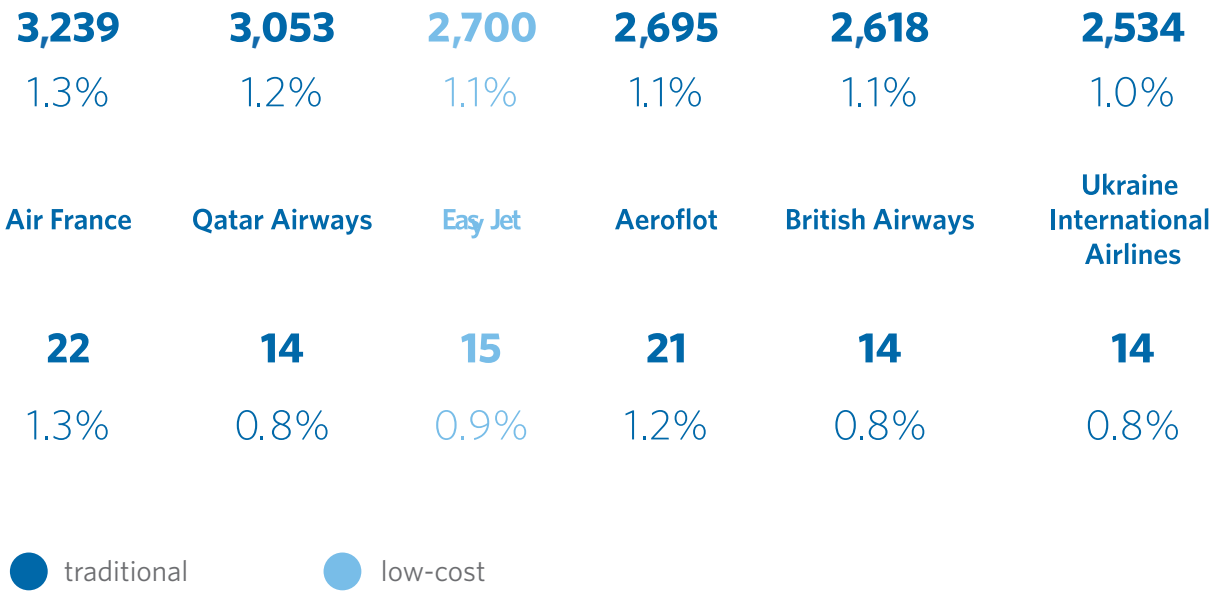
WARSAW AGGLOMERATION AVIATION MARKET



Additionally, other than the maximum serviceable number of passengers, traffic structure is also important. Chopin Airport does not have enough wide-body aircraft stations, and its non-Schengen traffic zone (serving all long-distance flights, as well as the UK, Ireland and Ukraine) is too small, as it was not designed as a large hub airport. Shortage of staff in ground handling companies, lowering the capacity of the baggage handling area, loading and pre-flight maintenance, is an additional limitation. Currently, during peak hours, especially in the summer season, Chopin Airport is overcrowded, flights are often delayed, and travel comfort is very low. The layout of two runways crossing in the middle also complicates operational efficiency.

Chopin Airport's expansion capabilities are limited mostly due to lack of space, especially in the critical non-Schengen zone, which almost adjoins the millitary area of the airport. The poorly planned route of the Warsaw ring road (S2 expressway) makes it impossible to construct a third runway, parallel to one of the current ones, which would significantly increase the capacity of the airport. Noise is also a severe limitation, as densely populated districts of Warsaw surround the airport.

The situation of Modlin airport is even worse, as in 2018 it exhausted the possibility of serving additional passengers. Capacity limitation mostly concerns the terminal. According to various estimates, the terminal can handle from 3 to 4.5 million passengers (in 2018 traffic was 3 million). Even with the most optimistic



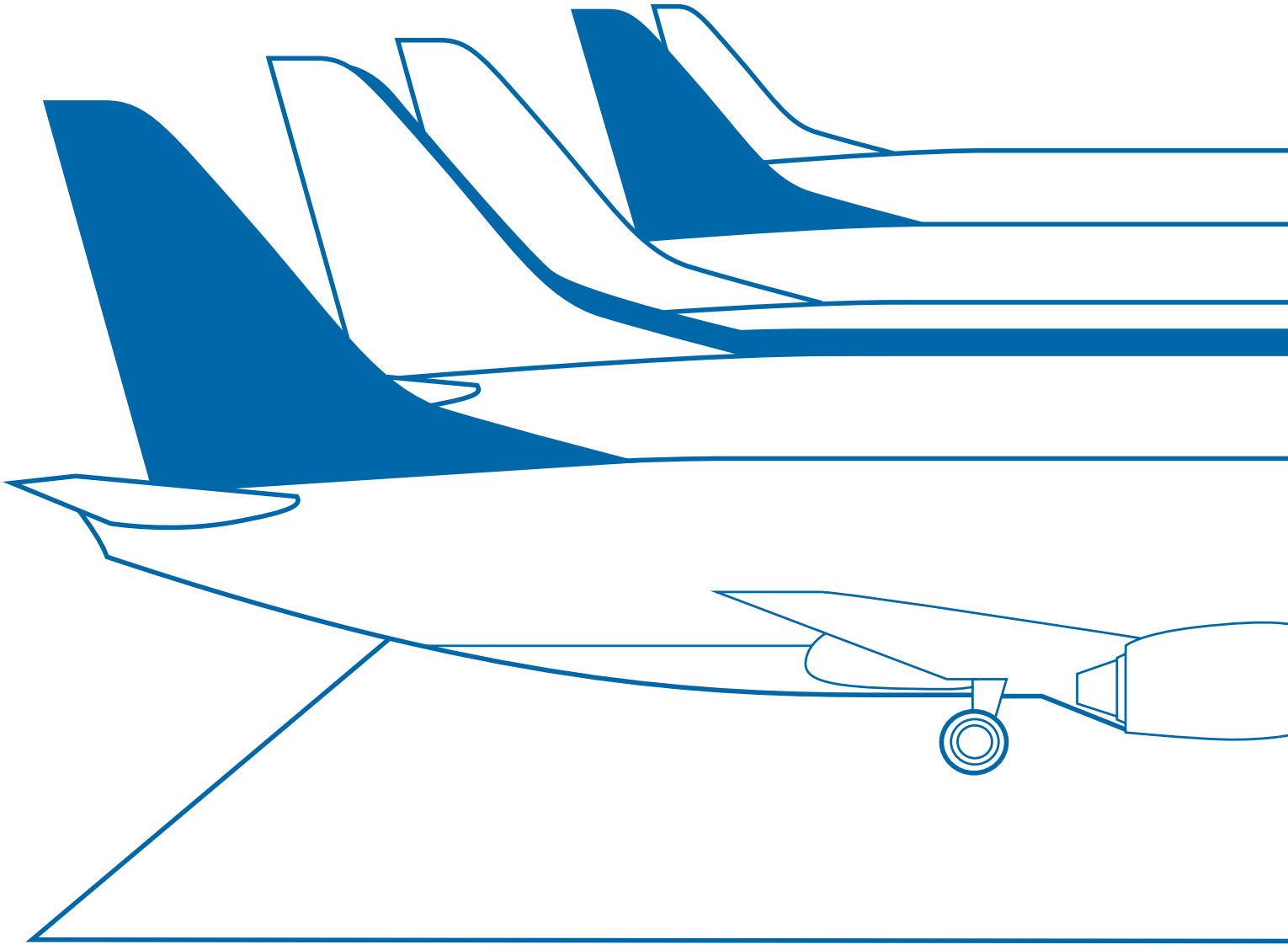
forecasts regarding passenger service, even with 3 million passengers the terminal is crowded and comfort is low. According to an ARUP analysis (Bujnik 2016), with this level of traffic the terminal should have an area of 25,000–30,000 m², but its area is only 12,500 m². Lack of free space also limits the growth of retail, which is the foundation of profitability for many low-cost airports. The airport infrastructure does not currently constitute a short-term limitation, but in the perspective of several years a major renovation or construction of a new runway will be required.

Polish air traffic growth forecasts

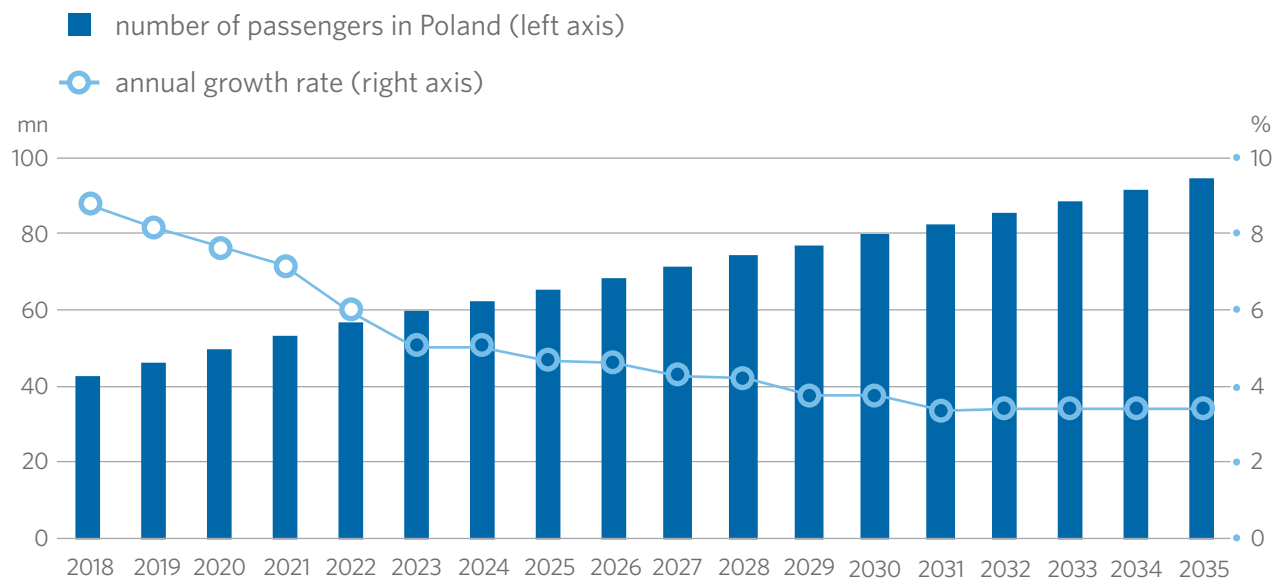
Globally air traffic shows medium- and long-term resilience to changing economic conditions. Statistically, the number of passengers all over the world doubles every 20 years. Currently it is difficult to identify any factors that could slow this trend, although it could be affected by climate change (more irregularities caused by extreme weather phenomena), regulations (such as a ban on short-distance flights) and, most importantly, lack of available airport and airspace capacity in Europe, North America and East Asia.

In Poland, the Civil Aviation Authority forecasts a stable increase in the number of air passengers. The forecast updated in 2017 predicts that in 2020 the number of passengers should reach almost 50 million (but data for 2017 and 2018 show that these estimates could be too low, as the growth rate is exceeding the forecasts). The next decade, as the market saturates, should prove a slowdown in growth dynamics, from 8% at the end of this decade to less than 4% in the next one.

According to a forecast by Eurocontrol, the European airspace control authority, until 2040 the number of aviation operations in Poland should grow by 1.9% per year on average. This means that in this period the number of daily flights in Polish airspace should rise by over a thousand. Even in the most pessimistic scenario, this means that 50,000 flights per year will not be operated due to lack of airport and airspace capacity. In the case of fast growth of global aviation, the capacity gap could exceed 200,000 flights per year. The same forecast claims that Chopin Airport would become one of the top 15 most crowded European airports, with flights delayed by 15–20 minutes just due to lack of capacity.

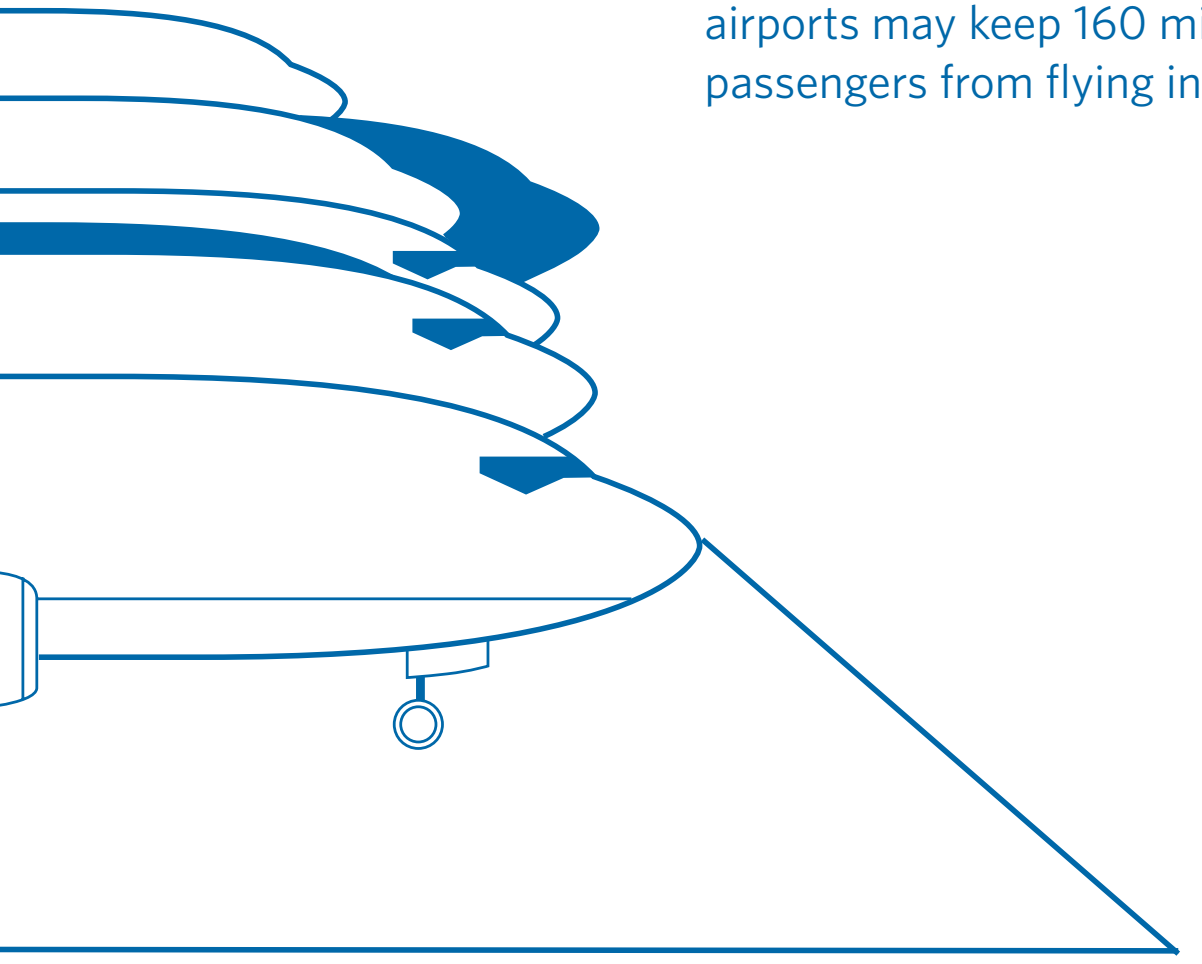


FORECAST OF AIR TRAFFIC GROWTH IN POLAND



Source: CAA.

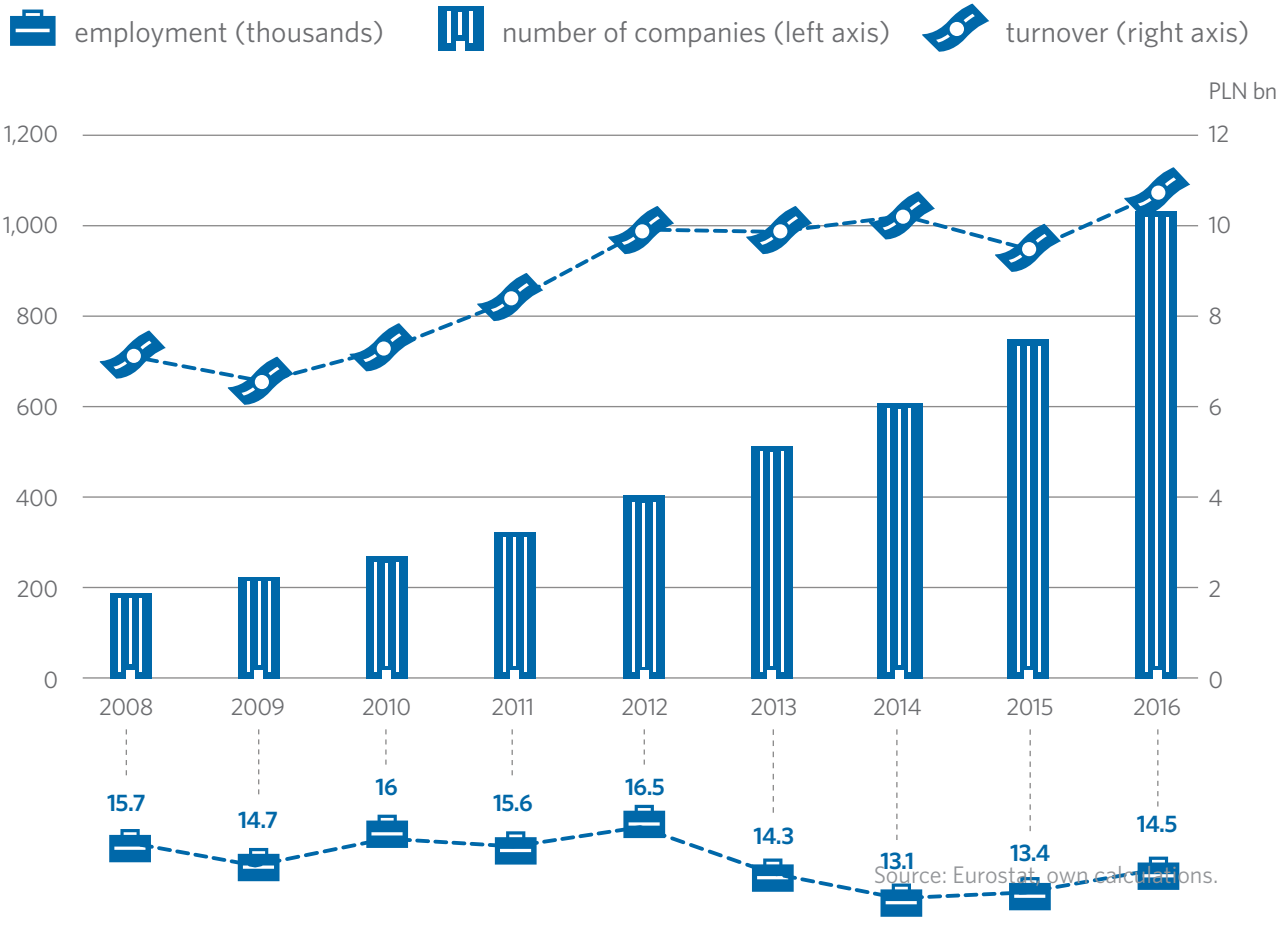
Lack of free capacity of European airports may keep 160 million passengers from flying in 2040.



Impact of aviation on the economy of Poland

According to the latest Eurostat data, in 2016 the aviation industry in Poland encompassed 1,032 companies, the largest number of companies since collection of such data began. This figure was made up by 442 companies servicing air transport of passengers, from the Polish flag carrier LOT Polish Airlines to local flying clubs, 74 air freight companies, and 516 companies supporting air transport: airports, air traffic control, and ground handling services for passenger and cargo transport. Altogether they generated turnover of PLN 10.6 billion while employing 14,500 people. Interestingly, despite the increase in the number of companies and steady growth in turnover, the number of employees in this industry has fluctuated around 15,000, with 2012 as the record year, with 16,500 people employed. This is arguably a result of the rising cost-effectiveness of the industry, as well as outsourcing of services. A significant fraction of workers switched to self-employment (resulting in a nearly tenfold increase in the number of companies in the last decade), while some of the most basic services, such as airport security and maintenance, have been subcontracted to companies from outside the industry.

POLISH AVIATION INDUSTRY* SIZE



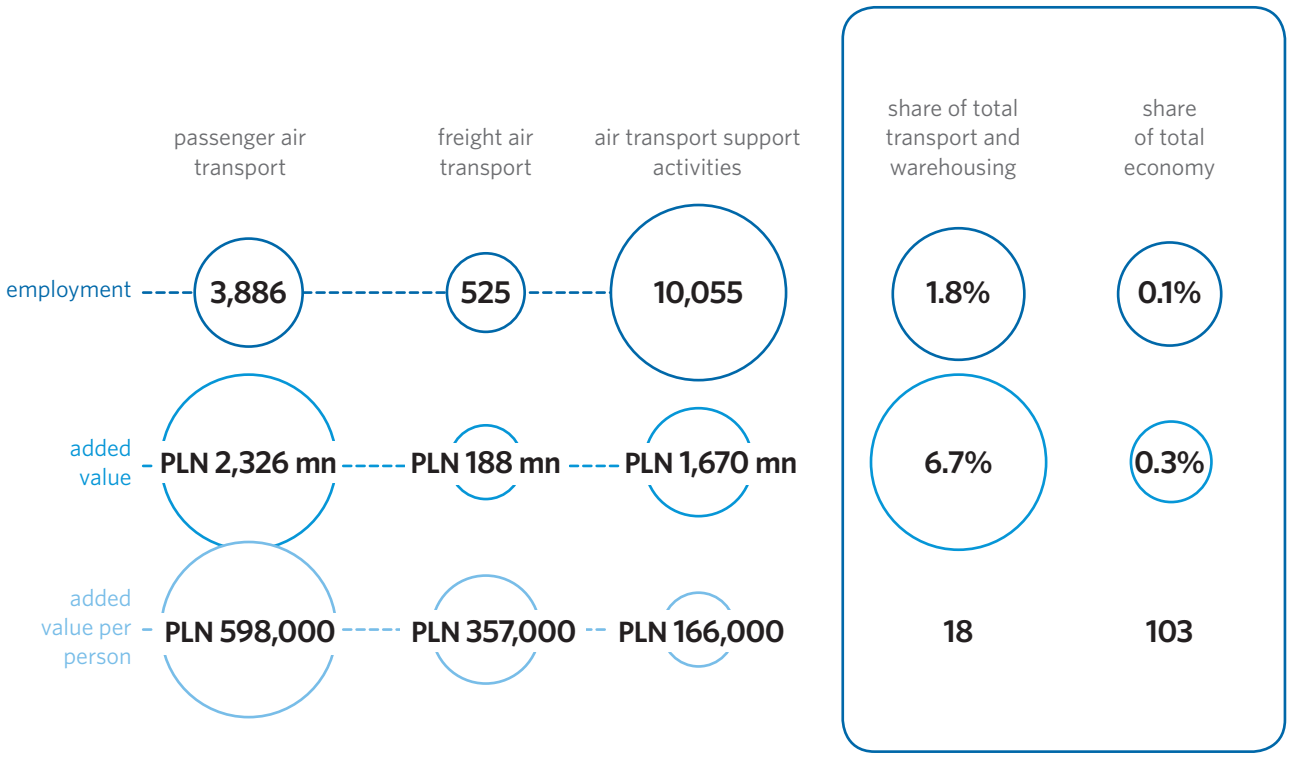
*classes: PKD 51.10 (passenger air transport), 51.20 (freight air transport), 52.23 (air transport support activities)

The aviation industry is one of the most efficient sectors of the Polish economy. One person employed in air passenger transport creates up to PLN 600,000 of added value, six times the average for Poland. Ground handling is the least efficient, creating around 2/3 more added value than the rest of the economy. As a result, the aviation industry's share in the economy is 0.3%, while it employs only 0.1% of all workers. The share of the aviation industry in the whole logistics sector, including warehousing and pipeline transport, is an astounding 6.7%, but the largest part falls to road transport.

There are also a number of companies operating in the direct vicinity of the aviation industry. These are airport shops, security and maintenance companies, transport companies moving passengers to airports and aircraft, as well as entities servicing and maintaining aircraft, from fuelling to de-icing. Additionally, there are companies cooperating with the aviation industry, not directly related to air transport but making it possible. These are IT companies guaranteeing the functioning of computer systems, fuel and energy companies, food and beverage firms supplying catering, as well as employment services companies allowing replenishment of the workforce.

Aviation industry employees create six times more added value than the average for the Polish economy.

POLISH AVIATION INDUSTRY STRUCTURE AND CONTRIBUTION TO THE ECONOMY



Source: Eurostat, GUS, own calculations

Based on a survey conducted as part of an InterVISTAS study (2015), we estimate that thanks to the Polish aviation industry, related companies employed 28,000 people in 2016 and created PLN 3.9 billion in total added value. For obvious reasons, this industry sector is not as productive as air transport companies themselves, and each employee there creates PLN 138,000 in added value per year.

An aspect often included in studies on the effect of the aviation industry on the economy are so-called multiplier effects. Due to the high added value generated by employees in this sector, as well as related high salaries, consumption of people employed in the aviation industry and investments of companies belonging to this industry have a significant impact on GDP. According to our estimates, such expenses raise GDP by PLN 3.3 billion (0.2%) and create 19,500 jobs in other sectors of the economy not related to the aviation industry in any way.

By aggregating information on the size of the aviation industry, companies operating in its direct vicinity, and the scale of multiplier effects, we have calculated that the aviation industry was responsible in 2016 for PLN 11.4 billion of added value to the economy, i.e. 0.7% of Polish GDP. This is much less than the European average (1.5%) but twice as much as the industry's contribution to GDP at the beginning of this decade. Companies operating air transport on islands and in smaller countries – Malta (5.1% of GDP), Luxembourg (4.7%), Cyprus (3.9%) and Iceland (3.7%) – have the greatest impact on their economies, which is understandable due to the tremendous significance of air transport for such countries.

Another, less tangible mechanism of the aviation industry's influence on the economy is increasing the economic potential of the region where the airport operates. This has a proven effect on a number of aspects of economic activity, from catalyzing international trade of exceptionally high unit-value goods (high tech), fostering an influx of new investments, especially foreign ones, and increasing the ability to attract world-class specialists, to a stimulus for growth of recreational and business tourism. According to an InterVISTAS study from 2013, Polish airports increased national GDP by 3.4%. Taking into account the growth of air connections between Poland and other countries, as well as the extremely rapid growth of regional airports, we estimate that in 2017 this influence was as large as 5%, twice the EU average (2.6% of GDP). This number is realistic, considering that availability of air transport is much crucial for developing countries and regions with low GDP than for those with high GDP per capita, where global business centres are located.

The aviation industry was responsible in 2016 for PLN 11.4 bn of added value to the economy, i.e. 0.7% of Polish GDP.

IMPACT OF AVIATION ON THE POLISH ECONOMY

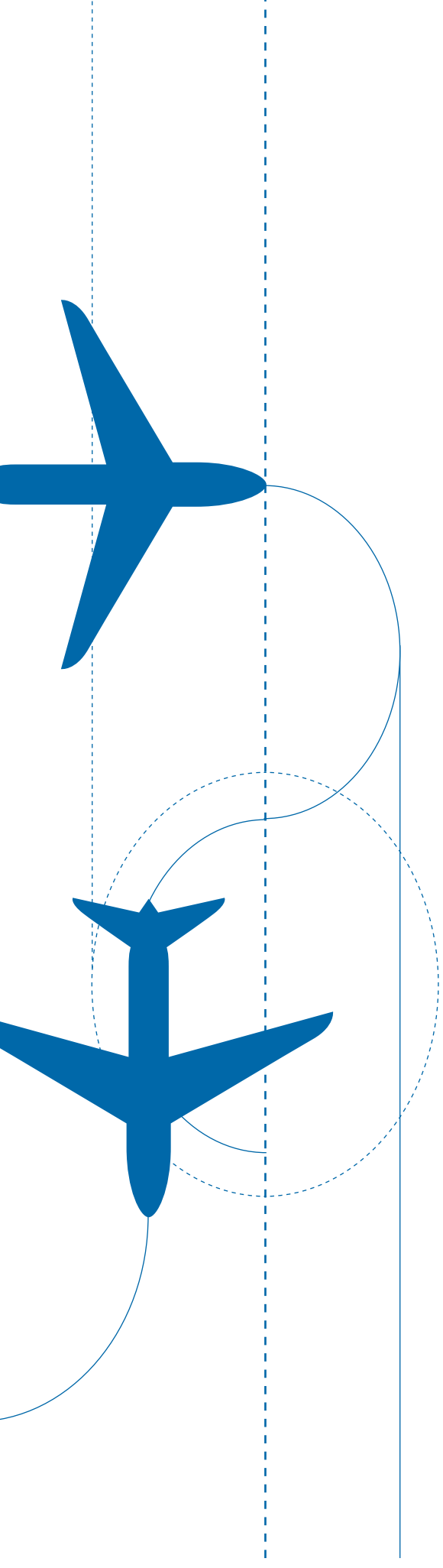
	direct impact	indirect impact	multiplier effects	total	% of total economy
employment	14,500	28,000	19,500	62,000	0.4%
added value	PLN 4.2 bn	PLN 3.9 bn	PLN 3.3 bn	PLN 11.4 bn	0.7%

Source: Eurostat, InterVistas (2015), own estimates.

Scenarios for central airports

The data presented in the previous chapter clearly indicate that the current airport infrastructure in central Poland will in the medium-term perspective be insufficient for serving the projected air traffic. Even if all planned investments at Chopin Airport are implemented, Modlin's ability to grow is unblocked, and Radom is adapted to serve scheduled flights, the capacity of this group of airports will be exhausted, depending on the traffic growth rate, after 2022–2025. At the same time, there are no doubts that overcrowding of airports and inability to meet demand for flights will negatively impact the development rate of Poland, as well as reduce the country's political importance.

Decisions on the expansion of Polish airports are at least five years late – they should have been made before 2013.



This means that central Poland requires prompt decisions on infrastructure expansion. Even in the most optimistic scenario, overcrowding of airports cannot be avoided due to the time needed to build new infrastructure. However, making proper decisions anchored in market reality, and successful implementation, independent of current politics, will allow minimisation of negative consequences in the short term, while contributing to Poland's economic growth and political position in the long term.

Among many analysed scenarios, there are four main ones:

a) construction of the Central Transport Hub while maintaining current airports in central Poland;

b) construction of the Central Transport Hub with shutdown of Warsaw Chopin Airport;

c) further expansion of the Chopin and Modlin airports (duoport);

d) complementing Chopin and Modlin airports with the Radom Airport (duoport+).

Despite existing controversies regarding the idea of CTH construction itself, the assumption that its development will proceed serves as the starting point for further analysis. Due to this, scenarios c) and d) will not be analysed. They should be treated as necessary provisional solutions, not permanent ones.

This assumption is the effect of the political will and determination of the Polish government to continue the construction of CTH. This decision has already been made and won't be retracted at least until the government changes. On the other hand, it is also a result of objective limitations on further development of the existing airports, primarily related to lack of space around Chopin Airport, as well as the environmental and noise-related circumstances of that facility. The authors are aware of divergent opinions regarding CTH construction, **but the following part of the report does not ask "if" CTH should be constructed, but "how" to do it in order to maximize benefits and minimize risk.**

An issue critical for further analysis is the decision on the future of Chopin Airport, as currently it serves the vast majority of Warsaw agglomeration and central Poland air traffic. Due to this, the general scenarios described below focus on the relationship between CTH and Chopin Airport. The future of the Modlin airport and, especially, the Radom airport still under construction, is not the most critical challenge related to CTH construction. However, the fate of the two smaller airfields will have a significant impact on specific decisions regarding the new projects, related for example to the planned traffic structure and the presence (or absence) of low-cost carriers at CTH.

Central Transport Hub replaces Chopin Airport

In the first variant, when CTH opens the existing Warsaw Chopin Airport will be closed to passenger and cargo traffic. (It could still function as a military or executive airport, serving business traffic using private planes.)

Such a scenario would require all carriers currently flying to Warsaw to switch to the new airport or abandon serving the Polish capital.

SWOT ANALYSIS

STRENGTHS

- consolidation of traffic at one airport
- identical conditions for all airlines: base LOT and other non-base airlines
- avoidance of environmental and noise limitations
- higher investments in logistics and business centres in the vicinity of CTH

WEAKNESSES

- shutdown of conveniently located Chopin Airport
- no time for return on investment in Chopin Airport expansion
- lesser appeal of CTH as a workplace, difficulties with acquiring tens of thousands of required employees
- lower growth rate of investments in Warsaw, and exit of some hotel investments from the capital

OPPORTUNITIES

- construction of a modern and efficient hub airport, attractive to passengers and carriers
- possibility of reusing the conveniently located Chopin Airport area
- using the aviation component of CTH as a spur to address overdue rail investments

THREATS

- worse access to the airport in comparison to Chopin Airport, lesser appeal of traffic to/from Warsaw
- project delays requiring interim solutions
- feasibility of new airport depends on LOT's condition and development plans
- limitation of growth of Warsaw as a business centre

CTH and Chopin Airport active concurrently

In the second scenario, launch of CTH does not lead to the shutdown of Chopin and Modlin airports. In this case, there are three large airports active in central Poland (or four if the Radom Airport development plan is implemented).

Regardless of keeping Chopin Airport active (in a reduced form, for example), LOT would move its flights to CTH in this example, as the new hub is necessary for the airline to implement its development plans. However, other carriers would have a choice. Limitations could be introduced at Chopin Airport, regarding for example the size of aircraft or number of flights. This would allow better management of the airport, but in practice, Chopin Airport and CTH would compete with each other to a degree.

STRENGTHS

- preservation of active Chopin Airport, with convenient location and transit near Warsaw business centre
- utilisation of current access infrastructure, with full return of investment in Chopin Airport
- easier development process (lower risk related to CTH delays)

WEAKNESSES

- further diversification of traffic in Warsaw agglomeration, lowering travel convenience and transfer possibilities
- prolongation of return of investment in CTH (due to lower traffic)
- further pollution and noise in Warsaw, and inability to reuse the Chopin Airport area

OPPORTUNITIES

- use of Chopin Airport for high-margin flights to and from Warsaw (not transit flights)
- precise traffic management and additional spare capacity, simplifying aviation expansion planning
- larger capacity of CTH for LOT with potentially lower construction costs (due to the lower amount of traffic from other airlines and building the airport with LOT in mind)
- creation of logistic and business centre in the vicinity of CTH

THREATS

- LOT's position weakened by carriers staying at Chopin Airport, closer to the city and preferred by passengers
- lowering of CTH traffic below the break-even point due to competing with Chopin Airport
- need to manage two large projects – Chopin Airport expansion and CTH – simultaneously

How to build CTH

Construction of an airport is a multi-year process, where critical decisions are made at the early design stage. Terminal architecture, aviation infrastructure layout, as well as airport financing and management model, all affect its later success as a transfer hub.

HUB AIRPORT SUCCESS FACTORS

Location

Impact: Hubs situated on main air traffic routes have the highest potential to succeed, as passengers don't need to make detours.

CTH situation: Central & Eastern Europe is conveniently located when it comes to transfers to two rapidly growing markets: Asia–Europe and East Asia–North America. The location of CTH will enable flights to Central Asia with cheaper medium-range airplanes.

Even the largest hubs serve mostly local traffic – the share of transit passengers rarely exceeds 50%.

Airport attractiveness

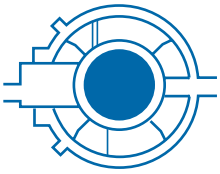
Impact: For some passengers, especially in case of longer connection times, the airport itself may be a factor when choosing an airline – a terminal with numerous shops, restaurants, attractions, and hotels appeals to travellers.

CTH situation: CTH may become an airport attractive to passengers, but due to higher construction costs in Poland in comparison to Asia and the Middle East, attempts to match airports such as Singapore or Dubai seem unrealistic.

Connection time

Impact: The shorter the minimum connection time (MCT), the more attractive a hub is. This factor is influenced by the flight schedule of the base carrier, terminal design, and efficiency of security checks, baggage handling etc.

CTH situation: CTH will be a newly-designed airport, so it can be designed with a maximum reduction of connection times in mind: 30 minutes in the Schengen zone and about 60 minutes when border control is required.



Aviation infrastructure

Impact: In the case of hub operations, timeliness (dependent on runway and taxiway layout, as well as ground handling and air traffic control efficiency, etc) is very important.

CTH situation: The Polish Air Navigation Services Agency is already preparing to increase the efficiency of air traffic management. Constructing an airport from scratch allows rational design of aviation infrastructure. The most significant challenge will be the quality of ground handling, dependent on employees not currently present on the market.

Base carrier

Impact: A hub is attractive only when it allows numerous connections to various destinations.

CTH situation: The current growth prospects of LOT are excellent, which makes building a connection network similar to current midrange hubs (such as Vienna, Copenhagen or Munich) more probable.

City access

Impact: Even the largest hub airports also function as important gateways to the cities they serve—at most of them, the share of local traffic exceeds 50%. Transit between a hub airport, usually located quite far from the city centre due to noise and environmental issues, and the city centre is one of the critical factors for an airport's appeal for local passengers.

CTH situation: As an airport located around 40 km from the Warsaw city centre, CTH is dependent on accompanying development of land infrastructure (especially rail). The airport will become an attractive site serving Warsaw only if transit time from the centre does not exceed 30 minutes.

Building an airport is not difficult. The difficulty lies in constructing a good airport.

Due to the time-consuming nature of the CTH design and construction phases, as well as the long period to recoup the investments, it is necessary to place the project on the map of market trends influencing the probability of success of such an ambitious undertaking.

Besides trends directly related to the aviation industry, discussed above, CTH will be influenced by broader geopolitical changes, such as the future of the Schengen zone and the European Union, as well as Polish and regional economic trends.

What will be the influence of market changes on CTH?

TREND 1 THE CHANGING ROLE OF LOW-COST AIRLINES

Boundaries between low-cost and full-service airlines on the European aviation market are becoming more and more blurred, especially in the short-distance flight segment. Low-cost carriers are currently offering (although not widely yet) transfer tickets not only inside their connection network (Ryanair, for example) but also in cooperation with other airlines, including full-service ones (e.g. easyJet). They have also introduced special offers for business passengers and foregone serving secondary airports (located further from cities) in favour of primary airports. The long-haul low-cost flight model is also gaining popularity (in Europe it is offered by Norwegian and Eurowings, among others).

On the other hand, full-service carriers increasingly offer services imitating low-cost carriers—without checked baggage and in-flight meals included in the ticket price. They have also been creating subsidiaries aimed at competing with low-cost airlines.

Due to these changes, we hear more and more often of hybrid airlines. In Europe, one example is the Irish Aer Lingus, owned by IAG. Norwegian also blends low-cost and full-service airline models, for instance flying through its own hubs. In the short-term perspective, low-cost airlines (owned by groups or independent) will probably take over an increasing number of short-distance European routes.

Are low-cost carriers going to fly to CTH?

✓ If YES, it is necessary to construct infrastructure meeting the needs of such airlines: simpler, cheaper in operation, but highly efficient. Low-cost carriers can be served in the same or a separate terminal.

Are full-service airlines still going to operate short-distance flights themselves?

✓ If YES, the terminal design must be prepared in close cooperation with the base airline (LOT) and be tailored to its needs, allowing the simplest possible connections in its connection network.

✗ If NO, the same coordination with a larger number of airlines will be required, including possibly also rail and bus lines that can transport passengers for example on domestic routes – they should also be provided the most convenient connections.

Amid pressure to lower airport charges, will airports profit mostly from retail activities?

✓ If YES, the terminal design must include extensive commercial infrastructure, as well as office buildings and hotels. At the same time, it should be constructed in cooperation with the base carrier and retail sector, to maximise the convenience of travel.

TREND 2 EXPANSION OF LOT

A hub airport is always strongly dependent on its base carrier, as it is the only airline to fully utilise aviation and passenger infrastructure designed with connection optimisation in mind. In the case of CTH, unless a new company aspiring to this role is created in the next few years, LOT Polish Airlines is the only possible base carrier. If LOT were acquired by an aviation group, the new owner could also make CTH its hub.

Is LOT going to reach the planned increase in passenger numbers?

✓ If YES, the Polish carrier will be able to fill CTH on its own. In such case, the airport should be constructed with some room to grow, in order to secure free capacity for some years after its launch.

✗ If NO, assumptions regarding the size of CTH should be reviewed and possibly lowered, in order to avoid rescaling of the airport.

Is LOT going to enlarge its long-distance fleet

✓ If YES, the airport needs to be designed adequately in terms of the number of positions for wide-body aircraft, transit area efficiency and border control capacity. The inefficient and too small non-Schengen zone at Chopin Airport is one of the main factors blocking LOT's expansion.

Is LOT still going to serve domestic routes?

✓ If YES, it is necessary to adapt the airport infrastructure and terminal design for the fastest possible transfers from small planes, often located at positions far from the terminal.

✗ If NO, domestic routes will be replaced by rail connections, so it will be necessary to adapt the terminal to fast intermodal transfers.

TREND 3 CHANGING IMPORTANCE OF HUBS

Development of new types of wide-body aircraft, such as the Boeing 787 Dreamliner and the Airbus A350, as well as narrow-body ones (Airbus A321neo, Boeing 737 MAX 8), enables the launch of new direct flight routes that were not profitable before due to aircraft size or distance limitations. More direct flights mean fewer transfers at hubs and a larger number of flights between secondary airports. Expansion of long-haul low-cost airlines is part of this trend.

Overcrowding of European hubs, losing market share to rapidly growing airports in Asia and the Middle East, is an additional factor. The launch of the new Istanbul airport, construction of the Dubai hub and expansion of Qatar Airways are why a large number of passengers travelling between Europe or North America and Asia choose a transfer in the Middle East, not the European Union.

Are direct flights going to replace hubs completely?

✓ If YES, this will negatively impact CTH traffic and change its profile (lowering the number of transit passengers). In the case of LOT, potential launch of direct long-distance flights from airports in Central & Eastern Europe (Budapest, Bucharest, Prague, Kiev, etc) by new airlines would have the most significant impact.

Are existing hubs going to be expanded?

✓ If YES, this will worsen the competitive position of CTH, forcing it to compete with expanded and established hubs. Expansion of existing airports – provided regulatory issues are resolved – is also faster than building a Polish hub from scratch. Thus, any development of European and Middle Eastern hubs will indirectly limit the growth potential of CTH.

Will the EU remain a competitive transfer location?

✓ If YES, this will strengthen the potential of CTH as an airport with an optimal geographical location for transfers to and from Asia.

✕ If NO, for example due to more and more strict environmental or social regulations lowering the profitability of European carriers, this will limit transfer traffic through CTH.

TREND 4 NEW PASSENGER FLOW DIRECTIONS

Forecasts show that Asia and Africa are the fastest-growing aviation markets, but in the case of Africa this is mostly due to the low base level and severely underdeveloped network of intracontinental connections.

Is the Asian market going to grow at its current rate?

✓ If YES, CTH will be one of the best-located hub airports. The airport design should take into account the preferences of Asian passengers (such as honouring Chinese payment cards).

✕ If NO, CTH may lose one of its main competitive advantages, leading to a decrease in traffic served.

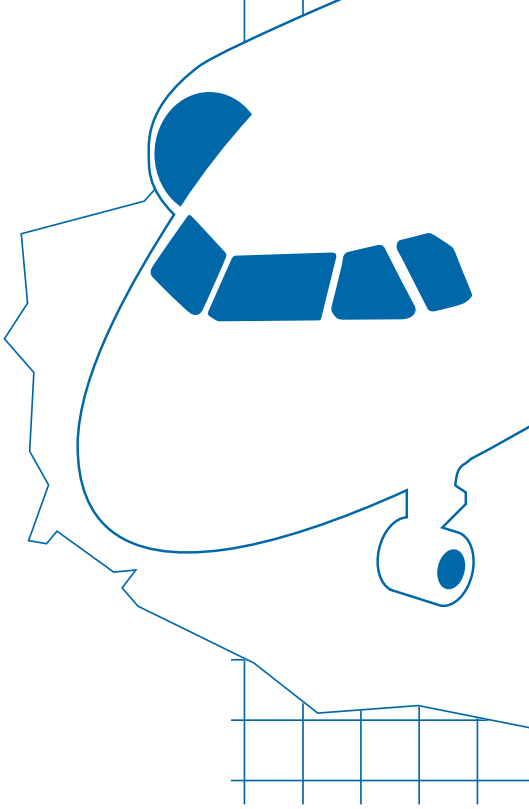
Are short-distance flights still going to be operated?

✕ If NO, the airport design needs to take into account alternative ways of transporting passengers, especially rail. It also needs to be ready for a relatively simple and cheap way to expand the terminal to include autonomous air taxis or a hyperloop.

Is there going to be an increase in traffic to new destinations, such as Africa and Central Asia?

✓ If YES, CTH's role will depend on destinations where demand is growing the fastest. Should these be Eastern markets, LOT and CTH may benefit from the convenient location and play a significant role. In case of faster growth of, for example, African or Latin American markets, traffic will move to hubs located more conveniently, such as Lisbon, Rome, Madrid or the Middle East.

CTH will increase Polish GDP by 3.2% during construction.



Potential gains and losses of the Polish economy

Expansion of aviation infrastructure has a dual effect on the economy. In the short term it stimulates demand, especially for construction and installation services, as well as manufacturers of raw materials required for construction of airports and related transit routes. In the long term, construction of an airport expands economic potential, fosters the growth of investments, and catalyzes international trade, especially in highly processed goods.

The impact of CTH construction on demand in the economy is relatively easy to determine. According to government estimates, all investments related to the airport will total some PLN 35 billion, with the aviation component taking up to PLN 16–19 billion (USD 4–5 billion). This equals 2% of Polish GDP, based on 2017 prices. Such a demand stimulus will spill over to various sectors of the economy (secondary effects) and cause relatively strong multiplier effects (increase in consumption and investments in other sectors). We estimate that it should additionally increase GDP by PLN 20.1 billion (1.3%), with PLN 13.5 billion in secondary effects, visible especially in the sectors of construction, trade and construction materials processing (cement, concrete, asphalt and steel). Another PLN 6.6 billion will be generated by multiplier effects, distributed evenly across the whole economy and not limited to the central voivodeships. In total, the demand effects of CTH construction should raise GDP temporarily by 3.2%, supplying a significant growth impulse, especially during the nearing economic downturn.

It's much more difficult to gauge the impact of CTH construction on the development of Poland in the long term, as it depends on both the economic growth of the country and the success of the project itself. What is more, econometric studies (Mukkala, Tervo 2013) show that these two factors are connected recursively. Air traffic scale strongly depends on the economic development of the region where the airport is located, but at the same time the construction of the airport stimulates the development of the vicinity, especially in the case of regions with a low starting GDP. Thus airports serve as triggers for economic potential, meaning that they don't stimulate growth when they are constructed in economically barren regions or their construction does not increase the number of connections available to passengers from the region (Button, Soogwan, Junyang 2009). This lack of positive economic effects of new airports has a scholarly name (the Appalachian Effect), and numerous examples, such as Mirabel Airport near Montreal, Canada, can be offered. [3]

From the macroeconomic perspective, to ensure the long-term benefits of CTH construction it is necessary to fulfil at least two boundary conditions. First, the CTH airport must be included in the ground transport network (both passenger and cargo). Transfer time to the centres of Warsaw and Łódź cannot be longer than 30 minutes for the airport to serve business and tourist traffic from both cities. Short transit times will also ensure optimal availability of a cheap workforce, as the job market in the immediate vicinity of the airport is too small to mitigate the shortage of employees without the need to significantly increase salaries. This factor is even more important in light of the very low mobility of the Polish

3. Montréal–Mirabel Airport, about 40 km from Montreal, was opened in 1975 and was supposed to replace the existing Montréal–Dorval Airport, but because of poor access and continued operation of the old airport, airlines didn't want to move to the new airport. Since 2004, Mirabel has hosted only cargo flights and the Bombardier manufacturing plant. The main airport for the city remains Dorval (Montréal–Pierre Elliott Trudeau International Airport).

workforce compared to other EU members. Initial estimates show that CTH and all its subsidiaries may require 100,000 or more employees, from low-skilled workers to specialists, such as aircraft technicians, air traffic controllers etc.

What is more, one of the main factors of CTH's economic success is the future of Chopin Airport. Maintaining its current functionality would definitely decrease the macroeconomic benefits of CTH, as it would endanger the development of the new airport – airlines would not be eager to move to the new facility farther from the city and viewed as less convenient for passenger access.[4] On the other hand, full shutdown of the existing airport could endanger the development of Warsaw itself. Currently the capital of Poland is one of the fastest-growing business centres in Europe, thanks among other factors to the convenient transit offered by Chopin Airport. Additionally, in the vicinity of the airport there is significant hotel and transport infrastructure. Shutdown of the airport would mean retiring these projects, with a total value of billions of zloty and employing some 10,000 people. These risks could be minimized in the case of a very well-designed CTH transit connection to Warsaw business centres, with transit taking no longer than now, 25–30 minutes (although it would not be possible to avoid the negative impact on the local economy in the vicinity of Chopin Airport). At the same time, total shutdown of the existing airport would create a chance to redevelop this part of Warsaw, ensuring both a short-term development stimulus and, in the long term, a chance to create high-quality public spaces and new jobs. During the transition period, after shutdown of Chopin Airport but before the redevelopment is finished, there would be negative economic consequences.

It is also open to discussion if it's possible to use regulatory and operational means to construct a traffic model for Chopin Airport eliminating the competition with CTH and providing added value to the economy. If so, the airport could still serve business passengers, preferably only on Schengen area routes, as a destination airfield. Limiting the size of the airport would still allow urban development projects, for example through demolishing part of the terminal, the cargo terminals, or one of the runways.

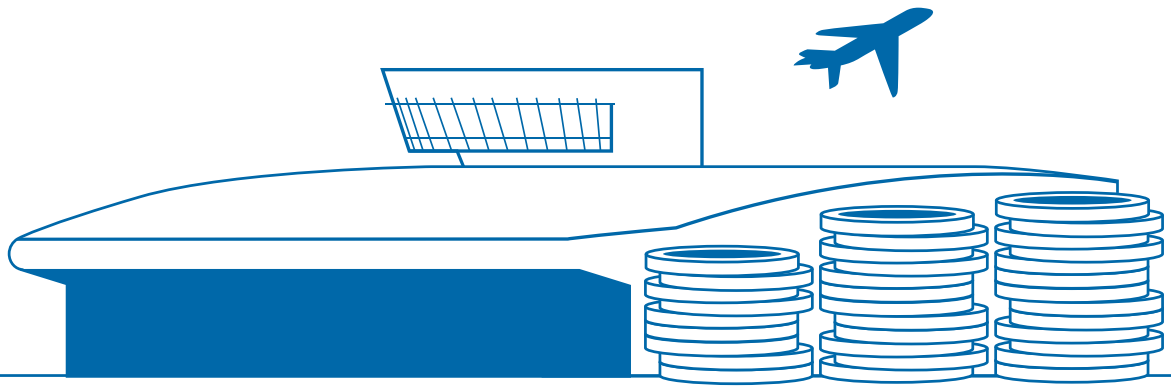
If both of these conditions were met, the macroeconomic benefits of CTH construction would be definitely positive and felt by many sectors of the economy, Firstly, CTH construction would definitely improve the significance of the region as a European logistics hub. Even now there are a large number of warehouses, distribution centres and freight centres in the area between Warsaw and Łódź. Launch of CTH, with transactional costs of air freight much lower than Chopin Airport, as well as a smaller distance from distribution centres, would speed up the development of intermodal trade in the region, especially in the case of highly processed goods. Air transport is responsible for 35% of global trade measured by value, but only 0.5% measured by volume (ATAG 2016).

Secondly, a well-connected and constructed airport would allow a large increase in the volume of air passenger travel to and from the region, as well as serving the growing number of people changing flights in Poland. Looking at the scenarios described in the first chapter, this would mean that the launch of CTH would significantly decrease the capacity gap, i.e. the inability to meet the demand for

4. Passenger perception is crucial in this respect, as an airport located far from the city may be perceived as less convenient even when access to the airport takes about the same amount of time. A good example is the airports in the London region: travel time from the low-cost Luton and Stansted to the city centre is only slightly longer than from the principal airports of Heathrow and Gatwick, but these two groups of airports are perceived very differently.

flights due to the lack of free airport capacity. Estimates claim that in 2040 Europe will be unable to serve 160 million passengers—but CTH could serve as many as 50 million travellers that year. This would mean some 120,000 additional jobs in the aviation industry and related sectors, as well as 400,000 additional jobs in other sectors of the economy. In total, CTH construction would mean a permanent increase of demand in the Polish economy by 4.5% of GDP.

Thirdly, CTH construction would also contribute to development of the Mazovian voivodeship. The vicinity of the airport would probably see the creation of a science park and a business centre for companies with foreign capital. Adding these three elements together, we can estimate that in an optimistic scenario of full CTH functionality, the share of the aviation industry in the Polish economy would rise to around 7% of GDP—one of the highest levels in the European Union. At the same time, should these boundary conditions not be met, construction of the airport would decrease the medium-term competitiveness of the Polish economy by slowing the economic growth of Warsaw and causing stagnation of air traffic in the region, instead of increasing it.



Who is going to pay for CTH construction?

Construction of a new hub airport in Poland is not an engineering challenge, especially in comparison to similar projects in other regions, such as Asia, where new airports are often constructed on artificial islands or difficult terrain. The challenging aspects will be environmental (including noise-related) limitations, as the EU regulations are much stricter than the legal frameworks in Asia or even the United States. This is one of the issues behind the lack of investment in new aviation infrastructure in Europe. A great example is the still unapproved construction of a third runway at the extremely overcrowded London Heathrow.

European Union

PROBABILITY: minimal

The European Commission objects to devoting EU funds to aviation projects, especially construction of new airports. Large airports are usually profitable, so they don't require subsidies and, according to the Commission, should be financed by private investors. There is no chance for financing the air component of CTH until 2020 and that is unlikely to change later. The EU might however subsidize some supporting investments, especially rail-related.

State budget/Polish Airports State Enterprise (PPL)

PROBABILITY: medium

Financing the project from the state budget is the simplest solution in terms of organization, as it does not require obtaining an external partner. With construction costs spread over the planned 8-9 years, the air component expenses would not exceed PLN 2 billion per year. The state budget could bear such an expense, although it would be a significant burden. Financing the project from the budget is risky, however, due to the lack of experience in such complex development projects, as well as the significant costs.

Commercial investor (infrastructure fund or other)

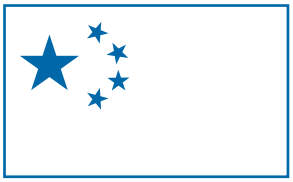
PROBABILITY: medium

Large airports are profitable enterprises, with a high return on investment. Even if the forecasts for the rate of air traffic growth in Poland and CTH itself turn out to be overstated, the airport operator should definitely profit – even with the current traffic volume at Chopin Airport, PPL can show stable profits. Commercial investors are interested in the project and could finance the whole project or part of it in exchange for a share in the operating company.

Industry investor (especially from Asia)

PROBABILITY: very high

An industry investor could be an existing airport operator – the companies operating airports in Singapore, Hong Kong, South Korea, Japan and Taiwan seem the most likely candidates. European entities, such as Vinci, Aéroports de Paris and Fraport, seem less likely. Such an investor could offer knowhow for designing, constructing and managing a hub airport, critical to CTH's success. This makes such partners the most attractive. In exchange for an investment they would probably expect a concession to operate the airport after its opening.



Chinese investor

PROBABILITY: high

Chinese capital (industrial and commercial) is very interested in European infrastructure projects, and CTH is one of the most important ones, also in the context of the Belt and Road Initiative. The availability and costs of such financing are not an issue, and some Chinese professional investors could also provide the necessary knowhow. However, such financing is the most risky in terms of geopolitics, as Chinese investors attempt to take over the market, often deliberately leading recipients of financing into a debt trap.

Airline

PROBABILITY: minimal

A carrier – most likely LOT – will definitely not finance the construction of the whole airport, due to the cost. It can however participate in financing of the passenger terminal. At the same time, cargo carriers could pay for the construction of cargo handling infrastructure. This financing model is quite popular (Lufthansa is a co-owner of the terminal in Munich, for example), but in the Polish reality the probability of such a solution is limited due to the modest cash reserves of LOT and more urgent investments in its fleet.

Hybrid models of CTH aviation component financing are also possible. Cooperation of commercial and professional investors seems most likely – the former providing financial means and the latter know how – in exchange for the opportunity to manage the airport.

CTH – legal perspective

Authors: Baker McKenzie

Large, systemic infrastructure projects are implemented more efficiently under a special act.

CTH Act

The Central Transport Hub Act of 10 May 2018 (Journal of Laws 2018 item 1089), regulating critical issues regarding preparation of the construction of CTH and supporting projects, entered into force on 21 June 2018.

Adopting a special act devoted to a large infrastructure project may be controversial, as it allows significant deviations from the basic procedures set forth in the Administrative Procedure Code, but experience shows that special legislation can significantly expedite such projects.

At the same time, the special act introduces a number of distinct procedures, different from the general regulations in force:

- it simplifies administrative proceedings, such as obtaining licences, abandoning the standard procedure described in the Administrative Procedure Code;
- it changes the method of real estate management, creating a special regime (lex specialis) in relation to the Property Management Act;
- it provides specific solutions for implementation of supporting projects, also related to and arising under other special acts;
- it coordinates the new regulations of the special act with the existing legal framework.

The CTH Act is a comprehensive regulation facilitating overall preparation and implementation of construction of the airport, as well as required access roads, stations, railways and other necessary projects.

Issues regulated by the CTH Act	Details
Site preparation	The area designated in the Council of Ministers regulation will be subject to special rules of spatial planning and management, real estate management and implementation of a public-purpose development.
Decision on siting of the Central Transport Hub (integrated decision)	The decision will allow partition and joinder of real estate in the designated project area. It will be the basis for the building permit and as such will be binding on the relevant administrative authorities in cases such as landmark protection, delivering, vacating and taking over of real estate, entries in the land register and cadastre, and other administrative issues.
Purchase of property in the area of the planned development by the State Treasury with compensation, as well as purchase of the perpetual usufruct rights to such property by the special-purpose vehicle (created by the special act)	The act defines the rules and procedure for such purchases.
Establishing limitations on use of neighbouring properties	The act ensures efficient implementation of the project (CTH and supporting projects).
Compensation for expropriation of real estate and creating limitations on use of real estate	The act defines the rules and procedure for granting such compensation.
Building permit	
Legal aspects of project implementation	For example, details of the operation and tasks of the special-purpose vehicle

All these changes are supposed to created systemic integrity of the regulations (eliminating potential ambiguities in interpretation) while increasing the efficiency of the whole project. Another goal is to achieve a compromise between the requirements of the development (CTH and supporting projects) and protection of the rights and interests of other entities.

The special act is an optimal solution, introducing effective tools for acquisition of real estate and the required legal and administrative permits, without generating extraordinary legal risks or other hazards. The special act also secures appropriate protection of the rights and interests of persons and entities affected by the project, such as the rights of the owners of expropriated real estate.

Permitted legal models of CTH contruction

Based on the special act, construction of CTH, as well as the installations and facilities required for its functioning, should be implemented by a special-purpose vehicle wholly owned by the State Treasury. Besides the airport component, the SPV will be responsible for projects supporting CTH, such as construction of railways, public roads and transmission networks required for the proper functioning of the new airport.

Public tasks may be executed by public-sector entities themselves or in cooperation with private parties. In the latter case, depending on the scope of the enterprise, financing sources, preferred division of tasks and risks between the contracting entity and the contractor, as well as the know how and experience of the public and private entities in implementation of such projects, public entities may choose among three models of public-private cooperation:

1. classic public procurement model ("procurement model")
2. public-private partnership model ("PPP model")
3. concession for construction works and services model ("concession model").

The scope of the undertaking the public entity will entrust to private contractors will partially determine its implementation model by itself. The PPP and concession models presume, in addition to contracting the construction works, also the long-term management or maintenance of the infrastructure by the private entity. The procurement model assumes entering into a short-term contract with the contractor (up to 4 years as a rule) for construction works, possibly including supporting services, supply of materials or just services themselves. Comprehensive assignment of the long-term execution of the undertaking, including implementation of the construction stage, as well as infrastructure management or maintenance during the operation stage, is possible under the PPP or concession model, while contracting a narrow scope or a specific project stage is typical for the procurement model.

Another key aspect differentiating the approved model for implementing the project is the financing sources (described in more details in p. 47-49 of the report), as well as the preferred division of tasks and risks between the public entity and the contractor. These factors directly influence the model for compensating the contractor.

In the procurement model, the project will be financed solely by the public entity, bearing all the economic risk, while the compensation of the selected contractor for work or services performed will be just a payment by the contracting entity. The situation is different in the other models.

Public-private partnership is based on a division of tasks and risk in a way agreed upon by the public and private entities. Compensation of the private partner is as a rule dependent on the actual use or availability of the subject of the partnership, and takes the form of an availability fee paid by the public entity in the operation stage. Usually, in the case of undertakings using the PPP model, income due directly to the public entity, such as taxes, public funds or levies collected for performing specific public services, is the source of financing such fee.

In the concession model, the private entity assumes most of the economic risk related to contract performance. It is presumed that the private entity will obtain its compensation mainly from the market, in the form of fees paid directly by users of the infrastructure, but without any guarantee that the private entity will recover its project expenditures or operating costs. In other words, unlike the procurement model, in both the PPP and concession models, the private partner or concessionaire finances the construction stage itself and recoups its expenditures only in the operation stage. The difference between these models is that the private partner in PPP receives compensation that may consist only or mainly of the availability fee paid by the public entity, while the compensation of the concessionaire should be solely or mostly fees from the users of the completed infrastructure.

From the perspective of the permissible allocation of risk between the parties and the contractor compensation model, the PPP formula is generally the most flexible of the three. This makes it especially attractive for contracting entities trying to carry out very complex undertakings (in terms of technical, legal and financial aspects). This is especially true in the case of enterprises where the final shape and sources of financing are not yet known to the contracting entity. In this model, all these issues can be agreed upon at a later stage of project implementation, during the selection of the private partner.

Additionally, the latest revision of the Public-Private Partnership Act introduced significant leeway for contracting entities in choosing the procedural rules under which the private partner is selected. This change was introduced to eliminate the risk of selection of an incorrect procedure by the contracting entity at an early stage of the project, should the premises and original risk-sharing concept change later due to negotiations with the private entity. According to the amended regulations, regardless of the final risk-sharing arrangement and private partner compensation model, the procedure for selection of the partner can always be conducted pursuant to the Public Procurement Law. Contracting entities can also choose a less rigorous licensing procedure if from the start they are sure that the economic risk will be borne primarily by the private party.

The public entity can also implement an undertaking in the joint-venture formula, i.e. in the form of a company in which a private entity may hold shares. The current regulations do not specify the procedure for the sale of shares in such a company. The decision in this regard has been left to the public entity selling the shares (e.g. the Council of Ministers in the case of State Treasury companies), which can freely decide on the terms of sale. As a consequence, this formula may not be completely transparent and competitive.

If the undertaking encompasses maintenance or management services for the new infrastructure, not just its construction, then according to the interpretation of the Public Procurement Office, execution of the project in a joint-venture model may lead to attempts to circumvent the Public-Private Partnership Act and the private partner selection procedures prescribed there. Additionally, depending on the sources of financing of the task and the authority of the public entity as a shareholder to commission tasks by a company with private and public capital, the public procurement regulations, requiring a formal tender procedure to be carried out in each case, might be applicable in a specific situation. It should also be mentioned here that as an alternative to the "contractual" PPP (in which the private partner implements the project on the basis of a contract with a public entity), the "regular" PPP model also allows project implementation by a PPP company created by the public entity and the selected private partner; the private partner may also join an existing company of the public entity. However, participation of a public entity in the ownership structure of a PPP company greatly increases the complexity of the project and tender procedures, as it imposes on the project implementation structure based on a PPP agreement internal relations between the shareholders of the PPP company (the public entity and the private partner), which also need to be regulated as part of a tender.

The special act does not expressly identify which private sector cooperation models are allowed or recommended for construction of the Central Transport Hub. The act only includes a general provision that orders and purchases by the special-purpose vehicle are subject to regulations on public procurement, concessions for construction works and services, and public-private partnerships, and that the SPV may (on its own or jointly with other entities) create subsidiaries pursuant to the Commercial Companies Code. Based on this, we can assume that all the models described in this part of the report are permitted. In particular, due to the reference to PPP and concession regulations, besides constructing the Central Transport

Hub, the SPV may also commission private entities to manage or maintain CTH at later stages of the project. The special act also requires the selected contractor to comply with the management regulations, adopted under the procedure defined in the act, with respect to implementation of the project. Information on the requirement to observe the management regulations must be included in the terms of reference or concession documentation, and the contractor must submit a formal statement agreeing to enforce them.

Considering the general description of various possible models for the airport component of implementation of the Central Transport Hub project, we should pay special attention to the PPP model, which assumes a division of tasks and risks related to execution of the undertaking between the public entity and the private partner.

Firstly, the flexibility of the PPP model allows the public and private parties to freely agree on the best division of tasks and risks, while, by using a negotiated, two-stage procedure for selection of the private partner, permitting the decision on the final shape of the undertaking to be made at a later stage of the project. This method of contractor selection is recommended especially in the case of undertakings as complex as CTH. Under this approach, after the initial qualification stage,

Public-private partnership is the most advantageous form for implementing the Central Transport Hub project.

the public entity can negotiate all technical, legal and financial aspects of the project with invited, experienced private parties, in order to determine the final shape of the endeavour.

The PPP model, combined with selection of the private partner using the competitive dialogue procedure, is especially beneficial for the SPV, as it allows the contracting entity to access professional knowhow not only in the area of airport construction, but also airport management. Thus, after finalizing the negotiation stage, the SPV can better determine the final scope of the undertaking, while avoiding difficult and hard-to-change decisions on the specifications of the project. The competitive dialogue mode assumes that the SPV will incorporate in the final terms of reference for the project some solutions proposed during negotiations by the private party. A call for tenders for implementation of the CTH project that takes into account suggestions made by experienced contractors should increase the number of competitive bids by reliable partners.

In an undertaking as complex as CTH construction, for the SPV to set non-negotiable conditions at the start of the process might thwart the tender by discouraging offers by experienced, reliable contractors or attracting excessively high bids (if the contractors decide that too much risk has been shifted to the private entity). Overly strict and non-negotiable tender criteria may also, paradoxically, cause problems in implementing the project itself, where contractors make overly optimistic price assumptions or risk evaluations, as happened in the case of the Berlin Brandenburg

Airport project. The final risk allocation defined by the SPV in the terms of reference should also take into account the results of economic, financial, legal and technical analysis and be constructed in line with the rule of allocating a specific risk to the entity that can manage it better and cheaper.

Automatic transfer of all risk to the private partner is not economically viable, as it can lead to a sharp increase in the project cost. It is possible to distribute that risk, however. For example, under the special act the SPV can obtain a number of permissions and real estate related to CTH using a special procedure, and thus it could assume the risk of acquiring the necessary documents instead of shifting this obligation to the private partner. Similarly, real estate taken over by the SPV may be transferred to the private partner as the public entity's contribution to the enterprise.

Secondly, as in the PPP model the private partner is constructing infrastructure which it will later operate, it is assumed that the partner is motivated to exercise due diligence at the construction stage in order to smoothly manage the project at later stages. An additional advantage of the PPP approach, assuming entrusting the project to a professional private entity, is that at the construction stage, the private partner contributes its specialized know how regarding technical and business solutions which can facilitate later operation of the airport. Under the procurement model, no general contractor responsible solely for the construction stage has such experience or motivation.

Thirdly, an essential advantage of the PPP model is the possibility for a private partner to provide financing to the Central Transport Hub. Obviously, the issue of the profitability of such investment in this model, as well as of the division of the private partner's compensation between the availability fee and fees collected directly from infrastructure users, requires detailed economic and financial analysis. Nonetheless, as the experience of foreign investors shows, the PPP model is suitable in the case of airport projects where part (not all) of the partner's compensation can be financed by fees collected by the private partner directly from tenants of the commercial part of the airport. Considering that the airport component itself will not be subsidized by the European Union, the possibility of its being financed by the private partner is a distinct advantage compared to the full-service public procurement model. It can also be added that the latest amendment of the PPP Act introduced much more advantageous solutions in the area of financing of public-private partnerships by external entities, allowing public entities to enter into direct agreements with financing parties that can assume implementation of the project, substituting for the contractor or designating a proper new contractor if correct execution is endangered.

Finally, the PPP model allows the contracting entity to select a private partner that can carry out the project using a transparent tender procedure, ensuring fair treatment of other parties. It is important, however, to require the private partner to present binding project financing conditions and to avoid situations (which have happened in the past) where after the finalization of a multi-year tender the party is not able to present the required financial guarantees. Thus is why it is so important to include institutions financing the project at an early stage of the tendering procedure.

Legal aspects of financing the airport component of CTH

In its scale, the Central Transport Hub is an unprecedented project in the modern history of Poland. And because the possibility of financing this undertaking from EU grants is low and it would be a significant burden for the state budget, CTH will also be one of the largest private capital investments.

Private capital means on one hand industry and financial investors hoping for a return on investment in the form of profit, and on the other hand financial institutions providing funds at a specific interest rate, in general not dependent on the success of the project or its profitability.

The EU's principle of free movement of capital basically eliminates significant legal obstacles regarding sources of private capital that could be used to finance CTH construction. Additionally, most major financial institutions from outside the European Union have a "European passport" in an EU country allowing them

Central Transport Hub is an unprecedented project in the modern history of Poland.

to conduct active operations on the European market without obtaining local regulatory approval, only notifying the authorities of their intention to operate on a specific market. This is applicable also to Poland.

Financing infrastructure projects using private capital improves the investment success rate statistically due to better recognition and optimal allocation of risk (technical, economic, legal). This in turn guarantees that the default rate, meaning the project failure factor, is significantly lower than in the case of projects financed through the state budget.

If the PPP model is used for CTH construction, we can imagine the SPV not being engaged at all in the project financing discussions. Under the division of tasks, this task would fall to the private partner, a capital or industrial investor, who would be responsible not only for finding financing for the airport project but also for the architectural design, construction itself, and subsequent management. In such scenario, the role of the CTH special-purpose vehicle would be limited to precise – and attractive to private investors – identification and definition of boundary conditions for the project.

The definition of the conditions might turn out to be an immensely complex task. We should remember that the private capital financing structure considered here is applicable only to the airport component, not the rail component, which is supposed to be financed using EU funds. At the same time, CTH's success is dependent on harmonious implementation of all its components: airport, rail and road.

Additionally, creating an appropriate model of compensating private investors, ensuring predictability and stability of future cash flows, is critical for attracting the attention of private capital. Such model should guarantee repayment of the capital

investor's obligations to institutions financing the CTH project, as well as achieving its own assumed rate of return on investment.

In the case of projects such as CTH a compensation model based on market demand risk will be difficult to accept for private investors, due to the coupling of CTH components (such as airport and rail components) as well as their implementation and financing by various entities, among other reasons.

Financial institutions would be more willing to risk financing a project based on a predictable financial model than a project based on a significant margin of error related to passenger numbers. As a consequence, one should assume a much higher chance of success in a compensation model based on a fixed airport infrastructure availability fee, freeing the private investor from demand risks.

Capital investors will not be willing to accept risks beyond their control, such as the timely completion of rail and road infrastructure and the condition of LOT Polish Airlines.

Another extremely important issue is adapting the legal and economic model of financing (financial engineering) to the sources of such financing. If, for example, the CTH construction funds come from private means, the structure of the financing should not diverge from known and proven financial solutions used in similar projects around the world. One such example is the project finance formula used in projects such as nuclear power plants, offshore wind farms, waste incineration plants, railway stations, transhipment ports and airports.

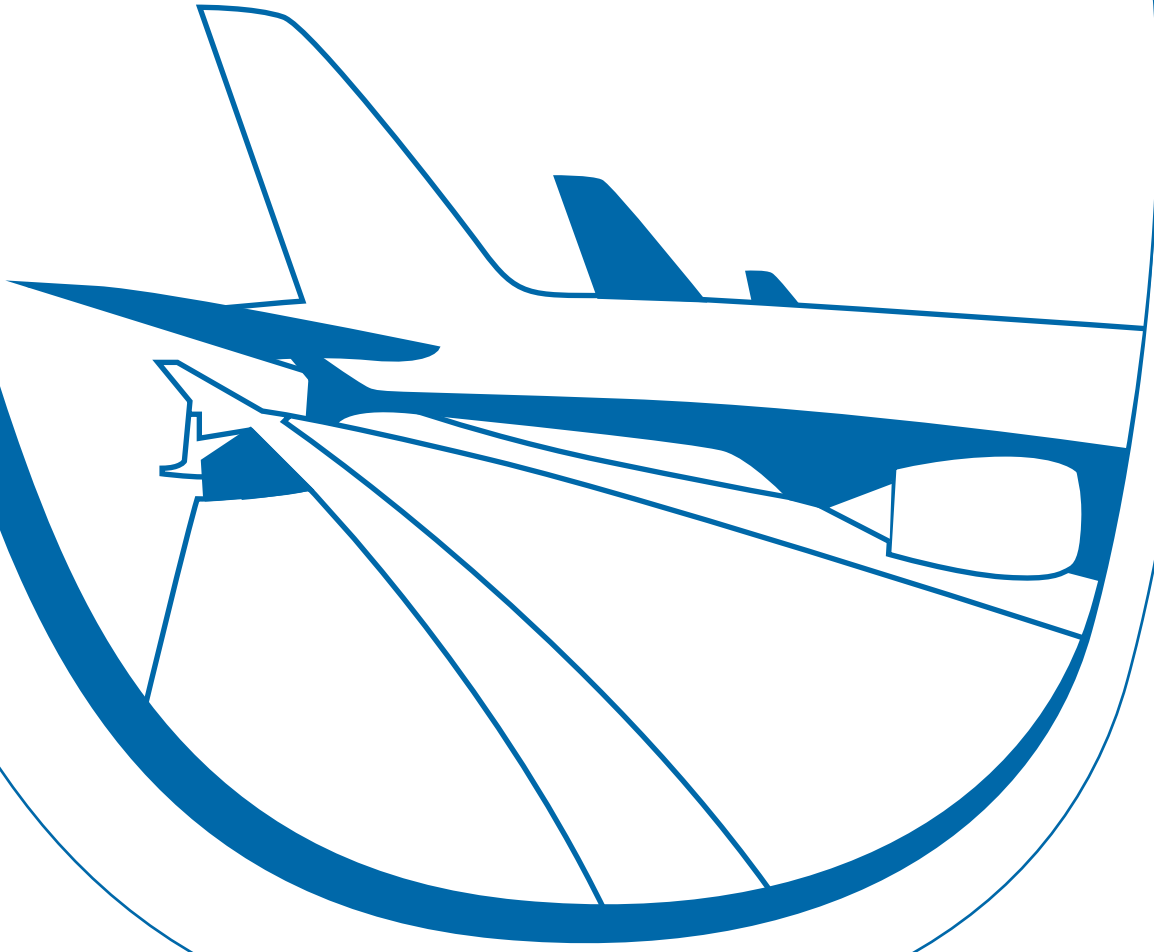
To outline a very much simplified model of financing the CTH airport component (based on the PPP formula and using project finance financial engineering), we could assume the following boundary conditions for this project.

Boundary condition	Aim
Obligation to provide financing of the whole airport component by a private partner.	Obtaining competitive financing conditions for the project. Potential private partners are active participants in the financial market, with experience and competence in financial aspects. Hence we can assume that they will strive to obtain the most financially attractive project conditions (the party able to obtain the cheapest financing will have a competitive advantage during the partner selection process).
20-30% own capital contribution of the private partner.	Higher engagement level of the private partner (risking its own funds), creating proper conditions for bank financing.
Bank financing: 70–80% of investment expenses, such as bank credit obtained by the private partner.	Ensuring higher financial efficiency of the project than in the case of equity financing, as well as providing conditions for equity financing of the remaining part.
20-25-year paid period of managing the airport by the private partner, followed by unpaid handover of the infrastructure to CTH.	Creating stable implementation conditions for all parties over a long but foreseeable period (CTH to provide management payments compensating the private partner for its expenses incurred on the project; private partner to obtain an assumed rate of return and banks to receive the agreed interest payments).
Private partner compensation model based on a fixed airport infrastructure availability fee during the management period, guaranteeing at least servicing the debt financing (including costs of hedging interest rate and foreign exchange risk), as well as the assumed minimum rate of return of the capital investor.	Creating foreseeable conditions (for future cash flows) for investors and banks financing the project.
Availability fee financed using profits from the completed project (airport fees, parking lots, retail and food infrastructure, services, fuel service etc).	Ensuring funds to finance the project.

Boundary condition	Aim
Potential surplus from profits generated by the airport infrastructure beyond the minimum assumed rate of return of the capital investor to be split between the private partner and CTH.	Motivating the private partner to manage the airport efficiently and maximize profit.
Securing debt (bank) financing for all airport project assets, with a simultaneous obligation to release guarantees if the project is taken over by CTH and earlier repayment of all obligations to the banks by the airport before the end of the management period (if CTH assumes airport management in the public interest or due to fault of the private partner before the end of the guaranteed management period).	Motivating the private partner to manage the airport efficiently and maximize profit.
Appropriate financial guarantees in case CTH does not fulfil its investment-related obligations, as well as interruption or takeover of the project by CTH (due to the public interest, for example) before the end of the management period.	Motivating the private partner to manage the airport efficiently and maximize profit.
Risk matrix and allocation consistent with accepted market practices and experiences with similar projects in Europe and other parts of the world, including non-recourse by financial institutions against the capital investor in case of failure of the project. If the project fails, the capital investor will lose only the funds invested (its own contribution of 20–30%), but will not be responsible for repaying the remaining bank financing.	Motivating the private partner to manage the airport efficiently and maximize profit.

In view of the current, still very limited, knowledge of plans for implementing CTH, we should not rule out any model for financing it. However, it seems that the model for financing the airport component based on private capital, public-private partnership, and project finance engineering should be the most successful.

Who is counting on the success of CTH?



CTH will greatly alter the Polish and European transport market.

Due to the scope of the planned investments, as well as the ambitions of the Polish government, the Central Transport Hub will be an undertaking impacting Polish and foreign companies operating in the aviation industry (including those not currently present in Poland or operating here in a very limited scope). Due to direct, indirect and induced influence, the project will also impact the market environment of rail and road carriers and service companies. During the planning and implementation of CTH, and then during its operation, these different, often conflicting interests should be taken into account in order to generate the fullest benefit to the Polish and European economy.

Airlines

Air carriers are the group of parties that will be most affected by the construction of CTH.

A hub airport can only operate with a strong base carrier. Here that means in practice that the success of CTH is strongly and bilaterally connected to the condition of LOT Polish Airlines. Without a strong flag carrier CTH will not be utilized and may even prove redundant. On the other hand, without the new airport, the growth opportunities of the Polish carrier will be greatly limited. In theory, a hub at the new airport could be operated by any of the foreign, full-service airlines experiencing capacity issues at existing hubs, but that is hardly feasible in practice, as carriers try to simplify their route networks and focus on one or two hubs of their own. Development of a new transfer airport would require creating a feeder network, meaning huge investments in new connections, aircraft and infrastructure. Development of CTH as a new hub is a threat to existing transfer airports and carriers serving them, but the scale of this threat should not be overestimated. Over a timeframe of 10-15 years LOT may endanger midsize airlines like Finnair or TAP Portugal, but will remain much smaller than Lufthansa, British Airways, Air France-KLM, Turkish Airlines or Aeroflot.

CTH should be built primarily for LOT Polish Airlines, but also take into account the market realities and scale of operation of LOT and its competitors.

IMPACT OF CTH

AIrlines

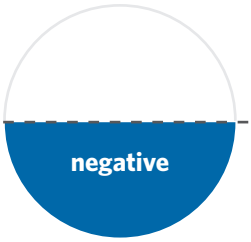
National carrier

LOT Polish Airlines

+ Higher capacity
+ Possibility of launching new connections, especially long-distance
+ Possibility of managing own terminal
+ Greater transfer convenience
+ Higher customer service quality
+ Airline appeal for potential investors

Foreign full--service

Lufthansa
Air France-KLM
British Airways



+ Higher European airport capacity, improving the continental economy and leading to increased traffic to the EU

– Outflow of passengers choosing transfers at CTH instead of existing hubs

Low-cost

Ryanair
Wizz Air

neutral/ unknown

+ In case of presence at CTH, potentially higher costs, but also higher capacity and possibility of launching new routes

? Dependent on airport fees and CTH strategy

– In case of lack of space at CTH, focus on airports cheaper but less convenient for passengers, such as Modlin and Radom

Charter

Enter Air
Travel Service
Ryanair Sun

neutral/ unknown

+ Higher capacity and operating efficiency, reducing delays

– Airport located farther from the city, negatively impacting passenger convenience

Cargo

DHL
UPS
FedEx
potentially LOT

very positive

+ Possibility of launching larger cargo handling centres – Chopin Airport cannot become a major cargo hub

+ Construction of separate cargo infrastructure (access roads, terminals, railway)

Airports

Large Polish regional

i.a.
Kraków
Gdańsk
Wrocław

neutral/ positive

+ Better transfer offers for long-distance routes thanks to new Polish hub, strengthening LOT

+ No impact on growing regional airport direct traffic

Small Polish regional

i.a.
Łódź
Bydgoszcz
Lublin

neutral/ negative

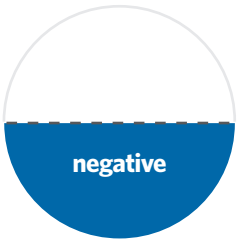
+ Higher attractiveness of small airports as a cheaper alternative for CTH (for low-cost and charter carriers)

– Danger of losing hub feeder flights replaced by rail connections

– Limiting the offer of direct connections from airports located in CTH vicinity (Łódź, Bydgoszcz)

Central

Chopin Airport



– Redirecting all or most of the traffic from Chopin Airport to CTH

– Possible shutdown of Chopin Airport

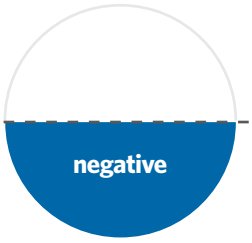
Central

Modlin
Radom

+ Strengthening the position of Modlin and Radom as alternative Warsaw airports (for low-cost and charter carriers)

Foreign hubs

Frankfurt
London-Heathrow
Istanbul
Dubai

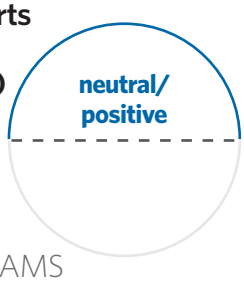


– Outflow of transfer traffic from existing hubs to CTH

Service and TSL industry companies

Companies operating at airports (ground handling, maintenance, etc.)

LS Airport
Services
BGS
Welcome AS LOT AMS
Linetech



+ Higher traffic meaning more orders

+ Better infrastructure (such as maintenance hangars)

– Problems with sourcing employees in CTH region

Fuel providers

Orlen Aviation
BGS

+ Higher traffic leading to higher turnover

+ New transport infrastructure facilitating fuel delivery

Cargo and courier companies

DHL
UPS
FedEx
Poczta Polska

+ Chance to create a large cargo handling centre
+ Easier intermodal transport

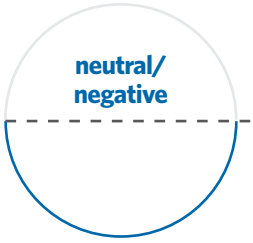
Rail and road carriers

PKP Cargo,
PKP Intercity
road freight
forwarders

+ Expansion of rail and road network
+ Increase in intermodal transport of cargo
+ Utilization of rail as CTH passenger feeder transport

Society

Inhabitants of Baranów, Teresin and Wiskitki municipalities



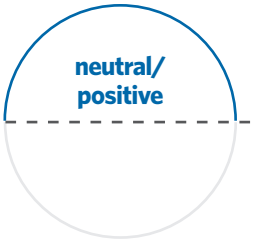
+ Airport jobs
+ Better access infrastructure

– Necessity of sale (expropriation) of real estate
– Noise and overcrowding for inhabitants remaining in the region

Łódź/Warsaw region inhabitants

+ Improvement of road and rail infrastructure connecting the two cities through CTH
+ Airport jobs

Warsaw inhabitants



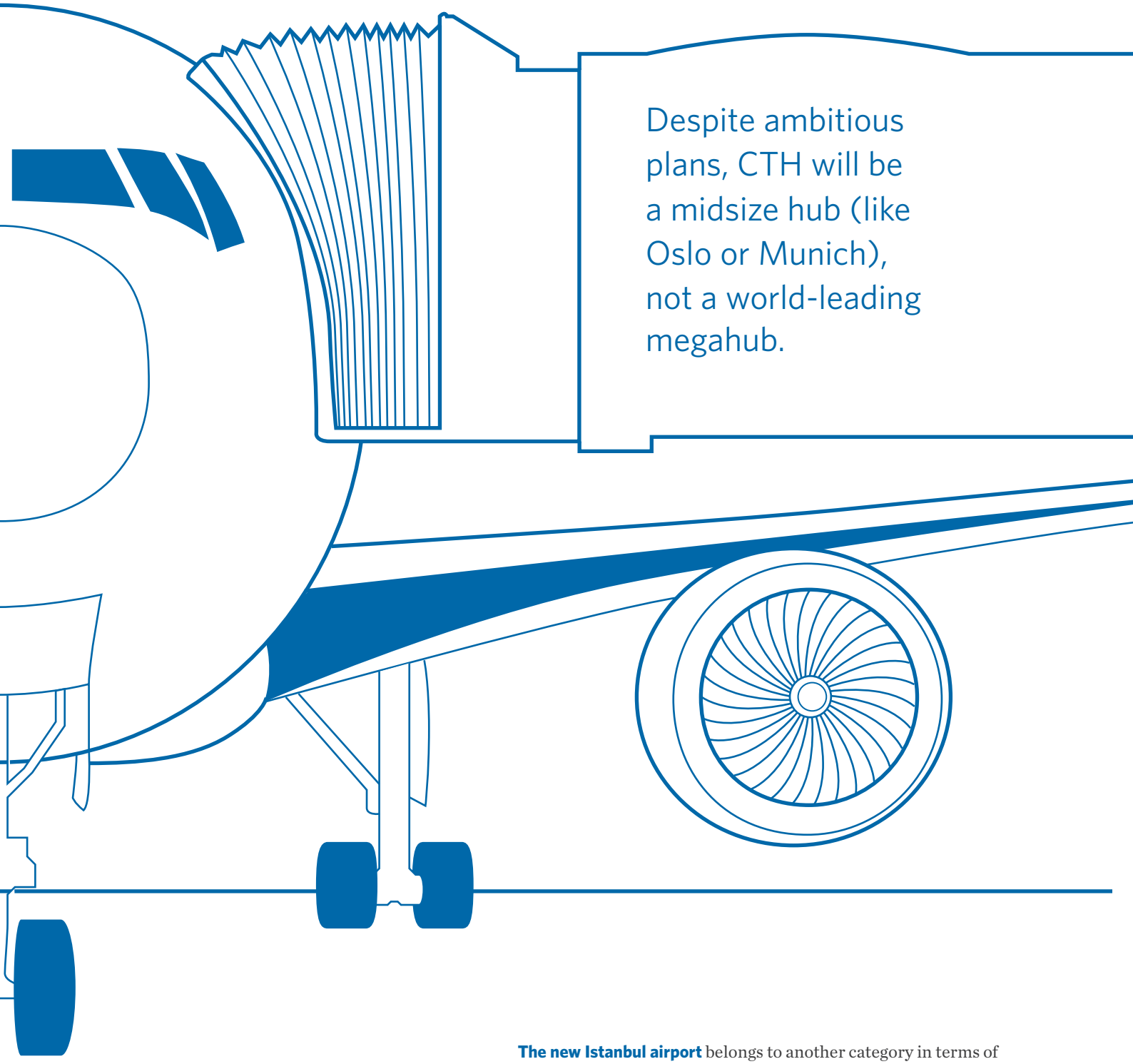
+ możliwości urbanistyczne związane z terenami po Lotnisku Chopina
+ Urban development opportunities at Chopin Airport site

– Potentially higher time and cost of airport transport in comparison to Chopin Airport

Case studies
Where airports have been built

The Oslo and Munich airports, both built relatively recently, basically from scratch, are a perfect model for CTH, in terms of both good public transit access and traffic magnitude.

Berlin Brandenburg Airport is a perfect counterexample. It can be compared to CTH in magnitude and general assumptions, but the development process starkly reveals all the risks related primarily to lack of professionalism, bad planning and politicized supervision.



Despite ambitious plans, CTH will be a midsize hub (like Oslo or Munich), not a world-leading megahub.

The new Istanbul airport belongs to another category in terms of airport size. Additionally, it has been constructed outside the EU regulatory regime, significantly accelerating the development process. However, the idea of granting a 25-year concession for airport operation to the consortium that built it is worth considering in the case of CTH.

Berlin Brandenburg (Willy Brandt)

Location	Design and construction years	Cost (including supporting infrastructure)	Base carrier	Traffic in 2018
Germany	**2004–**	**>PLN 31 billion**	**none**	**none**

The new Berlin airport has been under construction since 2006, although construction was planned in the early 1990s. It is supposed to share infrastructure with the existing Schönefeld, the former East Berlin airport. The new facility was supposed to open in 2011, but the date was moved several times due to construction delays and then construction defects were detected shortly before opening. Currently opening is planned for 2020. Berlin Brandenburg is an excellent example of how not to build a mega airport. The biggest problems of this project have been inadequate, politicized supervision, inexperience of project managers, poor planning (too small scale) and changes hastily introduced during construction, as well as underestimating construction costs. The new airport is supposed to replace both existing Berlin airports. It is being built by a public company owned by the Berlin and Brandenburg governments, which are supposed to manage it later.

Oslo Gardermoen

Location	Design and construction years	Cost (including supporting infrastructure)	Base carrier	Traffic in 2018
Norway	**1992–1998**	**approx. PLN 10 billion**	**SAS, Norwegian**	**28.5 million**

The decision to move air traffic from the small Fornebu airport near the city centre was made in the late 1980s. Gardermoen, then a small military airport, was one of the locations considered. The decision was made to locate the new airport far from the city but connect it using high-speed rail. The act regulating construction of Gardermoen was finally adopted in 1992 and the facility opened after 6 years of construction. It was basically built from scratch. The government of Norway decided to shut Fornebu down on the date of Gardermoen's launch. Oslo is still served also by the low-cost Torp airport, as well as, recently, Rygge airport. The Fornebu area was transformed into a modern residential and office district. The airport was built and is managed by a state-owned SPV (Avinor), under special regulations.

Munich

Location	Design and construction years	Cost (including supporting infrastructure)	Base carrier	Traffic in 2018
Germany	**1969–1992**	**PLN 20 billion**	**Lufthansa**	**46.3 million**

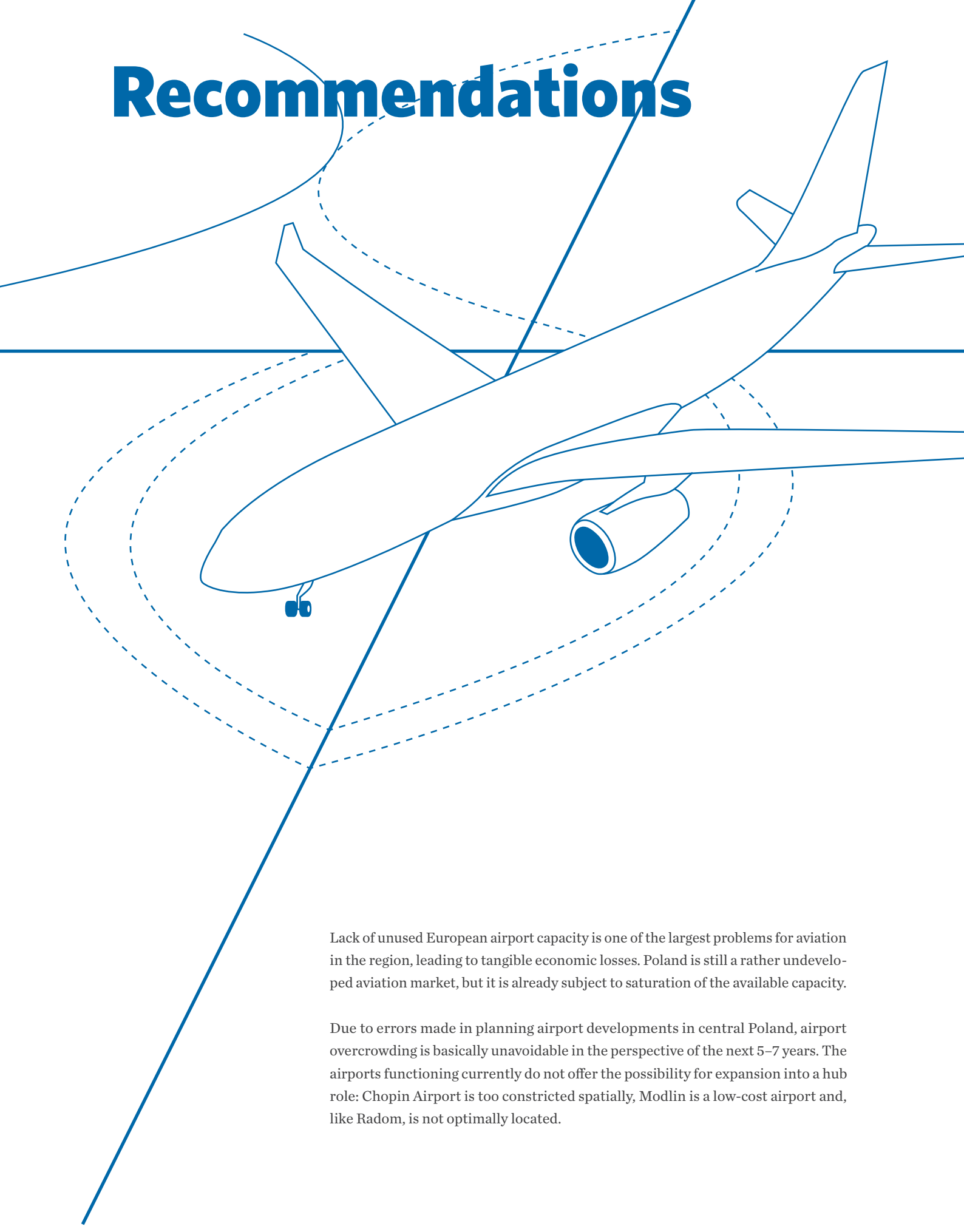
A decision to construct an airport to replace the limited Riem airfield was made in 1969, but project planning took 11 years (even though the location had been chosen earlier). The process was conducted regardless of political pressure and at a slow pace, as the existing airport had some spare capacity. Construction started in 1980. The airport is owned by a public company (shareholders Bavaria, Munich, federal government). The airport was designed to allow flexible expansion using satellite terminals. Currently discussions on construction of a third runway are being held. The terminals mostly designed 40 years ago have capacity to spare and the airport is considered one of the most efficient European hubs. The old Riem airfield was shut down on the date of opening of the new airport and then transformed into a trade fair and conference centre.

Istanbul New Airport

Location	Design and construction years	Cost (including supporting infrastructure)	Base carrier	Traffic in 2018
Turkey	**2012–2018**	**PLN 30 billion**	**Turkish Airlines**	**<0.1 million (tests)**

The decision to build a new airport in Istanbul was made by the government without consultations in 2012. A tender to select the airport construction contractor and operator, which would receive a 25-year lease, started a year later (won by a consortium of private Turkish companies). After the conclusion of the tender construction took only five years. The airport was designed to be the largest in the world, able to serve as many as 150 million passengers per year after the expansion planned for the next few years. During construction, workers protested against abuse of their rights, and there were also significant doubts surrounding the environmental responsibility of the contractors. The airport opened in October 2018, according to plan, starting with a small amount of test traffic. The airport has been fully operational since 6 April 2019. After the launch, the existing Ataturk Airport, overcrowded and lacking expansion options, will be shut down. Sabihy Gökcen Airport, on the Asian side of the city, serving mostly low-cost traffic, will continue operations, and is privately owned.

Recommendations



Lack of unused European airport capacity is one of the largest problems for aviation in the region, leading to tangible economic losses. Poland is still a rather undeveloped aviation market, but it is already subject to saturation of the available capacity.

Due to errors made in planning airport developments in central Poland, airport overcrowding is basically unavoidable in the perspective of the next 5–7 years. The airports functioning currently do not offer the possibility for expansion into a hub role: Chopin Airport is too constricted spatially, Modlin is a low-cost airport and, like Radom, is not optimally located.

Construction of a new airport is an ambitious undertaking, but necessary from the perspective of the Polish and European economy. Western European hubs are overcrowded, with limited expansion possibilities. A new hub airport in a region that has not played a hub role in the past would allow for an increase in traffic to and from the continent.

CTH is a project that must be planned nearly a decade before launch. This is difficult especially due to the rapid changes currently occurring on the aviation market. New trends in carriers' business models should be taken into account when designing the new airport.

1

After CTH is launched, Chopin Airport should be shut down or its operations significantly limited. Maintaining both airports would decrease the competitive advantage of LOT Polish Airlines, as well as discourage other carriers from moving to CTH, leading to a situation where the new airport would not be used optimally but the old one would still generate noise. Shutdown of Chopin Airport would create a chance for redevelopment of the district where it is located. The benefits of allowing strictly regulated use of Chopin Airport could be considered, with a limited number of flights in the style of London City, but this seems an unnecessary complication. A key condition for the shutdown of Chopin Airport is ensuring good rail access to the new airport, 25–30 minutes from the Warsaw city centre.

2

Low-cost carriers should be allowed at CTH, with infrastructure adapted to their needs. Such carriers play an increasingly important role in the transport system, and attempting to block their growth (motivated probably by a desire to protect LOT from more efficient competition) would be harmful to the economy. It should be assumed that when CTH is launched, low-cost carriers will cooperate more closely with full-service ones and offer more long-distance connections. They could also create their own hubs, due to continuing hybridization of business models. CTH's infrastructure should be adapted to their needs, for example by considering a separate terminal for low-cost carriers.

3

The CTH terminal(s) should be designed flexibly, allowing further growth. Foreseeing trends on the aviation market beyond a decade is very difficult, hence the terminal design should take into account issues such as changing traffic directions in the Schengen area and outside it. Construction blocking development should be avoided, for example due to lack of space for additional non-Schengen gates. An airport is built once every few decades, so the design needs to assume the possibility of building another terminal, supporting terminals and additional aviation infrastructure.

4

The design needs to be adapted to the scale of the market. CTH construction is a flagship public project, with a temptation to over-scale. This is worsened by the rapid growth of LOT in recent years, which could create the impression of a world--leading carrier. The reality is that LOT is and will remain a midsize carrier, while CTH will be a secondary hub. Hence, the design should be suited to scale, remembering though that it's better to slightly over-scale than under-scale and introduce corrections (as in the case of Berlin Brandenburg). Also, the architectural design itself should take into account the reality that solutions possible and profitable in Asia or the Middle East may not be viable on the regulated European market.

5

CTH should be an apolitical project. Independent project supervision, as well as listening to the opinions of all stakeholders, including low-cost carriers and LOT's competitors, is critical to the success of the project. The Polish carrier will be the most important client, but it can realistically fill only 50–60% of CTH's capacity. Attempts to politicize the project and giving it too much importance could easily lead to over-scaling or even limiting the air traffic of other carriers. Even in the most optimistic scenario, LOT will never be able to meet all the needs of passengers flying to and from Poland on its own.

The road to CTH launch

Years*	Task	Challenges identified	How to mitigate them
2019	Selection of strategic adviser	Selection of a partner bringing experience and knowhow to the company and flexible enough to function within the EU regulatory framework	Paying attention to experience and a long-term approach rather than just the most favourable financial terms offered by the potential strategic adviser

Years*	Task	Challenges identified	How to mitigate them
2019–2020	Environmental and siting proceedings	Risk of negative environmental impact of the project	The location chosen initially does not cause risks related to the project being blocked due to environmental issues
2019–2020	Feasibility study	Uncertainties regarding the model of financing airport construction and management	Making a decision on the financial model (even without choosing a specific partner) and a detailed investment budget, preparing financial forecasts for the airport management company
2019–2020	CTH strategic plan	Uncertainties regarding CTH traffic structure	Making a decision on the future of Chopin Airport and other airports in central Poland, as well as allowing low-cost carriers at CTH
Up to 2020	Real estate acquisition	Blocking of purchases by inhabitants	Dialogue with inhabitants plus fair prices, even slightly higher than market prices, expediting the acquisition process as much as possible
2020–2021	Tender for design and construction of CTH	Lengthy tender procedures, growing costs of construction and labour	Excellent formal preparation of the tender, conducting the tender under multiple criteria (not just the lowest price), acquiring support of consultants and parties with significant experience in similar projects
2021–2027	CTH construction	Construction costs, risk of (sub)contractor insolvency, errors made during construction	Assuming a time margin for the construction process, avoiding efforts to minimize cost by any means

* Schedule based on the government's CTH construction concept, as well as the current state of project preparation.

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