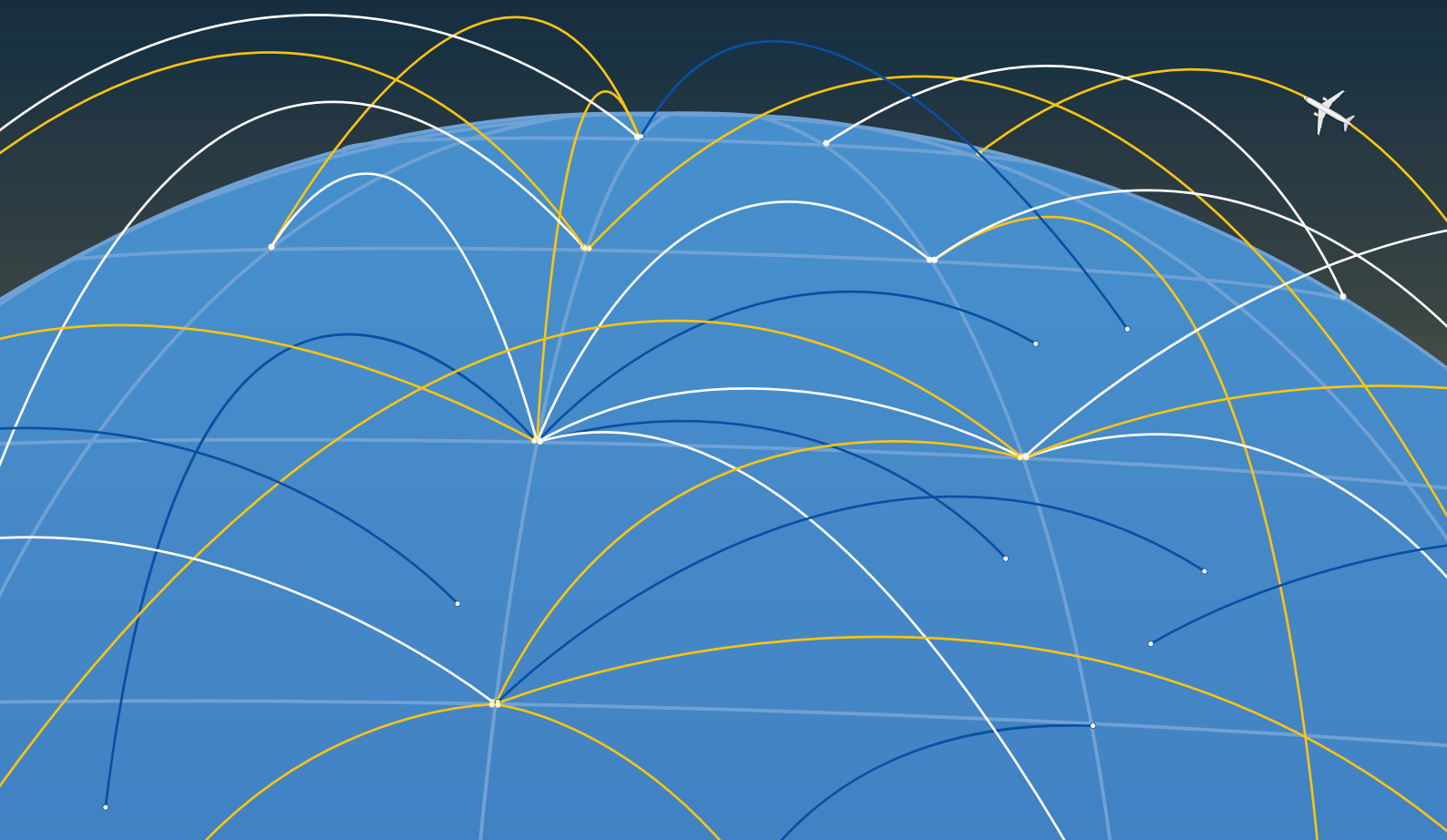




AIRPORT INDUSTRY CONNECTIVITY REPORT



In partnership with
seo aviation economics

2004 – 2014



ACI EUROPE is the European region of Airports Council International, the only worldwide professional association of airport operators. ACI EUROPE represents over 450 airports in 44 European countries. In 2012, member airports handled 90% of commercial air traffic in Europe, welcoming over 1.6 billion passengers, 16.7 million tonnes of freight and more than 16 million aircraft movements. Based in Brussels, ACI EUROPE leads and serve the European airport industry and maintain strong links with other ACI regions throughout the world.

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EXECUTIVE SUMMARY

Airport connectivity is an increasingly discussed topic in European policy circles. With good reason. Connectivity is closely connected with productivity, economic growth and international trade. And with the centre of global economic activity shifting eastward, it is essential that Europe remains as closely integrated as possible to emerging sources of future wealth.

Within the industry, an airport's route network – and the connectivity this delivers – will be a core element of that airport's business plan, with both airports and the regions/countries they serve having a strong common interest in boosting this connectivity wherever possible.

This Report therefore offers important insights into the development of airport connectivity over the past 10 years to both industry and policy makers, and provides hard information that will allow both parties to work together to safeguard Europe's airport connectivity and global relevance in the years ahead.

One clear common trend which emerges throughout the Report is the **weakening of EU connectivity**. This is particularly so when compared with the **connectivity gains made by non-EU airports**, but in some instances the weakness is in absolute terms as well as relative – direct connectivity at EU airports has decreased since the crisis, and has still yet to recover. While part of this shift is a reflection of a wider shift in economic activity, there are **policy steps** which the EU can take to both recognise the importance of and support the **development of airport connectivity** (see report conclusion section for proposed policy steps). Such policies will not only support the EU's connectivity, but also the wider economic and social benefits associated with the EU retaining its central position within the global economy.

Measuring Connectivity

Airport connectivity comes in different forms, although these are inter-related. There are different measures – **direct, indirect, total and hub connectivity**, as well as the closely related **onward connectivity**. Before

exploring in more detail the airport connectivity of Europe, it is first important to understand exactly what is meant by 'airport connectivity'.

European Connectivity at a Glance

- ➔ Across Europe, **total connectivity** increased by **+38%** between 2004 and 2014. This was a strong increase, but was a result of **larger increases in indirect connectivity**, considered to be less valuable than direct connectivity, given the increased travel times.
- ➔ In the last decade connectivity growth has been strongest to the **Middle East** and **Asia-Pacific** – regions in the process of establishing themselves as aviation and economic powerhouses respectively. However connectivity growth to Asia-Pacific was largely indirect in nature (and a product of the increased direct connectivity to the Middle East) and this overall increase was mirrored by an equivalent decline in the market share of connectivity to Europe and North America.
- ➔ The crisis in 2008 hit European airport connectivity hard (-4.9% in one year) and resulted in **structural shift in the nature of this connectivity**. While overall connectivity recovered by 2010, this was **driven by indirect connectivity**, with direct connectivity only returning to pre-crisis years in 2011, before then subsequently stagnating until today.

EU & Non-EU Markets

- ➔ Between 2004 and 2014, **total connectivity at non-EU airports doubled**, and increased at circa 4 times the pace of EU airports. However **EU airport connectivity** had a strong base, and in spite of the different growth rates today, still remains **four times larger** than Non-EU airport connectivity.

- ➔ The difference in growth rates is in part explained by the **varying impacts of the 2008 crisis**, which hit EU airport connectivity harder (-5.7% in one year versus a decrease of just -0.5% for non-EU airports) and with connectivity at EU airports recovering at a much slower pace compared to their non-EU counterparts.
- ➔ Most worryingly, **direct connectivity at EU airports has yet to recover from pre-2008 highs (-7% in 2014)**, meaning that overall connectivity gains have been realised via indirect connectivity, and that **the quality of EU connectivity has declined**. In contrast non-EU direct connectivity is now significantly above pre-crisis levels (+34%).

Airport Groups

- ➔ Between 2004 and 2014 airports of all sizes saw their connectivity increase – with the smallest (those with less than 5 million passengers per annum) enjoying the highest rate of growth, directly due to establishment of the Low Cost Carrier segment and indirectly via closer network integration with larger hub airports.
- ➔ However most of this growth was frontloaded before the crisis – subsequent to 2008 these same airports experienced the greatest drop in connectivity, and they have yet to recover their pre-crisis levels of direct connectivity. It was the **largest airports and hubs** (those with more than 25 million passengers per annum) **which recovered most from the crisis**, with healthy increases in both overall connectivity but also underlying direct connectivity.
- ➔ Despite these varying fortunes post-crisis, overall the market share of the different categories of airport size remained stable between 2004 and 2014, with the indirect connectivity of smaller airports being boosted by the increased direct connectivity of the larger airports to which they are linked.

Onward Connectivity from Europe

- ➔ Most indirect connections out of Europe are still channelled via **EU hubs**, but **their share has decreased by 10%** in the last decade, reflecting pressure from competing hubs in Turkey, the Gulf, and to an extent, North America. **The top 3 European hubs by onward connectivity remain Frankfurt, Amsterdam and Paris-Charles de Gaulle** respectively – however their collective market share has decreased from **33% to 29%** since 2004, and during this time **Istanbul-Atatürk, Moscow-Sheremetyevo** and **Dubai** have all now entered the ranks of the top 20.
- ➔ Individual hub airports have both appeared on disappeared from the top 20 list since 2004, reflecting **different fortunes in a competitive market**. This competitive landscape is also reflected in the relatively low market share of all individual hubs, with the airport with the most onward connectivity still only having 13% of Europe's overall onward connectivity. Some hubs are specialising in niche markets, with different airports having different relative strengths in terms of connectivity the various world regions.

Hub Connectivity

- ➔ In Europe, hub connectivity – which measures an airport's connectivity in terms of the intermediate links it provides between other origin and destination airports – is unsurprisingly generated mostly by the larger airports, with the hub connectivity **within Europe, between Europe and North America and between Europe and Asia-Pacific** forming an overall share of **74%**. However European hub connectivity increases have been dwarfed by **increases in the Gulf**. Between 2004 and 2014, the hub connectivity of **Abu Dhabi, Doha** and **Dubai** increased by +1,913%, 1,861% and 485% respectively.
- ➔ European hub connectivity growth over the last decade has come from **intercontinental hub connectivity** – i.e. European hubs facilitating

passengers traveling from one other world region to another. However again Europe is lagging behind other parts of the world – in 2004 the top 3 European hubs had circa 3.5 times the intercontinental connectivity of the top 3 Gulf hubs. Now the situation has reversed, with the same **Gulf airports** now providing **twice the level of intercontinental connectivity** compared to their **European counterparts**.

National Markets

Within Europe, the **connectivity gap** between western and eastern Europe is considerable, reflecting historical differences, although the partial overlap with contrasting EU and non-EU connectivity growth means that this gap should, to some extent, decrease with time. Beyond this trend, relative levels of national connectivity reflect country size and wealth, with **Germany, the UK and France** enjoying the top three connectivity positions respectively. Outside of the EU, the equivalent countries are **Turkey, Switzerland and Russia**.

Connectivity by Airport

Also within the Report are connectivity statistics for individual European airports – In terms of total connectivity the **top 5 airports are London-Heathrow, Frankfurt, Paris-Charles de Gaulle, Amsterdam and Istanbul-Atatürk**.



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1 FOREWORD: THE CENTRAL IMPORTANCE OF CONNECTIVITY



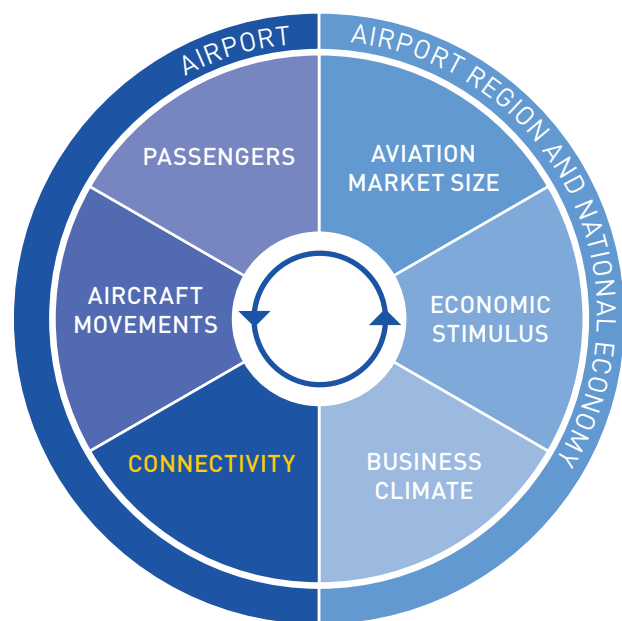
In recent years, connectivity has taken an ever more prominent position in policy debates in Europe. This reflects the fundamental shift that has taken place in the last century, in how human societies interact with each other, with this change only accelerating as time passes.

Today's connectedness of the global population has had profound implications for the way in which we generate economic growth. As technology advances and expertise becomes even more specialised and in-depth, less and less products and services can be created by one person, or even one nation or society. Trade, tourism, foreign direct investment and most fundamentally, increased productivity, all tally closely to the connectedness of a people. Those communities and societies which are disconnected from the global economy will find growth – or even simply maintaining their position – an increasingly challenging prospect.

In that context, **aviation** is today the **prime and unsurpassed enabler of global connectivity**, as it moves people and goods at a record speed to almost every corner of the world.

Europe's air connectivity is therefore an **essential element of its competitiveness** – and an integral element for **economic growth** and **job creation**. This all the more important in light of the on-going global shift eastward of economic activity. Europe might not be able to avoid this shift, but we can still ensure that

1. The virtuous circle of connectivity



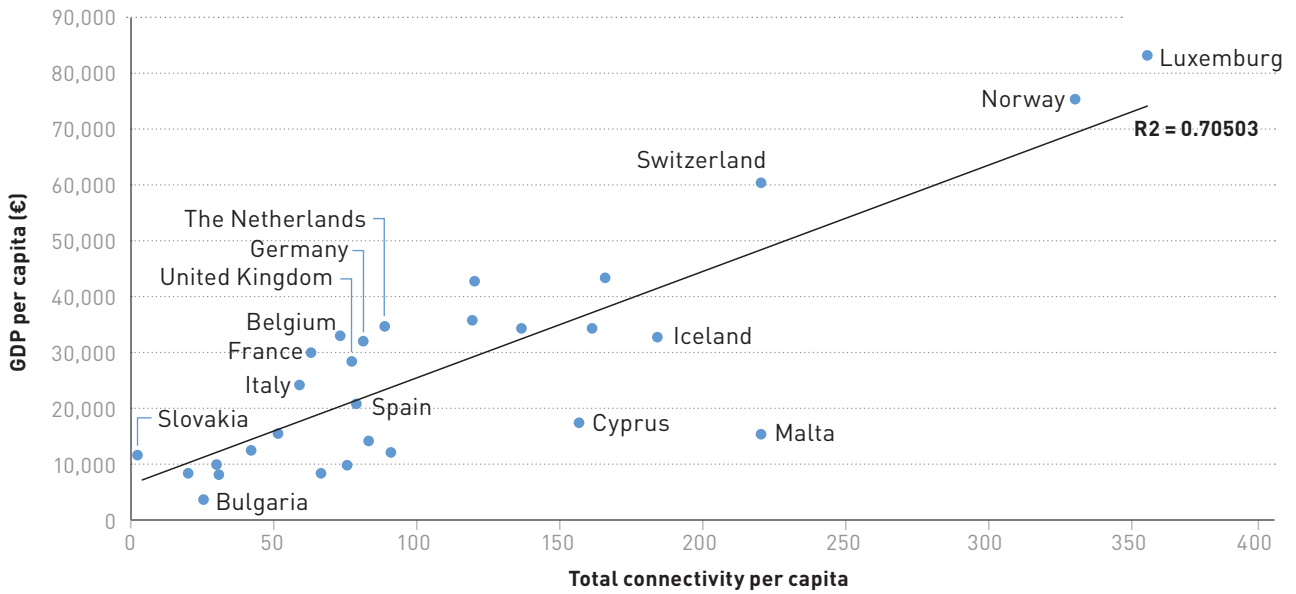
we remain closely connected to these new potential sources of prosperity.

The increasing strategic relevance of connectivity matters not just at a European level, but trickles down the **national, regional and local levels** – where it ends up shaping not just the fortunes of communities but also, as we will see, **the mandate of every airport**.

A forthcoming ACI EUROPE report¹ will consider in more detail the economic impact of European airports

¹ ACI EUROPE Study on the Economic Impact of European Airports – expected Autumn 2014

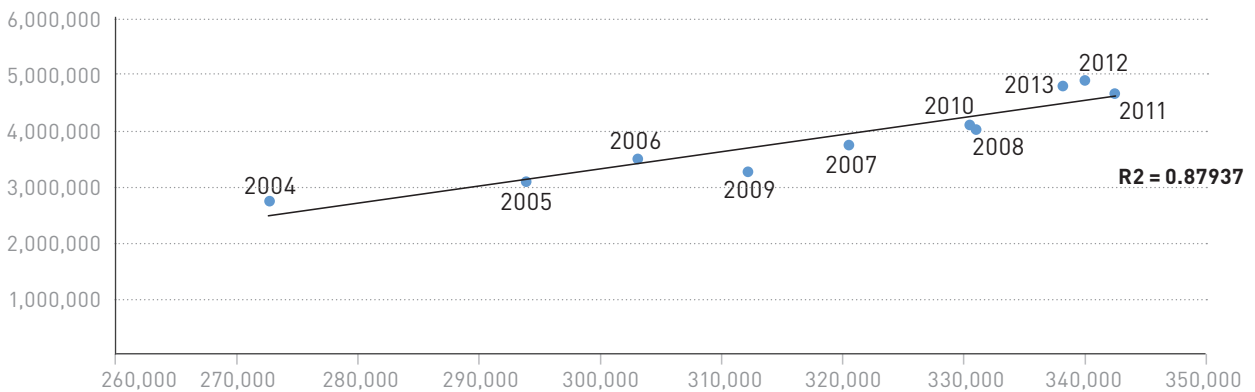
2. Total connectivity per capita vs. GDP per capita



The above graph shows the close correlation between how well connected by air a country is, and its level of wealth. Both connectivity and Gross Domestic Product (GDP)

figures are on a per capita basis, showing that high levels of GDP per capita as well as geographic positions positively influence connectedness of a country relative to its size.

3. EU International Trade vs. Total Air Connectivity (2004-2013)



The increased citizen wealth is delivered via a number of different streams, but one such key and tangible stream is international trade. Exports in goods and services facilitated by connectivity allow the creation of jobs and salaries which would otherwise not be available. Imports facilitated by connectivity allow citizens a wider choice of higher quality goods at lower prices.

Graph 3 shows a strong relationship between the EU's overall air connectivity to other global regions (Africa, Asia-Pacific, Latin America, the Middle East and North America) and the overall value of exports and imports between the EU and these regions. When EU connectivity and trade figures for these global regions are examined individually across time, this strong relationship continues to prevail.

– however some initial figures clearly demonstrate the integral link between air connectivity, economic growth and trade.

Airports increasingly not only play a role in facilitating this connectivity, but are rather instrumental in shaping its level and structure. Over the past 15 years, the **business transformation of Europe's airports** has seen them taking a **leading and ever proactive role** in attracting air services and developing their network of destinations. Airports compete for new routes and frequencies by tapping into the actual and prospective links between their catchment area and other destinations. This means that there is a natural complement between an airport's commercial incentive to develop its network and a local, regional or national economy's requirement for greater connectivity.

Given this, a thorough understanding of an airport's connectivity is equally important for airport management as it is for economic policy makers. Alongside air traffic figures, connectivity will become another essential driver of business performance for airports, as well as a measure of the associated benefits for their communities.

The objective of this report is to measure and analyse the connectivity of the European airport industry. It presents a **10 year perspective** on the evolution of airport connectivity (2004-2014), through various levels of aggregation, as well as individual airport connectivity figures for **461 airports in 44 countries** which collectively handle 95% of commercial air traffic in Europe. In the future, ACI EUROPE plans to release an *Airport Industry Connectivity Report* on a regular basis, so as to keep measuring and analysing the connectivity of its members.

The next section explains how airport connectivity is measured – and in particular the different kinds of airport connectivity – direct, indirect and hub connectivity. Beyond the data available in this report, ACI EUROPE provides upon request individual and more detailed connectivity analysis to interested airports (www.airport-connectivity.com).

Olivier Jankovec
Director General, ACI EUROPE

2 MEASURING CONNECTIVITY



Airport connectivity has so far mainly been represented through 'Top 10' lists of destinations and flight frequencies, broken down by geographical region. Although valuable in itself, this measure lacks the insights into the indirect connectivity of an airport (connectivity provided indirectly via other airports), as well as the connectivity afforded via hub airports – hub connectivity.

This report is based on the **SEO NetScan connectivity model**, which measures airport connectivity in a more comprehensive way. Using airline schedule data as input, the NetScan connectivity model is both **quantitative and qualitative**. It measures the number and quality of direct/non-stop connections as well as indirect connections via other airports. The quality element is assessed from the diverse perspectives of: individual airlines, airline alliances, airports and the travelling public. The value of the analysis lies in the comparison: either between competing networks (benchmarks of competing airlines, airline alliances and airports) or between distinct years (monitoring developments over time).

The NetScan model brings the most relevant connection components of every single market (frequency, travel time, connecting time) together into a single indicator: the **Airport Connectivity Index**.

This indicator expresses the overall network performance i.e. how well two points are connected by air. In other words, it represents the number of weekly frequencies (direct and indirect) weighted by their quality. The 3rd week of June was taken as the reference week¹. The quality is defined here as how fast the connection is and this quality is represented by a specific index – influenced by inflight time, transfer time and detour time. This quality index ranges from 1 (one) for direct connections with the shortest possible

travel time, to 0 (zero) when travel time (of indirect connections) exceeds particular predefined limits. Multiplying the quality index by the flight frequency yields the overall connectivity index. A detailed methodology outline is provided under Appendix H.

The NetScan model distinguishes between different types of airport connectivity:

➔ **Total connectivity:** which is made up of direct connectivity and indirect connectivity.

➔ **Direct connectivity:** direct connections offered by airport X to other airports.

➔ **Indirect connectivity:** indirect connections offered by airport X to other destinations via an intermediate airport hub.

➔ **Hub connectivity:** connections offered through hub airport X between two other airports.

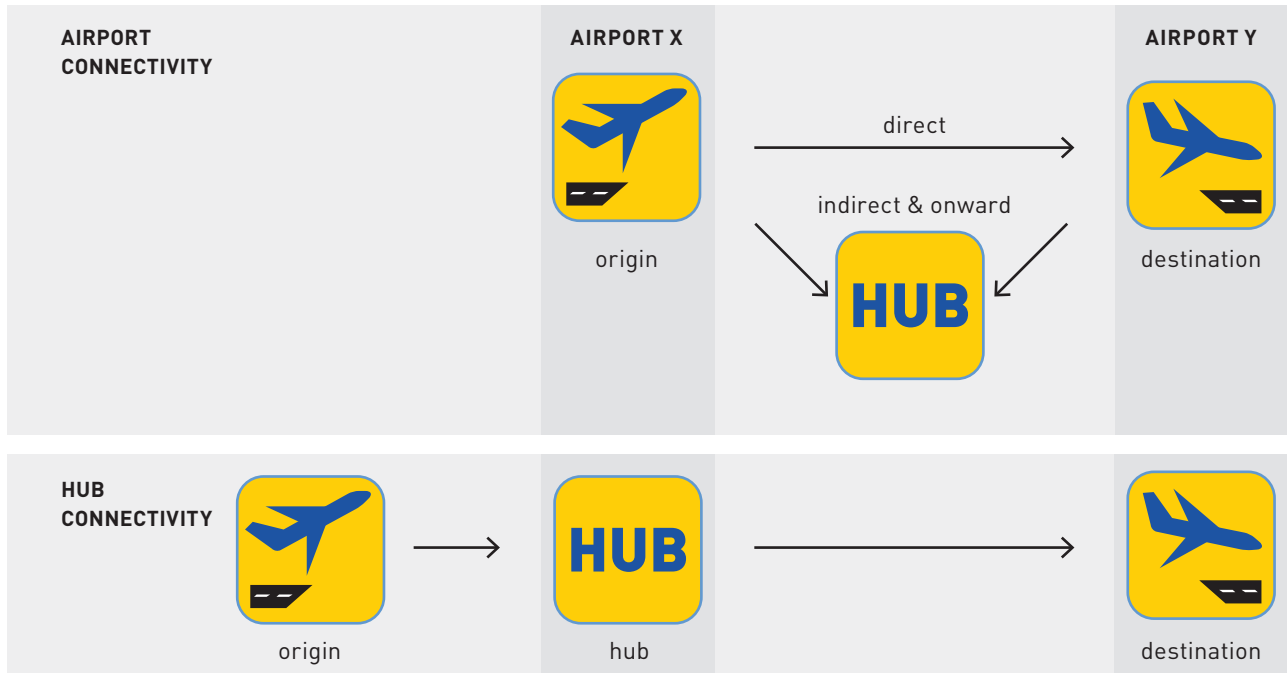
Indirect connectivity offered also allows to determine through which intermediate hub airport this connectivity is channelled. The connectivity channelled through hub airports is called the **onward connectivity**.

The NetScan connectivity approach is a widely acknowledged method for measuring connectivity.

¹ The choice of the 3rd week of June relates to the intention to reflect the full spectrum of connectivity usually associated with the Summer season while avoiding the distortive impact of holiday periods.

It has been applied in many consultancy projects, including the ongoing monitor of the hub performance of Amsterdam Airport Schiphol. A number of articles on this model have been published in international peer-reviewed academic journals.¹

4. Different types of connectivity



Source: SEO

¹ See: Lieshout and Burghouwt (2012), Burghouwt and Redondi (2013), Suau Sanchez and Burghouwt (2012), Morris and Veldhuis (2011), De Wit et al. (2009, 2008), Burghouwt et al. (2009), Burghouwt and Veldhuis (2006) and Veldhuis (1997).

3 EUROPEAN AIRPORT CONNECTIVITY AT A GLANCE



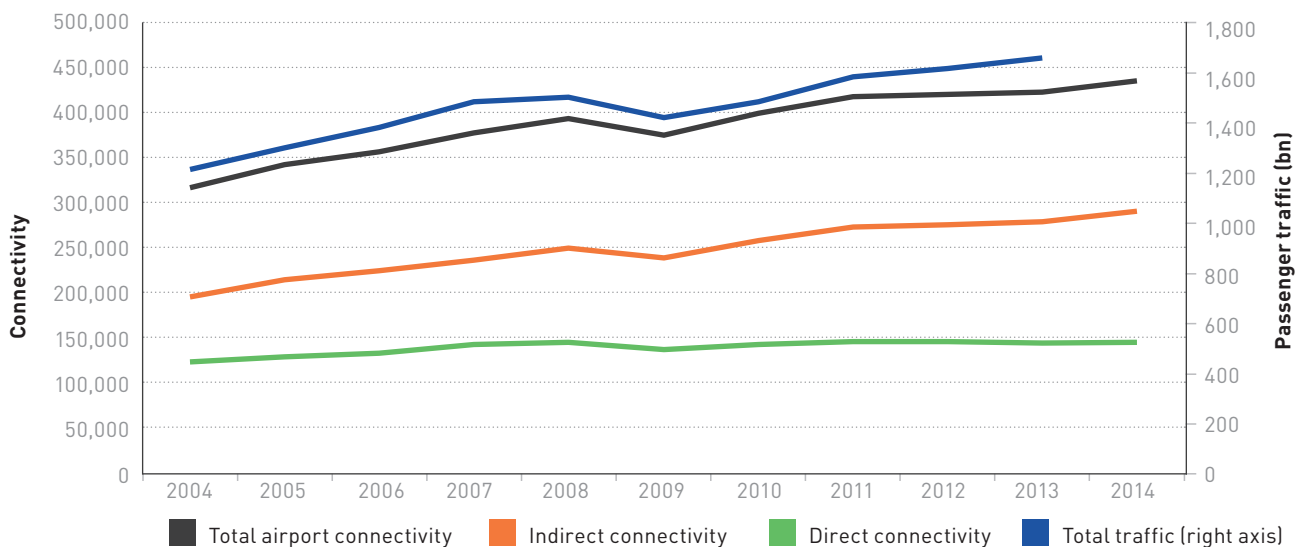
This section considers the direct, indirect and total connectivity of European airports overall. Direct connectivity is the sum of direct connections offered by airport X to other airports. Indirect connectivity is the sum of the indirect connections offered by airport X to other destinations via an intermediate airport hub, weighted according to their quality (inflight time, transfer time and detour time). Total connectivity is the sum of direct and indirect connectivity.

2004-2014: strong increase in European airport connectivity

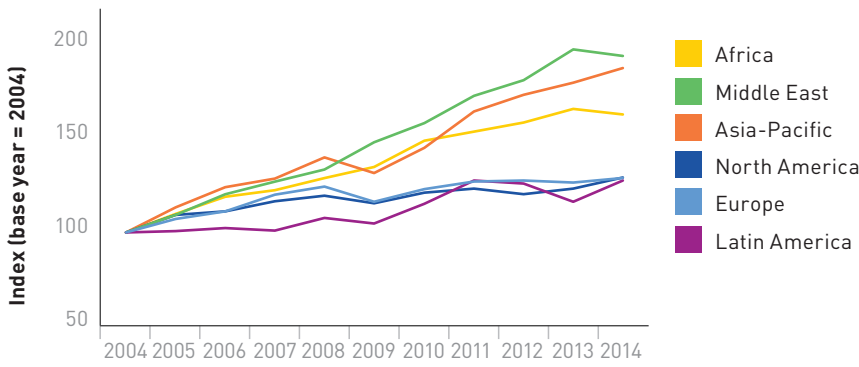
Between 2004 and 2014, the connectivity of Europe's airports has increased by +38% – almost perfectly mirroring the growth in passenger traffic between 2004 and 2013 (+37.4%). This increase in total connectivity results from the combination of a +19% increase in direct connectivity and a +50% increase in indirect connectivity.

Due to the so-called *network impact*, a direct connection from airport X to airport Y would typically enable a number of indirect connections from airport X to other airports via airport Y. While direct connections do not systematically enable indirect connections – due to scheduling issues or the absence of connecting opportunities, especially at smaller airports – indirect connectivity usually increases exponentially as a result of a growth in direct connectivity.

5. Airport connectivity & passenger traffic (2004-2014)

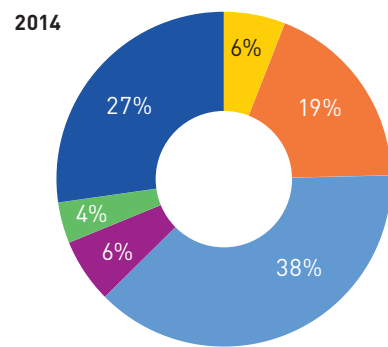
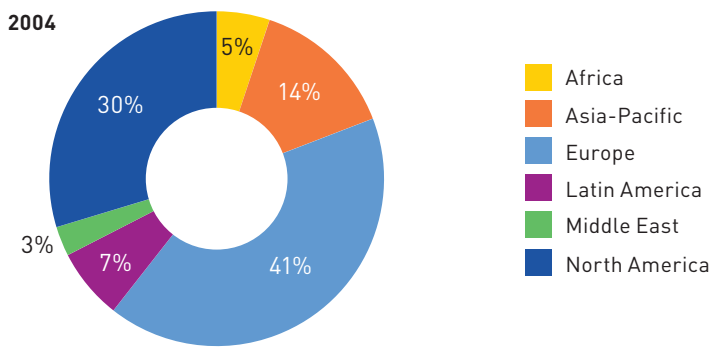


6. Total Airport Connectivity by world regions (2004-2014)

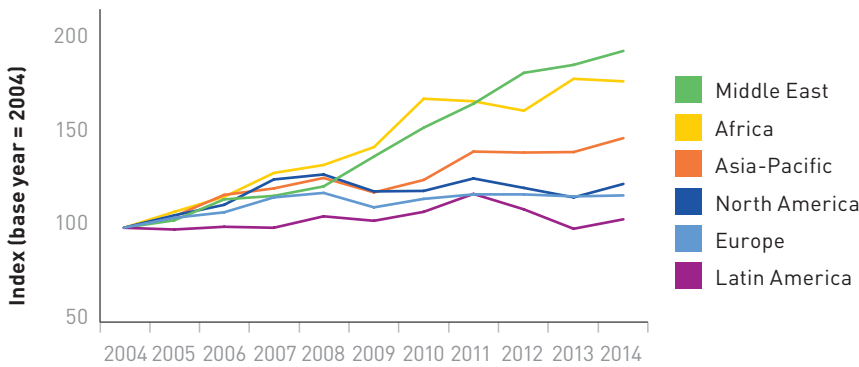


Region	Growth	
	'04-'14	Y-o-Y
Middle East	95%	6,9%
Asia-Pacific	88%	6,5%
North America	29%	2,6%
Europe	29%	2,6%
Latin America	28%	2,5%
TOTAL	38%	3,3%

7. European Airport connectivity shares by world regions (2004 & 2014)

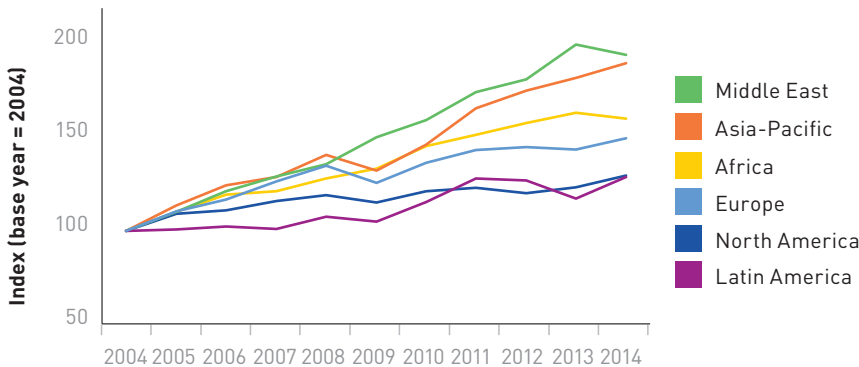


8. Direct connectivity by world regions (2004-2014)



Region	Growth	
	'04-'14	Y-o-Y
Middle East	94%	6.8%
Africa	78%	5.9%
Asia-Pacific	48%	4.0%
North America	23%	2.1%
Europe	17%	1.6%
Latin America	5%	0.4%
TOTAL	19%	1.8%

9. Indirect connectivity by world regions (2004-2014)



Region	Growth	
	'04-'14	Y-o-Y
Middle East	95%	6.9%
Asia-Pacific	90%	6.6%
Africa	61%	4.9%
Europe	50%	4.1%
North America	30%	2.6%
Latin America	29%	2.6%
TOTAL	50%	4.1%

From the perspective of the travelling public, businesses and public authorities, **direct connectivity is generally considered of more value than indirect connectivity and captures the majority of passenger demand**. The key rationale for that rests with the fact that direct connectivity delivers reduced travel time when compared to indirect connectivity – which in turn delivers increases in efficiency and productivity. However, other factors need to be taken into account, in particular frequency and travel costs (airlines, in particular Full Service Carriers, often price direct routings higher than indirect routings).

Indirect connectivity allows connections to be made where demand does not support direct services. In this regard, it also allows building demand and paving the way for future direct connectivity. Indirect connectivity gives additional choice, and creates additional competitive pressure both on airlines and airports – which lowers the cost of air travel. Therefore, **indirect connectivity is valuable both in the absence of direct connectivity, and as a complement to direct connectivity**.

Over the past 10 years, the above mentioned **network impact** was reinforced in Europe by a higher growth in direct connectivity to hub airports vs. non-hub airports, as well as by the growth of airlines alliances and other forms of airline cooperation. As a result, **while each direct connection to a hub generated 2.7 onward connections in 2004, this number had increased to 3.4 by 2014**.

Highest – but differentiated – connectivity gains to the Middle East & Asia Pacific

Between 2004 and 2014, European airport connectivity increased the most to the Middle East (+95% reflecting the dynamic growth of Middle East airlines in Europe), Asia-Pacific (+88%) and Africa (+63%). Connectivity within Europe and to the Americas increased at a slower but similar pace (just under +30%).

There were significant differences in the way these connectivity gains materialised. Most notably:

- ➔ **Direct connectivity to Asia-Pacific expanded at a sub-optimal pace (+48%)**, well below the growth of direct connectivity to the Middle East and Africa. Indeed, a **very large part of the connectivity gains to Asia-Pacific were delivered through indirect connectivity (+90%)**. This is correlated to the strong increase in direct connectivity to the Middle East (+94%) and Turkey, which have positioned hub airports in these regions as powerful enablers of indirect connectivity from Europe to Asia-Pacific.
- ➔ **Direct connectivity to Latin America has barely increased (+5%), with most connectivity gains being delivered through indirect connectivity (+29%)**.

Over the 10 year period, Europe's and North America's combined share of European airport connectivity has decreased entirely to the benefit of Asia-Pacific and the Middle East.

Strong crisis impact & contrasted recovery

The global financial crisis had an almost immediate impact on the connectivity of European airports, with a **loss of -4.9% in connectivity between 2008 and 2009**. Expressed in volume (-19,149), such loss is almost equivalent to losing all current connectivity between Europe and Africa (19,665).

This loss in connectivity was **primarily focused on Europe (-14,821/-6.7%), followed by Asia-Pacific (-2,794/-6.0%), North America (-2,785/-3.3%) and Latin America (-455/-2.6%)**. Connectivity to the Middle East and Africa was unaffected and kept growing (respectively by +993/+11% and +712/+4.6%).

Direct connectivity decreased by -6.1% while **indirect connectivity showed relatively more resilience**, decreasing by -4.2%. Given that indirect connections are normally a multiplier of direct connections, the stronger resilience of indirect connectivity indicates that there were less cuts in hub routes than in point to point routes. It also reflects the fact that airport connectivity in other world regions was less impacted by the crisis.

The recovery was fairly quick, with total airport connectivity already above the 2008 level by 2010, and posting a +10.7% cumulative growth since 2008. However, these gains are **almost entirely attributable to growth in indirect connectivity**. Indeed, while direct connectivity had recovered just above its 2008 level by 2011, it has remained essentially flat since then.

As a result, 2014 direct connectivity is just +0.2% above 2008 levels. By contrast, indirect connectivity was already +3.4% above 2008 level in 2010 and has grown by +16.8% since 2008 and +22% since 2009. This suggests that since the crisis an **increasing share of Europe's connectivity has been channelled through hub airports**.

In terms of geographical split, **connectivity to Asia-Pacific has posted the strongest recovery since 2009 (+43%), with a large share of these gains delivered through indirect connectivity (+44%)** rather than direct connectivity (+24%). This is once again linked to the strong performance of connectivity to the Middle East (+31%) and Turkey – in particular direct connectivity to the Middle East (+41%), which has been used to channel part of Europe's indirect connectivity to Asia-Pacific. As a result, while the level of direct connectivity to Asia-Pacific was 58% higher than the level of direct connectivity to the Middle East back in 2008, the gap has narrowed to just 16% in 2014.

Total connectivity to Europe and North America has posted the lowest recovery since 2009 (+11% and +12%), while total connectivity to Latin America and Africa has increased at almost the same pace (just above +20%). However, for all these regions with the exception of Africa, these positive figures are **predominantly attributable to an increase in indirect connectivity**. This means that when compared to pre-crisis levels (2008), **direct connectivity to Europe, North America and Latin America has not even fully recovered**.

10. Total, direct and indirect connectivity by world regions (2008-2014)

Airport connectivity By world region	Growth '08-'14		
	Total	Direct	Indirect
Middle East	46%	59%	43%
Asia-Pacific	34%	17%	35%
Africa	26%	33%	25%
Latin America	19%	-2%	20%
North America	8%	-4%	9%
Europe	4%	-1%	11%
TOTAL	11%	0%	17%

4 EU & NON-EU MARKETS



This section considers the contrasted performance over the 2004-2014 period of the direct, indirect and total connectivity of EU and non-EU markets, in particular since the global financial crisis of 2008/2009.

Doubling of connectivity from non-EU airports

Between 2004 and 2014, total **airport connectivity from European airports located outside the EU (non-EU airports) increased by +107%** while the **increase in connectivity from EU airports was +27%**. This follows closely the evolution of traffic in Europe, with non-EU airports that registered +125% increase in passenger volumes over the period 2004-2013 and EU airports where passenger volumes grew by +23% over the same period.

This contrasted performance reflects:

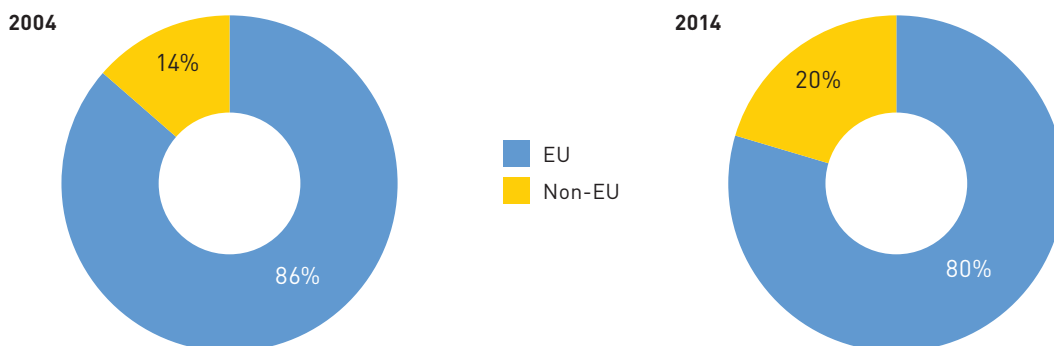
- ➔ Differences in the maturity of the economy and aviation markets, which entails similar differences in the overall level of connectivity between EU and non-EU airports.

Indeed, **the connectivity level of EU airports is almost 4 times that of non-EU airports** (346,604 v. 88,837). Despite the

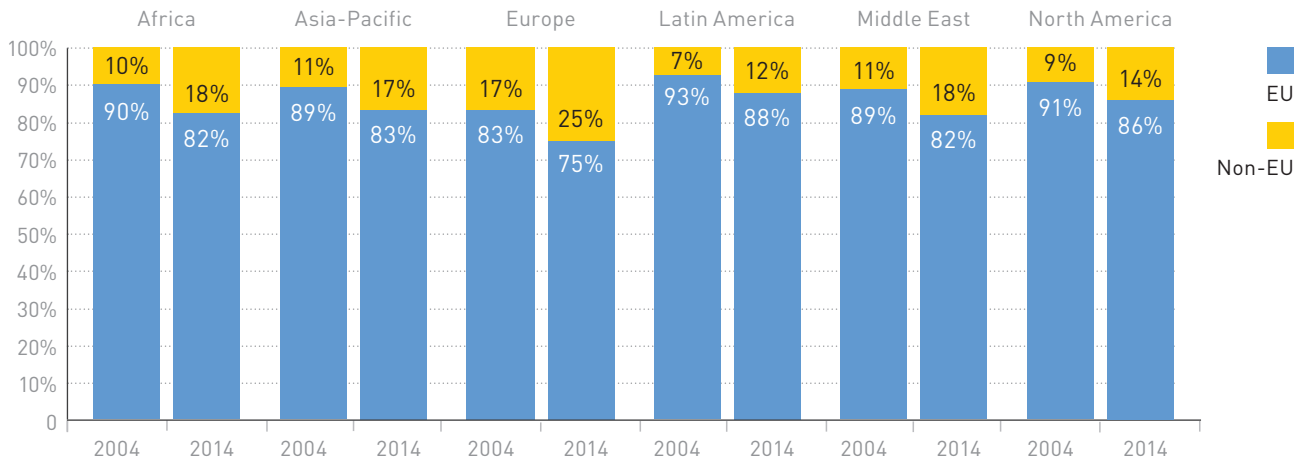
rebalancing in the share of connectivity between EU and non EU airports since 2004, EU airports are still delivering close to 80% of Europe's connectivity and nearly 85% of its connectivity to other regions of the World.

- ➔ Moreover, **direct connectivity at EU airports comes with a much higher enabling ratio of indirect connectivity than at non-EU airports** (2.1 v. 1.6 indirect connections per direct flight). This is mainly due to lower demand from non-EU airports, higher concentration of larger hub airports in the EU (which are able to generate a greater network impact than their competitors in non-EU countries) as well as closer economic integration between EU States.
- ➔ **EU economies and aviation markets were more affected by the global financial crisis**. In 2009, connectivity at EU airports decreased by -5.7% while it only decreased by -0.5% at non-EU airports. Also, post 2009, the connectivity at EU airports recovered at a

11. Market share of EU & non-EU in overall connectivity (2004 vs. 2014)



12. Market share of EU & non-EU in overall connectivity by world region (2004 vs. 2014)



slower pace when compared to connectivity at non-EU airports (see below).

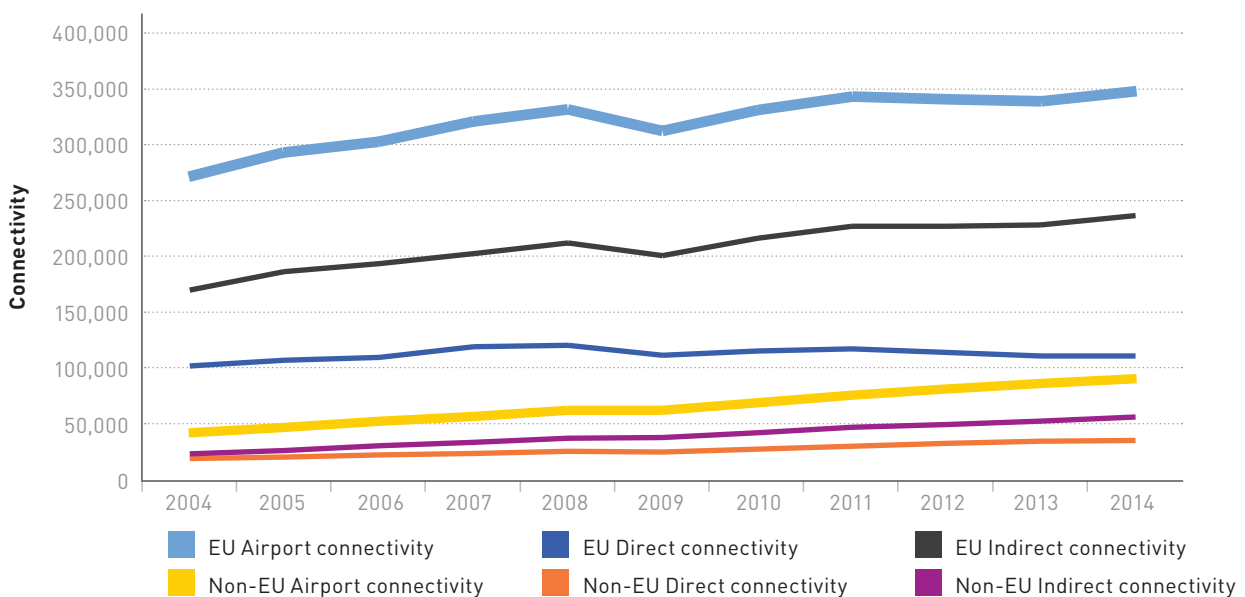
The geographical split in connectivity growth at EU and non-EU airports between 2014 and 2004 is broadly similar, with connectivity to the Middle East, Asia Pacific and Africa increasing the most. However, there are differences between direct connectivity and indirect connectivity. It is worth noting that the gap in connectivity level between the Middle East and Asia Pacific has reduced considerably. In particular, while the level of direct connectivity to Asia Pacific from non-EU airports was more than twice higher than to the Middle East back in 2004 (440 v. 195), it is now almost equivalent (950 v. 810).

Crisis impact stronger at EU airports

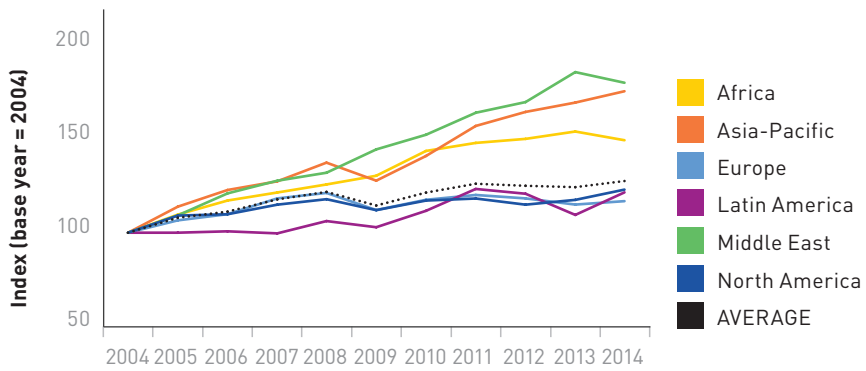
The crisis impact has been very different between EU and non-EU airports. While **connectivity from EU airports decreased by -5.7% in 2009, it remained almost flat from non-EU airports.**

- ➔ EU airports saw their connectivity decrease with all regions except the Middle East (+9.4%) and to a lesser extent Africa (+3.8%). The biggest decrease was to Europe (-7.4%), followed by Asia Pacific (-6.9%), North America (-4.9%) and Latin America (-3%).

13. Airport, direct and indirect connectivity for EU and non-EU airports (2004-2014)

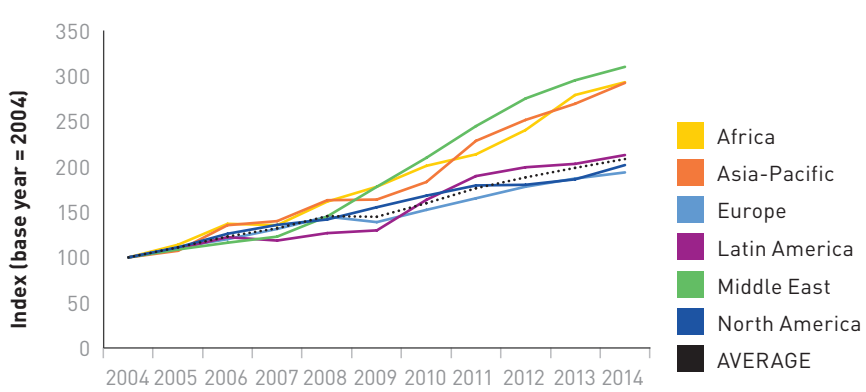


14. Airport connectivity from EU airports by world region (2004-2014)



Region	Growth	
	Total	Y-o-Y
Africa	49%	4.1%
Asia-Pacific	76%	5.8%
Europe	16%	1.5%
Latin America	21%	1.9%
Middle East	80%	6.1%
North America	22%	2.0%
AVERAGE	27%	2.4%

15. Airport connectivity from non-EU airports by world region (2004-2014)



Region	Growth	
	Total	Y-o-Y
Growth (indexed)	192%	11%
Africa	192%	11%
Asia-Pacific	92%	7%
Europe	112%	8%
Latin America	210%	12%
Middle East	100%	7%
North America	107%	8%

➔ Non-EU airports saw their connectivity decrease only with Europe (-3.9%). Connectivity to Asia-Pacific remained flat (+0.2%) while the biggest increase in connectivity was to the Middle East (+23%) followed by Africa (+10.4%), North America (+9.7%) and Latin America (+2%).

contrasts with the recovery in passenger traffic which posted +1% between 2011 and 2013. Indeed, **traffic growth did not translate into connectivity growth.**

This development is pointing to a **concentration trend in air traffic** due to the permanence of capacity/route cuts by airlines and passenger traffic growth being driven by higher load factors and larger aircrafts on existing routes rather than additional aircraft movements and/or new routes.

Direct connectivity loss at EU airports since 2008

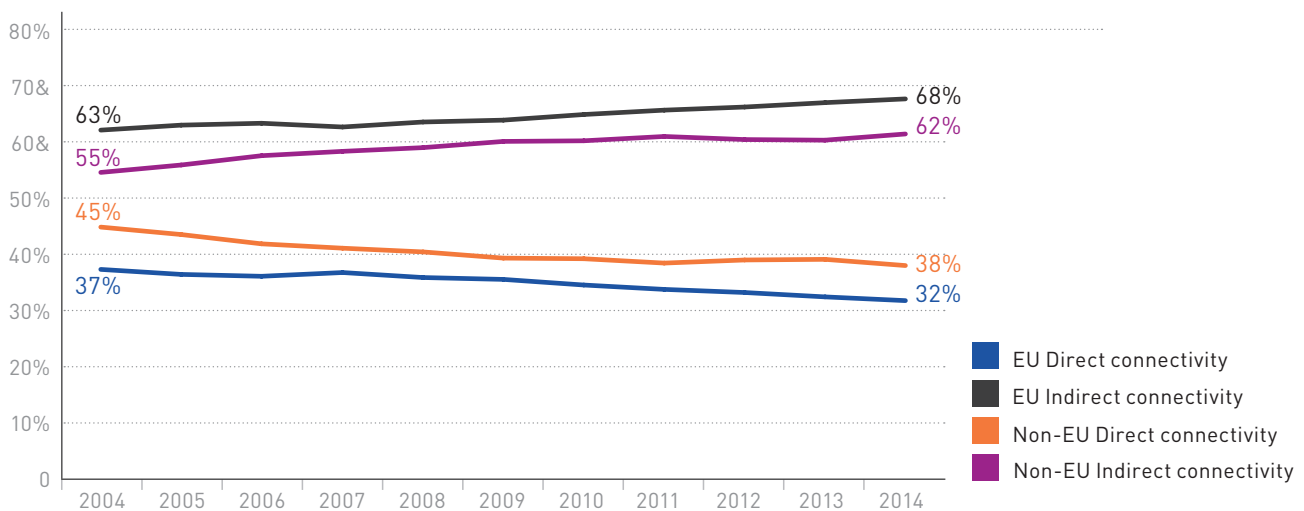
There is an **even wider gap in the way connectivity from EU and non-EU airports has developed since the financial crisis** with non-EU airports growing their connectivity at rate which is almost ten fold that of EU airports (+42.6% v. +4.7% between 2008 and 2014).

➔ Significantly, the present (2014) **overall level of direct connectivity from EU airports remains well below its 2008 level (-7%)**. This means that the growth in connectivity since the crisis is entirely attributable to indirect connectivity (+11.3%). As a result, direct connectivity now makes up 32% of overall connectivity from EU airports – down from 37% in 2008¹.

➔ Overall connectivity at **EU airports** actually decreased again between 2011 and 2013 (-1.2%), reflecting the double dip in the EU economy, before improving again in 2014. This

1. The decrease in the market share of direct connectivity relative to indirect connectivity is also caused by the Network Impact, which sees indirect connectivity growing at an exponential rate compared to direct connectivity. However, in the case of EU airports, the decrease in direct connectivity amplifies this market share evolution.

16. Direct and indirect connectivity from EU and non-EU airports (2004-2014)



This development is pointing to a relative **deterioration of the overall quality of connectivity out of EU airports**, as indirect connections are generally considered of lower value compared to direct connections. In addition, the increasing share of indirect connections routed through non-EU and non-European hubs reflects an increasing market penetration in Europe of the airlines based at these hubs.

Between 2008 and 2014, direct connectivity from EU airports to North America and Europe decreased the most (respectively by -8.4% and -8.2%).

The decrease in direct connectivity to Europe has been uninterrupted since 2011. In terms of connectivity volume lost since 2008 (8,972), such a loss is closed to losing direct connectivity to all other World regions (10,111).

Direct connectivity to Latin America also decreased (-2.7%) while the increase in direct connectivity to Asia Pacific was marginal (+2.3%), with most of the connectivity gains to these regions resulting from indirect connectivity (+28.8% for Asia Pacific and +1.51% for Latin America). In contrast, there was a significant increase in direct connectivity to the Middle East (+27.7%) and to Africa (+26.6%).

➔ **Both direct and indirect connectivity grew dynamically at non-EU airports since 2009, with both exceeding the pre-crisis – 2008 level by +34% and 48.5% respectively.**

The largest connectivity gains were in direct connectivity to the Middle East (+175%), and Africa (+110%), with Europe registering the lowest – yet significant – performance (+31%). Direct connectivity growth to North America, Latin America and Asia Pacific were broadly similar (50-60%).

The picture is slightly different for indirect connectivity with the biggest increases being to the Middle East (+91.7%) and Asia-Pacific (+82%). Like at EU airports, a disproportionate share of the growth in connectivity to Asia Pacific is due to indirect connectivity – which can be linked to the level of direct connectivity and hub connectivity to/from the Middle East, but also to/from Turkey and to a lesser extent Russia.

5 AIRPORT GROUPS



This section considers the direct, indirect and total connectivity of the different size categories of European airports:

17. ACI Airport groups

ACI airport group	Airport size (mln passengers per year)	No. European airports
I	> 25	14
II	10 – 25	23
III	5 – 10	34
IV	< 5	390

Highest connectivity growth from regional & small airports

Between 2004 and 2014, all groups of airports saw their total connectivity increasing – with the **highest growth in relative terms at Group IV airports (+46%)** and the lowest at Group I airports (+34%).

This mainly reflects the **dynamic development of low cost airlines**, which have opened up new direct connections out of small and regional airports (+23% in direct connectivity), but also the **increased opportunities offered for these airports by the network impact – through connections via larger airports** (+62% in indirect connectivity). It is worth noting that Group II airports saw the weakest increase in direct connectivity between 2004 and 2014 (+14%).

A large part of the growth in connectivity for all groups of airports took place between 2004 and 2008. This was especially the case for Group IV airports where connectivity increased by +33% during that period.

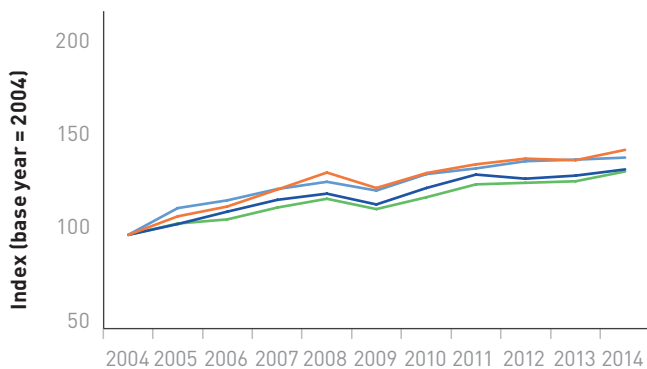
Hubs & larger airports' connectivity more resilient during the crisis

The global financial crisis saw the **biggest decrease in connectivity at Group IV airports**, with connectivity decreasing by -6.2% between 2008 and 2009. Group III airports (-3.6%) were marginally less affected than Group I and II airports (-4.5% and -4.7%).

The recovery benefitted the most to the very large airports and hubs with +12.1% increase in the overall connectivity from Group I airports. These airports also achieved the best recovery in direct connectivity (+2.1% between 2008 and 2014).

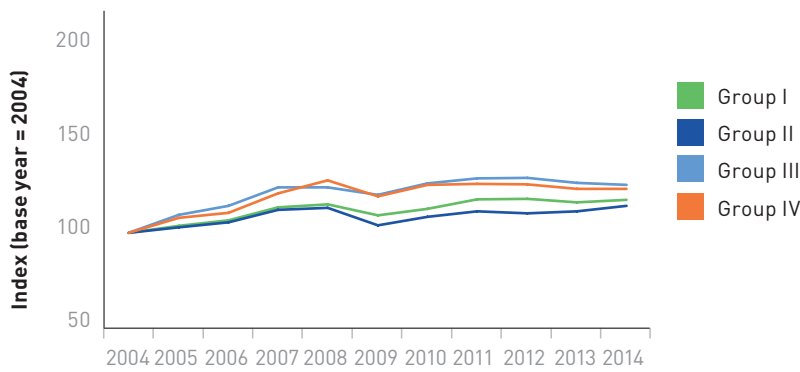
Group IV airports were the only ones which did not recover their pre-crisis level of direct connectivity (-3.4%). Direct connectivity at airport Groups II and III only marginally recovered (around +1%). The recovery in indirect connectivity was much stronger, with all groups of airports showing similar performance levels (+15-17%).

18. Connectivity by airport group (2004-2014)



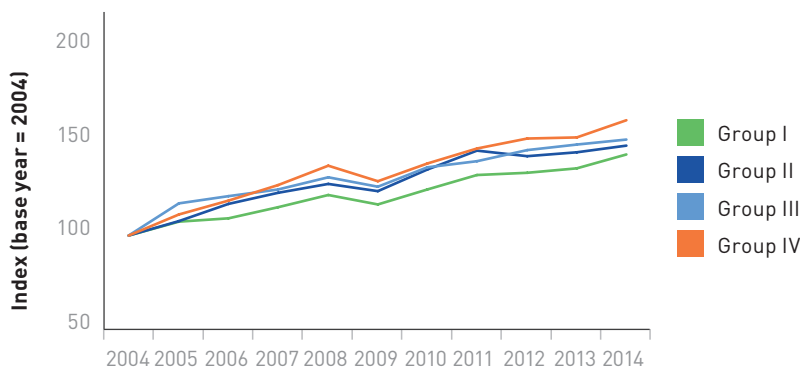
Group	Growth	
	'04-'14	Y-o-Y
I	34%	3.0%
II	35%	3.1%
III	41%	3.5%
IV	46%	3.8%
TOTAL	38%	3.3%

19. Direct connectivity by airport group (2004-2014)



Group	Growth	
	'04-'14	Y-o-Y
I	18%	1.6%
II	14%	1.3%
III	25%	2.3%
IV	23%	2.1%
TOTAL	19%	1.8%

20. Indirect connectivity by airport group (2004-2014)



Group	Growth	
	'04-'14	Y-o-Y
I	43%	3.7%
II	48%	4.0%
III	51%	4.2%
IV	62%	4.9%
TOTAL	50%	4.1%

Mostly stable market shares between airport groups

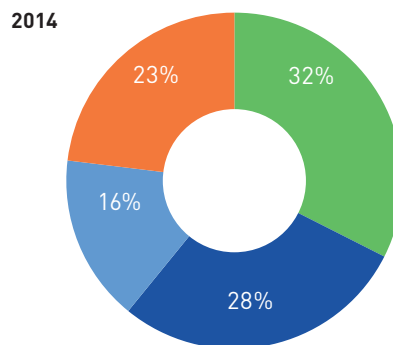
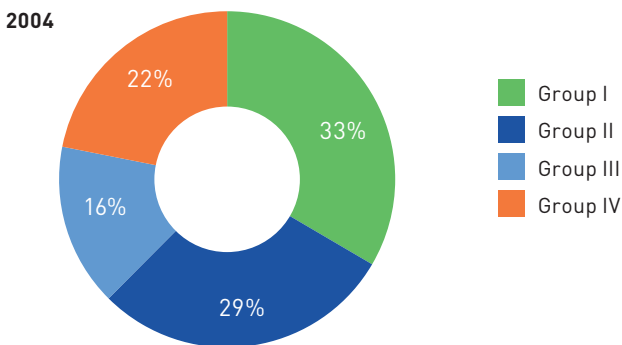
The market shares in connectivity between the different groups of airports did not change significantly over the last 10 years.

Group I airports continue to account for the biggest share of Europe's connectivity – and still accounted for the largest growth in connectivity in absolute terms (+35,812). This was achieved primarily through their volume increase in indirect connectivity (+29,086), which was higher than

at other groups. Conversely, their volume increase in direct connectivity slightly underperformed that of Group IV airports (+6,726 v. +6,877). While any new connection between Group IV airports would be counted twice, this still reflects the massive impact of Low Cost Carriers on the connectivity of small and regional and small airports – which mostly predated the crisis.

When compared to 2004, the 2014 market share of Group I airports has gone down by -1%, while the share of Group II airports has also gone down by -0.6% – to the benefit of Group IV airports (+1.2%) and Group III (+0.4%).

21. Airport connectivity market share by airport group (2004 vs. 2014)



6 ONWARD CONNECTIVITY FROM EUROPE



This section considers the onward connectivity of individual airports and onward connectivity of EU and non-EU airports as a whole. Onward connectivity qualifies the indirect connectivity which is channelled through hub airports and can be defined as the total indirect connectivity aggregated by intermediate hub airport. Analysing onward connectivity allows for identifying which intermediate hubs are most important in the indirect connectivity of an airport or a group of airports¹.

EU hubs losing out to non-EU European hubs and other hubs outside Europe

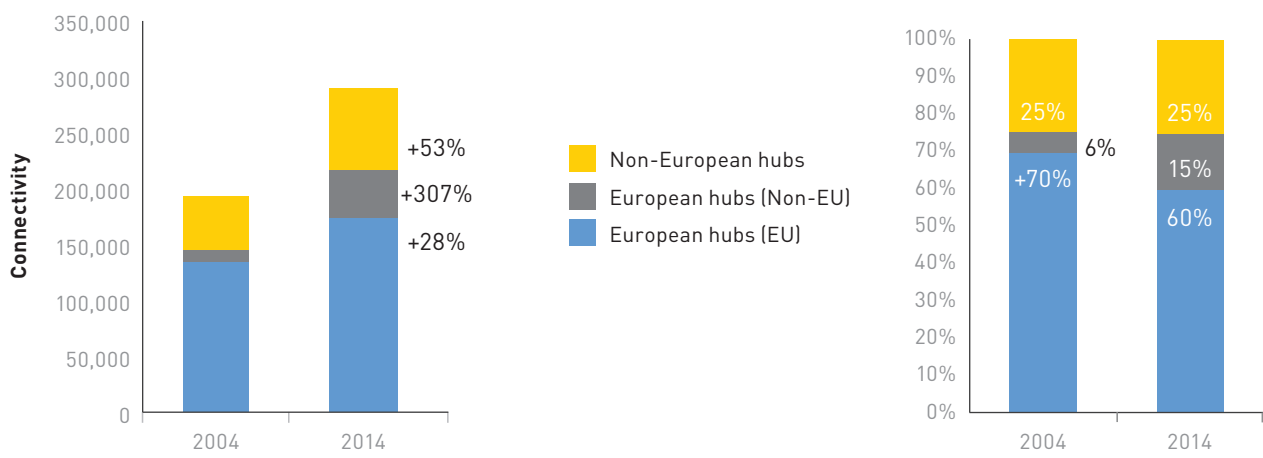
Most indirect connections offered from Europe to other world regions are channelled through European hubs (62%), the majority of which are located in the EU. However, over the last 10 years, **the share of EU hubs in onward connectivity has decreased by -8%**, to the benefit primarily of non-EU European hubs (+307% growth in onward connectivity) and also non-European hubs (+53% growth in onward connectivity). This reflects increased hub competition, in particular between EU hubs on the

one hand and Turkish, North American and Gulf hubs on the other hand.

EU hubs have been losing market share in onward connectivity originating from all four airport groups in Europe – despite absolute onward connectivity growth at these airports (between +21% from Group II airports to 33% at Group IV airports). This is due:

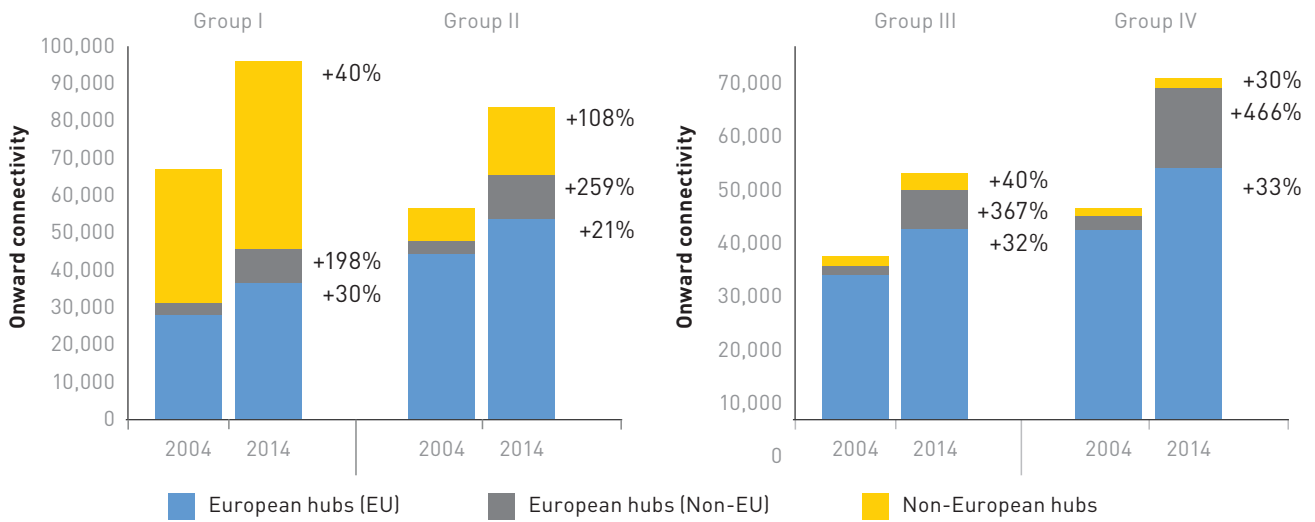
- ➔ Primarily, to the **exponential growth of non-EU European hub airports** (predominantly Istanbul-Atatürk, but also to a lesser extent to Moscow-Sheremetyevo) **in onward**

22. Onward connectivity growth & market shares – 2004/2014



¹ Let origin airport X have an indirect connectivity of 100. 50% of the indirect connectivity is channelled through hub H. The onward connectivity generated by hub H for airport X will then be 50.

23. Onward connectivity growth by airport group (2004 vs. 2014)



connectivity from all airport groups: + 198% from Group I, + 259% from Group II, +367% from Group III and +466% from Group IV. This reflects in particular the direct connectivity outreach of Istanbul-Atatürk to airports of very different sizes across Europe.

➔ Secondly, to the **dynamic growth of non-European hubs** (in particular Gulf hubs) in onward connectivity from Group I and II airports (+40% and +108%).

Sheremetyevo and Dubai did not feature in the top-20 list of hubs for onward connections in 2004, they are now included in that list for 2014.

Similarly, the 5 biggest European airports in terms of 2004 passenger traffic (London-Heathrow, Paris-Charles de Gaulle, Frankfurt, Amsterdam and Madrid) saw their combined market share of onward connectivity decrease from 43% to 36% between 2004 and 2014 – which also indicates an **increasing reliance of Europe on non-EU and non-European hubs for its connectivity.**

24. Evolution of market shares by airport group (2004 & 2014)

	European hubs (EU)		European hubs (non-EU)		Non-European hubs	
	2004	2014	2004	2014	2004	2014
Group I	42%	38%	5%	10%	53%	52%
Group II	79%	64%	6%	14%	15%	22%
Group III	89%	77%	5%	16%	6%	7%
Group IV	90%	74%	7%	23%	4%	3%

FRA, AMS & CDG still at the top

Frankfurt, Amsterdam and Paris-Charles de Gaulle remain the top 3 European hubs offering the most onward connections from Europe. However, their combined market share has gone down from 32% to 29% since 2004 – reflecting **increasing competition from non-EU and non-European hubs.** In this regard, it is worth noting that while Istanbul-Atatürk, Moscow-

Changing hub fortunes

The past 10 years have seen changing fortunes for several hubs, also pointing to increasing competition:

➔ **Milan-Malpensa** and **Barcelona** have disappeared from the top 20 list, following the decisions of Alitalia and Iberia to halt hub operations from these airports.

➔ **Brussels and Oslo** have joined the top 20 list. This reflects the growth of Brussels Airlines and its STAR alliance membership as well as the establishment of hub operations by Indian airline Jet Airways at Brussels and the growth of Norwegian at Oslo.

➔ **US hubs** have seen their position weakened – from a 12% share of European onward

connectivity in 2004 to a 7% share in 2014. While there were 7 US hubs in the top 20 list in 2004, there are only 4 in 2014. This is primarily due to the maturity of the North American markets compared to other non-European markets.

- ➔ Finally, **Istanbul-Atatürk, Moscow-Sheremetyevo and Dubai** have joined the top 20 list, with a combined market share of 10%.

25. Top 20 hubs for onward connections from Europe

Rank	2004	2014	2014
1	FRA	15%	FRA 13%
2	CDG	10%	AMS 8%
3	AMS	8%	CDG 8%
4	MUC	6%	IST 6%
5	LHR	5%	MUC 6%
6	MAD	5%	LHR 4%
7	VIE	5%	VIE 3%
8	ORD	3%	ZRH 3%
9	ATL	3%	SVO 3%
10	ZRH	3%	MAD 3%
11	EWR	2%	EWR 2%
12	CPH	1%	ORD 2%
13	HEL	1%	ATL 2%
14	MXP	1%	FCO 2%
15	BCN	1%	HEL 2%
16	FCO	1%	CPH 1%
17	IAD	1%	DXB 1%
18	DTW	1%	BRU 1%
19	PHL	1%	OSL 1%
20	DFW	1%	PHL 1%
	Other	30%	Other 27%

Hub specialisation & market shares

When looking at onward connectivity towards each world region, the lack of dominant position and the relatively low market shares of each hub are evident. At the same time, a certain degree of hub specialisation is also apparent – for example: Paris-Charles de Gaulle providing the most onward connections to Africa, Frankfurt to Asia-Pacific, Istanbul to the Middle East and Madrid to Latin America. Finally, it is worth noting that Istanbul-Atatürk is more important than Dubai as a connecting point between Europe and Asia Pacific, the Middle East and Africa.

The market share of European hubs v. non-European hubs (out of the top 20 hub airports) for onward connectivity from Europe to the different regions of the world is as follows:

- ➔ **European hubs hold a 49% market share to North America** vs. 51% for US & Canadian hubs.
- ➔ **EEA hubs hold a 54% market share to Asia-Pacific** vs. 26% for Asia-Pacific hubs, 11% for Turkish and Russian airports and 9% for Gulf airports.
- ➔ **European hubs hold a 76% market share to Latin America** vs. 24% for Latin American and North American hubs.
- ➔ **EEA hubs hold a 55% market share to Middle East** vs. 27% for all other European hubs (mainly Turkish airports), 15% for Middle East hubs, and 3% for African hubs.
- ➔ **EEA hubs hold a 68% market share to Africa** vs. 16% market share for African hubs, 14% market share for other European hubs (mainly Istanbul-Ataturk) and 2% for Gulf airports.
- ➔ **EEA hubs hold a 83% market share to Europe** vs. 17% market share for other European hubs.

26. **Top 20 hubs offering most connections between ACI Europe member airports and the world regions, 2014**

Rank	To											
	Africa		Asia-Pacific		Europe		Latin America		Middle East		North America	
1	CDG	20%	FRA	16%	FRA	13%	MAD	18%	IST	24%	FRA	12%
2	IST	13%	AMS	9%	MUC	10%	CDG	16%	FRA	17%	CDG	8%
3	FRA	13%	CDG	8%	VIE	8%	FRA	12%	AMS	7%	ORD	7%
4	AMS	12%	IST	7%	AMS	8%	AMS	12%	CDG	7%	EWR	7%
5	LHR	6%	LHR	6%	IST	7%	LIS	5%	LHR	7%	LHR	7%
6	JNB	5%	DXB	5%	SVO	6%	GRU	4%	AUH	5%	ATL	7%
7	BRU	4%	MUC	4%	ZRH	4%	LHR	3%	VIE	5%	AMS	6%
8	CMN	3%	PEK	4%	CDG	4%	FCO	3%	DXB	4%	MUC	4%
9	LIS	2%	SIN	3%	OSL	3%	MIA	3%	MUC	3%	PHL	4%
10	ZRH	2%	HEL	3%	HEL	3%	MUC	2%	FCO	3%	YYZ	4%
11	FCO	2%	HND	3%	FCO	3%	ATL	2%	CAI	2%	IAD	3%
12	MUC	2%	SVO	3%	CPH	3%	BOG	2%	AMM	2%	CLT	3%
13	CAI	2%	ZRH	3%	MAD	2%	IAH	2%	ZRH	1%	DTW	2%
14	ADD	2%	BKK	3%	SAW	2%	ZRH	1%	BEY	1%	ZRH	2%
15	MAD	2%	AUH	3%	BRU	2%	ORY	1%	SAW	1%	JFK	2%
16	DXB	2%	PVG	3%	BCN	2%	EWR	1%	BAH	1%	DFW	2%
17	NBO	1%	HKG	2%	TXL	2%	MEX	1%	SVO	1%	IAH	2%
18	VIE	1%	ICN	2%	ATH	1%	JFK	1%	MAD	1%	MAD	1%
19	ORY	1%	KUL	2%	WAW	1%	DFW	1%	ATH	1%	MSP	1%
20	TUN	1%	VIE	1%	DUS	1%	IAD	1%	TXL	1%	FCO	1%
OTHER		6%		10%		16%		7%		8%		14%

7 HUB CONNECTIVITY



Hub connectivity complements airport connectivity by generating transfer traffic – which supports direct connectivity and also stimulates cost efficiencies and economic growth. Transfer traffic is indeed needed to fill ‘the empty seats’ on those destinations for which local demand is too weak to justify the existence of an air service or increases in its frequency/capacity. Hence, transfer traffic allows an airport to grow its direct connectivity far beyond what its local market may support. Without transfer traffic, many direct connections offered from hub airports could not be sustained. Therefore, hub connectivity allows for the provision of more direct connections from which the local community benefits.

The vast majority of hub connectivity (connections offered by an airport between two other airports) is generated by larger airports (Group I: 77% of hub connectivity & Group II airports: 20% of hub connectivity). The share of hub connectivity ensured by airports with less than 10 million passengers is only 3%.

The **Intra-European, Europe-North America and Europe-Asia markets** represent the largest hub connectivity markets, with a combined share of overall hub connectivity of **74%**.

However, the largest growth in hub connectivity in relative terms over the past 10 years has been on the **Intercontinental market**¹, where European hubs have connected other world regions between each other, as well as on the **Europe-Middle East market** – with hub connectivity on these markets more than doubling. The intra-European and Europe-North America markets showed the highest growth in hub connectivity in absolute terms.

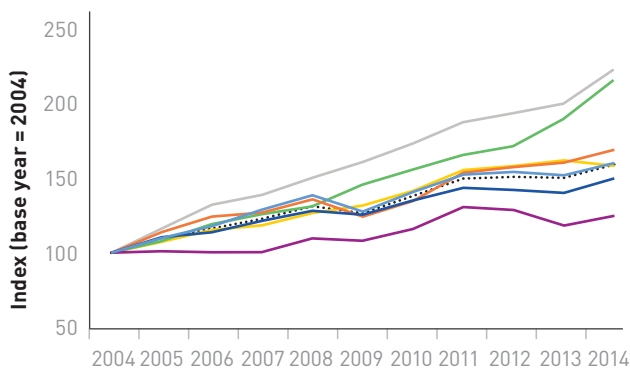
But fierce global competition

Prima facie, these developments point to an increasing global outreach for European hubs. However, the intercontinental market only accounts for 5% of their hub connectivity. Moreover, **European hubs have faced fierce competition** from hubs located in other regions of the world, in particular the Middle East.

As a result, **their relevance on the intercontinental market has considerably diminished**, with the top 3

Highest growth on intercontinental market

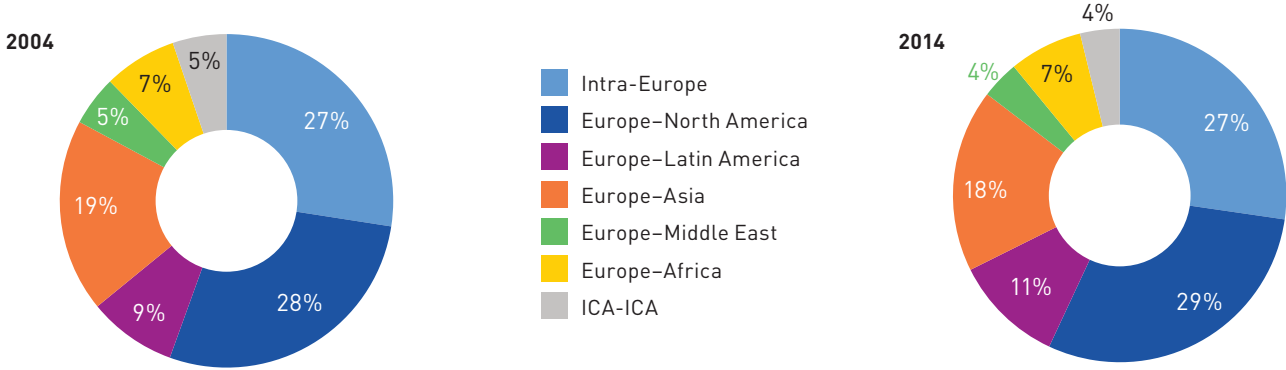
27. Hub connectivity by world region (2004-2014)



Region	Growth	
	'04-'14	Y-o-Y
Intra-Europe	54%	4.4%
Europe-North America	45%	3.8%
Europe-Latin America	23%	2.1%
Europe-Asia	62%	4.9%
Europe-Middle East	103%	7.3%
Europe-Africa	52%	4.3%
ICA-ICA	109%	7.6%
TOTAL	53%	4.3%

1. All routes originating outside Europe and terminating outside Europe via European hubs.

28. Growth in hub connectivity by connecting market, 2004-2014



Gulf hubs now firmly established as the providers of intercontinental connectivity. This reflects **Europe's weakened position as a global aviation hub**;

➔ While the hub connectivity levels offered by Dubai, Abu Dhabi and Doha still remain below those of the top 3 European hubs (39,888 vs. 170,828 for Frankfurt, Paris-Charles de Gaulle and Amsterdam), their growth in hub connectivity has been staggering. Between 2004 and 2014, the hub connectivity of Abu Dhabi, Doha and Dubai respectively grew by +1,913%, 1,861% and 485%.

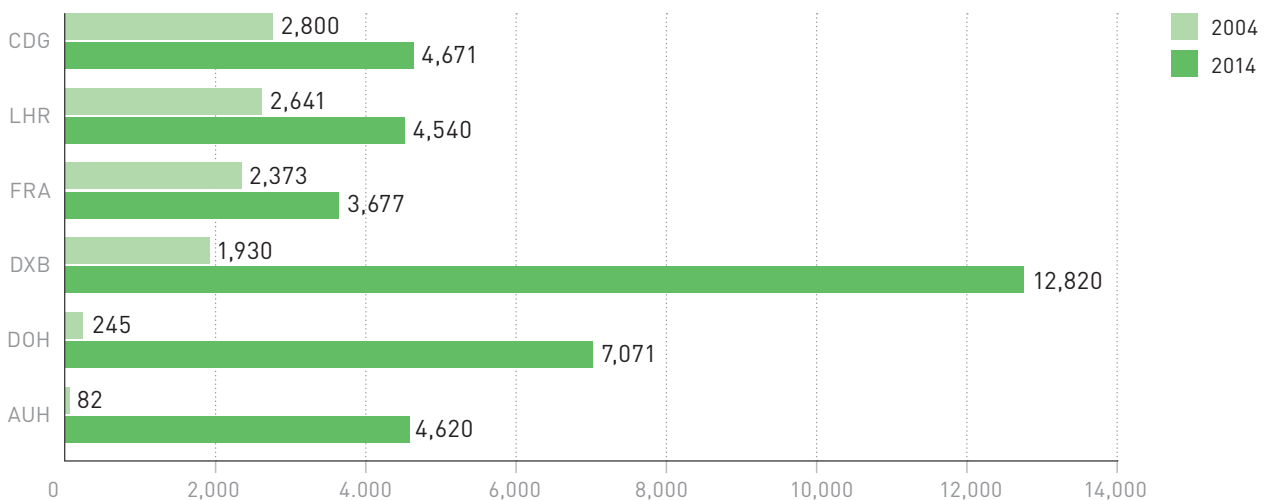
➔ Istanbul-Atatürk, Moscow-Domodedovo and Moscow-Sheremetyevo are the only European hubs showing similar growth levels (respectively +1222%, +774% and +422%).

➔ Significantly, the growth and hub connectivity of Dubai, Abu Dhabi and Doha has been focused on

the intercontinental market – ie. connecting other regions than the Middle East between themselves. In 2004, their level of intercontinental connectivity was well below that of the top 3 European hubs (London-Heathrow, Frankfurt and Paris-Charles de Gaulle): 2,257 v. 7,814. In 2014, the situation has reversed with the top 3 Gulf hubs providing twice the level of intercontinental connectivity provided by the top 3 European hubs: 24,511 v. 12,888. The level of intercontinental connectivity of Dubai airport alone (12,820) is equivalent to that of the top 3 European hubs.

➔ Beyond the Middle East, other airports have also started to grow significantly in terms of hub connectivity, increasingly competing with European hubs on intercontinental markets and markets between Europe and other regions. This is the case for example of Addis Ababa (+1572% between 2004 and 2014).

29. Hub connectivity: intercontinental market (2004 vs. 2014)



8 NATIONAL MARKETS



There are wide variations between countries as regards their connectivity, which reflect several factors, including country size and population, GDP (both absolute and per capita) and geographical location.

The level of national connectivity – airport connectivity provided from each country – is also influenced by:

- ➔ **The number of commercial airports.** A dense network of airports at national level will naturally tend to guarantee a higher level of national connectivity.
- ➔ **The presence of hub airports with a significant activity of Full Service Carriers.** This is due to the fact that the transfer traffic generated by hub airports allows all other national airports – which tend to be well connected to the national hub – to offer more connections than those that would otherwise be offered by the local market alone. Also, it is important to stress that the Network Impact – the ability a direct connection to generate a number of indirect connections which significantly contribute to total connectivity – is higher with Full Service Carriers operating a network based on hub(s) than with Low Cost Carriers operating point to point services.

There is clearly a **connectivity gap between the Western and Eastern parts of Europe**, which in part reflects the above mentioned connectivity gap between EU and non-EU markets (see section 3).

Germany is the country with the best airport connectivity, followed by the UK and France. Airports in these 3 countries account for 44%

(153,016) of the EU's total connectivity and for 35% of Europe's total airport connectivity. Together with Spain and Italy, they account for 65% (225,983) of the EU's connectivity and 51% of Europe's airport connectivity.

Turkey is the best connected of all the non-EU countries, followed by Switzerland and Russia.

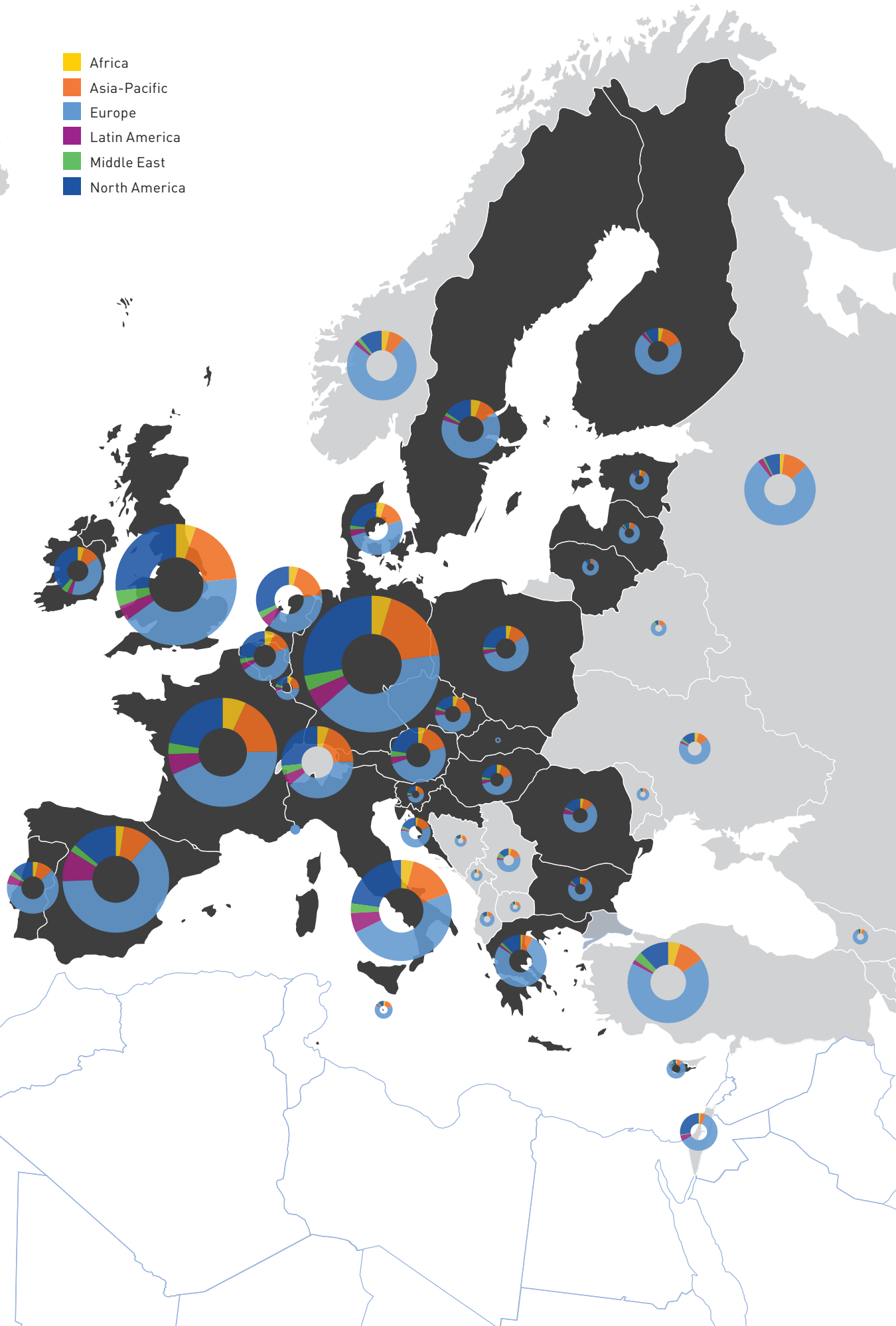
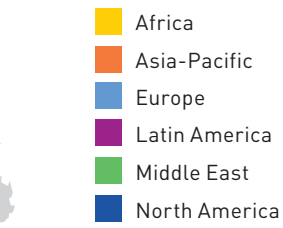
Airports in these 3 countries account for 64% (57,039) of non-EU's total connectivity and for 13% of Europe's connectivity.

Germany and the UK have almost the same level of direct airport connectivity (16,996 and 16,555) but Germany boasts a higher level of indirect connectivity (46,109 v. 33,254) – partly due to the presence of 2 large hubs which serve the same airline alliance and are well connected to other German airports. Spain comes at the 3rd position (14,689), followed by France (11,255) and Italy (10,040). The performance of Spain is strongly influenced by the importance of its leisure air traffic during the summer season.

The split between connectivity to Europe and to other world regions varies significantly for each of Europe's largest countries. Germany is the country with the highest share of its airport connectivity to non-European countries (60%), followed by the UK (59%), France (57%), Italy (52%), Spain (37%), Turkey (33%) and Russia (24%). Smaller countries with large hub airports achieve a comparatively higher share of their connectivity to non-European countries – also because of the absence or small level of domestic connections. This is the case of the Netherlands (63%) and Switzerland (60%).

In absolute terms, the UK has the most direct connections (2,390) to non-European countries, with 43% of these to North America and 18% to Asia

30. Airport connectivity offered from European countries to continents, 2014



Pacific. France comes 2nd for the number of direct connections to non-EU countries (2,166), with 52% of these to Africa and 20% to North America. Germany is 3rd (1,637), but with a more balanced geographical split – 35% of its direct connections go to North America and 35% to Asia Pacific and 19% to the Middle East.

Turkey follows France (1,174) with 45% of its non-European direct connections to the Middle East and 24% to Africa. Spain, Italy and the Netherlands have a similar level of direct non-European direct connections (between 757 and 795), followed by Russia (678). 33.5% of Spain's non-European direct connections are to Latin America and 32% to Africa. 31% of Italy's non-European direct connections are to North America and another 31% to Africa. 35% of the Netherlands' non-European direct connections are to North America, followed by 25% to Asia Pacific. For Russia, 77% of its non-European direct connections are to Asia Pacific and 12% to the Middle East.

As regards **hub connectivity, Germany is also the best performer (accounting alone for 26% of total European hub connectivity), followed by France (13%) and the Netherlands.** The UK only comes to the 4th position (9%), closely followed by Turkey (8.4%). Russia has a small share of hub connectivity (4.2%) given its size and geographical location – equivalent to Switzerland and lower than Spain (4.6%).

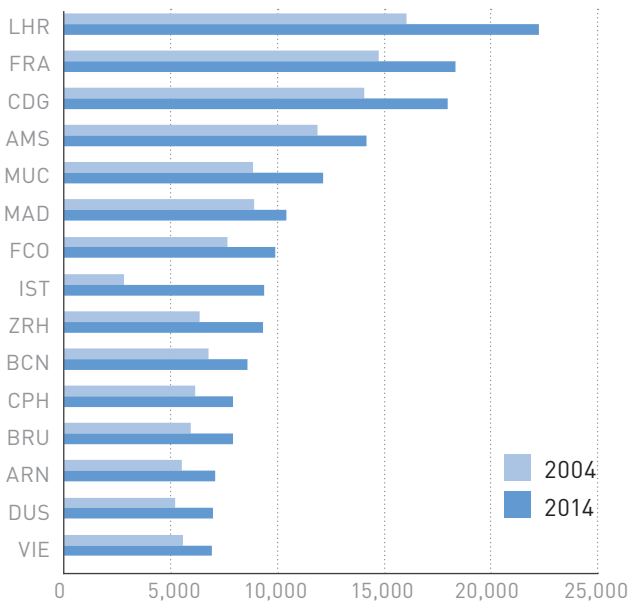
9 CONNECTIVITY BY INDIVIDUAL AIRPORT



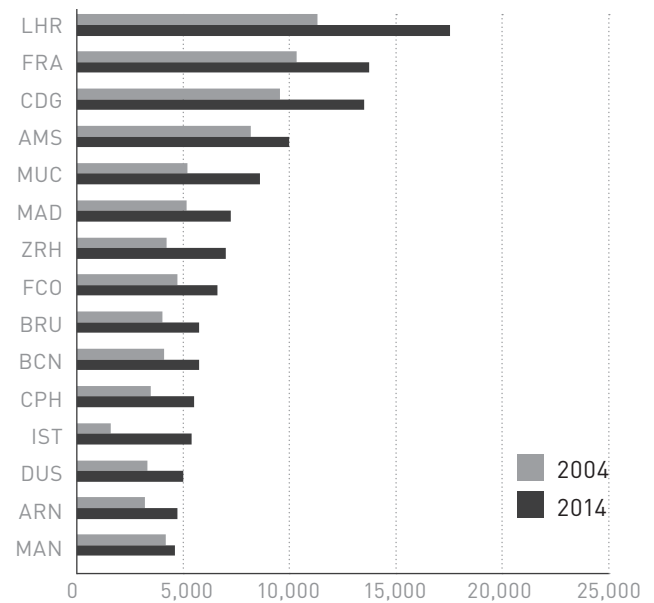
Total, direct, indirect and hub connectivity for each individual European airport are included in Appendix F.

31. Top 15 airports offering most airport connectivity, direct, indirect and hub connectivity, 2004-2014

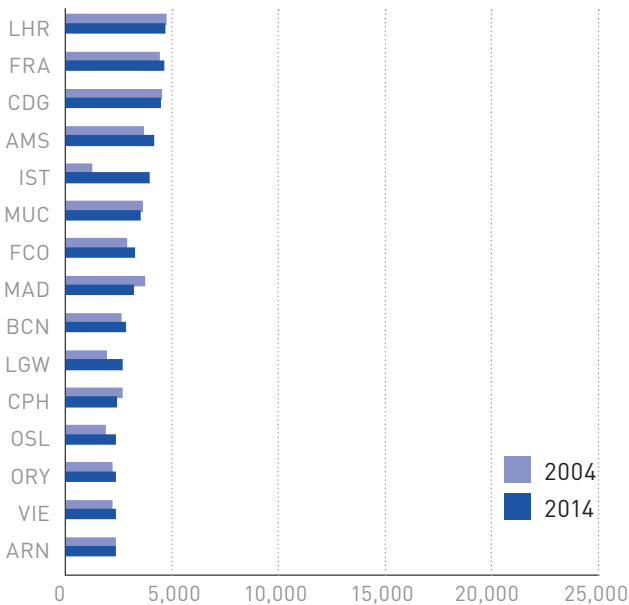
AIRPORT CONNECTIVITY



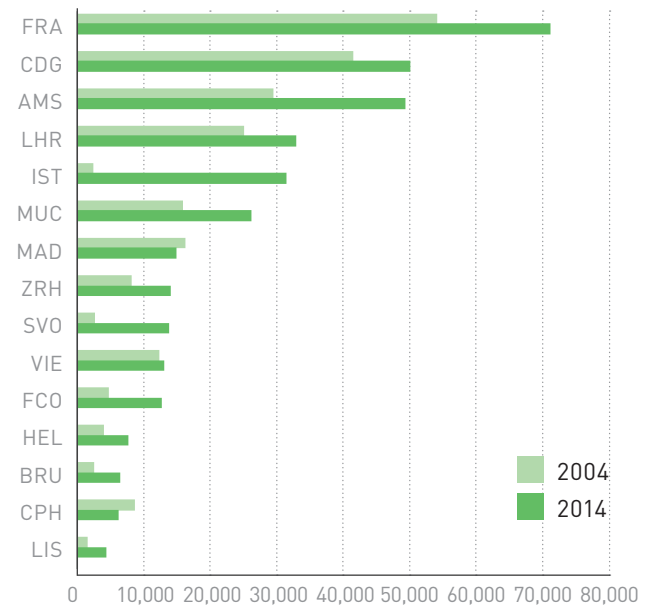
INDIRECT CONNECTIVITY



DIRECT CONNECTIVITY



HUB CONNECTIVITY



32. Top 10 airports showing strongest growth in airport, direct, indirect and hub connectivity, 2004-2014

Group	Growth (Y-o-Y), 2004-2014							
	Airport	Direct		Indirect		Hub		
I	AYT	16%	AYT	13%	DME	26%	IST	29%
	DME	14%	IST	12%	AYT	22%	DME	24%
	IST	13%	DME	8%	IST	13%	SVO	18%
	SVO	5%	SVO	5%	ORY	5%	FCO	10%
	LHR	3%	LGW	3%	MUC	5%	AMS	5%
	MUC	3%	AMS	1%	SVO	5%	MUC	5%
	FCO	3%	FCO	1%	LHR	4%	FRA	3%
	CDG	2%	BCN	1%	CDG	4%	LHR	3%
	BCN	2%	ORY	1%	MAD	3%	CDG	2%
	FRA	2%	FRA	0%	FCO	3%	MAD	-1%
	GROUP AVERAGE	3%	GROUP AVERAGE	2%	GROUP AVERAGE	4%	GROUP AVERAGE	5%
II	SAW	57%	SAW	73%	SAW	31%	TXL	37%
	LED	8%	LED	7%	LED	9%	GVA	18%
	PMI	5%	PMI	4%	PMI	7%	LED	15%
	LIS	5%	TXL	4%	OSL	6%	DUB	13%
	OSL	5%	GVA	4%	STN	6%	OSL	13%
	TXL	4%	OSL	2%	LIS	6%	DUS	12%
	ZRH	4%	LIS	2%	ZRH	5%	LIS	11%
	GVA	4%	AGP	2%	CPH	5%	BRU	10%
	DUB	4%	BRU	1%	DUB	5%	HEL	7%
	DUS	3%	DUB	1%	ATH	5%	AGP	6%
	GROUP AVERAGE	3%	GROUP AVERAGE	1%	GROUP AVERAGE	4%	GROUP AVERAGE	4%
III	BLQ	27%	BLQ	22%	CRL	94%	BGY	50%
	ADB	17%	ADB	18%	BLQ	29%	KBP	30%
	CRL	14%	ESB	14%	ADB	16%	IBZ	25%
	ESB	10%	CRL	12%	HER	14%	EDI	18%
	BGY	9%	BGY	8%	BGY	11%	CRL	15%
	HER	9%	TFS	8%	SXF	11%	SXF	13%
	FAO	9%	FAO	8%	FAO	9%	LIN	12%
	KBP	8%	IBZ	7%	KBP	9%	NAP	11%
	SXF	7%	KBP	7%	BGO	8%	VCE	11%
	IBZ	6%	OTP	7%	LIN	7%	ADB	10%
	GROUP AVERAGE	4%	GROUP AVERAGE	2%	GROUP AVERAGE	4%	GROUP AVERAGE	3%
IV	MQM	52%	MQM	43%	PDL	75%	MSQ	63%
	BAL	50%	BAL	34%	KSY	70%	EIN	63%
	DNZ	33%	KUT	27%	HTA	63%	CIA	58%
	MSR	31%	KYA	25%	SBZ	48%	UME	47%
	HTA	30%	RJK	22%	BOJ	47%	DBV	46%
	KUT	29%	DNZ	22%	PVK	46%	ODS	44%
	KYA	28%	ERZ	21%	CEK	44%	RIX	41%
	TOF	27%	MSR	21%	TOF	42%	CHQ	38%
	ERZ	27%	DIY	21%	TGD	39%	LWO	24%
	DIY	27%	SZF	21%	DNZ	39%	BMA	24%
	GROUP AVERAGE	4%	GROUP AVERAGE	2%	GROUP AVERAGE	5%	GROUP AVERAGE	7%

CONCLUSION

The increase in airport connectivity in Europe over the past 10 years has been impressive – but it has clearly not been linear and has also been very much contrasted. In particular, the **2008/2009 crisis** has been a **turning point in the way connectivity has developed in Europe**:

- ➔ While EU airports still deliver the bulk of Europe’s connectivity, their connectivity gains have been modest since the crisis compared to those achieved by non-EU airports. There has indeed been an acceleration of the **rebalancing in the connectivity outreach between EU and non-EU airports**, with airports in Turkey and Russia benefitting the most.
- ➔ More fundamentally, **EU airports have lost a significant volume of direct connectivity since 2008** and have become **more dependent on indirect connectivity** for their global outreach – in particular to Europe but also to North America, Latin America and Asia-Pacific.
- ➔ **Small and regional airports** have tended to be **more affected** than other airports by losses in direct connectivity. **Larger airports and hubs have shown more resilience** – with EU larger airports and hubs largely contributing to the resilience of total connectivity through their network impact and the indirect connectivity they provide from other European airports.
- ➔ However, **EU hubs** have been **losing market share** in terms of onward connectivity from Europe, primarily to the benefits of **non-EU hubs in Turkey and Russia** as well as other non-European hubs mainly in the Middle East. These hubs located outside the EU have become important in terms of the connectivity they deliver for Europe. They have also **grown exponentially** and much faster than EU hubs in terms of hub connectivity, acquiring a **prominent position in delivering global**

connectivity between the different regions of the world – with positive spill over impacts in terms of the direct & indirect connectivity they deliver for their own markets and communities.

These developments indicate that **connectivity cannot be taken for granted**. While market forces and technology are primarily shaping connectivity, **public policies and regulations also have a role to play** – especially given the strong correlation between connectivity and economic growth.

Clearly, the recent loss in direct connectivity at EU airports, the fact that an increasing share of indirect connectivity is afforded by hubs located outside the EU and the diminished position of EU hubs for intercontinental connectivity should not be ignored. These developments are pointing to the increasing **risk of Europe being by-passed as an aviation hub** and significant player in providing **global connectivity**. Beyond aviation, these developments are also **impacting the EU economy** – both in terms of its further integration (connectivity within Europe) and global outreach and competitive position (connectivity to other parts of the world).

While prominent non-EU and other non-European countries have placed airport connectivity at the heart of the policies and strategies underpinning their economic development, the **EU still needs to “up its game”** – and truly recognise airport connectivity and its different components (direct connectivity, indirect connectivity & hub connectivity) as an essential element for its competitive position on the global stage.

This means that significant **progress needs to be made** in relation to a number of **policy issues** which are directly impacting airport connectivity. These include:

- ➔ **Airport capacity** – in view of the capacity crunch that Europe is facing in the next 20 years. Given the essential role played by hub airports in Global connectivity, the prospect of

seeing the top 20 European airports becoming fully congested should be addressed as a priority as part of EU & national aviation long-term strategic planning¹. Otherwise, further connectivity loss or sub-optimal connectivity growth will be inevitable.

Moreover, attention also needs to be paid to the density of the airport network at national level, due to its impact on national connectivity.

➔ **Air traffic liberalisation** – Bilateral Air Services Agreements continue to limit the development of existing air services and the establishment of new air services, thus acting as an artificial constraint on the development of airport connectivity. Opening market access through EU negotiated agreements with the main trading partners of the EU should be another priority – given its ability to increase direct, indirect and hub connectivity².

The sub-optimal levels of direct connectivity to Asia-Pacific and South America in particular reveal opportunities to unlock connectivity improvements with these Regions.

➔ **Operating costs & aviation taxes** – regulation has a key role to play in minimising airport operating costs, in particular as regards security and safety. Achieving costs efficiencies in these areas would improve the competitive position of European airports, with positive spill over effects their connectivity. Similarly, attention should be paid to the levels of Terminal Navigation Charges (TNC) and aviation taxes in the UK, France, Germany and Austria should be repealed.

➔ **Airport charges** – rising non-European hubs are famed for their tight cooperation between airport and airlines, providing an additional competitive advantage in terms of service quality delivery and route network development. While Europe will always remain different, more can be done to empower

European airports and airlines to work together. In particular the extensive nature of European-level economic regulation of airport and the intrusive nature of the national-level equivalent in some Member States pits airlines and airports against each other, undermining efforts to work more closely together.

1. EUROCONTROL, "Challenges of Growth 2013".

2. ACI EUROPE, "Expanding Europe's Aviation Market: Prerequisite for Global Relevance" – June 2011

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APPENDICES



Appendix A

TOTAL AND HUB CONNECTIVITY

Total airport connectivity for European airports

Table A.1 **Total airport and hub connectivity for the European airport network, 2004-2014**

Connectivity	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Airport	315,526	341,307	355,664	377,113	393,321	374,172	398,842	417,630	420,343	422,539	435,440
<i>Of which:</i>											
Direct	121,491	128,090	131,825	141,683	144,608	135,828	141,720	145,291	145,081	143,544	144,873
Indirect	194,035	213,217	223,839	235,431	248,713	238,344	257,122	272,339	275,262	278,994	290,567
Hub	261,598	284,464	299,753	314,988	334,666	323,674	348,698	378,087	380,764	379,249	400,143

Table A.2 **Growth in airport and hub connectivity for the European airport network, 2004-2014**

Connectivity	Total growth over period					Y-o-Y growth over period				
	'04-'14	'09-'14	'08-'09	'04-'11	'11-'14	'04-'14	'09-'14	'08-'09	'04-'11	'11-'14
Airport	38%	16%	-5%	32%	4%	3.3%	3.1%	-4.9%	4.1%	1.4%
<i>Of which:</i>										
Direct	19%	7%	-6%	20%	0%	1.8%	1.3%	-6.1%	2.6%	-0.1%
Indirect	50%	22%	-4%	40%	7%	4.1%	4.0%	-4.2%	5.0%	2.2%
Hub	53%	24%	-3%	45%	6%	4.3%	4.3%	-3.3%	5.4%	1.9%

Appendix B

CONNECTIVITY BY DESTINATION WORLD REGION

Airport connectivity for European airports

Table B.1 **Total airport connectivity by world region, 2004-2014**

Region	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Africa	12,045	13,249	14,353	14,774	15,548	16,260	17,962	18,563	19,129	20,013	19,665
Asia-Pacific	32,971	37,376	40,933	42,444	46,231	43,437	47,950	54,317	57,260	59,418	62,018
Europe	177,879	190,845	198,134	213,629	221,720	206,899	219,005	226,339	227,319	225,387	229,714
Latin America	16,148	16,266	16,524	16,324	17,386	16,931	18,611	20,638	20,386	18,788	20,624
Middle East	6,736	7,363	8,109	8,571	8,999	9,992	10,691	11,672	12,241	13,345	13,112
North America	69,746	76,208	77,611	81,372	83,437	80,652	84,623	86,101	84,008	86,020	90,308
TOTAL	315,526	341,307	355,664	377,113	393,321	374,172	398,842	417,630	420,343	422,971	435,440

Table B.2 **Shares in airport connectivity for each world region, 2004-2014**

Region	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Africa	3.8%	3.9%	4.0%	3.9%	4.0%	4.3%	4.5%	4.4%	4.6%	4.7%	4.5%
Asia-Pacific	10.4%	11.0%	11.5%	11.3%	11.8%	11.6%	12.0%	13.0%	13.6%	14.0%	14.2%
Europe	56.4%	55.9%	55.7%	56.6%	56.4%	55.3%	54.9%	54.2%	54.1%	53.3%	52.8%
Latin America	5.1%	4.8%	4.6%	4.3%	4.4%	4.5%	4.7%	4.9%	4.8%	4.4%	4.7%
Middle East	2.1%	2.2%	2.3%	2.3%	2.3%	2.7%	2.7%	2.8%	2.9%	3.2%	3.0%
North America	22.1%	22.3%	21.8%	21.6%	21.2%	21.6%	21.2%	20.6%	20.0%	20.3%	20.7%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table B.3 **Indexed growth in airport connectivity by world region, 2004-2014 (base = 2004)**

Region	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Africa	100	110	119	123	129	135	149	154	159	166	163
Asia-Pacific	100	113	124	129	140	132	145	165	174	180	188
Europe	100	107	111	120	125	116	123	127	128	127	129
Latin America	100	101	102	101	108	105	115	128	126	116	128
Middle East	100	109	120	127	134	148	159	173	182	198	195
North America	100	109	111	117	120	116	121	123	120	123	129
TOTAL	100	108	113	120	125	119	126	132	133	134	138

Table B.4 **Percentage growth in airport connectivity by world region, 2004-2014**

Connectivity	Total growth over period					Y-o-Y growth over period				
	'04-'14	'09-'14	'08-'09	'04-'11	'11-'14	'04-'14	'09-'14	'08-'09	'04-'11	'11-'14
Africa	63%	21%	5%	54%	6%	5.0%	3.9%	4.6%	6.4%	1.9%
Asia-Pacific	88%	43%	-6%	65%	14%	6.5%	7.4%	-6.0%	7.4%	4.5%
Europe	29%	11%	-7%	27%	1%	2.6%	2.1%	-6.7%	3.5%	0.5%
Latin America	28%	22%	-3%	28%	0%	2.5%	4.0%	-2.6%	3.6%	0.0%
Middle East	95%	31%	11%	73%	12%	6.9%	5.6%	11.0%	8.2%	4.0%
North America	29%	12%	-3%	23%	5%	2.6%	2.3%	-3.3%	3.1%	1.6%
TOTAL	38%	16%	-5%	32%	4%	3.3%	3.1%	-4.9%	4.1%	1.4%

Direct connectivity for European airports

Table B.5 **Total direct connectivity by world region, 2004-2014**

Region	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Africa	1,836	1,995	2,138	2,370	2,448	2,624	3,094	3,072	2,975	3,289	3,265
Asia-Pacific	1,741	1,849	2,046	2,104	2,203	2,068	2,183	2,444	2,438	2,439	2,571
Europe	112,805	118,895	121,990	131,126	133,680	124,973	130,053	132,951	132,892	131,666	132,109
Latin America	925	917	930	927	983	960	1,004	1,092	1,015	922	968
Middle East	1,141	1,187	1,312	1,332	1,392	1,573	1,747	1,892	2,077	2,126	2,210
North America	3,042	3,247	3,409	3,824	3,903	3,631	3,639	3,840	3,684	3,534	3,751
TOTAL	121,491	128,090	131,825	141,683	144,608	135,828	141,720	145,291	145,081	143,977	144,873

Table B.6 **Shares in direct connectivity for each world region, 2004-2014**

Region	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Africa	1.5%	1.6%	1.6%	1.7%	1.7%	1.9%	2.2%	2.1%	2.1%	2.3%	2.3%
Asia-Pacific	1.4%	1.4%	1.6%	1.5%	1.5%	1.5%	1.5%	1.7%	1.7%	1.7%	1.8%
Europe	92.9%	92.8%	92.5%	92.5%	92.4%	92.0%	91.8%	91.5%	91.6%	91.4%	91.2%
Latin America	0.8%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.8%	0.7%	0.6%	0.7%
Middle East	0.9%	0.9%	1.0%	0.9%	1.0%	1.2%	1.2%	1.3%	1.4%	1.5%	1.5%
North America	2.5%	2.5%	2.6%	2.7%	2.7%	2.7%	2.6%	2.6%	2.5%	2.5%	2.6%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table B.7 **Indexed growth in direct connectivity by world region, 2004-2014 (base = 2004)**

Region	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Africa	100	109	116	129	133	143	168	167	162	179	178
Asia-Pacific	100	106	118	121	127	119	125	140	140	140	148
Europe	100	105	108	116	119	111	115	118	118	117	117
Latin America	100	99	100	100	106	104	109	118	110	100	105
Middle East	100	104	115	117	122	138	153	166	182	186	194
North America	100	107	112	126	128	119	120	126	121	116	123
TOTAL	100	105	109	117	119	112	117	120	119	119	119

Indirect connectivity for European airports

Table B.8 **Total indirect connectivity by world region, 2004-2014**

Region	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Africa	10,209	11,255	12,215	12,404	13,100	13,636	14,868	15,491	16,154	16,724	16,401
Asia-Pacific	31,230	35,527	38,887	40,340	44,028	41,369	45,767	51,874	54,822	56,979	59,447
Europe	65,074	71,950	76,144	82,503	88,040	81,926	88,952	93,388	94,427	93,721	97,605
Latin America	15,223	15,348	15,594	15,397	16,402	15,972	17,607	19,545	19,371	17,866	19,656
Middle East	5,595	6,175	6,796	7,239	7,607	8,419	8,944	9,780	10,164	11,219	10,901
North America	66,704	72,961	74,202	77,548	79,534	77,022	80,984	82,260	80,325	82,486	86,557
TOTAL	194,035	213,217	223,839	235,431	248,713	238,344	257,122	272,339	275,262	278,994	290,567

Table B.9 Shares in indirect connectivity for each world region, 2004-2014

Region	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Africa	5.3%	5.3%	5.5%	5.3%	5.3%	5.7%	5.8%	5.7%	5.9%	6.0%	5.6%
Asia-Pacific	16.1%	16.7%	17.4%	17.1%	17.7%	17.4%	17.8%	19.0%	19.9%	20.4%	20.5%
Europe	33.5%	33.7%	34.0%	35.0%	35.4%	34.4%	34.6%	34.3%	34.3%	33.6%	33.6%
Latin America	7.8%	7.2%	7.0%	6.5%	6.6%	6.7%	6.8%	7.2%	7.0%	6.4%	6.8%
Middle East	2.9%	2.9%	3.0%	3.1%	3.1%	3.5%	3.5%	3.6%	3.7%	4.0%	3.8%
North America	34.4%	34.2%	33.1%	32.9%	32.0%	32.3%	31.5%	30.2%	29.2%	29.6%	29.8%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table B.10 Indexed growth in indirect connectivity by world region, 2004-2014 (base = 2004)

Region	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Africa	100	110	120	121	128	134	146	152	158	164	161
Asia-Pacific	100	114	125	129	141	132	147	166	176	182	190
Europe	100	111	117	127	135	126	137	144	145	144	150
Latin America	100	101	102	101	108	105	116	128	127	117	129
Middle East	100	110	121	129	136	150	160	175	182	201	195
North America	100	109	111	116	119	115	121	123	120	124	130
TOTAL	100	110	115	121	128	123	133	140	142	144	150

Onward connectivity for European airports

Table B.11 Total onward connectivity by the hubs through which it is channelled, 2004-2014

Absolute	2004	2008	2009	2014
Non-European hubs	47,950	59,754	57,793	73,441
European hubs (non-EU)	10,704	20,397	21,075	43,615
European hubs (EU)	135,381	168,561	159,475	173,511
TOTAL	194,035	248,712	238,343	290,567

Table B.12 Indexed growth in onward connectivity by the hubs through which it is channelled, 2004-2014 (base = 2004)

Absolute	2004	2008	2009	2014
Non-European hubs	100	125	121	153
European hubs (non-EU)	100	191	197	407
European hubs (EU)	100	125	118	128
TOTAL	100	128	123	150

Table B.13 Percentage growth in onward connectivity by the hubs through which it is channelled, 2004-2014 (base = 2004)

Absolute	'04-'14	'08-'14	'09-'14	'08-'09
Non-European hubs	4%	3%	5%	-3%
European hubs (non-EU)	15%	14%	16%	3%
European hubs (EU)	3%	0%	2%	-5%
TOTAL	4%	3%	4%	-4%

Table B.18 **Indexed growth in hub connectivity by connecting market, 2004-2014 (base = 2004)**

Market	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Intra-Europe	100	109	116	126	135	125	136	147	149	146	154
Europe-North America	100	109	112	119	125	123	132	139	138	136	145
Europe-Latin America	100	101	100	100	109	107	114	128	126	117	123
Europe-Asia	100	112	122	124	132	122	131	148	151	154	162
Europe-Middle East	100	107	117	123	127	140	149	158	163	179	203
Europe-Africa	100	107	114	116	124	128	137	150	152	155	152
ICA-ICA	100	114	129	134	145	154	165	178	183	189	209
TOTAL	100	109	115	120	128	124	133	145	146	145	153

Table C.6 **Indexed growth in direct connectivity by ACI airport category, 2004-2014 (base = 2004)**

Category	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
I	100	104	107	114	115	109	113	118	118	116	118
II	100	103	106	112	113	104	109	111	110	111	114
III	100	110	114	124	124	120	126	129	129	127	125
IV	100	108	111	121	128	119	125	126	126	123	123
TOTAL	100	105	109	117	119	112	117	120	119	118	119

Indirect connectivity for European airports

Table C.7 **Total indirect connectivity by ACI airport category, 2004-2014**

Category	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
I	67,145	72,148	73,415	77,375	81,814	78,319	83,717	88,974	89,778	91,217	96,231
II	56,579	60,965	66,178	69,482	72,176	70,074	76,540	82,281	80,542	81,776	83,772
III	30,607	35,892	37,097	38,154	40,171	38,630	41,792	42,823	44,617	45,492	46,302
IV	39,704	44,212	47,149	50,420	54,552	51,321	55,072	58,261	60,325	60,510	64,263
TOTAL	194,035	213,217	223,839	235,431	248,713	238,344	257,122	272,339	275,262	278,994	290,567

Table C.8 **Shares in indirect connectivity for each ACI airport category, 2004-2014**

Category	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
I	35%	34%	33%	33%	33%	33%	33%	33%	33%	33%	33%
II	29%	29%	30%	30%	29%	29%	30%	30%	29%	29%	29%
III	16%	17%	17%	16%	16%	16%	16%	16%	16%	16%	16%
IV	20%	21%	21%	21%	22%	22%	21%	21%	22%	22%	22%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table C.9 **Indexed growth in indirect connectivity by ACI airport category, 2004-2014 (base = 2004)**

Category	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
I	100	107	109	115	122	117	125	133	134	136	143
II	100	108	117	123	128	124	135	145	142	145	148
III	100	117	121	125	131	126	137	140	146	149	151
IV	100	111	119	127	137	129	139	147	152	152	162
TOTAL	100	110	115	121	128	123	133	140	142	144	150

Hub connectivity for European airports

Table C.10 **Total hub connectivity by ACI airport category, 2004-2014**

Category	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
I	199,391	215,849	223,751	237,325	256,043	251,367	268,077	290,114	295,025	295,996	310,138
II	54,329	61,122	66,657	67,892	68,566	62,782	69,875	76,324	75,144	73,494	78,137
III	5,724	5,902	6,905	7,164	6,952	6,812	7,284	7,953	7,234	6,373	7,535
IV	2,155	1,591	2,439	2,607	3,105	2,713	3,462	3,696	3,361	3,385	4,334
TOTAL	261,598	284,464	299,753	314,988	334,666	323,674	348,698	378,087	380,764	379,249	400,143

Table C.11 **Shares in hub connectivity for each ACI airport category, 2004-2014**

Category	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
I	76%	76%	75%	75%	77%	78%	77%	77%	77%	78%	78%
II	21%	21%	22%	22%	20%	19%	20%	20%	20%	19%	20%
III	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
IV	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table C.12 **Indexed growth in hub connectivity by ACI airport category, 2004-2014 (base = 2004)**

Category	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
I	100	108	112	119	128	126	134	146	148	148	156
II	100	113	123	125	126	116	129	140	138	135	144
III	100	103	121	125	121	119	127	139	126	111	132
IV	100	74	113	121	144	126	161	172	156	157	201
TOTAL	100	109	115	120	128	124	133	145	146	145	153

Appendix D

EU AND NON-EU AIRPORTS CONNECTIVITY

Table D.1

		2004	2008	2009	2014
Airport connectivity	EU	272650	331026	312176	346592
	Non-EU	42867	62290	61991	88837
of which direct	EU	102189	119243	111288	110878
	Non-EU	19294	25360	24536	33986
of which indirect	EU	170461	211783	200888	235713
	Non-EU	23574	36930	37455	54851

			2004	2008	2009	2014	
Airport connectivity	EU	Africa	10868	13650	14165	16221	
		Asia-Pacific	29414	40444	37638	51652	
		Europe	148059	178706	165550	172316	
		Latin America	14960	15879	15395	18107	
		Middle East	5975	7897	8637	10755	
		North America	63374	74450	70791	77540	
	Non-EU	Africa	1178	1898	2095	3444	
		Asia-Pacific	3548	5782	5795	10354	
		Europe	29821	43014	41349	57398	
		Latin America	1188	1507	1537	2518	
		Middle East	761	1102	1355	2356	
		North America	6372	8987	9861	12767	
	of which direct	EU	Africa	1711	2251	2357	2851
			Asia-Pacific	1293	1578	1475	1612
Europe			94511	109748	102049	100777	
Latin America			919	965	946	939	
Middle East			946	1097	1169	1401	
North America			2809	3603	3293	3299	
Non-EU		Africa	125	197	267	414	
		Asia-Pacific	440	619	589	950	
		Europe	18295	23931	22924	31332	
		Latin America	7	18	14	29	
		Middle East	195	295	404	810	
		North America	232	300	338	452	
of which indirect	EU	Africa	9157	11399	11809	13370	
		Asia-Pacific	28122	38866	36163	50040	
		Europe	53548	68957	63501	71539	
		Latin America	14041	14913	14449	17168	
		Middle East	5029	6800	7468	9355	
		North America	60565	70847	67499	74242	
	Non-EU	Africa	1052	1701	1828	3030	
		Asia-Pacific	3108	5162	5206	9405	
		Europe	11526	19083	18425	26065	

	2004	2008	2009	2014
Latin America	1182	1489	1522	2489
Middle East	566	807	951	1546
North America	6139	8687	9523	12315

Appendix E

CONNECTIVITY BY EUROPEAN COUNTRY

Table E.1 Connectivity and GDP by country, 2014

Country	AIRPORT CONNECTIVITY			Hub connectivity	GDP (x bln USD), 2012
	Total	Direct	Indirect		
Germany	63,105	16,996	46,109	104,485	3,428
United Kingdom	49,809	16,555	33,254	36,851	2,476
France	40,102	13,421	26,682	52,156	2,613
Spain	38,472	15,484	22,988	18,783	1,323
Italy	34,495	10,808	23,687	14,643	2,015
Turkey	22,234	10,266	11,968	33,930	789
Switzerland	17,544	4,401	13,143	15,494	631
Russian Federation	17,261	6,988	10,273	16,984	2,015
Norway	16,460	7,626	8,834	4,501	500
Netherlands	14,867	4,631	10,237	49,449	771
Sweden	11,588	4,107	7,481	3,053	524
Austria	10,280	2,884	7,395	13,070	395
Denmark	9,379	2,728	6,651	6,234	315
Greece	9,269	4,073	5,195	2,059	249
Portugal	9,103	2,992	6,112	4,479	212
Belgium	8,462	2,639	5,823	6,464	483
Ireland	7,787	2,216	5,571	1,999	211
Finland	7,390	2,193	5,198	7,644	248
Poland	7,075	1,945	5,129	2,320	490
Israel	4,787	1,123	3,665	91	258
Czech Republic	4,328	1,260	3,068	1,543	196
Romania	3,914	966	2,947	270	169
Ukraine	3,372	980	2,392	1,310	176
Hungary	3,121	734	2,387	72	125
Croatia	3,019	870	2,149	6	59
Bulgaria	1,969	555	1,414	38	51
Luxembourg	1,890	428	1,462		55
Serbia	1,887	555	1,332	274	37
Latvia	1,500	601	900	306	28
Estonia	1,344	283	1,061	8	22
Cyprus	1,239	486	753	29	23
Malta	1,083	358	725	42	9
Lithuania	954	380	573	12	42
Slovenia	937	200	737	99	45
Belarus	856	295	561	17	63
Georgia	810	222	589	2	16
Albania	749	261	488	2	13
Iceland	662	372	289	1,406	14
Moldova	538	166	372	14	7
Bosnia and Herzegovina	488	102	386	1	17

Country	AIRPORT CONNECTIVITY			Hub connectivity	GDP (x bln USD), 2012
	Total	Direct	Indirect		
Montenegro	458	170	288	4	4
Macedonia	395	124	271		10
Monaco	334	334			6
Slovakia	111	86	25	0	91

Table E.2 Growth in connectivity, Y-o-Y, 2004-2014

Country	AIRPORT CONNECTIVITY			Hub connectivity
	Total	Direct	Indirect	
Germany	2%	0%	3%	4%
United Kingdom	1%	1%	2%	2%
France	2%	0%	3%	1%
Spain	2%	1%	3%	-1%
Italy	3%	1%	4%	3%
Turkey	16%	17%	15%	30%
Switzerland	4%	2%	5%	6%
Russian Federation	8%	5%	11%	18%
Norway	4%	1%	8%	12%
Netherlands	2%	2%	2%	5%
Sweden	3%	0%	4%	4%
Austria	1%	0%	2%	1%
Denmark	3%	-1%	5%	-3%
Greece	4%	1%	6%	5%
Portugal	4%	2%	5%	10%
Belgium	3%	2%	4%	10%
Ireland	3%	1%	4%	13%
Finland	1%	-1%	2%	7%
Poland	5%	4%	5%	5%
Israel	6%	5%	6%	4%
Czech Republic	3%	1%	4%	-3%
Romania	6%	4%	7%	6%
Ukraine	9%	6%	10%	30%
Hungary	1%	-2%	2%	-21%
Croatia	7%	7%	8%	1%
Bulgaria	8%	7%	8%	8%
Luxembourg	4%	0%	5%	
Serbia	9%	5%	11%	18%
Latvia	7%	10%	5%	41%
Estonia	8%	5%	9%	18%
Cyprus	2%	1%	3%	-12%
Malta	8%	2%	12%	-6%
Lithuania	3%	5%	2%	23%
Slovenia	3%	0%	3%	3%
Belarus	13%	14%	13%	63%
Georgia	16%	10%	20%	16%
Albania	10%	9%	11%	-1%

Country	AIRPORT CONNECTIVITY			Hub connectivity
	Total	Direct	Indirect	
Iceland	7%	9%	4%	17%
Moldova	9%	5%	11%	12%
Bosnia and Herzegovina	6%	6%	7%	
Montenegro	15%	5%	35%	
Macedonia	2%	5%	1%	
Monaco	4%	4%		
Slovakia	-9%	-6%	-15%	-25%

Table E.3 Connectivity (growth) by EU/non-EU countries, 2014

	AIRPORT CONNECTIVITY							
	Absolute '14				Growth (Y-o-Y, '04-'14)			
	Airport	Direct	Ind.	Hub	Airport	Direct	Ind.	Hub
EU	346,592	110,878	235,713	326,114	2%	1%	3%	3%
Non-EU	88,837	33,986	54,851	74,029	8%	6%	9%	17%

Table E.4 Airport connectivity by country and world region, 2014

Country	World region	Airport connectivity			
		Total	Direct	Indirect	
Albania	Africa	14		14	
	Asia-Pacific	89		89	
	Europe	515	261	254	
	Latin America	11		11	
	Middle East	25		25	
	North America	94		94	
	TOTAL		749	261	488
Austria	Africa	400	31	369	
	Asia-Pacific	1,695	45	1,650	
	Europe	5,082	2,736	2,346	
	Latin America	447		447	
	Middle East	357	46	311	
	North America	2,299	26	2,272	
	TOTAL		10,280	2,884	7,395
Belarus	Africa	14		14	
	Asia-Pacific	120	8	112	
	Europe	599	276	322	
	Latin America	6		6	
	Middle East	44	11	33	
	North America	75		75	
	TOTAL		856	295	561
Belgium	Africa	564	208	356	
	Asia-Pacific	1,058	29	1,030	
	Europe	3,937	2,283	1,653	
	Latin America	383	6	377	
	Middle East	282	19	263	
	North America	2,237	94	2,143	
	TOTAL		8,462	2,639	5,823
Bosnia and Herzegovina	Africa	33		33	
	Asia-Pacific	94		94	
	Europe	260	102	158	
	Middle East	27		27	
	North America	74		74	
	TOTAL		488	102	386
	Bulgaria	Africa	53		53
Asia-Pacific		186		186	
Europe		1,362	548	814	
Latin America		74		74	
Middle East		39	7	33	
North America		254		254	
TOTAL			1,969	555	1,414
Croatia	Africa	99		99	
	Asia-Pacific	464		464	
	Europe	1,764	865	899	
	Latin America	68		68	
	Middle East	80	6	74	
	North America	545		545	
	TOTAL		3,019	870	2,149
Cyprus	Africa	21	8	13	
	Asia-Pacific	107		107	
	Europe	970	442	529	
	Latin America	15		15	
	Middle East	44	36	8	
	North America	81		81	
	TOTAL		1,239	486	753

Country	World region	Airport connectivity		
		Total	Direct	Indirect
Czech Republic	Africa	220	5	215
	Asia-Pacific	784	12	772
	Europe	2,205	1,230	975
	Latin America	221		221
	Middle East	123	7	116
	North America	776	7	769
TOTAL		4,328	1,260	3,068
Denmark	Africa	495	9	486
	Asia-Pacific	1,371	31	1,340
	Europe	4,747	2,611	2,136
	Latin America	378		378
	Middle East	247	23	225
	North America	2,140	55	2,085
TOTAL		9,379	2,728	6,651
Estonia	Africa	49		49
	Asia-Pacific	123		123
	Europe	1,001	283	718
	Latin America	44		44
	Middle East	10		10
	North America	116		116
TOTAL		1,344	283	1,061
Finland	Africa	267		267
	Asia-Pacific	1,072	85	988
	Europe	5,140	2,094	3,046
	Latin America	166		166
	Middle East	52		52
	North America	694	14	680
TOTAL		7,390	2,193	5,198
France	Africa	2,812	1,145	1,667
	Asia-Pacific	7,168	267	6,901
	Europe	17,473	11,255	6,217
	Latin America	2,431	168	2,263
	Middle East	1,324	152	1,172
	North America	8,895	434	8,461
TOTAL		40,102	13,421	26,682
Georgia	Africa	30		30
	Asia-Pacific	65	9	56
	Europe	639	195	444
	Latin America	13		13
	Middle East	18	18	1
	North America	45		45
TOTAL		810	222	589

Country	World region	Airport connectivity		
		Total	Direct	Indirect
Germany	Africa	3,023	270	2,754
	Asia-Pacific	11,388	378	11,010
	Europe	25,800	15,359	10,440
	Latin America	3,092	106	2,985
	Middle East	2,281	306	1,975
	North America	17,521	577	16,944
TOTAL		63,105	16,996	46,109
Greece	Africa	137	19	118
	Asia-Pacific	585	3	582
	Europe	7,128	3,984	3,144
	Latin America	116		116
	Middle East	155	43	113
	North America	1,147	25	1,122
TOTAL		9,269	4,073	5,195
Hungary	Africa	167	10	157
	Asia-Pacific	458		458
	Europe	1,582	713	869
	Latin America	142		142
	Middle East	93	11	82
	North America	680		680
TOTAL		3,121	734	2,387
Iceland	Africa	2		2
	Asia-Pacific	19		19
	Europe	527	283	244
	Latin America	5		5
	North America	108	89	19
	TOTAL		662	372
Ireland	Africa	365	3	362
	Asia-Pacific	850		850
	Europe	2,989	2,005	985
	Latin America	270		270
	Middle East	345	17	328
	North America	2,967	191	2,776
TOTAL		7,787	2,216	5,571
Israel	Africa	74	11	63
	Asia-Pacific	214	21	193
	Europe	2,919	1,004	1,915
	Latin America	248		248
	Middle East	24	18	6
	North America	1,308	68	1,239
TOTAL		4,787	1,123	3,665

Country	World region	Airport connectivity		
		Total	Direct	Indirect
Italy	Africa	1,401	240	1,161
	Asia-Pacific	5,367	92	5,275
	Europe	16,699	10,040	6,659
	Latin America	2,163	53	2,110
	Middle East	1,068	141	927
	North America	7,796	241	7,555
TOTAL		34,495	10,808	23,687
Latvia	Africa	30		30
	Asia-Pacific	113	2	111
	Europe	1,146	597	549
	Latin America	33		33
	Middle East	43		43
	North America	135	2	134
TOTAL		1,500	601	900
Lithuania	Africa	9		9
	Asia-Pacific	61		61
	Europe	773	380	393
	Latin America	3		3
	Middle East	6		6
	North America	100		100
TOTAL		954	380	573
Luxembourg	Africa	145	9	135
	Asia-Pacific	342		342
	Europe	852	418	434
	Latin America	105		105
	Middle East	87		87
	North America	359		359
TOTAL		1,890	428	1,462
Macedonia	Africa	12		12
	Asia-Pacific	78		78
	Europe	235	122	113
	Latin America	7		7
	Middle East	27	2	25
	North America	36		36
TOTAL		395	124	271
Malta	Africa	34	18	16
	Asia-Pacific	165		165
	Europe	708	335	374
	Latin America	33		33
	Middle East	39	6	33
	North America	104		104
TOTAL		1,083	358	725

Country	World region	Airport connectivity		
		Total	Direct	Indirect
Moldova	Africa	8		8
	Asia-Pacific	50		50
	Europe	423	164	259
	Middle East	14	2	12
	North America	43		43
TOTAL		538	166	372
Monaco	Europe	334	334	
TOTAL		334	334	
Montenegro	Africa	33		33
	Asia-Pacific	39		39
	Europe	342	170	172
	Latin America	3		3
	Middle East	13		13
	North America	28		28
TOTAL		458	170	288
Netherlands	Africa	694	133	561
	Asia-Pacific	2,672	189	2,483
	Europe	5,620	3,874	1,747
	Latin America	777	98	679
	Middle East	467	68	399
	North America	4,636	268	4,368
TOTAL		14,867	4,631	10,237
Norway	Africa	625		625
	Asia-Pacific	1,196	7	1,189
	Europe	12,270	7,583	4,687
	Latin America	373		373
	Middle East	274	10	264
	North America	1,723	26	1,697
TOTAL		16,460	7,626	8,834
Poland	Africa	278	10	268
	Asia-Pacific	830	3	827
	Europe	3,906	1,886	2,020
	Latin America	249		249
	Middle East	122	17	105
	North America	1,690	29	1,660
TOTAL		7,075	1,945	5,129
Portugal	Africa	312	104	208
	Asia-Pacific	888		888
	Europe	5,851	2,738	3,113
	Latin America	548	82	466
	Middle East	242	7	235
	North America	1,263	61	1,202
TOTAL		9,103	2,992	6,112

Country	World region	Airport connectivity		
		Total	Direct	Indirect
Romania	Africa	141		141
	Asia-Pacific	367		367
	Europe	2,497	951	1,545
	Latin America	194		194
	Middle East	59	15	44
	North America	656		656
TOTAL		3,914	966	2,947
Russian Federation	Africa	341	26	316
	Asia-Pacific	1,977	523	1,455
	Europe	13,141	6,310	6,830
	Latin America	419	8	411
	Middle East	165	78	87
	North America	1,217	42	1,175
TOTAL		17,261	6,988	10,273
Serbia	Africa	73	10	63
	Asia-Pacific	298		298
	Europe	1,058	518	540
	Latin America	70		70
	Middle East	114	27	86
	North America	275		275
TOTAL		1,887	555	1,332
Slovakia	Africa	2	1	1
	Asia-Pacific	1		1
	Europe	106	85	20
	North America	2		2
TOTAL		111	86	25
Slovenia	Africa	47	3	44
	Asia-Pacific	166		166
	Europe	445	197	248
	Latin America	27		27
	Middle East	48		48
	North America	204		204
TOTAL		937	200	737
Spain	Africa	1,050	253	797
	Asia-Pacific	3,350	20	3,330
	Europe	24,268	14,689	9,579
	Latin America	3,652	267	3,385
	Middle East	869	56	812
	North America	5,284	200	5,084
TOTAL		38,472	15,484	22,988

Country	World region	Airport connectivity		
		Total	Direct	Indirect
Sweden	Africa	644	13	632
	Asia-Pacific	1,150	17	1,133
	Europe	7,493	4,014	3,479
	Latin America	302		302
	Middle East	220	28	192
	North America	1,779	36	1,743
TOTAL		11,588	4,107	7,481
Switzerland	Africa	952	82	870
	Asia-Pacific	3,427	76	3,351
	Europe	6,870	4,001	2,869
	Latin America	935	9	926
	Middle East	699	87	612
	North America	4,663	146	4,516
TOTAL		17,544	4,401	13,143
Turkey	Africa	1,102	284	818
	Asia-Pacific	2,314	272	2,042
	Europe	15,047	9,092	5,954
	Latin America	344	12	332
	Middle East	829	533	296
	North America	2,600	74	2,526
TOTAL		22,234	10,266	11,968
Ukraine	Africa	133	1	132
	Asia-Pacific	374	34	340
	Europe	2,218	916	1,302
	Latin America	85		85
	Middle East	84	24	60
	North America	479	6	473
TOTAL		3,372	980	2,392
United Kingdom	Africa	2,761	360	2,401
	Asia-Pacific	8,870	440	8,430
	Europe	20,772	14,165	6,607
	Latin America	2,172	158	2,013
	Middle East	2,053	392	1,662
	North America	13,181	1,040	12,141
TOTAL		49,809	16,555	33,254

Appendix F

CONNECTIVITY BY INDIVIDUAL AIRPORT

Table F.1 Connectivity by airport (ranked by airport connectivity in 2014)

AIRPORT		CONNECTIVITY							
		Absolute '14				Growth '04-'14			
Code		Airport	Direct	Ind.	Hub	Airport	Direct	Ind.	Hub
LHR	London Heathrow	22,272	4,717	17,555	33,006	39%	0%	55%	31%
FRA	Frankfurt	18,364	4,629	13,735	71,252	24%	4%	33%	32%
CDG	Paris-Charles de Gaulle	17,989	4,475	13,514	50,188	28%	-2%	42%	21%
AMS	Amsterdam	14,168	4,170	9,999	49,389	19%	13%	22%	67%
MUC	Munich	12,132	3,521	8,611	26,170	37%	-3%	65%	65%
MAD	Madrid-Barajas	10,440	3,194	7,246	14,952	17%	-15%	41%	-8%
FCO	Rome Fiumicino	9,889	3,257	6,632	12,683	29%	12%	40%	166%
IST	İstanbul-Atatürk	9,365	3,973	5,392	31,536	231%	219%	240%	1222%
ZRH	Zürich	9,338	2,312	7,026	14,050	47%	9%	67%	72%
BCN	Barcelona	8,582	2,850	5,733	2,762	27%	8%	39%	-23%
CPH	Copenhagen	7,943	2,426	5,517	6,218	30%	-9%	59%	-29%
BRU	Brussels	7,900	2,156	5,744	6,418	33%	14%	43%	153%
ARN	Stockholm-Arlanda	7,062	2,344	4,718	2,677	27%	0%	48%	38%
DUS	Düsseldorf	6,994	1,988	5,006	2,945	34%	5%	51%	210%
VIE	Vienna	6,919	2,366	4,553	13,031	24%	9%	34%	5%
MAN	Manchester	6,347	1,742	4,605	971	9%	7%	11%	-16%
DUB	Dublin	6,198	1,712	4,486	1,941	42%	13%	58%	251%
TXL	Berlin Tegel	6,159	1,796	4,363	2,651	52%	44%	56%	2232%
OSL	Oslo-Gardemoen	6,143	2,380	3,763	4,098	58%	27%	86%	232%
GVA	Genève	5,930	1,400	4,530	1,236	47%	43%	48%	405%
LIS	Lisbon (Mainland)	5,774	1,515	4,259	4,346	58%	26%	74%	175%
HAM	Hamburg	5,527	1,378	4,149	486	30%	4%	42%	71%
MXP	Milan-Malpensa	5,505	1,508	3,997	780	5%	-19%	18%	-86%
SVO	Moscow	4,756	2,316	2,440	13,764	65%	71%	59%	422%
HEL	Helsinki-Vantaa	4,632	1,557	3,075	7,640	12%	-5%	23%	88%
TLV	Tel Aviv Ben Gurion	4,567	903	3,664	91	88%	101%	85%	51%
ATH	Athens	4,513	1,452	3,061	1,988	23%	-15%	57%	69%
DME	Moscow	4,415	2,021	2,393	2,285	271%	113%	887%	774%
NCE	Nice Côte d'Azur	4,376	1,502	2,874	125	26%	9%	37%	5%
WAW	Warsaw	4,265	1,151	3,114	2,307	31%	14%	38%	71%
PRG	Prague	4,162	1,165	2,998	1,539	29%	1%	44%	-26%
LGW	London Gatwick	3,760	2,689	1,071	987	-41%	39%	-76%	-47%
VCE	Venezia	3,696	798	2,898	292	54%	5%	76%	187%
STR	Stuttgart	3,672	971	2,701	462	0%	-19%	9%	38%
EDI	Edinburgh	3,642	995	2,647	52	32%	-1%	51%	417%
ORY	Paris-Orly	3,462	2,380	1,082	1,157	21%	7%	66%	-12%
BHX	Birmingham	3,340	984	2,356	118	22%	7%	29%	-6%
LYS	Lyon-Saint Exupéry	3,320	1,006	2,314	380	7%	-9%	16%	-68%
LIN	Milano Linate	3,317	920	2,397	476	57%	-1%	103%	219%

AIRPORT		CONNECTIVITY							
Code		Absolute '14				Growth '04-'14			
		Airport	Direct	Ind.	Hub	Airport	Direct	Ind.	Hub
LED	St-Petersburg	3,200	1,193	2,007	901	118%	99%	132%	297%
BUD	Budapest	3,121	734	2,387	72	11%	-18%	26%	-91%
OTP	Bucharest Otopeni	3,083	712	2,371	269	82%	90%	80%	133%
PMI	Palma de Mallorca	3,021	1,964	1,057	764	64%	50%	97%	77%
TLS	Toulouse-Blagnac	2,805	779	2,025	52	41%	23%	50%	-18%
MRS	Marseille Provence	2,714	840	1,875	152	33%	15%	43%	-60%
AGP	Malaga	2,650	1,080	1,570	81	27%	18%	34%	81%
HAJ	Hannover	2,645	487	2,158	42	12%	-26%	26%	-22%
GOT	Göteborg Landvetter	2,632	561	2,072	85	30%	-6%	45%	-35%
BLQ	Bologna	2,553	569	1,983	90	984%	617%	1171%	-
KBP	Kiev Boryspil	2,491	776	1,714	1,304	122%	92%	140%	1278%
GLA	Glasgow	2,236	768	1,468	40	-9%	-7%	-10%	-65%
ABZ	Aberdeen	2,196	583	1,613	18	64%	25%	85%	160%
BSL	Basle-Mulhouse	2,191	605	1,587	194	72%	61%	77%	86%
CGN	Köln/Bonn	2,127	838	1,290	380	-5%	-20%	8%	48%
NUE	Nürnberg	2,078	370	1,708	42	23%	-6%	32%	-19%
SVG	Stavanger, Sola	2,035	635	1,400	134	77%	29%	112%	75%
BIO	Bilbao	1,967	401	1,566	44	19%	-15%	33%	1%
ESB	Ankara Esenboğa	1,937	885	1,052	14	158%	284%	102%	73%
FLR	Firenze	1,901	318	1,583	26	35%	25%	37%	5%
LUX	Luxembourg	1,890	428	1,462	0	41%	1%	60%	-
BEG	Belgrade	1,887	555	1,332	274	144%	71%	196%	431%
BGO	Bergen, Flesland	1,882	790	1,091	150	60%	19%	112%	125%
SAW	Istanbul Sabiha Gökçen	1,852	1,657	194	2,354	9134%	23574%	1390%	-
AYT	Antalya	1,727	899	827	7	342%	225%	629%	-24%
TRN	Turin	1,699	339	1,361	15	11%	-18%	22%	-62%
ZAG	Zagreb	1,694	340	1,353	0	59%	37%	66%	-
STN	London Stansted	1,624	1,407	217	897	-2%	-8%	78%	19%
SOF	Sofia	1,596	372	1,224	38	84%	64%	92%	128%
BRE	Bremen	1,595	271	1,324	29	16%	-1%	21%	463%
OPO	Oporto	1,593	575	1,018	96	21%	34%	15%	-13%
RIX	Riga	1,500	601	900	306	90%	155%	63%	2972%
LCY	London City	1,499	652	847	418	39%	22%	57%	449%
ADB	İzmir Adnan Menderes	1,496	596	900	18	372%	413%	348%	150%
VLC	Valencia	1,439	424	1,015	30	17%	-3%	28%	3%
BLL	Billund	1,436	302	1,134	17	38%	11%	47%	-82%
TRD	Trondheim, Værnes	1,414	656	759	20	42%	8%	94%	87%
TLL	Tallinn	1,344	283	1,061	8	113%	59%	134%	445%
NAP	Naples	1,301	532	770	31	39%	8%	74%	194%
ALC	Alicante	1,256	739	517	25	37%	35%	41%	65%
BOD	Bordeaux	1,234	529	705	47	10%	30%	-2%	-82%
KRK	Krakow	1,188	319	870	1	135%	147%	131%	-90%
LPA	Gran Canaria	1,164	674	489	16	1%	9%	-9%	20%
MLA	Malta	1,083	358	725	42	107%	26%	202%	-47%
BRS	Bristol	1,075	576	499	200	34%	36%	32%	126%

AIRPORT		CONNECTIVITY							
Code		Absolute '14				Growth '04-'14			
		Airport	Direct	Ind.	Hub	Airport	Direct	Ind.	Hub
NTE	Nantes-Atlantique	1,062	467	595	16	88%	83%	92%	-50%
LCA	Larnaka	1,043	343	700	29	19%	-6%	37%	-72%
IBZ	Ibiza	1,013	651	362	38	84%	97%	65%	860%
FAO	Faro	1,001	524	478	5	130%	117%	147%	-69%
VRN	Verona	982	269	712	0	4%	-10%	11%	-93%
SKG	Thessaloniki	954	429	525	51	28%	-2%	70%	0%
LJU	Ljubljana	937	200	737	99	29%	1%	40%	30%
PMO	Palermo	932	438	494	7	35%	5%	80%	15%
GRZ	Graz	891	143	748	11	-2%	-26%	5%	184%
SZG	Salzburg	884	165	719	18	6%	-9%	10%	49%
MSQ	Minsk	856	295	561	17	240%	261%	230%	13498%
SXF	Berlin Schönefeld	836	525	311	25	91%	62%	176%	230%
VNO	Vilnius	811	308	503	6	26%	66%	10%	324%
SNN	Shannon	787	181	606	47	-16%	19%	-22%	-16%
TFN	Tenerife Norte	749	415	334	0	-1%	0%	-2%	-
HER	Heraklion	749	444	305	4	130%	82%	275%	101%
TIA	Tirana	749	261	488	2	167%	127%	194%	-11%
SVQ	Sevilla	733	320	414	28	1%	16%	-8%	-8%
BGY	Bergamo	730	592	138	149	132%	123%	182%	5697%
TOS	Tromsø, Langnes	726	462	264	66	56%	15%	313%	87%
SVX	Ekaterinburg Koltsovo	702	270	432	23	103%	48%	164%	282%
LNZ	Linz	699	98	601	9	1%	-21%	6%	409%
TBS	Tbilisi	692	168	524	2	314%	123%	471%	333%
OVB	Novosibirsk Tolmachevo	666	227	440	4	149%	26%	401%	-46%
KEF	Keflavik	662	372	289	1,406	88%	134%	50%	361%
CAG	Cagliari	645	333	312	6	49%	28%	80%	34%
ADA	Adana Airport	634	276	357	1	390%	433%	362%	-12%
ORK	Cork	629	214	416	9	17%	-10%	39%	434%
INN	Innsbruck	617	71	547	1	18%	-32%	30%	-33%
TFS	Tenerife Sur	608	394	214	6	73%	119%	24%	-66%
BOD	Bodø	591	454	137	33	9%	-8%	169%	38%
FMO	Münster	580	86	494	0	-8%	-54%	12%	-99%
SOU	Southampton	556	386	171	90	-6%	10%	-30%	112%
BMA	Stockholm-Bromma	556	455	101	277	61%	51%	124%	760%
RHO	Rodos	555	329	226	7	93%	59%	181%	510%
POZ	Poznan	554	111	443	1	117%	40%	152%	-64%
KRS	Kristiansand, Kjevik	539	154	385	0	29%	-4%	50%	-
KIV	Chisinau	538	166	372	14	136%	63%	194%	220%
WRO	Wroclaw	534	171	363	6	189%	142%	219%	238%
DBV	Dubrovnik	532	178	354	0	228%	184%	256%	4167%
SPU	Split	522	199	323	5	160%	119%	192%	35%
BJV	Muğla Milas - Bodrum Airport	512	238	274	0	453%	398%	512%	-100%
SXB	Strasbourg	497	205	291	26	-47%	-48%	-46%	-19%
CRL	Charleroi	490	416	74	44	269%	213%	74079%	292%
SJJ	Sarajevo	488	102	386	1	87%	73%	91%	-

AIRPORT		CONNECTIVITY							
Code		Absolute '14				Growth '04-'14			
		Airport	Direct	Ind.	Hub	Airport	Direct	Ind.	Hub
AES	Alesund, Vigra	486	120	366	0	227%	6%	926%	-100%
DLM	Muğla Dalaman Airport	469	276	193	0	400%	335%	535%	-98%
ACE	Lanzarote	469	370	99	1	42%	67%	-9%	-78%
EMA	East Midlands	463	448	15	53	43%	44%	15%	-41%
ODS	Odessa	446	98	347	6	155%	53%	216%	3810%
RNS	Rennes	444	94	350	0	44%	-27%	94%	-
FNC	Funchal	433	171	263	4	14%	-21%	59%	-87%
SCQ	Santiago	412	170	242	9	0%	2%	-1%	18%
OUL	Oulunsalo Oulu	412	100	312	1	-2%	-24%	8%	-
ASR	Kayseri Airport	410	118	292	0	378%	437%	357%	-
KUF	Samara Kurumoch	407	119	288	0	-9%	-47%	30%	-99%
CFE	Clermont-Ferrand	407	80	327	0	-17%	-68%	35%	-48%
SKP	Skopje	393	122	271	0	23%	69%	10%	-
KGD	Kaliningrad	393	126	267	0	121%	14%	295%	-100%
VVO	Vladivostok	392	118	274	3	172%	26%	443%	131%
JER	Channel Islands	392	330	61	0	-9%	-8%	-13%	-
RTM	Rotterdam	391	183	207	0	35%	17%	55%	-
TZX	Trabzon Airport	371	168	203	0	390%	412%	373%	-
FUE	Fuerteventura	365	269	96	3	6%	12%	-8%	-56%
PUF	Pau-Pyrénées	359	87	272	0	12%	3%	15%	-
OLB	Olbia	353	275	79	4	47%	20%	577%	28%
TRS	Trieste	340	86	255	0	19%	-5%	30%	-
KTW	Katowice	340	60	280	0	16%	31%	13%	-
MCM	Monaco	334	334	0	0	42%	42%	-	-
TKU	Turku	334	76	258	0	6%	-22%	18%	-
OVD	Asturias	333	108	225	0	13%	7%	16%	-
LCG	A Coruña	332	98	234	0	7%	45%	-3%	-
CIA	Rome Ciampino	326	283	42	72	59%	65%	29%	9631%
FDH	Friedrichshafen	325	71	254	0	-5%	17%	-10%	-
BES	Brest	322	124	197	0	-5%	21%	-16%	-
VGO	Vigo	320	75	245	0	-15%	-30%	-10%	-
KYA	Konya Airport	320	76	244	0	1059%	846%	1145%	-
MAH	Menorca	320	227	93	1	33%	20%	80%	-47%
CFU	Kerkyra (Corfu)	315	211	104	2	178%	131%	372%	68%
KZN	Kazan	312	98	213	0	242%	57%	645%	-100%
GZT	Gaziantep Airport	312	132	179	0	309%	512%	228%	-
MRV	Mineralnye Vody	309	103	206	3	173%	17%	718%	30%
MMX	Malmö	305	210	95	0	29%	24%	40%	-
GOJ	Strigino Nizhniy Novgorod	301	62	238	0	122%	26%	177%	-100%
TGD	Podgorica	298	91	207	1	417%	83%	2554%	-
EIN	Eindhoven	296	266	31	60	0%	280%	-87%	13325%
KUO	Kuopio	291	48	243	0	34%	-20%	54%	-
SZF	Samsun Çarşamba Airport	291	91	200	0	500%	550%	480%	-
JTR	Santorini (Thira)	289	115	174	1	178%	69%	385%	-
DIY	Diyarbakir Airport	289	114	175	0	978%	569%	1687%	-

AIRPORT		CONNECTIVITY							
		Absolute '14				Growth '04-'14			
Code		Airport	Direct	Ind.	Hub	Airport	Direct	Ind.	Hub
CEK	Chelyabinsk	286	81	205	0	277%	15%	3700%	-
XRY	Jerez	284	79	205	0	28%	-14%	59%	-100%
UFA	Ufa	281	89	192	0	71%	-10%	192%	-
UME	Umeå	279	144	134	6	36%	11%	81%	4633%
TMP	Tampere-Pirkkala	270	75	195	0	-25%	-29%	-23%	-100%
KGS	Kos	269	169	100	0	119%	109%	139%	-100%
KLU	Klagenfurt	269	42	227	0	-44%	-50%	-43%	-
GRX	Granada	267	71	196	0	14%	18%	13%	-
GRO	Girona	267	200	66	21	39%	20%	166%	174%
VAA	Vaasa	259	64	195	0	15%	-21%	35%	-
HTY	Hatay Airport	254	79	175	0	-	-	-	-
LLA	Luleå	251	143	108	7	8%	1%	19%	377%
LEI	Almeria	248	89	159	0	5%	6%	5%	-100%
LIL	Lille-Lesquin	247	208	38	12	-17%	26%	-71%	24%
CHQ	Chania	245	138	107	2	61%	73%	48%	2478%
TSR	Timisoara	240	57	183	0	-4%	-62%	80%	-100%
JMK	Mykonos	233	100	133	1	194%	94%	378%	-
LWO	Lviv	226	63	164	1	119%	31%	193%	768%
SDR	Santander	219	84	135	0	-2%	15%	-11%	-
EVE	Harstad/Narvik,Evenes	219	87	132	0	111%	24%	291%	-
RVN	Rovaniemi	217	32	185	0	41%	-8%	55%	-100%
HRK	Kharkiv	210	43	167	0	184%	168%	189%	-
TOF	Tomsk	206	27	178	0	1014%	109%	3175%	-
PFO	Pafos	196	143	54	1	94%	145%	24%	-42%
PDL	Ponta Delgada	195	134	61	29	63%	12%	26505%	305%
AJA	Ajaccio	195	160	35	0	10%	46%	-49%	-90%
OSD	Åre Östersund	187	77	110	0	115%	40%	245%	-
VAR	Varna	187	74	113	0	333%	119%	1125%	-
HAU	Haugesund, Karmøy	186	71	115	0	45%	-29%	305%	-
BAX	Barnaul	185	21	164	0	236%	-33%	580%	-
BOJ	Bourgas	177	103	74	0	554%	305%	4596%	-100%
IOM	Isle of Man	177	115	62	0	-49%	-59%	-6%	-
SBZ	Sibiu	175	34	141	0	704%	80%	4800%	-
CLJ	Cluj Napoca	175	53	122	0	56%	-19%	158%	-
EAS	San Sebastian	174	42	132	0	1%	-29%	18%	-
ALF	Alta	173	99	74	0	89%	25%	485%	-
DNZ	Denizli Çardak Airport	171	35	137	0	1586%	603%	2504%	-
KOK	Kronoby Kruunupyy	168	45	123	0	72%	6%	122%	-
INV	Inverness	168	104	64	0	-5%	-20%	35%	181%
MJV	Murcia San Javier	165	105	60	0	13%	53%	-23%	-
MOL	Molde, Årø	162	77	85	0	94%	28%	265%	-100%
BIQ	Biarritz	160	104	56	0	-53%	13%	-77%	-
TIV	Tivat	160	79	81	3	166%	47%	1164%	-
NAV	Neveşehir Kapadokya Airport	159	30	129	0	-	-	-	-
HTA	Chita	158	42	116	0	1299%	299%	12925%	-

AIRPORT		CONNECTIVITY							
Code		Absolute '14				Growth '04-'14			
		Airport	Direct	Ind.	Hub	Airport	Direct	Ind.	Hub
TSF	Treviso	156	143	13	10	99%	118%	-2%	-
KKN	Kirkenes,Høybuktkmoen	151	94	57	0	10%	-20%	175%	-
MLX	Malatya Airport	151	47	104	0	487%	367%	563%	-
MLN	Melilla	150	68	82	0	40%	-3%	121%	-
TPS	Trapani Birgi	149	131	18	2	69%	77%	28%	-
VOG	Volgograd	149	44	105	0	111%	19%	213%	-
VBY	Visby	149	92	57	0	-1%	-25%	107%	-
HFT	Hammerfest	146	140	6	0	9%	7%	99%	-
ERZ	Erzurum Airport	146	63	83	0	990%	600%	1789%	-
ASF	Astrakhan	144	31	113	0	373%	30%	1677%	-100%
WMI	Warsaw Modlin	144	108	35	5	-	-	-	-
VAN	Van Ferit Melen Airport	143	66	78	0	578%	446%	751%	-
SPC	La Palma	138	101	37	0	-24%	-32%	11%	-100%
JYV	Tikkakoski Jyväskylä	137	17	120	0	-3%	-65%	30%	-
KSU	Kristiansund, Kvernberget	135	75	60	0	46%	2%	213%	-
ETH	Eilat-Ovda	128	128	1	0	-17%	-14%	-89%	-
KAJ	Kajaani	127	23	104	0	60%	1%	84%	-100%
IAS	Iasi	125	43	82	0	475%	296%	656%	-
ZAD	Zadar	124	71	53	0	482%	282%	1883%	-
ZTH	Zakynthos	123	69	54	0	279%	143%	1255%	-
JOE	Joensuu	121	30	91	0	-5%	-31%	8%	-
PUY	Pula	119	63	56	0	529%	334%	1175%	-100%
EZS	Elaziğ Airport	119	60	59	0	-	-	-	-
GNY	Şanlıurfa Gap Airport	119	51	68	0	-	-	-	-
BAL	Batman Airport	117	39	78	0	5752%	1834%	-	-
VDS	Vadsø	116	113	3	0	8%	6%	-	-
GZP	Alanya - Antalya Gazipasa	113	41	72	0	-	-	-	-
VAS	Sivas Nuri Demirağ Airport	112	32	80	0	-	-	-	-
BTS	Bratislava	111	86	25	0	-62%	-48%	-81%	-94%
NOC	Knock	110	75	35	1	82%	66%	128%	-
MJT	Mytilini	109	55	54	0	2%	-33%	113%	-
PNA	Pamplona	107	25	82	0	-45%	-66%	-31%	-
KEM	Kemi-Tornio	103	20	84	0	6%	-16%	12%	-
REU	Reus	94	86	8	0	6%	137%	-85%	-
SDV	Tel Aviv Sde-Dov Hoz	92	92	0	0	-16%	-16%	-	-
RNB	Ronneby	87	46	41	0	23%	-20%	224%	-
BNN	Brønnøysund,Brønnøy	86	86	1	0	9%	11%	-70%	-
BRN	Bern	86	86	0	13	-73%	22%	-100%	-
ERC	Erzincan Airport	83	21	62	0	-	-	-	-
JKH	Chios	82	34	48	0	24%	-24%	132%	-
TLN	Toulon-Hyères	81	55	26	0	-2%	6%	-14%	-
KRN	Kiruna	81	36	46	0	45%	51%	41%	-
KTT	Kittilä	80	7	73	0	551%	0%	1274%	-
BUS	Batumi	79	22	57	0	856%	163%	-	-
EFL	Kefallinia	75	50	25	0	156%	137%	204%	-
SSJ	Sandnessjøen,Stokka	75	74	0	0	-7%	-3%	-88%	-

AIRPORT		CONNECTIVITY							
Code		Absolute '14				Growth '04-'14			
		Airport	Direct	Ind.	Hub	Airport	Direct	Ind.	Hub
FRO	Florø	74	73	1	0	32%	33%	-2%	-
SMI	Samos	74	44	30	0	-6%	4%	-18%	-
MQN	Mo i Rana, Røssvoll	73	73	0	0	-12%	-8%	-87%	-
PLQ	Palanga	73	21	52	0	63%	-53%	-	-
MJF	Mosjøen, Kjærstad	72	72	0	0	-7%	-5%	-85%	-
AOK	Karpathos	72	43	29	0	72%	18%	419%	-
HOR	Horta (Azores)	71	41	30	0	3%	-16%	50%	-
KUN	Kaunas	70	51	19	5	435%	292%	-	-
IVL	Ivalo	69	13	56	0	303%	-1%	1298%	-
FMM	Memmingen	66	61	5	1	-	-	-	-
OSR	Ostrava	66	49	17	2	-10%	88%	-64%	-
BDU	Bardufoss	65	20	45	0	64%	5%	117%	-
MZH	Amasya Merzifon Airport	65	10	55	0	-	-	-	-
SKN	Stokmarknes, Skagen	65	59	5	0	1%	-3%	101%	-
MQM	Mardin Airport	64	35	29	0	6274%	3393%	-	-
LYR	Svalbard, Longyear	63	15	47	0	63%	-24%	159%	-
KIR	Kerry	63	34	29	0	-6%	-30%	59%	-
KLX	Kalamata	62	28	34	0	-	-	-	-
LIG	Limoges	62	51	11	0	-59%	4%	-89%	-
PGF	Perpignan-Rivesaltes	61	43	19	0	-16%	-11%	-26%	-
BOH	Bournemouth	61	59	2	1	53%	51%	133%	-
LRH	La Rochelle - Ile de Ré	60	50	10	0	86%	93%	60%	-
KAO	Kuusamo	60	6	54	0	60%	-45%	101%	-
KVA	Kavala	57	29	28	0	40%	-5%	180%	-100%
SOG	Sogndal, Haukåsen	57	55	1	0	-13%	-11%	-55%	-
KLV	Karlovy Vary	55	8	47	0	221%	33%	322%	-
NOP	Sinop Airport	55	7	48	0	-	-	-	-
LKN	Leknes	54	51	3	0	12%	5%	-	-
MEH	Mehamn	53	53	0	0	-8%	-8%	-100%	-
HVG	Honningsvåg, Valan	52	51	2	0	-22%	-23%	45%	-
IGD	Iğdır Airport	52	14	38	0	-	-	-	-
LXS	Limnos	51	30	21	0	-5%	-2%	-9%	-
BJF	Båtsfjord	51	51	0	0	2%	2%	-	-
ANX	Andøya, Andenes	50	33	17	0	36%	-6%	922%	-
HOV	Ørsta-Volda, Hovden	50	48	2	0	40%	37%	235%	-
	Isparta Süleyman Demirel	50	7	43	0	-	-	-	-
ISE	Airport								
KSY	Kars Airport	49	27	23	0	607%	288%	19901%	-
KCM	Kahramanmaraş Airport	49	17	32	0	-	-	-	-
MSR	Muş Airport	46	21	26	0	1441%	589%	-	-
JSI	Skiathos	45	22	24	0	439%	207%	1600%	-
SVJ	Svolvær, Helle	45	39	6	0	-4%	-17%	-	-
BRQ	Brno	44	38	6	1	-	-	-	-
ADF	Adiyaman Airport	43	14	29	0	-	-	-	-
AJI	Ağrı Airport	43	14	29	0	-	-	-	-

AIRPORT		CONNECTIVITY							
Code		Absolute '14				Growth '04-'14			
		Airport	Direct	Ind.	Hub	Airport	Direct	Ind.	Hub
CFR	Caen Carpiquet	42	23	19	0	-8%	21%	-28%	-
VAW	Vardø, Svartnes	42	42	0	0	10%	10%	-	-
PAS	Paros	42	27	15	0	-6%	42%	-42%	-
RJL	Logroño	41	6	35	0	-38%	-71%	-23%	-
LCJ	Lodz	41	19	22	0	320%	131%	1352%	-
FDE	Førde, Bringeland	41	40	1	0	9%	8%	-	-
KUT	Kutaisi	40	32	8	0	1220%	960%	-	-
MHQ	Maarianhamina	39	27	12	4	-23%	-40%	110%	-
UIP	Quimper	39	24	15	0	-5%	0%	-13%	-
POR	Pori	38	38	0	0	9%	9%	-100%	-
OSY	Namsos	38	38	0	0	-1%	-1%	-100%	-
RVK	Rørвик, Ryum	38	38	0	0	36%	37%	-100%	-
LDE	Tarbes	37	26	11	0	106%	116%	85%	-
CND	Constanta	36	5	31	0	-	-	-	-
PVK	Aktio (Preveza)	36	25	11	0	100%	40%	4221%	-
PIS	Poitiers-Biard	35	28	7	0	63%	46%	196%	-
SDN	Sandane, Anda	35	35	0	0	-13%	-9%	-92%	-
AXD	Alexandroupolis	34	21	13	0	-44%	-45%	-42%	-
BCM	Bacau	33	33	0	0	24%	112%	-100%	-
BVG	Berlevåg	32	32	0	0	-9%	-9%	-	-
SOJ	Sørkjosen	31	31	1	0	10%	9%	91%	-
VDE	Hierro	29	29	0	0	7%	7%	-	-
VLL	Valladolid	29	15	14	0	-79%	-79%	-78%	-
JKI	Ikaria	29	18	10	0	256%	360%	153%	-
LGG	Liège	28	25	3	3	-	-	-	-
LRS	Leros	27	21	6	0	55%	43%	123%	-
JSH	Sitia	27	27	0	0	170%	176%	-68%	-
JKL	Kalymnos	26	21	6	0	-	-	-	-
SVL	Savonlinna	26	10	16	0	-12%	-66%	-	-
ZAZ	Zaragoza	26	22	4	0	-70%	-16%	-93%	-
ANR	Antwerp-Deurne	26	26	0	0	-40%	-23%	-97%	-
LKL	Lakselv, Banak	26	23	3	0	-13%	-15%	0%	-
BJZ	Badajoz	23	11	12	0	-60%	-37%	-71%	-
RJK	Rijeka	23	15	8	0	272%	644%	94%	-
EDO	Balikesir Koca Seyit Airport	23	14	9	0	-	-	-	-
KIT	Kythira	23	16	7	2	33%	12%	138%	89%
MLO	Milos	22	12	10	0	23%	50%	3%	-
IOA	Ionnina	22	12	10	0	-43%	-59%	6%	-
PMF	Parma	21	18	3	0	-65%	-33%	-91%	-
OMR	Oradea	20	12	8	0	-24%	-49%	242%	-
KSJ	Kasos	20	19	0	0	28%	26%	-	-
DNR	Dinard	19	14	5	0	-56%	-65%	44%	-
NVK	Narvik, Frammes	18	18	0	0	-42%	-40%	-85%	-
HAA	Hasvik	18	17	1	0	8%	4%	-	-
OST	Ostend	17	16	1	0	-	-	-	-

AIRPORT		CONNECTIVITY							
Code		Absolute '14				Growth '04-'14			
		Airport	Direct	Ind.	Hub	Airport	Direct	Ind.	Hub
USQ	Uşak Airport	-	-	-	-	-	-	-	-
FAB	Farnborough	-	-	-	-	-	-	-	-
VRK	Varkaus	-	-	-	-	-100%	-100%	-100%	-
ANG	Angoulême	-	-	-	-	-100%	-100%	-	-
CER	Cherbourg	-	-	-	-	-100%	-100%	-	-
GNB	Grenoble	-	-	-	-	-100%	-100%	-100%	-
LTT	Saint-Tropez Airport	-	-	-	-	-100%	-100%	-	-
NCY	Annecy	-	-	-	-	-100%	-100%	-100%	-
URO	Rouen	-	-	-	-	-100%	-100%	-100%	-
KZI	Kozani	-	-	-	-	-100%	-100%	-	-
HFA	Haifa	-	-	-	-	-100%	-100%	-	-
VBS	Brescia	-	-	-	-	-100%	-100%	-100%	-
VRV	Værøy Heliport	-	-	-	-	-100%	-100%	-	-
BBU	Bucharest Baneasa	-	-	-	-	-100%	-100%	-	-
NAL	Nalchick	-	-	-	-	-100%	-100%	-	-
ABC	Albacete	-	-	-	-	-100%	-100%	-100%	-
VIT	Vitoria	-	-	-	-	-100%	-100%	-100%	-

Appendix G

CONNECTIVITY BY SELECTED NON-EUROPEAN AIRPORTS

Table G.1 **Connectivity by airport (ranked by airport connectivity in 2014)**

Code	AIRPORT		CONNECTIVITY						
	Absolute '14						Growth '04-'14		
	Airport	Direct	Ind.	Hub	Airport	Direct	Ind.	Hub	
DXB*	Dubai*	8,943	3,364	5,579	18,052	165%	127%	194%	485%
AUH	Abu Dhabi	4,801	1,216	3,585	8,275	409%	161%	651%	1913%
DOH	Doha	4,654	1,669	2,985	13,561	306%	240%	356%	1861%
ADD	Addis Abeba	1,836	688	1,148	2,740	364%	153%	828%	1572%

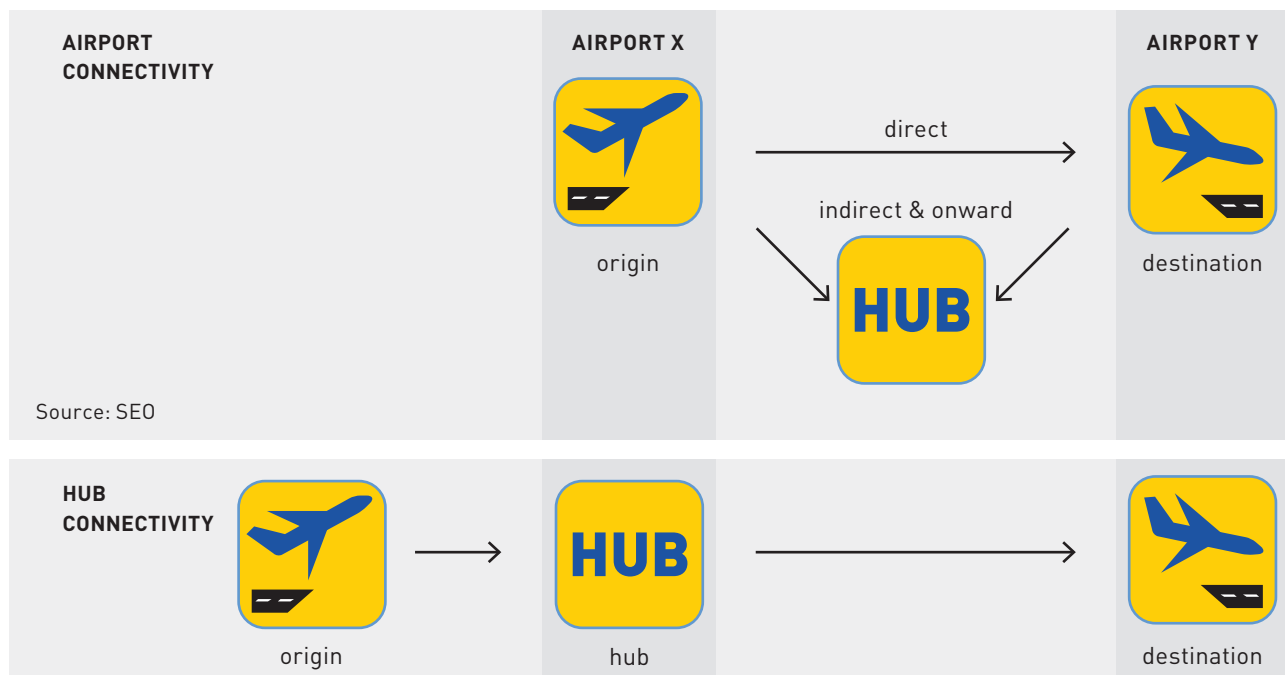
* September 2014

Appendix H

NETSCAN METHODOLOGY

The connectivity performance offered from an airport (airport connectivity) is made up of all connections offered from the airport either direct or indirect via an intermediate hub. Hubconnectivity represents the connectivity offered via (with a transfer at) the airport.

Different types of connectivity:



- ➔ flights of the same airline;
- ➔ flights of airlines working together in an alliance or through a codeshare agreement. The alliance and codeshare compositions are specified for the specific year of analysis.

Traditionally, connectivity is represented by the number of destinations or the number of direct flights offered from an airport. Although valuable in itself, this does not provide insight into the indirect and hub connectivity provided by the airports. The SEO NetScan connectivity model follows a more comprehensive approach and takes all three types of connectivity into account.

The NetScan model first identifies all direct and indirect (one-stop) connections available on an airport-pair. The model uses OAG passenger flight schedule data on direct flights as input. The flight schedules for the third week of June are used. Indirect connections are created within the model by connecting two direct flights taking into account minimum and maximum connecting times. Indirect connections are possible at any given airport between:

As indirect connections are less attractive to the passenger than direct connections, due to the transfer and circuitry time involved, each connection is weighted for its quality. The quality of a connection ranges between zero and one. A direct, non-stop flight operated by a jet aircraft is given the maximum quality of one. The quality of an indirect connection will always be lower than one since travel time is added due to transfer time and circuitry time. The same holds true for a direct multi-stop connection or a direct connection operated by a turboprop: passengers face a lower network quality because of a longer travel time. Connections with a too long travel time relative to the theoretical direct flight time will be assigned a quality of 0. As such, these connections are considered to be unrealistic travel options for the passenger. Box 1 shows how the quality of individual connections is determined.

The quality of each connection is calculated as follows:

Box 1 Determining the quality of individual connections

First the maximum allowable perceived travel time is calculated. The maximum allowable perceived travel time $t_{x(h)y}^{perceived, max}$ between airports X and Y depends upon the non-stop flight time between both airports $t_{xy}^{flight, non-stop}$ and a factor which decreases with distance. The non-stop flight time is determined by the geographical coordinates of origin and destination airport and the flight speed of an average jet aircraft taking into account the time needed for take-off and landing. Over longer distances passengers are willing to accept longer transfer and circuitry times. Therefore the maximum allowable travel time also depends on a factor which decreases with distance: the further apart two airports are, the longer the maximum perceived travel time will be. For example, when the direct flight time between two airports is one hour, the maximum allowable perceived travel time will be about three hours, whereas this will be 24 hours for airports which are 12 hours apart by direct flight.

$$t_{xy}^{perceived, max} = t_{xy}^{flight, non-stop} + 5 * \log(t_{xy}^{flight, non-stop} + 0.5)$$

Second the actual perceived travel time is determined. For direct connections, the actual perceived travel time between airports X and Y $t_{x(h)y}^{perceived, actual}$ equals the actual flight time. $t_{xy}^{flight, actual}$ For indirect flights the perceived travel time equals the flight times on both flight legs and the transfer time at hub H. $t_h^{transfer}$ As transfer time is considered more uncomfortable than flight time, the transfer time is penalized by a factor which decreases with distance: P_{xy}

$$t_{x(h)y}^{perceived, actual} = \begin{cases} t_{xy}^{flight, actual} & \text{for direct flights} \\ (t_{xh}^{flight, actual} + t_{hy}^{flight, actual}) + P_{xy} * t_h^{transfer} & \text{for indirect flights} \end{cases}$$

If the actual flight time is smaller than or equal to the average non-stop flight time, then the weight of the connection $q_{x(h)ya}$ equals one. In practice, this is only the case on direct flights operated by aircraft that are at least equally fast as the average jet aircraft on which the non-stop flight time is based. When the perceived travel time becomes larger than the maximum allowable perceived travel time, then the weight of the connection is zero and the connection will be considered unviable. In any other case, the perceived travel time lies between the non-stop flight time and the maximum allowable perceived flight time. In these cases, the weight of the connection depends on the relative difference between the perceived and maximum allowable travel time.

$$q_{x(h)y} = \begin{cases} 1 & \text{if } t_{x(h)y}^{perceived, actual} \leq t_{xy}^{flight, non-stop} \\ 1 - \frac{t_{x(h)y}^{perceived, actual} - t_{xy}^{flight, non-stop}}{t_{xy}^{perceived, max} - t_{xy}^{flight, non-stop}} & \text{if } t_{xy}^{flight, non-stop} < t_{x(h)y}^{perceived, actual} < t_{xy}^{perceived, max} \\ 0 & \text{if } t_{x(h)y}^{perceived, actual} \geq t_{xy}^{perceived, max} \end{cases}$$

When the perceived travel time is relatively small compared to the maximum allowable travel time, then the weight of the connection will be high and vice versa. The connectivity $CNU_{x(h)ya}$ of an individual direct or indirect connection equals its quality. $q_{x(h)ya}$

$CNU_{x(h)ya} = q_{x(h)ya}$ The CNU is calculated for each individual direct and indirect connection. This means that when a flight is offered with a daily frequency, the CNU's for each of these seven flights as well as for each possible connection have been calculated. The reason for distinguishing between individual flights is twofold. First, the flights might be carried out by different airplane types during the week leading to different flight times and therefore differing CNU's. Second, the same flight might connect to different flights on for example a Monday than on a Friday.

Summing the quality adjusted connectivity values offered by an airport on a certain airport-pair gives the total connectivity on the airport-pair. Summing direct and indirect connectivity offered from an airport yields the airport connectivity, which measures the connectivity available to passengers departing from the airport. Adding up hubconnectivity by transfer (hub) airport yields the connectivity offered via the airport, which gives an indication of the performance of an airport as a transfer point.

Since 1997, NetScan has been applied in many consultancy studies for different stakeholders and has been widely published in the international peer-reviewed academic journals:

Connectivity is the metric by which airports live – the more connected an airport is to the wider world, the more attractive it becomes to its users and the greater the value it provides to the community and local, regional or indeed national economy it serves.

Globalisation has prompted burgeoning interest in measuring the connectivity of hub airports and other airports offering point-to-point services. With airport competition now a firm reality for European airports big and small, connectivity is shifting, changing each year.

ACI EUROPE has partnered with SEO Aviation Economics to produce this industry-wide analysis, the ACI EUROPE Airport Industry Connectivity Report.

This is the first report of its kind – measuring direct and indirect connectivity and the analysis is based on SEO's NetScan connectivity methodology.

The **ACI EUROPE Customised Connectivity Analysis** service is also available for individual airports. To find out how to request an ACI EUROPE Customised Connectivity Analysis for **your airport**, visit **www.airport-connectivity.com**

ACI EUROPE is the European region of Airports Council International, the only worldwide professional association of airport operators.

ACI EUROPE represents over 450 airports in 44 European countries. In 2012, member airports handled 90% of commercial air traffic in Europe, welcoming over 1.6 billion passengers, 16.7 million tonnes of freight and more than 16 million aircraft movements.

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EVERY FLIGHT BEGINS AT THE AIRPORT.

