Asia-Pacific Economic Cooperation

Develop Air Connectivity in the APEC Region

PERU

Tourism Working Group | October 2016

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Asia-Pacific Economic Cooperation

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Glossary

The following section presents a list of commonly used expressions and abbreviations found in the report.

Connecting Potential – Common rates of passengers connecting beyond/behind when traveling through a hub to/from a particular region.

Induction/Stimulation – Initial spike in passenger demand when new non-stop service is offered due to better accessibility, shorter travel time, lower cost, etc.

List of Abbreviations

PDEW – Passenger daily each way (passenger demand in each direction between a select origin and destination).

SDEW – Seats daily each way (number of seats offered in each direction on a non-stop or one-stop flight segment).

OD – Origin and destination.

Airport codes:

AAQ – Anapa, RUS
ACA – Acapulco, MEX
ADL – Adelaide, AUS
AER – Sochi, RUS
AGU – Aguascalientes, MEX
AKJ – Asahikawa, JPN
AKL – Auckland, NZ
ANF – Antofagasta, CHL
AOR – Alor Setar, MAS
AQP – Arequipa, CHL
ARH – Arkhangelsk, RUS
ASF – Astrakhan, RUS
ATL – Atlanta, US
AUS – Austin, US
AYP – Ayacucho, PE
BCD – Negros Occidental, PH
BDJ – Banjarmasin, INA
BHE – Blenheim, NZ
BJX – Silao, MEX
BKI – Kota Kinabalu, MAS
BKK – Bangkok, THA
BLI – Bellingham, US
BMV – Buon Ma Thuot, VN
BNA – Nashville, US
BNE – Brisbane, AUS
BOS – Boston, US
BPN – Balikpapan, INA
BUR – Burbank, US
BWN – Bandar Seri Begawan, BD
BXU – Butuan, PH
CAN – Guangzhou, PRC
CBO – Cotabato, PH
CCP – Concepción, CHL
CEB – Cebu, PH
CEI – Chiang Rai, THA

CEK – Chelyabinsk, RUS
CEN – Ciudad Obregón, MEX
CGK – Jakarta, INA
CGO – Zhengzhou, PRC
CGQ – Changchun, PRC
CGY – Cagayan de Oro and Iligan, PH
CHC – Christchurch, NZ
CJA – Cajamarca, PE
CJC – Calama, CHL
CJJ – Cheongwon-gu, ROK
CJU – Jeju, ROK
CKG – Chongqing, PRC
CLT – Charlotte, US
CME – Ciudad del Carmen, MEX
CNS – Cairns, AUS
CNX – Chiang Mai, THA
CSX – Changsha, PRC
CTS – Hokkaido, JPN
CTU – Chengdu, PRC
CUN – Cancun, MEX
CUZ – Cusco, PE
CVG – Cincinnati, US
CXR – Nha Trang, VN
DAD – Da Nang, VN
DAL – Dallas, US
DCA – Washington, US
DEN – Denver, US
DFW – Dallas, US
DGO – Durango, MEX
DGT – Dumaguete, PH
DJB – Jambi City, INA
DLC – Dalian, PRC
DLI – Da Lat, VN
DME – Domodedovo, RUS
DMK – Bangkok, THA
DPS – Bali, INA
DRW – Darwin, AUS
DTW – Detroit, US
DUD – Dunedin, NZ
DVO – Davao City, PH
EAT – Douglas County, US
EWR – Newark, US
EZE – Buenos Aires, ARG
FAT – Fresno, US
FLL – Fort Lauderdale, US
FOC – Fuzhou, PRC
FSZ – Shizuoka, JPN
FUK – Fukuoka, JPN
GDL – Guadalajara, MEX
GEG – Spokane, US
GMP – Seoul, ROK
GUM – Tamuning and Barrigada, GUM
GYS – Guangyuan, PRC
HAK – Haikou, PRC
HAN – Ha Noi, VN
HGH – Hangzhou, PRC
HKG – Hong Kong, China, HKC
HKT – Phuket, THA
HND – Tokyo, JPN
HNL – Honolulu, US
HRB – Harbin, PRC
HUI – Hue, VN
HUZ – Huizhou, PRC
IAD – Washington, US
IAH – Houston, US
ICN – Seoul, ROK
ILO – Ilo, PE
IQQ – Iquique, CHL
IQT – Iquitos, PE
ISG – Ishigaki, JPN
ITM – Osaka, JPN

IWK – Iwakuni, JPN
JFK – New York, US
JHB – Johor, MAS
JJN – Quanzhou, PRC
JNZ – Jinzhou, PRC
JOG – Yogyakarta, INA
JUL – Juliaca, PE
KBR – Kota Bharu, MAS
KBV – Krabi, THA
KCH – Kuching, MAS
KGD – Kaliningrad, RUS
KHH – Kaohsiung, CT
KHN – Nanchang, PRC
KIX – Osaka, JPN
KKE – Kerikeri, NZ
KLO – Kalibo, PH
KMG – Kunming, PRC
KNH – Kinmen, PRC
KNO – Kuala Namu, INA
KOJ – Kirishima, JPN
KRR – Krasnodar, RUS
KUF – Samara, RUS
KUL – Kuala Lumpur, MAS
KWL – Guilin, PRC
KZN – Tatarstan, RUS
LAS – Las Vegas, US
LAX – Los Angeles, US
LED – Saint Petersburg, RUS
SVX – Yekaterinburg, RUS
LGA – NY–La Guardia, US
LGK – Padang Matsirat, Langkawi, MAS
LHW – Lanzhou, PRC
LIM – Lima, PE
LOP – Lombok, INA
LPF – Liupanshui, PRC
LPT – Lampang, THA
MBT – Masbate City, PH
MCC – Sacramento, US
MCO – Orlando, US
MDW – Chicago, US
MDZ – Mendoza, ARG
MEL – Melbourne, AUS
MEX – Mexico City, MEX
MFM – Macau, MAC
MIA – Miami, US
MLM – Alvaro Obregon, Michoacan, MEX
MNL – Manilla, PH
MRY – Monterey, US
MSP – Minneapolis–Saint Paul, US
MTT – Cosoleacaque, MEX
MTY – Apodaca, MEX
MZG – Magong City, CT
NBC – Nizhnekamsk, RUS
NGB – Ningbo, PRC
NGO – Nagoya, JPN
NKG – Nanjing, PRC
NKM – Nagoya, JPN
NNG – Nanning, PRC
NPE – Napier, NZ
NPL – New Plymouth, NZ
NRT – Tokyo, JPN
NSN – Nelson, NZ
NTG – Nantong, PRC
OAK – Oakland, US
OAX – Oaxaca, MEX
OKA – Naha, JPN

OOL – Gold Coast, AUS
ORD – Chicago, US
OVB – Novosibirsk, RUS
OZC – Ozamiz, PH
PDG – Sumatra, INA
PEK – Beijing, PRC
PEN – Penang, MAS
PER – Perth, AUS
PHL – Philadelphia, US
PHX – Phoenix, US
PIU – Piura, PE
PLM – Palembang, INA
PLW – Palu, INA
PMC – Puerto Montt, CHL
PMR – Palmerston North City, NZ
PNK – Pontianak, INA
POM – Port Moresby, PNG
PPQ – Paraparaumu, NZ
PQC – Phu Quoc, VN
PSP – Palm Springs, US
PUS – Busan, ROK
PVG – Shanghai, PRC
PVR – Puerto Vallarta, MEX
PXU – Pleiku, VN
PYX – Pattaya, THA
RDU – Raleigh, Durham, US
REP – Siem Reap, KHM
REX – Reynosa, US
RGN – Mingaladon, MMR
RNO – Reno, US
ROC – Rochester, US
ROT – Rotokawa, NZ
ROV – Rostov-on-Don, RUS
RSU – Yeosu, ROK
RTW – Saratov City, RUS
RXS – Roxas City, PH
SAN – San Diego, US
SCL– Santiago, CHL
SEA – Seattle, US
SFO – San Francisco, US
SGN – Ho Chi Minh, VN
SHA – Shanghai, PRC
SHE – Shenyang, PRC
SIN – Singapore, SGP
SIP – Simferopol, UKR
SJC – San Jose, US
SJD – San Jose del Cabo, MEX
SLC – Salt Lake City, US
SLP – San Luis Potosi, MEX
SMF – Sacramento, US
SNA – Santa Ana, US
SOC – Solo/Surakarta, INA
SPN – Saipan, US
SRG – Semarang, INA
STL – St. Louis, US
STW – Stavropol Krai, RUS
SUB – Surabaya, INA
SVO – Moscow, RUS
SVX – Koltsovo, RUS
SWA – Jieyang Chaoshan, PRC
SYD – Sydney, AUS
SYO – Sakata, JPN
SYX – Sanya, PRC
SZX – Shenzhen, PRC
TAC – Tacloban, PH
TAM – Tampico, MEX
TAO – Qingdao, PRC

TAV – Tau, ASM
TBP – Tumbes, PE
TDX – Trat, THA
TGG – Kuala Terengganu, MSA
TGZ – Chiapa de Corzo, MEX
TIJ – Tijuana, MEX
TKG – Bandar Lampung, INA
TLC – Toluca, MEX
TNA – Jinan, PRC
TPE – Taipei, CT
TPP – Tarapoto, PE
TRC – Torreon, MEX
TRU – Trujillo, PE
TSA – Songshan, CT
TSN – Tianjin, PRC
TTJ – Tottori, JPN
TXG – Taichung, CT
TYN – Taiyuan, PRC
UFA – Ufa, RUS
UIH – Qui Nhon, VN
UKB – Kobe, JPN
UPG – Makassar, INA
URC – Urumqi, PRC
USM – Koh Samui, THA
VCL – Chu Lai, VN
VDH – Dong Hoi, VN
VER – Veracruz, MEX
VII – Vinh, VN
VKO – Moscow, RUS
VOZ – Voronezh, RUS
VSA – Villahermosa, MEX
VVO – Vladivostok, RUS
WAG – Whanganui, NZ
WEH – Weihai, PRC
WLG – Wellington, NZ
WNZ – Wenzhou, PRC
WRE – Whangarei city, NZ
WUH – Wuhan, PRC
WUX – Wuxi, PRC
XIY – Xi'an, PRC
XMN – Xiamen, PRC
YEG – Edmonton, CDA
YGJ – Yonago, PRC
YHZ – Halifax, CDA
YKA – Kamloops, CDA
YLW – Kelowna, CDA
YNJ – Yanji, PRC
YOW – Ottawa, CDA
YPR – Prince Rupert, CDA
YQM – Moncton, CDA
YQR – Regina, CDA
YSJ – Saint John, CDA
YTS – Timmins, CDA
YUL – Montreal, CDA
YVR – Vancouver, CDA
YWG – Winnipeg, CDA
YXC – Cranbrook, CDA
YXS – Prince George, CDA
YXT – Terrace-Kitimat, CDA
YYB – North Bay, CDA
YYC – Calgary, CDA
YYJ – Victoria, CDA
YYZ – Toronto, CDA
YZP – Sandspit, CDA
YZR – Sarnia, CDA
ZAL – Valdivia, CHL
ZCL – Calera de Victor Rosales, MEX
ZQN – Queenstown, NZ
ZUH – Zhuhai, PRC

1. Introduction to the project

The APEC Secretariat and Economies have observed that the flow of goods, services, capital and people in the APEC Region is constrained by air connectivity limitations and gaps that exist between the APEC economies, between the Americas and Asia Pacific particularly. Improving connectivity is a long-term target of the APEC economies. The APEC Tourism Working Group (TWG) and Transport Working Group (TPTWG) are particularly interested in pursuing this long-term target.

This Project (the "Project") was proposed in 2014 by Thailand and co-sponsored by Australia; Indonesia; Malaysia; Peru; the Philippines; and Chinese Taipei and aims to develop air connectivity in the APEC Region and in turn stimulate a more efficient flow of goods, services, capital and people. The Project has the following objectives:

- To develop market demand based recommendations for potential new routes, improved flight schedule connection times, and hubs between APEC economies based on analysis of air passenger flow, schedules and new aircraft range capability, including analysis of the number of seats, flights and air traffic.
- To help airlines and regulators develop more accurate demand predictions so they can in turn help APEC economies by providing better air connectivity services, capacity and schedules.

The Project was approved in December 2014 with IATA Consulting selected as the consultant in May 2015. IATA was mandated to complete the following tasks:

1. Develop market demand based recommendations for potential new routes;
2. Provide recommendations to improve connection between flights at the main hubs linking the APEC economies; and,
3. Determine which APEC market-pairs could benefit from the introduction of new aircraft with an extended range.

2. Approach followed and data used

This section explains the methodology applied by IATA and presents the data used to feed the various underlying analysis. To conduct the analysis, IATA took systematic steps identified in Figure 1.

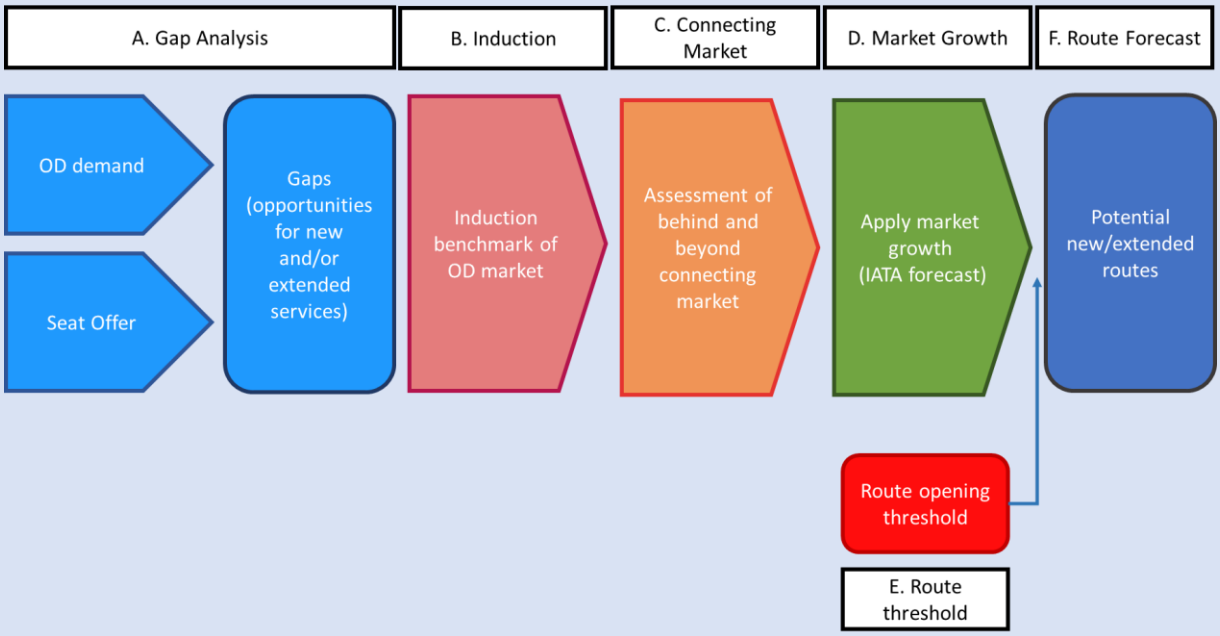

Figure 1: Process used to complete analytical work

The first step involved a demand-supply gap analysis aimed at identifying the unserved routes, presenting potential demand for future development. The size that this potential demand could actually represent if turned into direct service in the future was subsequently forecast, using realistic assumptions related to induction, connecting potential and demand growth.

2.1 Data fueling the model

Principal data for the model originates from Airport IS. IATA's Airport IS system uses IATA billing and settlement plan data to provide detailed demand and supply information on total air traffic. This data has been available for over a 10-year historical period (since 2005).

Approximately 18,500 international APEC routes were analyzed in the execution of this study. Airport IS data was particularly relevant in the gap analysis and assumption development.

Academic articles and published ratios were also used to justify some of the assumptions, including induction and origin destination traffic captured through direct service.

For some of the other variables used in the final traffic determination, economic forecasts were extracted from IHS Global Insight, one of the world's largest commercially available economic databases.

Tourism data was extracted from the World Travel and Tourism Council.

2.2 Gap analysis

IATA applied a funnel approach in conducting the analysis. It first considered the market at the economy-pair level, followed by city pairs leading to a market potential assessment (see figure below). Both seat supply and seat demand were considered in the analysis to identify gaps in air service.

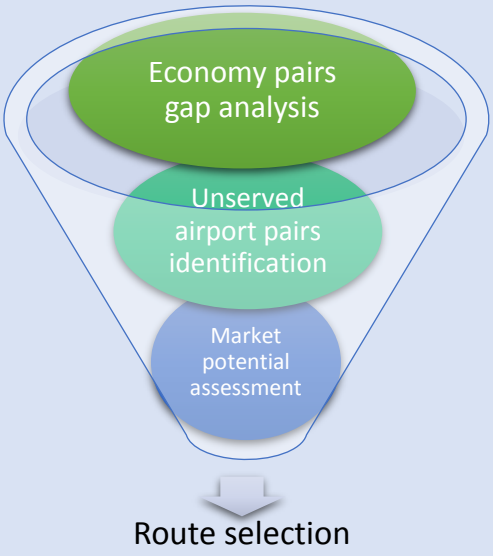

Figure 2: Funnel approach used to conduct analysis

The economy-pair analysis allowed IATA to identify unserved markets.

As an illustration, the analysis showed that there is a daily demand of 929 Passengers Daily Each Way (PDEW) via existing connecting routings between the Peru and Chile.

When extending the analysis down to the city pairs it was possible to identify the largest unserved routes between the two economies. There are for instance 74 PDEW traveling between CUZ and SCL.

The top 15 unserved routes from Peru to the entire APEC region are presented in the table below.

Origin Airport	Origin Economy	Destination Airport	Destination Economy	2015 OD Demand	Direct seats in 2015	Demand Excess Over
CUZ	Peru	SCL	Chile	74	0	74
LIM	Peru	NRT	Japan	55	0	55
LIM	Peru	DCA	United States	55	0	55
LIM	Peru	SFO	United States	51	0	51
LIM	Peru	YUL	Canada	43	0	43
LIM	Peru	ORD	United States	36	0	36
LIM	Peru	BOS	United States	34	0	34
LIM	Peru	IAD	United States	33	0	32
LIM	Peru	YVR	Canada	29	0	29
LIM	Peru	ICN	Republic of Korea	28	0	28
LIM	Peru	DEN	United States	26	0	26
LIM	Peru	LGA	United States	22	0	22
LIM	Peru	SYD	Australia	21	0	21
CUZ	Peru	MEX	Mexico	21	0	21
LIM	Peru	HKG	Hong Kong, China	20	0	20

Table 1: Top 15 unserved routes from Peru to APEC, 2015 data

2.3 Induction

To determine realistic estimates of the success of new air service, various assumptions were considered and applied to current passenger demand.

Induction is a well proven concept that explains how new direct air service has a significant impact on increasing the total number of O&D passengers on a city pair market. This is due to product improvement: shorter travel time, greater convenience and more affordable ticket prices. The extent to which the market will be stimulated varies based on current levels of service (price and flight frequency) offered on a particular route. As stated in the Successful Air Service Development presentation (ICF International, 2014) a market's first non-stop flight can stimulate demand by 100% to 300%.

IATA quantified this induction value to show a relationship between two primary factors: region pair and the size of the market before a new route is initiated.

The table below shows the stimulation rates considered for this analysis of Peru. For some instances where inadequate data (less than 4 routes) to conduct a region pair analysis was available, other variables were considered, including the average of all routes, the average of long-haul routes or the average of short-haul routes, depending on the specific market.

Market	Base of 10,000 annual pax	Base of 25,000 annual pax	Base of 50,000 annual pax
All APEC Economies	130%	42%	18%
Long Haul	101%	36%	16%
Short Haul	150%	50%	21%
NAFTA-Peru, Chile	90%	28%	

Table 2: Induction rates used during the analysis

2.4 Connecting potential

Increasing the quality of connections through alliance agreements, codeshares, shorter journey times or fewer stops increases overall travel demand in connecting markets. It is a normal phenomenon for new routes to not only increase demand for the city pairs served but also for beyond and behind destinations that are now more easily accessible (Swan, 2008). On long-haul routes, typically two-thirds of the passengers will make a connection.

IATA's analysis found that connecting markets would stimulate at various rates depending on the region of origin and the hub airport being flown through. These ratios are applied in determining the impact of a new route on connecting flows.

The tables below present the connecting ratios of Lima, and other hubs flown to and from the Peru-Chile region.

	LIM
North America	29%
Peru-Chile	13%

Table 3: Connecting potential rates used when flying to/from APEC regions and Lima

	SYD	AKL	YYZ	LAX	DFW	JFK/EWR	MEX	LIM	SCL
Peru-Chile	46.90%	57.20%	70.60%	34.80%	90.70%	27.90%	42.40%	13.10%	10.10%

Table 4: Connecting potential of hubs flown to in the APEC region on flights to/from Peru and Chile

2.5 Demand growth

This refers to the consideration of the natural growth observed on a market segment. IATA Economics publishes a detailed inter- and intra-regional global traffic forecast. These demand growth forecasts were used to provide a regionally specific rate of growth to and from Peru between 2016 and 2018. Growth was typically seen to be around 5%. Demand growth also refers to

the fact that approximately 80% of a market will choose a non-stop flight option if it is available (Belobaba, 2015).

2.6 Other

Other factors, including distance and available traffic rights, were used to refine the assessment of potential new service to be offered. Distance considers the feasibility of offering a non-stop flight with existing technology, using 15,000km as a maximum distance. Available traffic rights consider the bilateral agreements between economies and the current use of those bilateral rights.

2.7 Final route forecast

After conducting the gap analysis and applying the established rates from the various assumptions, the future market potential was estimated, as illustrated in Figure 3 below for the CUZ-SCL route.

				1	2	4	
Origin Airport	**Destination Airport**	**Destination Economy**	**2015 OD Non-direct Demand**	**OD Captured Though Deorect Service**	**OD Stimulation**	**Behind/Beyond Connecting Potential**	**Caculations**
CUZ	SCL	Chile	(A) 74	(B) 80%	(C) 25%	(D) 10%	
				(1) 59	15		(1) = AxB
				(2)			(2) = 1xC
			Subtotal	(3)	74		(3) = 1+2
		CUZ - SCL Total Market Potential (2015 Base)				(4) **82**	(4) = 3/(1-D)

Figure 3: Example of the various assumptions being applied to determine the potential for a new air service.

3. Peru

A summary of Peru's economy and demographics, aviation demand, and airport specific information is presented in this section.

3.1 Economy and demographics

Peru sits on the west coast of South America. It is famous for the rich history of housing several Andean civilizations in the past with the most notable of all the Incas.

3.1.1 Demographics

Peru's population is estimated at 31,774 million as of 2016, making it the 42th most populous nation in the world, and 4th in South America (United Nation, 2016). More than a quarter of Peruvians reside in the capital city, Lima. Peru's population density is approximately 30 people per square kilometre (United Nation, 2016)

Peru is a multi-ethnic nation formed by different groups over five centuries. According to the last census in 2007, the population is made up of Amerindians (45%), Mestizo, (37%), European (15%), and ASIAN Peruvian (3%). Although Spanish is the official language of Peru, used nationwide, indigenous languages also have official status in areas where they predominate.

Peru's population is expected to grow at an average annual rate of 1.1 % over the next 10 years (United Nations, 2016), decreasing from the past 1.3% annual growth rate between 2005 and 2015.

About 78% of Peru's population live in urban areas (World Bank, 2014). Major urban cities and towns include:

City	Population (million)
1. Lima	9.83
2. Arequipa	0.87
3. Trujillo	0.79
4. Chiclayo	0.60
5. Iquitos	0.44
6. Piura	0.43
7. Cusco	0.42
8. Huancayo	0.36

Table 5: Largest cities in Peru in 2014 (Source: National Institute of Statistics and Informatics of Peru- INEI)

3.1.2 Economy

Peru is an emerging social market economy characterized by a high level of foreign trade. Its commodity exports make up a significant proportion of economic activity and thus subject the economy to the risks of price volatility in the international markets. Peru's service sector accounts for 56.3% of its GDP, followed by industry (37.5%) and agriculture (6.2%) (CIA World Factbook, 2015). In 2015, Peru is the 49th largest economy in the world and ranks 91th in terms of per capita income (International Monetary Fund, 2016). Peru' GDP growth has been approximately 3.9% p.a. over the past three years.

The top export destinations of Peru are the United States; China; Switzerland; Canada; and Japan. Peru's main exports are copper, gold, zinc, textiles, chemicals, pharmaceuticals, and manufactures. The top import origins are the United States; China; Brazil; Mexico; and Ecuador. Its top imports are refined petroleum, crude petroleum, cars, delivery trucks and computers.

In 2016, economic growth is expected to be similar to 2015 levels and to gradually recovery to an average rate of 3.8 percent in 2017-2018. Over the next two or three years, large-scale mining projects are expected to begin production and increased private and public investment in infrastructure projects will support aggregate demand. Additionally, the economy will continue to implement structural reforms to ensure confidence of private investors. On the external front, the main challenges that may have an impact on economic growth include: the decline in commodity prices, which is closely related to the economic slowdown in China, one of Peru's main trading partners. A possible period of financial volatility, associated with the expectation of higher interest rates in the United States. (World Bank 2016)

3.1.3 Tourism

Tourism in Peru is directed towards archaeological monuments, ecotourism in the Peruvian Amazon, cultural tourism in colonial cities, gastronomic tourism, adventure tourism, and beach tourism.

Tourism makes up the economy's third largest industry, behind mining and fishing (World Travel and Tourism Council, 2015). In 2014, tourism contributed to 9.7% of Peru's GDP (both direct and indirect), and this share is forecast to grow to 11.1% in 2025 (World Travel and Tourism Council, 2015). The international arrivals increased at an average annual rate of 15% over the past decade to 3.2 million in 2014 (Ministry of Foreign Trade and Tourism).

3.2 Aviation demand

3.2.1 Recent demand growth

Peru's aviation market had been growing strongly in the past decade, with traffic growing almost four folds in between 2004 to 2014. Majority of the growth came from the domestic market and the market size of domestic flights grew from 65% in 2004 to almost 70% in 2015.

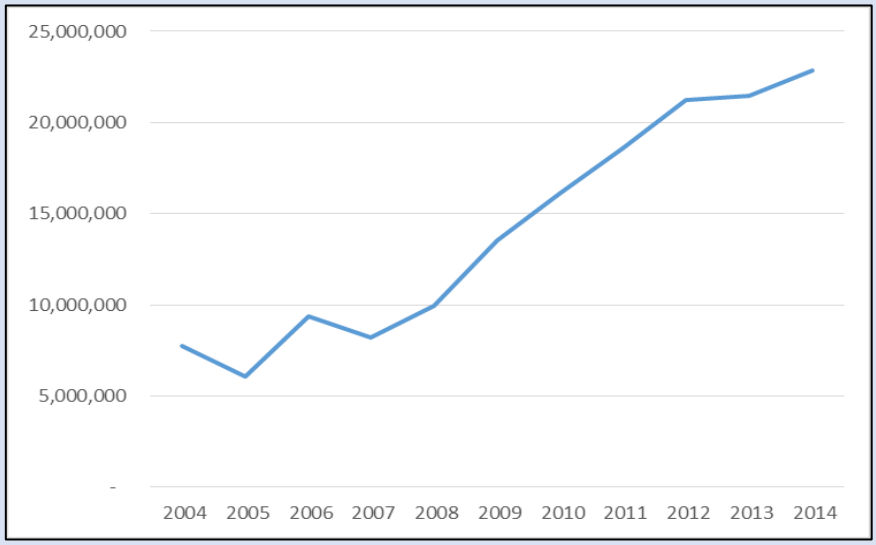

Figure 4: Total air traffic of Peru 2004-2015 (Source: Albatross Airport, 2016)

Passenger traffic number of the principal cities operated from/to Lima are shown in the table below.

CITY	2010	2011	2012	2013	2014	2015	Total 2010- 2015
Lima	10,127,708	11,540,514	13,581,314	15,271,842	16,020,584	17,575,919	84,117,881
Cuzco	1,447,280	1,679,411	1,925,472	2,308,110	2,485,859	2,889,206	12,735,338
Arequipa	939,397	1,025,476	1,148,438	1,282,504	1,351,182	1,492,423	7,239,420
Iquitos	644,910	649,626	738,079	862,169	995,208	1,032,200	4,922,192
Piura	394,462	518,506	628,033	714,595	753,000	836,511	3,845,107
Tarapoto	291,660	367,560	429,381	537,336	650,973	636,008	2,912,918
Trujillo	291,224	352,222	402,491	430,621	484,192	489,258	2,450,008
Chiclayo	274,411	302,874	364,113	414,401	441,632	455,457	2,252,888
Tacna	247,508	253,440	280,215	315,146	339,511	380,959	1,816,779
Pucallpa	285,634	295,246	326,425	425,694	446,290	484,204	2,263,493
Juliaca	211,236	257,917	330,879	353,045	371,298	424,245	1,948,620
Cajamarca	176,214	194,123	222,262	246,331	253,314	256,530	1,348,774
Tumbes	91,889	87,557	111,182	154,334	183,503	190,299	818,764
Puerto Maldonado	178,598	199,253	246,079	274,098	268,169	285,159	1,451,356
Ayacucho	51,604	53,170	70,185	74,628	86,058	140,940	476,585
Anta	9,371	7,305	13,043	11,342	12,420	14,554	68,035
Talara	290	12,989	11,591	422	16,637	107,872	149,801
Pisco	24,291	1,404	1,268	5,601	1,213	1,239	35,016
Chachapoyas	3,478	1,569	60	416	557	259	6,339
TOTAL	**15,691,165**	**17,800,162**	**20,830,510.00**	**23,682,635.00**	**25,161,600.00**	**27,693,242.00**	**130,859,314**

Table 6: Passenger traffic by cities. (Source: Ministry of Foreign Trade and Tourism of Peru)

3.2.2 Current air services from Peru

Peru currently has 17 direct routes to other APEC economies. All services are concentrated in North and South America with majority of the routes serving between Lima and the US.

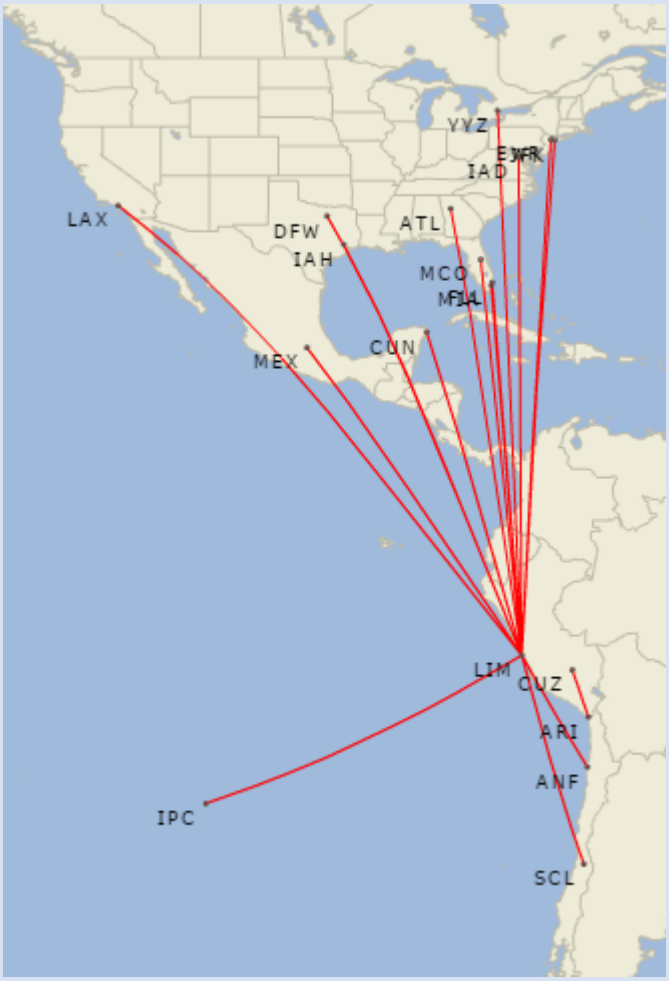

Figure 5: Non-stop international service from Peru within the APEC region 2016 (Source: Airport IS)

Air services across the Pacific from Peru to Asia are not always feasible. This is partly due to the limitations in current aircraft technology in terms of range. It is also costly for the airlines to operate such ultra-long-haul routes. At present, a lot of the trans-pacific traffic is routed through other aviation hubs in the APEC economies, such as LAX and SFO in the United States. IATA anticipates that these hubs will continue to perform their current functions in the medium to long term.

3.2.3 Aviation and the economy

Economic Footprint

The aviation industry and its related activities provide around 51,000 jobs in Peru and contributed USD702 million (0.5%) to the Peruvian GDP in 2009 (Oxford Economics, 2011). This comprises of direct and indirect spending.

Consumer Benefits

The aviation industry has benefits for visiting friends and family and the shipping of high value products. In 2009, a total of 10 million passengers and 265,000 tonnes of freight travelled to, from and within Peru by air (Oxford Economics, 2011).

Long-term impact

Economically, aviation has a long-term impact in Peru. According to Oxford Economics (2011) air travel enables long-term economic growth by:

- Opening up foreign markets to Peruvian exports;
- Lowering transport costs, particularly over long distances;
- Increasing the flexibility of labor supply, which should enhance allocative efficiency and bring down the natural rate of unemployment;
- Encouraging local businesses to invest and specialize in areas that play to the economy's strengths;
- Speeding the adoption of new business practices, such as just-in-time-inventory management that relies on quick and reliable delivery of essential supplies;
- Raising productivity and hence the economy's long-run supply capacity. It is estimated that a 10% improvement in connectivity relative to GDP would see a USD98 million per annum increase in long-run GDP for the Peru economy.

3.2.4 Government position on aviation

The General Directorate for Civil Aviation (DGAC, Dirección General de Aeronáutica Civil) is a nation-wide line agency that exercises civil aviation authority in Peru and is in charge of promoting, regulating and managing air transport activities, as well as civil aviation activities within the territory. Furthermore, the DGAC leads the process to manage Civil Aviation in a comprehensive manner, subject to Peruvian aeronautical law, annexes and documents of the International Civil Aviation Organization (ICAO), as well as the Peruvian Aviation Regulations (RAP, by its Spanish initials), in order to establish itself as a solid organization that contributes to the development of the economy's civil aviation industry as means for developing other economic activities.

The Peruvian Government has been supportive to aviation development. In 2004, the government invested close to USD23 million to upgrade technical equipment and infrastructure at airports. In 2006, Peru approved investments totalling USD124 million for the next 25 years to modernize regional airports. In 2007, another USD7 million were invested in upgrading infrastructure at minor regional airports. In 2009, delegations of the European Commission and Peru initialled a Horizontal Aviation Agreement in Lima, leading to an important step forward towards strengthening and encouraging further air traffic between the EU and Peru.

The continued investment by the Peruvian government in the economy's aviation infrastructure underpins the fact that the government is committed to developing its aviation infrastructure capabilities in order to cater for the rise in passenger traffic.

3.3 Airport specific information

3.3.1 Busiest airports in Peru

Aviation in Peru is heavily concentrated in the capital city Lima and its airport, Jorge Chavez International Airport, has a market share of 56% of all Peruvian traffic:

Rank	Airport	Most Recent Annual Traffic Statistics	% of Total Peruvian Market
1	LIM	17,112,536	56%
2	CUZ	2,485,859	8%
3	AQP	1,148,430	4%
4	IQT	1,071,830	4%
5	PIU	841,430	3%
6	TPP	707,921	2%
7	Others	3,578,650	13%

Table 7: Top 6 busiest airports in Peru (Source: Albatross Airport, 2016).

Figure 6: Map of Peru's busiest airports (Source: Google maps)

Jorge Chávez International Airport (LIM)

Jorge Chávez International Airport is Peru's main international and domestic airport. It is located in Callao, 11 kilometers from the center of Lima. Being the busiest airport in Peru, LIM handled 17.1 million passengers in 2015. It serves as a hub for many aviation companies, such as Avianca Peru, LATAM and Peruvian Airlines.

Capitán FAP José A. Quiñones González International Airport (CIX)

Capitán FAP José A. Quiñones González International Airport is an airport serving Chiclayo, Peru and the surrounding metropolitan area. CIX is the main airport of the Lambayeque Region, one of the most populous of the economy. The terminal has one runway.

Alejandro Velasco Astete International Airport (CUZ)

Alejandro Velasco Astete International Airport is located in the city of Cusco, in southeastern Peru. Cusco, a principal tourist attraction in Latin America, receives various domestic flights as well as some international flights. CUZ has consistently ranked as Peru's second busiest air terminal, handling 2.5 million passengers in 2015.

3.3.2 Principal airline operators

Two airlines with international scheduled services are based in Peru:

Avianca Peru

Avianca Peru is one of the seven airlines under the Avianca Holding group of airlines. It operates a fleet of 12 aircrafts and is based in LIM.

Avianca Peru serves the APEC economies of Chile; Mexico; and the United States.

LATAM Peru

LATAM Peru is an airline based in Lima, Peru. It is a subsidiary of Chilean publicly traded company LATAM Airlines. It operates domestic and international services from LIM. It has a fleet of 33 aircrafts with 5 new Boeing 787 Dreamliner on order to replace some of the older Boeing 767 fleet. LATAM Peru is a member of the Oneworld alliance.

Internationally within the APEC region, LATAM Peru serves Chile; Mexico and the United States.

4. Medium-term new route opportunities

This section of the report is dedicated to explaining the potential future air service developments to and from Peru within the APEC region over the next three years. Service gaps, route traffic forecasts, and high-level feasibility analysis will be conducted.

4.1 Service gaps

As part of the process, air services to Peru were considered at an economy-pair and city-pair basis.

4.1.1 Economy pair analysis

The following chart outlines the demand for air travel between Peru and other APEC economies and the related supply. Essentially the data shows the economy pairs where:

- Non-stop service is sufficiently supplied (in green).
- Air service is adequate but may need to be improved in the long term (in yellow).
- Air service is at a shortfall and should be improved in the medium term (in red).

Typical ratios found in highly liberalized domestic markets with adequate capacity for demand ranges from 60% to 80%. This ratio is attributed to the fact that aircraft usually fly at under 80% load factors, and there is a natural phenomenon for approximately 20% of passengers to take connecting options.

In some cases, the demand-to-supply ratio is under 60%. In such instances, supply is adequate and the low percentage figure may be representative of high rates of connecting passengers flying

between economies. Where demand-to-supply ratios are higher than 80%, seat offer could be increased between economy pairs.

Origin Economy	Demand (PDEW)	Non-Stop Seat Offer (SDEW)	One-Stop Seat Offer (SDEW)	Ratio of Demand to Supply
Australia (AUS)	56	0	0	**
Brunei Darussalam (BD)	0	0	0	*
Canada (CAN)	192	110	1,660	174%
Chile (CHL)	939	1,862	0	50%
People's Republic of China (PRC)	44	0	0	*
Hong Kong, China (HKC)	20	0	0	*
Indonesia (INA)	2	0	0	***
Japan (JPN)	78	0	0	**
Republic of Korea (ROK)	29	0	0	*
Malaysia (MAS)	2	0	0	***
Mexico (MEX)	520	861	0	60%
New Zealand (NZ)	8	0	0	*
Papua New Guinea (PNG)	24,084	32,295	2,219	70%
The Republic of Philippines (PH)	4	0	0	*
Russia (RUS)	0	0	0	*
Singapore (SGP)	3	0	0	*
Chinese Taipei (CT)	3	0	0	*
Thailand (THA)	3	0	0	*
United States (US)	1,968	2,854	449	60%
Viet Nam (VN)	0	0	0	*

Table 8: Total daily demand (PDEW), non-stop seat offer (SDEW), one-stop seat offer (SDEW) and demand-to-supply ratio (Source: IATA analysis of Airport IS Data)

*** Delineates an economy pair with no air services that has inadequate demand to consider air services in the long term**

**** Delineates an economy pair with no air services that may have adequate demand for service in the long term (next 10 years)**

***** Delineates an economy pair with no air services that has adequate demand for service in the short to medium term (within the next 5 years)**

Based on the analysis, at the economy level, Peru may need to improve service to five economies in the long term (highlighted in yellow) and could take actions to increase service frequencies with three economies in the medium term if traffic levels grow (highlighted in red). The remaining thirteen destination economies are adequately served at an economy pair level or have inadequate demand for non-stop services. The following section will look into greater detail at these shortfalls in supply at a city-pair level.

4.1.2 City pair analysis by APEC economy

Origin Airport	Origin Economy	Destination City	Destination Economy	Demand PDEW
LIM	Peru	SYD	Australia	31
LIM	Peru	YUL	Canada	43
LIM	Peru	YVR	Canada	29
CUZ	Peru	SCL	Chile	74
LIM	Peru	PEK	China	18
LIM	Peru	PVG	China	16
LIM	Peru	HKG	Hong Kong, China	20
LIM	Peru	NRT	Japan	55
CUZ	Peru	MEX	Mexico	21
LIM	Peru	ICN	Republic of Korea	28
LIM	Peru	DCA	United States	55
LIM	Peru	SFO	United States	51
LIM	Peru	ORD	United States	36
LIM	Peru	BOS	United States	34
LIM	Peru	IAD	United States	33
LIM	Peru	DEN	United States	26
LIM	Peru	LGA	United States	22
LIM	Peru	LAS	United States	17
LIM	Peru	PHX	United States	14

Table 9: APEC routes to/from Peru over 13 PDEW with no non-stop service (Source: IATA analysis of Airport IS data).

When considering the shortfall in service to city pairs from Peru, nineteen routes were examined which have a demand of 14 or greater PDEW with no non-stop service. The following section provides a narrative explaining the phenomenon seen at a combined economy pair and city pair level for the economies where air service development is a possibility.

Australia (AUS)

In 2015, Peru received 41,568 international arrivals from Australia. As this market grows, it may be possible to commence a non-stop service in the long term. Currently, considering the distance and the higher cost associated with operating an ultra-long-haul flight to Australia, it is not a viability.

Canada (CDA)

Canada has the highest demand-to-supply ratio with non-stop service to Peru. Peru received 70,560 international arrivals from Canada in 2015, which represented a growth of 14% from 2014. This indicates that frequency should be increased or additional non-stop services added. Due to the large area of Canada, demand is thinly spread across the economy, with the United States and Mexico having a geographic advantage to capture a large portion of passengers on connecting services. In the long term, it may be viable to commence non-stop services to other key Canadian markets including YUL and YVR.

Chile (CHL)

Currently Chile and Peru are well connected on services from LIM to SCL. Peru received 984,584 international arrivals from Chile in 2015, which represented a 9% growth from 2014. Overall the two economies have supply rates above demand. There is one city pair SCL-CUZ which has adequate demand for a new non-stop service. This is presented in section 4.3 below.

Japan (JPN)

Japan is the economy with the largest transpacific market for air services to/from Peru. Peru received 55,311 international arrivals from Japan in 2015. The distance between NRT and LIM is approximately 15,509km which is beyond the range of modern commercial airliners today. As new aircraft continue to be developed, routes such as this will become a viability. The development of the Airbus A350-900 Ultra Long Range aircraft is expected to enter service in 2018 with a maximum range of approximately 16,000km. It will likely take 5-10 years until the Japan-Peru route is mature enough for non-stop services. If initiated, this type of service would have significant beyond and behind potential, improving overall access between Asia and South America as a whole.

United States (US)

The United States is the largest international market for air travel to/from Peru within APEC. Peru received 545,212 international arrivals from the United States in 2015, which represented a 6% growth from 2014. Currently air service between the two economies is well served with a demand-to-supply ratio of 60%. As growth continues, there will be a number of viable new routes from LIM, including DCA and SFO, and some of the routes between Peru and the United States will also need capacity or frequency improvements within the medium term.

4.2 Route traffic forecast

Selected routes which have strong development potential are further examined. A traffic forecast based on historical market trends, induction, connecting potential and expected economic and tourism development is presented in this section.

4.2.1 Preliminary feasibility/viability considerations

City pairs with 14 or greater PDEW (5,110 annual passengers each way) were considered as the minimum threshold for analysis. There is 19 routes to and from Peru that met this criterion.

As a way to further define a viable route selection, IATA used two metrics: distance and market size. Due to aircraft range restrictions, city pairs with a distance of over 15,000km apart from one another are eliminated. The second criterion used the application of induction and connection potential rates (unique to each region and route type) to determine if the route would garner a minimum demand threshold within the coming three years (113 PDEW for short-haul routes under 4,000km, 130 PDEW for long-haul routes or 158 PDEW for ultra-long-haul routes over 12,000km). The selection process is seen below in Table 10.

Origin Airport	Origin Economy	Destination Airport	Destination Economy	2015 OD Demand	2015 Estimated Market	Distance is Viable for Non-Stop Flight with Current Technology	Market size Adequate for Non-Stop Service in Medium Term	Proposed Route
CUZ	Peru	SCL	Chile	74	82	✓	✓	Yes
LIM	Peru	NRT	Japan	55	118	✗	✗	No
LIM	Peru	DCA	United States	55	85	✓	✗	No
LIM	Peru	SFO	United States	51	81	✓	✗	No
LIM	Peru	YUL	Canada	43	73	✓	✗	No
LIM	Peru	ORD	United States	36	66	✓	✗	No
LIM	Peru	BOS	United States	34	65	✓	✗	No
LIM	Peru	IAD	United States	33	63	✓	✗	No
LIM	Peru	YVR	Canada	29	60	✓	✗	No
LIM	Peru	ICN	Republic of Korea	28	38	✗	✗	No
LIM	Peru	DEN	United States	26	57	✓	✗	No
LIM	Peru	LGA	United States	22	49	✓	✗	No
LIM	Peru	SYD	Australia	21	64	✓	✗	No
CUZ	Peru	MEX	Mexico	21	58	✓	✗	No
LIM	Peru	HKG	Hong Kong, China	20	31	✓	✗	No
LIM	Peru	PEK	China	18	29	✗	✗	No
LIM	Peru	LAS	United States	17	39	✓	✗	No
LIM	Peru	PVG	China	16	26	✓	✗	No
LIM	Peru	PHX	United States	14	31	✓	✗	No

Table 10: Selection process based on feasibility considerations

4.3 Proposed route analysis

Based on the filtering process applied above, IATA eventually identified one route that could potentially be added through a direct service in the medium-term. This section decomposes the route potential and presents a forecast of the current demand in the medium term.

4.3.1 Route CUZ-SCL

2015 CUZ-SCL total route potential definition:

				1	2	4	
Origin Airport	**Destination Airport**	**Destination Economy**	**2015 OD Non-direct Demand**	**OD Captured Though Deorect Service**	**OD Stimulation**	**Behind/Beyond Connecting Potential**	**Caculations**
CUZ	SCL	Chile	(A) 74	(B) 80%	(C) 25%	(D) 10%	
				(1) 59	15		(1) = AxB
				(2)			(2) = 1xC
			Subtotal	(3)	74		(3) = 1+2
		CUZ - SCL Total Market Potential (2015 Base)				(4) 82	(4) = 3/(1-D)

IATA estimates that the CUZ-SCL route could present a market potential of 82 PDEW in 2015 if a direct service were to be introduced.

The market potential would grow to 96 by 2018 as displayed below. This forecast uses the 2015 estimated demand and applies to it the IATA inter- and intra-regional global traffic forecast published by our Economics Division.

Economy Pair	City Pair	2015 Base	2016	2017	2018
Peru-Chile	CUZ-SCL	82	86	91	96

4.4 High-level feasibility analysis

This section considers the above route through three main feasibility criteria:

- air service agreements
- airline network strategies and fleets
- route economics

Additionally, proposed operational aspects of the route are presented, including an indicative start date based on market maturity, a proposed airline to serve the route, type of aircraft to be used, flight frequency, and estimated load factors.

4.4.1 Route CUZ-SCL

CUZ-SCL is a short-haul route (approximately 2,221 Km) that could be served by a narrow-body aircraft such as the A319 which has 138 seats. It is estimated that a load factor of greater than 65% would allow for break-even operations with this kind of aircraft.

LATAM Peru airlines was selected as the carrier to operate this service. LATAM Peru has a large fleet of 26 A319 aircrafts with SCL as its principal hub of operations.

Considering the 2016 estimated demand, a six times weekly service could be operated as from inception, making the route particularly attractive.

The proposed service would therefore allow for a 69% average load factor, as illustrated below:

Route (non-directional)	Minimum Opening Date	Airline	Aircraft	# of Seats	Flight Frequency per week	Number of Pax per Flight	Load Factor
CUZ-SCL	Now	LAN	A319	138	6	95	69%

Finally, in terms of air service agreements, IATA assumes the necessary agreement is in place. This point should however be further validated based on the official bilateral agreements in place (not available for consultation to IATA).

5. Conclusions and other opportunities

In addition to the development of new air services in the medium term, other opportunities for air service development such as connectivity improvement, route frequency increases, and long-term developments are also presented.

5.1 Connectivity improvement

This section identifies poorly connected markets that could be better served by improved connecting times, hence granting additional access to already existing yet less accessible connecting markets.

IATA examined international flights in LIM and was able to identify a small amount of schedule improvements that will improve the flight connectives in LIM.

- LATAM Airlines flight 2604 currently departs at 12:45 for LAX. By pushing the departure time back by 40 minutes, it will allow better connections from CUZ and AQP.
- LATAM Airlines flight 2800 for IAD currently departs at 09:20. By pushing the departure time back by 45 minutes, it will enable connections from AYP, CJA, CUZ and Arequipa.
- LATAM Airlines flight 2638 from SCL currently lands at LIM at 09:30. By bringing the arrival time forward by 25 minutes, it will allow onward connections to TBP, CUZ, JUL and CJA.

- Avianca flight 818 to TRU currently leaves LIM at 21:32. Connections from MIA and MEX can be enabled if the departure time is postponed by 45 minutes.

5.2 Route frequency increase

IATA considered all of the international non-stop routes from Peru to determine whether the current supply adequately matches the demand. IATA identified three routes on which frequency could be increased.

Due to the fact that most aircraft fly at only an average 80% load factor, the ideal supply to demand ratio should be under 80%. All of the identified routes in the table below have demand-to-supply ratios of greater than 80%.

Origin Airport	Origin Economy	Destination Airport	Destination Economy	2015 OD Demand	Non-Stop Seats in 2015	Demand Excess over Supply	Ratio of Demand to Non-Stop Supply
LIM	Peru	MCO	United States	74	73	2	102%
LIM	Peru	CUN	Mexico	186	226	-41	82%
LIM	Peru	JFK	United States	213	260	-47	82%

Table 11 List of the routes for frequency increase

5.3 Long-term new route opportunities

In the longer term, routes that do not provide a sufficient market base for viable operations could potentially become interesting for airlines. IATA would recommend to re-verify the market potential of those routes previously identified that did not meet the current requirements in five years from now.

One route is forecast to be viable in the long term: LIM-NRT. Currently this route is out of range and does not have adequate market size. As the economies of Japan and Peru continue to grow and as aircraft technology improves, this route will likely become a viability in the next decade.

Origin Airport	Origin Economy	Destination Airport	Destination Economy	2015 OD Demand	2015 Estimated Market	Distance is Viable for Non-Stop Flight with Current Technology	Market size Adequate for Non-Stop Service in Long Term	Proposed Route
LIM	Peru	NRT	Japan	55	118	✘	✓	Yes

Table 12: Currently projected long-term viable route from Peru

5.4 Development of aircraft technology

The latest aircraft available on the market, Airbus' A350-900 and Boeing's B787-9, are capable of flying ultra-long-haul routes. The technical capabilities of these aircrafts will allow new direct routes to be operated between APEC economies across the Pacific. The following map illustrates the range limit[1] of the A350-900 and B787-9.

Figure 7: Range limit for the latest generation of aircraft from Lima (Source: GCMap)

6. Recommendations to improve air connectivity

The various recommendations to improve air connectivity both generically and specifically for each APEC member economy are presented in this section.

6.1 Generic recommendations

This chapter provides recommendations applicable to all economies such as greater liberalization of air routes by allowing more access and the elimination of curfews and operational restrictions.

- Continue to liberalize the air services market to other APEC economies, allowing the fullest access to Peruvian airports.
- Explore the feasibility to lift operational restrictions in place at the airports.

6.2 Specific recommendations

- Keep investing in operational safety and efficiency to maintain international standards;

[1] For illustration only. Based on published range for the base model of each aircraft type. Specific operating conditions may affect the range of the aircraft.

- Ensure capabilities and capacity of the existing airports remain adequate to cater future demand.

6.3 How the APEC economy's regulator can help

- Work closely with different stakeholders, such as the Ministry of Foreign Commerce and Tourism of Peru (MINCETUR), the Chamber of Commerce etc., to gain a deeper understanding of the development of the aviation demand.
- Maintain a liberal visa policy for international tourists.
- Reduce Passenger Movement Charge on international air passengers.

7. Appendix

7.1 Overview of IATA and IATA Consulting

7.1.1 IATA

IATA – The International Air Transport Association was founded in 1945 as the prime vehicle for inter-airline cooperation in promoting safe, reliable, secure and economical air service for the benefit of the world's consumers. IATA is fully committed to supporting the commercial aviation industry's stakeholders and governments in their efforts to achieve profitability and long-term viability.

IATA's mission:

- To represent, lead and serve the airline industry.

IATA's vision:

- To be the force for value creation and innovation, driving a safe, secure and profitable air transport industry that sustainably connects and enriches our world.

IATA in numbers:

- 250+ member airlines
- 83% of total air traffic
- $387B processed by IATA financial systems
- 1,400+ employees
- 54 offices in 53 countries

7.1.2 IATA Consulting

IATA Consulting overview

IATA Consulting has comprehensive experience in the full array of buSGPess challenges facing the aviation sector. Serving the airline industry for 70 years, IATA has developed unrivalled practical experience, which we bring forth to provide the best solutions to our clients.

With our depth and breadth of aviation industry experience, we assist clients to maximize the value of their operating model, realize growth ambitions and gain insights that translate into sustainable competitive advantages.

IATA Consulting has expertise in the following areas:

SAFETY & FLIGHT OPERATIONS

Solutions for aviation organizations and airlines to improve safety, efficiency and air transport management.

ENVIRONMENT & ECONOMICS

Solutions for fulfilling the vision of a safer, more competitive and sustainable aviation industry.

AIRLINES

Solutions to achieve real and lasting results in every aspect of airline commercial and operational management.

AIRPORTS, PASSENGERS & SECURITY

Solutions to plan your airport efficiently to avoid costly mistakes and profit from untapped opportunities.

GROUND HANDLING & CARGO

Solutions to optimize your operations and improve your safety and security while reducing costs.

Our Clients

IATA Consulting has successfully demonstrated its capabilities by providing airlines, airports, tourism offices and other organizations with accurate, unbiased and reliable high quality information and analysis to help them define and understand their markets, while ensuring their long-term facility development and financial success.

IATA is trusted by multiple clients all over the world including airlines, airports, governments and aviation institutions.

Why IATA Consulting was chosen for this project

IATA has, over time, recruited and retained some of the most highly experienced and capable aviation consulting resources within the aviation industry. Due to its position at the heart of the industry, IATA has access to exceptionally skilled and informed subject matter experts and specialists. IATA Consulting's objective is to make a positive difference in its clients' performance, while delivering quality services to all industry stakeholders.

IATA Consulting provides its customers with vast knowledge and expertise in all sectors of the industry worldwide. Our approach has been finely tuned to leverage IATA's global presence and industry thought leadership position in the development of tailored solutions that fit with local cultural considerations and embody international best practices. Our consultants rely on international state-of-the-art standards, unmatched access to data, and products and expert resources to provide cost-efficient and highly informed solutions.

IATA is backed by a robust set of decision support tools, Airport IS and Pax IS have been essential to undertake this study.

Airport IS and **Pax IS** are the most comprehensive aviation databases available in the marketplace, capturing 100% of traffic around the world and bringing together total market supply and demand under a single platform. The data provided is accurate and reliable as it is captured through IATA's Billing and Settlement Plan (BSP).

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