Australia Indonesia Partnership
Kemitraan Australia Indonesia

AIR TRAFFIC MANAGEMENT
ANALYSIS AND FORECASTS




INDONESIA
INFRASTRUCTURE
INITIATIVE

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August 2010

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The views expressed in this report do not necessarily reflect the views of the Australian Indonesian Partnership or the Australian Government. Please direct any comments or questions to the IndII Director, tel. +62 (21) 230-6063, fax +62 (21) 3190-2994. Website: www.indii.co.id.

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Bert-Åke Wahlgren
Magnus Åberg
Johann Rollen

Jakarta, 1 August 2010

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ACC	Area Control Centre
ACT	Aviation Consulting Team
ANS	Air Navigation Services
APAC	Asia Pacific
ATC	Air Traffic Control
ATM	Air Traffic Management
ATS	Air Traffic Services
BPS	Badan Pusat Statistik
DGCA	Director General of Civil Aviation
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
IndII	Indonesian Infrastructure Initiative
LCC	Low Cost Carrier
RNAV	Area Navigation
RNP	Required Navigation Performance
UTA	Upper Control Area

LIST OF DEFINITIONS

International passengers	Passengers travelling to/from Indonesia
Domestic passengers	Passenger travelling within Indonesia
Movement	Takeoff or landing of an airplane

EXECUTIVE SUMMARY

BACKGROUND

The Republic of Indonesia is a huge archipelagic country in South-east Asia spreading more than 5,000 km from west to east and more than 1,800 km from north to south. Indonesia, with more than 15,000 islands, is therefore very dependent on a well functioning air transport system for the socioeconomic growth, both on a regional basis as well as on a national one. In fact, the whole Asia-Pacific region is dependent on Indonesia's air transport, since almost 50 percent of all flights going to and from the Australian continent crosses the Indonesian airspace.

OBJECTIVE

The LFV Aviation Consulting Team (ACT) has been assigned the task by SMEC International Pty Ltd. (SMEC), for the Indonesia Infrastructure Initiative (IndII), to support the Director General of Civil Aviation (DGCA) to develop an updated Air Traffic Management (ATM) Master Plan, earlier conducted by the French company Sofréavia.

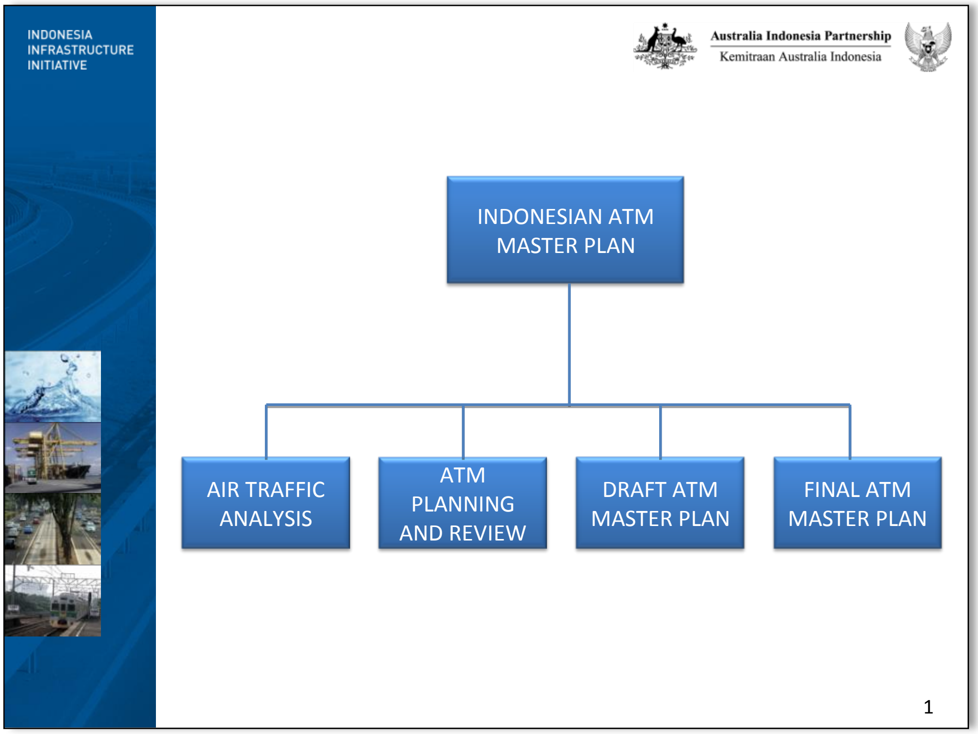
The role of LFV ACT is to collaborate with DGCA personnel to achieve a thoroughly researched and realistic planning document that will assist DGCA in prioritising and designing ATM systems. The activity comprises of the completion of the following four deliverables within the stipulated timeframe, as depicted in Figure 1:

Before providing this Plan LFV Aviation Consulting was to provide two deliverables:

- Deliverable 1 - Report on Traffic Analysis.
- Deliverable 2 - Report on Indonesian ATM Planning Review.
- Deliverable 3 – Draft of ATM Master Plan.
- Deliverable 4 – ATM Master Plan final version.

The objective of Deliverable 1 is to identify predicted traffic growth for Indonesia, including key domestic and international routes and city-pairs, and over-flying traffic.

Figure 1: Deliverables of the Indonesian ATM Master Plan project



FINDINGS – NATIONAL LEVEL

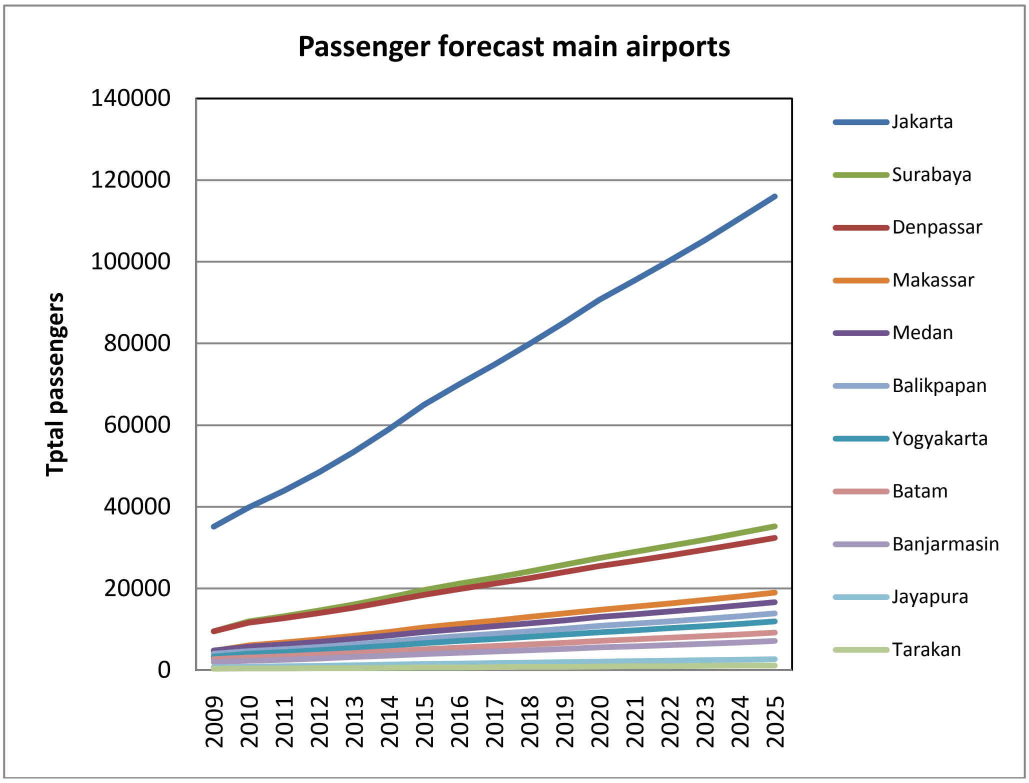
The strong growth in the Indonesian economy can be gauged from the high demand for air travel. In an effort to understand how air traffic will grow up to the year 2025, a forecast based on the relationship between the country's Gross Domestic Product (GDP) and air passengers has been developed using traffic data and economic indicators for the period 2002-2009. Two main forecasts on a nationwide level, one for international passengers and another for domestic, were developed. A forecast on future aircraft movements was developed, using the passenger forecast and estimates on future average seating capacity and load factor on typical domestic and international flights. To narrow the scope of work it was agreed to focus the study on 12 main airports and the routes connecting those airports with the country's main hub at Jakarta. Individual airport forecasts for passengers and movement were developed using the average growth ratios for the nation as a whole, derived from the nationwide forecasts.

It is evident that Indonesia will face a dramatic increase in air travel over the next 15 years. The traffic forecasts indicate that domestic passenger numbers may grow to 280 million in 2025 (as compared to 82 million in 2009) and international passengers may grow to over 40 million (as compared to 16 million in 2009). This number is slightly higher than previous forecasts. However, these figures are justified since (i) the sector witnessed a very high growth in the last year, (ii) there have been changes in the aviation market with low cost carriers gaining market share over traditional legacy carriers and, (iii) the implementation of Open sky agreements which will boost air travel further. Of course, there are some negative factors as well such as higher crude oil prices, implementation of taxes on aviation fuel, capacity constraints at airports and in the airspace etc. Keeping this in mind, the forecasted traffic volumes in this report should be taken as estimates only; with a possibility of a -10 percent to +5 percent deviation from the main forecast due to the aforementioned factors.

FINDINGS – AIRPORT AND ROUTE LEVEL

The analysis shows that Indonesia's main gateway at Jakarta Soekarno-Hatta (SH) airport could have more than 100 million passengers and 500-600 thousand movements per year in the end of the forecasting period, given that the airport can continue to expand unrestricted. The high-density route between Jakarta and Surabaya could be the world's most dense route by 2025. Meanwhile, overflying traffic will continue to grow, although at a slower pace; more in line with the region as a whole. Given International Air Transport Association's (IATA's) and International Civil Aviation Organisation's (ICAO's) traffic forecasts for the region, the number of flights overflying Indonesia could double.

In accordance with its brief, the ACT has developed passenger and movement forecasts for 12 airports; refer to chapter 4.8. The results are very disparate; from capacity problems already visible in the short term – like Jakarta airport mentioned above, to more easily handled growth at Tarakan and Jayapura.



Source: LFV Aviation Consulting forecast study

Possible capacity restraints which can appear before 2025 are likely to be well known and required action to meet expected traffic growth can be determined fairly easily. In contrast, this is not the case at the route level. The airspace situation is scrutinised at length in the Indonesian ATM Planning Review report (deliverable 2), where it became clear that huge investments are required for other reasons apart from the sheer traffic growth. Required actions concerning airspace, given limited funds, are more complicated to pinpoint and expected traffic growth is far from being the only determinant. This air traffic analysis report does mention about expected growth at some routes but to understand the total situation at route level, the ATM Planning Review report should be used.

CHAPTER 1: ANALYSIS OF THE AVIATION MARKET

Recent slowdown in world trade has squeezed both, passenger and cargo airlines. The region's airlines will probably return to their long-term growth trend when the global economy recovers.

1.1 ASIA-PACIFIC REGION

Over the last 20 years, economic growth in the Asia Pacific (APAC) region averaged 4.4 percent per year, increasing the region's share of world GDP from 25 to 33 percent. Economic growth is the main driving force behind air transport and it is estimated that about 8,900 new aircrafts will be delivered in the region up to 2025.

The APAC region is served by a variety of airlines, including established network carriers, new low cost airlines and airlines specialising in short-haul networks. Some of the largest cargo operators in the world also serve the region. APAC travel volumes are generally large and growing rapidly and the region will account for around 40 percent of world commercial aviation in 20 years, as compared to about 32 percent today. In fact, within 10 years, APAC may become the largest aviation market in the world. Boeing expects air traffic in the region to grow 6.5 percent annually over the next 20 years. Regional airline fleets are expected to grow from around 3,900 to 11,200 aircrafts.

In fast-growing Southeast Asia, Low Cost Carriers (LCCs) keep adding new routes with dramatically lower fares than what is customary in the region. These airlines make air travel more accessible by keeping operating costs down and using innovative distribution strategies. This way, even people without credit cards can easily purchase tickets since the prices are low. Especially in island nations, which like Indonesia are predisposed to air travel, airlines like Lion Air, Air Asia and Cebu Pacific continue to expand despite the global economic slowdown. This fact has spurred legacy carriers such as Malaysia Airlines, Philippine Airlines and Garuda Indonesia to increase focus on improving its efficiency and product offerings to compete. New, efficient aircrafts with greater capacity and lower operating costs are part of all of these operators' business strategies.

Southeast Asia continues to strengthen its common economic community and encourage cooperation. Air transport plays an important role and a rapid GDP growth is projected. Cheaper air travel options increase growth across the spectrum of service industries in the region, from tourism to financial services.

Air traffic between Association of South East Asian Nations (ASEAN) countries and other countries in the region has increased by 67 percent, fuelled by liberalisation largely achieved through bilateral arrangements. Today, routes below 2,000 nm (3,700 km) account for 60 percent of the market, where LCCs traditionally operate. A number of LCCs are also operating on longer routes using mainly larger, wide-body type aircraft. Today, 20 percent of all international APAC air traffic is over 2,000 nm (3,700 km). Over the next 20 years, it is predicted that nearly 250 new routes (including additional carriers on existing routes) will be added. One quarter of the new routes over 2,000 nm (3,700 km) will probably require wide-body aircrafts. LCCs may account for a significant proportion of this traffic as LCC operations continue to expand into the Northeast Asian region. For example, LCC traffic among and between ASEAN countries and South Korea is expected to increase by 10 percent per year over the next 20 years. If the markets of Japan and China become more accessible to LCCs, the growth of air transport would be much higher. Growing LCC services will continue to offer people in Asia-Pacific an opportunity to benefit from aviation through new routes and cheaper travel.

1.2 INDONESIA

Indonesia's economy did not bear a high brunt from the general world economy slowdown since 2008. In fact, growth has continued at about 6 percent per year and is estimated to continue at the same or even a higher rate for the next 10 to 15 years. As a result, and in combination with the arrival of LCCs, air passenger volumes are growing drastically. According to Boeing forecasts, the growth rate for Southeast Asia is expected to average around 6.6 percent per year over the next 20 years. Intra-region travel will grow even faster, averaging 8.1 percent per year. This is a good indication of the future average growth in Indonesian air traffic.

1.3 BOEING FORECAST 2008-2028

Boeing regularly publishes updated air traffic forecasts for the whole world in the "Boeing Current Market Outlook". Boeing's latest forecast for the region is summarised below.

Forecast for Southeast Asia

- GDP growth 4.6 percent per year for the next 20 years
- Ratio Revenue Passenger Kilometers/Gross Domestic Product (RPK/GDP): 1.4
- RPK= 1.4 * 4.6 percent = 6.4 percent
- Airplane fleet increase: 5.3 percent per year

Table 1: Boeing forecast - SE Asia

Airline fleet development	2008	2028
Large	130	220
Twin aisle	290	910
Single aisle	490	1,450
Regional jets	20	20
Total	930	2,600

Forecast for Australasia

- GDP 2.9 percent per year until 2028
- Airplane fleet: 3.8 percent
- RPK/GDP: 1.8

Table 2: Boeing forecast - Australasia (growth by regional flow)

Route	Av. Annual growth in RPK 2008-28
China – SE Asia	5.5 %
NE Asia – SE Asia	5.9 %
SE Asia – SE Asia	8.1 %
Oceania - SE Asia	5.3 %

1.4 AIRBUS FORECAST 2009-2028

Airbus' Global Market Forecast for the period 2009-2028 is summarised in the following tables.

Table 3: Airbus traffic forecast - Asia-Pacific

Asia Pacific traffic	2009-2018	2009-2028
Total passenger growth	6.4 %	6.1 %
Domestic and Intra-regional	7.2 %	6.3 %
International traffic	5.6 %	5.5 %
Total Freight traffic	7.1 %	6.3 %

Table 4: Airbus deliveries forecast - Asia-Pacific

Asia Pacific Deliveries	2009-2028
Passenger airplanes < 100 seats	1,054
Passenger airplanes > 100 seats	7,672
Total passenger airplanes	8,726

Table 5: Airbus sub-market traffic forecast - Asia-Pacific

Submarket	2009-2028
Asia-Australia/NZ	4.6 %
Asia-Indian Subcontinent	7.1 %
Asia-Japan Asia-China	3.5 % 7.1 %
Asia-Pacific Intra-Asia	2.8 % 5.4 %

1.5 ICAO FORECAST

ICAO has published an air traffic forecast for the region in the document *"Asia/ Pacific Traffic Forecasts 2008-2025"*. A summary of the forecast is shown below.

Table 6: Various ICAO forecasts - Intra-Asia Pacific

Average annual growth rates for passenger traffic

Period	Low	Most Likely	High
2007-2015	4.6 %	5.8 %	7.2 %
2015-2025	4.3 %	5.2 %	6.3 %
2007-2025	4.4 %	5.5 %	6.7 %

Average annual growth rates for size and load factor

Period	Average number of seats	Average load factor
2007-2015	0.6 %	-0.2 %
2015-2025	0.8 %	0.3 %
2007-2025	0.7 %	0.1 %

Average annual growth rates for movements

Period	Low	Most Likely	High
2007-2015	3.7 %	4.8 %	6.2 %
2015-2025	3.2 %	4.1 %	5.2 %
2007-2025	3.4 %	4.4 %	5.6 %

1.6 IATA FORECAST 2010-2026

IATA's *"World Air Transport Statistics 54th Book"* contains a forecast for 2010 and the coming 17 years. As per the IATA forecast, passenger traffic globally is predicted to rise by 4.9 percent per year between 2010 and 2026. Meanwhile, airfreight will grow by 5.8 percent annually in the same period. The greatest demand will come from the APAC region, where airlines are expected to take delivery of some 31 percent of new planes in the next 20 years, compared with 24 percent for Europe and 27 percent for North America.

For the period 2010-2020, passenger volumes are expected to grow at an annual rate of 5.4 percent. Average growth rates of 5.7 and 5.2 percent are forecasted for the periods 2010-2015 and 2015 - 2020, respectively.

Table 7 IATA's forecast, for passenger volumes - Trans-Pacific

Average annual growth rates

Period	Low	Medium	High
2010-2015	4.5 %	5.7 %	7.0 %
2015-2020	4.0 %	5.2 %	6.5 %

The Intra-Asia/Pacific passenger aircraft movements are expected to increase at an average annual growth rate of 4.6 percent to the year 2020. Growth rates for the intermediate periods of 2010- 2015 and 2015-2020 are expected to be 4.3 and 4.2 percent, respectively.

Table 8: IATA's forecast for, movements - Intra-Asia-Pacific

Average annual growth rates

Period	Low	Medium	High
2010-2015	3.1 %	4.3 %	5.2 %
2015-2020	3.1 %	4.2 %	5.2 %

1.7 SWEDAVIA'S FORECAST IN 2006

As a part of the project *"Integrated Modernisation Plan for Air Transport in Eastern Indonesia"*, Swedavia developed a forecast in 2006 for air traffic in all of Indonesia. The forecast indicated 270 million domestic passengers and as many as 180 million international passengers in 2025. Domestic aircraft movements would grow from 636,000 in 2005 to almost 1.2 million in 2025.

Figure 2: Swedavia's 2006 domestic passenger forecast

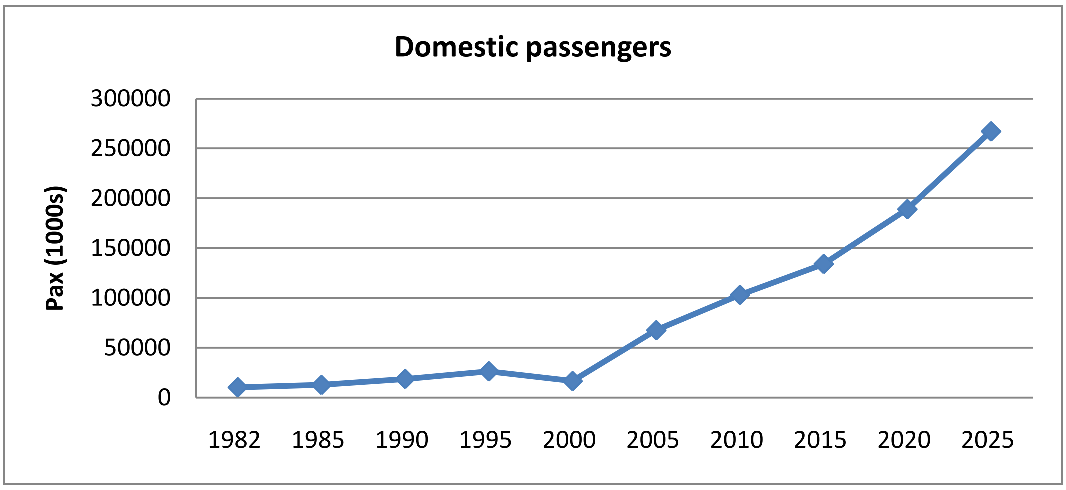
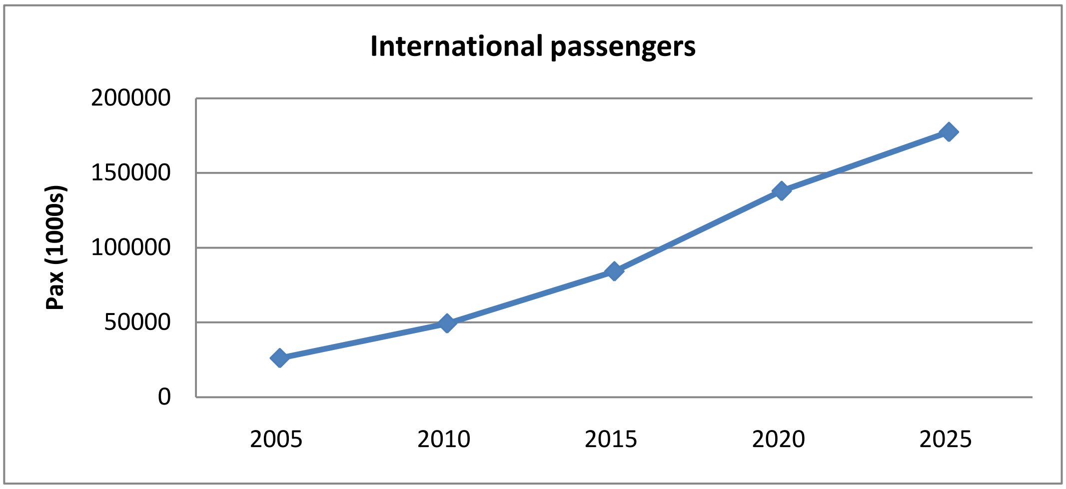


Figure 3: Swedavia's 2006 international passenger forecast



1.8 JICA/PACIFIC CONSULTANTS INTERNATIONAL FORECAST IN 2008

The air traffic forecast provided by the Japan International Cooperation Agency (JICA)/Pacific Consultants International team in 2008 predicted around 200 million domestic passengers in 2025 and 45 million international passengers as a maximum

Figure 4: JICA/PCI 2008 domestic passenger forecast

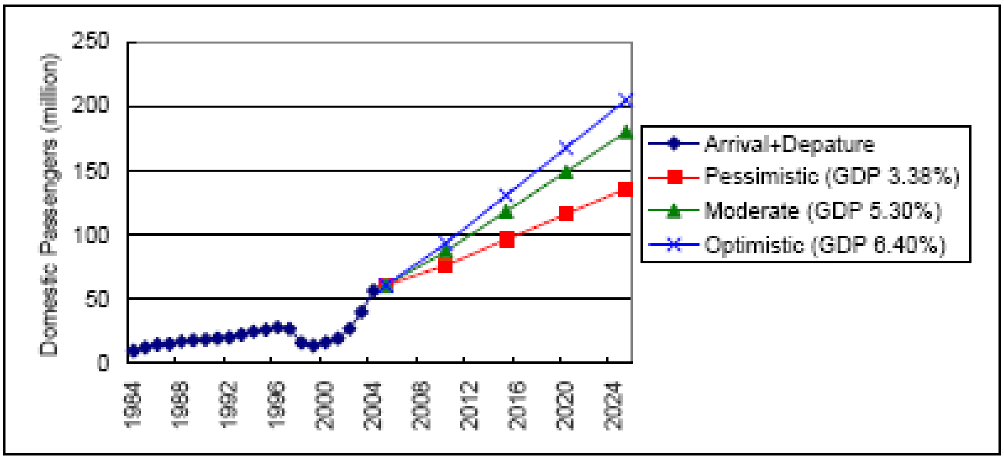
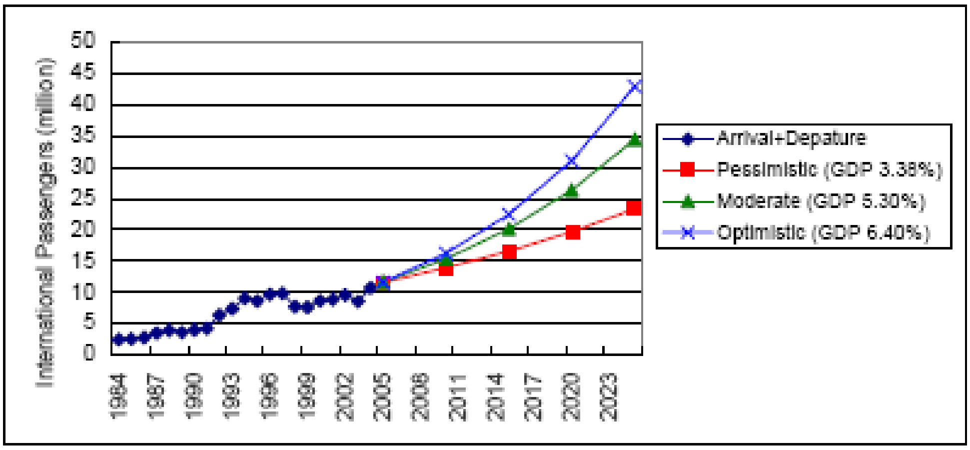


Figure 5: JICA/PCI 2008 international passenger forecast



The forecasted number of total aircraft movements ranges between 1.3 and 1.6 million domestic movements and 160,000 to 290,000 international movements in 2025.

Figure 6: JICA/PCI 2008 domestic movement forecast

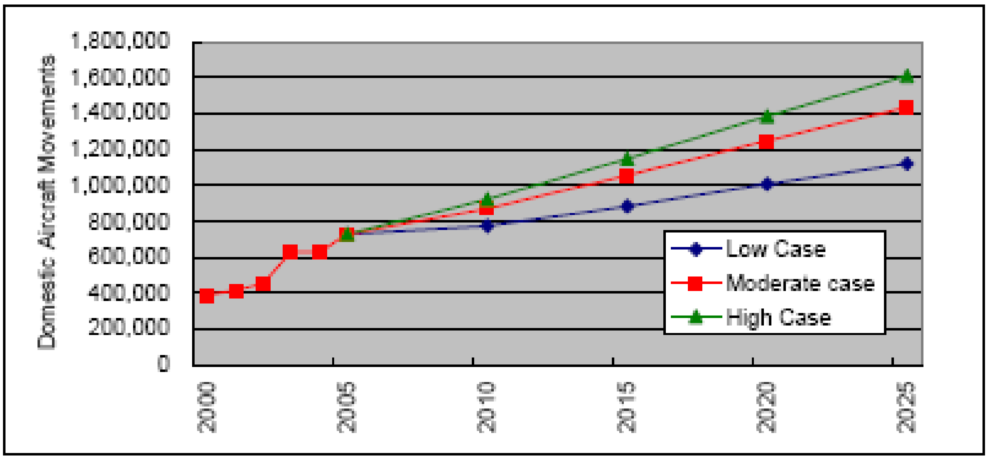
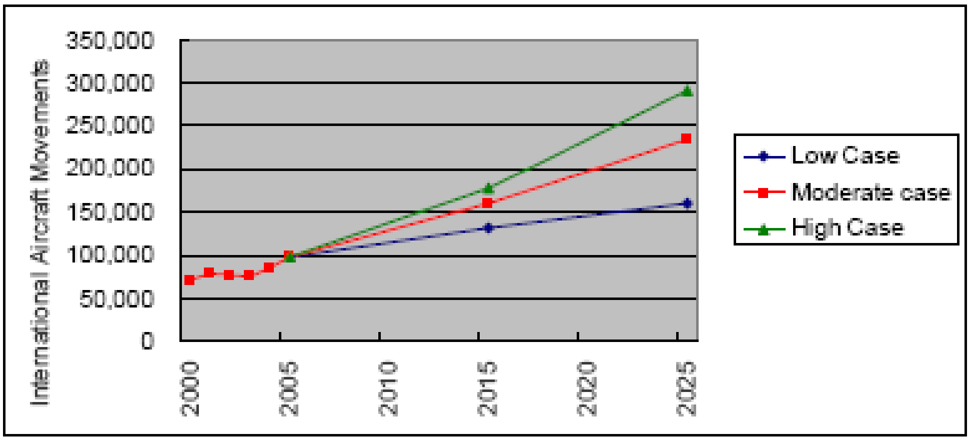


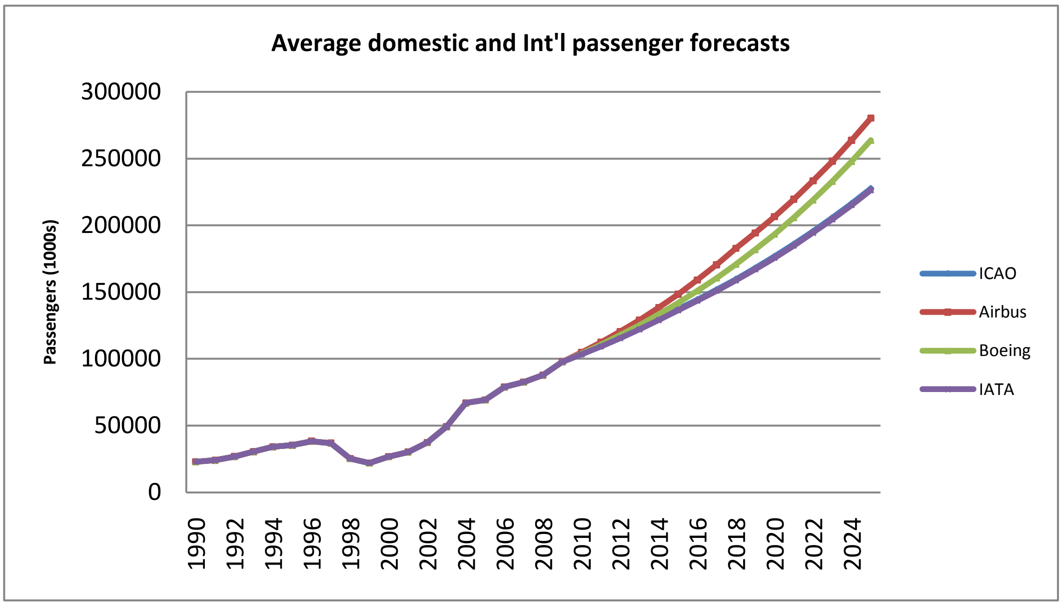
Figure 7: JICA/PCI 2008 international movement forecast



1.9 CONCLUSIONS FROM PAST FORECASTS

Summarising the different forecasts leads to the conclusion that in 2025, the total air passenger volume is likely to reach the 230-280 million range. Aircraft manufacturers - Airbus and Boeing - predict a higher growth rate than IATA and ICAO forecasts while the latter ones are almost identical. As indicated by Swedavia and JICA/PCI, the air traffic growth for Indonesia is likely to be much larger than the average of the Asia-Pacific region.

Figure 8: Average Asia-Pacific forecast growth rates



Note: ICAO line is covered by IATA line.

CHAPTER 2: ANALYSIS OF INDONESIAN AVIATION

This section analyses Indonesian aviation at network, airline and airport level.

2.1 MAIN AIRPORT CLASSIFICATION

In Indonesia, there are four classes of airports:

1. International (29, of which five are "major")
2. International Regional (28)
3. International Hajj (11)
4. International Specialist Cargo (7)

The five major international airports in Indonesia are:

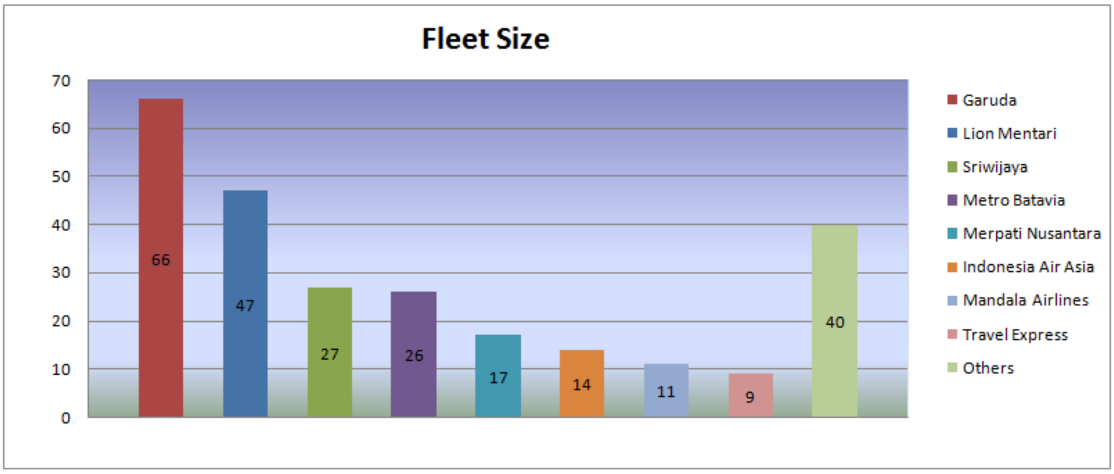
- Soekarno-Hatta, Jakarta;
- Ngurah Rai, Bali;
- Juanda, Surabaya;
- Polonia, Medan; and
- Sultan Hasanuddin, Makassar.

Class boundaries are sharp in an administrative sense but far from distinct with respect to actual traffic. Cargo is handled at all airports to a different extent; "international" airports also cater to the regional traffic and so on.

2.2 OPERATORS AND FLEETS

As of May 2010, Indonesia has about 16 scheduled passenger airlines, three scheduled cargo airlines and 42 non-scheduled airlines. Scheduled airlines are those operating regular services (on a time schedule) whereas non-scheduled airlines are those operating charter, corporate, military/governmental or other on-demand services. Scheduled airlines operate about 250 passenger aircrafts with a total capacity of 37,000 seats. In addition, eight cargo aircrafts are operated by Indonesian airlines. The average size of a passenger aircraft was 149 seats while the average number of passengers was 90 on domestic flights and 130 on international flights.

Figure 9: Indonesian airlines fleet sizes



Source: DGCA and Mott McDonald

Garuda Indonesia is the state-owned, national flag carrier. In 2009, Garuda carried 8.4 million domestic and 2.2 million international passengers and is the nation's largest carrier. The passenger volumes increased by 5.9 percent from 2008. The Garuda fleet is steadily growing and is expected to comprise more than 116 aircrafts by 2014.

Table 9: Present and imminent Garuda fleet

Aircraft Type	In operation	On order up to 2014
Airbus 330-300	6	
Boeing 737-400	17	
Boeing 737-300	7	
Boeing 737-500	5	
Boeing 737-800	20	44
Boeing 747-400	3	
Airbus A330-200	4	14
Boeing 777-300ER		10

Garuda Indonesia flies to 18 International destinations:

Table 10: Garuda international destinations 2010

Asia:	Bangkok, Hong Kong, Kuala Lumpur, Singapore, Seoul, Shanghai, Guangzhou (Canton), Beijing, Ho Chi Minh City
Japan:	Tokyo, Nagoya, Osaka
South West Pacific:	Darwin, Melbourne, Perth, Sydney
Middle East:	Jeddah, Riyadh

Garuda also serves 22 domestic destinations:

Table 11: Garuda domestic destinations 2010

Ampenan, Banda Aceh, Banjarmasin, Balikpapan, Batam, Biak, Denpasar, Jakarta, Jayapura, Manado, Medan, Padang, Palembang, Pekanbaru, Pontianak, Palangkaraya, Semarang, Solo, Surabaya, Timika, Ujung Pandang and Yogyakarta.

Garuda was the dominant Indonesian international airline in 2009 with a market share of around 45 percent. In June 2010, Garuda resumed services to Europe with daily flights to Amsterdam. The airline plans to add another four routes to Europe in 2012: London, Frankfurt, Rome and Paris.

However, in terms of passenger volume, Garuda is likely to be overtaken in 2010 by the LCC: Indonesia Air Asia. This airline, with its hub in Kuala Lumpur, Malaysia, serves the following 11 airports in Indonesia: Banda Aceh, Bandung, Bali, Jakarta, Kuching, Makassar, Medan, Padang, Pekanbaru, Solo and Surabaya.

Indonesian LCCs in general grow very fast. Other LCCs operating in the country are Lion Air, Batavia Air and Sriwijaya Air.

For domestic traffic, Lion Air had a market share of approximately 30 percent in 2009, making it the biggest domestic player. Its current fleet comprises Boeing 737-300, -400 and 900ER plus McDonnell-Douglas MD-90 aircrafts. No less than 148 Boeing 737-900ER have been ordered, making Lion Air the largest Indonesian airline. Lion operates on both, domestic and international sectors and intends to expand the international route network as new airplanes with extended range are put into service.

Mandala Airlines, currently, has orders for 25 Airbus A320s, more than doubling the size of the current fleet and flies mainly to 17 domestic and a few international destinations. The airline intends to expand its international route network.

Merpati Nusantara is about to take delivery of 15 MA60 aircrafts during 2010, and plans to lease 11 Saab340B and seven ATR72 aircrafts.

A vast majority of the expansion of Indonesian airlines is expected to be driven by low cost carriers.

Table 12: "Non Garuda Airlines" Fleet size May 2010

Airline	Fleet size	Note
Lion Air	56	138 on order
Indonesia Air Asia	17	
Batavia air	39	
Sriwijaya Air	25	
Mandala Airlines	9	25 on order
Merpati Nusantara Airlines	33	15 on order + 18 on lease

In addition, there are a number of charter and corporate operators with a mix of small and large turboprop and jet airplanes. Among the largest is AirFast which provides on demand services to domestic and international destinations.

Figure 10: Domestic market shares in 2009

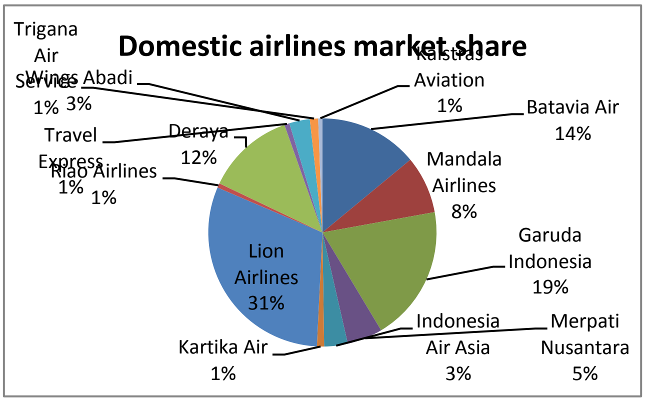
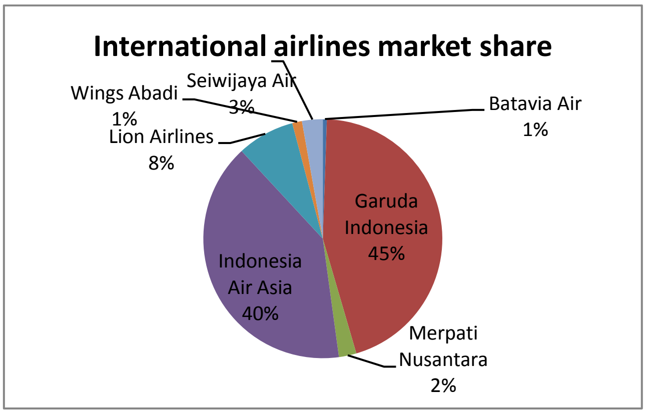
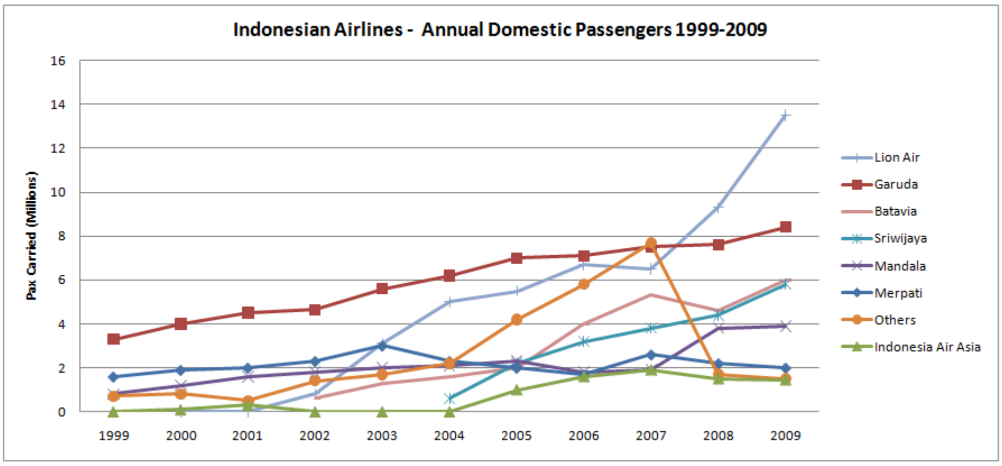


Figure 11: International market shares in 2009



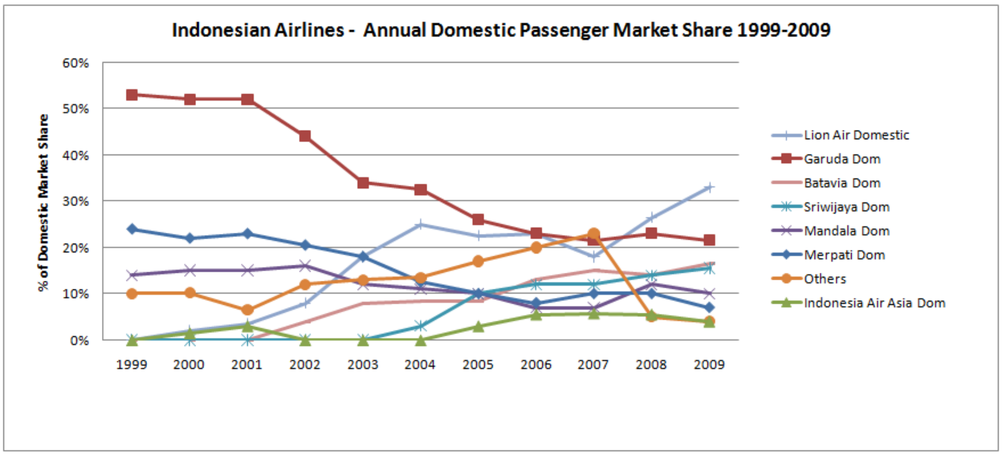
The clear shift from a market completely dominated by Garuda, to a much more diversified market with LCCs playing a dominant role, can be seen in the graphs below. In these, both, market share and total number of passengers are depicted for domestic and international traffic for the different airline operators in the period 1999-2009.. This trend is forming the base for the traffic forecasts developed as a part of the overall support for the ATM-planning process.

Figure 12: Indonesian Airlines – Annual Domestic Passengers 1999 to 2009



Source: DGCA Annual Reports and Statistics 2008/2009

Figure 13: Indonesian Airlines – Annual Domestic Passenger Market Share 1999 to 2009



Source: DGCA Annual Reports and Statistics 2008/2009

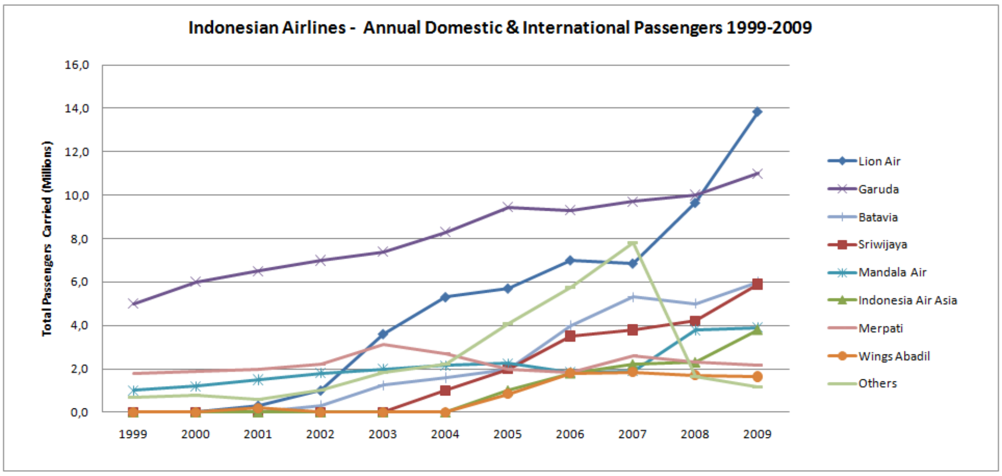
Figure 14: Indonesian Airlines – Annual International Passenger Market Share 1999 to 2009

Source: DGCA Annual Reports and Statistics 2008/2009

Figure 15: Indonesian Airlines – Annual International Passengers 1999 to 2009

Source: DGCA Annual Reports and Statistics 2008/2009

Figure 16: Indonesian Airlines – Annual Domestic and International Passengers 1999 to 2009

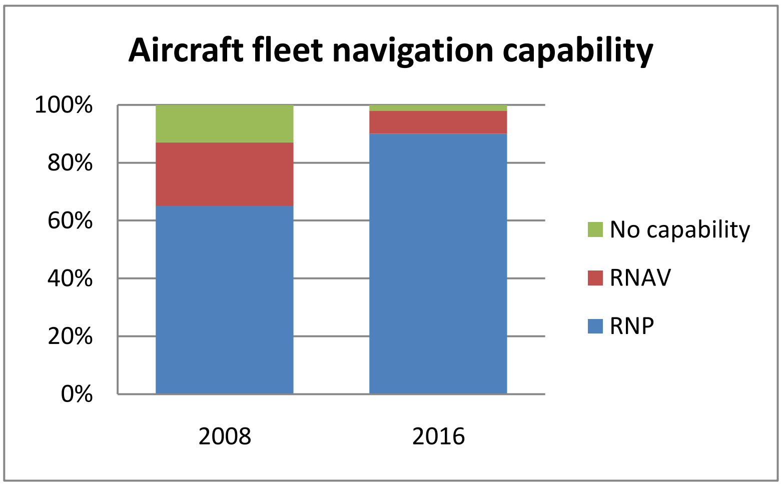


Source: DGCA Annual Reports and Statistics 2008/2009

2.3 FLEET EQUIPMENT AND CAPABILITY

Future aircraft fleet navigation capabilities has been determined by ICAO and IATA in the Asia/Pacific Regional Performance-based Navigation Implementation Plan. In 2008, 78 percent of the Asia-pacific fleet had Area Navigation (RNAV) or Required Navigation Performance (RNP) capability. It has been predicted that this will grow to 98 percent in 2016 and beyond. Virtually all airlines manufactured in the 1980's and onwards have RNAV capability. The figure below is valid for the Asia-pacific region.

Figure 17: Fleet capabilities predicted by ICAO/IATA for the Asia-Pacific region



The Indonesian airline fleet is not considered to deviate much from the Asia-pacific fleet with regard to onboard equipment and navigation capability. Indonesian airlines are expected to take delivery of several hundreds of new airplanes in the coming years, drastically reducing the average age of the fleet and increasing the share of RNAV/RNP equipped aircraft. Common airliners in Indonesia capable of at least RNAV navigation are the Boeing 737-300/-400/-500 series, MD-80, RJ100 as well as majority of the turboprops. Airliners likely to have RNP capability include the Airbus 319/320, 330 as well as the Boeing 737-800/-900. There are still a number of older generation B737-200s in operation that probably do not have RNP capability.

Normal cruise speed for jet airliners in the present domestic fleet has been summarised in the table below as they may be of importance during the ATM planning process.

Table 13: Jet aircraft types, numbers in operation and typical cruise speeds

Aircraft type	Operators	Number of aircrafts in operation	Normal cruise speed (Mach number)
A319/320	Indonesia Air Asia, Mandala, Batavia Air	25	M 0.78
A330-200/-300	Garuda Indonesia, Batavia Air	12	M 0.82
B737-200	Kartika Air, Merpati Nusantara, Batavia Air, Republic Express, Sriwijaya Airlines, Travel Express, Trigana Air Service	23	M 0.74
B737-300/-400/-500	Garuda Indonesia, Indonesia Air Asia, Lion Air, Merpati Nusantara, Batavia Air, Sriwijaya airlines, Travel Express, Cardig Air	91	M 0.78
B737-800/-900ER	Garuda Indonesia, Lion Air	44	M 0.78
B747-400	Garuda Indonesia, Lion Air	5	M 0.85
MD-80	Kartika Air, Wings Abadi	2	M 0.76
MD-90	Lion Air	3	M 0.76
F100	Merpati Nusantara	1	M 0.72
BAe 146/RJ100	Riau Airlines	2	M 0.73

Source: DGCA, Airbus, Boeing, Fokker and British Aerospace

2.4 AIRPORT CAPACITY CONSTRAINTS

Jakarta SH airport had 273,000 aircraft movements in 2009. The number of passengers in 2009 increased by 15 percent from 2008 and during the first four months of 2010, the growth was close to 20 percent as per BPS (Badan Pusat Statistik) statistics. The airport, currently operating two runways, is likely to be heavily congested during daily peak hours, particularly in the domestic passenger terminals, with annual demand likely to be around 40 million passengers in 2010. The airport is the main gateway in Indonesia, accounting for 25 percent of all domestic movements and 40 percent of all international movements in the country.

There is an urgent need to increase the capacity of the airport. The current forecast indicates a need for a capacity of 65 million passengers annually, within the coming five year period.

The airport capacity constraint has several implications for ATM planning purposes. To begin with, it has to be included as a parameter when predicting the future traffic growth. In this report, it has been included and integrated by assuming that impact on growth due to congestion during the historical period, which the model for traffic forecast is based on, is the same as it will be in the planning period of 2011-2025. We hereby assume that capacity will be added along with rising demand. This is normally the most solid approach in the long term perspective when making forecasts.

We see a significant potential in adding capacity using several different “tools” such as operational initiatives to utilise the facilities more efficiently, introduction of new management support systems and tools, construction of new infrastructure, new technology etc.. This further supports the fact that capacity most likely can, and will be added along rising demand.

There are also possibilities, by way of regulations and/or economical incentives, to change the distribution of traffic between different airports to ease congestion. This would, consequently, also be a method to ensure that growth can be dealt with in an optimal manner.

It would be a highly interesting task to explore how capacity optimisation can take place on Indonesian airports and how the distribution of traffic between airports could be affected by regulations and incentives. Here, a sustainability approach as discussed in chapter 6 would form a solid base to balance different perspectives.

2.5 ASEAN AGREEMENTS AND OPEN SKY

An open sky policy has been signed by the ten ASEAN member states to be fully implemented in 2015. According to a recent report by Mott MacDonald, Indonesia has to ratify two existing ASEAN multilateral agreements (one on the full liberalisation of air freight services and the other on air services). The multilateral agreement on the full liberalisation of passenger services is expected to be agreed by member states in late 2010. Once ratified by the member states, the agreement will mean the liberalisation of third, fourth and fifth freedom traffic rights within the ASEAN region. The effect on air traffic on future implementation of Open Sky has not been modeled in the air traffic forecast. The forecast is based on the future development of the Indonesian economy as the only variable.

The reasons for not including Open sky in the forecast are:

a) to keep the air traffic forecast model as simple as possible;

b) it is difficult to predict when the full implementation will come into effect and exactly how much the demand will increase; and

c) as shown in chapter 4, the annual growth rate is forecasted to be high, hence the additional growth gained by Open Sky will be relatively small.

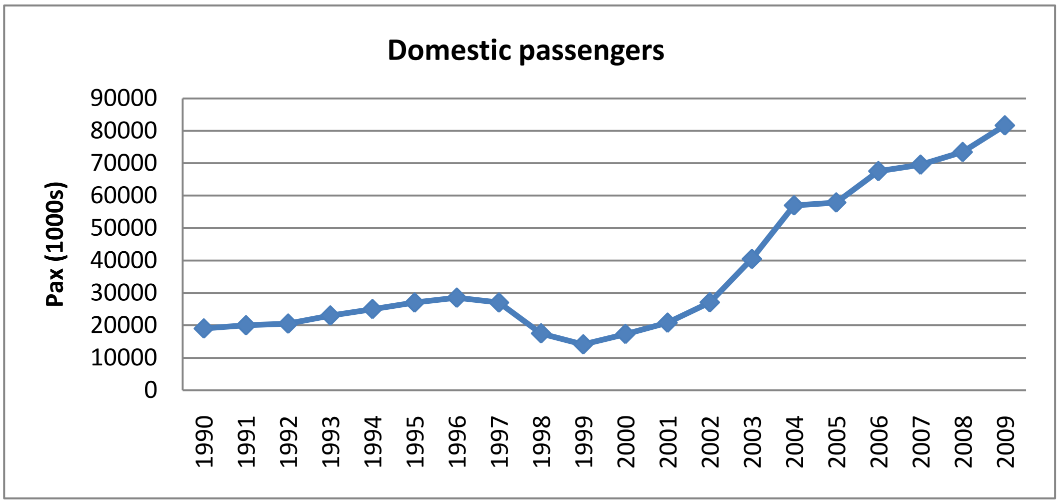
CHAPTER 3: AIR TRAFFIC STATISTICS

This section deals with traffic statistics during the last two decades, with the aim to form a basis for the forecasts in section 6. Statistical data held by DGCA for the period 1990-2001 was found to be incomplete for some airports. Data for this period has therefore been taken from previous studies and reports and may not be completely accurate.

3.1 DOMESTIC AVIATION

Domestic air passengers in Indonesia have grown significantly since the financial crisis in 1998. The growth follows the growth in GDP and has been further increased by the introduction of low cost airlines, with considerably lower air fares as a result. It is evident (refer to Figure 19) that the fall in passenger volume due to the economic downturn in the late 90's was quickly reversed.

Figure 18: Domestic passenger volume 1990-2009



3.2 INTERNATIONAL AVIATION

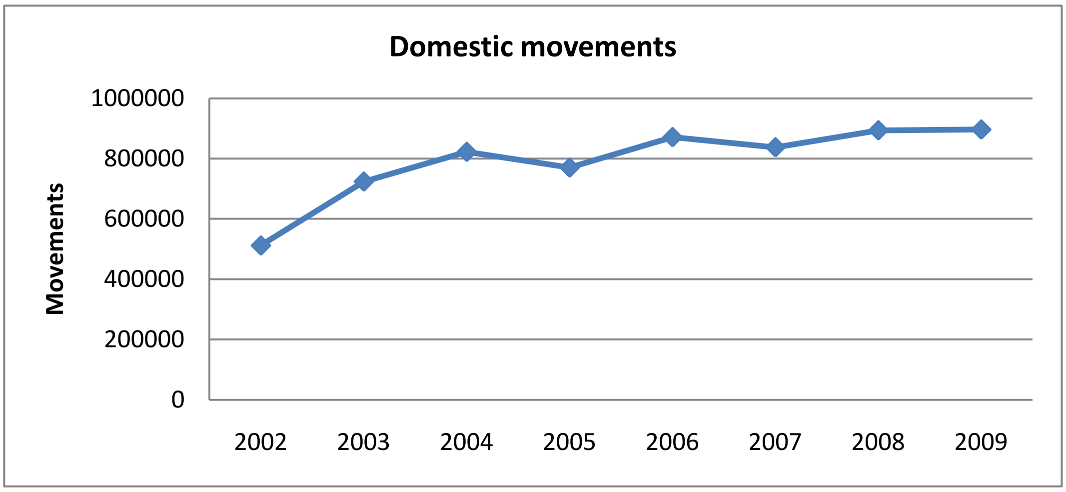
International volume growth has also been dramatic, from very low numbers in the early 1990's. The economic crisis in the late 90's affected domestic as well as international travel but the downturn was not as dramatic and passenger numbers returned to earlier levels quite fast. As shown in the figure, passenger numbers continued to grow more rapidly in 2004 and onwards, after a downturn in the late 1990's.

Figure 19: International passenger volumes 1990-2009

3.3 MOVEMENTS

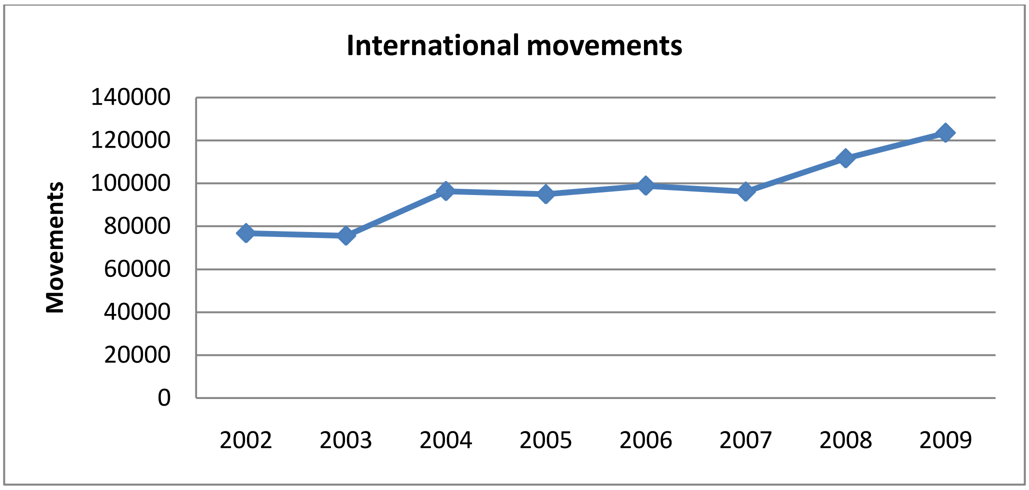
The data for domestic take-offs and landings at Indonesian airports is shown in the figure below. The growth was particularly strong in the early 2000's; thereafter the number has stabilised to around 900,000 annually.

Figure 20: Domestic movements 1990-2009



International movements at Indonesian airports are shown below. The growth from 2002 has been about 50 percent.

Figure 21: International movements 1990-2009



3.4 LOAD FACTORS AND AVAILABLE SEATS

Average load factor for domestic and international flights was 82 and 72 percent respectively, in 2009. This was an all-time-high score for domestic aviation but slightly below the 2007 peak value for international aviation.

Figure 22: Domestic load factor 2002-2009

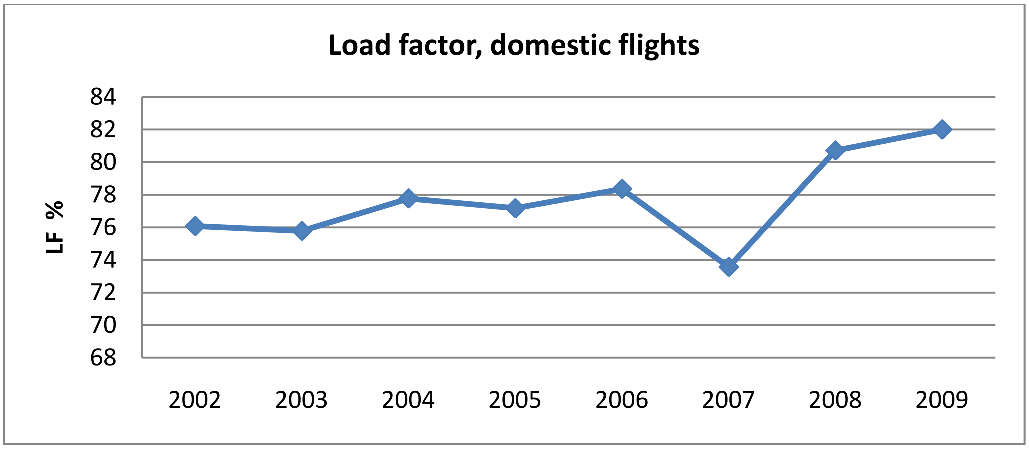
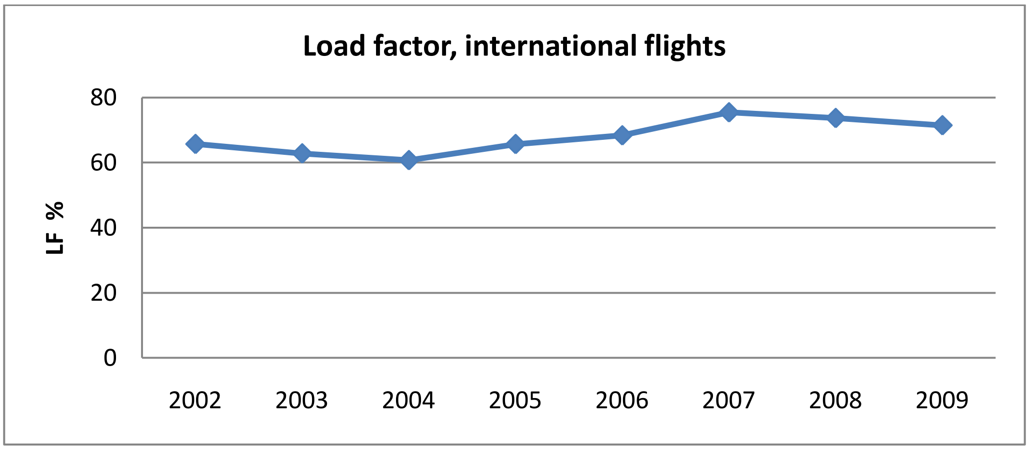
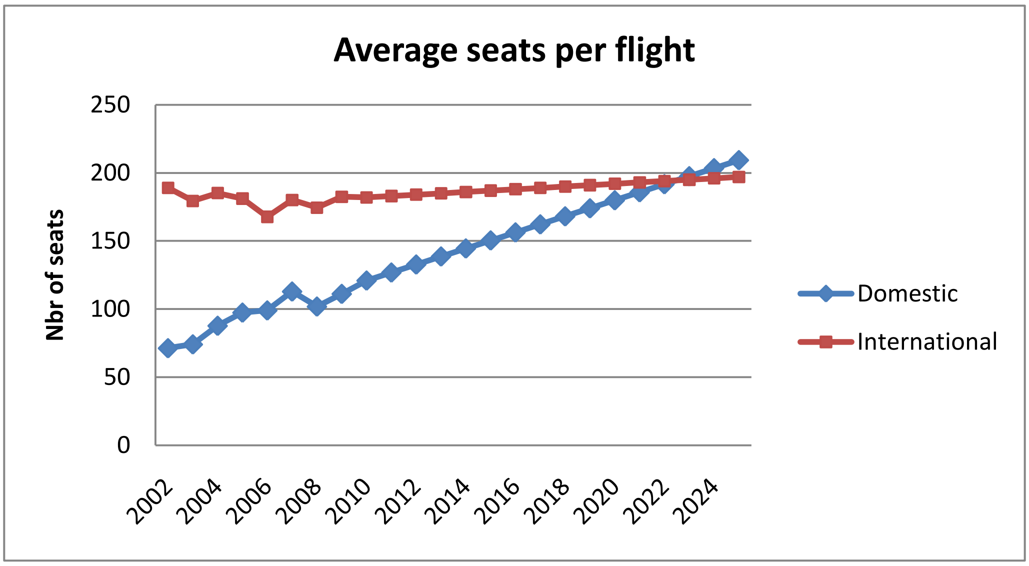


Figure 23: International load factors 2002-2009



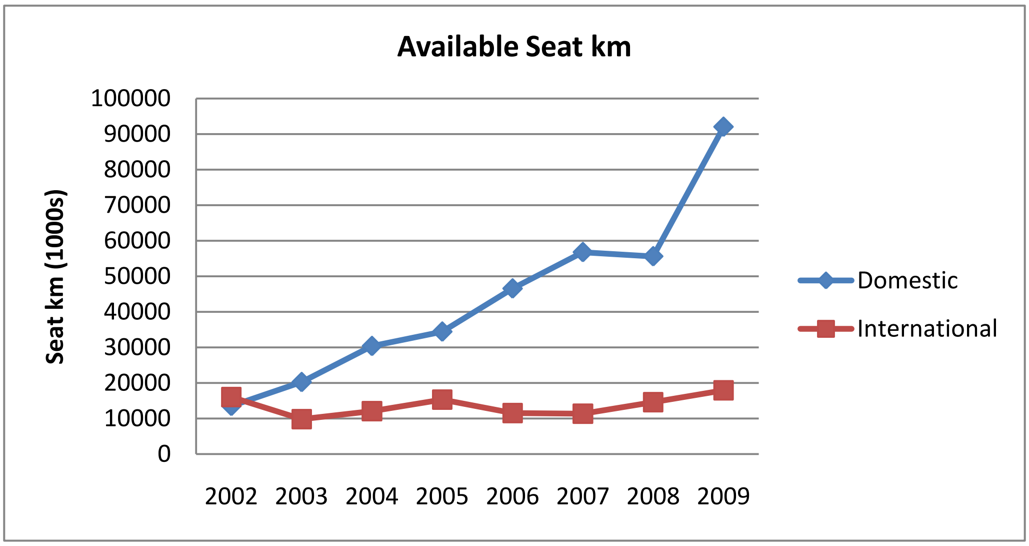
Average number of seats per flight was 111 for domestic flights and 182 for international flights in 2009. Number of seats per flight on the domestic market has increased steadily during the last ten years as a result of larger aircrafts being introduced by low cost operators and also due to the high demand for air travel in general across the nation. The number of seats per international flight has remained fairly steady over the same period.

Figure 24: Average seats per flight 2002-2009



Passenger capacity, measured as available seat-kilometers offered by commercial airlines, has increased dramatically in recent years on the domestic market. For international services, the capacity was only about 10 percent higher in 2009, as compared to 2002.

Figure 25: Available seat-kilometers 2002-2009

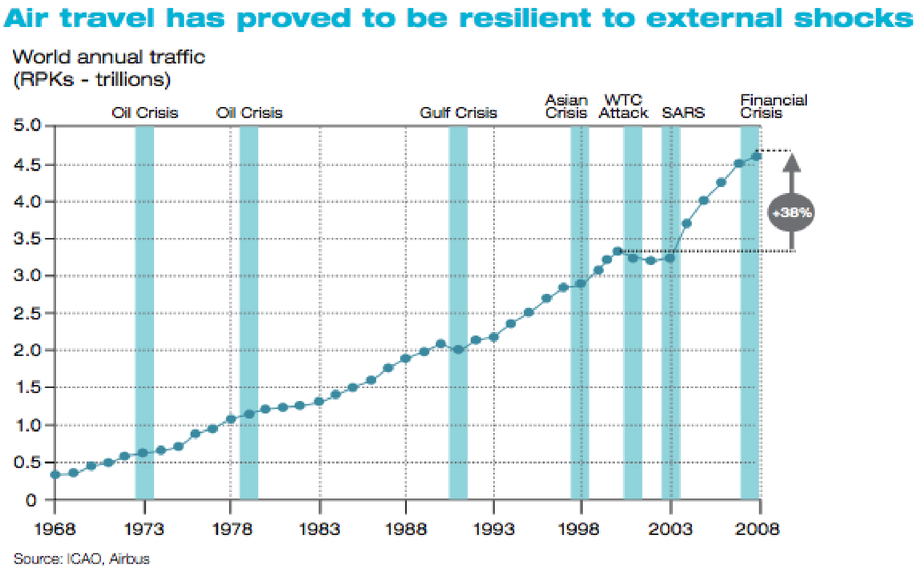


CHAPTER 4: AIR TRAFFIC FORECAST

4.1 LONG-TERM TRENDS AND SHORT-TERM DIPS

The historical, different types of crisis such as the Gulf crisis, Asian crisis, World Trade Center attack, SARS and the latest financial crisis affected the aviation sector significantly in the short term. However, it has been proved that in the long term, the trend seems to continue quite undisturbed, as depicted in the graph below. Consequently, the team´s forecast for Indonesia is based on a long term perspective and does not take into account any external factors that, in the short term, may give temporary "dips" in the trend but that in the long run have no effect.

Figure 26: Long-term trend 1968-2008



Source: Airbus Global Market Outlook. Note: trillion = 1,000,000,000,000.

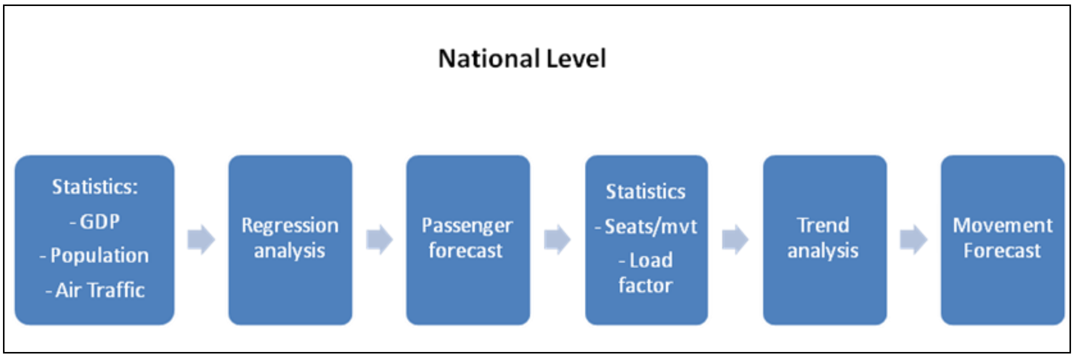
4.2 METHODOLOGY

The development of an air traffic forecast for Indonesia will follow the methodology outlined below. According to the ICAO Manual on Air Traffic Forecasting, it has been proven that traffic, in general, has grown in parallel with prevailing economic development. Socioeconomic indicators used will be GDP growth and GDP per capita growth. The indicator with the best correlation to historic passenger volume will be used to determine future air traffic demand in terms of total number of air passengers in Indonesia. Since the demand will vary between international and domestic, two different forecasts will be developed.

Future average seating capacity per aircraft will be determined by trend analysis of historic data, in combination with forecasts from aircraft manufacturers Boeing and Airbus. Future average load factors will be determined as the average of the last five years. Once average seating capacity and load factor of each movement has been determined, the forecast of total air traffic movements in Indonesia, shared between international and domestic can be developed.

The forecasts of air passengers and movements will be compared with forecasts done in the past by other organisations and consulting companies to assess its relevance.

Figure 27: Forecasting methodology, national level



Forecasts of individual airports' traffic growth will be done by applying the resulting growth ratios for the whole nation from the nation-wide forecasts.

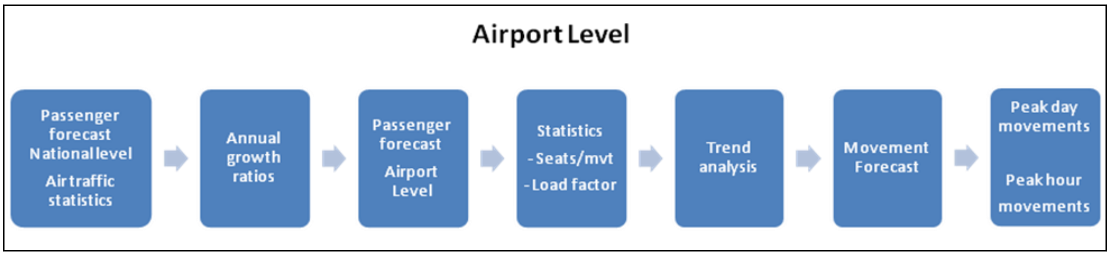
Regional variations in GDP growth may not be completely covered but the method is considered accurate enough for the purpose of the ATM study.

Furthermore, the methodology assumes that existing travel patterns will remain and capacity at the airports and in the airspace will grow parallel with demand.

A more diversified route network with several international and domestic hub airports to release the pressure of the main gateway in Jakarta would of course affect the individual airport forecasts.

The passenger forecast is converted to movements by dividing passenger volume with seats per movement and load factor. Future seats per movement and load factor is determined using a combination of trend analysis and judgment. The movement forecast will be broken down into peak day and peak hour figures using planning coefficients used for aviation forecasting in Japan.

Figure 28: Forecasting methodology, airport level

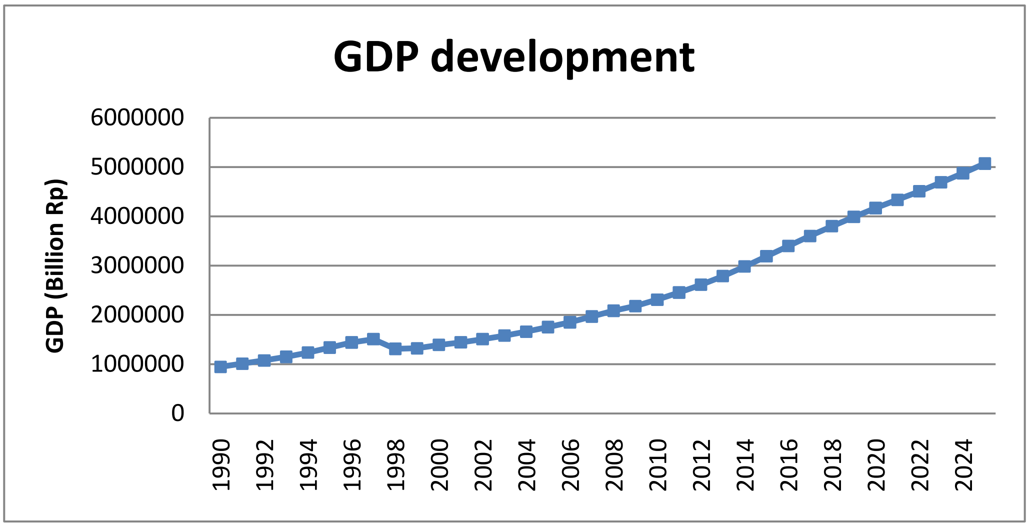


Air traffic movements along major Air Traffic Services (ATS) routes in the country will be forecasted using the expected growth ratio for total movements in Indonesia. Overflying air traffic will be forecasted by using expected growth ratios of movements in the Asia-Pacific region as provided by IATA, ICAO or other organisations.

4.3 SOCIOECONOMIC DEVELOPMENT IN INDONESIA

GDP development is shown in table below. For the years 2010-2025, the International Monetary Fund (IMF) GDP forecast has been used. The GDP growth ratio has been determined using IMF data for the years 2010-2015. Between 2015 and 2025 the GDP growth is expected to decline, to meet an average growth ratio of 5.0 percent per year for the entire period 2000-2025, which is equivalent with the IMF projection.

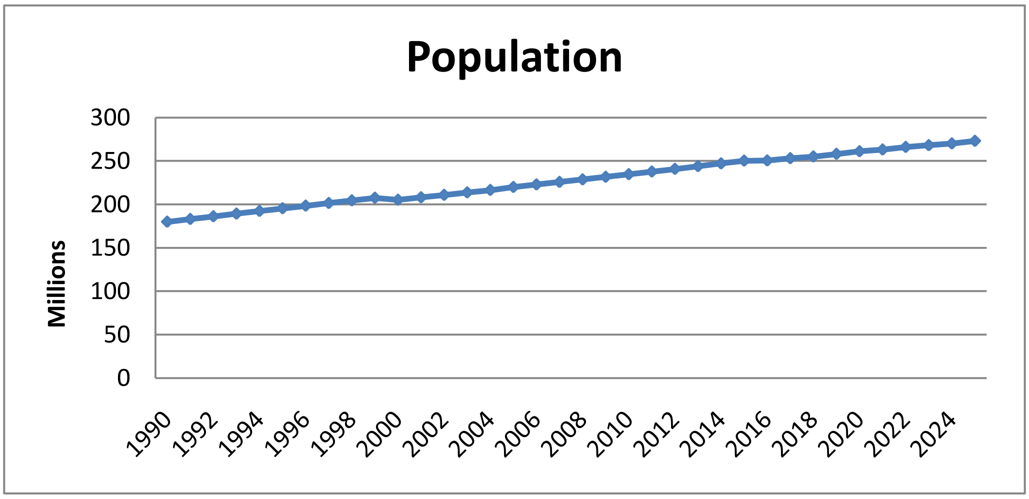
Figure 29: GDP development



Source: IMF (Base year 2000, constant prices, national currency)

Indonesia's population is growing steadily, though it is expected that annual growth rates will decrease as a result of both - a decrease in the fertility rate and mortality rate, where the decrease in fertility rate will be faster. The IMF forecast of Indonesia's population has been used for years 2010-2015 and the BPS forecast has been used for the last ten years of the planning period (2016-2025). It is expected that Indonesia's population will increase to around 273 million in 2025, growing at approximately 1 percent each year.

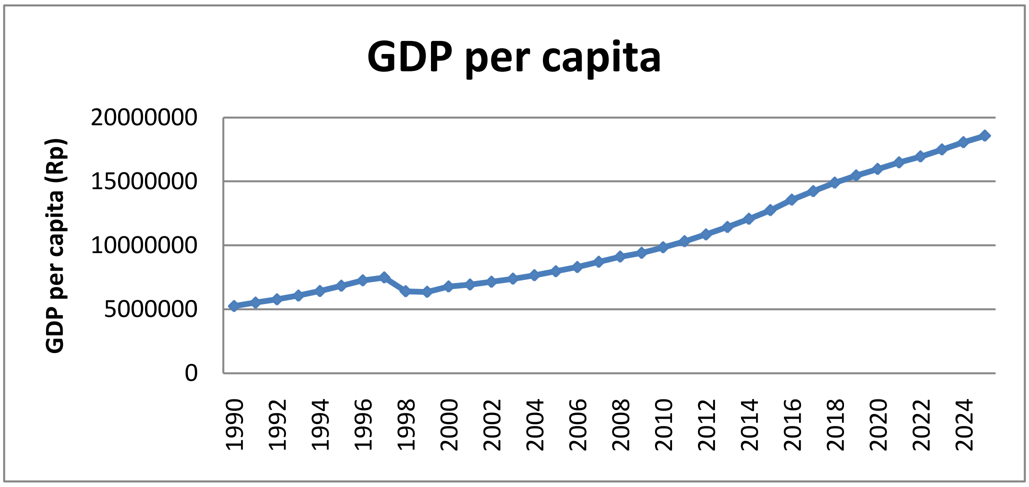
Figure 30: Current and forecast population



Source: BPS and IMF.

The forecast GDP per capita follows from data on future GDP and population.

Figure 31: Current and forecast GDP per capita



Source: IMF.

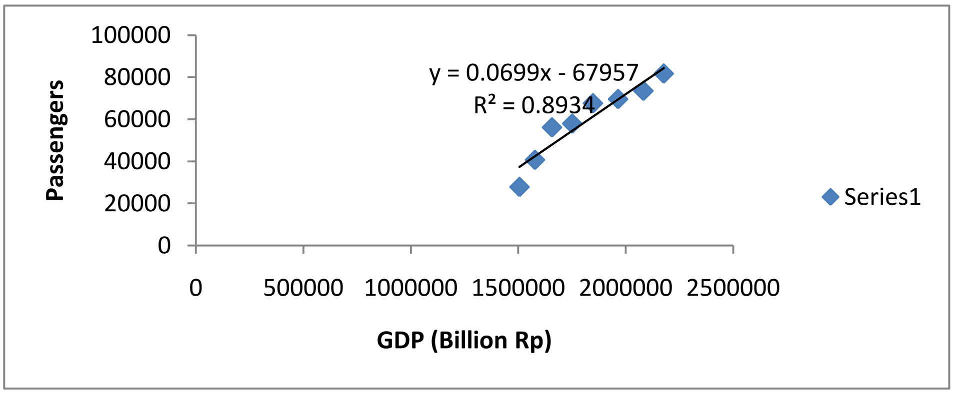
4.4 DOMESTIC PASSENGERS ON NATIONAL LEVEL

The number of air passengers on domestic routes is generally a function of GDP or GDP per capita. Other factors such as population, air fares, frequencies, geography, availability of other modes of transportation etc. are also important for the growth of air traffic. For the purpose of developing an ATM Master Plan it has been considered sufficient to establish a correlation between GDP and air traffic demand. Using regression analysis for the period 2002-2009, the following relationship between GDP (Rp Billion) and total air passengers has been derived:

Domestic pax = -67957+0.07*GDP

R (sq) = 89.3%

Figure 32: Relationship between Domestic passengers and GDP



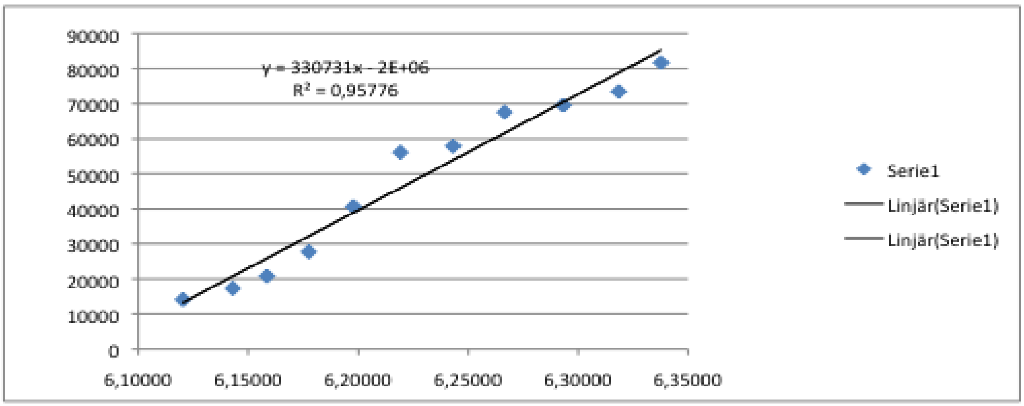
Using the above relationship between GDP and domestic air traffic demand, a forecast for total domestic passengers can be developed, based on a linear function. The relationship between GDP *per capita* and domestic air traffic was also analysed but the correlation was found to be slightly weaker; hence it was decided to use GDP as a base for the forecast. Regression on the period 1990-2009 was also done but with even weaker correlation. In addition, the statistical data from this period was considered to be less reliable as described in chapter 4. The team has also done statistic analysis of models based on lin-log and log-log design, both quite frequently used in similar situations, as shown below:

Domestic Passengers= k* log GDP +m

as well as

Log (Domestic Passengers)= k*log GDP + m

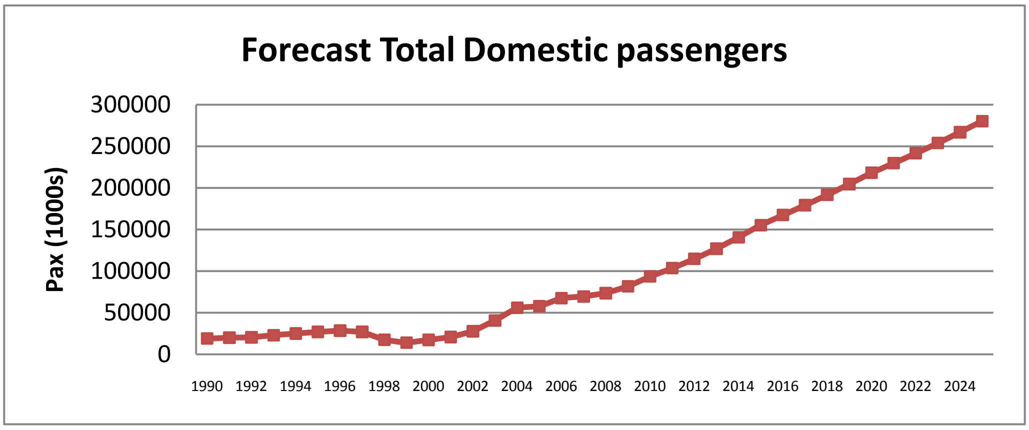
Figure 33: A lin-log approach to GDP/passenger relationship



Both these functions are normally considered to provide a better fit than linear functions. The first formula (lin-log), applied to data from 1999-2009, provides the following result:

The different functions were translated to passenger development and a comparison of the different types of functions was carried out by the team. After including all facts available and comparing with major forecasts done for the region, the team decided to use the linear function as a base for the forecast; as the other functions tend to underestimate passenger growth in the long term perspective. Especially the high growth rate likely in 2010 would not be reflected by this model. The linear function gives the following development of domestic air traffic in Indonesia for the period until 2025:

Figure 34: Historic and forecast domestic passenger volume



The main forecast indicates that domestic passengers will be 280 million in 2025 or approximately three and a half times today's numbers.

This air traffic forecast for Indonesia gives a slightly higher average annual growth rate than those developed by ICAO, Airbus and Boeing. The LFV ACT forecast will mean growth rates of around 10 percent for the next few years, thereafter declining to about 5 percent per year. The higher growth rate is justified by the fact that Indonesia is undergoing major changes in the aviation sector at the moment, such as the implementation of Open Sky agreements and the establishment of new low cost operators with a reduction in air fares as a result. This development is already largely in place in other countries in the region. In addition, Indonesia has a very strong economic growth, even compared with other countries in the region, which is the main driving force of air traffic growth. Preliminary traffic statistics from BPS show a 20-25 percent increase in passenger numbers for the major airports during 2010. It is not likely that this growth rate will prevail but if it should, it will result in considerably higher passenger numbers in the end of the forecast period than presented in this report.

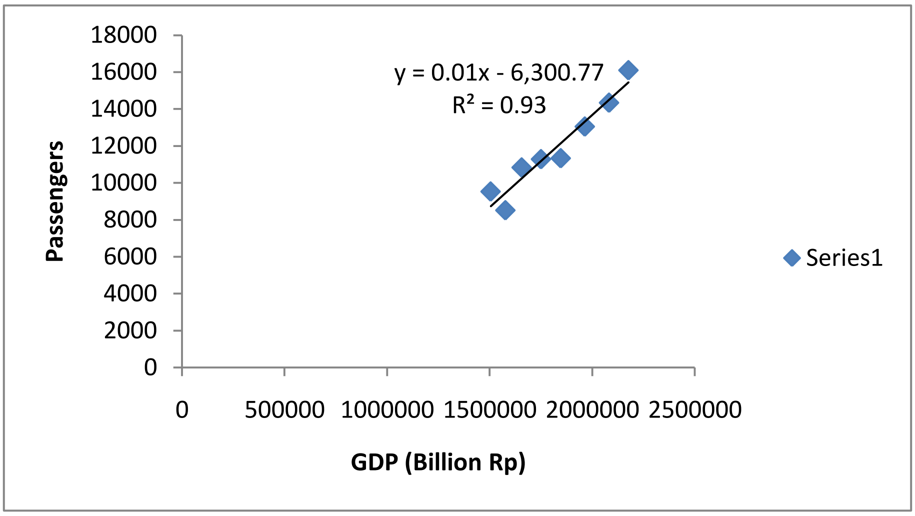
4.5 INTERNATIONAL PASSENGERS AT NATIONAL LEVEL

For the development of the international passenger forecast, a similar approach was chosen with traffic growth as a linear function of GDP (Rp Billion) development.

International Pax = - 6300 + 0.01*GDP

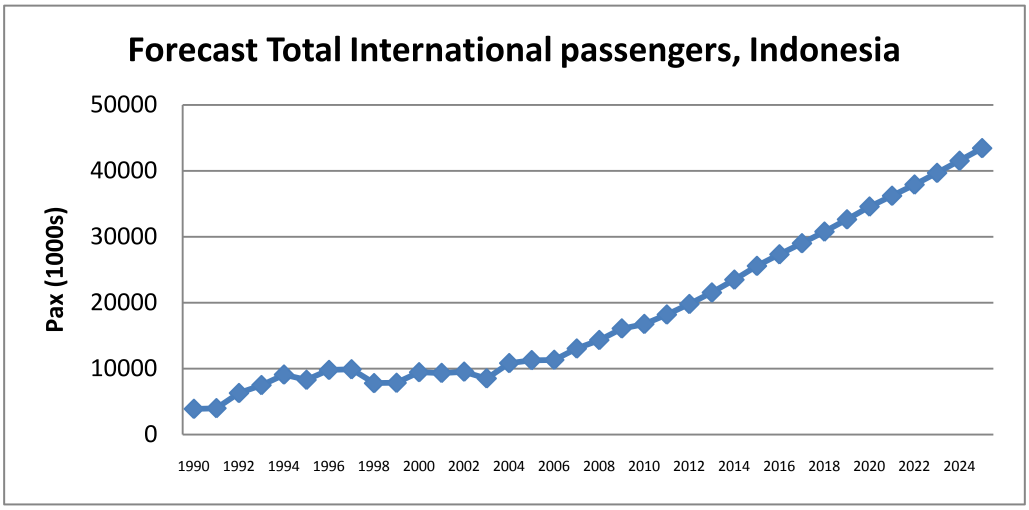
R (sq) =93.0 percent

Figure 35: Relationship between International passengers and GDP



This will result in approximately 43-44 million international air passengers arriving in and departing from Indonesia in 2025; on the optimistic side compared to other forecasts but reflecting the dramatic growth in recent years.

Figure 36: Current and forecast international passengers



The total number of passengers, including both domestic and international, will be around 320 million in 2025 as compared to 98 million in 2009. Compared with the Indonesian population, the number of air passengers per capita and year can be determined to 0.25 in 2009 increasing to 0.67 in 2025.

Table 14: Air passengers per capita 2009-2025

	2009	2025
Flights per person	0.25	0.67

4.6 DOMESTIC MOVEMENTS

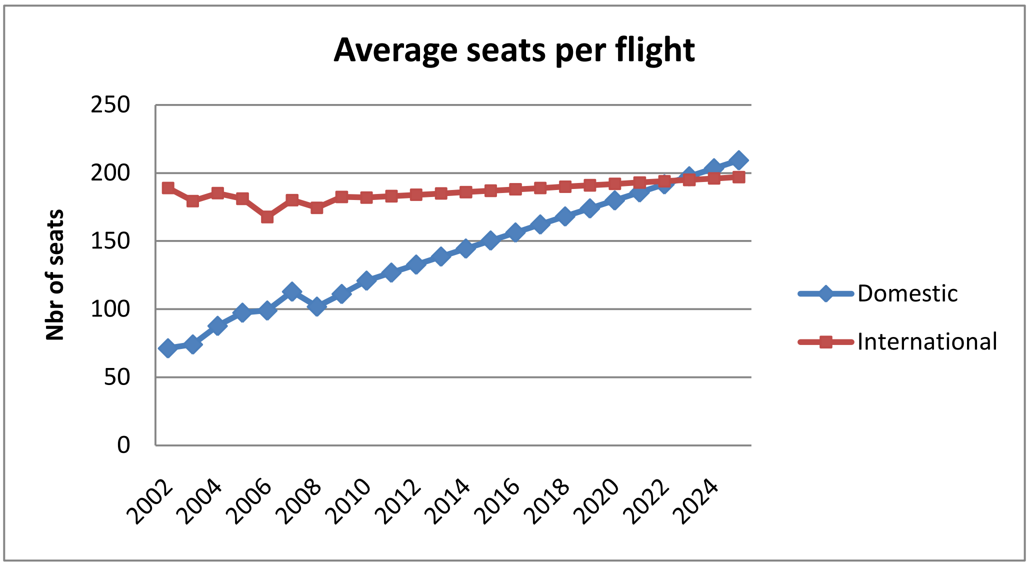
To understand what the passenger forecast will mean for ATM, the forecast has to be converted to aircraft movements. This is done by the formula:

Movements = Passengers / (Load factor x Average seats per flight)

4.6.1 Seats per flight

Average number of seats per flight has been forecasted using trend analysis and assumptions on future domestic aircraft fleets. It is assumed that average number of seats per flight will continue to increase from today's 110 for domestic flights to 210 in the end of the forecast period. This can be justified by the estimated growth of medium size jets in the region, expected to triple in numbers over the coming years, according to Airbus, to account for 55 percent of the total fleet. Indonesian airlines are expected to gradually introduce new, larger airplanes in the market. One example is Lion air which, in the next few years, will operate a single fleet of B737-900ER configured for 213 passengers.

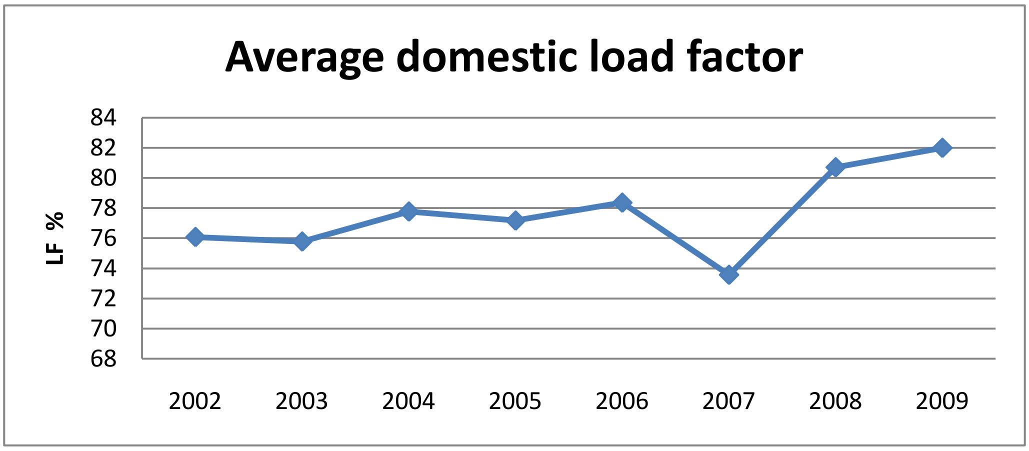
Figure 37: Forecasted number of seats per flight



4.6.2 Average load factor

Average domestic load factor has fluctuated somewhat in recent years and was 82 percent in 2009. The trend since 2002 is growing and can partly be explained by the introduction of low cost airlines. It is unlikely that growth will continue substantially since higher load factors usually will be a trigger for operators to increase frequencies. In this study, an average domestic load factor of 78 percent has been used for the planning period 2010-2025; this is equivalent to the mean value during the years 2002-2009.

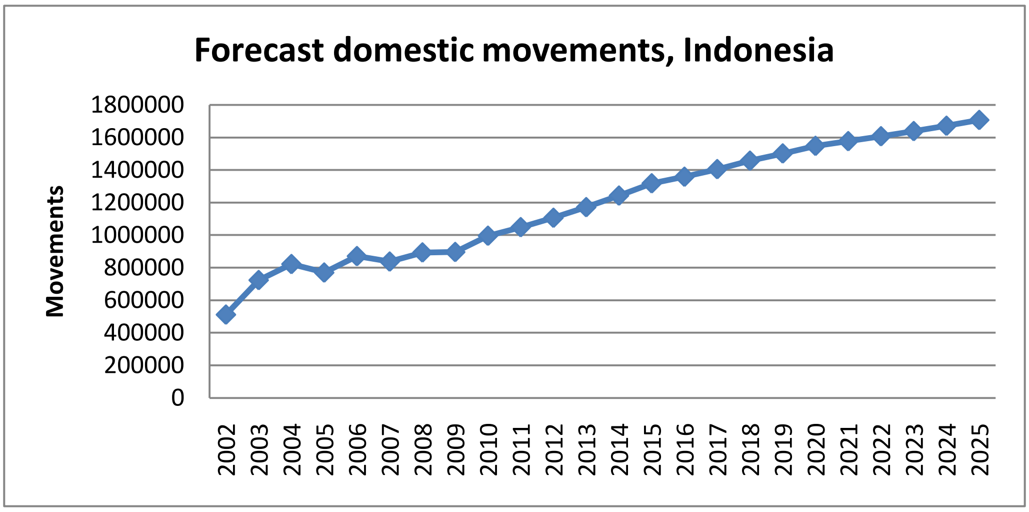
Figure 38: Average domestic load factor



4.6.3 Movement forecast

The movement forecast has been calculated using load factors and average seats above. The number of domestic passenger movements is expected to double by 2025, reaching approximately 1.7 million arrivals and departures at Indonesian airports, equal to 8,50,000 domestic flights. Expected growth of aircraft size on the domestic market will balance the increase in movements, which is why the movement forecast is well below the passenger forecast.

Figure 39: Current and forecast domestic movements



In addition to these figures, come additional movements from non-passenger aircrafts such as military and cargo flights. To account for these movements the figures above should be increased with 5 percent.

4.7 INTERNATIONAL MOVEMENTS

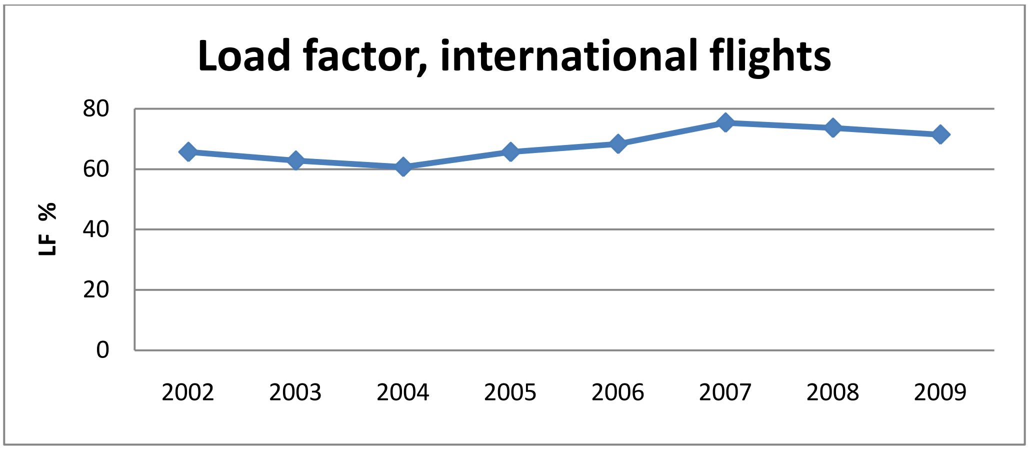
The same methodology as for domestic movements has been used to develop the forecast for international movements in Indonesia.

4.7.1 Seats per flight and load factor

Average number of seats per flight has been forecasted using trend analysis and assumptions on future aircraft fleets. Historically, the number has fluctuated around 170-180 seats per flight. It is assumed that this figure will increase slowly to be close to 200 seats per flight in the end of the forecast period. This can also be justified by the estimated growth of medium size jets in the region which is likely to operate on short to medium range international flights. Although the wide body fleet with 300-400 seats is growing, Garuda Indonesia has 10 B777-300ER and 12 A330-300 on order, the number of such airplanes will only account for a minor part of the total fleet; hence it will not influence the average seat numbers much.

The average load factor on international flights has fluctuated between 65-75 percent during the last years. In this study a load factor of 70 percent has been chosen for international flights.

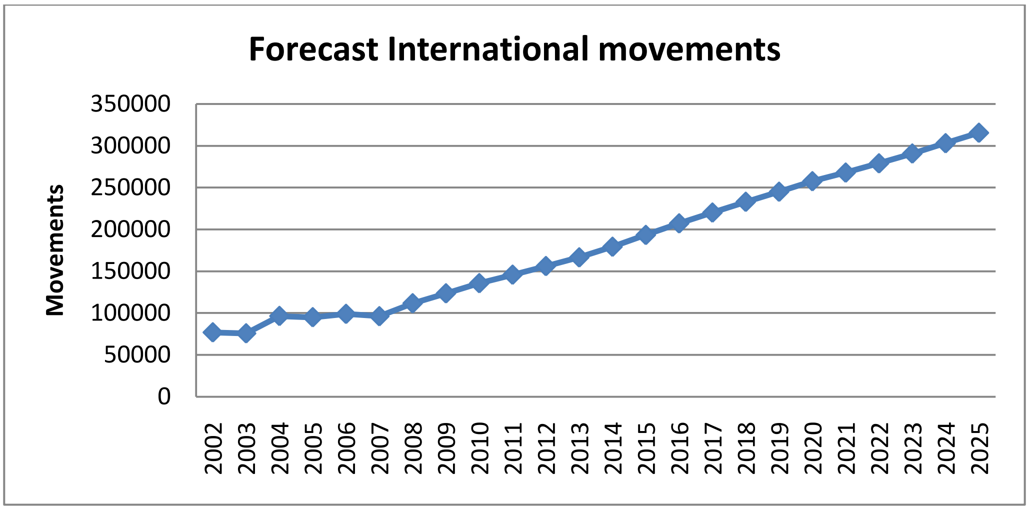
Figure 40: International load factors 2002-2009



4.7.2 Movement forecast

The movement forecast has been calculated using the passenger, seats per flight and load factor forecast. Movements to and from Indonesia are expected to almost triple by 2025 reaching 315,000 flights.

Figure 41: Current and forecast international movements



4.8 PASSENGERS AND MOVEMENTS FOR 12 MAJOR AIRPORTS

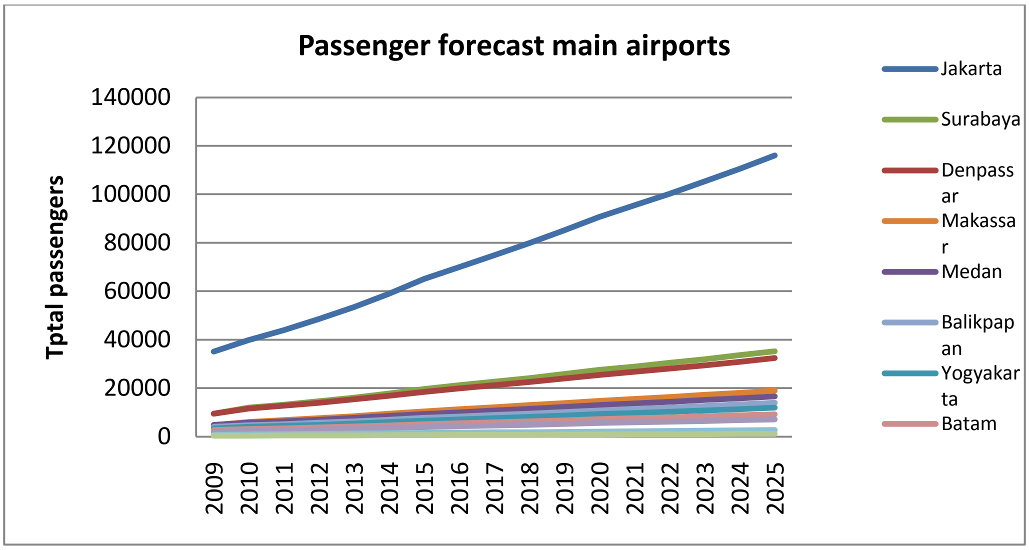
As agreed with the project's counterpart Team, the total number of passengers and movements shall be forecasted for the period 2010-2025 for twelve major airports:

- Soekarno Hatta – Jakarta
- Polonia – Medan
- Juanda – Surabaya
- Ngurah Rai – Denpasar
- Hassanudin – Makassar

- Sepinggan – Balikpapan
- Hang Nadim – Batam
- Sentani – Jayapura
- Juwata – Tarakan
- Syamsudin Noor – Banjarmasin
- Adi Sutjipto – Yogyakarta
- Training Area : Budiarto – Curug (no statistics available at this stage)

Jakarta Soekarno-Hatta is, by far, the largest airport in the country and will remain to be so if continued expansion is done. In 2025, the second largest airport – Juanda at Surabaya, may have grown to the present size as of Soekarno-Hatta airport.

Figure 42: Forecast passenger volumes of major airports



In the following graphs, the forecasted annual passengers, annual movements and peak movements for each airport is shown without further explanations unless deemed necessary.

4.8.1 Soekarno Hatta – Jakarta

Figure 43: Current and forecast passengers, Jakarta

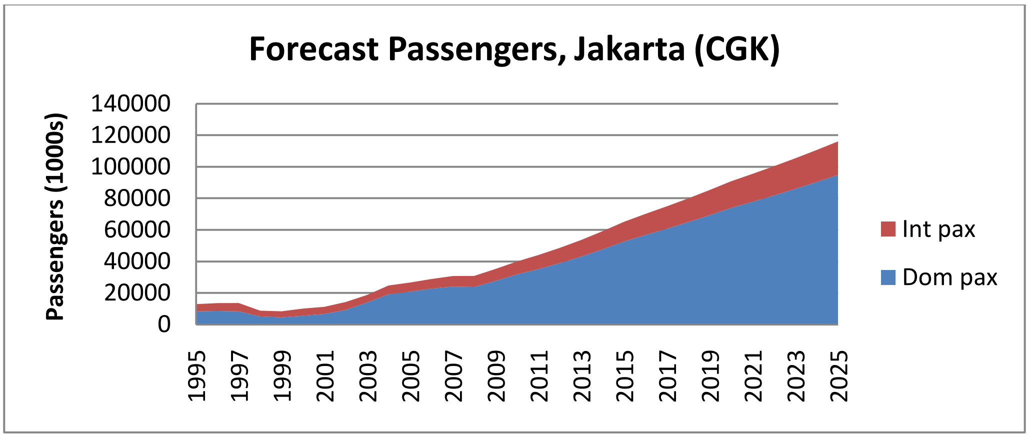


Figure 44: Current and forecast movements, Jakarta

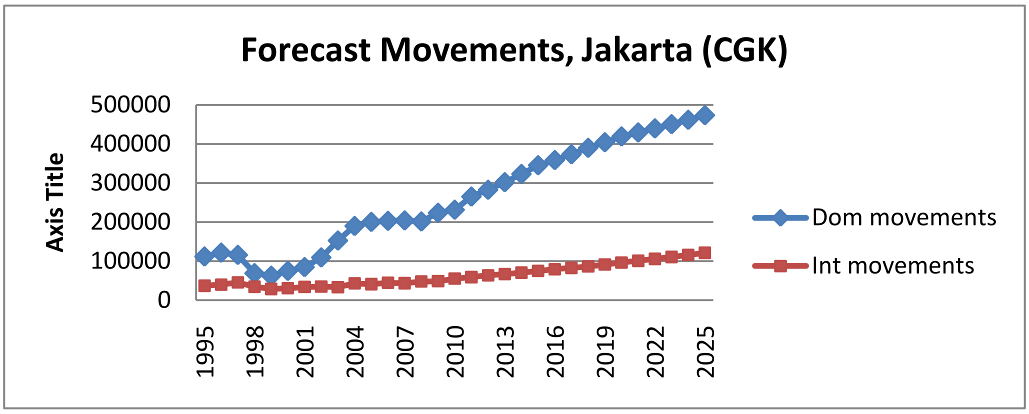


Figure 45: Forecast peak day movements, Jakarta

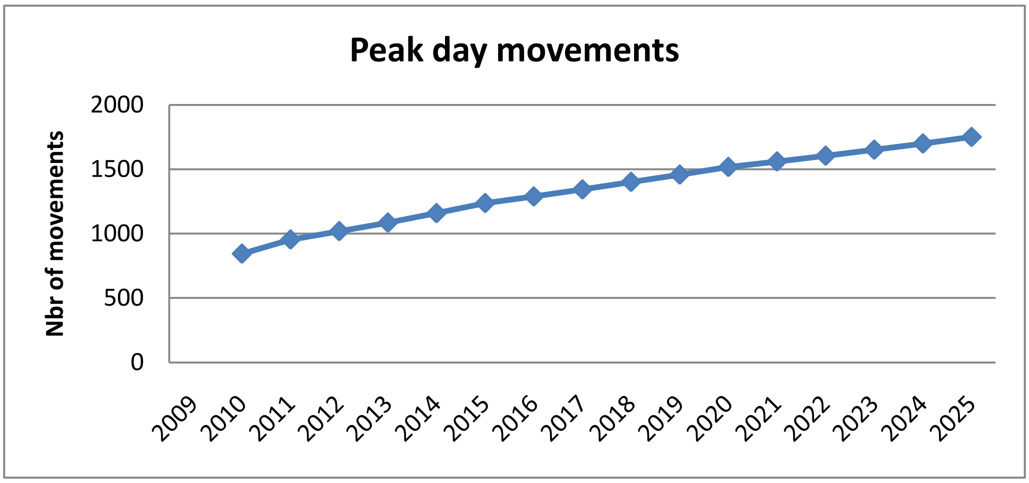
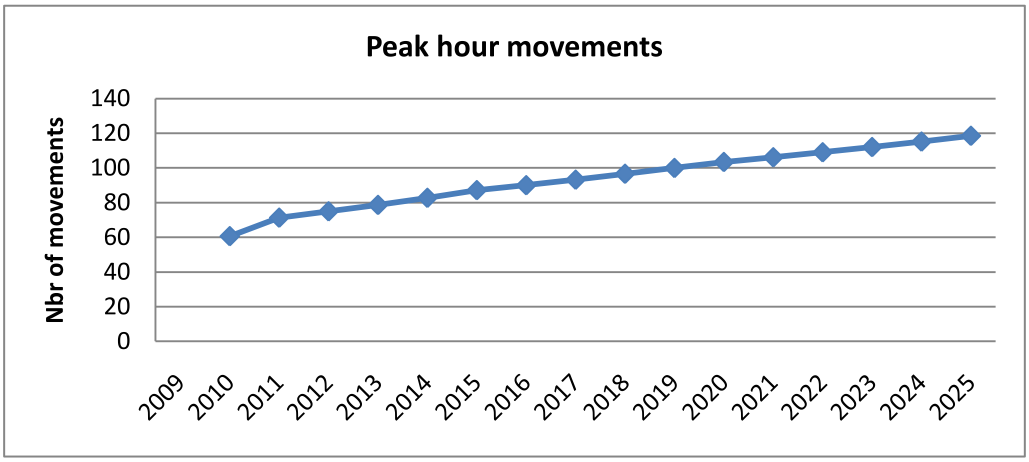


Figure 46: Forecast peak hour movements, Jakarta



Note: The forecast for Soekarno-Hatta assumes the construction of a third parallel runway during the period to accommodate unrestricted growth of traffic or development of Halim airport for civil commercial operations. No such decision has yet been taken.

4.8.2 Polonia – Medan

Figure 47: Current and forecast passengers, Medan

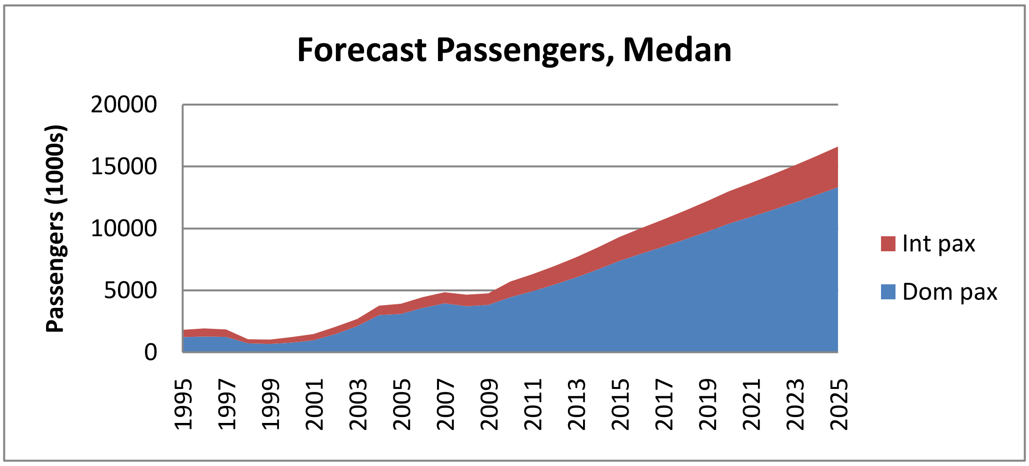


Figure 48: Current and forecast movements, Medan

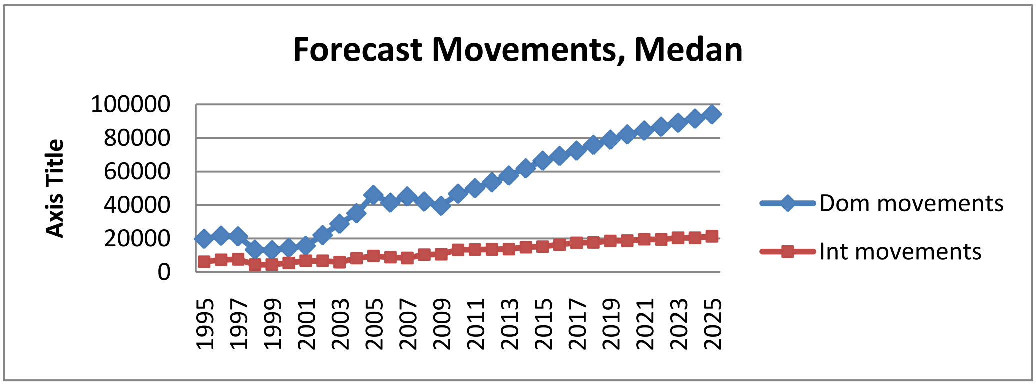


Figure 49: Forecast peak day movements, Medan

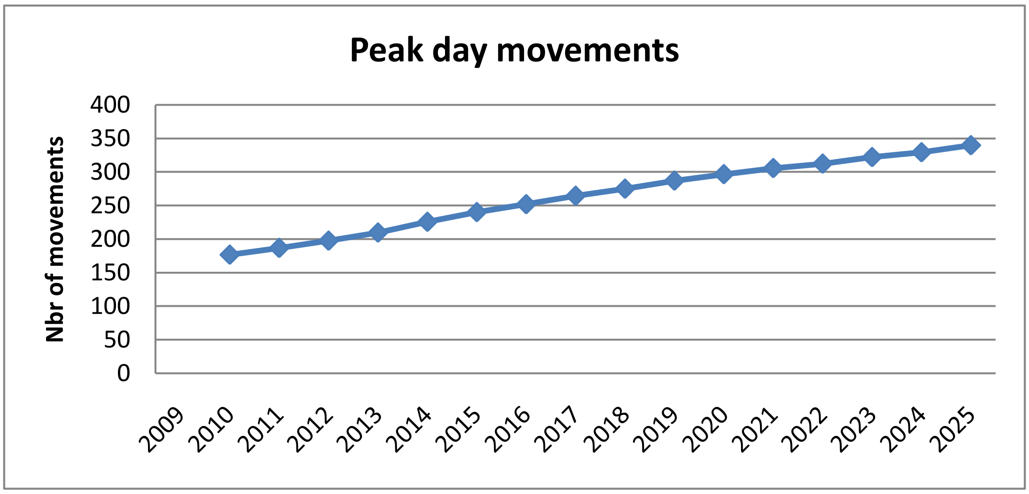
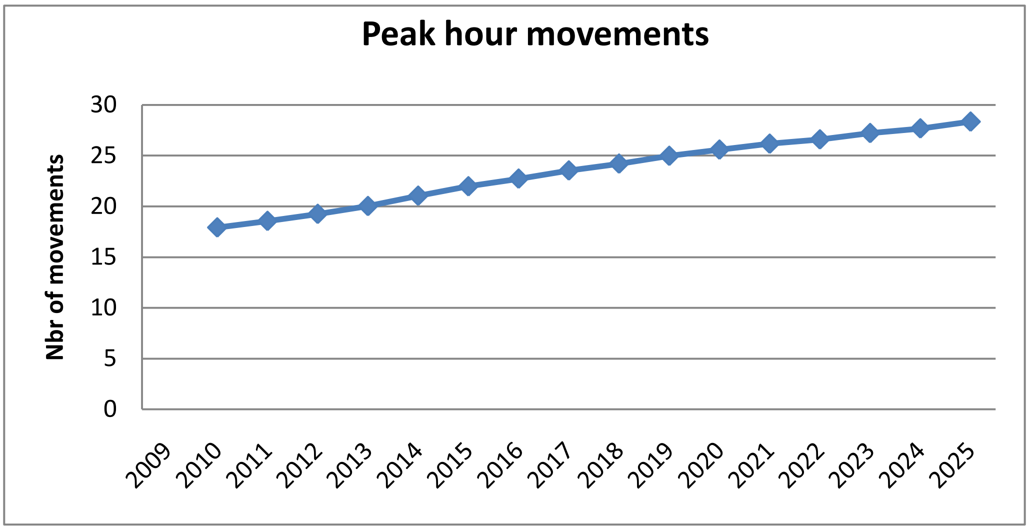


Figure 50: Forecast peak hour movements, Medan



4.8.3 Juanda – Surabaya

Figure 51: Current and forecast passengers, Juanda

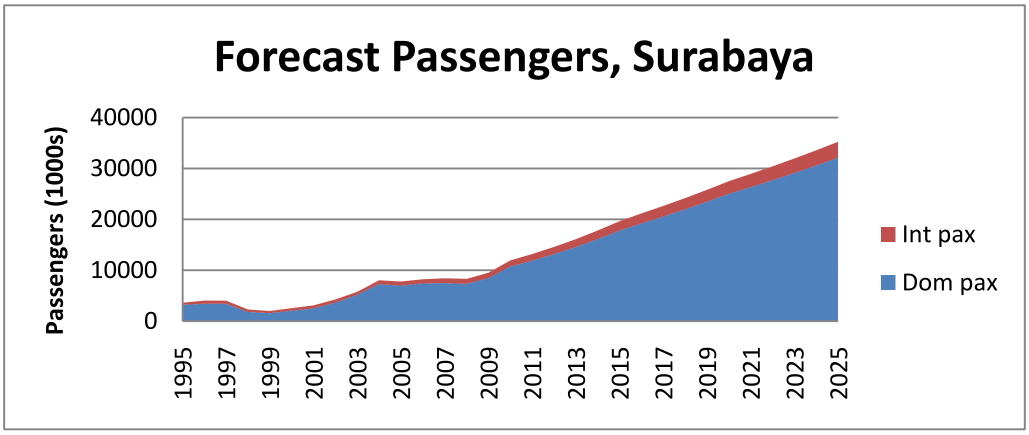


Figure 52: Current and forecast movements, Juanda

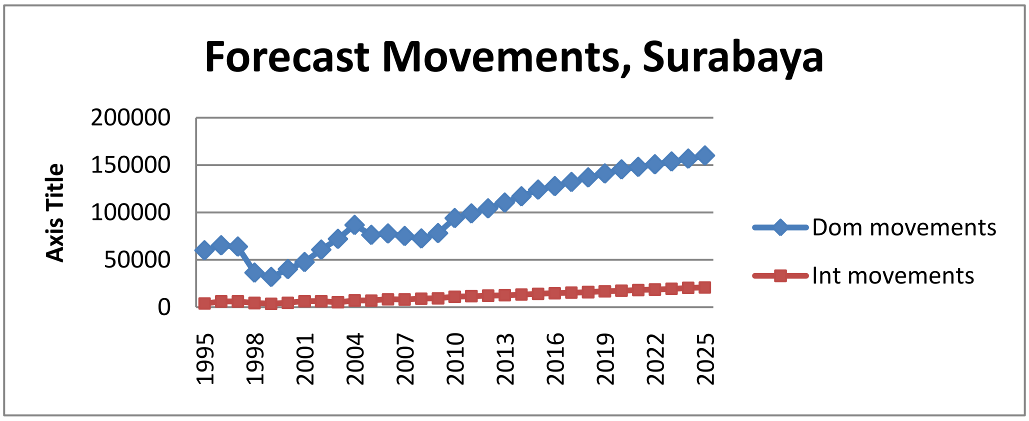


Figure 53: Forecast peak day movements, Juanda

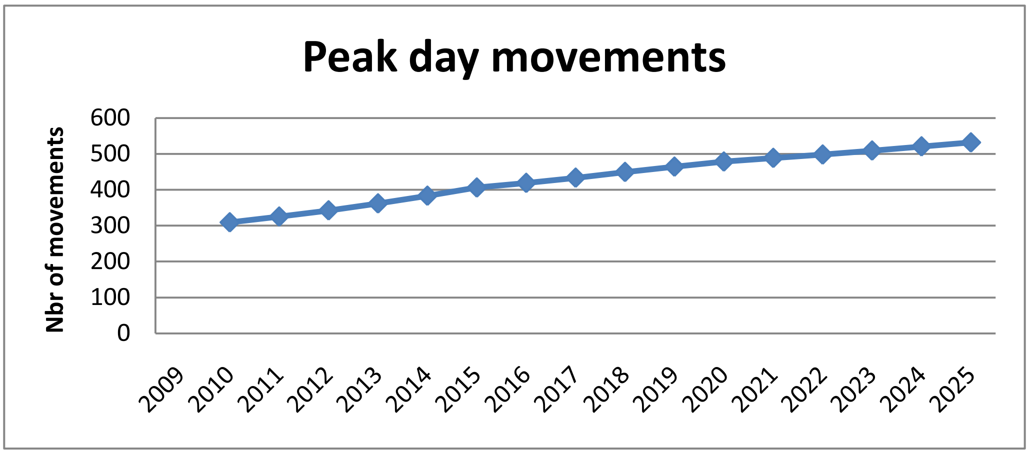
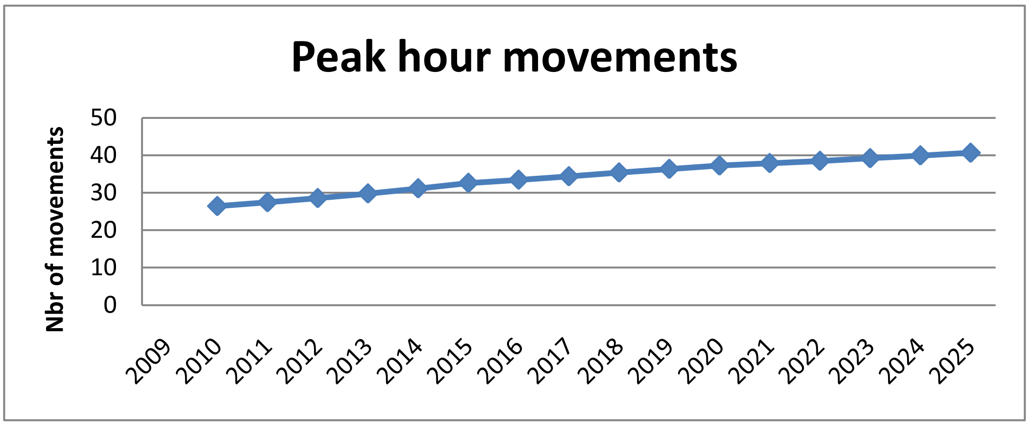


Figure 54: Forecast peak hour movements, Juanda



4.8.4 Ngurah Rai – Denpasar

Figure 55: Current and forecast passengers, Ngurah Rai

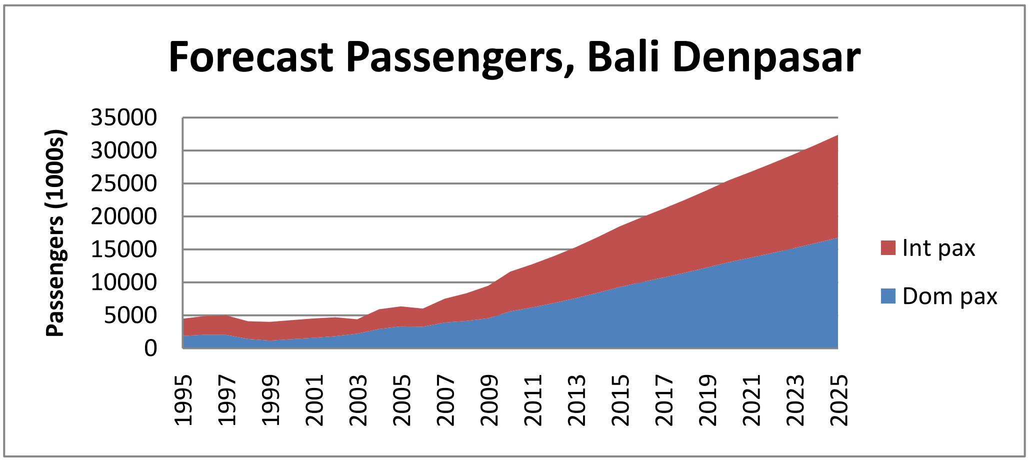


Figure 56: Current and forecast movements, Ngurah Rai

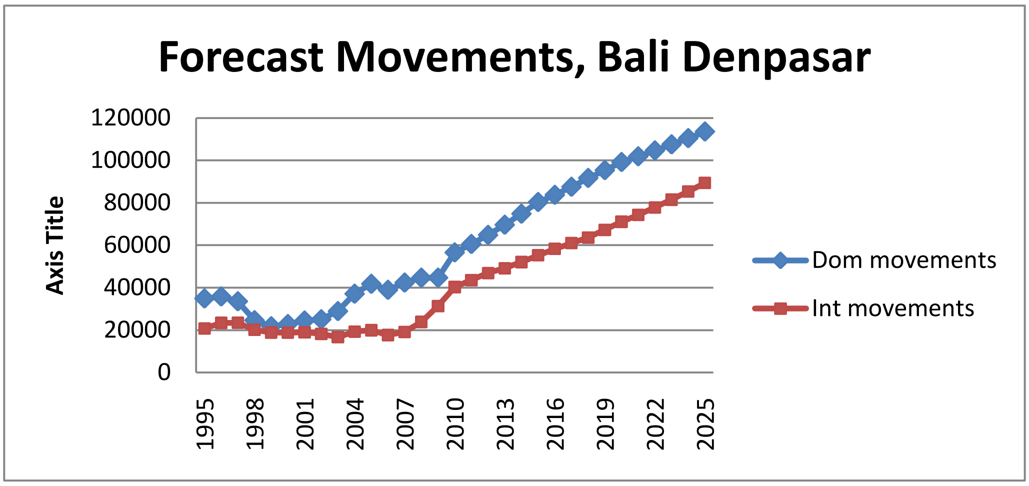


Figure 57: Forecast peak day movements, Ngurah Rai

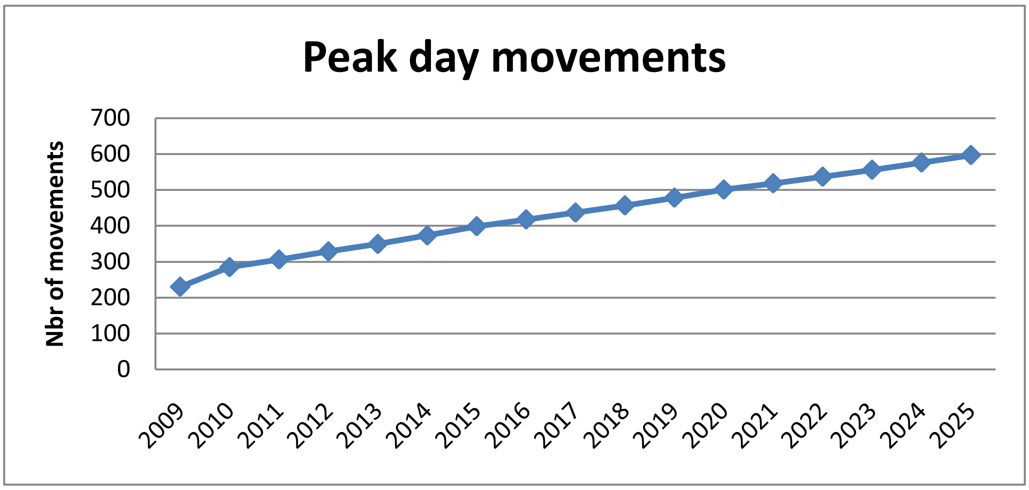
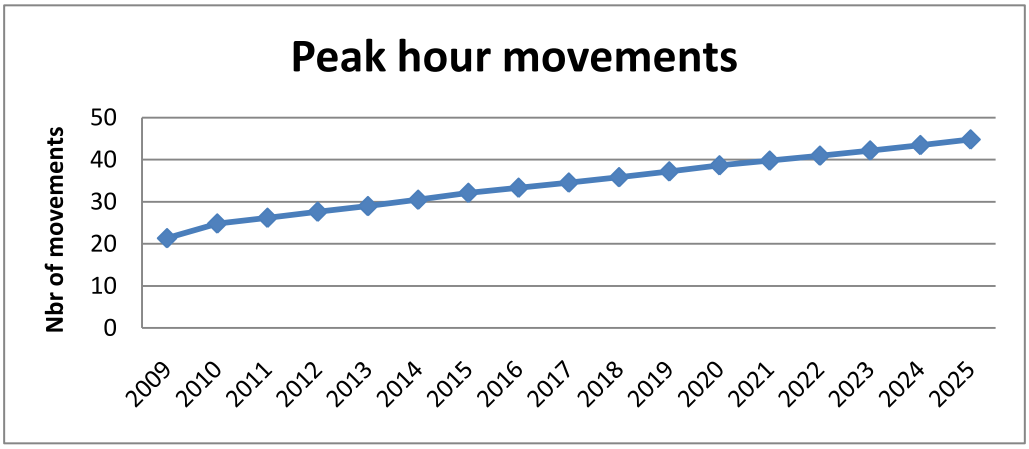
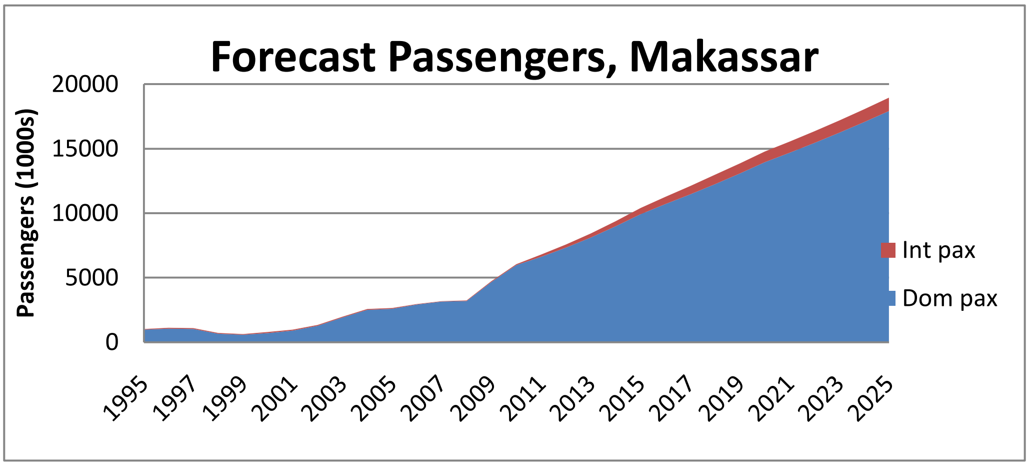


Figure 58: Forecast peak hour movements, Ngurah Rai



4.8.5 Hasanudin – Makassar

Figure 59: Current and forecast passengers, Hasanudin



Note: It is assumed that new international routes will develop during the forecast period.

Figure 60: Current and forecast movements, Hasanudin

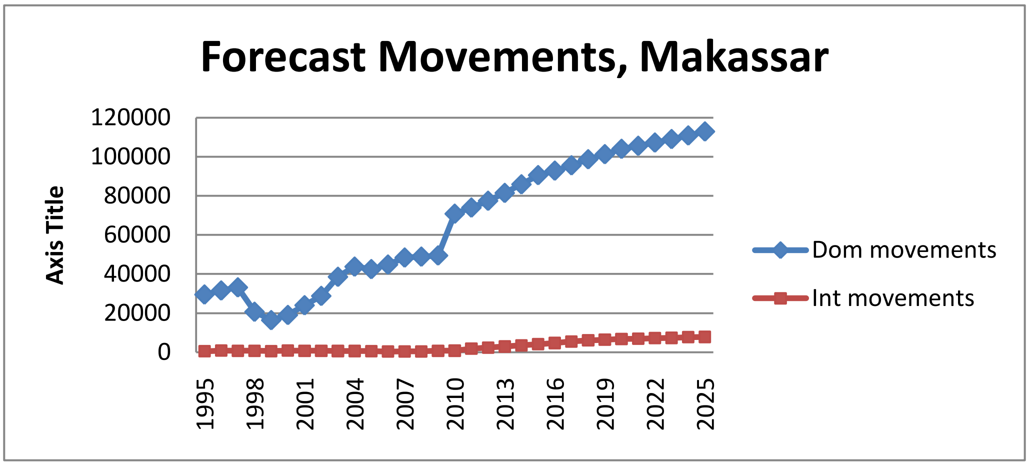


Figure 61: Forecast peak day movements, Hasanudin

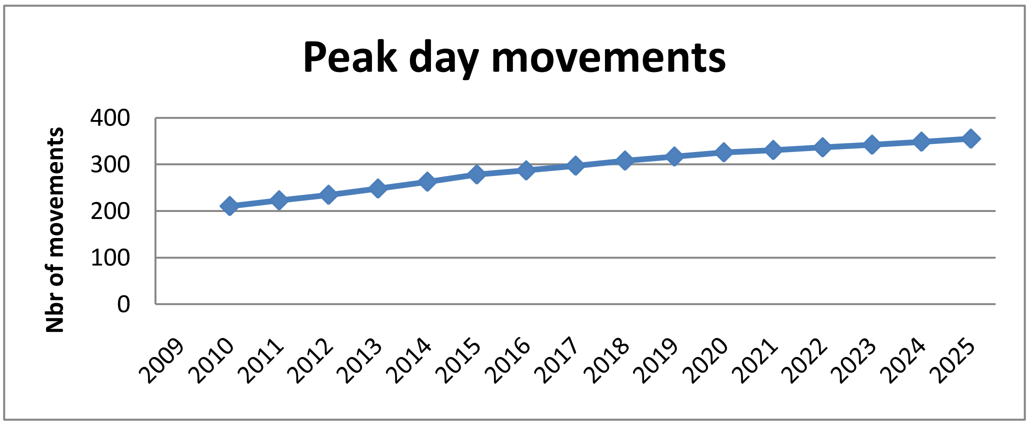
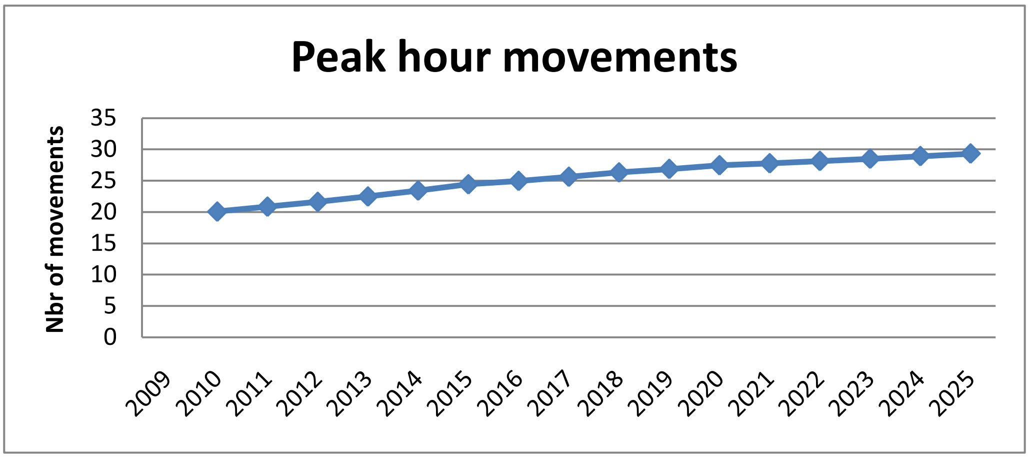


Figure 62: Forecast peak hour movements, Hasanudin



4.8.6 Sepinggan – Balikpapan

Figure 63: Current and forecast passengers, Sepinggan

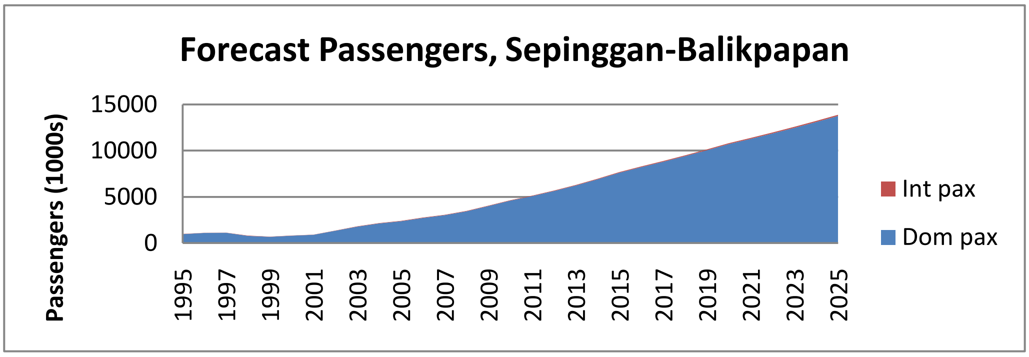


Figure 64: Current and forecast movements, Sepinggan

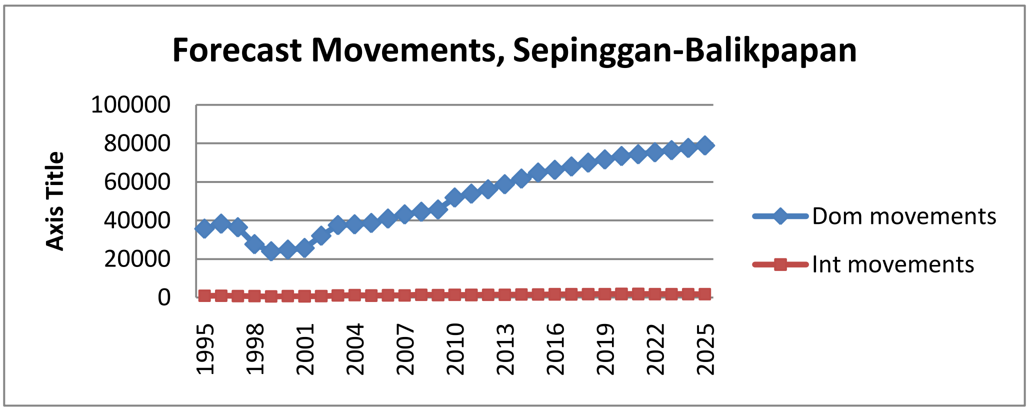


Figure 65: Forecast peak day movements, Sepinggan

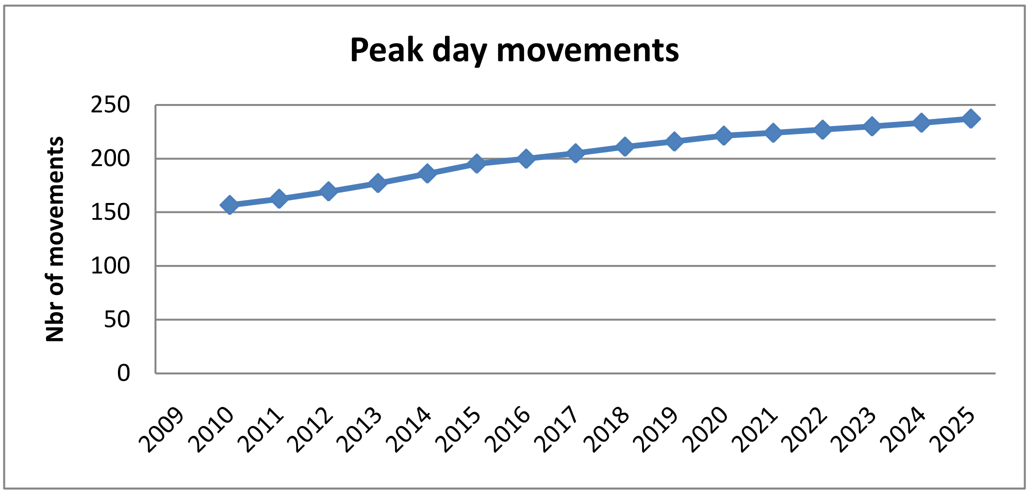
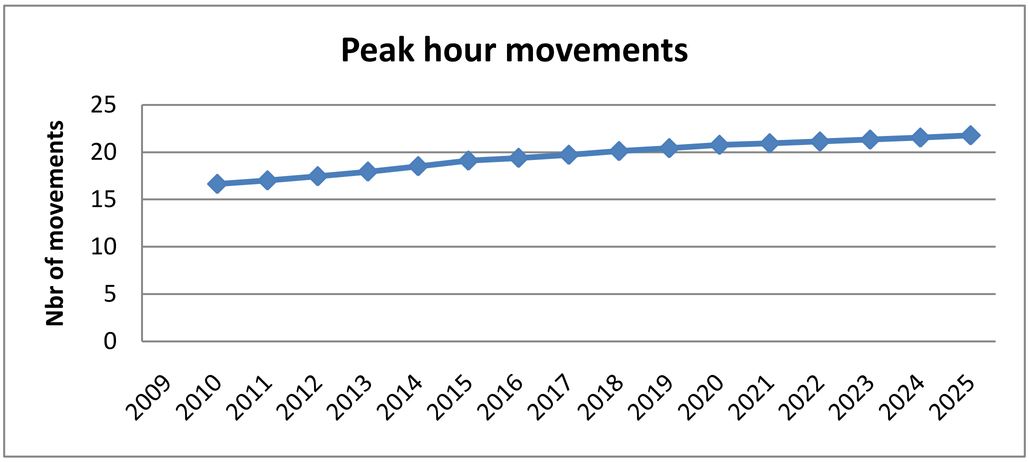
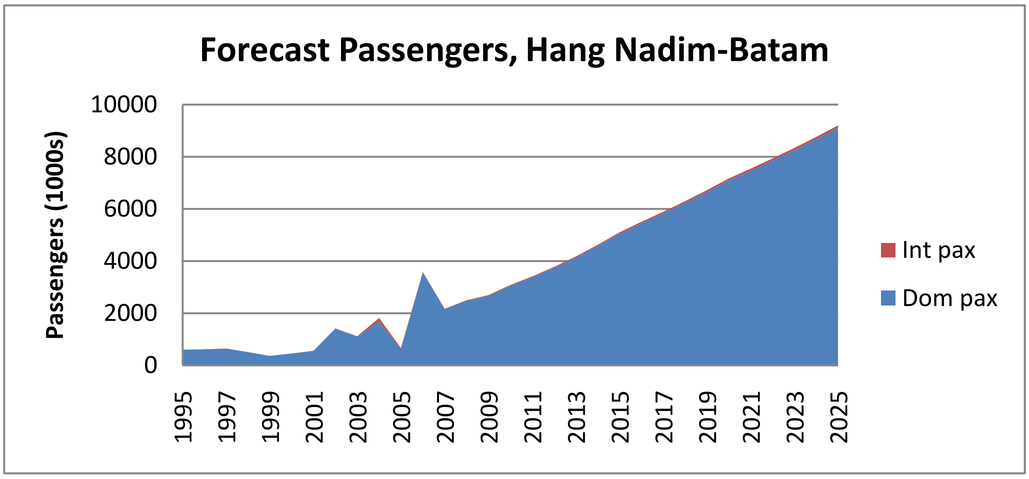


Figure 66: Forecast peak hour movements, Sepinggan



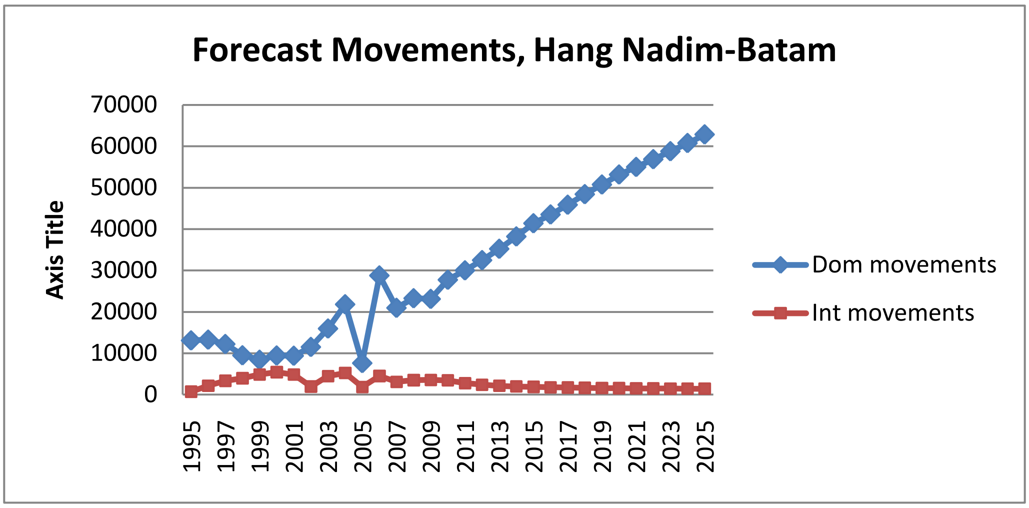
4.8.7 Hang Nadim – Batam

Figure 67: Current and forecast passengers, Hang Nadim



Note: Possible errors in data for 2005 and 2006.

Figure 68: Current and forecast movements, Hang Nadim



Note: Possible errors in data for 2005 and 2006.

Figure 69: Forecast peak day movements, Hang Nadim

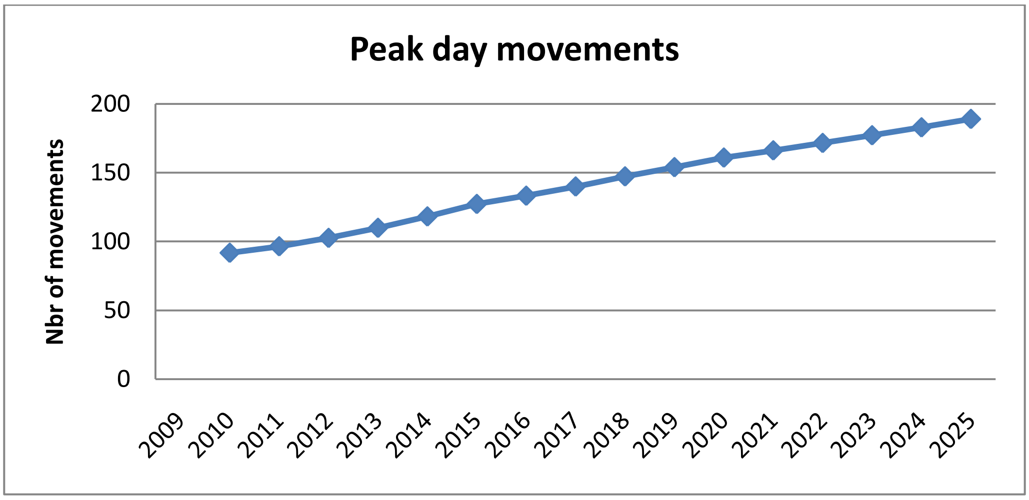
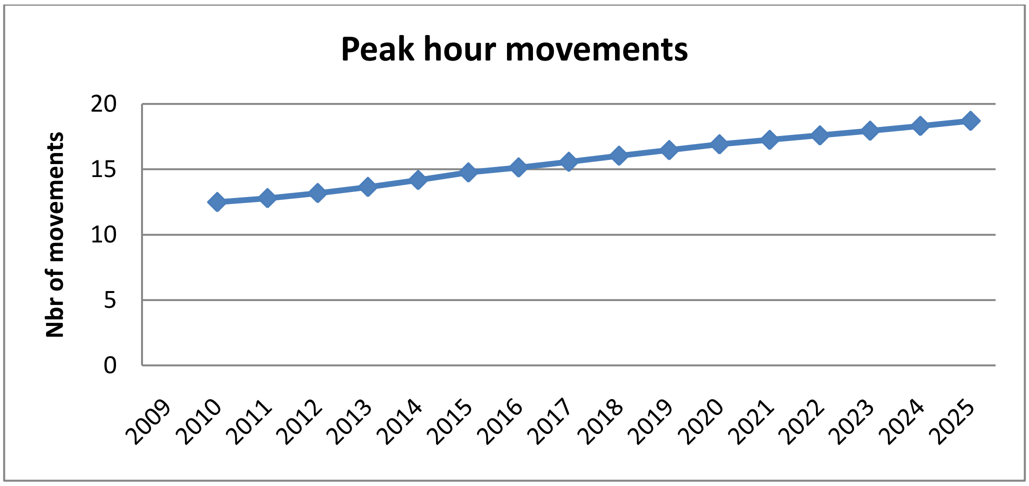
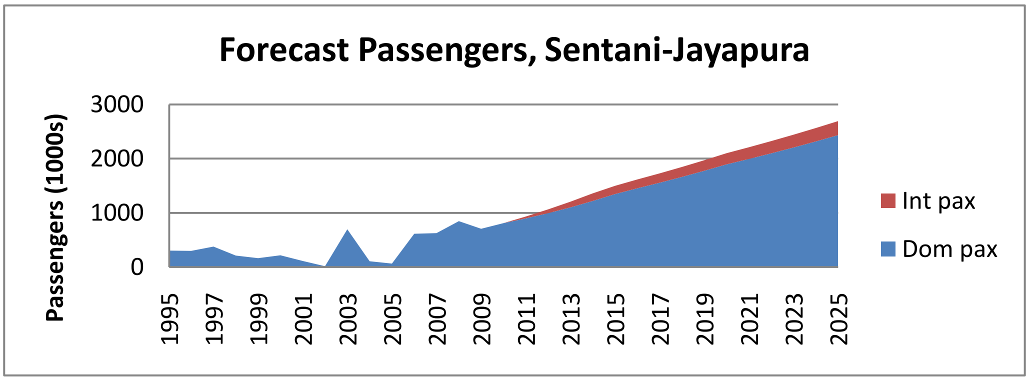


Figure 70: Forecast peak day movements, Hang Nadim



4.8.8 Sentani – Jayapura

Figure 71: Current and forecast passengers, Sentani



Note: It is assumed that international traffic will be introduced during the forecast period.

Figure 72: Current and forecast movements, Sentani

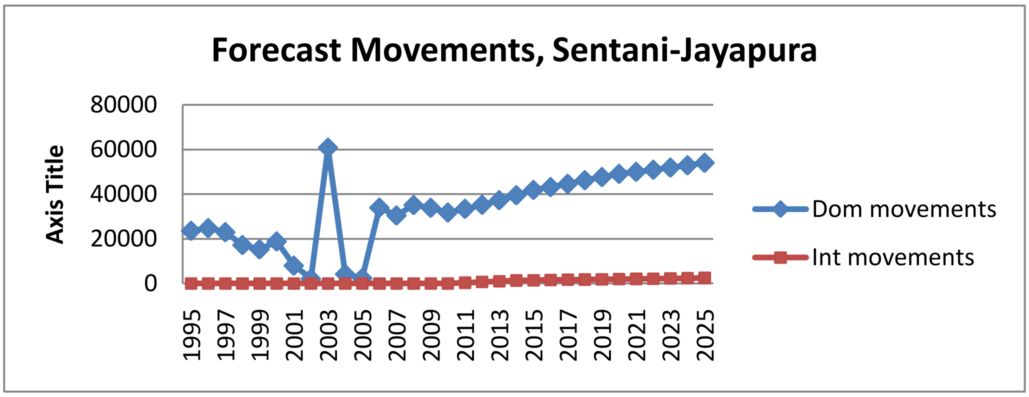


Figure 73: Forecast peak day movements, Sentani

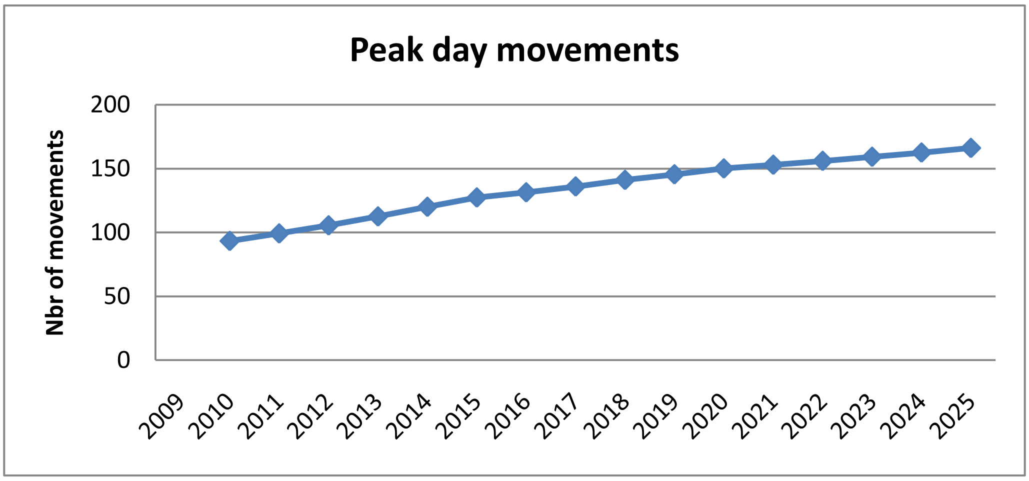
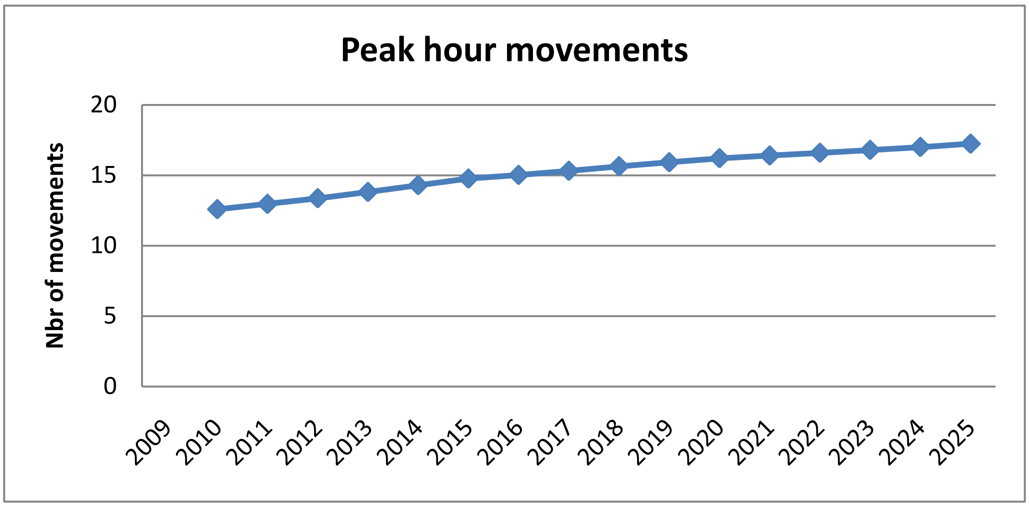
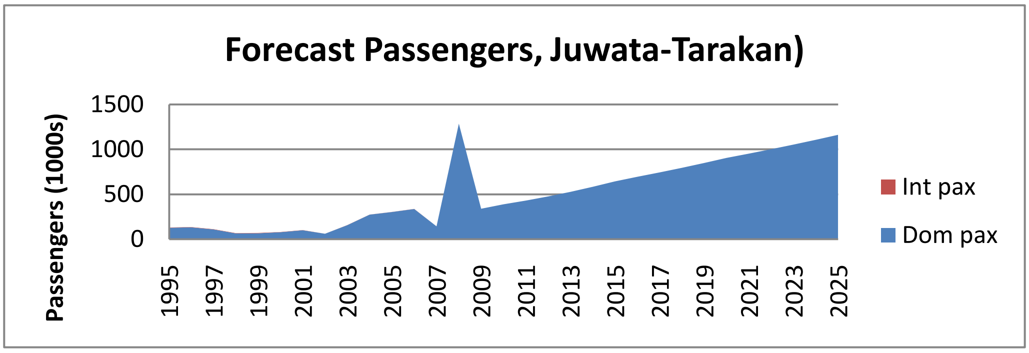


Figure 74: Forecast peak hour movements, Sentani



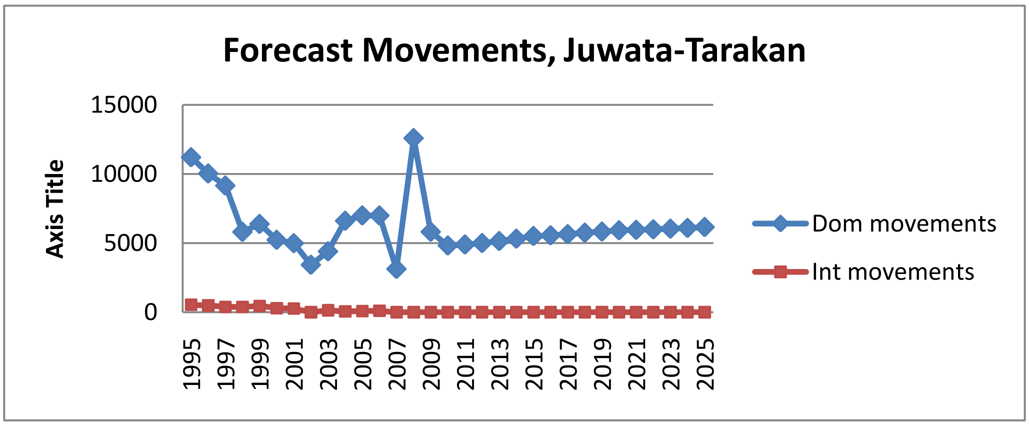
4.8.9 Juwata – Tarakan

Figure 75: Current and forecast passengers, Juwata



Note: Possible error in data for 2008.

Figure 76: Current and forecast movements, Juwata



Note: Possible error in data for 2008.

Figure 77: Forecast peak day movements, Juwata

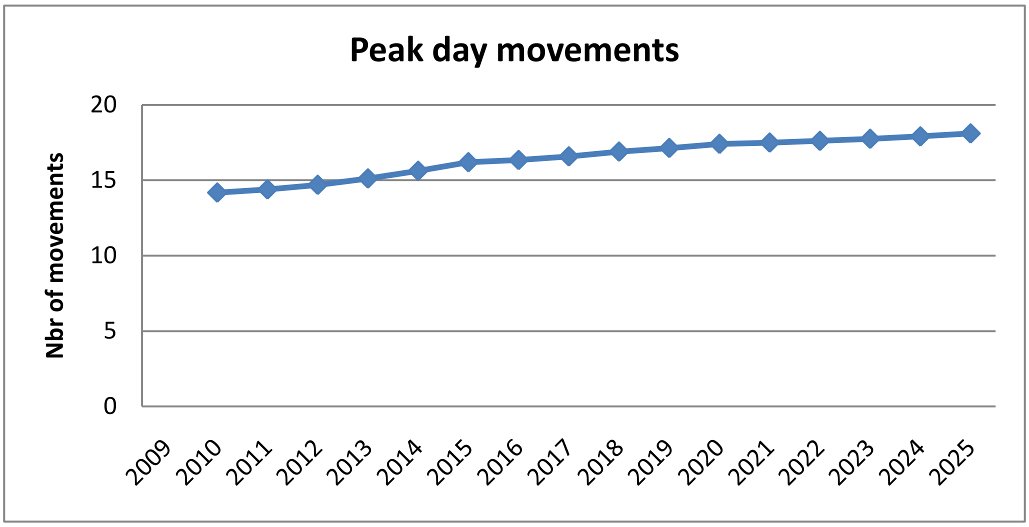
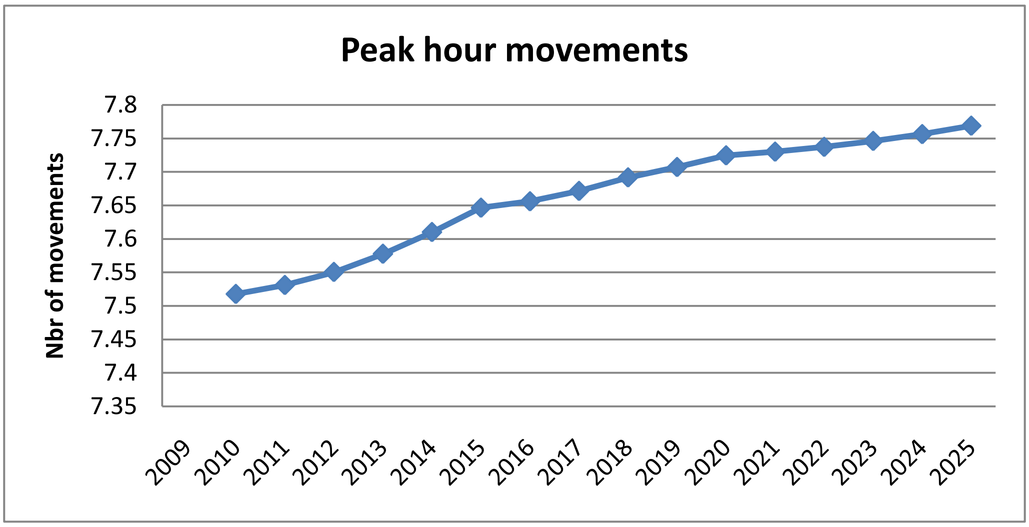
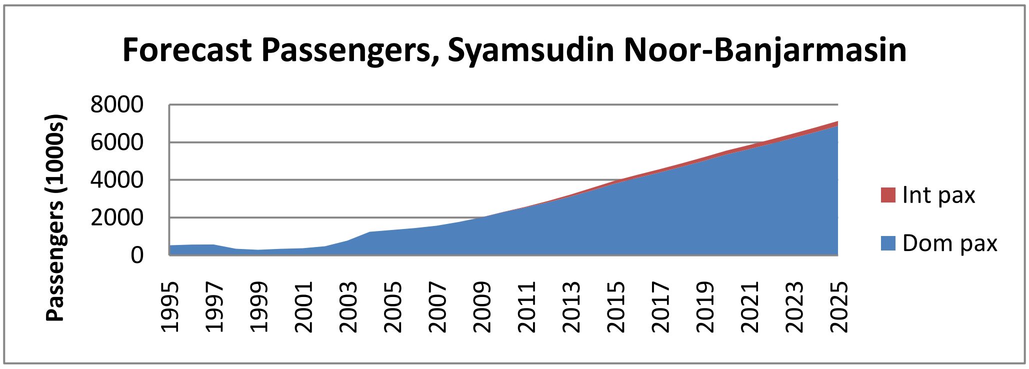


Figure 78: Forecast peak hour movements, Juwata



4.8.10Syamsudin Noor – Banjarmasin

Figure 79: Current and forecast passengers, Syamsudin Noor



Note: It is assumed that international traffic will be introduced during the forecast period.

Figure 80: Current and forecast movements, Syamsudin Noor

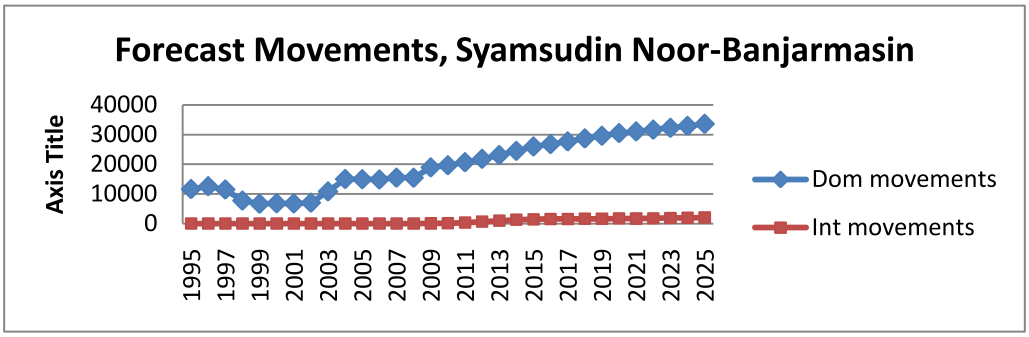


Figure 81: Forecast peak day movements, Syamsudin Noor

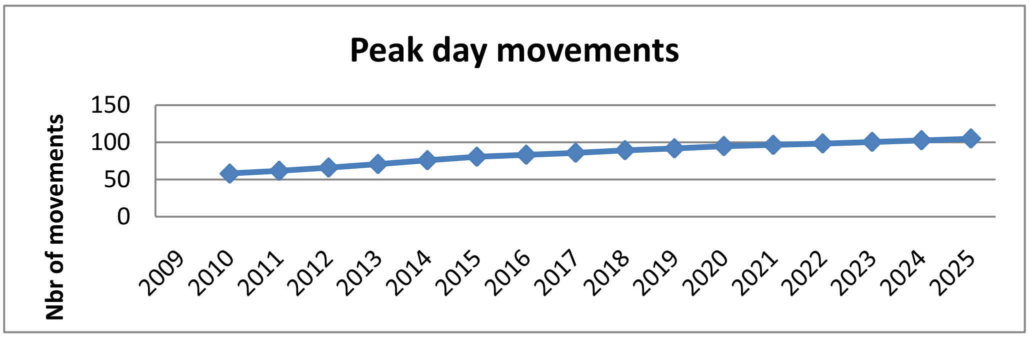
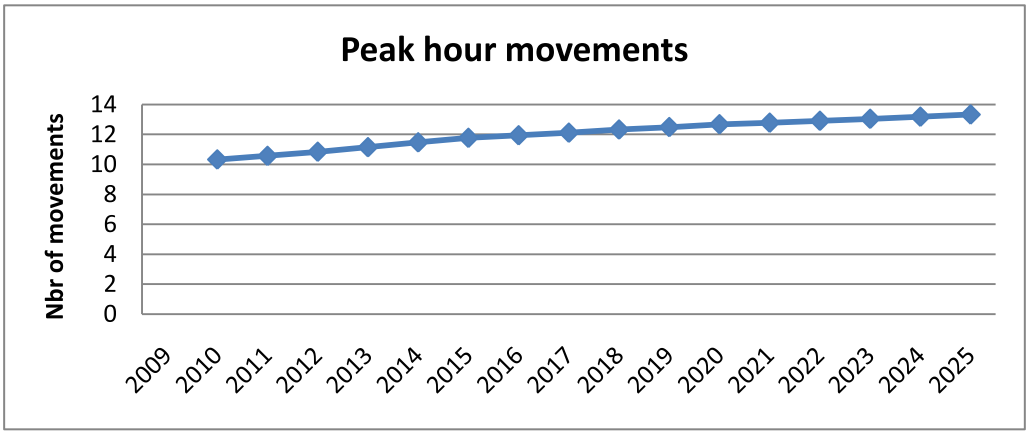


Figure 82: Forecast peak hour movements, Syamsudin Noor



4.8.11 Adi Sutjipto – Yogyakarta

Figure 83: Current and forecast passengers, Adi Sutjipto

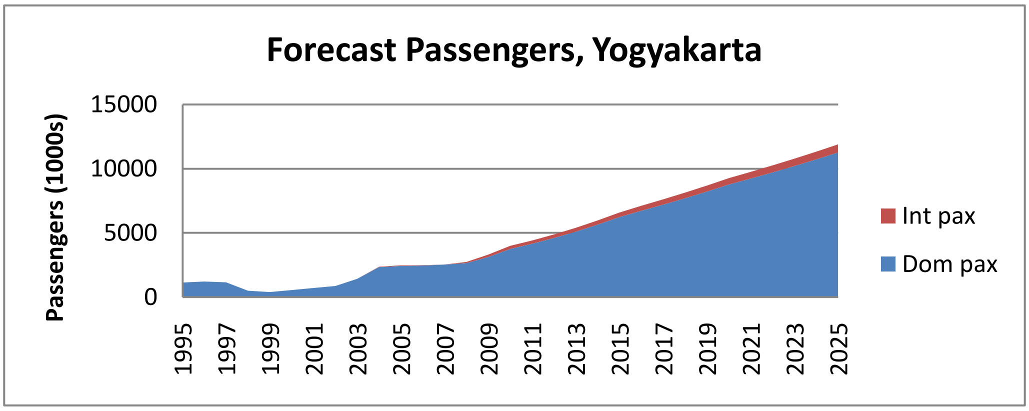


Figure 84: Current and forecast movements, Adi Sutjipto

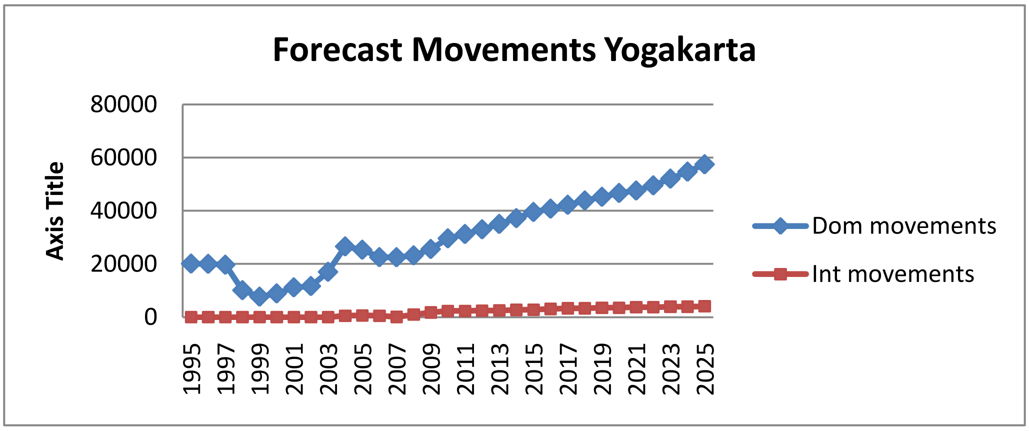


Figure 85: Forecast peak day movements, Adi Sutjipto

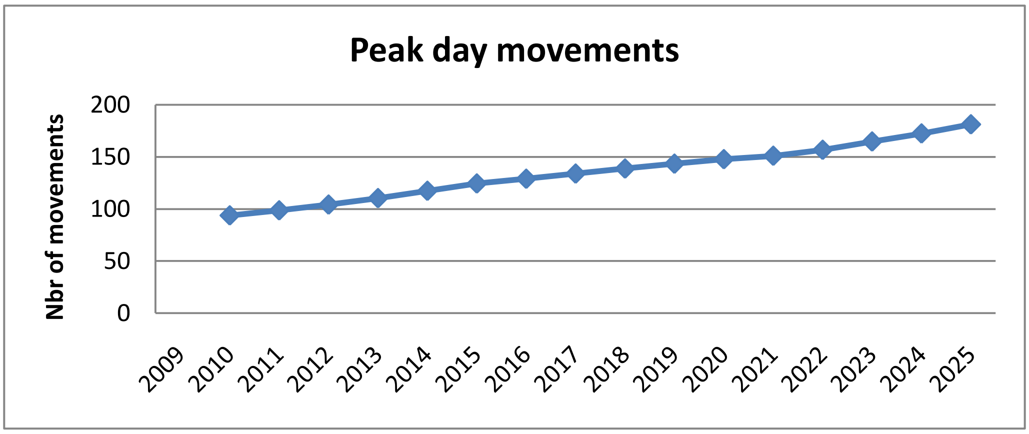
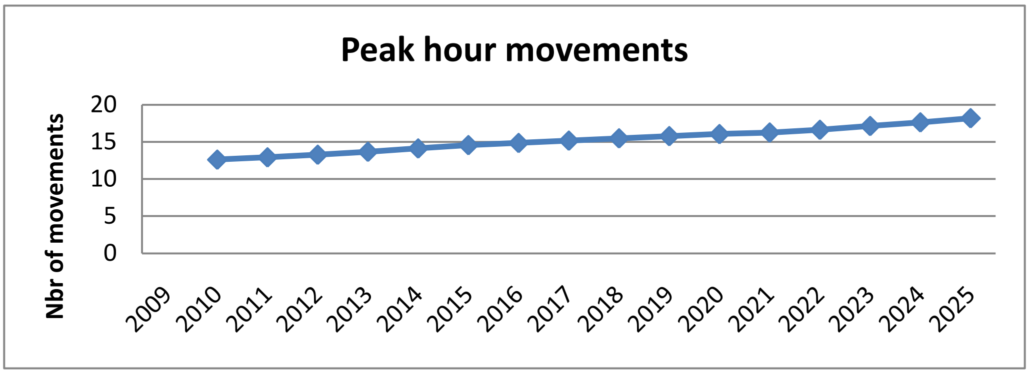


Figure 86: Forecast peak hour movements, Adi Sutjipto



4.8.12Training Area : Budiarto – Curug

No statistical data available at this stage.

4.9 PASSENGERS AND MOVEMENTS, CITY-PAIRS

Passenger volumes and movements have been forecasted for the city-pairs as shown on the map below.

Figure 87: Forecast city-pairs

The forecast has been developed using known annual passenger numbers and movements on each route for 2009. Passenger volume for each route has been determined using the average growth ratio of domestic passengers from the nationwide forecast. The average number of passengers per movement has been determined similarly, using the nationwide forecast's average annual growth ratio for passengers per movement. Movements on each city-pair were then calculated by dividing pax with pax/mvt for each year.

It must be added here that the forecasted number of movements is strictly theoretical and does not take into account arising airspace or airport capacity constraints nor does it take into consideration the effect from increased competition from high speed trains (where applicable) or other modes of transportation. Especially the high density route Jakarta – Surabaya, which is already among the world's top 10 densest routes, will continue to grow and may even become the densest route in the world in 2025, with some 70-90 departures per day in each direction given growth can continue unrestricted.

Figure 88: Possible development of the high-density route Jakarta-Surabaya given unrestricted growth

Figure 89: Forecast of annual movements between Jakarta and Medan given unrestricted growth

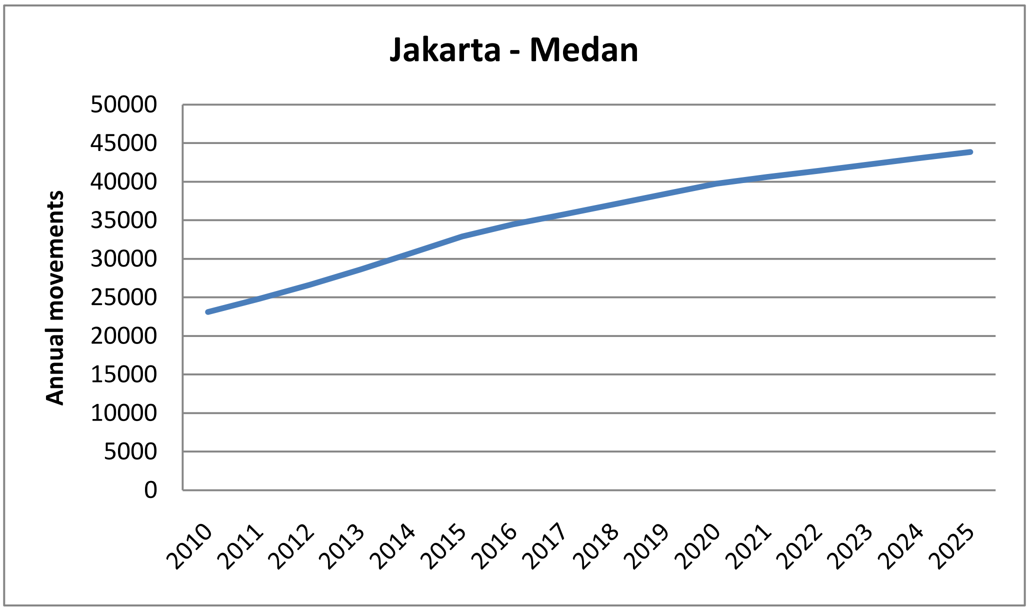


Figure 90: Forecast of annual movements between Jakarta and Denpasar given unrestricted growth

Figure 91: Forecast of annual movements between Jakarta and Makassar given unrestricted growth

Figure 92: Forecast of annual movements between Jakarta and Balikpapan given unrestricted growth

Figure 93: Forecast of annual movements between Jakarta and Batam given unrestricted growth

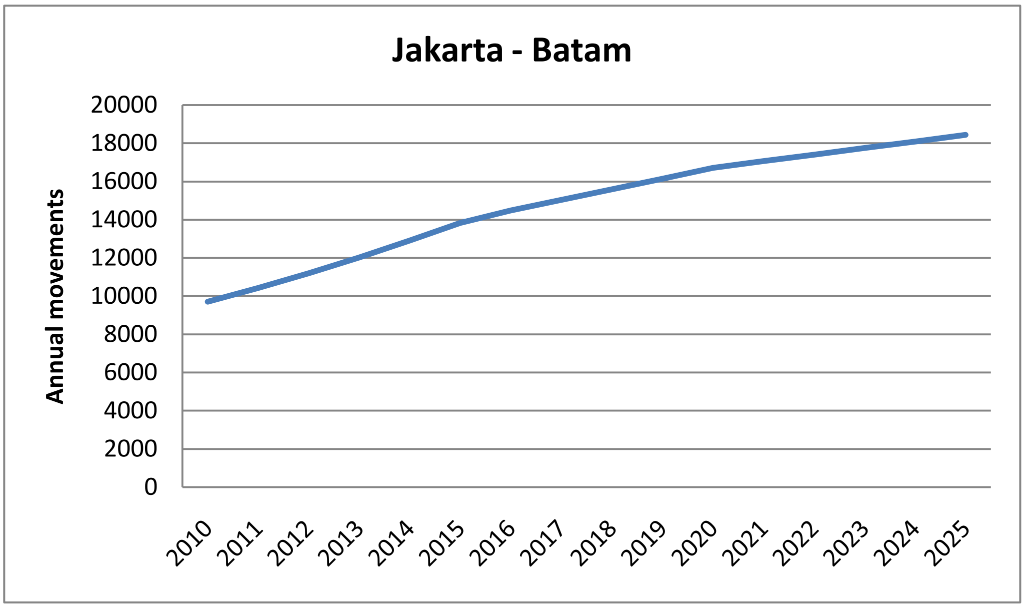


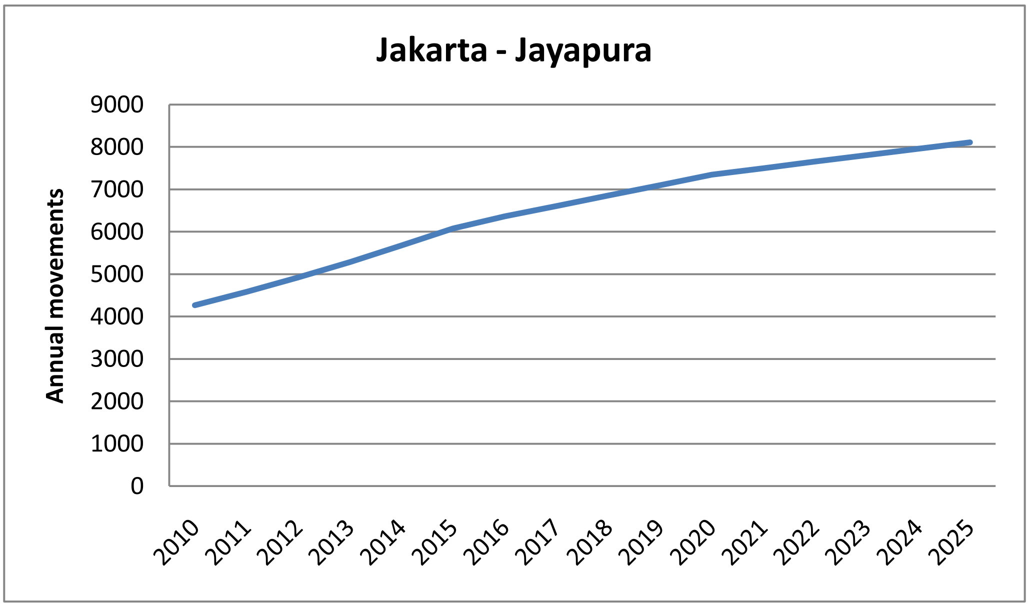
Figure 94: Forecast of annual movements between Jakarta and Yogyakarta given unrestricted growth

Figure 95: Forecast of annual movements between Jakarta and Banjarmasin given unrestricted growth

Figure 96: Forecast of annual movements between Jakarta and Tarakan given unrestricted growth

(Note: Traffic data for year 2009 unreliable)

Figure 97: Forecast of annual movements between Jakarta and Jayapura given unrestricted growth



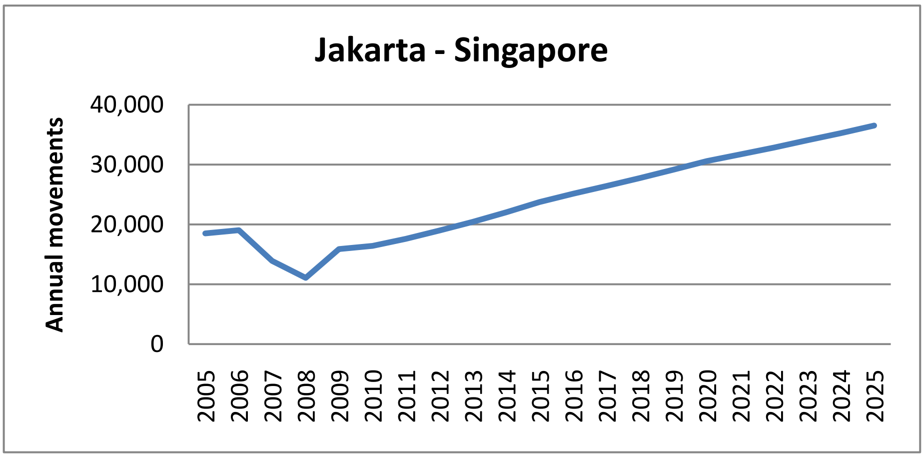
A summary of possible route developments are given in the following maps. As shown, movements are expected to double or triple in the next 15 years. The traffic situation over the island of Java will be particularly complicated due to close proximity to several high-density routes.

Figure 98: Movements between major city-pairs in 2010

Figure 99: Movements between major city-pairs in 2025

In addition to the domestic routes presented above, the very popular international route Jakarta-Singapore has been analyzed using the same methodology which is used for the domestic city-pairs forecast.

Figure 100: Forecast of annual movements between Jakarta and Singapore given unrestricted growth.



4.10 MOVEMENTS ON ATS ROUTES

Statistics on movement at selected airways in Area Control Centre (ACC) Ujung Pandang in eastern Indonesia has been collected from PT Angkasa Pura 1 (AP1). Using the average annual growth ratio for movements in Indonesia determined in section 4.7, the future number of movements at the selected airways can be estimated. Of course this approach will not be completely correct since the characteristics of the traffic will vary over time. New routes, changes in aircraft size and frequencies as well as changes in airspace structure and management will affect how traffic is distributed. The figures below will therefore serve only as a rough estimate of annual movements. “DCT” in the legend to the figures corresponds to the number of flights given a “direct to” clearance, hence not following the airway structure. In UTA East the percentage of DCT flights has been large for a couple of years, however it is beyond the scope of this report to forecast the future share of DCT flights since it is directly related to the progress of the ATM Masterplan implementation.

Figure 101: Possibile development on ATS routes in ACC Ujang Pandang, UTA West.

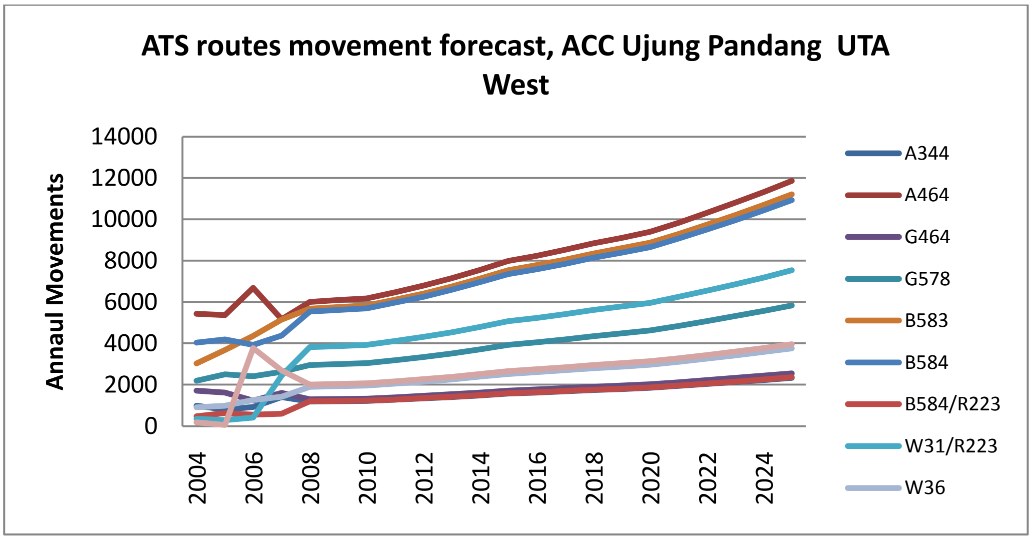
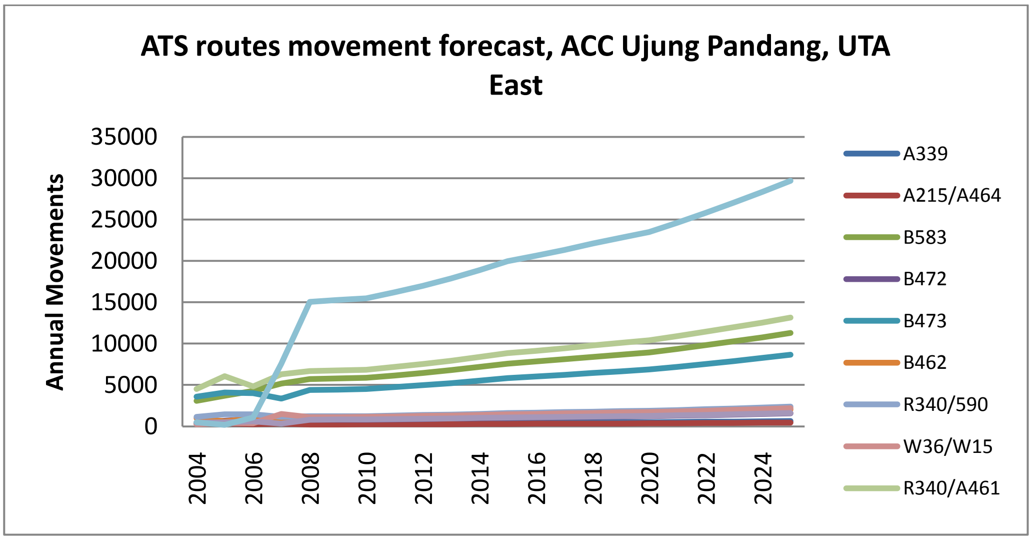


Figure 102: Possibile development on ATS routes in ACC Ujang Pandang, UTA East.



At the time of writing this report, no similar statistics for PT Angkasa Pura 2 (AP 2) has been made available. Hence, a forecast of traffic along ATS routes in the western part of Indonesia cannot be developed at this point.

4.11 OVERFLYING AIR TRAFFIC

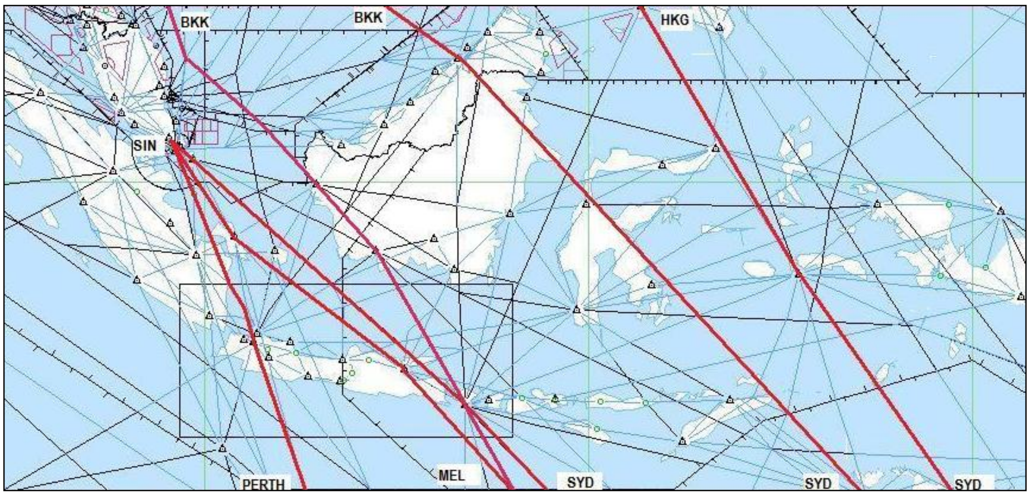
A majority of flights flying over the Indonesian airspace consists of traffic to/from the Australian continent. Aviation statistics have been collected from the Australian Bureau of Infrastructure, Transport and Regional Economics, to get a picture of the current volume of flights. According to statistics from 2009, the number of scheduled international flights between Australia and Southeast Asia was 35,873 (Indonesia not included) whereas the number of flights to and from Northeast Asia was 20,199. Additionally, 130 flights were operated between India and Australia, where at least a part of those flights would have been routed through the Indonesian airspace.

Table 15: Statistics on overflying traffic 2009

Region	Destination countries	Flights	Passengers	Passengers per flight
Southeast Asia	Brunei, Malaysia, Philippines, Singapore, Thailand, Vietnam	35,873	8,260,105	230
Northeast Asia	China, Hong Kong, Japan, Korea, Taiwan	20,997	4,558,797	217
India	India	130	25,432	195
Total		57,000	12,844,244	225

This indicates about 160 daily commercial flights flying over the Indonesian airspace, assuming that traffic is distributed evenly throughout the year. In addition there were some commercial flights to/from New Zealand as well as non-commercial and military flights. According to ICAO statistics, from a sample week in July 2008 the Bangkok-Sydney route had 88 flights, Bangkok-Melbourne had 32 flights and Hong Kong-Sydney had 76 flights. Average annual growth rate in 2002-2008 had been 9.5 percent between Bangkok and Sydney but only 0.4 percent between Hong Kong and Sydney, indicating that the latter route has reached its mature stage.

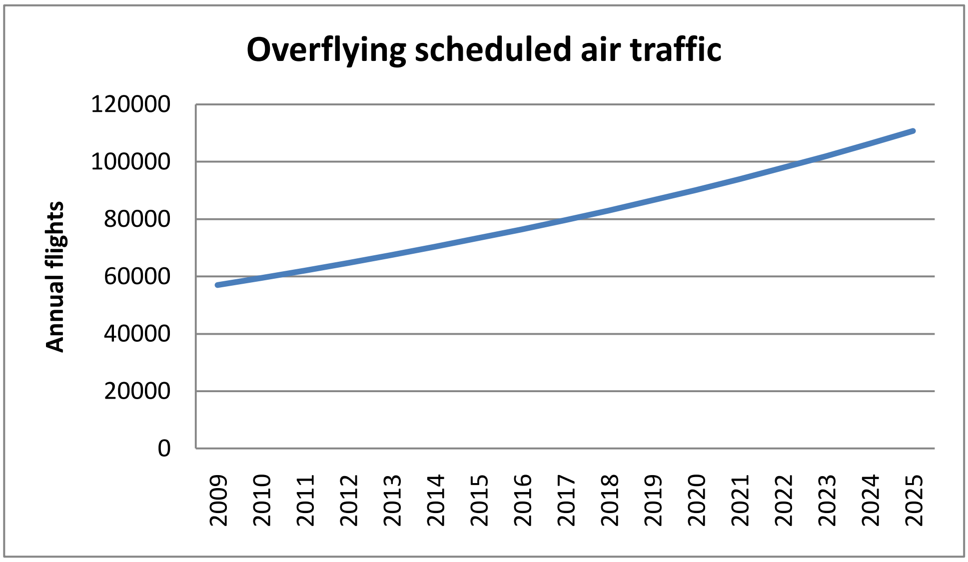
Figure 103: Typical routings for overflying traffic



Although not complete, the picture above illustrates the routing through Indonesian airspace of flights between common city-pairs. The majority of overflying air traffic seems to be routed over the island of Java and Bali to/from the Australian continent, in airspace which is today already heavily congested with domestic flights.

Application of IATA's passenger aircraft movement forecast for the region, 4.3 percent to 2015 and 4.2 percent beyond 2015, provides a good estimate on future development of overflying air traffic.

Figure 104: Forecast of commercial flights overflying Indonesia



As shown in the figure, the amount of flights overflying Indonesia can be expected to almost double in the next 15 years. The concentration of overflying traffic to the region of Java and Bali is likely to continue.

CHAPTER 5: VALIDITY OF THE FORECASTING METHOD

As explained in section 4.2, the forecasts are based on regression analysis using aviation statistics for the 2002-2009 period. This approach entails some implications that should be borne in mind when interpreting the results.

5.1 INDEPENDENT VARIABLES

Only one explanatory (independent) variable is used - GDP. The R^2 value, 89.3 can be interpreted as the amount of variation in air traffic volume that is “explained” by variations in GDP but this rendering must be used with caution. From Figure 21, it is evident that GDP varies very little around an almost continuous growth trend. This means that if the variable GDP is replaced by the variable “time” in the regression analysis, the R^2 value would still be fairly high. Hence, it may be the case that both GDP and air traffic volume have inherent growth trends and that the effect of GDP on aviation is overrated. This problem adheres to all forecasts based on statistical analysis, regardless of the model specification.

The “unexplained” part of air traffic variation, 10.7 percent, is normally attributed to several other variables, e.g. ticket prices (fares), travel speed, cost of alternative travel modes etc. left outside the model. Airline fares are normally the most important one. Findings from regressions on Western European aviation, which is huge, hint that fares is an important factor for domestic aviation but not so much for international services. This is due to the fact that domestic traffic in most of Europe is short-haul and competes with surface transport to a much higher extent than what international services do. Applying this experience on the Indonesian aviation market, it is evident that almost all domestic services have the same characteristics as international services. Due to the size and archipelagic character of the country, very few city-pairs are short-haul and competition from surface transport is in most cases feeble, in particular on inter-island routes where ferries form the only alternative. Against this background, the implicit assumption that fares constitute an insignificant explanatory variable is quite acceptable and would, in all probability, be confirmed by statistical analysis, had the data been available.

A related question is whether the reduction in real (constant-rupee) fares brought about by the arrival of low-cost carriers (LCCs) is a factor that contradicts the conclusion above. The LCC share of the market has been growing in recent years but this growth cannot possibly continue at the same pace until 2025. Consequently, the regression analysis for the 2002-2009 period includes a factor that clearly will be less significant during the coming 15 years. On the other hand, several other factors may outweigh this problem:

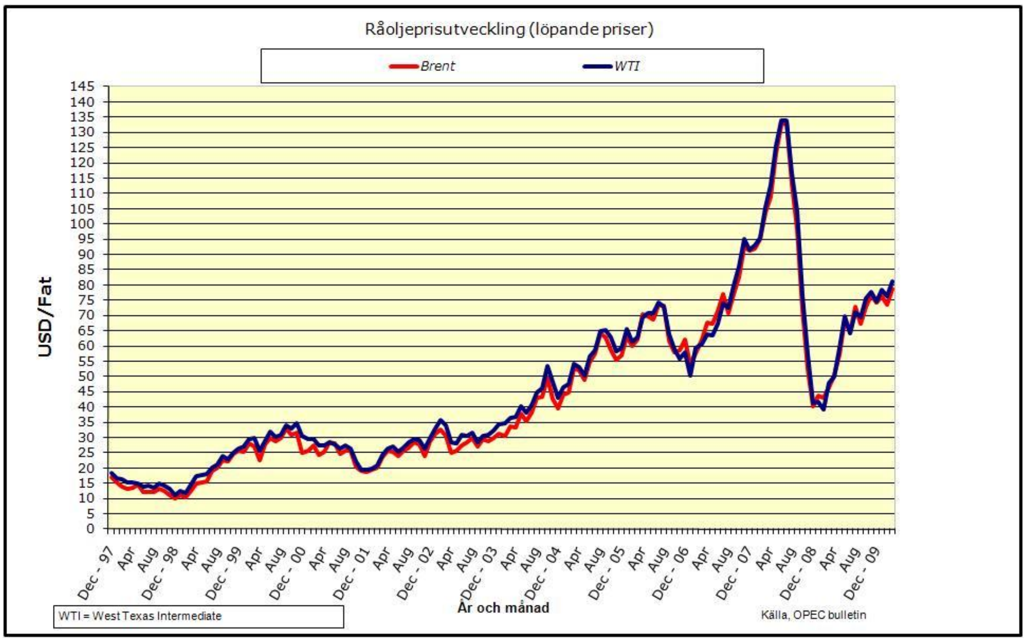
- LCCs attained a noteworthy market share only towards the end of the regression period and will probably continue to grow only in the first part of the forecast period, i.e. regression conditions are mirrored in the forecast.
- Traditional (network- legacy- etc.) carriers will respond to the LCC challenge with lower fares and improved service, even if the LCC growth would halt now.

To sum up, it is unlikely that airline fares in Indonesia will affect the future development of air transport to a significantly higher or lower degree than during the 2002-2009 period. However, actual fare development should be closely monitored and major changes analysed as to their effect on aviation. The arrival of LCCs was not anticipated in the early 1990’s and other surprises will be in the pipeline for the coming 15 years.

5.2 FUEL PRICES

All civil jet and turboprop aircrafts use the same kind of kerosene fuel, quite similar to normal diesel oil. Regional differences in chemical compositions exist but are small. The US uses JET A with 0.07 weight percent sulphur content; Europe JET A1 with 0.02 percent and China Jet Fuel 3 with 0.2 percent. Prices for jet fuel normally follow crude oil prices more closely than what motor vehicle fuels do, due to the fact that no taxes are levied on jet fuel. Variations in crude oil prices can be used as an indicator to see how jet fuel prices vary over time.

Figure 105: Crude oil prices Dec. 1997 – Dec 2009, current US$/barrel



Source: http://www.spi.se/statistik.asp?art=94 24th July 2010. Note: barrel = 156 liter.

As shown by the figure, the 1997-2009 period starts with very low prices, well below USD 20, and ends at around USD 80 after a peak at USD 135 and a rapidly following trough at USD 40. Prior to that, the 1990-91 Gulf war sent prices skyrocketing followed by several years of decline. As all quotations are in current dollar terms, real price development has been a bit less dramatic as inflation alone would have increased prices by at least 25 percent during the 1997-2009 period.

Prophecies about oil price development until 2025 are extremely disparate. Predictions for 2025 vary between several hundred dollars per barrel in the "peak-oil" camp to around 100 among the natural resource optimists. It is far beyond the scope of this report to settle that debate; the issue at hand is whether the price development on which the regression is based (1990-2009) is a reasonable estimation of future price development. The team's answer is yes – the price *trend* during the 2002-2009 regression period is quite steep. The 1997-2009 curve indicates a price of around USD 200 /barrel in 2025 (in current dollars, corresponding to maybe USD 150 in 2009 dollars).

Additional factors tend to balance each other out. It may be that airlines react to rising fuel prices with a lag, in which case the rising prices in recent years are not yet reflected in air traffic volumes. On the other hand, fuel efficiency (burn per seat-km) will continue to improve slowly throughout the forecast period. Finally, before 2025, no alternate fuel will have more than microscopic fractions of the fuel market and no new propulsion technology will replace those currently used in civil aviation.

5.3 CLIMATE POLICY

As hinted above, no taxes are currently levied on commercial aviation fuel. This fact attracts increasing criticism in a situation where carbon dioxide (CO^2) emissions must be curbed and probably decreased well before 2025. The relation between fuel consumption and CO^2 emission is straightforward; one liter of fuel will produce about 2.5 kilo of CO^2 regardless of engine technology. Hence, an alternative to fighting emissions by taxing fuel is to tax emissions, as these can be easily estimated either via fuel burn or flight plan data. Emission fees and tradable emission rights under a cap are the two main methods. The European Union will introduce the latter system for commercial aviation in 2012.[1]

In the team's opinion, it is highly probable that commercial aviation in the ASEAN area will face some kind of climate policy measures in a not too distant future. It is obvious that as this factor was not present during the regression period, its absence will disturb the forecast but it is impossible to estimate its effect. As soon as actual policy measures are known to their design, incidence and level, all forecasts should be revised. In the present absence of this information, the team suggests that when the forecasts are used for planning purposes, an allowance for a 5-10 percent decrease in 2025 traffic volumes should be made.

[1] Details are found at http://ec.europa.eu/environment/climat/aviation/index_en.htm

CHAPTER 6: ENVIRONMENTAL, SOCIAL AND ECONOMICAL FACTORS

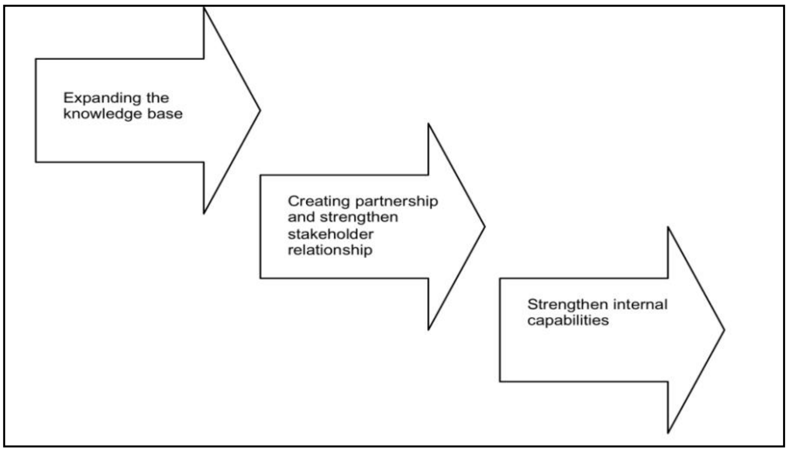
A sustainable approach for Air Traffic Development in Indonesia

Today, airports and aviation constitute complex operations where economic, social and environmental systems need to interact functionally and efficiently. As much as successful development in the aviation sector now requires solid and sustainable foundations; aviation planners and authorities need to design and manage these interacting systems and processes to produce positive business results.

Sustainable development is based on the utilisation of balanced strategies. This means taking a holistic approach to present and future challenges through the integration of economic growth, social equity and environmental management. It has been LFV ACT's experience that a change in management strategy is needed in order to migrate to effective and integrated structural decision-making, whether for incremental improvements or a more comprehensive system and process innovations. In the end, sustainability is about understanding and balancing the visions, goals and needs of all stakeholders, with the balance between creativity and structure being critical to success. This balance between creativity and structure is an ongoing management objective that requires flexibility adapted to the various stages of a particular development initiative. *The substantial development of air traffic expected for Indonesia in the future requires careful considerations.*

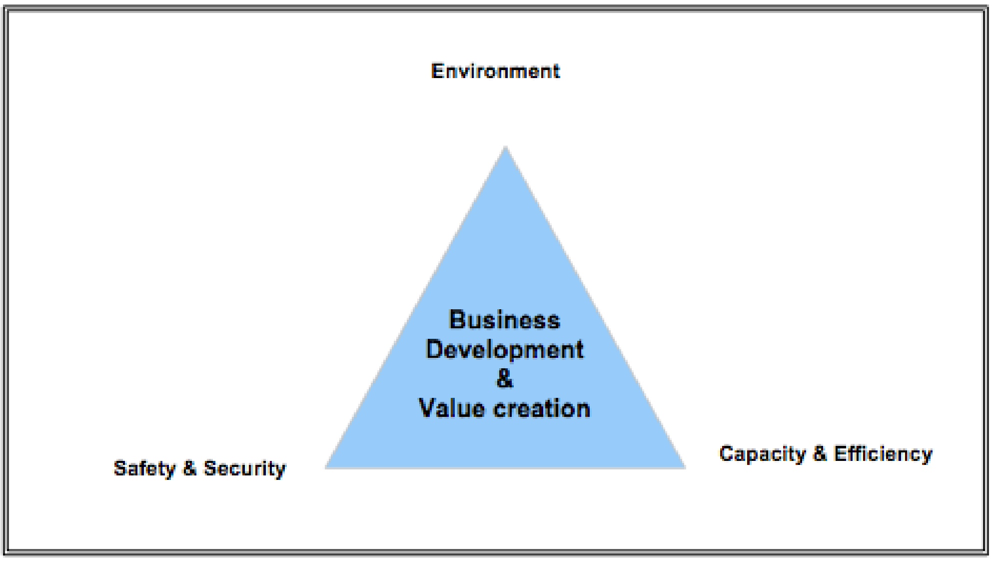
LFV ACT's experience from its own aviation development projects has demonstrated the need to operate on a number of levels to produce the best sustainable business practices. Naturally, all objectives are closely linked and interact both internally and with additional external components. These interactions act both as enhancers and as constraints depending on specific objectives. It is important in any such endeavour, however, to eventually move beyond conceptual frameworks and produce clear processes that result not only in an overview of issues but also a concrete action plan. This concrete plan covers the three main phases which need to be acted upon in order to achieve greater sustainability.

Figure 106: Three main phases to achieve greater sustainability



On-going monitoring, together with statements of intent, review of schedules, as well as access to toolkits, information and workshops, are all important components of a successful development process. Within the context of sustainable development and to build on a concept introduced briefly above, LFV ACT proposes that a sustainable development concept for Indonesia should be based on three cornerstones: the environment; safety and security, and; capacity and efficiency. All three of these areas require full attention and equal weight when decisions are being contemplated to ensure that a solid base for successful business development and long term value-creating capabilities is created.

Figure 107: The three cornerstones in the sustainable development concept



6.1 SAFETY AND SECURITY

Safety and security are the two most important factors when building and maintaining the confidence of both the passenger and society at large for commercial air transport. Together they form the cornerstone for development initiatives and are the foundation of all the economic and social benefits within the air transport system.

The challenge here is to identify and clarify on a global as well as local basis, the main safety and security concerns. Many solutions can be found within current safety and security management systems, and by designing and implementing a comprehensive safety system that fulfils the requirements of an ICAO Certification process for aviation (ICAO Doc no. 9774 AN/969), along with compatible security initiatives, a great deal can be achieved in this regard. Whereas the need for state-of-the-art security and safety technologies and processes is self-evident, the most important objective is to develop and establish proactive and also generative safety and security cultures for continuous improvements.

6.2 CAPACITY AND EFFICIENCY

The economic and social aspects of air transport are well known. Lack of capacity in the present and the future will inevitably lead to undefined and un-quantifiable consequences, including lost productivity for the business traveller who has to delay his departure overseas by a day, or for instance the social costs for a granddaughter who finds herself unable to travel to visit her grandparents. This study aims to provide guidance on how to structure and develop the ATM system.

On the airport level also, capacity is a fundamental concern. Obvious issues are lack of runway capacity, too few taxiways and aprons, terminal size and flows, operational procedures etc. A maybe trivial but relevant example regarding capacity issues on a system level - service levels for an airport's ground service providers are normally dictated via bilateral agreements between an airline and the respective ground handling company. Imagine, however, that an airline signs a contract resulting in a service level that causes delays on perhaps 10 percent of the flights. This may very well be justified for the isolated airline, but what about the consequences for the entire airport due to the delays of this one carrier? Undoubtedly, such isolated planning and decision-making will have cascading effects such as blocked gates/stands, airport traffic flow disruptions, etc.

One likely reason for not coping with issues of this nature is the lack of tools to describe consequences in detail. Collaborative Decision-Making (CDS) represents one tool that can be employed to increase predictability, which is of major importance for airlines and airports in their operations management, and it also serves to enhance decision-making capabilities through information sharing among airport partners. It is now well-understood that increased operational efficiencies resulting from collaborative approaches also result in welcome environmental benefits.

Another interesting area is the unlocking of latent capacity. This can be identified and extracted by using theoretical knowledge as well as best practices developed for runway, taxiway and apron operations. To summarise, when dealing with capacity issues on airports we see a number of inter-related initiatives and developments that need to be dealt with parallel. Examples are:

- Infrastructure investments
- Management initiatives
- Technological development
- Operational initiatives
- Unlocking of latent capacity

6.3 ENVIRONMENT

In the context of continually rising transportation demand both globally in general and specifically for Indonesia, the environmental challenge requires constant consideration. Although air transport today counts for approximately 1 percent of the CO^2 emissions on a global level, the environmental focus on the aviation industry is huge and must be treated with care. Environmental areas relevant for Indonesia are amongst others:

- Noise
- Air Quality
- Water Quality
- Waste
- Energy efficiency
- Climate change.

LFV´s experience reveals that if the environment is integrated into the business development process as a value-adding factor, it becomes more obvious to planners and operators. This approach must be complemented and thoroughly coordinated with regulatory initiatives. Solutions to environmental issues can be found in technical improvements, operational measures and infrastructure investments. There will be a combination of global development in more efficient aircraft engines and more environmentally adapted fuels; on national level with for example ”green approaches” and environmentally adapted construction methods; to local initiatives such as more efficient use of vehicles, provision of alternate ground transportation modes to and from the airport etc. Just as the environment needs to be considered during other phases and planning, the holistic approach requires that profitability and safety concerns are not overlooked and are balanced with regulatory issues when environmental measures are being considered.

As with safety and security initiatives, a structured system such as an environmental management system should form the basis for actual, measurable environmental improvements.

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