2. Need of the Project

2.1 Introduction

2.1.1 Purpose and Structure of this Section

The purpose of this section is to provide information on the need for the project and to describe scenarios with and without the project. This section has been structured as follows:

Section 2.2 – Background presents the historical setting for the project, including a review of the airport planning and development process which led to the existing Hong Kong International Airport (HKIA) and its current operations.

Section 2.3 - Constraints of the Existing HKIA to Meet Future Traffic Demand, explains why the third runway project is needed and why it is considered that there is no other viable alternative to meet the future demands on HKIA.

Section 2.4 – The Benefits of the Project describes the scenarios with the project, and the benefits associated with a three-runway system (3RS) at HKIA.

Section 2.5 – Consequences of Not Proceeding with the Project describes scenarios without the project and the consequences associated with restriction of HKIA as a two-runway system (2RS).

Section 2.6 – Summary provides a brief review of the key points raised in this section.

Section 2.7 – References lists all the reference documents which have been referred to in this section.

2.2 Background

2.2.1 Development of HKIA

2.2.1.1 There are extensive planning studies documenting the historical development of the airport. To appreciate the long-term and continuous airport planning and development process in Hong Kong, the following sub-sections provide an overview of the airport development history leading up to commissioning of the current HKIA at North Lantau.

Overview of Kai Tak Airport (1925 to 1998)

2.2.1.2 Hong Kong has had an international airport for over 70 years. The first airport, Kai Tak Airport, was located along the eastern waterfront of the densely urbanised Kowloon City District. The airport’s facilities were progressively expanded throughout the years to handle up to 24 million passengers and 1.5 million tonnes of cargo annually. However, by 1996 the airport had far exceeded its annual design capacity and was handling 29.5 million passengers\(^1\) and 1.56 million tonnes of freight, making it the third busiest airport in the world in terms of international passenger traffic and the busiest in terms of international cargo throughput [1] at that time.

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\(^1\) This number excludes transit passengers
Early Studies on Airport and Development Needs in the 1970s and 1980s

2.2.1.3 As early as the 1970s, and throughout the 1980s and early 1990s, the need for replacing Kai Tak Airport was identified and debated. Key reasons cited for the airport replacement included [2]:

- Kai Tak Airport was approaching its maximum capacity. The capacity of Kai Tak Airport was ultimately constrained by its single-runway system;
- The location of the airport affected approximately 350,000 people living under the flight paths (and who were subject to aircraft noise levels exceeding internationally accepted standards);
- The location imposed physical constraints to aircraft arrivals / departures and created less than ideal safety standards; and

- Continuation of Kai Tak Airport at full capacity would severely limit local economic growth, which could result in Hong Kong losing out to neighbouring competitors as the major centre for trade, finance and commerce.

2.2.1.4 Options for the expansion of Kai Tak Airport were considered first; however due to constraints associated with marine safety and reclamation further south of the existing runway, these options were not considered viable. In view of the Government's priority to retain (and enhance) Hong Kong's sea port and airport facilities and given the lack of practical and cost-effective options to enhance the capacity of the old single-runway airport, alternative sites for a replacement airport were then considered.

2.2.1.5 A number of studies were commissioned in 1970s and 1980s to review the overall development of Hong Kong, including options for a replacement airport. A chronological account of the major studies is as follows:

- Hong Kong Air Transport System Long Term Planning and Investigation Studies (ASTI) - 1973
- Consultancy Report for the New International Airport at Chek Lap Kok - 1980
- North Lantau Development Investigations (NLDI) – 1980 to 1984
- Replacement Airport at Chek Lap Kok Master Plan Consultancy Final Report - 1982
- A Chek Lap Kok airport master plan was produced as part of a full master plan study in 1982, with associated planning, civil engineering, design, environmental analysis and construction
programming completed in 1983 [4]. However, due to economic downturn, these projects were discontinued.

Port Development Strategy Study - 1986

2.2.1.10 This study looked at the long-term port requirements in Hong Kong and provided recommendations for port expansion to 2001 [4]. This led to subsequent proposals for Western Harbour – Lantau Strategic Development (WH-LSD), which included major expansion of deep water berth facilities in the western harbour; a new airport either at Chek Lap Kok or in the vicinity of Peng Chau – Hei Ling Chau, and associated large scale urban development areas [4].

Development Potential of Hong Kong International Airport – The Kai Tak Consultancy - 1988

2.2.1.11 Following increases in airport activity in the mid-1980s, this study re-examined the demand, capacity and other constraints on development of Kai Tak Airport. The study estimated that Kai Tak Airport’s ultimate capacity would be exhausted by 1996 and the programme of improvements required to reach the ultimate capacity would cost in the order of HK$ 2.4 billion [4]. In the absence of a replacement airport, economic losses between 1996 and 2010 were estimated at HK$ 101 billion, excluding other unquantifiable losses to business opportunities [4]. These findings revived plans for the replacement of Kai Tak Airport.

Chek Lap Kok Airport Master Plan Review Final Report - 1988

2.2.1.12 This study reviewed the findings of the Replacement Airport at Chek Lap Kok Master Plan Consultancy study and reconfirmed the results.

Alternative Replacement Airport Site Study (ARAS) - 1989

2.2.1.13 This study examined suitable locations (in addition to the Chek Lap Kok site) between Lantau and Lamma islands where a twin-runway replacement airport could be developed. It identified the potentially suitable alternative sites, which were subsequently taken up by the Port and Airport Development Strategy (PADS) study for further comparison with the Chek Lap Kok site [2]. The PADS study formed a crucial turning point that led to the decision by Government to confirm and adopt the Chek Lap Kok site as the new site for a two-runway airport.

Port and Airport Development Strategy (PADS)

2.2.1.14 Following on from the earlier studies, a long-term strategy on port and airport development was required both to consolidate the findings of the previous studies as well as to present a more holistic way forward. Thus in 1988, PADS was commissioned.

2.2.1.15 The PADS study comprised an assessment of the combined land uses of port facilities, container port back-up facilities, airport, industry and warehousing, and residential development. The strategy for these combined land uses largely centred around the development scenarios for the airport. Following the findings of the earlier studies, three airport location scenarios were appraised:

Scenario A – airport retained at Kai Tak
Scenario B – airport relocated to Chek Lap Kok, North Lantau

Scenario C – airport relocated to east Lantau / Western Harbour (based on the findings of the ARAS study)

2.2.1.16 For each of these scenarios, a number of potential initial options were created based on various combinations of airport, port, industry and residential uses and locations. A total of 46 initial options were drawn up and subsequently 12 preferred options were identified [4]. This was then reduced to one recommended strategy for each airport location scenario.

2.2.1.17 Each of the recommended strategies was appraised to compare the advantages and disadvantages under the major categories of economic performance, environmental and social impact, programming, flexibility and financial performance. The findings of the strategies appraisal was submitted to the Government, and in 1989, the Government announced the decision to adopt the strategy that incorporated a replacement airport at Chek Lap Kok [4].

North Lantau Development Study

2.2.1.18 The proposed new airport at Chek Lap Kok and its high capacity road and rail connections represented requirements and pressure for urban development on Lantau. The North Lantau Development study was commissioned in 1990 to provide an appropriate context for the detailed planning, engineering feasibility, traffic and transport, as well as environmental studies needed to implement PADS in the North Lantau area. It involved formulating a Recommended Outline Development Plan (RODP) for the study area and included a comprehensive Environmental Impact Assessment (EIA) study for the development [5]. The final report was published in 1992.

New Airport Master Plan 1992

2.2.1.19 After Chek Lap Kok was selected for development as the ‘new’ airport site, a New Airport Master Plan (NAMP) study was initiated in 1990. This study comprised a planning report, a civil engineering report and an EIA.

New Airport Master Plan EIA Study 1992

2.2.1.20 The planning and civil engineering reports produced a range of conceptual infrastructure and facility designs, proposed construction methodologies and operational forecasts, which were used as the basis for the development of detailed designs. The NAMP-EIA defined how identified environmental impacts of building and operating HKIA could be minimised, proposing associated environmental controls, mitigation measures and monitoring and audit requirements for construction and operation stages. The study focused on identifying potential impacts on noise, air quality, water quality, marine and terrestrial ecology, waste, and aesthetics (visual). Based on the findings of the NAMP EIA, some of the key recommendations included [6]:

- Retain the sea channel between North Lantau and Chek Lap Kok to enable natural flushing of the Tung Chung Bay area (thereby reducing adverse impacts on water quality);

- Implement various control measures on pollutant discharge from the operational airport including oil interception facilities, spillage response plans and routine environmental monitoring;
- Select the runway configuration and alignments with less potential for noise impacts on nearby noise sensitive receivers, and locate aircraft maintenance facilities further away from the North Lantau residents and distant from passenger handling areas;

- Set aside the southern tip of Chek Lap Kok (Scenic Hill) both to reduce noise impacts to North Lantau residents during the construction stage and then to retain its natural character by designating an open space reserve to form a green gateway for HKIA;

- Adoption of airport operations designed to minimise freshwater use, incorporating the use of seawater for cooling and flushing in many airport buildings, as well as provisioning for a greywater treatment plant, which would enable the re-use of wastewater;

- An approach requiring stormwater drainage from all areas with potentially polluting activities to discharge away from the more sensitive southern sea channel; and

- Recommendations on a range of mitigation and compensation measures including tree-planting on North Lantau, mangrove planning in Tai O and support of further ecological studies, for example on local seagrass communities and species such as Romer’s Tree Frog.

2.2.1.21 While the aforementioned recommendations were made in the NAMP EIA to minimise environmental impacts associated with operation of the airport at the Chek Lap Kok site, it should be noted that the decision to move the airport from Kai Tak to Chek Lap Kok enabled a substantial reduction of adverse noise impacts to large areas of urban Kowloon. This occurred because the Chek Lap Kok location allowed flight paths to be routed mainly over the South China Sea and away from urban areas, thereby substantially reducing the number of sensitive receivers potentially affected by aircraft noise.

**Airport Core Programme Projects**

2.2.1.22 To commence construction of the new airport and associated developments, a set of 10 major projects known as the Airport Core Programme projects was commissioned. These comprised the Chek Lap Kok Airport, Tung Chung Development Phase I, North Lantau Expressway, Airport Railway, Lantau Fixed Crossing, Route 3, West Kowloon Reclamation, West Kowloon Expressway, Western Harbour Crossing, and Central & Wanchai Reclamation Phase I. Another set of projects related to port developments was also adopted. Work on the infrastructure to that would link with the new airport began in 1991 [7].

**New Airport Master Plan Update 1998**

2.2.1.23 In 1998, a NAMP-EIA update was published. The update reported on the status of implementation of environmental commitments made in the 1992 NAMP-EIA relating to the design, construction and operation of HKIA. The update also included the projection of new noise contours according to a commitment in the 1991 NAMP-EIA. Changes from the 1992 contours resulted mainly from alterations to the flight track design and proposed runway operation modes that were made after approval of the 1992 NAMP. The new noise contours reflected a substantial improvement in noise impacts resulting from the operation of the airport, as the proposed changes meant that Ma Wan and a section of Castle Peak Road were no longer within the 25 Noise Exposure Forecast (NEF) contours [8]. The study also reconfirmed the recommendations of the NAMP EIA 1992 and the effectiveness of the sea channel in maintaining the flushing capacity of North Lantau and Tung Chung Bay, thereby demonstrating that long-term water
quality deterioration (and associated adverse impacts to marine ecology) was successfully prevented.

2.2.2 Operation of HKIA at Chek Lap Kok

2.2.2.1 Since its opening in 1998, HKIA has been recognised for the quality of its services as evident from worldwide recognition as the best airport for more than 50 times by different trade / travel organisations over the past 15 years.

2.2.2.2 HKIA has achieved similar operational accolades elsewhere, ranked as the world’s busiest international cargo airport since 1996 [9], and third busiest airport for international air passengers in 2013 [10]. This rapid growth in traffic demand is due to many factors including the following:

- HKIA’s strategic position within Asia Pacific, allowing it to develop the best connections which in turn attracts transfer traffic for both passengers and cargo;
- The Hong Kong Special Administrative Region (HKSAR) Government’s progressive liberalisation policy on air services which opened access to a wide network of destinations worldwide;
- Professional airport management, operation and continued investment in airport infrastructure;
- Investments and contributions made by Hong Kong based airlines and other airport stakeholders; and
- Hong Kong’s overall economic growth.

2.2.2.3 Over the years, HKIA has played a significant role in Hong Kong’s economy, providing jobs both directly and indirectly (refer to Section 2.4.4) as it experienced high growth rates in passengers, cargo and air traffic movements, converting it into an international and regional aviation and logistics hub.

2.2.3 HKIA’s Hub Status

2.2.3.1 A hub airport is defined as an airport with connections that allow both the direct and indirect transport and transfer of passengers and cargo between destinations other than (but nevertheless via), and including, the hub itself. This means that the airport is not simply for the purpose of transporting local people, tourists and goods into and out of the territory. A hub airport performs a larger role by allowing the transfer / transit of passengers and goods to other destinations via the hub airport, and with it, a wide range of associated logistical and economic gains for the territory in which the hub airport is based.

2.2.3.2 An example of these ‘gains’ is market opportunities. Some direct flights to destinations with emerging markets are only economically feasible due to the transfer / transit demand (i.e. there would not be enough demand from local residents of the two departure / destination cities to enable direct connections to be commercially viable). In the absence of a hub airport, there would be next to no transfer / transit passengers and such direct connections would not exist. Consequently, the associated economic opportunities to these emerging markets would be lost. A hub airport is thus considered to be a strategically important component of the competitiveness of a city.
2.2.3.3 As a hub airport, HKIA serves traffic originating or terminating in Hong Kong (origin-destination traffic) as well as transfer traffic of passengers and transhipment of cargo around the world, facilitated by its capacity and 24-hour operations. More than 100 airlines provide services between Hong Kong and around 170 destinations, including 50 in the Mainland. HKIA's advantageous geographical location at the heart of Asia Pacific region, together with the growing Mainland market means that nearly half of the world's population live within five hours flying time from Hong Kong [12].

2.2.3.4 The growth in throughput and connectivity that HKIA has experienced since its commissioning reflects HKIA's status as an international and regional aviation hub. In 1998, HKIA handled 28.6 million passengers and 1.6 million tonnes of cargo, with 450 air traffic movements (ATMs) per day to about 120 destinations [12] or totalling 163,000 ATMs per year (rounded to the nearest thousand) [11]. By the end of 2013, the level of throughput has risen to 59.9 million passengers and 4.1 million tonnes of cargo, with more than double the number of ATMs as compared with 1998 figures. Table 2.1 shows the historical throughput of HKIA between 1998 and 2013.

Table 2.1: Historical Throughput of HKIA (1998 – 2013)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of passengers handled (millions per year)</td>
<td>28.6</td>
<td>27.4  (-4%)</td>
<td>48.6  (70%)</td>
<td>59.9  (109%)</td>
</tr>
<tr>
<td>Quantity of cargos handled (million tonnes per year)</td>
<td>1.6</td>
<td>2.6  (62%)</td>
<td>3.6  (125%)</td>
<td>4.1  (153%)</td>
</tr>
<tr>
<td>ATMs (per year)</td>
<td>163,000</td>
<td>188,000 (15%)</td>
<td>301,000 (84%)</td>
<td>372,000 (128%)</td>
</tr>
</tbody>
</table>

Note: ATM numbers have been rounded to the nearest thousand.
Percentages inside bracket represent the percentage increases over the corresponding 1998 figures.
2003 is the worst performance year due to SARS outbreak.

2.2.3.5 This substantial increase in throughput signifies the importance of HKIA for transport of passengers and cargo throughout Asia Pacific and beyond. The importance of maintaining Hong Kong's hub position is also expressed in the 2013 Policy Address by the Chief Executive,

“We will continue to improve our aviation, maritime and land transport facilities and their connectivity, and reinforce and enhance Hong Kong's role as a regional hub for passenger and cargo traffic.”

2.2.3.6 To meet the continued expectations of HKIA as an aviation hub, regular monitoring of existing and future demand against the capacity of HKIA is needed to ensure that plans for expansion and improvements to HKIA are optimised to meet demands without compromising on service quality.

2.2.4 Enhancements to the Existing Two Runway System

2.2.4.1 As passenger and cargo demands at HKIA grew, facilities and services at HKIA also expanded to accommodate. Investment in the infrastructure at HKIA has been continuous since its opening. At the end of 2011, approximately HK$ 18 billion had already been invested in capital expenditure for airport-related improvements [12]. These include (but are not limited to) the following major enhancements / expansion on the airport island [12] [13]:
- 2000 – Arrivals Hall was reconfigured to provide better passenger and transport counter services to airport users;
- 2002 – East Hall at Terminal 1 was renovated and expanded to enhance the airport experience;
- 2003 – cross-boundary ferry service of (temporary) SkyPier began, allowing passenger connection from HKIA to the ports of Macao and the PRD area;
- 2005 – six e-channels opened at the Arrivals Immigration Hall to improve the efficiency of immigration clearance;
- 2006 – airfield facilities were enhanced to cater for the new A380 (a double-deck, wide-bodied passenger jet airliner that began commercial operation in 2007);
- 2007 – Terminal 2 (with enhanced cross-boundary airport coach and limousine services) was completed and began operation;
- 2008 – an additional 10 cargo stands and taxiways were added to cater for increased cargo demand;
- 2010 – North Satellite Concourse was completed, improving passenger convenience and reducing the number of flights that need to park at remote bays. The permanent SkyPier was also completed; and
- 2011 – various capacity and service enhancements to Terminal 1, including the central concourse, arrival and departure processing, and Baggage Handling System.
- 2014 to 2017 – apron expansion and Midfield development which will provide additional aircraft parking stands and passenger concourse / airfield facilities.

2.3 Constraints of the Existing HKIA to Meet Future Traffic Demand

2.3.1.1 This section explains why the third runway project is needed and why there is no other viable alternative to meet the future demands on HKIA.

2.3.2 Purpose of Airports

2.3.2.1 Airports worldwide represent international gateways for the transfer of passengers, goods, and commodities across borders. These activities create a number of economic benefits that reach far beyond the boundaries of the airport itself. HKIA, as Hong Kong’s one and only international airport, is the physical infrastructure needed to permit this air-based transfer and the capacity of HKIA directly affects the amount of passengers, goods, and commodities that can be transferred (by air) into and out of Hong Kong. The operation of HKIA is a fundamental driver for the various economy sectors that rely on passengers, goods, and commodities that are to be transferred by air.

2.3.2.2 Up until now, HKIA has grown within the physical limits of the airport island footprint; providing increased and improved services, and thus meeting the increasing needs and demands of the various economy sectors that depend on air travel / airfreight. However, in order to assess the...
ability of HKIA to grow and continue to meet demands relies first and foremost on forecasts for air traffic demand, which forms the starting point for any such assessment.

2.3.3 Practical Maximum Capacity

2.3.3.1 The handling capacity of HKIA is primarily constrained by the runway capacity, as well as the availability of parking facilities and environmental constraints. The practical maximum capacity of the existing 2RS is 420,000 ATMs per year. This is based on a consultancy study by National Air Traffic Services (NATS) endorsed by Civil Aviation Department (CAD) concluding that 68 ATMs per hour is the practical maximum regardless of operation mode. There are a combination of factors taken into account including (but not limited to) aircraft fleet mix at HKIA, terrain constraints imposed by the proximity of Tai Mo Shan, Castle Peak and other mountainous areas on Lantau Island, complicated airspace management, and safety compliance requirements imposed by the International Civil Aviation Organisation (ICAO) [12].

2.3.4 Demand Projections

2.3.4.1 HKIA’s design was based on the 1992 NAMP, which estimated that by the Year 2040, the airport would handle 87 million passengers, 8.9 million tonnes of cargo and 376,000 ATMs per year, the majority of which would be from origin and destination traffic. However, the enhanced capacity, scheduling flexibility and connectivity advantages of HKIA coupled with the rapid development of Hong Kong as a centre of international business and finance have transformed the airport from the originally anticipated origin / destination airport into a hub airport. Simultaneously, air traffic demands have increased dramatically and driven by market, aircraft mix has changed, comprising a growing number of narrow-bodied (smaller) aircraft. Consequently, the recent air traffic demand forecast is now much higher than that was originally envisaged by the 1992 NAMP at the time HKIA was designed. Forecasts published in 2011 projected demand to be approximately 97 million passengers, 8.9 million tonnes of cargo and 602,000 ATMs per year by 2030 [12]. These long-term forecasts have been reviewed by International Air Transport Association (IATA) and the updated demand projection for 2030 is 102.3 million passengers, 8.9 million tonnes of cargo and 607,000 ATMs. Table 2.2 shows the projected throughput of HKIA up to 2030.

Table 2.2: Projected Throughput of HKIA Based on the Updated Projections

<table>
<thead>
<tr>
<th>Yearly throughput</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>1992 NAMP Projection for 2040 (for comparison)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of passengers (in millions)</td>
<td>70</td>
<td>86</td>
<td>102</td>
<td>87</td>
</tr>
<tr>
<td>Quantity of cargos (in million tonnes)</td>
<td>5.8</td>
<td>7.3</td>
<td>8.9</td>
<td>8.9</td>
</tr>
<tr>
<td>ATMs (rounded to the nearest thousand)</td>
<td>420,000</td>
<td>505,000</td>
<td>607,000</td>
<td>376,000</td>
</tr>
</tbody>
</table>

2.3.4.2 Further to Hong Kong International Airport Master Plan 2030 (MP2030), and for the purpose of EIA, the long-term forecasts have been updated by the IATA in 2013 following a robust approach. IATA reviewed the models underlying the forecasts published in 2011 and concluded that the passenger and cargo equations were still valid. It was further established that Hong Kong’s economy was bouncing back faster and stronger than anticipated and this justified revising up HKIA forecasts. The revised forecasts are based on the latest information made available to
IATA through various sources at the time the forecast was established. In particular these forecasts included the following factors:

- Updated economy forecasts;
- 2RS and 3RS constrained capacity; and
- Latest strategies of the main passenger and cargo operators. About 40 passenger and cargo airlines representing over 80% of the 2011 busy day ATM have been consulted on their future offer and fleet in the specific context of the foreseen saturation of the existing 2RS and future 3RS at HKIA.

2.3.4.3 In the context of the long-term forecast, IATA anticipates that the 2RS saturation will happen in 2018. In general, long-term forecasts are needed to provide directional guidance for planning purposes, but they are not meant to be used for predicting short-term fluctuations. Based on the latest fast growing slot demands for 2014 and summer 2015, however, it seems that 2RS saturation may happen even earlier. It is not uncommon to see accelerated ATM growth before an airport reaches capacity saturation. Similar trends have been observed at other airports facing an imminent saturation. Airlines pre-empt available slots before they become unavailable. The short-term growth pace will influence when an airport becomes saturated but has minimal impact on the long-term demand.

2.3.4.4 Relevant details of the air traffic forecasting methodology are presented in Appendix 2.1.

2.3.5 Comparison of Actual versus Constrained Demand in the Context of the Practical Maximum Capacity of the Two-Runway System

2.3.5.1 Chart 2.1 shows the comparison of actual and projected ATMs up to 2030 in the context of the practical maximum capacity of the 2RS [11]. It was estimated in MP2030 that the existing two-runway system at HKIA would reach its practical maximum capacity sometime between 2019 and 2022 [14]. The latest review by the IATA on MP2030 suggests that this maximum capacity may be reached one to three years earlier than what was previously projected and presented in MP2030.

2.3.5.2 The revised air traffic forecasts include a long-term constrained ATM forecast that takes into account relevant factors including the maximum practical capacities of the 2RS and 3RS. This ATM forecast cannot be directly compared with short-term projections and recorded variations in ATM growth rates experienced at HKIA, especially for the earlier years when HKIA was operating under an unconstrained environment with respect to runway capacity.
2.3.6 Relevant Factors taken into Consideration

2.3.6.1 As part of the MP2030 forecasts, a range of external factors that might affect traffic demand was also reviewed and considered in the forecasting model. These include air services agreements, cross-strait direct flights, trade agreements, travel policy, tourism development, cross-boundary infrastructure development, passengers’ travelling preferences, modal competition from containerised shipping, developments of surrounding airports and airlines’ strategies. On the whole, these have been found to have negligible impact or have already been factored into the traffic demand models. Some of the main factors and queries raised by stakeholders during the MP2030 studies that have been accounted for are reviewed below.

Consideration of Aircraft Size

2.3.6.2 It has been suggested that the capacity constraint could be addressed by airlines using larger aircraft. Using larger aircraft will allow more passengers and cargo to transit through HKIA. However, this does not solve the capacity constraint in terms of ATMs, which will remain capped by the 2RS regardless of the size of aircrafts deployed. In addition, to be an effective hub HKIA needs to accommodate a mix of large and narrow-bodied feeder type aircraft so as to allow access to a broader choice of onward destinations. Without the ability to fly directly to secondary destinations, passengers will travel via other regional hubs instead and Hong Kong’s position as an international aviation hub (with its associated logistical and economic benefits) would be compromised [15]. Based on the MP2030 study, a 3RS would enable HKIA to handle up to 620,000 ATMs per year [14], thus meeting the ATM demand projections for 2030.
Expansion of Hong Kong International Airport into a Three-Runway System
Environmental Impact Assessment Report

Competition from High Speed Rail

2.3.6.3 It has been suggested that with the development of high speed rail networks between Hong Kong and cities in the Mainland, air traffic demand to/from the Mainland will decrease, thereby reducing the need for expanded air services.

2.3.6.4 While it is considered that the high speed rail may affect the competitiveness of air travel between Hong Kong and short haul Mainland destinations like Shantou, Changsha, Nanning, Xiamen, Wuhan, Nanjing, Nanchang and Fuzhou (which are served by high speed rail connections), these regional Mainland routes combined equates to only about 3% of HKIA’s passenger traffic in 2010 [12]. Therefore, the impact on air traffic demand due to the high speed rail services is considered to be relatively insignificant in the long term.

2.3.6.5 Conversely, data from Europe and Japan indicate that the introduction of high speed rail can increase people’s willingness to travel, which in the medium to long term, increases the overall market size for both rail and air transportation, thereby compensating for the potential air traffic loss on individual short haul routes [12].

Optimisation of Pearl River Delta (PRD) Airspace

2.3.6.6 There are queries as to whether the busy PRD airspace would effectively cap the number of flights that would be permitted to arrive/depart via HKIA, thereby offsetting any increase in HKIA runway capacity. Flights to/from HKIA using PRD airspace accounted for only 21% of total flights served by HKIA in 2012. While PRD airspace is busy during certain periods of time, it has not been a constraint to HKIA from an overall development of air services perspective. There is a plan agreed among relevant civil aviation authorities of Mainland, Macao and Hong Kong to address the issues relating to optimising PRD airspace. Thus, it is not expected that growing usage of PRD airspace would affect the viability of capacity expansion at HKIA.

2.3.7 Review of the Viability of Alternatives to Airport Expansion

Optimising the Remaining Two-Runway Capacity

2.3.7.1 The option of maintaining a 2RS would require further expansion beyond the already committed Midfield development, including the passenger Terminal 1 (T1), apron, passenger concourse, Automated People Mover (APM) system, Baggage Handling System, road network and landside transportation facilities (refer to Figure 2.1). However, under the constraint of the practical maximum runway capacity described in Section 2.3.5, HKIA is unable to meet the air traffic demand forecast (of 607,000 ATMs per year) for 2030. Under this two-runway option, air traffic demand will be met up before 2020, at which point, the airport will saturate and will thereafter be operating under a ‘constrained’ mode, with the same consequences as described in Section 2.5.
2.3.7.2 It has been suggested that the airport can be expanded into a 3RS after exhausting the two-runway capacity. However, this delayed expansion is not considered viable as differences in airport layouts would mean that a significant amount of infrastructure built to enhance the 2RS would need to be dismantled to accommodate a 3RS layout. This will result in substantial resource wastage and incur greater costs. The added delay in adopting the 3RS and the time required to construct would also mean that HKIA’s capacity would be exhausted before the third runway would be built and air traffic lost to competing airports could be difficult to recover.

2.3.7.3 Overall, relying on continuous enhancement of the existing airport and not expanding into a 3RS would only provide a short-term relief to air traffic demands. In the long-term, it is considered that this approach would impact adversely on Hong Kong’s competitiveness and long-term growth opportunities.

Co-operation with Neighbouring Airports

2.3.7.4 The possibility of relying on neighbouring airports in the PRD (Guangzhou, Shenzhen, Zhuhai and Macao airports) to address HKIA’s capacity issues has been raised as a possible alternative. However, there are many issues with the viability of this alternative. These include the following:
2.3.7.5 Air services are governed by a series of jurisdiction-specific regulations as well as international bilateral agreements. Both HKIA and airlines that route to or via HKIA are required to operate within these regulations which are set by the corresponding governments of individual jurisdictions. Consequently, it is not permitted to simply funnel airlines and flights to different airports purely based on the preferences of HKIA. In the case of Hong Kong and any of the PRD airports, the fact that they do not belong to the same administrative region further complicates matters as they have separate governments, administrative systems, currencies, border controls and immigration requirements, air services agreements, airport operators, stakeholders and designated and operating airlines [15].

2.3.7.6 It should be noted that there is airport cooperation in terms of knowledge transfer and management of shared networks. This form of cooperation is typically founded on the basis of air traffic flying between the cooperating airports (e.g. the cooperation pact between Singapore’s Changi Airport and Japan’s Narita Airport [16]). Even services between Hong Kong and Shenzhen, such as the proposed rail link connecting Hong Kong and Shenzhen airports, aim at increasing convenience of travel between airports as a form of enhanced customer choice [12]. This form of cooperation is entirely different from the idea of re-routing flights originally bound for (or originally departing from) HKIA, to Shenzhen instead, which refers to a form of unilateral bypass rather than mutual cooperation, and is typically only performed during emergency situations. There are also no known successful examples of this latter type of cooperation between airports. Attempts to link London’s Heathrow and Gatwick Airports, or Montréal’s Mirabel and Dorval Airports, have not been successful [15], despite being located in the same jurisdiction (due mainly to user preferences). Proposals for a high speed rail link between Heathrow and Gatwick to create a virtual hub is still under review and its viability (and user acceptability) remains to be confirmed.

2.3.7.7 A hub airport, as previously defined, needs to be able to support a substantial proportion of transfer / transit traffic. To re-direct this transfer / transit traffic to another airport for the first or second part of the journey essentially eliminates the benefits to airlines and passengers of directing their flights via HKIA in the first place. Operation of a dual-airport concept not only adds inconvenience to travellers, but also incurs additional time and resource depletions affecting both the scheduling and affordability of the journey. Transferring traffic between airports via rail or road links also adds to the burden of existing infrastructure and generates additional environmental impacts such as air and noise emissions, potential ecological issues, visual impacts, etc. Given the lack of benefits to passengers and the airfreight industry, these users will simply opt for other airports to make their transfer journeys, thus essentially eradicating the transfer / transit traffic at HKIA, and its hub status.

2.3.7.8 Relying on other airports to meet Hong Kong’s air traffic demand reduces benefit to Hong Kong’s economy. By redirecting flights to airports outside of Hong Kong, airfreight operators may no longer obtain any advantage by basing their operations in Hong Kong, and will consequently relocate their operations elsewhere. Similarly, international business sectors that require a highly
mobile workforce may also shift their operation centres to other cities that can better serve their travel needs, consequently diminishing the overall competitiveness of Hong Kong.

2.3.8 Conclusion of the Demand Analysis

2.3.8.1 As explained in Section 2.3.2, airports are a fundamental driver for the various economy sectors that rely on passengers, goods, and commodities that are to be transferred by air. However, the MP2030 air traffic forecasts and demand analysis presented in Section 2.3.4 has shown that demand will soon exceed the existing maximum capacity of HKIA taking into consideration the effects of external factors such as aircraft size, competition from high speed rail and optimisation of PRD airspace. Maintaining the 2RS is not a sustainable solution and the notion of cooperation with neighbouring airports is not a viable alternative. All in all, the analysis clearly demonstrates that the future air traffic demand cannot be met with the existing 2RS.

2.3.8.2 Once the maximum capacity of the 2RS is reached, a series of impacts will affect the operation of HKIA, which are detailed in Section 2.5. To avoid the wider impacts associated with suppressing the demand that can be met by advance planning, HKIA needs to develop in tandem with demand, which necessitates a 3RS.

Implication of Lead Time

2.3.8.3 Airport infrastructure development is capital investment-intensive, and due to the scale and complexity of the construction works, a long lead time with considerable advance planning is required. It is estimated that the 3RS would take approximately 11 years from planning to completion and hence 2023 is the earliest it could be expected to start commissioning [17]. With the growing competition from other rapidly developing aviation hubs in the Asia Pacific region such as Seoul, Kuala Lumpur, Bangkok, Singapore, Taipei and airports in the Mainland like Shenzhen, Guangzhou and Shanghai (some of which plan up to five runways) [18], investing in a 3RS is an urgent requirement for HKIA to meet and capture the forecasted demand and retain its pre-eminent hub status, thereby retaining its competitive and economic advantages.

2.4 Benefits of the Project

2.4.1.1 This section describes the scenarios with the project, and the benefits associated with a 3RS at HKIA.

2.4.2 Quality of Airport Services and Facilities

2.4.2.1 The proposed project involves construction of a number of new airport infrastructure and facilities, all aimed at improving the operational efficiency of the airport and the associated quality of services to passengers and the airfreight industry. These facilities include new passenger concourses, a revamped Terminal 2 (T2), an expanded APM and a new high-speed Baggage Handling System (BHS) and associated facilities, all of which will contribute to improving and maintaining the existing high quality of services for passengers. The airfreight industry will benefit from increased facilities including new aircraft stands and associated airfreight handling facilities as well as an improved road network at the cargo areas. Infrastructure improvements will also provide better road networks, car parking and public transport facilities for increased passenger convenience when travelling to and from the airport.
2.4.2.2 As well as providing an opportunity for developing new world class airport facilities and infrastructure, the proposed third runway project provides a unique opportunity to learn from experiences gained in operating existing facilities, including knowledge on operational constraints to explore operational and efficiency improvements during re-configuration of existing facilities. For instance, providing some buffer to ATMs, BHS, parking capacity and airside and landside road networks will permit HKIA to prepare better operational contingency for handling and recovering from emergencies or occasional service disruptions due to abnormal incidents, such as typhoons, so that impacts to passenger and airfreight can be kept to a minimum.

2.4.2.3 With expanded runway capacity, some flexibility in the operation of the 3RS will be made possible. For example, as suggested in the MP2030, the South Runway will be assigned to standby mode during night time (where possible) to reduce noise impacts to residents of North Lantau.

2.4.3 Increased Air Connectivity

2.4.3.1 Air connectivity refers to the number of destinations served and the frequency of flights to each destination. A world class airport is one that is able to offer both a wide choice of destinations and departure / arrival times as well as high quality ground-based services. It should also have the capacity to modify existing routes and open new routes to keep in line with changing passenger and market-driven demands.

2.4.3.2 At the same time, it is widely recognised that air connectivity is crucially important for international business and trade. Trade sectors that provide international products and services require mobile workforces and a frequent and reliable air service to enable them to operate flexibly and within tight time constraints. Increasing air connectivity makes Hong Kong a more attractive location for foreign investment and setting up of regional headquarters, thus forming part of the cycle that perpetuates economic growth.

2.4.3.3 With the proposed expansion of HKIA, flight capacity will increase which is a precursor to increased air connectivity. According to the MP2030 study, with an additional (third) runway, HKIA will be able to support a practical maximum capacity of 620,000 ATMs per year, which translates to 102 ATMs per hour (compared to the practical maximum of 68 ATMs per hour based on a 2RS) [12]. The additional ATM capacity would allow HKIA to increase the frequency of flights to existing destinations, provide more reliable air services, and open up new destinations, thereby increasing HKIA's air connectivity and the associated trade and economic benefits. For passengers, this translates into the direct benefits of more choices in airlines and routes, reduced time spent in transit and waiting time due to better ‘matching’ of (and more choices in) departure and arrival times, as well as the better services such as reliability, punctuality and quality of travel experience [19].

2.4.4 Economic Benefits

Direct Employment

2.4.4.1 The aviation industry is known to be a major source of employment. HKIA is one of the biggest single-site employers in Hong Kong, supporting about 65,000 direct jobs on the existing airport island in 2010. It is estimated that the proposed expansion would increase direct employment to 141,000 by 2030 [12].
2.4.4.2 Indirect jobs are those that involve supplies of goods or services to the aviation sector and non-aviation activities at HKIA, and induced jobs refer to those jobs that are supported by the spending of income by direct and indirect employees associated with HKIA. When these jobs are factored into the equation, HKIA effectively generates a total of approximately 199,000 indirect and induced jobs by 2030. This growth will be possible as a result of the proposed airport expansion.

Gross Domestic Product (GDP)

2.4.4.3 HKIA is an international and regional aviation centre providing social and economic contributions to Hong Kong. It supports the four pillar industries of Hong Kong’s economy: financial services, trading and logistics, tourism, and producer and professional services, which in 2010 accounted for 58 % of Hong Kong's GDP [20]. The aviation industry and other businesses at HKIA contribute significantly to Hong Kong’s economy, making HK$ 78 billion in value added total economic contributions in 2008, which represented 4.6 % of Hong Kong's GDP at the time [20]. According to Oxford Economics, the aviation sector contributed HK$ 88.9 billion or 5.5 % of Hong Kong’s GDP in 2009 of which 57 % were directly contributed through the outputs of the aviation sector, 26 % were indirectly contributed through aviation sector’s supply chain, and 17 % were contributed through the spending by employees of the aviation sector and its supply chain [19].

2.4.4.4 As global GDP grows, the aviation market will also grow, and demand for airport services (and associated economic contributions) will continue to rise. Given Hong Kong’s open market and externally-oriented economy, similar relationship between GDP and air traffic growth exists in Hong Kong (refer to Chart 2.2 below) [12].
2.4.4.5 It has been estimated that a 10% improvement in connectivity relative to GDP would see a HK$1 billion per annum increase in long-run GDP for the Hong Kong economy [19]. With the proposed third runway project, the MP2030 study projected that HKIA would bring HK$912 billion in economic net present value by 2030 [12]. These benefits arise because airports are gateways to global economies and vital for business activities as well as family and leisure travels. HKIA serves as a transit point for one third of its passengers, and in terms of freight value, a third of Hong Kong's total imports, exports and re-exports pass through HKIA [18]. The ability of Hong Kong to sustain its competitive position in today's highly globalised economy is therefore significantly attributed to the high-value products and services as well as the highly skilled and mobile professional workforce that is reliant on, and supported by, HKIA [18]. Economic growth in this sector is thus directly dependent on growth (via expansion) of HKIA.

International Business

2.4.4.6 Global connectivity is essential to Hong Kong and its economy. The connections that an airport creates between cities and markets generate benefits through enabling foreign direct investment, business clusters, specialisation and other spill-over impacts on an economy's productive capacity [19]. Hong Kong's position as an international aviation hub has undoubtedly contributed to making Hong Kong the world's fourth and Asia's second largest foreign direct investment recipient [18].

2.4.4.7 In Hong Kong, an estimated 3,500 regional offices provide employment to about 140,000 people [17]. Domestic firms gain economic benefit from increased connectivity through increased access to foreign markets and increased foreign competition in the home market, and through freer...
movement of investment capital and workers between countries [19]. As revealed by an international study, 64 % of firms consider aviation a decisive factor in locating certain types of economic activities, particularly those involving investment decisions [18]. Increased connectivity also brings knock-on benefits associated with increased competition from foreign-based producers, which encourages greater efficiency and drives down prices for consumers [19].

2.4.4.8 Air transport also plays a vital role in the cross boundary trade of goods, particularly high value and perishable goods. Globally, 35 % of the world trade by value is transported by air, with HKIA supporting 36 % of Hong Kong’s external trade by value via air transport in 2012 [21].

2.4.4.9 Equally important is the tourism sector’s contribution to the economy, where over 48 million visitors spent over HK$ 290 billion in the local economy in 2012 [22]. According to Oxford Economics, the tourism (catalytic) effects of aviation involved an employment of 101,000 people in 2009 [19]. With expansion of the airport to meet anticipated future demand, Hong Kong based businesses reliant on global connectivity and tourism can continue to grow and contribute to Hong Kong’s economy.

Interface with Mainland China and the Pearl River Delta

2.4.4.10 Mainland is the manufacturing capital of the world, and the World Tourism Organisation (WTO) has also projected it to become the world’s fourth-largest tourist source market and the largest domestic tourist market by 2015 [12]. Given this trend, the MP2030 study forecasted that overall aggregated air traffic to and from the Mainland alone would reach nearly 2.1 billion trips and 44 million tonnes of cargo traffic by 2030 [12]. The PRD is one of the fastest growing areas in the Mainland, and forms part of the catchment area of HKIA. The MP2030 study forecasted air traffic demand in the Greater Pearl River Delta (GPRD - which includes Hong Kong and Macao) to reach 387 million passenger trips and 18 million tonnes of cargo by 2030 [12]. Despite the increase in capacity of other airports within the PRD as well as potential impacts to short haul air travel between Hong Kong and Mainland China due to the development of the Guangdong – Hong Kong Express Rail Link, significant unfulfilled demand is still anticipated both in the medium and the long term (up to 2030). This is shown in Chart 2.3 [12].
2.4.4.11 With an unconstrained handling capacity, HKIA was able to capture about 80% of the GPRD airports’ international passengers and about 90% of its international cargo throughput in 2008 [12]. HKIA is well positioned to continue to capture a majority of this market as long as its handling capacity remains unconstrained. The proposed project will enable HKIA to maintain this advantageous position.

2.4.5 Environmental Improvements

2.4.5.1 It is unavoidable that a development of this scale will have impacts on the environment, which are identified and addressed in this EIA with the aim of avoiding (where practicable) and at the very least, minimising such impacts to within acceptable levels. Nevertheless, there are opportunities, at the project’s design, construction and operation stages, for incorporating positive environmental aspects into the project.

Allowing More Flexibility to Avoid Night Time Use of Southern Runway for the Benefits of North Lantau Residents

2.4.5.2 Current operation of HKIA requires night time use of the South Runway due to the existing high demand and the scheduled closure of North Runway for maintenance purposes. This means that some residents along North Lantau are currently covered by NEF contours. With the
implementation of the 3RS, scheduling flexibility would be improved, and preference can be given to avoiding the need for operation of the South Runway during night time by shifting night time air traffic movements to the centre runway or new North Runway. This would reduce the number of noise sensitive receivers (NSRs) covered by the NEF contours.

**Increased Flexibility to Preferential Use of Flight Tracks for Avoiding Aircraft Noise Impact**

2.4.5.3 Addition of a third runway provides increased flexibility in aircraft operations. This would, in turn, allow for increased flexibility in the implementation of preferential flight track use for aircraft landing and take-off with the aim of further minimising air traffic movements over populated areas.

**Minimising Unnecessary Aircraft Emissions while Waiting for Landing**

2.4.5.4 Increased runway capacity provided by the third runway also means that aircraft landing slots would increase, and this would reduce the waiting time required for approaching aircrafts to land. Reduced landing time provides the benefit of reducing airspace congestion and the associated emissions arising from aircrafts ‘circling’ the airport. Similar reductions in waiting time for take-off and taxiing into parking stands would also reduce idling emissions. These measures can only be implemented with the additional capacity and flexibility resulting from implementation of the 3RS.

**Beneficial Use of Unwanted Materials Generated by Other Local Projects**

2.4.5.5 Inert construction & demolition (C&D) materials generated by other local projects and accumulated in the government’s public fill reception facilities would be used for the land formation work of this project. This will, on one hand, allow for the beneficial use of a substantial amount of such unwanted materials, and on the other hand, will minimise the need for import of raw materials for land formation.

**Incorporating Best Practice Environmental Efficiencies into Airport Buildings and Facilities**

2.4.5.6 The design process for new development at HKIA is predicated on the identification of opportunities for incorporating elements into the design of facilities and infrastructure that are able to enhance environmental efficiency and minimise environmental impacts over the building / facility lifecycle. Opportunities for efficiency must be considered for both the construction and operations stages.

2.4.5.7 Energy efficiency will be built into the new airport facilities, including the expanded T2 and third runway concourse (TRC) buildings, which will adopt efficient cooling systems combined with building envelopes and other design elements that reduce cooling energy demand; efficient light-emitting diode (LED) lighting and occupancy / sensor control technologies that reduce energy demand combined with building façade designs that reduce the need for artificial lighting. On-site emissions will be minimised through the increasing use of electric vehicles and ground support equipment making use of grid powered fixed-ground power and pre-conditioned air systems to be provided at stands (instead of diesel powered auxiliary generators / cooling units). Several other innovative technologies and systems are being evaluated as designs progress.

2.4.5.8 Efficient water management will comprise various systems intended to reduce water demand and encourage water reuse. These will include extending the use of seawater for cooling and flushing
to minimise potable water demand, the adoption of low flow water fixtures and the implementation of a greywater collection and treatment system to treat greywater generated from certain new airport facilities for beneficial reuse (e.g. landscape irrigation or cleaning related activities).

2.4.5.9 Waste recycling initiatives during operation phase will build on existing HKIA good practice in this area in existing buildings and facilities. Initiatives will include provision for on-site waste collection and separation facilities for food waste and glass bottles as well as the standard recycling bins for paper, plastic and metal cans. Green procurement strategies will be required both during construction and operation of the project, to minimise waste generation and maximise re-use and recycling opportunities.

2.5 Consequences of Not Proceeding with the Project

2.5.1.1 This section describes the scenarios without the proposed project and the consequences associated with restriction of HKIA as a 2RS.

2.5.2 Airport and the Aviation Industry

2.5.2.1 Investment in airport infrastructure has been continuous since the opening of HKIA, with HK$ 18 billion already invested and more than HK$ 12 billion committed to the Midfield development and Apron Expansion [23] (refer to Section 2.2.4). These investments are part of the upgrading works to maintain operation of HKIA ahead of air traffic demand (i.e. maintain unconstrained operation mode), however, the airport is approaching the physical limit of expansion within the existing airport footprint. Under the current 2RS, the MP2030 study identified that the maximum practical runway capacity would be 68 ATMs per hour, and this maximum was expected to be reached between 2019 and 2022 [12]. Latest information suggests that this maximum capacity may be reached one to three years earlier than previously projected. In the absence of a third runway, HKIA will have to operate under a constrained mode and the implications are described below.

Implications of a ‘Constrained’ Operation Mode

2.5.2.2 Constrained mode refers to a mode of operation where demand (for aircraft landing and take-off slots) exceeds supply (availability of landing and take-off slots). When an airport changes its operation mode from ‘unconstrained’ to ‘constrained’, a series of consequential reactions will typically occur, leading to impacts that reach far beyond the boundaries of the airport itself. The most immediately and directly affected areas include the airport operators, the airline operators, and the aviation industry in general. Chart 2.4 summarises the sequence of impacts that are expected to occur. These are based on experience by other hub airports overseas such as London Heathrow Airport, as well as experience from the constrained operation of Kai Tak Airport in the past.

Airport Operation

2.5.2.3 With an airport operating at full capacity, the risk of congestion during landing and take-off will increase, and aircraft parking on the ground and at the gates will also be restricted. Apart from the increased holding time required for aircraft waiting to take off / land (which generates additional air and noise emissions), a congested airport has limited room to cater for operational delays, and such delays can have a much greater knock-on effect for other air traffic movements,
ultimately increasing the time required to negate the effects of the delay and restore scheduled operations.

2.5.2.4 Similarly, an airport running at full operational capacity has limited flexibility to cope with more significant disruptions such as severe adverse weather conditions or other unforeseen incidents such as security breaches. These disruptions typically result in a substantial backlog of flights that not only frustrate passengers but also generate congested and disorderly service at the airport terminals. The baggage / cargo handling system may also be disrupted, resulting in residual delays even after the airport returns to normal operation. In some instances, baggage and cargo may be damaged or lost, thereby further affecting customers as well as the airport. All of these factors contribute to an overall deterioration of the quality of service at the airport.

Airline Operations

2.5.2.5 Airports that operate under a constrained mode typically experience changes in air traffic patterns as airlines try to optimise their operations within a constrained airport. Past experience at Kai Tak Airport has shown that there will normally be a transition period when airlines try to adapt to the capacity constraint by switching to larger aircraft in order to keep up with continued passenger and cargo demands, and then perhaps preferential routing and a switch to origin-and-destination focus.

2.5.2.6 Preferential routing arises when airlines have to make a decision between routes of different profitability. When the airport only has a limited number of slots, airlines typically cut down on those routes that are less profitable in favour of the more lucrative routes. A reduction in frequency of certain routes leads to reduced passenger choice, increased connection time and potentially higher price that passengers must pay [12]. Routes that are eliminated from the network altogether mean that passengers must resort to other means by which to travel. These changes lead to the single outcome of a loss in passenger and cargo business, both for the airlines and for the airport.

2.5.2.7 A switch to origin-and-destination routes is another likely consequence of constrained airport operation, as airlines need to focus the limited slots for higher yield origin-and-destination routes rather than the lower yield transfer / transit network. A hub airport by definition requires a substantial proportion of transfer / transit traffic. However with a reduction in the number of routes being offered by airlines, this transfer / transit traffic will correspondingly decrease, and the hub status of the airport (with its associated logistical and economic benefits) will be lost.

Aviation Industry

2.5.2.8 Growth in the aviation industry in Hong Kong is directly reliant on the capacity of HKIA. When HKIA reaches its maximum two-runway capacity, no new routes or increased frequency of existing routes can be made unless existing flights were to be substituted. This would effectively cap the growth of the aviation industry in Hong Kong. The resulting economic losses will be translatable to a reduction in the aviation industry’s contribution to Hong Kong’s GDP.
**Chart 2.4: Summary of Impacts to Airport and the Aviation Industry Resulting from ‘Constrained’ Airport Operation**

<table>
<thead>
<tr>
<th>Constrained Airport Operation</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; tier impacts (Impacts that are expected to occur as an immediate result of constrained airport operation)</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; tier impacts (Impacts that are expected to occur as a result of the 1&lt;sup&gt;st&lt;/sup&gt; tier impact)</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; tier impacts (Impacts that are expected to occur as a further consequence of the 1&lt;sup&gt;st&lt;/sup&gt; and 2&lt;sup&gt;nd&lt;/sup&gt; tier impacts)</th>
<th>Ultimate impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>When all arrival and departure slots are full</td>
<td>Limited flexibility for handling service disruptions / delays</td>
<td>Longer time required to restore to normal operations after a disruption</td>
<td>Deterioration in the quality of airport services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Airport operations</td>
<td>Airline operations</td>
<td>Aviation industry</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Airlines deploy larger aircraft to meet passenger / cargo demands</td>
<td>Airlines shrink the frequency of less profitable routes, or eliminate these routes altogether</td>
<td>Airlines focus on origin / destination traffic and reduce transfer / transit traffic</td>
<td>Halt in the growth of the aviation industry in Hong Kong</td>
</tr>
<tr>
<td></td>
<td>Airline operations</td>
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</tbody>
</table>

**Airport operations**

- Limited flexibility for handling service disruptions / delays
- Longer time required to restore to normal operations after a disruption
- Deterioration in the quality of airport services

**Airline operations**

- Airlines deploy larger aircraft to meet passenger / cargo demands
- Airlines shrink the frequency of less profitable routes, or eliminate these routes altogether
- Airlines focus on origin / destination traffic and reduce transfer / transit traffic
- Passengers switch to other airports to reach less profitable destinations
- Passengers experience longer connection times and higher prices
- Loss of transfer / transit passengers and cargo
- Loss of ‘hub’ airport status
- Loss of passenger and cargo business

**Aviation industry**

- Halt in the growth of the aviation industry in Hong Kong
- Loss of economic benefits associated with aviation industry growth
- Reduced contribution to Hong Kong’s GDP
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Resulting Impacts on Passengers and Cargo

2.5.2.9 From the perspective of airport users, the aforementioned implications on airport and airline operations ultimately have a detrimental effect on activities that are dependent on the airport. A summary of the impacts to passengers and cargo is listed in Table 2.3.

Table 2.3: Summary of Impacts to Passengers and Cargo due to ‘Constrained’ Airport Operation

<table>
<thead>
<tr>
<th>Impact associated with ‘constrained’ airport operation</th>
<th>Impacts to Passengers</th>
<th>Impacts to Cargo and Cargo-dependent Businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport Operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased probability for disruptions due to less operational flexibility</td>
<td>Greater likelihood of flight delays</td>
<td>Greater likelihood of delays in sending / receiving goods</td>
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<tr>
<td></td>
<td>Increased risk of disruption to personal schedule</td>
<td>Increased risk to time-sensitive cargo (e.g. fresh meat, fruit and flowers)</td>
</tr>
<tr>
<td>Longer time required to restore to normal operations after a disruption</td>
<td>Greater likelihood of flight cancellation</td>
<td>Greater likelihood of cargo not arriving at intended destination</td>
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<tr>
<td></td>
<td>Longer waiting time for next available flight</td>
<td>Loss of perishable goods in waiting for next available flight</td>
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<tr>
<td></td>
<td>Increased risks of personal luggage damage or loss</td>
<td>Increased risk of damage to cargo</td>
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<tr>
<td></td>
<td>More crowded and disorderly experience at the airport</td>
<td>Loss of income to cargo-dependent businesses</td>
</tr>
<tr>
<td></td>
<td>Personal / business time lost</td>
<td></td>
</tr>
<tr>
<td>Airline Operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferential routing with associated reduction / loss of less popular routes / destinations</td>
<td>Reduced choice of flight dates / times</td>
<td>Less flexibility in cargo scheduling</td>
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<tr>
<td></td>
<td>Less destinations with direct flights</td>
<td>More time required for cargo to reach destinations</td>
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<tr>
<td></td>
<td>Less flexibility / longer wait time for connecting flights</td>
<td>Increased cost to cargo company and cargo-dependent businesses</td>
</tr>
<tr>
<td>Switch to origin-and-destination routes with associated reduction in transit / transfer network</td>
<td>Less opportunity to ‘stopover’ in Hong Kong</td>
<td>Less options for routing of cargo</td>
</tr>
<tr>
<td></td>
<td>Less choice for arranging own transit via Hong Kong (i.e. greater difficulty in customising own flights and connections)</td>
<td>Cargo companies may be forced to do business through another airport instead</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loss of business for Hong Kong based cargo companies</td>
</tr>
<tr>
<td>Aviation Industry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No / less new routes available</td>
<td>Less choice for obtaining flights to new destinations</td>
<td>Less options for routing cargo to new destinations</td>
</tr>
<tr>
<td></td>
<td>No direct flights available to new destinations</td>
<td>Increased time and cost for airfreight to reach new destinations</td>
</tr>
<tr>
<td></td>
<td>Increased time required to reach new destinations</td>
<td>Greater difficulty in competing with other (non-Hong Kong based) cargo businesses for new business</td>
</tr>
</tbody>
</table>

2.5.2.10 Table 2.3 highlights that all of the identified impacts to airport and airline operations and the aviation industry will have knock-on impacts to passengers, cargo and cargo-dependent businesses. While international airlines and cargo businesses can re-organise their operations to some extent to adjust to the constraints at HKIA, there is no such option for Hong Kong based travellers or travellers to Hong Kong, who will be faced with the only alternative of not travelling via HKIA. For those travellers who must travel via HKIA, the quality of the airport experience that can be achieved with a congested airport operating under constrained mode is unlikely to be
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equivalent to the world class quality of services that HKIA has been internationally recognised for since 2001.

2.5.3 Hong Kong's Competitiveness

2.5.3.1 History has shown that whenever an international hub airport (such as London’s Heathrow Airport and Tokyo’s Narita Airport) can no longer keep up with the air traffic demand in the region, they inevitably surrender their leading air hub position to other airports in their respective regions. Without the proposed airport expansion, HKIA’s connectivity advantage and international hub position would eventually be lost to neighbouring airports that go ahead with expansion plans. This has implications on the overall competitiveness of Hong Kong, as its position as an international business centre is clearly linked to the world class standing of HKIA. When HKIA is no longer a leading hub airport in Asia Pacific, the market share of the Hong Kong logistics industry (including freight forwarding and insurance) would shrink, and the competitiveness of these HKIA-reliant industries will be adversely affected.

2.5.4 Environmental Constraints

2.5.4.1 While it is given that the absence of the project would not create any new environmental impacts, the absence of the project may lead to a worsening of the environmental performance in some areas, and would also severely constrain the potential environmental improvements that can be accrued from operation of HKIA. As described in Section 2.5.2, with an airport operating at full capacity, air traffic congestion would increase, leading to increased holding times for take-off and landing. This would increase aircraft emissions both on the ground (while aircrafts wait for take-off, or wait for a vacant parking stand) and in the local airspace (while aircrafts wait to land). An airport operating at full capacity would also not have any spare capacity for preferential use of runways and flight paths. Instead, flights on existing routes over populated areas would only increase to capacity, thereby potentially worsening aircraft noise impacts to populated areas. Other environmental improvements as described in Section 2.4.5 would also not be realised in the absence of the project.

2.6 Summary

2.6.1.1 HKIA has always been recognised as an important infrastructure asset supporting the economic development of Hong Kong. When Kai Tak Airport began to experience constrained operation, increasing adverse impacts to both the economy and the environment (particularly in terms of noise) was apparent. Relocation of the airport to Chek Lap Kok was a strategic decision to prevent long-term economic loss as well as to improve the environmental quality of the urban Kowloon area. This decision was pivotal to enabling the success that Hong Kong continues to enjoy as one of the key players in the international arena for the economic sectors of finance, trade, logistics, tourism and professional services. From an environmental perspective, selection of the Chek Lap Kok location created less environmental impacts overall compared to other viable options, hence the Chek Lap Kok location was seen as the best way forward for both economic and environmental reasons at the time.

2.6.1.2 As of 2013, HKIA continues to enjoy a pre-eminent status as an international aviation hub ranked as the world's busiest international cargo airport since 1996 [9]. HKIA is also the third busiest airport for international air passengers in 2013 [10]. While part of this is due to geographical, legislative and management factors and contributions, it is also the current 'unconstrained'
operation mode that has permitted HKIA to continue to perform on par with globally increasing demands. However, the current HKIA operation has been approaching the maximum capacity of 420,000 ATMs per year that is practicable with a 2RS. Air traffic demand projections in MP2030 have forecasted that the maximum 2RS capacity of HKIA will be exhausted between 2019 and 2022 [14] and will not able to cope with the air traffic demand of 602,000 ATMs per year by 2030 predicted in MP2030 [12]. According to the latest review by IATA, this maximum capacity may be reached one to three years earlier than previously projected. In the absence of the proposed 3RS, HKIA would have to face the challenges of operation under a ‘constrained’ mode, which would, in turn, result in degradation of airport service quality, customer choice and economic contribution to Hong Kong. Inevitably, HKIA would even lose its international aviation hub status and Hong Kong in general would suffer from diminishing competitiveness and economic slowdown as compared to neighbouring regions.

2.6.1.3 To secure the continual growth of HKIA operation and to avoid the potential impacts that may arise from constraining the operation of HKIA in the near future, expansion of HKIA into a 3RS is required. This would create additional benefits by enabling further improvements to airport service quality; providing more choices to airport users in addition to increased operational flexibility, which would permit runway operations to better take into account the needs and concerns of nearby residents. Expansion of HKIA would also provide a number of economic benefits including increased direct and indirect employment, GDP contribution and Hong Kong’s capture of the international business and trade markets. A number of environmental improvements would also be realised including avoidance of night time operations at the South Runway; increased flexibility on preferential use of flight tracks to minimise aircraft noise impact to populated areas; reduced aircraft taxiing and holding times to minimise aircraft emissions; beneficial use of fill materials generated by other projects; and improvements to the energy efficiency, water conservation and waste recycling at airport buildings and facilities.

2.6.1.4 Given that future air traffic demand is also dependent on a number of external factors, a review of other key factors that may influence the future air traffic demand in Hong Kong has been carried out, including the aircraft mix, competition from high speed rail and optimisation of PRD airspace. The analysis suggests that these external factors will not significantly affect or reduce the projected air traffic demand in Hong Kong.

2.6.1.5 Alternatives to meet future increasing air traffic demand besides the proposed airport expansion were also considered. The option to optimise the 2RS which can only provide a short-term relief is not a sustainable option. The notion of cooperation with neighbouring airports to meet future air traffic demand is not viable, due to regulatory constraints as well as passenger and cargo inconvenience, and provides next to no economic benefit to Hong Kong.

2.6.1.6 It is therefore concluded that there is a genuine need for the proposed project and that justification for the proposed 3RS, as opposed to other alternatives, has been demonstrated.

2.7 References


[23] Airport Authority Hong Kong, "Future Development, Medium-Term Development," [Online]. Available:
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