The Airport and the Territory

Cross-Border Urbanism in the Singapore-Johor-Riau Tri-National Region

Anna Gasco
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THE AIRPORT AND THE TERRITORY:

Cross-Border Urbanism in the Singapore-Johor-Riau Tri-National Region

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Publications
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Abstract

Since Changi Airport opened in 1981, Singapore’s air traffic has grown at an astounding rate: passenger numbers have quintupled and airfreight tonnage has risen by a factor of ten. The increased human and cargo flows articulated by Changi have been central not only to Singapore’s development, but also—as this research reveals—to the growth of the greater Singapore-Johor-Riau (SIJORI) tri-national cross-border region.

In the recent expansion of global air travel, airport hubs have evolved from pure infrastructures into multifunctional urban nodes. Combining aviation and ground transport with shopping, offices, leisure programs, and public space, airports act as destinations in themselves. They become complementary neuralgic points within their polycentric urban region. In the fields of architecture and urban-planning however, research on the urbanising effects that airports have on larger regions is limited. It tends to oversimplify the complex relationship between each airport and city region, disregarding the unique, multi-causal dynamics shaped by the long, specific histories of urban and airport development, topography, politics, and culture in each instance.

By focusing on Changi Airport, this dissertation exposes how Singapore’s specific geographical conditions—a well-defined border, land scarcity, and close proximity to neighbouring, developing countries—coupled with strong ‘extra-territorial’ and ‘centralised’ planning legislations contribute to Changi’s particular effects on the region’s built environment. Within the island’s boundaries, urban planning is highly regulated. Singapore’s small land area creates urban pressures; but Changi Airport’s immediate periphery is not subject to those same demands. Its surroundings are reserved for future airport expansion and infrastructural access. At first glance, Changi appears to be a dead-end terminal condition at the end of a road- and railway- corridor, focused on air-transport only. On the other hand, the economic gradient between Singapore and its surrounding regions has pushed airport-related developments beyond the border, triggering new forms of private transnational activities and transport-networks. As such Changi’s urban effects can be found less in the airport periphery than on a much larger territorial scale throughout the SIJORI cross-border region.

By tracing Changi Airport’s specific cross-border flows of cargo and tourism in SIJORI, this dissertation reveals how the airport has significant urbanisation effects and economic roles in Singapore’s hinterland development. Through regionalisation strategies starting in the 1990s, airfreight-dependent activities, among others, were relocated from Singapore throughout the rural and industrial hinterlands of the SIJORI region, while keeping their strategic bases in Singapore. Changi Airport’s regional air-cargo networks enable local small and medium enterprises of ‘perishable’ goods, as well as multinational corporations of ‘high-value’ electronics, to expand their commercial activities across the national border. Similarly, transnational flows of tourists traveling through Changi Airport support ‘leisure-urbanisation’ on the island of Bintan and other SIJORI cross-border regional sites.
Through interviews, photographs, digital mapping techniques, and fieldwork conducted in Singapore, the State of Johor in Malaysia, and Batam and Bintan Islands in Indonesia, the dissertation documents how Changi Airport's specific regional flows exemplify an enhanced reciprocity between the airport and the organisation of this larger territory. The spatial relations between Changi and SIJORI are shaped by the multiple cross-border activities, as well as by the people who enable them and connect them back together through various terrestrial-, sea-, and air-networks. Together, these seemingly disparate elements generate a complex urban networking and interaction at multiple scales. Changi becomes one of the key forces in regional integration, which unifies SIJORI's three component territories.

The thesis posits the airport as critical lenses for re-examining the cross-border perspective of Singapore. The dissertation uncovers a new representation of Changi's cross-border airport region, one where the catchment area of the airport extends up-to 150-kilometres beyond the national border and which spatial relations are defined by a set of different correlated parameters of geographic, politic, legislative and infrastructure-related nature. In doing so, The Airport and the Territory introduces policymakers and design practitioners with an alternative approach to the study of airport infrastructures, one that uncovers the specific and contextual relationships between the airport and its region. The resulting ‘Extended Airport Region of Singapore’ contains broader implications that transcend the specific case of SIJORI.
Résumé

Depuis l’ouverture de l’aéroport de Changi en 1981, le trafic aérien de Singapour a augmenté à un rythme soutenu : le nombre de passagers a quintuplé et le fret aérien a décuplé. L’accroissement des flux de cargaison et des migrations engendré par Changi a joué un rôle central non seulement pour le développement de Singapour, mais aussi –ce que cette recherche révèle– à la croissance de la région transfrontalière ‘Singapour-Johor-Riau (SIJORI).”


En se concentrant sur l’aéroport de Changi, cette thèse expose comment les conditions géographiques spécifiques de Singapour – une frontière géographique bien définie, une territoire limité et une proximité de pays voisins en voie développement – couplées avec un arsenal législatif de planification a la fois «centralisée» du territoire et pointu sur l’«extra-territorialité» contribuent aux effets particuliers de Changi sur l’environnement bâti de la région. Au sein des frontières territoriales, la planification urbaine est très réglementée. La petite superficie de Singapour crée des pressions sur le développement urbain; mais la périphérie immédiate de l’aéroport de Changi n’est pas soumise à ces mêmes exigences. Ses alentours sont réservés pour l’expansion future de l’aéroport et l’accès aux infrastructures. À première vue, Changi semble être une grappe de terminaux aéroportuaires en bout d’autoroute et de voie de chemin de fer, concentré exclusivement sur le transport aérien. A y regarder de plus près, le développement économique entre Singapour et les régions limitrophes a induit des investissements en infrastructure aéroportuaire au-delà des frontières, déclenchant de nouvelles formes d’activités transnationales privées et de nouveaux réseaux de transport. En soi, les effets urbanistiques de Changi peuvent se faire ressentir bien au delà de la périphérie de l’aéroport, à l’échelle de la région transfrontalière SIJORI.

En retraçant les flux transfrontaliers de marchandises et du tourisme dans SIJORI, cette thèse démontre le rôle économique important qu’a l’aéroport de Changi sur l’arrière- Pays de Singapour et son urbanisation. Grâce à des stratégies de régionalisation lancées dans les années ’90, des activités de fret dépendantes du transport aérien ont été transférées de Singapour vers les arrière-pays ruraux et industriels de la région SIJORI, tout en gardant leurs bases stratégiques à Singapour. Les réseaux air-cargo régionaux de l’aéroport de Changi permettent aux petites et moyennes entreprises locales de marchandises périssables, ainsi que des multinationales produisant des appareils électroniques «à haute valeur ajoutée», d’élargir leurs activités commerciales au delà de la frontière nationale. De même, les flux transnationaux de touristes voyageant depuis l’aéroport de Changi soutiennent le secteur des loisirs et l’urbanisation de l’île de Bintan et d’autres sites régionaux transfrontaliers.
A travers des interviews, des photographies, des techniques de cartographie numérique et le travail de terrain menés à Singapour, dans les états de Johor en Malaisie, de Batam et de Bintan en Indonésie, cette thèse documente comment les flux spécifiques à l’aéroport de Changi illustrent une stratégie de réciprocité gagnante entre l’aéroport et l’organisation d’un territoire plus vaste. Les relations spatiales entre Changi et SIJORI sont façonnées par de multiples activités transfrontalières, utilisant divers modes de transport interconnecté: terrestre, mer et air. Ensemble, ces éléments apparemment disparates génèrent un réseau urbain complexe et des interactions à de multiples échelles. L’aéroport et le Territoire introduit une approche nouvelle à l’étude des infrastructures aéroportuaires, contextualisant la relation singulière entre l’aéroport et sa grande région. Changi devient une des forces clés de l’intégration régionale, qui unifie les trois territoires constitutifs de SIJORI. Ce faisant, cette thèse postule que l’aéroport de Changi est un élément essentiel pour examiner la perspective transfrontalière de Singapour. Cette thèse illustre une nouvelle représentation de la région de l’aéroport transfrontalière de Changi, celle où la zone de chalandise de l’aéroport s’étend jusqu’à 150 kilomètres au-delà de la frontière nationale et où les relations spatiales sont définies par un ensemble de différents paramètres corrélés tels que la géographie, la politique, l’arsenal législatif et d’autres éléments liés à l’infrastructure. Le résultat liant “aéroport & région limitrophe” plaide en faveur de l’élargissement du savoir-faire spatial des études actuelles en urbanisme aéroportuaire, ainsi qu’élargit au contexte Asiaticque les limites géographiques des études actuelles.
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CONTENT

List of Tables 17
List of Figures 18

INTRODUCTION: AIRPORT GEOGRAPHIES IN THE SIJORI REGION 25
Prelude 25
I. Executive Summary 26
II. Research Description 30
  2.1 An Investigation into Airport-related Territorial Effects on Urbanisation: with Singapore’s Changi Airport in the SIJORI Cross-Border Region as the Case 30
  2.2 Research Context 32
  2.2.1 Early Studies on Airport Related Development 33
  2.2.2 Relevant Research on the Urban Impact of Airports Beyond their Terminal Fences 34
  2.2.3 Introducing the Cross-Border Airport 40
III. Research Methodology and Case Studies Selection:
  Tracing the Airport and its Hinterlands 42
    3.1 Using the ‘Mobilities’ Approach to Investigate the Cross-Border Airport 42
    3.2 Case Studies Methodology 43
      3.2.1 Case Studies Selection 44
        - Regional Cargo Flows of Perishable and High-value Goods 44
        - Cross-border Flows of Tourists 46
      3.2.2 Empirical Research 47
        - Site Survey and Data Analysis 47
        - Meeting Attendance 48
        - Interviews 48
IV. Structure of the Dissertation 50

CHAPTER 1: SINGAPORE AND THE SIJORI CROSS-BORDER REGION 55
I. The SIJORI Cross-Border Region 55
II. Territorial Policies Fostering Urbanisation Beyond the Border 58
III. Top-Down Centralised System within the Border 62
IV. Changi’s Airspace Control: a Vertical Border Regime 63

CHAPTER 2. THE AIRPORT ISLAND 69
I. Introduction 69
II. The Airport Island 70
CONCLUSION

I. Singapore's Extended Airport Region 171
II. Answers to the Research Questions 172
III. Limitation of the Study 180
IV. Theoretical Implications 182
V. Outlook 183

5.1 Hybrid Transborder Infrastructures Bridging the Gap 183
   Air and Bus 184
   Air and Ferry 186
5.2 Learning from Other Cross-Border Regions 188
5.3 An Open Question for the Future of the SIJORI Tri-National Region 189

APENDIX

I. Methodology Notes 192
   1.1 The Multiple Actors 192
   1.2 Interviews Practicalities 193
   1.3 Transfer Points 194
      Illustration of ‘transfer points’ investigation: fieldwork notes in Changi Airfreight Centre 194
II. History of Singapore Changi Airport 196
III. History of Changi Airport’s Periphery (The Airport Area) 200
IV. Upcoming Regional MRO’s hub: Bintan Industrial Estate’s Regeneration 202

BIBLIOGRAPHY 204
List of tables

INTRODUCTION
Table 0-1 Effect types and affected areas. Source: Salewski, Boucsein, and Gasco 2014
Table 0-2 Interview Sources

CONCLUSION
Table 5-1 Multi-causal parameters defining the Extended Airport Region of Singapore
Table 5-2 Changi’s airport-related urbanisation characteristics in SIJORI
List of figures

INTRODUCTION
Fig. 0-1  Singapore-Johor-Riau (SIJORI) cross-border tri-national region
Fig. 0-2  Perishable regional cargo flows—‘Hock Wee Nurseries’: a Singaporean family-run orchid farm based in Kota Tinggi, Johor
Fig. 0-3  High-value regional cargo flows—Electronic Multinational Corporation in Batamindo Industrial Park in Batam. Production of electronic chips to be exported globally via Changi
Fig. 0-4  Cross-border flows of tourists—Sanshaya: Colonial ‘black&white’ style luxury hotel set on the pristine sand of Bintan Lagoi Bay (opened in January 2015- SG$1000/night)
Fig. 0-5  Singapore mobility network to Changi Airport
Fig. 0-6  Changi North Estate: logistical park located on the western side of Changi Airport
Fig. 0-7  Categories of airport-related activities around airports, Source: Guller and Guller, 2010
Fig. 0-8  The Airport Corridor, Source: Schaafsma and all, 2008
Fig. 0-9  The Aerotropolis by Kasarda, Source: Schaafsma and all, 2008
Fig. 0-10  Conceptual Models of Urban Regional Integration of Airports and Cities, Source: Sawleski 2008
Fig. 0-11  High-value flow: local logistic company transporting electronic microchips to Batam’s Hang Nadim Airport where they are flown to Changi Airport for global exportation
Fig. 0-12  High-value flow: Infineon Technologies, workers assembling electronic microchips in Batam
Fig. 0-13  Perishable flow: logistic company packing ornamental fish for air-transport from Changi
Fig. 0-14  Perishable flow: orchids treatment in Johor for air-transport from Changi
Fig. 0-15  Perishable flow: orchids delivery to Coolport perishable Terminal in Changi Airfreight Centre
Fig. 0-16  Incentives examples of collaboration between Changi Airport and Bintan Beach International Resorts

CHAPTER 1
Fig. 1-1  Greater Singapore’s Extended Metropolitan Region - Source: Dick and Rimmer, 2003
Fig. 1-2  Indonesia-Malaysia-Singapore Growth Triangle (IMS-GT) – Source: Sparke and all, 2004
Fig. 1-3  SIJORI political and development timeline
Fig. 1-4  Rationing agriculture timeline –Source: De Koninck and all, 2008
Fig. 1-5  Singapore policies and development timeline
Fig. 1-6  Changi Flight Information Region (FIR) the airport’s air space control
Fig. 1-7a  Changi FIR evolution through time: in 1981 - n.2 encompasses parts of the State of Joho, Source: Hutton 1981
Fig. 1-7b  Changi FIR evolution through time: in 2014, Source: CAAS 2014

CHAPTER 2
Fig. 2-1  Changi Aviation Gallery in T3, International School Fieldtrip
Fig. 2-2  Changi Crowne Paza, Transit hotel, Woha Architects, Source: Teteris 2013
CHAPTER 3

Fig. 3-1 Local airfreight forwarder: exportation of the high-value microchips from Batam Hang Nadim Airport to Singapore Seletar Airport

Fig. 3-2 Singapore's licensed farms inside the 6 Agrotechnology Parks - Source: Agri-Food and Veterinary Authority (AVA) 2014

Fig. 3-3 Farm in Lim Chu Kang Agrotechnology Park

Fig. 3-4 Zion Orcgids, Lim Chu Kang farm (2ha), Singapore

Fig. 3-5 Hock Wee Nurseries, Tai Hong farm (100ha) in Kota Tinggi, Johor
Fig. 3-6  Hock Wee Nurseries, 205ha in total in Johor - regional cargo flows of orchids towards Changi Airport for global exportation

Fig. 3-7  ‘Tai Hong’ main farm of ‘Hock Wee Nurseries’ in Johor

Fig. 3-8  Flowers preparations for air-travel

Fig. 3-9  Hock Wee Nurseries’ Main Export Destinations - Source: Hock Wee Nurseries 2003

Fig. 3-10  Orchids Logistical Timeline of Exportation

Fig. 3-11  Market shares of import countries in Asia, Source: FAO 2004

Fig. 3-12  Market shares of export countries in Asia, Source: FAO 2000

Fig. 3-13  World trade shares of main exporting regions in the world, Source: FAO 2004

Fig. 3-14  Qian Hu Corporation in Sungei Tengah Agrotechnology Park

Fig. 3-15  Ornamental Fish: Worldwide Exports from Changi Airport and Qian Hu Distribution Centres- Source: Qian Hu 2013

Fig. 3-16  Ornamental Fish: Worldwide Imports to Qian Hu Singapore via Changi Airport - Source: Qian Hu 2013

Fig. 3-17  Qian Hu Farm in Singapore’s Sungei Tengah Agrotechnology Park (6.2 ha)

Fig. 3-18  Qian Hu Fish farm: regional cargo flows of fish in and out of Changi Airport for global exportation

Fig. 3-19  Qian Hu Fish farm: logistical timeline for global exportation

Fig. 3-20  Singapore skyline from the Strait of Singapore on the way to Batam Island

Fig. 3-21  Arrival to Batam Centre, a 45’ ferry ride away from Singapore

Fig. 3-22  Batamindo Industrial Park figure ground (350 ha) - Source: Ass Prof Milica Topalovic

Fig. 3-23  A self sufficient industrial park with different functions and warehouses

Fig. 3-24  High-Value Chips: Worldwide Production Sites (Source: Infineon October 2012)

Fig. 3-25  High-value Chips: Regional Production Map: Production warehouses/testing/distribution stations

Fig. 3-26  High-Value Chips Logistical timeline from Batamindo to Changi Airport

Fig. 3-27  Changi Airport Extended Urbanisation related to regional cargo flows: defining parameters diagrams

Fig. 3-28  Changi’s regional flows of cargo in SIJORI: Ornamental Fish, Chips, Orchids - Regional Production Map

CHAPTER 4

Fig. 4-1  BBIR border towards the rest of Bintan Island (land entry post 1)

Fig. 4-2  Bintan Beach International Resort (BBIR): Regional links and site developments

Fig. 4-3  Bintan International Airport and Garuda MRO hub: Illustrative plan, Source: BRI 2015

Fig. 4-4  Bintan International Airport: runway construction (state of works in 2014)

Fig. 4-5  Kelongs along Trikora beach on the eastern side of Bintan

Fig. 4-6  Mutiara Beach Guesthouse

Fig. 4-7  Nikoi Island

Fig. 4-8  Tourist sites in Johor and the Riau: direct and less direct connections with Changi Airport

Fig. 4-9  Annual visitors arrivals 1996-2014, Source: BRI 2015

Fig. 4-10  Annual visitors arrivals projections, Source: BRI 2015

Fig. 4-12  Fake elephants welcoming tourist at the entrance of Nirwana Gardens Resort

Fig. 4-13  Sanshaya - colonial ‘black&white’ style luxury hotel set on the pristine sand of Bintan
Lagoi

Fig. 4-14  Lagoi Bay: 2.5km-long, manmade clear water lake parallel to the sea
Fig. 4-15  Beach being cleaned at Nirwana Gardens Resort
Fig. 4-16  Boulder being bleached at Nirwana Gardens Resort
Fig. 4-17  Pasar Oleh Oleh tourist oriented ‘traditional village’ within BBIR
Fig. 4-18  Migrant workers dormitories within BBIR
Fig. 4-19  Lagoi Bay: plots and land uses – planned, Source: BRI 2015
Fig. 4-20  Lagoi Bay: Lagoi Beach Village retail hub
Fig. 4-21  BBIR site developments map – current and future
Fig. 4-22  Changi Airport extended leisure urbanisation: defining parameters diagrams
Fig. 4-23  Extended Airport Region of Singapore: leisure-related urbanisation in SIJORI
Fig. 4-24  Nikoi Island: Bintanese Architect presenting the new restaurant for the upcoming private island developed by Nikoi owners

CONCLUSION

Fig. 5-1  Changi Airport Footprint Diagram
Fig. 5-2  Case studies timeline
Fig. 5-3  Singapore’s Extended Airport Region
Fig. 5-4  Transborder air-related passenger flows in SIJORI
Fig. 5-5  Air Asia Skyshuttle from Johor Senai Airport to three different destinations in Singapore
Fig. 5-6  Singapore-bound “hotel&ferry” counters and tour operators in Batam Hang Nadim

APENDIX

Fig. 6-1  Singapore Civil Aviation Timeline
Fig. 6-2  Map of Changi -1942, Source: Probert 2006
Fig. 6-3  Map of RAF Headquarters -1965, Source: Probert 2006
Fig. 6-4  Batamindo Industrial Park: a striving ‘high-tech’ industrial park owned by Gallant Venture (GV): Self-sufficient infrastructure with warehouses, industries, workers houses and dormitories, town hall, amenities, etc.
Fig. 6-5  Bintan Industrial Estate: same model and owner (GV) as Batamindo but different results: derelict infrastructures, empty industries and dormitories.
INTRODUCTION

Airport Geographies in the SIJORI Region

Yet infrastructures have long been confined to technical knowledge and debates, to the fields of civil or military engineering, as if the “real city” (buildings, streets, squares, monuments...) existed without them, and in the imaginary, despite them.

PRELUDE

In October 2013, for the first time, 500 lambs from Canada were flown to Singapore for the yearly Muslim korban ritual of Hari Raya Haji. Otherwise known as the “Festival of Sacrifice”, Hari Raya Haji is celebrated by Muslims worldwide. It commemorates Prophet Abraham’s faith in God and marks the end of the Hajj - the annual holy pilgrimage to Mecca. These Canadian lambs supplemented the 2358 Australian and 1500 Irish sheep that were flown to Changi Airfreight Centre for the same occasion. These animals however did not come cheap – at $757 for the lambs and $455 for the sheep - due to airfreight transportation costs (JKMS 2013). All of them were sold out by the day of the celebrations on the 15th of October (Zaccheus 2013). To cope with possible supply disruptions¹ from Australia, Singapore’s primary source of livestock for korban, Singaporean authorities² have looked for alternative sources in Canada, the USA, France, Ireland and New-Zealand. According to the Islamic Religious Council of Singapore (Muis), livestock imported from regional countries had been considered but did not meet the necessary conditions required by the Singapore’s Agri-Food and Veterinary Authority’s (AVA) (Mokhtar 2013). As a result, every

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¹ In 2012 the Australian Government implemented the Exporter Supply Chain Assurance System (ESCAS) meant for transport operators and slaughterers to comply with internationally accepted animal welfare standards. In 2013 the 16 Singaporean mosques offering Korban with Australian sheep met the ESCAS requirements. The 5 other mosques using Canadian lambs adopted similar standard operating procedures in order to ensure that the standards of the World Organisation for Animal Health’s (OIE) were met. (JKMS 2013)

² Given the importance of Korban to the local Muslim community in Singapore, the Inter-Agency Korban Review Committee, comprising officers from Agri-Food and Veterinary Authority (AVA), with Majlis Ugama Islam Singapura or Islamic Religious Council of Singapore (MUIS), and Ministry of Culture, Community, and Youth (MCCY), was set up in December 2012 to explore several alternative sources. (JKMS 2013)
year Changi Airport welcomes thousands of animals from all over the world to serve the religious needs of the local Muslim community.

When I enquired more on the related logistic process, a manager from Muis informed me “the livestock for Korban is transported directly from the airport to the mosques.”3 This is apparently due to the lack of slaughterhouses available in Singapore.4 While Changi Airport teems of local pilgrims heading towards their Hajj journey, a local logistic firm appointed by Muis greets the animals at Changi Airfreight Centre, sees them through customs and quarantine, and delivers them by trucks to 24 mosques and religious schools islandwide. There the animals are sheltered inside temporary sheep pens while waiting for the Korban ritual to be performed and offered to the public.

A few months earlier, just across the border at Senai Johor Airport in Malaysia, a special deal was signed between the Saudi Arabian domestic low-cost airline National Air Services (NAS) and the travel agent Tiram Travel, a subsidiary of the Malaysian State investment corporation Johor Corporation (JCorp). Muslims can now charter direct flights from the small airport of Johor to the Saudi Arabian city of Jeddah at a competitive price.5 Located on the coast of the Red Sea, Jeddah is the principal gateway to the holy city of Mecca. Hoping to turn Senai Airport into a “Umrah hub”6 of the southern region, the JCorp president and chief executive who officially launched the service explained to journalists that “[d]ue to the strategic location of Senai International Airport, we believe the package will attract those from Singapore and Indonesia as well as locals.” He later added “[t]hat the tour company was also planning to introduce flights for pilgrims from the Riau Islands via Batam.” (Senai International Airport 2013)

I. EXECUTIVE SUMMARY

This dissertation is not about Muslim culture or habits. The efforts to airfreight livestock from Canada to Singapore or to implement competitive and specialised mobility hubs at the fringe of the City-State7 international border are only two examples of how dependent on aviation infrastructures Singapore is, and how aviation-related cross-border activities influence the processes of interactions in the larger Singapore-Johor-Riau (SIJORI) cross-border tri-national region. According to Saskia Sassen, the city-state of Singapore is a ‘Global City’ standing as one of the ‘command and control centres of world capitalist economy.’ (Sassen 1991) But unlike other global financial centres, Singapore is not part of a larger political entity, such as New York, London or Tokyo. In this case, its immediate regional hinterland spans interstate boundaries that make this World City distinctive from others. Like Hong Kong before its restoration to Chinese sovereignty in 1997. As Lindquist points out, Singapore is limited in size — just over 700 square kilometres including

3 Abdullah Redzuan Bin, Manager of Islamic Religious Council of Singapore (Muis), email exchange with the author, March 2014, Singapore.
4 Singapore’s Agri-Food and Veterinary Authority’s (AVA), phone call with the author, February 2014, Singapore.
5 The Hajj is the largest gathering of Muslim people in the world every year. In 2012 ‘Al Arabiya’ - the Saudi-owned pan-Arab news television - reported that 3,161,573 went on Hajj with over 50% of them - 1,700,000 - coming from outside of Saudi Arabia (Aljazeera 2013). Some airlines team with travel agents to offer packages for Muslims going to Mecca, these generally travel to Hajj in groups. As numbers of Muslims performing the religious duty have increased yearly — especially the number of foreing pilgrims travelling from abroad with a phenomenal increase of 2,824% since 1920 (Shah 2012) — airports have built special facilities for them such as the dedicated ‘Hajj Terminal’ of King Abdulaziz International Airport in Jeddah designed by the American firm SOM in 1980’s or in Jakarta Soekarno-Hatta Airport to service pilgrims as they depart and return home.
6 The Umrah is a Muslim pilgrimage to Mecca that can be undertaken at any time of the year. It is sometimes called the ‘minor’ pilgrimage or ‘lesser’ pilgrimage. As opposed to the ‘major’ pilgrimage of the Hajj, the Umrah is not compulsory but nevertheless highly recommended.
7 The terminology ‘City-State’ used throughout this dissertation refers to the Republic of Singapore.
land reclamation works—and is a Global City that is also a Nation-State. Therefore the distance to offshore locations is much closer, "compressing the space between centre and periphery." (Lindquist 2010).

Since the 1970s, in order to address rising land and labour cost, the economic development strategy of Singapore promoted the relocation of land and labour-intense activities across the national border. However, in order to avoid the rapid industrial hollowing-out that was occurring in Hong Kong as industries relocated in droves to the Pearl River Delta, policymakers in Singapore formalised the government’s outward investment drives in the region in the early 1990’s through by-and-tri-lateral agreements, supported with territorial policies. While Singapore relocated intensive agriculture, manufacturing, and leisure activities outside the national border, it kept them as close and as secure as possible within its peripheral region. Eased by a past joint history and territorial proximity, two neighbours became the main inheritors of this capital spill-over: the Malaysian state of Johor, just north of Singapore; and the Riau Islands Province in Indonesia, south of the island. (Fig. 0-1) It is in this context that the Indonesia-Malaysia-Singapore (IMS) Growth Triangle (GT) was formalised in 1994 to optimise the complementarity between the three countries.

Throughout the years, interactions between the three components of the SIJORI cross-border region have multiplied and grown deeper. Each day, people are crossing the borders of this tri-national territory as workers, students, tourists, or transport operators, to offer services, move or consume goods. This research

Fig. 0-1 Singapore-Johor-Riau (SIJORI) cross-border tri-national region
argues that Changi Airport’s regional networks of cargo and passengers are key in supporting SIJORI’s economic development and in doing so channelling urbanisation throughout this territory. As such the research uncovers that Changi’s effects materialise on a large territorial scale, introducing the notion of a cross-border airport typology, which reciprocal spatial influence emerges across the tri-national region. These effects encompass the geographic manifestations of aviation-related flows and functions, including the urban forms that these cross-border activities acquire, their use and the range of infrastructures that facilitate their accesses and links from to and from the airport.

Singapore’s specific geographical conditions—an island Nation-State with strong economic gradient and border vis-a-vis its developing peripheral neighbours—coupled with tailored ‘extra-territorial’ and ‘centralised’ planning legislations greatly contribute to Changi’s particular effects on the built environment. Although development-pressure-due-to-size-concerns affects most of the island of Singapore, the close periphery around Changi Airport is reserved for future airport expansion and infrastructure facilities. As a result, it is ‘all of Singapore’ that can be interpreted as an ‘Airport Area’ with clusters of international trade and tourism equally spread-out at key locations throughout the island. On the other hand, while urban development is strictly controlled in Singapore, specific territorial policies enabled urbanisation beyond the border and control of the “hinterlandisation of [Singapore’s] economy.” ([Sparke et al. 2004](#)) This power exerted on the larger territory also escalates in the airspace, where through an extended Flight Information Region (FIR) Changi Airport controls all of the Riau Archipelago airspace. This research argues that as much as Singapore’s development and capital spilled out from the island’s frontier into nearby Johor and the Riau Islands, Changi’s urban effects can be found less in the airport periphery than on a much larger territorial scale throughout the SIJORI cross-border region. As such Changi Airport is one of the central factors, in a multi-causal relationship, of significant urbanisation of Singapore’s hinterland. Through its cross-border flows, Changi is one of the key forces linking back the three countries’ territories together.

Through case studies based research and fieldwork conducted in Singapore, the State of Johor in Malaysia, and the islands of Batam and Bintan in the Indonesian Riau Archipelago, this thesis uncovers how Changi Airport has both facilitated and responded to urban development taking place in SIJORI. Following Singapore’s 1990s regionalisation strategies—such as the phasing out of agricultural land and industrial productions—airfreight-dependent activities, among others, were relocated throughout the rural and industrial hinterlands of the SIJORI region while keeping their strategic bases in Singapore. Changi Airport’s regional air-cargo networks enabled local small and medium producers of ‘perishable’ goods (Fig. 0-2 Perishable regional cargo flows—‘Hock Wee Nurseries’: a Singaporean family-run orchid farm based in Kota Tinggi, Johor).
0-2), as well as multinational corporations of high-value electronics (Fig. 0-3) to expand their commercial activities across the national border. Similarly, Changi’s cross-border flows of tourists support ‘leisure-urbanisation’ on the island of Bintan and other sites in the SIJORI cross-border region, in forms of tourist-related developments built following Tourism 21, Singapore’s regional-scale “collective attractiveness” strategy. Over 65% of resorts’ clients in Bintan are international passengers who fly into Singapore via Changi Airport for a combined global city and tropical paradise holiday. (Fig. 0-4)

In doing so the dissertation uncovers a new representation of the Airport Region of Singapore, one where the catchment area of the airport, its footprint, extends up-to 150-kilometres beyond the national border. Through the case studies analysed, the findings unveil the multi-causal principles defining the Extended Airport Region of Singapore: a set of different correlated success factors and parameters —of geographic, politic, legislative and infrastructure-related nature— such as the access to a reliable airport hub with world-wide connectivity, the close geographic proximity of a low-key hinterland and a Global City or the implementation of specific planning policies and tax regimes, among the many other parameters that will be revealed in the dissertation. Ultimately the Extended Airport Region of Singapore engages the airport with a larger territorial scale and reveals the many actors involved in supporting Changi’s extended territorial links throughout the rural, industrial and leisure areas of the SIJORI cross-border region. The airport appears to be more than an ‘isolated transport infrastructure’ and emerges as a key player in regional integration, portraying and enhanced reciprocity of the airport with its larger region.

Finally in the outlook, the conclusion proposes a broader research agenda including the smaller airports along the fringe of Singapore international border. As these peripheral regions develop, the multiple secondary airports these hinterlands contain—namely Batam’s Hang Nadim and Senai in Johor—also expand, in support of further, correlated urban growth, while new specialised airports —such as the Hajj hub at Johor’s airport or the tourists-oriented Bintan International Airport—are currently being developed. The economic gradient has started to generate a trade in cross-border traffic for passengers on both sides of the borders who take advantage of cheaper regional fares at SIJORI’s secondary airports. These cross-border passenger flows are still insignificant, a few thousands a month, in comparison to Changi’s market share, 4,480,000 for May 2015 only. (CAG 2015) Changi will remain the international hub by far, overshadowing in capacity and connections these smaller airports. However as they grow, the dissertation questions at the end whether their role in supporting the cross-border activities shaping the SIJORI tri-national region, may become more important and have catalytic elements on the region’s future development.
II RESEARCH DESCRIPTION

2.1 An Investigation into Airport-related Territorial Effects on Urbanisation: with Singapore’s Changi Airport in the SIJORI Cross-Border Region as the Case

The importance of airports as mobility hubs for their cities is evident and the expansion of global air travel has further magnified their reciprocal relationship with cities. Airports hubs have become important magnets within their urban agglomerations, attracting various types of air- and non-air-related activities to their surroundings. Airports play a strategic role in city regions: for their accessibility, as factors in locational choice of activities, and by fostering global production and economic development. In recent years, airport areas have become constantly transforming distinct and complex spaces that exemplify the interaction of global flows and local dynamics. As urbanisation expands into the airports’ previously remote locations, many large airports become more and more embedded in the urban context. And as new functions emerge in their urban peripheries, airports become complex metropolitan nodes. The airport acts as a magnet for several functions, some of which obvious, located within its actual physical boundaries, but many others being part of a much larger spatial imprint and in the case of Singapore related with its geopolitical uniqueness.

The last two decades have witnessed a growing interest—in both praxis and academia—of what may be called ‘airport-related urban development’. Some authors have tried to capture the airport’s urban effects in “ideal-type” explanatory “spatial models” —such as the ‘Airport City’ (Schaafsma, Amkreutz, and Güller 2008) or the ‘Aerotropolis’ (Kasarda and Lindsay 2011) Not only these ‘models’ have been questioned for their empirical scrutiny; their broad generalisation of airport’s effects in order to categorise them into simplified concepts, regardless of the specificities of each context, renders them inadequate to analyse different locales. Relevant, and more empirically-based, studies can be found in the disciplines of regional sciences in terms of locational patterns linked to the knowledge economy-related activities around airports (Thierstein and Conventz 2014) or other functions emerging along inland suburban and hinterland corridors beyond the edge of a metropolitan area. (Hesse and Rodrigue 2004, Notteboom and Rodrigue 2008, O’Connor 2009) However, rather little research has been conducted on the spatial relation between airports and larger regions in the fields of planning and urban design. While Changi’s development as a global hub and its importance for Singapore are well documented in an array of historical, economic and structural studies (See Apendix point 2), Changi’s role in the SIJORI cross-border region has been under-studied. If many publications and reports give a clear account of the airport’s growth milestones and achievements, few describe Changi within its larger territorial context nor investigate its potential interactions with its larger urban region.

When I began my research on Changi Airport in 2012, I quickly discovered a distinct disconnect between what I had read in journals and scholarly publications about Changi—or airports in general—and what I experienced and noticed on the ground during my fieldwork. For instance, despite the allure of models such as the ‘Aerotropolis’ to proponents of ‘airport-driven urbanisation’, the volume of airport-related development on the periphery of Changi Airport—called one of the ‘Best Airports in the World’—appeared very modest.

8 Over the years, Singapore Changi Airport has received a consistent record of awards and accolades and was rated the World’s Best Airport in 2013 by the World Airport Awards for the 4th time since it opened in 1981.
The reality was more associated with spatial segregation, functional deadlocks, and underdeveloped public transport connectivity. The location of Changi Airport at the eastern-end of the island shows the ambition of an ‘air terminus’—a singularly-oriented transport hub, focused mainly on air traffic. (Fig. 0-5) Changi’s close periphery consists of relatively small mono-functional quarters, with poor public accessibility and transport connectivity. In contrast, European airports like Amsterdam and Zürich have become urban nodes and destinations in themselves. Like “spiders in a public transport web” (Christiaanse 2013), they are well integrated in their respective cities’ public transport networks. Changi Airport at first glance appears to be a dead-end at the end of a road- and railway- corridor, like Hongkong Airport, which is also located at the end of an island. As such, Changi’s immediate spatial periphery is more of a dead-end terminal condition. (Fig. 0-6)

Fig. 0-6 Changi North Estate: logistical park located on the western side of Changi Airport
When I mentioned this to the Senior Planner at the Singapore Urban Redevelopment Authority (URA) who is in charge of the airport periphery area, he agreed, noting that Changi is important to the City-State’s development, however due to land scarcity, the authorities had to carefully balance all of the Nation’s development needs. “The development of the area surrounding Changi is deliberately suppressed. We do not want big developments near the airport to limit its future accessibility or infrastructure expansion. [...] The airport is not far from the city centre. We consider all of Singapore when we think about an ‘Airport-City.’”9 During my fieldwork interviews in Singapore, not a single government representative ever forgot to emphasise the scarcity of land resources as a persistent threat to each and every Singapore citizen. The message is that the Island-state will virtually become dysfunctional if land resources are not allocated wisely. From the 1970s onwards, this limitation led the government of Singapore to create a transborder region, relocating land- and labour-intense activities in Johor and in the Riau Islands Province. The specific situation of the island-state of Singapore provided me with a set of questions:

- How does Changi’s proximity to Malaysia and Indonesia relate to urbanisation beyond Singapore’s borders?
- What are the specific types of flows through Changi Airport with reciprocal urbanisation effects?
- Where and at which territorial scales do these flows materialise in the built environment? And what are their characteristics?
- How are they organised and distributed?

This research hypothesise that if Singapore’s development and capital spilled out from the island’s frontier into nearby Johor and the Riau Islands, the urbanising effects of Changi Airport emerge on a larger scale as well, throughout the SIJORI cross-border region. In so doing, the thesis attempts to probe if a hub airport could spur the developmental growth of its related larger hinterland. The Singapore-Johor-Riau transborder urban region offers an interesting testing ground to investigate this question. Singapore is a finite island Nation-State. ‘Centralised’ planning mechanisms exert a tight control on the island’s development, such as limiting urbanisation around Changi and leading to a so-called dead-end airport type in its periphery. On the other hand, the same geographic limitation, coupled with the economic gradient between Singapore and its surrounding regions, have pushed urbanisation beyond the border. The dissertation postulates that airport-related developments have similarly been pushed into the hinterlands, triggering new forms of private transnational activities and transport-networks. Singapore’s specific geopolitical context has led to a particular relationship condition between the airport and the larger cross-border region. This ‘a-typical’ condition of Changi Airport in relation to its tri-national context will be studied in this dissertation.

2.2 Research Context

“Airports have become a common feature of our industrialised landscape and have left indelible imprints on our environment and culture. They enable people, goods and information to travel around the world. They have brought nations closer together in time and space and have enabled business and personal relationships to be routinely conducted at a distance. Yet they have also provoked controversy and become increasingly criticised for their congestions, delays, their deleterious environmental impacts and strict security. In a little over 100 years, the airport has been transformed from a place of excitement and opportunity into an increasingly maligned aspect of modern culture. They have been sites of political protest, opposition and violence. Yet despite controversy

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9 Bert Wee, senior planner, Physical Planning East Department (PPE), Physical Planning Group (PPG), Urban Redevelopment Authority (URA), interview with the author, February 2013, Singapore, URA meeting room.
surrounding their development, airports are emblematic spaces of the modern world whose importance to, and influence on, human society are difficult to overstate.” (Budd 2012)

2.2.1 Early Studies on Airport Related Development

As Lucy Budd introduces in her book chapter, Airports: from flying fields to 21st century aerocities, starting in the late 1960s, passengers’ layover time in airport terminals increased. This was due to more stringent and time-consuming security checks, triggered by the growth of air travel following the introduction of ‘economy’ class fares. These changes led airport operators to develop ‘airport retailing’ in order to mitigate passengers’ waiting time while raising valuable revenues. (Budd 2012) The related development of a ‘universally familiar’ airport environment with duty-free shops and other retail concessions led many scholars, from the early 1990s onward, to advocate that airports within the global airport system had become similar in form and appearance, regardless of their physical location, while becoming more socioeconomically and spatially segregated from their surrounding cities.10

As a consequence, airports have often been described as generic places that “look the same” everywhere, with an homogenous “unmistakable architectural airport aesthetic” (Ibelings 1998): like “quarters of the Generic City... with the added attraction of being hermetic systems from which there is no escape” (Koolhaas and Mau 1995 & 1998); or “spatial manifestation” of the “space of flows” segregated from the surrounding city (Castells 1996 & 2000)13 and increasingly disconnected from ground context by “urban bypass through network redesign” and “elite corridors” (Graham and Marvin 2001). Cwerner, Kesselring and Urry further this argument by claiming that “air travel and its visible inequalities are a synecdoche of the increasingly global pattern of social inequalities.” (Cwerner, Kesselring, and Urry 2009)15

10 Singapore Changi Airport did not escape that trend either: describing her ‘life in transit’ Fuller enounces: “I know Singapore airport almost as well as my local mall. I seem to transit it in Singapore almost every time I travel. I use the airport’s email centre, smoke on the rooftop terrace garden, eavesdrop on conversations at the carp pond, and buy American cigarettes at a good price. Habituated in a literacy learned from a lifetime of roads and shopping malls, I move from floor to floor, gate to gate in a way that seems instinctual. I have of course, never been to Singapore. I have never left the airport. Singapore – whatever that entity may be -- is quite abstract to me. My knowledge of Singapore is gleaned through newspaper reports, stories told by students, and by time spent at its airport. I may never have been ‘to Singapore’, but I have been ‘in Singapore’. On my way elsewhere, I have pressed against this nation’s frontiers from somewhere within its geophysical borders.” (Fuller 2003)

11 Ibelings identifies airports as generic places that “look the same” everywhere, with an homogenous “unmistakable architectural airport aesthetic”: “the main ingredients of which are an exposed steel construction [...], a marked preference for vaulted roofs, a colour palette of grey, white, [...] and, above all, acres and acres of glass.” (Ibelings 1998, 29)

12 For Koolhaas, airports have become ‘the most singular, characteristic elements’ of his ‘Generic City’. Airports “[...] give a first concentrated blast of local identity (sometimes it is also the last). [...] they are like quarters of the Generic City, sometimes even its reason for being (its centre?), with the added attraction of being hermetic systems from which there is no escape – except to another airport.” (Koolhaas and Mau 1995 & 1998, 1951 & 1952)

13 In his famous book The Rise of the Network Society Castells identifies airports as “spatial manifestation” of the “space of flows” - a space constituted by nodes and hubs and serving as “spatial organisation of the dominant, managerial elites” (Castells 1996 & 2000, 441 & 445). To further illustrate his theory he draws example from Ricardo Bofill’s design of Barcelona’s new airport and describes it as follow: “No cover up of the fear and anxiety that people experience in an airport. [...] In the middle of the cold beauty of this airport passengers have to face their terrible truth: they are alone, in the middle of the space of flows, they may lose their connection, they are suspended in the emptiness of transition. And there is no escape.” (Castells 1996 & 2000, 450 & 451)

14 In their book Splintering Urbanism Graham and Marvin further argue that airports become increasingly disconnected from ground context by “urban bypass through network redesign”. Such as the example of the Heathrow Express link where no stops exist between the airport and Paddington Station in London West End, totally bypassing intermediary spaces. The idea is “to improve the smoothness of flow, [...] constructing private, dedicated rail link that carry passengers more directly between the premium city core and the airport. [...] hermatically sealed from all intervening places, embedding a profound logic of glocal bypass into their design operation.” (Graham and Marvin 2001, 67)

15 In the edited volume Aeromobilities Cwerner, Kesselring and Urry argue that: “Air travel and its visible inequalities are a synecdoche of the increasingly global pattern of social inequalities. [...] In particular, the global kinetic elite experiences: ‘the construction of a (relatively) secluded space across the world along the connecting lines of the space of flows’ (Castells).” (Cwerner, Kesselring, and Urry 2009, 32)
Coined as symptomatic “non-places”\textsuperscript{16} by Augé (Augé 1992, 100), scholars have identified airports as locus of “global anxieties” (Easterling 2005, 101), reinforcing our “ontological alienation, a sense of [...] being lost in space.” (Thackara 2006, 100)

Such accounts have however been criticised on several grounds. Michael Peter Smith and Adrian Favell note that they lack empirical research and tend “to reify the lives and cultures of [certain] groups in order to make theoretical and political points rather than empirical ones.” (2006) Vidler and also Merriman argue that writing in this vein and framing airports as “empty, sterile, non-spaces” glosses over the rich and variegated sociality of air travellers, who are likely to have a very different experience. (Vidler 1998, Merriman 2004) Their point reflects geographer Peter Adey’s contention that “the inevitable danger is that the mobile scholar may suppose that their experience of mobility is the same as anyone else’s.” (Adey 2010) Additionally, architect and Professor Kees Christiaanse notes that these scholars generally have little specific experience with airports and their influence on urban structures and cities.\textsuperscript{17}

2.2.2 Relevant Research On The Urban Impact Of Airports Beyond Their Terminal Fences

In terms of the urban impact of airports beyond their terminal fences, both Bruegman (in the book edited by Zukowsky) and Roseau (in Aerocity) describe how the ‘aerial subject’ has stimulated architects’ and designers’ visions for the ‘city of the future’ since the beginning of the twentieth century (Bruegmann 1996, 194-211, Roseau 2012). The expansion of global air travel has magnified the impact of airports on their cities. Airport hubs have become major drivers of urbanisation, shaping the built environment and landside infrastructure by drawing large flows of people, goods and capital. More recently, airport areas have become distinct and complex spaces, incorporating different air- and non-air-related programs into their perimeters. These various urbanisation effects define the ‘airport region’ and are sometimes difficult to recognise as such because none is mono-causal.

The need for non-aeronautical revenues for the airport can be accounted for in the increasing pressure of development on airports’ immediate surroundings. In the western hemisphere, one consequence of deregulating\textsuperscript{18} the airline industry was a shift from a ‘government-owned’ to a ‘commercially-driven’ airports (Doganis 1992). Deregulation enabled airports to develop more competitive strategies such as capitalising on airport’s “landside” revenues (Prins 2008) and generating other sources of incomes than the more traditional—and no longer sufficient—“airside” ones (mainly landing fees and concessions). Today, airports have established commercial and real estate divisions to develop their landside areas in order to finance additional infrastructure for and by the airport.

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\textsuperscript{16} ‘Non-places’ is a translation of ‘non-lieux’ term coined by anthropologist Marc Augé who describes the supermodern condition in his book Non-Lieux. Introduction à une anthropologie de la surmodernité where ‘non-places’ are spaces exempt from emotions or memories and to which nobody feels any attachment. Spaces ‘which cannot be defined as relational, or historical, or concerned with identity’ (Augé 1992, 100)

\textsuperscript{17} Professor Kees Christiaanse, on-going discussions with the author

\textsuperscript{18} Until the late 1970’s in the USA, and much later in Europe, the world of aviation was highly regulated. National governments not only owned airlines, and often airports, they were also directly involved in regulating traffic rights and air traffic control. The deregulation of the airline industry in 1978 in the US and the intra-European liberalisation completed in 1997, meant that airlines were no longer committed to airports (Schachts, Amkreutz, and Güller 2008). To survive some airlines optimised their networks in ‘hub-and-spoke’ setups and enlarged their markets through mergers and take-overs. Other ‘new’ types of carriers re-invented the airline business model by flying on trunk routes of traditional carriers and not organising the network thru expensive airports hubs. By flying ‘point to point’ in short, the low-cost carriers (LCCs) were able to cut costs, offer competitive prices and largely conquer the traditional airlines - in 2011, LCCs transported about one third of all passengers worldwide (CAPA 2011) ; nowadays in Southeast Asia, they account for 50-60 percent of all regional scheduled flights. (CAPA 2013) Some airports became privileged hubs offering direct access to higher number of destinations. Putting airports and airlines in direct competition.

34 The Airport and the Territory Anna Gasco
As Graham notes, non-aviation commercial revenues nowadays account on average for half of all airport income worldwide (Graham 2009). Non-aviation commercial sources of airports are nowadays generated by retail, parking, car-rental concessions and other property income from leasing airport-land mainly for hotels and offices. (ACI 2004). According to Kasarda, airport areas have also become magnets for time-critical manufacturing, distribution, entertainment, tourism and other enterprises that require speedy connectivity to distant suppliers, customers, clients and partners nationally and worldwide (Kasarda 2008a). Other easily recognisable effects on the built environment relate to activities directly associated with the logistic flow of air cargo. With ‘trade development’ on airport peripheries expanding to include time-sensitive manufacturing, logistical and distributions centres, some companies have specialized in ‘high-value’ products such as micro-technological components, precious goods or perishables (Kasarda 2009).

As a result of urbanisation processes between the city and the once-remote airport, some larger airports have become increasingly embedded in their urban contexts. As Christiaanse notes, functions previously found in downtown areas have re-emerged among these airports’ urban peripheries. As such, airports become complex metropolitan nodes, with retail developments, offices, hotels, convention, trade and exhibition facilities, but also university and research and development campuses, artistic venues, along with culture, entertainment and recreation centres. The following literature review analyses two of the main fields of research that came out as a result of the growing concentration of airport-related functions clustering around the terminal or in the larger airport region. The first category consist of simplified ‘models’ devised by scholars and business strategists to describe the relationship of airports with their surroundings in ‘ideal-type spatial modes’. These are often used by airport-authorities as normative blueprints to promote landside development around the terminals regardless of the local context. The second, related to regional science studies, attempt to empirically assess the impacts that airports have on larger region. After evaluating these bodies of knowledge, the following literature review ends by framing the contribution of the thesis: a more empirical and context-based approach to address the reciprocal space-related relation of an airport with its larger region.

- Spatial Models

In their book From Airport to Airport City, architects Mathis and Michael Güller define an ‘Airport City’ as “the more or less dense cluster of operational, airport-related activities, plus the other commercial and business corners, on and around the airport platform.” (Güller and Güller 2003) They recognise that due to land-availability, effective connections and synergetic effects of business concentration, other functions are attracted to the airport vicinity. Built development therefore stretches beyond the airport perimeter, and in particular in the ‘zone between the airport and the main city center.’ Güller and Güller classify the clustering of operational and other commercial activities in and around the airport in four categories, ranging from ‘airfreight-traffic oriented’ to ‘passenger-traffic oriented activities’ (Güller 2010).

The first category includes ‘core aeronautical’ activities that directly support air traffic functions and passengers: duty-free, commercial nexus, restaurants, ground handling, maintenance, freight centres, movements, etc. The second group are the ‘airport-related’ activities that directly relate to air transportation: international logistic headquarters, courier services or distribution centres. The third are...

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19 Professor Kees Christiaanse, on-going discussions with the author.
The ‘airport-oriented’ activities, which are located just outside the fence, but benefit from excellent ground and air accessibility, and their associated marketing advantages. These include international business headquarters, convention and exhibition centres, hotels, etc. Finally, the last category are emerging non-air traffic-related activities ‘profiting from the network position’ with no direct link to the terminals or passengers, but which nevertheless settle near the airport, along primary transportation corridors, proximate to universities, schools, cinemas, shopping malls, recreational sites, etc. (Fig 0-7)

The ‘airport corridor’ concept introduced by Schaafsma, Amkreutz and Güller in their book Airport and City describes: “Airports as the economic centres of so called airports areas [...] the territory where most airport-related businesses are located. This can be an area up to 10 to 20 kilometres around the airport.” (Schaafsma, Amkreutz, and Güller 2008, 34) (Fig 0-8) In this publication, the airport is investigated as driver of economic growth and urban development, through which the airport corridor emerges as an infrastructural spine with potential to attract various functions. But the best-known model defining the effects of airports on urban development is the ‘Aerotropolis’ developed by American economist John Kasarda. With slogans such as “Look for yesterday’s busiest train terminals and you will find today’s great urban centres. Look for today’s busiest airports and you will find the great urban centres of tomorrow.” (Kasarda and Lindsay 2011) Kasarda has, over the last decade, consistently popularised the idea that airports could catalyse a broader development area. (Kasarda 2000, 2008a, b, 2009, Kasarda and Lindsay 2011). The ‘Aerotropolis’ is a normative ‘airport-centric spatial concept’ consisting of an airport city at its core, with optimal business and industrial-logistics cluster developments extending up to 25 km outward from the airport, which are supported by dedicated highways, “aerolanes,” and high-speed rail lines, “aerotains,” radiating out from it. (Fig 0-9)

The ‘Aerotropolis’ is based on a purely economic-functional view of airports and cities and has been criticized on several grounds. Freestone and Baker question its mono-causal “build and growth will come” optimism. They argue that successful airport-related urban development does not come from the airport alone (Freestone and Baker 2011), but a combination of critical factors including government incentives,
regional policy supports, ground transportation accessibility, success of the airport activity itself. Other aspects related to land, such as cost, land-use or tenure restriction and concerns of adjacent communities also contribute to airport-related urban development. Prosperi expresses his annoyance with the applicability of the ‘Aerotropolis’ concept in different contexts (Prosperi 2007), arguing that vast differences from city context to airport types (international “origin and destination”, secondary hub, or regional airport) are also contributing factors. He questions the research for lacking realistic economic assessments and presenting a simplistic outlook in economic benefits, as noted in (Freestone and Baker 2011). Finally, common to the ‘Airport city,’ ‘Airport corridor’ and ‘Aerotropolis,’ is the focus on airports’ positive economic impacts. This reveals a certain bias for the desirability of airport-related development and questions the integrity of airport operators’ intentions when suing such ‘models’. In that sense—as Prosperi further argues—the ‘urbanisation models’ are not as useful to urban planners and urban designers as to airport operators. (Prosperi 2007) Their economic and functionalist desirability, as well as their obliviousness to other social or ecological perspectives, calls into question the long-term resilience of their urban structure. (Michaeli, Salewski, and Frei 2011)

After all, while the airport has inarguably become an important catalyst for development, that does not automatically make the airport area a ‘vibrant urban centre’. “Airports are enclaves, connected in their networks but often disconnected from their surrounding communities.” (Schaafsma, Amkreutz, and Güller 2008, 122). The airport has more specific contextual relationships than other urban typologies as illustrated by the dead-end condition of Singapore Changi Airport’s periphery for example. In Singapore the spatial relation between the airport and its close periphery do not materialise in an “ideal-type” way, such as these “models” suggest. If the ‘Aerotropolis,’ ‘Airport city,’ and ‘Airport corridor’ concepts help to explain current trends around airports, their great flexibility of interpretation do not offer practical guidelines for sustainable growth.

Finally, as Salewski and all argue, these models, which regard the airport as an urban entity, place it at the centre of influence. They “replace the old city at its core with the airport” and are based on the outdated urban theory model of the monocentric city. (Salewski et al. 2012, 7) While comprehensive historic centres may remain important, today they have been supplemented with multiple centres, hubs and nodes. Together, these ‘centralities’ are drawn together in a network of infrastructures to form complex polycentric urban systems serving whole regions. Salewski and all argue for a model that needs to integrate different scales, and in which the airport is also an urban centre, but one of many. (Fig. 0-10)
Before the airport was understood as an urban entity, it was regarded as a large-scale transport infrastructure located outside the monocentric old city and its surrounding urban sprawl. Office compounds located in its vicinity were regarded as Edge Cities (Garreau 1991) on the limits of the monocentric city (see Diagram 1, Figure 1). [...] The models of Airport City and Aerotropolis simply replace the old city at its core with the airport and rename its surrounding urban sprawl (see Diagram 1, Figure 2). Both of these models can be enhanced by introducing an Airport Corridor without changing their fundamental set-up. A better model needs to start with a better urban model such as the contemporary network city or polycentric city-region (cf. Oswald et al. 2003; Shane 2005; Hall et al. 2006). Here, the airport is also an urban center, but one of many, amongst which the old city centers (see Diagram 1, Figure 3).

**Regional Sciences Studies**

The fields linked to regional sciences, in particular transport geography and logistics, territorial and spatial development, and regional economics currently offer more in-depth and empirical research on the spatial relation between airports and ‘airport regions.’ This literature review section limits the analysis to the topics that are translatable into the discipline of planning. In terms of locational qualities in the airport region for example, Thierstein and Conventz analyse knowledge economy linked locational patterns emerging around airports. (Thierstein and Conventz 2014) They define the ‘knowledge economy’ as the “interdependent system of advanced producer service (APS), high-tech industries and knowledge-creating institutions such as universities and research establishments.” (Ibid, 7) In their study of two major European airports, Amsterdam’s Schiphol and Frankfurt’s Rhine-Main Airport, they conclude that though initially planned as stand-alone facilities, hubs airports have evolved into “urban-like entities” and powerful “economic engines.” Combined with a multimodality of transportation infrastructure, airports impact cities and regions by acting as ‘nodes of transnational value-creation chains and hubs of knowledge exchange.’ They argue how “new location patterns” therefore emerge around airports that offer qualities and meet requirements of knowledge-intensive companies.

Thierstein and Conventz illustrate how Schiphol and Frankfurt airports have become attractive sites for real estate development and property-led capital accumulation. The office stock on and around Frankfurt Airport comprises more than 576,000 m2 generated and occupied by knowledge economy firms such as IT & telecommunications, computer industries, healthcare, etc. Schiphol has been successful in attracting the international or European headquarters of prominent companies and institutions that are not directly related to the aviation business, like the American Chamber of Commerce, Citibank, Microsoft, etc., leading to a remarkable high-value of the airport sites (with higher rents than in the city centre of Amsterdam) (Ibid, 19-22). Through these examples, they argue that “as the traditional role of airports is redefined, a new spatial entity is evolving within city regions.” They link this ‘node’ or ‘centrality’ with the new reality of polycentric spatial configuration.
In terms of transport geography, several studies attempt to address the impact of hub-related logistics activities on cities and larger regions. In their study of the emerging transport geography of logistics and freight distribution for instance, Hesse and Rodrigue suggest that logistics activities are located not only in and around the physical nodes of seaports and airports, but are also found at inland suburban and hinterland corridors beyond the edge of a metropolitan area. (Hesse and Rodrigue 2004) Illustrating these outcomes, Rodrigue and Notteboom have identified an “extended gateway” in an area of 100-150 km around the port of Antwerp, and links extending over 100 km around Rotterdam. (Notteboom and Rodrigue 2008) As O’Connor notes, the geographical impact of these “extended gateway[s]” linked to major sea or airfreight terminals within global city regions may well be “a new species of global city” (O’Connor 2009), the one defined by Easterling as “the global city as Logistics city, ... a 24 hour conveyance urbanism of infrastructures, containers and specialised vehicles.” (Easterling 2004) In the same vein, van Wijk argues in his dissertation, Airports as City Ports in the City-Region, that lower added-value activities requiring larger space, such as warehouses for goods storage and distribution, may prefer to locate within the ‘wider airport region’, rather than the direct airport vicinity (van Wijk 2007).

Related to this “extended footprint” of hub airports, Towards an Effect-Based Model for Airports and Cities, a study conducted by the ‘Airports and Cities’ platform of the ETH Zurich, is a rare spatial-related scholarly work that attempts to provide a more analytical interpretation and empirical description of the hub airport’s impact on their surrounding areas and regions. Based on fieldwork and design research studios conducted on three airports, Amsterdam’s Schiphol, Zürich’s Kloten, and Singapore’s Changi Airport, the team proposes an ‘empirical descriptive model’ based on five types of effect: territorial effects, aviation effects, flows effects, allocation effects, and urbanisation effects. (Table 0-1) The team argues that these effects can stretch from the airport’s closer periphery out to larger regional scales and may demand several hours of commuting. The study reveals that the territorial expressions of each effect depend on geographical, topographical, historical, political, and technical conditions, as well as spatial planning policies. The research team argues for a non-mono-causal relationship between airports and urban growth. They conclude that the airport is one of many relevant forces of urban mutation, and models placing it in the centre of an affected area are inadequate guides for spatial interventions. (Salewski, Boucsein, and Gasco 2014)

<table>
<thead>
<tr>
<th>Effect Type</th>
<th>Effect explanation</th>
<th>Possible Affected Area</th>
<th>Distance to Airport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Territorial Effects</td>
<td>Interruption of connecting ground networks</td>
<td>Airport Area (Airport Territory and Airport Periphery)</td>
<td>0–4 km</td>
</tr>
<tr>
<td></td>
<td>Blocking of urban development</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Spatial distortion of urban structure around the airport</td>
<td></td>
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<tr>
<td>Aviation Effects</td>
<td>Noise-related construction limitations</td>
<td>Noise Landscape, Noise Contour Inversion</td>
<td>0–10 km</td>
</tr>
<tr>
<td></td>
<td>Building height limitations</td>
<td></td>
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<tr>
<td>Flows Effects</td>
<td>Creation, concentration, and diversion of flows of people, cargo, energy, waste, water</td>
<td>On all scales</td>
<td>0–Several hundreds km</td>
</tr>
<tr>
<td>Allocation Effects</td>
<td>Attraction of aviation-related firms</td>
<td>Airport Region (Catchment Area)</td>
<td>Up to 3h commuting depending on the frequency of air travel</td>
</tr>
<tr>
<td></td>
<td>Attraction of time-intensive firms</td>
<td></td>
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<tr>
<td></td>
<td>Location of new firms regionally because of enhanced regional connectivity and productivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urbanization Effects</td>
<td>Creation of housing and urban services because of new workplaces</td>
<td>Airport Mega-City Region (Overlapping Daily Urban Regions of the Catchment Area)</td>
<td>Up to 3h plus ~30min commuting depending on local commuting patterns</td>
</tr>
</tbody>
</table>

Table 0-1 Effect types and affected areas. Source: Salewski, Boucsein, and Gasco 2014
In particular, the question of causality and correlation is important when evaluating the urban effects of airports at larger regional and territorial scales. Transportation in general, and air transportation in particular, are important factors in evaluating the economic potential of a region. However, as Mukkala and Tervo point out, “providing transportation does not automatically lead to economic development. It may also work in reverse; economic development may spur a region to provide increased, better transportation. Thus while there is typically a strong correlation between air traffic and economic growth, the causation between the two is not entirely clear.” (Mukkala and Tervo 2012) In Air transportation and regional growth: which way does the causality run? they conduct an empirical analysis on the causality between air traffic and regional economic performance for 86 regions and 13 countries in Europe. The work differs from previous studies in the sense that it focuses on regional growth in peripheral regions, rather than concentrating on hub airports and the development of metropolitan areas. If earlier studies indicated that access to air transportation has an important effect on the locational decisions of many businesses (as shown in the previous literature cited), Mukkala and Tervo conclude that the causality processes from air traffic to regional growth is even stronger in peripheral regions boosting regional development, since air-traffic decreases the effects of long distances. (ibid, 5, 18) They make the case for supporting local airports in remote regions, through specific regional policies and subsidies, in order to increase regional growth and welfare.

2.2.3 Introducing the Cross-border Airport

With the case of Changi, this study attempts to probe how hub airports relate to urban development in their surrounding larger hinterland. In Singapore, the ‘a-typical’ dead-end airport condition with emergent urbanising cross-border flows across the border, offers the nearly ideal testing ground to investigate this question. The spatial relations between Changi Airport and its larger region are shaped by multiple cross-border activities, as well as by the people who enable them and connect them back together through various terrestrial-, sea-, and air-networks. Together, these seemingly disparate elements generate a complex urban networking and interaction at multiple scales. In this research the understanding of the organisation of the airport region (how people and goods relate to and are transported to the airport for example) is equally crucial in uncovering the spatial imprints of airport-related urbanisation. In doing so the dissertation introduces a ‘novel’ approach to the study of airport infrastructures. Through this approach, the relationship between the airport and its larger territory becomes highly specific and contextual in comparison to the existing generic models.

The study illuminates how the airport interacts with various small-scale, wide-ranging transport systems, secondary airports and local operators that enable passengers to cross borders, and move goods
between the production sites and to Changi, their gateway to the global market. (Fig. 11-14) As such, the thesis posits that the airport, along with its related transport links, is a critical lens for re-examining and broadening Singapore’s cross-border perspective. To answer the research questions set out at the beginning, a specific methodology needs to be deployed. The cross-border airport condition and its related airport region organisation will be determined by being ‘traced-back’: by tracing its transborder flows and showing how they work; how they are supported by people and infrastructures; how they manifest at the borders and on the ground. This methodology will be detailed in the next section.

In addition, the dissertation adds empirical ground and expands the spatial development-related knowledge of current studies on airport urbanisation. It also widens the geographical constraints of existing research, which is mainly concentrated in the western hemisphere, to Asia. As Hirsh notes, “over the past 20 years the proportion of the world’s air travel taking place in North America declined by half; while Asia’s share doubled.” (Hirsh 2012, 33) However current airports studies mostly focus on major airport hubs in the United States and Western Europe. Their relevance for policymakers and design practitioners in Asia is questionable since they provide meagre information about the world region where aerial mobility has expanded the most dramatically over the past three decades.
III RESEARCH METHODOLOGY AND CASE STUDIES SELECTION: TRACING THE AIRPORT AND ITS HINTERLAND

“Only a theory as mobile as its target can be an adequate instrument with which to comprehend urban reality”
(Sullivan 2014, 103)

3.1 Using the ‘Mobilities’ approach to investigate the cross-border airport

The landscape of Singapore Changi Airport’s region is shaped by flows that jump across the national border. In the field of social sciences, the ‘mobilities turn’ (Sheller and Urry 2006, Cresswell 2006) offers helpful methodological guidance for the study of transnational flows. Driven by increased levels and new forms of mobility, a mobility “turn” began in the 1990s in response to the importance that movement had on individuals and society. ‘Mobilities’ is a contemporary paradigm in the social sciences that explores the movement of people but also ideas and goods, as a means to study the broader implications of those movements. John Urry uses ‘mobilities’ in the plural since it remedies the “academic neglect of various movements.” The aim is to understand not only how people, but also how objects, images, or information are ‘on the move’ and how these structure and organise social life; “how ‘moves’ make social and material realities.” (Büscher and Urry 2009) The term encompasses the forces that drive, constrain, and are also produced by those movements.

The ‘mobilities turn’ emerged in reaction to the challenges that globalisation poses to existing methods of enquiry in the field of social sciences, which have in the past relied heavily on ‘fixed units of analysis’ (Kloppenburg 2013, 19). Since these movements are increasingly crossing nation-state borders, Urry argues that scholars need to draw up a new agenda based on the study of ‘mobilities’ (Urry 2000) In Mobile Methods and the Empirical, Büscher and Urry suggests a list of research methods that are ‘on the move’ to “track in various ways—including physically travelling with their research subjects—the many and interdependent forms of intermittent movement of people, images, information and objects.” (Büscher and Urry 2009, 103) Such ‘mobile methods’ include ‘observing’ movement, ‘walking with’, ‘participation [to movement] while interviewing’, employing a range of recoding techniques such as ‘time-space diaries’, etc. Much of these methods involve “experiencing... the ‘atmosphere’ of place.” (ibid, 104-108)

Two of the described methods are particularly relevant for this study. One is ‘to follow around objects’ since commodities move as part of a world trade that increasingly involves complex products that move in order to be combined into other objects “such as the components of a computer that travel the equivalent of a journey to the moon.” (ibid, 107) The other method is the study of ‘transfer points’, when ‘population’ - objects or people - ‘move through nodes’ - such as airports - and are ‘slowed down’ to be “monitored by various agencies charged with policing that territory”. Scientist can therefore use those moments of ‘slowed down visibility’ to assemble their analysis of movements and surveillance (ibid, 108). Büscher and Urry’s ‘mobile methods’ allow researchers “to be moved by, and to move with, their subjects” (ibid, 103). To literally be physically present and understand how people and objects move in particular site. In so doing, as Kloppenburg notes, these accounts of flows aim “at making the people and goods that move through nodes ‘legible.’” (Kloppenburg 2013, 35)

Appropriating these methods, this dissertation investigates the flows and transfer points. The research promotes a practical approach to study the cross-border airport, one that emphasises ‘close reading’ of specific case studies of Changi’s regional flows and ‘direct observations’ of their related built spaces. Most of the research takes place on site: ‘in the flows’ of air passengers and logistic firms, who cross the border in trucks or small propeller planes loaded with goods manufactured in Singapore’s hinterland to be delivered worldwide via Changi Airport; and at ‘transfer points’ such as key logistic airport terminals, border checkpoints, or productive areas. The air cargo supply chain for example is complex in the way it works.21 Likewise passengers, goods meet and pass through a multifaceted ‘transportation chain’ at different responsibility levels as they move in, through and out of the airport. (Sales 2013) The study of these transfer points helps unveiling key specificities in each case study. (More details in Appendix point 1.3)

Through the practical approach, the dissertation illustrates the less-observed urban impacts of Changi at different scales, from the periphery of the terminal to the larger SIJORI cross-border region. The dissertation engages the airport with a larger territorial scale, including rural, industrial and leisure areas—the provinces and hinterlands; in other words, the ‘backyards’ of Singapore’s metropolis. Such backyards are, as Hirsh points out in his study of the Pearl River Delta in relation to Hong Kong Airport, “at the centre of developing networks of aerial mobility that bypass the established taxonomy of ‘Global Cities’” (Hirsh 2012, 35) Unlike most accounts on airport-related urban effects, the project visually—and empirically—establishes how deeply integrated with its cross-border region Changi Airport is.

3.2 Case Studies Methodology

In order to illustrate the complexity of Changi’s extended airport region, shaped by the airport’s cross-border flows, key case studies of regional flows were analysed for built evidence of how they physically materialise on the ground. For the selected cases —although the focus varied depending on each specificities— generally the pre-conditions; the urban layers and typologies; the functions and programmes; the supporting infrastructural networks and actors; as well as their relationship to the surroundings (space and time) where investigated at different territorial scales: from the airport’s periphery to the cross-border region. By mapping the spatial, infrastructural and programmatic constellations of each cases; identifying the elements supporting or restricting their movements; and revealing the key actors and stakeholders involved in the key-chain, the methodology uncovered the richness of the airport-related networks shaping this region.

Case studies are important to urban research, but they also have their limitations. The insights that emerge from such studies have the potential to be literally transposed from their original locales to other sites, therefore becoming generic features and observations. Although this dissertation attempts to expand the typological and geographical bounds of current airport urbanism knowledge, the practical and ‘on the ground’ methods are specific to conditions in the SIJORI cross-border region.

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21 Sales explains how the global express logistics companies (FedEx, UPS, DHL etc.) ‘integrate’ the different steps of air transport chain and therefore manage - by cutting out all of the middle-man - to provide a “seamless end-to-end systems” and “point-to-point” delivery from the shipper to the retailer or customer. However this ‘full-service procedures’ comes at a price that many shippers (manufacturers or seller of a products) cant afford if they want to sell goods at a competitive price. (Sales 2013, xxiii)
### 3.2.1 Case Studies Selection

The research produced findings based on particular case studies of specific regional flows articulated by Changi Airport in Singapore, the State of Johor and the islands of Batam and Bintan. To narrow the scope of my fieldwork, I followed the flows likely to generate a stronger impact on the physical environment beyond the border of Singapore. The research therefore concentrated on two types of flows: ‘cargo’ because they require production facilities, treatment or storage warehouses, as well as logistical infrastructures; and ‘tourists’ because they imply border checkpoints, transport infrastructures, ferries or secondary airports terminals, leisure facilities, resort towns, etc. As I was aiming to understand the correlation between Singapore specific geopolitical logic and Changi urban-related impact, I isolated the special air-cargo and passenger’s case studies that were linked to Singapore’s particular conditions.

- **Regional Cargo Flows of perishable and high-value goods**

  Airfreight transportation is expensive, up to ten times ground transportation. (CETMO 2011, 6) What makes airfreight such a vital trade is the 35 per cent and upward value of goods transported. In fact if only three per cent of total world tonnage are transported by air, these cover over a third of the value of worldwide trade. (Sales 2013, xvii) Air cargo therefore caters for more time-sensitive and expensive categories of goods such as cut flowers, fresh food, pharmaceutical, medical equipment, valuable spare parts, computers, works of art, etc. These goods defined as ‘high-value’22, ‘perishable’23 and ‘process-critical’24 have become key for airport operators as well as airlines. For the cargo case studies I discovered that Changi Airfreight Centre (CAC)—one of the largest airfreight facilities in the world25, processing an estimated 1.9 million tonnes annually with a full handling capacity of three million tonnes per annum (CAG 2012b)— had a high share of high-value electronics and perishable goods, specifically orchids and ornament fish, which represent nearly two-thirds of Singaporean agrarian productions. (AVA 2015)

  These high-revenue goods have also resulted in an above-average connectivity for Singapore Airlines’ (SQ) passenger network. The SQ airfreight business model combines belly freight and passenger services together in ‘belly cargo’ aircrafts, which carry cargo in the holds of passenger jets as an additional revenue stream. Having the “right” type of goods—meaning ‘high-value,’ ‘perishable’ and ‘process-critical’— produces not only high cargo revenues, but more importantly, continuous returns on routes in the network, which otherwise would not pay off (e.g. because of relatively small passenger markets or seasonal effects). This airfreight concept therefore also creates and supports a relatively big and diverse network, which results in an expanded network of connections for Changi passengers. Reciprocally, it results in new business opportunities for Singapore.

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22 ‘High-value’ - and generally low weight - are goods where the shipping costs, although high, are marginal in proportion to the total costs of the cargo. Examples include works of art, high-end electrical equipment or pharmaceuticals. For these goods, the proportional share of transport costs is very similar for both air and sea freight, at around 5% of the total value of the goods shipped. (UK Department for Transport 2009, 6)
23 ‘Perishables’ are goods with a limited life cycle and minimising travel and transit time is essential to minimize spoilage and cost. They need to reach the consumer as quickly as possible and in the best possible condition. In terms of volume, fresh produce heads the list of perishables transported worldwide. 80% of the total trade of perishables are classical perishables like flowers, ornamental fish, fruits, seafood, fish, meat, etc. (Bridger 2008)
24 ‘Process-critical’ are goods that may have limited intrinsic value but that are essential for the good functioning of other business processes such as spare machinery parts in aeronautics or automobiles. (UK Department for Transport 2009, 6)
25 In 2011 Airports Council International (ACI) ranked Changi as the world’s 8th busiest cargo airport by international freight and in 2012 the World Bank ranked it the first in logistic performances. (CAG 2012b)
Perishables are part of the top ten commodities handled by CAC and account for fifteen percent of Changi’s cargo throughput. (CAG 2012a) Aiming to play a central role in the perishable business development, Singapore opened Coolport, a dedicated “Perishables Terminal Par Excellence” in June 2010. Extensive PR material can be found on Coolport; located within Changi Airport’s Free Trade Zone, “the 8,000-square-metre warehouse offers 18 temperature zones ranging from -28°C to 19°C with unique segregation facilities.” (CAG 2011-2012) Coolport has capacity to store a wide range of fresh produce, including chilled meat, live seafood and fresh flowers, as well as pharmaceutical and biomedical products, which require stringent temperature controls. Since June 2010, the volume of perishable cargo moving through Changi Airport has increased by a factor of ten—from 12,000 tonnes in the first month to 200,000 tons in 2012 (CAG 2011-2012)—and further expansion plans are underway*(Fig. 0-15)*

The high share of ‘high-value’ goods on the other hand is characteristic of Singapore’s manufacturing sector, which remains the highest contributor to Singapore’s Gross Domestic Product (GDP), at 21% compared to 15% from business services and 12% in financial services. (EDB 2012) However, Singapore primarily manufactures ‘high-value’ added products such as biomedicals, electronics, and aerospace engineering*27*. Because of their manufacturing processes, these goods are ‘airfreight dependent’. For example, aerospace manufacturing requires spare parts to be shipped on a daily basis, and end products often need to reach their final destination in a critical time frame for maintenance or repair of an engine. Similarly, for electronics, the production is generally divided in two stages: a high-tech manufacturing process, followed by a more labour-intensive assembly. These can be carried out in different parts of the globe depending on labour costs and workforce skill levels. The distances between are quickly overcome with aviation, given the relatively small size and cost per unit. Within SIJORI Changi Airport acts as the main hub for these high-value electronic dispatching the various regional components and finished products.

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*26 Interview with CAG’s Senior Manager of Cargo & Logistics Development. Spurred on by increasing globalisation the perishables business has gained importance worldwide. Once considered a seasonal, low rate fill-up commodity by most airlines, today approximately 15% of total worldwide air cargo is perishable (Fernd) and these are part of the top 3 fastest growing shipper industries segment. (Lufthansa Consulting 2009) The perishable flows have proven to be resilient during economic crisis and their contraction was far lower than general cargo. (CAG 2011-2012) Consumers are willing to pay for the privilege of having flowers, fresh fruits and vegetables of their choice throughout the year, unrestricted by seasonal changes.

*27 Manufacturing breakdown in Singapore: Biomedical 25.5% - Electronics 25.0% -Transport Engineering (aerospace) 15.7% -Precision Engineering 14.6% - General Manufacturing 11.3% - Chemicals 7.9% (EDB 2012)
But more specifically if these perishable and high-value goods represent a high share for Changi Airport, they are linked to the specific geopolitical conditions of Singapore, which ‘naturally’ engages their productions. Perishables require a ‘low-key hinterland’ —offering cheap and large availability of land with minimal costs of labour given the intensive nature of their cultivation— coupled, at the same time, with fast and direct connections to effective and world class airport infrastructures in order to guarantee that these expensive products will reach worldwide markets in a critical time-frame and with optimal conditions, such as the ones offered by Coolport. Similarly, in addition to a well-connected global airport, the high-value production of electronics requires extensive warehouses facilities for the back-end assembly of the components by low-skilled personnel, coupled at the same time with a safe and well regulated environment to localise the headquarters, the test or the distribution centres of the producing MNC’s where high-skilled engineers, regional managers, logistical specialists are based. Singapore offers all of these factors. The economic gradient between Singapore and its cross-border hinterland in Johor or the Riau shows a steep drop in GDP per capita creating a border condition between areas located geographically very close to each other’s and therefore guaranteeing a fast logistical process. These border condition makes this goods production possible — at profitable market prices —and therefore are significant for Singapore and Changi Airport. I therefore decided to study the regional air-cargo flows of perishable orchids and ornamental fish, as well as the regional high-value electronics networks.

- Cross-border flows of Tourists

Similarly, for the case studies of passengers, I decided to focus on transnational flows of people that, if not unique to Singapore, were very specific to the cross-border context. Specifically I concentrated on international tourist landing in Singapore to combine the World city’s urban experience with a vacation in the tropical paradises of the SIJORI region. I found out that Bintan Beach International Resorts (BBIR) —an 18,000-hectares resort enclave built in the northern stretch of the Riau island of Bintan in Indonesia— is primarily visited by international tourists traveling through Singapore Changi Airport. The number of tourists visiting the resorts has quadrupled since its 1996 opening, from 113,000 to over 478,000 in 2014. Aside from Singaporeans (31%), the key markets are China (21%), Korea and Japan (each 6%), and India (5%), followed by Australia, UK, France, and so on. (International arrivals by country of residence, 2014) (BRI 2015)

In order to increase the appeal of Bintan as twin destination with Singapore, Changi Airport Group (CAG) has stepped up its claim as the “Gateway into Bintan” (Chen 2014) through several collaborations with Bintan Resorts, such as ‘transit shopping vouchers,’ which Chinese or Indian visitors receive upon checkout from their rooms, to use in Changi during their return trip home; or discounted rates on BBIR facilities for Singapore Airlines passengers. (Fig. 0-16) I therefore decided to study the specific cross-border flows of tourist between Changi Airport and BBIR. I complemented this case study with another specific one as well, researching the cross-border flows of tourists entering Singapore but originating from the smaller airports of Batam Hang Nadim and Johor Senai. These transborder passenger flows are insignificant in numbers however they are important to understand the relationship between Singapore and its hinterland region.
3.2.2 Empirical Research

Fieldwork was conducted throughout the Singapore-Johor-Riau SIJORI cross-border region from October 2011 until March 2015. Living in Singapore during the entire length of my PhD gave me the flexibility to conduct extended site visits whenever needed, as well as the opportunity to go back several times and investigate changes over time. This level of access was crucial, given the cross-border region’s rapid, on-going changes in urban environment and aviation systems. During the four years of my PhD study, Changi’s budget terminal was demolished and rebuilt; the mega Terminal 5 and related extensions announced; Bintan International Airport started construction; the next phase of the Bintan Resorts master plan (Lagoi Bay and Treasure Bay) kicked off; several key tourist developments in the free-trade zone of the Iskandar Corridor in Malaysia were completed; Malaysian and Indonesian low-cost carriers were licensed to operate from the airports of Batam and Johor; Maintenance Repair and Overhaul (MRO) aviation parks were completed in Singapore and Batam, and announced in Bintan; changes to Changi Airport’s Flight Information Region (airspace control) confirmed the restoration to Indonesia in 2019 of the air space above the Riau Islands currently controlled by Singapore; etc.

- Site Survey and Data Analysis

A mix of research methods has been deployed. From urban analysis, including fieldwork, extended site visits documented with notes, time-space diaries, photographs, mapping and graphic techniques; to ‘semi-structured’ interviews, including a range of different actors: from pilots to truck drivers and airline passengers, from local entrepreneurs to managers of multinational firms, from architects to urban planners and airport authorities. These qualitative investigations and first-hand experience complement the data such as statistical numbers provided by governing agencies\(^{28}\), logistic or airlines companies\(^{29}\), as well as private firms\(^{30}\) and multinational corporations\(^{31}\); or empirical data gathered from published sources including government reports\(^{32}\), statistical annals, daily readings of local newspapers\(^{33}\); or sourced in archives investigations, historical maps analysis, past normative plans and current master plan reviews, as well as literature sources.

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\(^{28}\) Changi Airport Group, Economic Development Board, Urban Redevelopment Authority, Bintan Resorts International, etc.
\(^{29}\) Singapore Airline Cargo division, Batam Logistics, Handal Hinda, etc.
\(^{30}\) Hock Wee Nurseries, Qian Hu
\(^{31}\) Infineon
\(^{32}\) Singapore Tourism Boards, etc.
\(^{33}\) The Straits Times and Today in particular
Meeting attendances helped to observe the different desires and struggles among the various actors and authorities involved in the cross-border activities shaping this region. Meetings in Singapore were especially useful in understating the role of hierarchical power on key decisions related to Changi’s or Singapore’s future development in terms of planned cross-border infrastructural links such as the upcoming High Speed Rail project between Kuala Lumpur and Singapore; or the limitation of cross-border busses between the different airports in SJORI; among other examples. I attended one key conference on former PM Lee Kuan Yew in September 2013 where key officers from the Housing Development Board (HDB), the Urban Redevelopment Authority URA, the Civil Aviation Authority of Singapore (CAAS,) etc. discussed PM Lee contribution on the physical transformations of Singapore. Across the border, I participated in two workshops and meetings with national agencies such as the Iskandar Regional Development Authority (IRDA) in Johor, as well as the Regional Development Planning Board (Bappeda) and Batam Industrial Development Authority (BIDA)34 in Batam. These were organised by ETH Zürich Assistant Professor Milica Topalovic. In Bintan I met with the The Island Foundation (TIF)35 an NGO working with coastal communities in the Riau Archipelago and discovered with them the more hidden impact of BBIR.

Interviews

Adding to the urban analysis and empirical research, a series of semi-structured and in-depth, face-to-face (synchronous) interviews were conducted. When necessary, asynchronous communication was used (mainly in email form) to gather supplementary information from a respondent previously interviewed in person. During the interviews, no tape recordings were taken, in order to establish a trustful relationship with the interviewee, compel me to focus and synthetize the findings on the spot, and minimise transcription time following the interview. Each interview lasted between thirty minutes and two hours. Although I always prepared a questionnaire or thematic framework in advance, the semi-structured, open interview technique was chosen in order to allow new ideas to be brought up during the interview in reaction to the respondents’ statements. Most governing agencies’ officers requested that the questionnaire to be sent to them prior to our meeting. While this enabled them to frame their responses, after many encounters, I became adept at reading ‘in between the lines.’ In addition to these prepared and semi-structured interviews, more informal ones also took place spontaneously during site visits. Apart from gaining insightful information, the interviews were also useful for networking purposes, each actor connecting me to another and helping to uncover the multifaceted-nature of the organisation of Changi Airport’s region. In total, I held 63 interviews with stakeholders and passengers within and outside airports in Singapore, in the State of Johor and the islands of Batam and Bintan. (Table. 0-2) The interviewees included heads of departments for the governmental authorities; directors of the airports operators; professors involved in research on the SJORI region or on Changi for the universities; general managers and marketing or logistic directors for

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34 Bappeda is the Regional Development Planning Board and BIDA is Batam Industrial Development Authority. BIDA was established in 1971 by the Government of Indonesia as the authority in promoting and developing the municipality of Batam, this includes land management, planning, executing and managing developments and infrastructures - such as the airport -, but also providing trading license and processing investment applications.

35 The Island Foundation (TIF) was set up by the founders of Nikoi Island. TIF is a charitable organisation working with coastal communities in the Riau Archipelago to help improve their income, health and education. Their objective is to empower the coastal communities in the Riau Archipelago through targeted skills transfer, to create sustainable economic development and self-reliance among coastal villages. Their projects vary from education and literacy programs, village development and health and nutrition programs. TIF is do this date the only NGO active in Bintan. (The Island Foundation 2015)
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<thead>
<tr>
<th>Interview Sources</th>
<th>Table 0-2 Interview Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Airport authorities and operators</strong></td>
<td><strong>Table 0-2 Interview Sources</strong></td>
</tr>
<tr>
<td>Civil Aviation Authority of Singapore (CAAS)</td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<tr>
<td>Changi Airport Group for Changi Airport (CAG)</td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<td>CAG for Seletar Airport</td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<tr>
<td>CAG cargo division</td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<tr>
<td>Singapore Aviation Academy (SAA)</td>
<td><strong>Table 0-2 Interview Sources</strong></td>
</tr>
<tr>
<td><strong>Government agencies:</strong></td>
<td><strong>Table 0-2 Interview Sources</strong></td>
</tr>
<tr>
<td>Urban Redevelopment Authority (URA)</td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<tr>
<td>Economic Development Board (EDB)</td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<tr>
<td><strong>Governmental linked corporations:</strong></td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<tr>
<td>Jurong Town Corporation (JTC)</td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<td><strong>Universities:</strong></td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<tr>
<td>National University of Singapore (NUS):</td>
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<td>Department of Geography;</td>
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<td>School of Design and Environment</td>
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<td><strong>Hotel operators:</strong></td>
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<tr>
<td>Changi Crowne Plaza Hotel</td>
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<td>Hyatt Hotel</td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<tr>
<td><strong>Logistic companies and freight forwarders:</strong></td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<td>Fine Art Logistics, Natural Le Coultre Pte Ltd (high-value Art)</td>
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<td>Singapore Freeport (high-value Art)</td>
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<td>Sustainable Seafood (perishable)</td>
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<tr>
<td>BigFoot (perishable and livestock)</td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<td><strong>Transport operators:</strong></td>
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<td><strong>Small and Medium Enterprises:</strong></td>
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<td><strong>Table 0-2 InterviewSources</strong></td>
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<tr>
<td>Qian Hu Enterprises (ornamental fish)</td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<td>Venturindo</td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<td>Batamindo Industrial Park, Bintan Industrial Estate</td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<tr>
<td><strong>Transborder passengers:</strong></td>
<td><strong>Table 0-2 Interview Sources</strong></td>
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<td>At Singapore Tanah Merah ferry terminal (Singapore&gt;Bintan)</td>
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<td>At Senai Airport (Johor&gt;Singapore)</td>
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<td>At Hang Nadim Airport (Batam&gt;Singapore)</td>
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<td><strong>Table 0-2 Interview Sources</strong></td>
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the MNC’s or logistic companies; owners for the SME’s of perishable goods; but also truck drivers; budget passengers; etc.

These interviews complemented the urban analysis, the extended site visits and empirical gathering previously discussed. As Woods notes “qualitative research results in large amount of richly detailed data”, which therefore must “be reworked or reduced” to represent major themes or categories that describe the phenomenon being studied. (Woods 2011) From each fieldwork visit or interview I conducted, more knowledge was generated. Overlapping all of the components together, and over time, generated a sufficient depth of information to develop my research. Moreover, this information enabled me to account for the changing conditions of the specific SIJORI context in relation to aviation infrastructures.

My research on transnational flows of cargo and passengers in the SIJORI cross-border region brought me in contact with multiple actors involved in airport infrastructures. These agents added to the methodological challenges of researching across nations, borders, and territorial scales. A section in the Appendix is dedicated to the description of practicalities of doing research in and around airports, and discusses the key factors in interview decisions. (See Appendix points 1.1 and 1.2)

IV STRUCTURE OF THE DISSERTATION

Chapter one: Singapore and the SIJORI Cross-Border Region exposes the historical context background as well as the key planning mechanisms and legislations at work behind the urbanisation processes in Singapore. The chapter frames this geopolitical background in relation to Changi’s particular role in the built environment both within and outside the City-State;

The following second chapter: The Airport Island therefore examines the resulting spatial conditions of airport-related activities within Singapore with a detailed analysis on the national scale and on the periphery of Changi Airport. Specifically, the chapter reveals that while some elements of urban centrality are emerging in and around Changi Airport —such as the new campus of the Singapore University of Technology and Design (SUTD) at Changi Business Park (CBP), or the future Jewel shopping mall— these remain small in comparison to other areas of international trade in Singapore. On the other hand it is ‘all of Singapore’ that is planned as an ‘Airport Area.’ Changi’s urban effects can be found less in the airport periphery than on a much larger territorial scale throughout Singapore and the Singapore-Johor-Riau cross-border region.

The third chapter: Flying Fish and Chips: Cross-Border Cargo Networks in Johor and Batam explores the air-cargo networks articulated by Changi Airport throughout the State of Johor in Malaysia and the island of Batam in Indonesia. It does so through an analysis of the spatial manifestations and implication on cross-border regulatory regimes of three case studies focused on the trade of tax-free ‘perishable’ goods, such as fresh cut flowers and ornamental fish organised by local small and medium enterprises (SMEs) across SIJORI’s rural hinterlands, and the offshore production of ‘high-value’ electronics by multinational corporations (MNCs) and their transhipment between Changi and the industrial free-trade zones of the SIJORI region.
The fourth chapter: The Airport Leisure Landscape: Cross-Border Flows of Tourism in Bintan examines the cross-border tourism flows articulated by Changi Airport on Bintan Island. This chapter focuses on Bintan Beach International Resorts’ enclave, built in the northern stretch of Bintan. It uncovers how Changi Airport feeds ‘leisure-urbanisation’ in the Singapore-Johor-Riau (SIJORI) cross-border region by supplying the resorts with over 65% of its clients, who fly into Singapore via Changi Airport for a combined global city and tropical paradise ‘staycation’. Specifically, the chapter explores the spatial changes of the Bintanese landscape to attract a more globalised clientele and analyses its implication on the local environment and native communities.

Finally the conclusion of the thesis: Singapore’s Extended Airport Region demonstrates how these specific cross-border mobility flows, their combination of both ‘high-tech’ and ‘low-tech’ solutions and their related urbanisation patterns not only broaden the transborder perspective of Singapore, but also presents policymakers and design practitioners with an alternative approach in describing airport infrastructures as integrated with their surrounding larger region. In so doing the dissertation offers a new representation of the Extended Airport Region of Changi Airport. This extended airport footprint consists of different correlated and overlapping parameters, in which Changi is a central factor, but complemented by other geographic, political, human and infrastructural-related features such as the specific organisations of each flow; their dependence on the ‘low-key hinterland and Global City’ proximity; Singapore’s strong border condition; hierarchical position to other airports; etc. Finally in the outlook, the conclusion proposes a broader research agenda including the smaller airports on the fringe of Singapore’s international border to investigate their role in cross-border interactions and the related implications for urban design in the future of the SIJORI region.
CHAPTER ONE
Singapore and the SIJORI Cross-Border Region

The following section exposes the historical context background as well as the key planning mechanisms and legislations at work behind the urbanisation processes both within and outside the City-State of Singapore. Framing this background, the section exposes how Singapore's specific geographical conditions—namely its well-defined border, land scarcity, and close proximity to neighbouring developing countries—coupled with strong ‘extra-territorial’ and ‘centralised’ planning, contribute to Changi’s particular role on the built environment, which will be revealed in the following empirical chapters (2 to 4) of the dissertation.

I. THE SIJORI CROSS-BORDER REGION

As a wave of sustained urbanisation and development unfolded around the Asia-Pacific region in the 1980s, this part of the world became the emergent economic region of the future, one that would connect Asia with the United States (Dirlik et al. 1998). Globalisation began to garner attention from scholars and business strategists alike. The term ‘borderless world’ was coined by Kenichi Ohmae who advocated for an ‘End of the Nation State’ and for the promises of ‘regionalisation’ (Ohmae 1996). Transborder regional development plans were promoted around the world with visions of ‘free-trade areas’, ‘new city-regions as key nodes in a networked global economy’. However as Sparke et al. explain, the usage of cross-border regionalism as a motif of ‘borderless world’ discourse was particularly evident in East and Southeast Asia (Sparke et al. 2004). McGee coined the term ‘volatile globalisation’ in the 1990s to illustrate the Southeast Asian globalising city phenomena with “growth triangle, extended metropolitan regions and corridors” (Fig. 1-1) (Rimmer and Dick 2009, 11). The most successful of these geographical slogans were applied to Hong Kong and Singapore, the region’s premier emergent global cities (Lindquist 2010).

1 Arif Dirlik defines the Pacific Region – also named ‘Pacific Rim’, ‘Pacific Basin’ and ‘Asian-Pacific’ – as the societies situated on the boundaries of the Pacific Ocean and within it. It is an area that stretched from the Bering Strait to Antarctica, from California to Korea and China, from Alaska to Tasmania and Southeast Asia, and from Kamchatka to Chile. (Dirlik et al. 1998).
The largest cross-border region encompassed the Pearl River Delta and Hong Kong in Southern China. Following Hong Kong’s incorporation into China, the Indonesia-Malaysia-Singapore (IMS) Growth Triangle (GT) became the most widely cited and discussed example of transnational development project. (Sparke et al. 2004, Lindquist 2010) (Fig. 1-2) The IMS-GT title was adopted in lieu of the ‘SIJORI Growth Triangle’ partnership signed between Singapore, Johor (Malaysia) and the Riau Islands (in Indonesia) back in 1989. As more Malaysian and Indonesian states joined the partnership, the IMS-GT was formed in 1994 to formalise the new grouping.

The IMS-GT agreement connected the City-state with its neighbours to the north and south—the Malaysian state of Johor and the Riau Islands Province in Indonesia, respectively. It was signed to strengthen economic ties and optimise the complementarity of the three countries. It linked the infrastructure, capital and expertise of ‘land constrained’ Singapore on one hand, with the cheap labour and abundant natural resources of Johor and the Riau on the other. To enable its transformation from a manufacturing to a financial centre (and more recently a knowledge-based economy), Singapore promoted the relocation of land- and labour-intensive activities to offshore sites in Johor and the Riau from the 1970s onwards. Singapore’s highly developed financial sector played a key role towards ‘re-territorialisation,’ displacing agrarian productions the hinterland of the SIJORI region, financing industrial developments in Johor and the island of Batam, and building industrial parks and tourist enclaves on the island of Bintan. As Sparke et al. note, the IMS-GT enabled Singapore to ‘control the hinterlandisation’ of its economy. (Sparke et al. 2004)

Throughout the coming years, many scholars have questioned the idea of complementarity and problematised how the relations within this ‘Triangle’ are by no means ‘equilateral’ given the supremacy of Singapore and limited direct links between the Riau Archipelago and Johor (Macleod and McGee 1996). The severe economic gradient between Singapore and its neighbours has resulted in significant disparities and uneven development. Grundy-Warr et al. have discussed the fragmented development vision of the Triangle due to lack of governmental cooperation (Grundy-Warr, Peachey, and Perry 1999). More recently, Bunnell et al. have delivered a critical analysis of the environmental and sociological impact of the tourist
enclave developed by Singapore on Bintan Island’s northern coast (Bunnell, Muzaini, and Sidaway 2006) (This topic to be further discussed in chapter 4). Lindquist’s ethnographic research on Batam has portrayed the world of factory workers and prostitutes, on an island where foreign capital meets cheap land and labour. His work contrasts the frustration and exploitation of these migrants with the formal cross-border Triangle of business planners and technocrats. (Lindquist 2010) These objections to the ‘hinterlandisation’ vision of Singapore are important not only because they unpack the mechanisms and political context that have coined the IMS-GT, but also because they untangle the negative impacts of Singapore foreign investment on its hinterland. These scholars illustrate how implementation of the IMS-GT often contradicted the supposedly ‘neat’ complementarities of capital, land and labour. (Sparke et al. 2004)

Nonetheless, as Sparke et al. recognise, this ‘Triangle’ was more than just a politically influential promotional story, and there is no doubt of the economic forces of such complementarities. If the IMS-GT enabled Singapore to control the ‘hinterlandisation’ of its economy, it in turn promoted the development of the ‘weaker’ components of this trinational region. Following the establishment of a ‘special economic zone’ with free trade agreements, the island of Batam in the Riau developed at a rapid pace. The island attracted multinational corporations headquartered in Singapore, who built factories to house labour-intensive production. Nowadays, Batam boasts some of Indonesia’s highest economic growth (BIFZA 2014) and houses the majority of the Riau Province’s population (1,153,860 people at the Civil Registry Survey, conducted in April 2012)2 Its residents are mostly Indonesian migrant workers coming to work in the various industrial parks. Comparatively, to capitalise on synergies with Singapore, the State of Johor envisioned the special economic zone of Iskandar Malaysia as “the first choice to Invest, Work, Live and Play.” (IRDA 2014) Part of a larger strategy to foster Malaysia’s economic growth by attracting foreign capital (mainly from Singapore), Malaysia’s primary, southern development corridor aims to increase jobs, improve standard education3 and healthcare facilities, and provide top-level accommodation. As Lazman Halim Lajman from Iskandar Investment Group explained, “The prosperity of the southern gateway of Peninsular Malaysia is mainly made possible by and thanks to Singapore.”4

Throughout the years, the interactions between the three components of the SIJORI region have multiplied and grown deeper. Nowadays, private firms headquartered in Singapore are linked through production chains across these neighbouring territories, while Singapore dollars fuel tourism and residential development in Iskandar and Bintan. In addition, this flow of capital is supplemented by the daily flows of commuters crossing the border into Singapore as service providers and consumers. An estimated 50,000 Malaysians5 cross the causeway into Singapore every day to access better education and employment opportunities. Conversely, Singaporeans visit Johor and the Riau for tourism, cheaper goods or groceries, as well as other unintended economies.6 As Hutchinson and Chong note, these cross-border flows, whether in the form of capital, services, labour, or leisure consumption, have had profound ramifications on both

2 If this information has been published in several governmental websites and documents, the author has not been able to locate the original source.
3 The Marlborough College Malaysia opened in 2012 on ‘a secure 90-acre’ in Johor, just across the second bridge from Singapore. It is the sister school of the Marlborough College founded in 1843 in Wiltshire England, an independent private school committed to excellence and innovation (Marlborough College Malaysia 2014). Many pupils live in Singapore and commute daily to the Marlborough College located in Iskandar resulting in special cross-border mobility arrangements such as green channel, on-coach identity inspections or biometric passes in lieu of passports. (Marlborough College Malaysia 2012)
4 Lazman Halim Lajman, VP from Iskandar Investment Group, interview with the author, November 2011, Johor.
5 (Hutchinson and Chong Forthcoming)
6 The island of Batam in the Riau Archipelago is notorious for offering alternative and illegal entertainments that are too dangerous or expensive to get in Singapore, such as drugs and prostitution. Many Singaporean men travel to Batam over the weekend to enjoy such ‘pleasures’, a possible contributor to the number of Singaporean tourists staying only a day or two in Batam, a figure that has increased dramatically since 1990. (Lindquist 2010)
sides of the border. While the City-state plays a pivotal role in this sub-regional grouping, the relationship between the three sites is deep and complex. (Hutchinson et al. Forthcoming) Implemented in stages, and supported by the governments of both Indonesia and Malaysia, Singapore’s regionalisation strategy in Johor and in the Riau was the result of years of complex development policies put in place by Singapore since independence. These programmes enabled Singapore’s expansion beyond its border through specific territorial policies that fostered the Nation State’s urbanisation in Johor and the Riau. These legislations bypassed the need for Singapore to be ‘naturally’ or ‘legally’ able to control and plan in these territories. Since it is necessary to understand how these policies correlate with Changi Airport’s urban impact in the SIJORI cross-border region, they are therefore the focus of the following section. (Fig. 1-3)

II. TERRITORIAL POLICIES FOSTERING URBANISATION BEYOND THE BORDER

Shortly after its separation from Malaysia, the Singaporean Government implemented several policies to support industrialisation and attract foreign investors. As Prime Minister Lee Kuan Yew recalled in his memoirs, “Singapore’s best hope lay with the American Multinational Corporations (MNCs)…[they] brought higher technology in large-scale operations, creating jobs.” (Lee 2000, 75) The ‘MNC-based growth policy’ encouraged exports through reduction of taxes; offered State subsidies to help sustain low-wages that made Singapore attractive for investors (Cairns and Friedrich 2013); and enabled land concessions for foreigners in industrial estates developed by the Jurong Town Corporation (JTC), which provided the necessary infrastructure in the western part of the island. (Teo and Ang 2001) The Economic Development Board (EDB) was established in 1961 as a “one-stop agency” to sort out “all of an investor’s requirements,” so they need not deal with many different government departments and ministries. (Lee 2000, 77) These mechanisms created a strong basis for export-oriented industrialisation.

The re-structuring policies that followed in 1975-85 moved Singaporean industry away from lower-technology and labour-intensive production towards higher-skilled manufacturing. The research and development (R&D) aspects of production were actively encouraged; high wage policies motivated employers to automate production and to develop workers qualifications to better suit high-technology industries; process and quality improvements were stressed to increase competitiveness vis-à-vis labour in the neighbouring, cheaper countries. (Cairns and Friedrich 2013) To support these policies, several measures were developed under government initiatives. In 1980, the ‘Singapore Science Park’ was established as an infrastructure for R&D to flourish. Simultaneously, the National Computer Board (NCB) was established in 1981 to support the potential growth of Information Technology (IT). Finally, through the introduction of the Skills Development Fund (SDF), employers received grants to support staff training. Through these mechanisms, a large, local, high-skill industry emerged to produce electronics, computer components, and parts.

At the same time, the government initiated a comprehensive and fast-paced program to restructure its domestic agricultural sector. “Agricultural restructuring involved a shift towards the production of higher value-added agricultural and horticultural commodities, both for domestic use and for export, a greater spatial concentration of agricultural production, and a re-composition of Singapore’s food import

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7 Now the Infocomm Development Authority of Singapore (IDA).
8 Singaporean employers have to contribute Skills Development Levy (SDL) for all employees. The SDL is collected on behalf of the Singapore Workforce Development Agency. The levy collected is channelled into the Skills Development Fund (SDF), which provide grants to companies that send their workers for training. (Ministry of Manpower 2014)
Chapter 1

Fig. 1-3  SIJORI political and development timeline: in caption: Johor-related explanation // Singapore-related // Riau-related

1826 - (1942 - 1945) - 1968
Productive hinterland in Johor // Singapore as a ‘trading port’ and capital city of the Straits Settlements under the British Empire // ‘Natural Archipelago’ in the Riau under the Dutch Empire

1963 - 1965
Shift to palm oil plantation in Johor under Malaysia // Singapore independence from the British Empire followed by disagreements with Malaysia // Independence of the Riau and affiliation to Indonesia

1965 - 1975
Early development of manufacturing sector in Johor // ‘Birth of a Nation’ in Singapore & industrialisation period // Batam is designated ‘Industrial Zone’ and manufacturing centre of Indonesia

1975 - 1985
Expanding manufacturing sector in Johor with direct investment from Singapore // Singapore technological upgrade with development of high-tech/skills industrialisation, phasing out of agrarian productions // Batam declared ‘Bonded Zone’ and development of economic agreements with Singaporean companies

1985 - 2000
Signature of the IMS GT — Singaporean companies account for 40% of direct investment in Johor // Singapore move towards a service-based economy with offshoring of manufacturing industries and land intensive activities across border // All of Batam island declared Bonded Zone, Development of Bintan Resorts start

2000s - today
Development of the ‘Iskandar Malaysia Special Economic Zone’ to capitalise from Singapore dynamics // Singapore move towards a knowledge-based economy with development of R&D sector & productive hinterlands across the border // Batam is declared ‘Bonded Zone +’ with Batam, Bintan and Karimun islands

Fig. 1-3  SIJORI political and development timeline: in caption: Johor-related explanation // Singapore-related // Riau-related
Traditional farming systems were phased out by State mandate, and agricultural production was restricted to state-sponsored high-tech ‘Agrotechnology Parks’. Consequently, Singapore relied increasingly on the rural areas of SIJORI for agricultural products. Indeed, during this rationalisation of agriculture land in Singapore, many Singaporean farms relocated their productive field in the rural hinterlands of Johor and the Riau Archipelago. (Refer to Chapter 3’s discussion of the ‘perishable’ air-cargo ‘ornamental’ case studies.) The successful farms with parent locations within one of Singapore’s Agrotechnology Park, now mainly focus on “higher-value added” ornamental goods aimed at exportation. (AVA 2010) (Fig. 1-4)

From the early 1990s, the Government continued to implement several programs to promote and develop Singapore as a “total business centre”. The 1991 Strategic Economic Plan (SEP) developed high-tech and high value-added manufacturing in parallel with other services as ‘twin engines of growth’. Strategies were grouped under Manufacturing 2000 (M2000) and International Business Hub 2000 and implemented by EDB. (Yue 2005) The model for Singapore’s continued role as a manufacturing base was ‘value-chain analysis’,9 which saw modern manufacturing and services as integrated and complementary activities. The key element of Manufacturing 2000 was the development of ‘industry clusters’ (particularly in chemicals, shipbuilding and repair, electronics, and biomedical sciences) and the upgrade of capabilities across the entire value chain in each ‘industry cluster’. EDB established the Cluster Development Fund and Co-investment Programme to co-invest with foreign MNCs and local enterprises in joint ventures and strategic projects. (Ibid. 8)

As Yue explains, these policies and programmes, coupled with Singapore’s advantageous location, made it the hub for distribution and transhipment in the region. Singapore became a host to over 5,000 MNCs, many with divisions performing regional HQ functions. Policymakers in Singapore wanted to avoid the rapid industrial hollowing-out (deterioration) occurring in Hong Kong as industries relocated in droves to the low-cost facilities of the Pearl River Delta.

9 The concept of the ‘value-chain’ comes from business management and was first described and popularized by Michael Porter in 1985. It is based on the idea of seeing a manufacturing (or service) organization as a system, made up of subsystems each with inputs, transformation processes and outputs. These involve the acquisition and consumption of resources - money, labour, materials, equipment, buildings, land, administration and management. How value chain activities are carried out - and where - determines costs and affects profits. In Porter’s value chains, Inbound Logistics, Operations, Outbound Logistics, Marketing and Sales and Service are categorized as primary activities. Secondary activities include Procurement, Human Resource management, Technological Development and Infrastructure. (IIM Cambridge)
So as Singapore offshored its labour-intensive manufacturing industries in favour of a domestic service-based economy, the government formalised its outward investment efforts in the region in the early 1990s. Singapore provided infrastructures, signed bilateral agreements with countries of interest for its private sector and disbursed various regionalisation financial schemes to assist companies venturing abroad such as tax incentives and risk-sharing partnerships. These government initiatives also included promoting growth triangles and overseas industrial parks in other parts of Asia. \textit{(ibid, 10)} It is in this context that the IMS-GT was formalised to enable Singapore to control the ‘hinterlandisation’ of its economy outside its borders. Offshore industrial enclaves included Batamindo Industrial Park (BIP) and Bintan Industrial Estate (BIE). These were set up through joint venture between Singapore state-owned enterprises (GLCs) and Indonesia’s largest business conglomerate at that time, the Salim Group. As Yeoh et al explain, Salim’s close ties to Indonesian politicians provided some guarantee with respect to regulatory issues and government permissions, while Singapore’s GLCs—namely JTC and SembCorp Industries—led the design, development, and management of the estates. \textit{(Yeoh, Koh, and Cai 2004)}

The case-study of Infineon, a company whose aviation-related flows will be analysed in chapter 3, illustrates well the different phases in Singapore’s territorial policies. During the early stage of industrialisation, Infineon Asia Pacific was incorporated in Singapore as Siemens Components Pte Ltd in 1970. \textit{(Infineon 2012)} In the late 1980s, when Singaporean policies focused on fostering high-skills industry, Infineon moved its production factory to the newly developed Kallang Way Industrial Estate in Singapore, which offered cutting-edge facilities for the production of high-value electronics. Finally, following Singapore’s regionalisation, Infineon’s labour-intensive facilities were moved in 1996 from Kallang to Batamindo Industrial Park, while Infineon’s regional headquarters, global R&D hub, final test centre, and distribution and marketing centre remained located in Singapore. \textit{(Yeoh, Koh, and Cai 2004)}

From the early 1990s, the Government of Singapore pursued a similar strategy for its tourism sector, developing destinations that transcended its national borders. \textit{(Refer to the ‘Airport Leisure Landscape’ case studies in Chapter 4). The IMS-GT promoted itself as a ‘resort region’ capitalising on Singapore’s air and seaport connections and Indonesia and Malaysia’s natural and cultural landscape. \textit{(Chang 2004)}. In 1994, the Singapore Tourism Board (STB) evaluated the lack of diversity in tourism ‘products’ available in the City-state and in 1996, outlined the development vision \textit{Tourism 21}. The \textit{Tourism 21} plan tried to mitigate Singapore’s land scarcity by configuring “a new tourism space” which positioned the Riau islands as complementary places bundled in the Singapore’s “collective attractiveness” as a destination. \textit{(Chang 2004, Chang and Yeoh 1999, Bunnell, Muzaini, and Sidaway 2006)} Today, over 65% of Bintan Resorts’ clients are international tourists passing through Changi Airport on a combined holiday: Singapore’s urban experience followed by a couple of days in Bintan’s tropical paradise.

While Singapore relocated intensive agriculture, manufacturing facilities and leisure activities outside its national borders, it secured control of them through bilateral agreements and growth-triangle treaties. \textit{(Fig 1-5)} Its specific geographical context—an island-based Nation-state with a strong economic gradient and border vis-à-vis of its immediate neighbours—directly correlates to Singapore’s successful economic strategies. Here, it was possible to integrate manufacturing, service and even leisure activities within

10 Other Singapore outward investments lead to the International Tech Park in Bangalore, Vietnam Singapore Training Centre and Vietnam Singapore Industrial Park.  
11 Infineon’s facilities in Singapore include the Regional HQ, Global R&D Competency Hub, Competency Hub for Test, Supply Chain Hub for Asia Pacific & Japan and Regional Sales and Marketing centre. \textit{(Infineon 2012)}

Chapter 1
Fig. 1–5  Singapore policies and development timeline

‘industry clusters’ in very close geographical proximity to the country. These would still 'benefit' from cost savings and profits thanks to the border condition and to high-performance infrastructures bridging the gap. The nature of Singapore’s enduring border effect—limited space and geographical proximity to neighbouring developing countries—has been crucial for the urbanisation processes outside but also within the City-state. We have seen how these specific territorial policies enabled urbanisation beyond the border, through relocation of land-intensive activities. On the other hand, inside the boundary, two other pieces of legislation signed shortly after independence, the Land Acquisition Act (LAA) and the Foreshores Act, enabled the Singaporean government to centrally and tightly control the island’s development as well. These two pieces of legislation will be shortly analysed in the next section.

III. TOP-DOWN CENTRALISED SYSTEM WITHIN THE BORDER

Motivated by its unique geographic conditions—rigid boundary coupled with land scarcity—the government of Singapore has consistently exerted a centralised control on the island’s development. The central piece of legislation that enabled this right was the Land Acquisition Act (LAA) of 1966, which provided the government with broad powers to acquire land from private owners significantly below market value to clear and utilise it (Shatkin 2014). The state gained control of land use just after gaining independence in 1965. In all, state ownership of land rose from 31% in 1949 to 80% in 1992 (Han 2005). This percentage has continued to rise with the government’s land reclamation projects, designed to expand the City-state’s land area. To do so, the government amended the Foreshores Act in 1964, “so that owners of prime seafront land would not need to be compensated even if they lost seafront as a result of reclamation” as stated Peter Ho, Chairman of the Urban Redevelopment Authority (URA), at the 2013 conference Lee Kuan Yew and the Physical Transformation of Singapore.13

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12 As Shatkin explains: Prices were set at terms that were very favourable to the government — one analysis conducted in 1979 and 1980, for example, placed the compensation provided in many instances at ‘less than 20 per cent of the value claimed by the owners and assessed by chartered land values’ (Shatkin 2014).

13 Peter Ho, Chairman of the Urban Redevelopment Authority (URA), at the Conference “Lee Kuan Yew and the Physical Transformation of Singapore”, 18.09.2013, notes taken by the author. “When it was decided to move the main airport from Paya Lebar to Changi, the government decided to build an expressway to connect Changi Airport to the CBD. Because to be truly world-class as a hub for business and tourism, the city needed to be easily and quickly accessible from the airport. But there was no land — the British had allowed people to build properties all the way up to the coastline. The entire east coast was already built up to the sea. The solution was to reclaim the coastline. But the main obstacle to reclamation was the high cost of compensation for coastal land. So the government amended the Foreshores Act in 1964, so that owners of prime seafront land would not need to be compensated even if they lost seafront as a result of reclamation. As Lee Kuan Yew recalls, ‘So we passed a law that said that when government acquires coastal land, we compensate without taking into account that it’s by the seaside. The market was at all time low at the time and so we acquired large tracts of land. They were lying fallow — investors were waiting for the climate to change so they could manipulate and sell it at a big price. We just acquired as many large pieces of land as possible and claimed the right to reclaim coastal areas.’”
Through government-linked corporations such as JTC, the government of Singapore further directs urban development and economic growth with Temasek Holdings, a State-owned investment company. As Shatkin argues, “The resulting model of urban planning has transformed the nation essentially into one massive mega project—public housing new towns strung like pearls around the island, master planned and meticulously designed central business districts (CBDs) and historic districts comprehensively redeveloped as tourism-oriented simulacra.” (Shatkin 2014, 177) Planning process in Singapore can therefore be defined as truly ‘all-embracing,’ covering everything from infrastructures, to workplaces and housing, to recreation environments. This process involves not only planning, but also funding, realisation and maintenance. As former PM Lee put it, “The State took on the role of urban imaginer as readily as it became its entrepreneur, planner, and developer” (Lee 2009, 152)

In this highly regulated urban environment, it is not surprising that airport-related developments, which have ‘naturally’ taken place in others airports’ close peripheries around the world, are kept at minimum in Singapore. (More in the following section) This thesis argues that the specific border and geographical conditions coupled with strong ‘extra-territorial’ and ‘centralised’ planning legislation greatly contribute to Changi's particular effects on the built environment. The land scarcity pressures on the rest of Singapore’s urban environment do not apply equally to the land around Changi Airport, which remains on reserve for future expansion. The government has so far prevented the allocations of extended airport-related development in the immediate periphery around Changi Airport. As described by Wee, the URA’s Senior Planner in charge of the airport periphery, “We consider the all of Singapore when we think about the ‘Airport-City.’” On the other hand, while urban development is strictly controlled in Singapore, this thesis argues that Changi Airport has urbanisation effects beyond Singapore’s borders, in its hinterland. For the geographic and political reasons revealed above, Changi’s urban effects can be found less in the airport periphery than on a much larger territorial scale throughout Singapore and the Singapore-Johor-Riau (SIJORI) cross-border region, as will be uncovered in the chapters two to four.

The border condition dividing, yet binding together, this tri-national region is a crucial element in the development of this cross-border territory. In addition to this geographic boundary, another one —similarly crucial for Singapore Airport— adds to the level of control exerted by the City-state on part of this tri-national region: Changi’s airspace control.

**IV. CHANGI’S AIRSPACE CONTROL: A ‘VERTICAL BORDER REGIME’**

Changi’s Flight Information Region (FIR) shows a control airspace area remarkably big compared to the size of Singapore, extending over a very large northeast-to-southeast patch of the South China Sea. The boundary encompasses all of the Riau Archipelago, parts of the island of Sumatra and a great portion of the South China Sea. (Fig. 1-6) There is no standard size for FIRs. It is a matter of administrative convenience of the country concerned. In fact when Changi Airport opened in 1981, its FIR used to be even bigger and incorporate the area of the Malaysian State of Johor as shown in Hutton’s book. (Hutton 1981) (Fig. 1-7)

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14 Bert Wee, senior planner, Physical Planning East Department (PPE), Physical Planning Group (PPG), Urban Redevelopment Authority (URA), interview with the author, February 2013, Singapore, URA meeting room.
Fig. 1-6  Changi Flight Information Region (FIR) the airport's air space control

Fig. 1-7a  Changi FIR evolution through time: in 1981 - n.2 encompasses parts of the State of Joho, Source: Hutton 1981

Fig. 1-7b  Changi FIR evolution through time: in 2014, Source: CAAS 2014
If Malaysia successfully regained control of all of its airspace, the one above the Indonesian Riau Islands remains controlled by Singapore since 1946, albeit efforts from Indonesia to reclaim it since 1993. (Fadli 2012) This has deprived the country of incomes from route charges imposed on aircrafts passing through the airspace or blocked Indonesian’s airports located within Changi’s FIR to freely add new routes. Every airplane entering Changi’s FIR or every airport located within the boundary is under Changi Control Tower.

This condition offers an unusual illustration of the well-known powers and dependencies prevailing in the SIJORI territory. Changi’s FIR can be read as another administrative border —vertical this time— superimposed on the tri-national territory. It enables Changi Airport to control and extend its catchment area on the territory. Changi’s airspaces control is therefore one of the defining parameters of the Extended Airport Region of Singapore that will be uncovered in this dissertation.

It is important to note that, as mentioned by Dendi Gustinandar, director at Batam Hang Nadim Airport, the International Civil Aviation Organisation (ICAO) has given the green light for Singapore to hand over control of the airspace above the Riau Islands if Indonesia develops the adequate air control infrastructures and radar management. The Indonesian Directorate General of Civil Aviation (DGCA) has been given until 2024 to take control of any airspace managed by another nation. Yet recent announcements have confirmed that this could happen by 2019 at the latest. (Fadli 2015) Once the airspace is returned to Indonesia, the rearrangement of the air-traffic may spur the development of the Riau’s secondary airports through additional new routes and revenues. These remain speculations and cannot be considered as defining factors in the analysis of this dissertation. However they are illuminating examples of the rapidly changing context in which this research is taking place.
CHAPTER TWO
The Airport Island

THE “Singapore is already a fully conquered island in the imaginary, in that every foot of space is already assigned to a particular use, as signified by the multicolour coded planning maps. No space has been left to chance and even nature has to have the permission of the planning agencies to survive.” (Chua 1997, 50)

I. INTRODUCTION

This chapter uncovers the specific spatial imprint of airport-related functions in Singapore —namely a dead-end terminal condition of the airport’s periphery complemented by a special Airport Island situation throughout Singapore —and correlates them to particular factors and defining parameters: the presence of a global airport hub such as Changi, located within Singapore’s specific geopolitical conditions. Through interviews with local authorities, archival research on past normative plans and texts, as well as fieldwork throughout the island of Singapore, the chapter reveals how, in spite of the land scarcity concerns driving urban pressure for most of Singapore, Changi’s immediate land periphery remains reserved for future airport expansion and infrastructure accessibility. Although Changi’s different public amenities within the terminals landside and its south-western periphery may show the premises of a centrality based on the airport, the close surroundings of Changi Airport are to these days mainly characterised by mono-functional developments with poor public accessibility and transport connectivity. On the other hand, Singapore’s globalised economic sectors are highly dependent on aviation. Specialised business parks and tourism attractions are therefore developed in strategic locations, throughout the island, and well connected with Changi Airport via effective roads infrastructures. As a result it is the ‘all of Singapore’ that is planned as an ‘Airport City or Island.’ In doing so the chapter argues that as much as Changi’s urban effects are evident less in its own periphery than on a larger scale —throughout the island of Singapore—, outside of Singapore’s restrictive urban space, Changi Airport has had significant urbanisation effects on its hinterland as well (the SJORI cross-border region), as will be uncovered in the following chapters of this dissertation.
II. THE AIRPORT ISLAND

The following section examines the resulting spatial conditions of the ‘Airport Island’ of Singapore with a study of the airport as a destination in itself first, followed by a detailed analysis on the National scale of Singapore.

2.1 Changi Airport as a destination

Changi Airport plays a crucial role for Singapore by extending the Island-state’s global reach. As Prime Minister Lee Hsien Loong stretched during his 2013 National Day Rally Speech:

[...] What is Changi Airport? To travellers - an icon of Singapore. To Singaporeans - a welcome landmark telling us that we have arrived home. To me it is a part of the Singapore identity - a symbol of renewal and change. [...] But Changi Airport is more than an emotional symbol. It is how the world comes to Singapore and how Singaporeans connect with the world. It is why we thrive as an international hub for business, for trade, for tourism. [...] it is 163,000 jobs in Singapore, 6 per cent of the GDP and it is all levels of society. (PM Lee 2013)

If the airport’s global reach and ‘success story’ is well accounted by the annual reports¹ of Changi Airport Group (CAG) —the airport operator—, Changi has also started to act as a destination in itself for the residents of Singapore. The different public areas located within Changi’s three terminals and the buildings directly linked to them on the airport’s landside are attracting Singaporeans who come to Changi to enjoy the airport facilities for reasons other than aviation.

¹ In 2013, the airport served more than 100 airlines and 6,500 weekly flights that globally connected Singapore to over 250 cities in about 60 countries. 2013 was also the year when Changi crossed the 50 million passenger mark, ranking it the 7th busiest international airport in the world, before Suvarnabhumi Airport in Bangkok, one of the world’s top tourist destinations. In addition Changi Airport International (CAI), a wholly owned subsidiary of CAG, also makes yearly progress in overseas markets with worldwide consultancy and investment projects in China, Brazil, Russia, Italy, India, the Emirates, Uganda and the Philippines. In 2013 CAG consolidated revenues of S$1,911,070 billion, an increase of almost S$135,000 million compared to 2012 (Lee 2009). An example of CAG’s international activities is the fact that since 2012 Changi Airport Planners and Engineers (CAPE) have been engaged to carry out the master plan and conceptual layout for the Brasilia Airport City project. In June 2012, CAI also completed the acquisition of a 30% stake in Airports of the South (AOS), comprising a group of four airports in the South of Russia.
Featured on international websites such as Huffingtonpost.com,^{2} the Canopy Playground located in the public viewing gallery of Terminal (T)1 is popular on weekends among Singaporean families who benefit from landside shopping and eating facilities while the children enjoy the free ‘forest-themed’ indoor play. As CAG’s manager reports “the playground is so popular at weekends that it becomes difficult to access.”^{3} Ms Kirsty, mother of 2, adds, “Whenever we run out of ideas or the rain comes to spoil all outdoor plans, we always know where to go. Changi Airport! It never fails to entertain our kids.”^{4} For every $10 spent at the airport in a single receipt, members of the public also enjoy a slide down the four-storey “world’s tallest slide in an airport” located in arrival hall of T3 (Changi Airport 2014a), or sneak in the free Aviation Gallery to learn insights into the history of aviation in Singapore or Changi’s ground operations. (Fig. 2-1) Changi Airport was also reported by The Straits Times as one of the favourite places among secondary and tertiary students to study for their examinations, with travellers finding these students “very uniquely Singapore” or even “a distinctive trademark at the airport.” (The Straits Times 2009)

The use of Changi Crowne Plaza Hotel, located within the airport’s grounds, probably best illustrates the link between the airport and its city residents. (Fig. 2-2) Designed by local firm WOHA Architects and opened in January 2008, the ‘transit hotel’ serves Changi’s three terminals. It is directly accessible from T3 and is linked by the Skytrain to T1 and 2. Although around 85% of its occupancy is made up of passengers in transit, the hotel is a favourite among Singaporeans looking—in the architects’ words—to “breakaway from the city.”^{5} Fully booked months ahead, the hotel hosts an average of 26 weddings per month, all concentrated over the weekends with two sessions per Saturdays and Sundays, lunch and dinner.^{6} (Fig. 2-3) As General Manager Steven Chan notes, “The wedding market is very lucrative in Singapore. The Crowne Plaza offers the value of a great architectural design combined with generous parking availability and fast transport connection to the city centre.” Combined with conferences during the week, restaurant reservations, as well as hotel rooms booking during the weekend, the hotel registers 15% occupancy by local Singaporeans throughout the week.

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^{2} See (CAG 2012-2013) and different family friendly local blogs such as Sassy Mama, Little Steps, etc.

^{3} Loh Tzu Liang, Manager, Planning & Policy Headquarters Airport Operations, CAG, Interview with the author during The Future of Asian Airports Seminar, Site visit to Changi Airport Facilities, August 20st 2013. Unfortunately CAG does not collect statistics of the number of visitors to the Airport public facilities.

^{4} Mum of 2 active toddlers, interview with the author on the rainy Sunday of November 23rd 2014.

^{5} Pha Hong Wei, WoHa Architects, Project Architect for the Changi Crowne Plaza, interview with the author, 20st of January 2012

^{6} In 2011 the hotel recorded 146 weddings. Steven Chan, Changi Crowne Plaza Hotel General Manager, interview with the author, 8th of February 2012
Changi holds a key position in public discourse as well. During his 2013 National Day Rally Speech, PM Lee extensively discussed the history and future of the airport. After recalling the crucial role of his father Lee Kuan Yew in making the Changi “vision” happen, PM Lee warned how competition was avid among airports in Southeast Asia.

So we inherited this but we have also progressively expanded and upgraded Changi over the years. Now three terminals, handling 51 million passengers last year. [...] Passenger traffic is up. All over Asia, middle-classes are travelling, air travel is booming. [...] Other airports in Southeast Asia are expanding to take advantage of these opportunities. KLIA, they are planning to service 100 million passengers per year. Bangkok Suvarnabhumi (Airport) also aiming for 100 million passengers a year and both of them are geographically better-placed than Singapore to be the hub in Southeast Asia. Because from Europe to Southeast Asia to the Far East whether it is Hong Kong or Japan or China, KL is nearer, Bangkok is nearer still. But we are the hub. Why? Because they are not Changi Airport! That makes a difference. Now the question is: Do we want to stay this vibrant hub of Southeast Asia or do we want to let somebody take over our position, our business and our jobs? That is our choice. (ibid)

At the end of his speech, he announced the long-awaited plans for the airport’s expansion. Changi is currently redeveloping its former ‘Budget Terminal’ into Terminal 4 - dubbed “A Terminal For The Future” (Kaur 2014b). The airport will be further expanded with the new Mega-Terminal 5 and a third runway by the end of next decade.

“T5 sounds like a terminal but actually it is a whole airport by itself, as big as today’s Changi Airport but connected together so it all operates as one. Two runways, third runway, new T5, doubling the capacity. [...] this is how we can stay the hub in Southeast Asia and create many more opportunities for Singaporeans.” (PM Lee 2013)

He also announced the replacement of the open-air car park by the project codenamed “Jewel,” a new retail hub designed by ‘Starchitect’ Moshe Safdie. As reported in the press during the months after Lee’s speech, the “Jewel” will enhance Changi’s attractiveness amid competition from regional rivals (Kaur 2013) and offer the chance to “hub the three terminals together” (Kaur 2014a). But in PM Lee’s speech, Singaporeans remained the centre of the focus:

it will have shops, restaurants and a beautiful indoor garden. So we have Gardens by the Bay (the public gardens opened in 2013 next to the centrally-located Marina Bay Sands), this one is Gardens at the Airport. Not just for visitors but for Singaporeans too - families on Sunday outings, students maybe studying for exams, newly-weds taking bridal photos. (PM Lee 2013)

The public areas located in Changi’s different terminals coupled with key landside buildings—such as the Crowne Plaza Hotel or the future project “Jewel”— may portray the premises of an urban centrality based on Changi Airport. In the ‘contemporary network city’ model (Oswald, Baccini, and Michaeli 2003, Shane 2005, Hall and Pain 2006) the airport acts as a magnet for several functions, some of which obvious, located within its actual physical boundaries, but many others being part of a much larger spatial imprint. However, as will be uncovered in the next section, the urban effects of Changi Airport’s reciprocity interactions with the city can be found less in the airport’s immediate periphery than all over the island, due to Singapore’s specific geopolitical uniqueness.
2.2 The “Amusement Park with an Airport”

The travel and tourism industry in Singapore offer clear examples of the all-encompassing “Airport-City” condition of Singapore. Singapore’s international visitor arrivals in 2013 reached 15.6 million, registering a growth of 7.4% from previous year. (STB 2013) Among these, over 76% arrived by air (ibid, 24). The global gateway of Changi Airport unsurprisingly plays a key role in the tourism industry, which contributes to nearly 11% of Singapore’s annual GDP. It is interesting to note that the average length of stay is however relatively short - 3 days - with one quarter of overall visitors spending less than 24 hours in the City-state (ibid, 3). Unlike other Southeast Asian countries that offer unique historical sites, attractive natural resources, and exotic experiences, Singapore has to bank on other more ‘sophisticated’ attractions and marketing strategies to lure global tourists. Together, shopping, sightseeing, entertainment and gaming total nowadays over 50% of the overall tourism expenditure (ibid, 10).

As introduced earlier, in 1994 the Singapore Tourism Board (STB) embarked on the Tourism 21: Vision of a Tourism Capital strategy that repositioned tourism as a serious business for the City-state. (Centre for Liveable Cities 2013) To overcome its limited natural resources, Tourism 21 reformulated “the product” of Singapore by repositioning it as a “New Asia” offering a mix of old and new, a place where “Western” and ‘Asian’ cultures coexist [...] to convey the fusion between modernity and dynamism on the one hand, and a traditional ‘Asian soul’ on the other.” (Chang and Yeoh 1999, 105) In addition to the regional agenda of “collective attractiveness” bundling the Riau and Johor with Singapore, part of the Tourism 21 strategy was to develop “attractions” by grouping them in “zoned themes.” (Maunati et al. 2007, 7) The STB recommended 11 zones of thematic development ranging from “Ethnic Singapore”, “International Vacation Gateway”, “Mall of Singapore”, etc. Opportunity areas were targeted “around suitable existing attractions and [transformed] into “thematic zones” with a unifying character or theme.” (STB 1996, 27)

Tourism 21 echoed the earlier conservation scheme initiated by the government in the late 1980s, when heritage redevelopment programs were promoted to tackle the homogeneity resulting from more than two decades dominated by a demolish-and-rebuild philosophy (Yeoh and Kong 1994) and attract new visitors to the country. The STB’s Tourism Product Development Plan of 1986 promoted the re-development of “ethnic enclaves” such as Chinatown, Little India and Kampong Glam into “valuable tourism assets.” (Chang and Yeoh 1999, 109) By integrating “activity clusters, services, facilities, and even street furniture” in historic areas into a single themed development, and by creating “cultural trails” and providing edited storyboards and maps, both Tourism Product Development Plan and Tourism 21 reformulated Singapore’s cultural sights into more transparent and “digestible” products “for tourist consumption.” (ibid, 109)

‘Attractions’ and ‘Integrated Resorts’9 are two of STB’s core industries, which aims at strengthening “Singapore’s position as a leading ‘Attractions’ destination.” (STB 2014) Among these “noteworthy attractions capturing worldwide mindshare,” the most notorious and popular is the Integrated Resort (IR), Marina Bay Sands (MBS). IR is a Singaporean euphemism for a hotel and convention centre with a casino component (Lee 2009). MBS integrates shopping, eating, museums, and gambling into a ‘consumption

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7 The share of Travel & Tourism spending - or employment in the equivalent economy-wide concept - reached 10.9% in 2013 as published in the national income accounts. (Shields 2013)
8 Tourism receipts by major components - S$23.5 billion: Sightseeing, Entertainment and Gaming (23%), Local Transport (4%), Shopping (19%), Food & Beverage (10%), Accommodation (23%), Medical (3%). Others (include expenditure on airfares, port taxes, business, education and transit visitors – 18%)
9 Singapore’s Integrated Resorts are Marina Bay Sands (MBS) and Resorts World Sentosa (RWS), which were opened in 2010.
compound. Nowadays MBS and Sentosa Island are the most visited ‘paying’ attractions, while Gardens by the Bay is becoming one of the most popular ‘free’ ones. Orchard Road remains a favourite for shopping with fashion and accessories being ranked as the most popular shopping items, both in terms of amount spent and popularity (42%).

MBS Casino has even started using luxury jets and larger aircrafts to fly in ‘high rollers,’ players wagering large amounts of money, from emerging Asian economies to Singapore to gamble. With a minimum spend of SG$1 million, clients have the benefit of being flown ‘for free’ from their home country to Changi Airport, and whisked to the MBS casino by limousine. Other casinos in the Asia-Pacific region offer similar services. Crown, a large casino and entertainment precinct in Melbourne, Australia, has expanded its high-roller air-fleet business from 41% in 2010 to 60% in 2013. The “VIP commission program” is a key part of the casino’s business and responsible for almost a third of revenue. The Crown’s private aircrafts have become a critical part of the international and interstate VIP tourism business for the casino. (Butler and Butt, 2013)

According to a private pilot for MBS, “MBS has identified 5,000 potential clients in the region, but I can be asked to fly on the other side of the world. I am on call six days a week and usually receive five hours’ notice before having to pick up a client. There are several of us working for MBS”

As noted, the average length of stay for tourists in Singapore is relatively short—just three days—with one-quarter of overall visitors spending less than 24 hours. Several tourism trails and self-explanatory short guides are devised to ease visitors’ quick consumption of the City-state and support the branding and repackaging of Singapore’s cultural landscape (see Chinatown and other ethnic enclaves’ repackaging introduced earlier). A transit passenger with at least four hours to spare in Changi Airport before her connecting flight can register for a free two-hour guided tour of Singapore. (Fig. 2-4) Jointly organised by Changi Airport and Singapore Airlines (SIA), the City Lights Tour showcases Singapore by night. Visitors-in-transit are bussed to various attractions, including a panoramic view of “Singapore’s famous icons”—the Flyer, MBS and the Esplanade, while the Heritage Tour:

*has a short stopover at the Merlion Park before proceeding to the Colonial District, Central Business District and Chinatown or Little India. The journey to the Merlion Park offers you a panoramic view of Singapore’s cityscape and landmarks like Marina Bay Sands, Singapore Flyer and Gardens by the Bay. You will also pass The Fountain of Wealth (world’s largest fountain) and one of Singapore’s icons – the Esplanade. The tour will bring you through a discovery journey where you will have a glimpse of a unique blend of East and West, tradition and modernity. It will be a splendid way for you to explore the history, culture and lifestyle of multi-racial Singapore while in your transit.*

Changi Airport 2014c

10 The other ‘attractions’ listed by the Singapore Tourism Board are Resorts World Sentosa (which includes Universal Studio and the Underwater World Aquarium); Gardens by the Bay; the Singapore Flyer; the Singapore Zoo and the Night Safari; the Jurong Bird Parks and the island of Sentosa. In addition to these ‘paid-access’ destinations, other ‘free-access’ ones are offered such as Orchard Road, the Botanic Garden, Chinatown, Little India, the Merlion Park and the Singapore River with Boat Quay and Clarke Quay. New and exciting developments in the pipeline include the Singapore Sports Hub and the National Art Gallery.

11 MBS private pilot, [identity kept private], interview with the author on 06.12.2014 in Singapore. It is interesting to note that it is not possible to find any publicly available source mentioning the MBS elite service.

12 In 2013, 30% of all pax landing in Singapore Changi Airport were ‘transfer’ passengers (Knoema Data Atlas, 2014)

13 Eligibility to participate in the tour is subject to visa entry requirements stipulated by the Immigration & Checkpoints Authority of Singapore. Registration for the tour must be made at least 1 hour before the start of the tour, with passport and boarding pass, at the Free Singapore Tours (FST) Registration Booth located in Terminal 2 and 3. All passengers should remain in the transit area prior to the tour and not clear immigration before. (Changi Airport 2013)
With the SIA Hop-on Bus, Singapore Airlines offers visitors who purchased one of SIA’s numerous ‘Stopover Holidays’ packages a free and “easy way to enjoy Singapore sights.” The bus service loops around the city centre and brings travellers to ethnic districts, major attractions, shopping malls and entertainment hot spots. “With strategically located stops across the city, it is an efficient way of touring Singapore.” (SIA 2014) A 1.5-hour route with its own narrative is mapped onto the city-centre landscape, complete with places of interest and shopping centres.

As Chang and Yeoh argue regarding the “Yours To Explore” tourism brochure devised by the STB for Chinatown in 1997, “in this repackaging, Singapore is reduced to a highly legible map of unidirectional pathways, where the tourists traverses [...] nodes of cultural or commercial significance such as temples, shopping complexes and landmark buildings.” (Chang and Yeoh 1999, 112) Towards this end, one could argue that the highly-constructed landscape of Singapore, made possible through its centralised planning approach, could be interpreted as a series of key tourist attractions (Fig. 2-4), industrial nodes and business districts, efficiently linked through highways to the international gateway of Changi Airport. MBS-dedicated-aircraft-fleet is only one illustration of this condition. The next section uncovers how clusters of international trade are likewise spread out across the island.
2.3 Spread-out Clusters of International Trade

Issued in 2014, the latest URA master plan shows the allocation of different industries and business clusters across several peripheral areas of Singapore. For example, Jurong West along the expressway serving the Port of Singapore, is largely dominated by logistics companies and other light industry warehouses. Nearby are the petrochemical island of Jurong and the ‘heavy-industries’ zone of Tuas. Other similar areas of industries, public utilities and manufactures are located in the North region around Woodlands Industrial Park; in the Northeast region with Seletar Aerospace Park; or in the East with the industrial clusters of Kallang Sector and around the former Paya Lebar military airbase. In these clusters, the URA permits the following “Business 2” developments: distribution centres, computer software, hardware and electronic equipment firms, manufacture of electrical apparatus and supplies, etc.\(^{14}\) (Fig. 2-5)

Although the business sector contributes a sizeable proportion of Singapore’s service-based economy and employs a large number of skilled professionals, the manufacturing sector remains the highest contributor to Singapore’s GDP, with 21% before financial (12%) and business services (15%)\(^{15}\). (EBD 2012) The manufacturing sector in Singapore essentially produces ‘high-value-added’ products such as biomedical (25.5%), electronics (25.0%), aerospace (15.7%) or precision engineering (14.6%)\(^{16}\). Because of their manufacturing processes, these goods are largely ‘airfreight dependent’. Aerospace manufacturing for example requires spare-parts to be shipped on a daily basis, while the end product often needs to reach the final destination in a critical time frame to enable maintenance or repair of an engine. Similarly for electronics, the production is generally divided in a high-tech manufacture and later a more labour-intensive assembly. Both can be carried out in different locations of the globe depending on labour-costs and qualification, while distances are quickly resolved through aviation given the size and cost of components. Kasarda discusses the clustering of “aviation-oriented business parks” and “time-critical goods facilities” around airports such as airport-linked e-commerce fulfilment centres, facilities for perishables (seafood, fresh cut flowers or pharmaceuticals), logistic firms, as well as manufacturers of high-tech products (aircraft parts, computers, cell phones, and other microelectronics). (Kasarda 2009, 50-53).

A look at the developments found in the Singapore “Business 2” parks reveals the allocation of ‘airport-related’ functions throughout the island (Fig. 2-5). In the Kallang Sector for example, there are ‘time-sensitive’ electronic chips companies such as Infineon Technologies or Siemens, while Rolls Royce, the world’s second-largest maker of aircraft engines, located its Asian hub within Seletar Aerospace Park. The ‘International Business Park,’ located in the Western regional centre of Jurong, hosts several MNCs, such as the headquarters of BlackBerry or the centre of Acer Computer. While the distribution centre of Mandai Link, an air-based logistic company specialising in perishables, is located in Woodlands, a northern area of Singapore. Compared to these extensive clusters the business and industrial estates located on

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\(^{14}\) The ‘Business 2’ zoning definition of the URA is for “…areas used or intended to be used for clean industry, light industry, general industry, warehouse, public utilities and telecommunication uses and other public installations. Special industries such as manufacture of industrial machinery, shipbuilding and repairing, may be allowed in selected areas subject to evaluation by the competent authority. Developments allowed for the following: 1. Computer software development, 2. Distribution services, 3. Assembly and repair of computer hardware and electronic equipment, 4. Printing, publishing and allied industries, 5. Packaging of dried foodstuff, 6. Warehouse except for storage of chemicals, 7. Biotechnology, 8. Manufacture of electrical apparatus and supplies, 9. Vehicle repair and servicing, 10. Manufacture of furniture and fixtures, 11. Warehouse, 12. Electrical Substation, 13. Industry/power generation plant, 14. Gas Installation (Changi Airport 2014c)

\(^{15}\) Manufacturing breakdown in Singapore: Biomedical 25.5% - Electronics 25.0% - Transport Engineering (aerospace) 15.7% - Precision Engineering 14.6% - General Manufacturing 11.3% - Chemicals 7.9% (Urban Redevelopment Authority 2014) 

\(^{16}\) Wei Chuen Chua, assistant head transport engineering, Economic Development Board (EDB), interview with the author, May 2013, Singapore, EDB meeting room
the western periphery of Changi Airport—namely Loyang, Changi North, Changi Business Park and South Industrial Area—appear modest in scale and output.

JTC Corporation is Singapore’s main developer and manager of industrial estates and their related facilities. It provides modern developments for potential corporate and industrial tenants in various parts of the island. In addition to the clusters of Changi North and Changi Business Park located near the airport, JTC’s portfolio includes the International Business Park, Jurong Island, One-North, Seletar Aerospace Park, and Tuas Biomedical Park, among others¹⁷. (Fig. 2-5) The prevailing logic around the world is that firms seeking quick access to the airport tend to settle near it; however, Singapore’s efficient road and expressway system free firms from this constraint. Thus locational choice is based on infrastructural quality and other facilities provisions, as well as on the government’s tightly controlled urban development. Among JTC’s Parks, Seletar Aerospace Park requires a closer look as an example of aviation-related development.

¹⁷ As noted by Wruck, the Real Estate Investment Trusts in Singapore (S-REITs) offer other indicative evidences. EDB 2012) S-REITs invest in commercial real estate and rent workspace areas to private companies, which can benefit from special taxes advantages related to REITs. There currently are 26 S-REITs listed on the Singapore Stock Exchange that specialise in industrial and logistic properties. Relevant for this study are the popular a-reit, Cambridge Industrial Trust, Mapletree Industrial and Logistic Trust, as well as CACHE Logistic Trust. These specialise in business and science parks, high-specification industries, warehouses, logistic and distribution centres. Although Changi Airport is featured as a ‘sale argument’ for locational choice in the respective sale material (Wruck 2013), the property portfolios of these S-REITs show a regular distribution of business, industrial and logistic companies all over Singapore, instead of a clear conglomeration around the airport.
From the late 1960s, the aerospace industry was identified as a key economic sector for Singapore; governing agencies (mainly EDB and JTC) pushed to attract aerospace investment in the City-state. By the early 2000s, Singapore had become Asia’s most comprehensive industry cluster for aerospace with a full suite of maintenance, repair, and overhaul (MRO) facilities located around Paya Lebar Airport, and near Loyang industrial park and Changi North. (Yok 2011) Given its former use as Britain’s Royal Air Force (RAF) base, its proximity to Changi and its vast land availability, the Seletar Airbase was identified as the best location to host the expansion of the aerospace industry in Singapore. It is important to mention that in the early 2000s, the clusters of Loyang industrial park and Changi North were not fully developed yet and could have accommodated further MRO expansion. However, as Mister X (named changed for confidential reasons), the officer in charge of aerospace industries within EDB, explains, “When an aerospace industry partner approaches us to locate their business in Singapore, we direct them to the newly developed Seletar Aerospace Park. [...] Only if they are very special [important clients] do we direct them to JTC to evaluate the possibility of a location at Changi North”

JTC acquired the lease for the 160 hectares of land around Seletar airport, acting as the developer of all industrial facilities for the aerospace park, while CAAS undertook the redevelopment of the airport to accommodate larger aircraft. (ibid, 58, 59) Set amidst lush greenery, Seletar Aerospace Park offers a unique environment with shady trees and clusters of colonial black and white bungalows formerly built to house RAF officers. As stated in JTC’s planning guidelines issued in 2008, “Seletar Aero+sPace will offer an attractive plug-and-play industrial space dedicated to aerospace activities [...] and is envisioned to be an inspiring world-class aerospace park by 2015.” (JTC 2008, 1) Allowing industrialists, suppliers and service providers in the same value chain to be clustered in one location, the aim was to provide economies of scale and foster collaboration opportunities. Six years later, in addition to big players like Rolls Royce or Singapore Technologies (ST) Aerospace, a growing number of small and medium-sized local companies are setting up shop at the Aerospace Park. There are now 45 global and local aerospace firms operating in the area. About half are SMEs (Kaur 2014c) and more are expected to join as JTC moves into the third and final phase of development.

In the planning, document detailed attention is given to parcel sizes, land use allocation, built and landscape preservation as well as ‘micro-design’ defining visual or green corridors (Fig. 2-6). Detailed guidelines are developed in order to “showcase the historical virtues of the site while selectively inserting new aviation, educational, commercial, and recreational programs that would fit well into the built fabric of the areas.” For example, several scenarios have been developed for the commercial and recreational centre located in the colonial black and white cluster. Landscape design guidelines have been developed not only for the new plantation strategy in the public areas, but also for the landscaping within the individual land

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18 Tang Hsiao Ling, Deputy Director, Land Planning Division, Urban Planning Department, JTC Corporation, email exchange with the author, 7 August 2013, Singapore. “Changi North was planned for the aerospace industry that has synergistic relationship with the airport, however due to the lack of demand in the earlier phases, besides aerospace related companies like Sasco, the land was also subsequently filled by some non aerospace companies too.”

19 Mister X (named confidential), assistant head transport engineering, Economic Development Board (EDB), interview with the author, May 2013, Singapore, EDB meeting room.

20 The transformation of the airbase began in 2007 with phase 1 and 2. Since then, in addition to roads and landscape infrastructures, the seven-storey building “JTC Aviation One” and 8 factories – including Rolls Royce Campus - were built and leased out by JTC to different aerospace industries. Moving to phase 3 JTC announced the development of “JTC Aviation Two”, a 2 eleven-storey towers development complemented with 7 warehouses. These will accommodate the growing number of SMEs wanting to locate in the park. (CACHE-reit 2014)
parcels. Detailed architectural design requirements even specify the colours for the roofs and facades of the factories.21

As opposed to Seletar’s detailed guidelines and official documents,22 the planning guidelines for the close periphery of Changi Airport are poorly developed. As JTC’s director of urban planning mentioned, “when Changi North Estate was planned... many years ago... no design, or clear guidelines were developed. It was more a functional ‘lot + road division’ strategy than anything else. The person who worked on this is long gone. And I am afraid it will be difficult to dig out more background than you already did.”23 While design guidelines for the airport periphery might have been less relevant 30 years ago, when Changi was planned, the fact that nothing has changed is symptomatic of the government’s restrictive control of the site to enable its future expansion. The periphery of the airport matters less here, for it is the all of Singapore that is considered an ‘Airport-City’.

Before shifting this discussion to the resulting spatial conditions on Changi’s close periphery, it is important to highlight another unique case-study of ‘extra-territoriality’ within Singapore’s border and linked to Changi Airport: the Singapore Freeport—a super-secure, state-of-the-art facility that operates in its own duty-free zone next to Singapore’s Changi Airport. The largest such facility in the world, it provides wealthy collectors with tax-free storage, as well as a place to display and sell their art. This brings us back to Singapore’s development strategy, particularly with regards to its recent policies. As illustrated by the import of international foreign talents; the strong promotion of research, innovation and enterprise (monitored by the Agency for Science, Technology and Research (A*STAR)); the opening of partnership with prestigious universities funded by the Singaporean government; as well as strong interested towards the ‘arts’ (with provision of cultural infrastructure such as the purpose-built iconic Esplanade and Theatre on the Bay in 2002, or the opening of the Singapore Art Biennale in 2011 among many other examples), Singapore has changed its priorities from manufacturing to a service economy to a knowledge-based one. The Singapore Freeport gives momentum to two major parts of Singapore’s development strategy: to become Asia’s regional arts hub and a global centre for wealth management.

21 In Seletar AeroSpace, where the entire development is frequently viewed from the sky, the use of colour on the roof of each building collectively plays a potential role in creating unique identity to the estate without compromising the technical requirement of the industry and incurring additional cost. The design guidelines further encourage the wrapping of the roof colour onto the building facades fronting major roads and pedestrian thoroughfares. (Pour 2010c)
22 See JTC’s World Class Hub in Asia (JTC 2008) or EDB’s publications How Seletar Aerospace Took Off relating the complex process behind the Seletar Park implementation (JTC 2006).
23 Tang Hisao Ling, Deputy Director, Land Planning Division, Urban Planning Department, JTC Corporation, interview with the author, July 2013, Singapore.
2.4 The Singapore Freeport

In early 2000, looking to attract foreign investors and become a private-banking hub, Singapore began to create a facilitative legal and regulatory environment that reinforced bank secrecy and strengthened trusts. (Long and Tan 2010) At the time, Asia’s growing wealth was spurring demand and Switzerland was scaling back bank secrecy. (Prystay 2010) Between 2000 and 2009, the number of private banks in Singapore doubled (from 20 to 42) and private-banking assets grew accordingly by 50 billion to SG$300 billion. (Bowman 2009) According to the Business Times, Singapore was the second-largest private banking centre internationally in 2010, holding six percent of global private banking assets, behind Switzerland. (ibid) In 2013, Singapore was ranked fifth on the ‘Financial Secrecy Index’ position (based on a combination between secrecy score and offshore financial services) placing it towards the high end of the secrecy scale. (Tax Justice Network 2013) As Christian Pauli, General Manager of Fine Art Logistics, puts it, the FreePort service appeals to the same type of high-net-worth individual, as those storing their money in private banks. Because of this correlation, Yves Bouvier and Alain Vandenborre, the two co-founders of the Freeport, were able to persuade the government to support their idea in 2005\(^\text{24}\). Knowing Singapore was hoping that its status as a global private-banking hub would boost the economy by inducing rich individuals to spend, shop, holiday or invest in the City-state, they argued the facility would magnify that effect. As Vandenborre puts it, “If you have money in a bank, you might not come. But if you have a Van Gogh here, you will.” (Prystay 2010)

The Freeport is the ultimate art-safe and high security warehouse for the world’s finest collections. (The Singapore Freeport 2010) (Fig. 2-7) The largest facility of this kind in the region, it provides wealthy collectors with tax-free storage, as well as a place to display and sell their art or other precious goods.

\(^{24}\) Christian Pauli, General Manager of Fine Art Logistics, interview with the author, 08.11.2012, at the Singapore Freeport.
Among the five tenants are Christie’s and Fine Art Logistics. These companies specialise in particular types of precious goods, such as art, antiques, wines, vintage cars, cigars, gold, diamonds, jewellery, etc. The Freeport also offers long-term storage for confidential archives or other Government goods. Directly connected to Changi’s apron for the ease of rapid and safe transfers, the facility was designed and engineered by a team of Swiss specialists. The gigantic arcing sculpture that spans the entire lobby, titled “la Cage sans Frontières” by Ron Arad, symbolises the use and global reach of the facility. Aside from private collectors & dealers, international art galleries use the facilities to store and exhibit their collections to rich clients specially flown in from India, China, Australia or Southeast Asia for the occasion.

As Fine Arts Logistics’ general manager explains, “Connections are very important for the ‘high-value’ segment” In the mid-2000s, Bouvier—not only a Freeport co-founder, but President of Geneva’s Freeport, largest art operator, Natural Le Coultre—started searching for a suitable location to replicate the Geneva model. He was drawn to Singapore for its stability, its strategic location to the growing markets in the region, as well as the presence of Changi Airport. Coincidentally, Singapore had resolved to become Asia’s regional arts hub and the government was quick to support this project. The Freeport was made possible thanks to the support of different governing agencies such as EDB, CAAS, the National Arts Council and Heritage Board, but also Singapore Customs, which enacted regulations and conditions necessary to optimally operate the Freeport, namely the facility’s location next to the airport’s fence. With extra costs and permission from CAAS, important goods can be whisked directly inside, using the airside door. Otherwise they are transported to the Freeport using public roads but without losing their “bounded” status. In fact, the facility was given the status of ‘Licensed Warehouse’, an area licensed by Singapore Customs to store “tax-free” imported dutiable goods outside of an approved Free Trade Zone.

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25 They currently are five tenants in the Singapore Freeport: Helutrans, Malca-Amit, Stanford Cellars, Christies and Free Arts Logistics (Yok 2011).
26 The building was designed by architects Benedicte Montant and Carmelo Stendardo from Atelier Architecture 3BM3. Renowned contemporary designers, Ron Arad and Johanna Grawunder, designed the lobby, showrooms and furniture as well as the internal and external lighting systems, “creating an iconic, futuristic environment.” (The Singapore Freeport 2014)
27 The cage without frontiers
28 Christian Pauli, General Manager of Fine Art Logistics, interview with the author, 08.11.2012, at the Singapore Freeport.
In addition, while the tenants have to register the goods with Singapore Customs, they only need to report what general category they fall under—say, one painting, not one Picasso. As Vandenborre says, “They only need to give a code that indicates the broad nature of the item—gold, wine or a painting. There’s no value, no ownership, no inventory list; all details are confidential. We offer more confidentiality than Geneva,” whose free port was established in 1888. If Singapore Police or Customs have the right to conduct investigations, the procedures are regulated by the Freeport. These must take place inside the facilities, be motivated and planned beforehand. Surprise checks are not allowed. Finally, if the art collectors have to comply with Singapore visa regulations, the customs offer a ‘one-time registration’ to regular clients for the ease of future immigration procedures. These can thereafter get accelerated entry through Changi Airport’s JetQuay CIP luxury terminal29 (CIP stands for “Commercially Important Person”), also known as the “Élite Gateway at Changi”. Collectors are picked up by Freeport staff at JetQuay terminal and transferred directly to the Singapore Freeport.

One of the last programs granted a space within Changi North Estate, the Singapore Freeport is accessible 24 hours a day, seven days a week to owners and potential buyers only. The 25,000-sqm building has four levels. The facilities comprise strong rooms, huge vaults, private offices, showrooms, workshops, and photo studios. (Fig. 2-9) The ambient conditions, temperature, and humidity are closely monitored and regulated. With 98% of the space fully allocated, a second phase planned on the adjacent plot of land (Fig. 2-10) will double the size of the facility, according to Vandenborre. (The Singapore Freeport 2010) As a special function associated with Changi Airport and directly linked to the City of Singapore, the Freeport is a highly controlled space, completely prohibited to the public and practically operating under its own laws. Here again, the border condition is key to Changi’s impact on the built environment. After locating Changi Airport within its National scale and examining the resulting spatial conditions of an ‘all-encompassing’ special ‘Airport City’, the next section studies Changi’s close periphery through spatial analysis of an area of roughly four kilometre radius around the passenger terminals: the ‘Airport Area.’

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29 The JetQuay CIP Terminal is an elite, dedicated airport terminal, which opened in September 2006. Passengers who use JetQuay get a personalized service, including check in, baggage handling and Immigration clearance. Facilities include a business center, private meeting rooms, boardroom, showers, day rooms, and contemporary art exhibition. (The Singapore Freeport 2010)

Fig. 2-9 The Singapore Freeport: internal strong rooms and vaults, Source: The Singapore Freeport 2012
Fig. 2-10 The Singapore Freeport: plot of land waiting to be developed
III. Changi Airport Area

3.1 History and Concept Plans

The historical development of the area surrounding Changi Airport is well illustrated and discussed in an array of different historical publications from the early 1900s through the British Royal Air Force (RAF)'s airbase handover to Singapore Ministry of Defence (Mindef) in 1963, and therefore will not be discussed in this thesis (see Appendix point 3). After these historical accounts, there is little documentation of the development around Changi Airport. The areal pictures of the British RAF airbase taken in 1965, just two years after the handover to Singapore Mindef, shows the RAF landing strip located right next to the coast (Fig. 2-12) and gives a good indication of the massive works and planning efforts that took place to turn the airbase into Singapore’s Changi Airport, which opened in 1981. (Fig. 2-11)

The lack of focus on Changi Airport periphery in relation to the airport infrastructure is symptomatic of, among others, official reports and scholarly publications. One such informative document is the early 1980s report by the Changi Airport Development Division in the Public Works Department. The report emphasised how the construction of two new expressways would ease travels to and from the airport and efficiently link it “to the rest of the Republic.” Built on land reclaimed from sea and running along the southeastern coast of the island “a 20 km high-speed expressway, the East Coast Parkway (ECP), will link the airport to the hearth of the city and extend beyond it to Jurong Industrial Estate. The journey to Shenton Way (Singapore’s Wall Street) along this highway will take about 20 minutes.” A second high-speed expressway, the Pan Island Expressway (PIE), would ‘conveniently’ link the airport to the residential and industrial areas throughout the island. The Changi Airport’s Road Links diagram (Fig. 2-13) illustrated how the airport sat on the eastern edge of Singapore, among other centralities and nodes located throughout the island.

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30 See (JetQuay CIP Terminal 2014) (Chew 1980) (Hutton 1981)
The last available detailed URA Planning Report on the ‘Changi Area’ issued in 1994, just over a decade after the airport opened, subdivides the area into three planning sub-zones (Fig. 2-14). Out of these, ‘Changi Point’, along the northern stretch, was envisioned as the “hearth of the Changi Planning Area […] to become an attractive and lively recreational destination for all Singaporean.” (Changi Airport Development Division 1981, 10, 11) The other two sub-zones were ‘Changi Airport’, owned by the CAAS and dedicated to the airport’s infrastructure (totalling 70% of the all Area); and Changi West, along the western periphery of the airport. The area located on the eastern side of the airport is not included nor shown on the planning zone maps. Illustrated in blue, as part of the sea, the area is annotated as “shallow and suitable for further land reclamation.” (URA 1994, 4) Throughout the report, the proposals focus on the revitalisation of Changi Point and Village as a “charming sea-side resort for all Singaporeans” with upgrades to parks, beach areas, retail and recreational facilities, and transport connectivity. (ibid, 16) Another key planning ‘Strategy’ listed for the area stresses “to provide adequate land for the future growth of Changi Airport.” (ibid, 20) The report positions Changi Village as “the hearth of the Changi Planning Area” while apart from development constraints on building heights and noise limitations, the relation between the area and the airport is rarely mentioned.

Fig. 2-12 RAF Changi’s airfield base, circa 1965, Source: Probert 2006

Fig. 2-13 Changi Airport’s Road Links diagram, Source: Changi Airport Development Division 1981
Not until the very end of the report are ‘aviation-related’ uses prescribed for JTC’s Changi North Estate. This 82-hectare site located on the southern part of the ‘Changi West’ planning zone is shortly listed as “the only industrial use in the Changi planning area […] This estate has been earmarked for aviation-related industries given to its strategic location next to Changi International Airport.” (ibid, 22) When I enquired further on the relationship between Changi North Estate’s development and the airport in the early planning vision for the area, JTC’s deputy director admitted, “Changi North was planned for the aerospace industry that has synergistic relationship with the airport, however due to the lack of demand in the earlier phases, besides aerospace related companies like Sasco, the land was also subsequently filled by some non aerospace companies too.” It is interesting to note that the other key clusters located on the periphery of Changi Airport nowadays—such as Changi Business Park, the nearby Changi South Industrial Area and Loyang Industrial Estate—were already present and marked for “Business 2” land use in the URA master plan of 1980. However, these are not mentioned in the detailed 1994 URA Planning Report on Changi Area as if they were not part of the airport’s catchment area or under Changi’s influence.

With air traffic estimated to triple by 2030 (ibid, 31), competition among airports in Asia Pacific is heating up. Changi has to not only step up its efforts to entice carriers to add more connections and flights, but keep up its development, too. Announced by PM Lee during his 2013 National Day Rally Speech, Changi is redeveloping Terminal 4 and the Jewel—a new retail hub designed by Moshe Safdie, the architect behind Marina Bay Sands—is due for completion by 2018. The airport will also add the new mega-terminal 5—literally a ‘new airport’ in PM Lees’ words (CAAS 2014)—and a third runway by the mid 2020s. Future developments for the airport periphery, however, did not echo the grand plans announced for the airport expansion. The latest URA master plan issued in 2014 confirmed that the Changi Coast Road would be paved over and integrated into Changi airfield, and replaced by a new road hugging the coastline. (Fig. 2-16) For the area located on the eastern side of Changi Airport and gazetted as “special use,” (dark green) the construction of a new Singapore Air Force (RSAF) airbase has been announced, following the relocation of Paya Lebar Airbase to Changi East. In the past four URA master plans, the western side of the airport has remained unchanged. (Fig. 2-14-16)
When I discussed the lack of vision for Changi’s close periphery with EDB’s officer Mister X, he stressed, once again, how space was limited near Changi and how the periphery could not host extended aviation-related uses. As much as possible, the periphery of Changi has been preserved to enable future airport expansion and infrastructure accessibility. Therefore other (airport) areas such as Seletar Aerospace Park are being planned for non-runway aviation related activities, while urbanization pressure on the periphery of Changi is purposely kept to a minimum.

3.2 The Dead-end Terminal

Today, the ‘Airport Area’ of Changi portrays different zones of economic activities and residential districts with little or no relation to one another. Its surroundings appear as a patchwork of localised functions with no effective connections to one another or to the airport. This is partly due to the suburban road infrastructure—a hierarchy of highways and main roads fed by neighbourhood cul-de-sacs (Fig. 2-17)—instead of an integrated network. The result is that each neighbourhood is isolated, separated from each other by the major expressways. The mixed ownership of the zones—including various government entities and private investors—does not help the development of a cohesive landscape around the airport either. Each agency aims has its own prerogatives; JTC is focused on business enclaves; SAF is concerned about security; and HDB is expanding housing; with little or no collaboration between them. In addition, Changi area is characterized by poor public transport connectivity.

3.2.1 Airplanes terminus stop

Located at the eastern end of the island, Changi Airport demonstrates the conditions of a single oriented transport hub focused solely on air traffic. Although directly connected to the Mass Rapid Transit rail (MRT), Changi’s links to public transport are incredibly inefficient. Passengers taking the East-West MRT line from T3 proceed via Expo toward Tanah Merah station, where they must change trains to the line coming from Tampines and Pasir Ris before continuing to the city centre. (Fig. 2-18) In contrast to a twenty-minute car ride along the Pan Island (PIE) or East Coast Park Expressways (ECP), the indirect MRT trip downtown takes up to one hour. This may somehow explain why the train operating between T3 and Tanah Merah MRT station is empty most of the time, except for Changi workers commuting in the early morning and late afternoon. As disclosed by CAG, the current modal split in public transport is 30% “self-driven

32 Mister X (named confidential), assistant head transport engineering, Economic Development Board (EDB), interview with the author, May 2013, Singapore, EDB meeting room.
private cars”; 50% taxis; and only 10-15% MRT. The use of public transport is extremely low in comparison to Zurich Airport, where over 50% of passengers use public transport.33

Future MRT plans will extend the downtown MRT line to Expo station at the end of 2017. This will increase the connectivity to the city centre from Changi Business Park (CBP), Singapore Expo, and the newly built Singapore University of Technology and Design (SUTD) campus. However, no further extensions or connections to Changi Airport are currently planned. Only six public bus lines serve Changi, of which only one connects to the centre and Orchard Road areas. The most remarkable fact is that none of them serve the activities clusters located in the airport’s immediate surroundings, namely the three business and industrial parks previously discussed. The existing bus links are geared towards everyday commuters and local residents living in the neighbouring New Towns of Tampines and Pasir Ris. As Kho Ming Sue, Director of Engineering and Master Planning at Changi Airport, says, “The current split in public transports will remain.”34

Changi Business Park (CBP) and the Singapore Expo are the only areas within the airport’s immediate surroundings served by an MRT station. However, the Expo station is not located on a direct line to the airport, and employees have to change at Tanah Merah station. Furthermore reaching the Expo station from the different companies located in the Park can take up to thirty minutes on foot, which in Singapore’s tropical climate is not considered ideal for commuting to work. To compensate for the poor public transport network, the MNCs that have settled in CBP, such as Credit Suisse, Citibank, DBS, IBM and Nestle, have partnered with local private bus companies to offer their employees free shuttles from CBP to various MRT stations located throughout the island of Singapore. Instead of taking the MRT between Tanah Merah and Expo, employees usually choose to hop on a private bus at Tanah Merah station, which conveniently shuttles them to within a five minute walk of their companies’ doors. It is interesting to note that Changi Airport operates a free shuttle bus from 11:45 to 14:30 to carry employees from Business Park to the restaurants at Terminal 3. (PM Lee 2013) Within the other business clusters, the first— and only—public bus connection to Changi North Estate was introduced in March 2013, and links the Estate to Pasir Ris MRT. Before that, employees working in Changi North had no other option than to drive private cars.

Apart from the MRT link to Expo station and the localised “lunch express,” no other public transport connections exist between the Airport and its immediate surroundings. The PIE and ECP expressways form a border that is virtually impossible to cross without being in a car, and the suburban structure of secondary roads adds its non-permeability. For example, Changi North Estate has only one single access point from Upper Changi Road on the west, and one from the southern corner of Changi North Crescent, towards the PIE. Bordered by the airport on the East and the prison in the North, the estate is very difficult to access. Changi South Industrial Area is not much different. Travelling between one neighbourhood to the other proves to be very difficult due to the strong borders and the lack of connectivity. (Fig. 2-19/20) In addition, local drains, water trenches, and open vacant sites add to the segregating phenomena of expressway infrastructures and restricted land-use areas located around the terminal. (Fig. 2-21, see following pages)35

33 Discussions between Thomas Muller (head of masterplanning and operations at Zurich airport), Koh Ming Sue (Director of Engineering and Master Planning at Changi Airport), NG Cher Keng (Director of Airport Economic and Service Regulation at Changi Airport), Max Hirsh and Anna Gasco from FCL, during a meeting at the CAAS offices in Changi Airport organised by FCL, notes taken by the author, 27 August 2012.
34 Koh Ming Sue, Director of Engineering and Master Planning at Changi Airport, Lecture during the Future of Asian Airports conference organised by FCL at the Singapore Aviation Academy, notes taken by the author, 19 August 2013.
35 This is however not typical of Changi Airport’s periphery only. Expect for the downtown area of Rochor, Singapore is mainly caracterised by a network of large streets, impermeable borders and suburban local roads.
3.2.1 Functional Deadlocks

The operational grounds of the airport owned by Civil Aviation Authority of Singapore (CAAS) are clearly identifiable as one of the main functions of the area. The two runways and related airport apron stretch around the terminal buildings. The cargo areas of Changi Airfreight Centre (CAC) and the Airport Logistic Park of Singapore (ALPS) are located further north within the airport’s hermetically-fenced boundary. Security-related functions form the predominant use found all around Changi Airport’s close periphery with the restricted areas of the Singapore Armed Forces (SAF), the Changi Prison, and the SIA test centre. These are located directly on the western side of the airport (Changi Airbase and Seralang Camp) within the former British RAF base, as well as occupy whole of the reclaimed area East of Changi Airport (SAF Changi Airbase and Naval Base) due to be partly redeveloped as the new Terminal 5 by mid 2020’s. The area directly south of the airport is dominated by three golf courses: Tanah Merah Country Club; Laguna National Golf and Country Club; and the National Service Resort and Country Club (NRSCC). Located right under the planes’ southern approach routes to Changi Airport, these are ‘buffer zone’ functions that one could typically expect in airports’ vicinity. (Fig. 2-22)

Beyond this first periphery ‘ring’ of restricted military areas, golf amenities, and business clusters are the recreational areas of Changi Village on the northern coast, and the residential developments on
The West owned by the Housing Development Board (HDB)\(^\text{36}\). The residential quarters comprise the area of Bedok and the New HDB Towns of Pasir Ris and Tampines, one of Singapore's four regional centres.\(^\text{37}\) Following the URA's plan, these residential areas are supported by an array of welfare and community facilities such as schools, a library, shopping, food courts, parks, and green areas. Pasir Ris and Tampines were built following the United Nation concept plan of 1971\(^\text{38}\), which, in order to provide adequate and sufficient housing for Singapore, formulated the development of high and low-density residential estates (New Towns) in a ring formation around the central area. Their relationship and connection with Changi Airport is therefore minimal.\(^\text{39}\)

\(^{36}\) The Housing Development Board (HDB) is the state agency that oversees the planning and construction of subsidised housing in Singapore where 85% of the local population lives. The above seawaters North-South approach route of the planes to Changi leave the airport's surroundings almost unaffected by noise, allowing large residential areas to locate in close proximity. Within these residential quarters, we can distinguish three housing typologies: HDB in the New Towns bordered by condominiums and landed properties along Upper Changi Road East and North. HDB's are mainly composed of high-rise slabs and tower blocs sitting on a public open 'void' decks. Condominiums are fenced-off guarded residential mid and high-rise blocs, offering on-site recreational amenities. Sizes range from single towers to extensive clusters of buildings. The landed properties are single-family houses on a private plot of land, mainly composed of terraced houses and shop-houses.

\(^{37}\) Tampines is one of Singapore's four regional centres, along with Woodlands, Jurong East and future Seletar, under the plan of the URA. The urban planning policy of Singapore is to create partially ‘self-sufficient’ new towns, in terms of commercial and community needs to relieve strain on traffic drawn to the city centre. Thus an array of facilities such as schools, library, shopping, food courts, parks and green areas are provided in these new towns primarily for residents.

\(^{38}\) To cope with the rapid social and economic changes taking place in Singapore upon Independence, Singapore's government sought the help of the United Nations (UN) to formulate a long-term framework for urban development in Singapore. For the government, land-use planning then had to address the two priorities of a newly independent Singapore: the provision of adequate housing and the generation of employment opportunities for the people. Assisted by the UN, the government completed Singapore’s first concept plan in 1971, a long-range plan to guide the country’s physical development for the next 20 years. The concept plan envisaged the development of high- and low-density residential estates (new towns), industrial areas and commercial centres in a ring formation around the central area, as well as a network of expressways and a mass rapid transit (MRT) system to provide island wide interconnectivity. (Probert 2006)

\(^{39}\) This is partially supported by the findings of a public transport analysis conducted in 2012 by FCL's Transport module. The results show that around 30% of Changi Airport's workers commutes originate in Tampines and Pasir Ris. Yet this has to be balanced against the fact that public transport represents only 10-15% of the trips. (Chew 2009)
In terms of business-related uses there are the three clusters located within the airport close vicinity: Loyang Industrial Estate; Changi North, which contains the most airport-related activities; and the area of Changi Business Park (CBP) with the Singapore Expo and Changi South Industrial Area. (Fig. 2-23)

Loyang is a high-tech industrial estate. Half of the area is dedicated to an important offshore logistics hub for oil and mineral exploitation, restricted to public access. The remaining area contains a mix of aviation and aerospace related industry, as well as different logistic, printing and manufacture companies with little relation to aviation.

Changi North Estate, which was earmarked by URA for aerospace industry, is the area containing the most airport-related activities. The area hosts different MRO facilities such as Hamilton Sundstrand, UTC Aerospace Systems or ST Aviation Services. The latest is located on the eastern edge with the hangars directly connected to Changi’s apron for aircrafts maintenance. The eastern edge along the airport has 4 direct accesses to Changi’s apron. SATS in-flight Catering Centre – providing mainly inflight-meals solutions – is located on the southern tip of the Estate. Changi North also contains different global logistics companies such as Panalpina or Pan Asia. Other companies are airfreight-dependent such as Zuellig Pharma, or related to aviation such as Thales (defence and security technologies). The remaining companies are related to various sectors such as Real Estate, construction, cosmetics and other manufacturing industries. (Fig. 2-24, see following pages)

Changi South Industrial Area contains two different zones. The eastern edge is occupied by an array of different companies related to furniture, printing, children toys’ manufacturing, heavy metal industries, as well as real estate,

Fig. 2-23 Business related clusters in Changi Area
offshore petrochemical, etc. The Southern edge contains global airfreight logistic companies and distribution centres such as Schenker, DHL Express, UPS, etc.

All three clusters are owned and run by JTC Corporation. The fact that aviation-related activities are found throughout the island, and that these clusters are smaller than others around Singapore, has been introduced earlier. Within these, the only function that stands out is the Singapore Freeport, the last function that was allocated a piece of land within Changi North Estate’s prime space. Other areas of note are Changi Business Park (CBP) and the nearby Singapore Expo. Located at the last MRT stop before the airport, the 71-hectare CBP portrays the promise of a somehow more ‘vibrant’ quarter in the close periphery of the airport. It is also the only quarter within the Changi Area where recent literature is available, although the primary source of these accounts is local newspapers.

3.2.2 The Last Stop Before the Airport

CBP currently offers a mix of offices and retail outlets, a convention and exhibition centre, and the new SUTD campus designed by UN Studio, with its related R&D functions, student housing and public space. (Fig. 2-25) These mixed-use activities located at last public transport stop before the airport are not functionally related to Changi but may have settled in its vicinity to benefit from increased connectivity and the nexus of other functions. The Park was coined the “CBD of the East” (Changi Airport 2014b)
and one of the hottest place in back-office employment in Singapore’s banks. Over the years, different banks, such as Standard Chartered, DBS, CitiBank, Credit Suisse and JP Morgan, have gradually relocated and consolidated back office operations in CBP that were scattered across the island. The banks saved 30 percent on rent (Compared to the central business district (CBD), gained more space, and increased efficiency with “under one-roof” back-office operations. (Boon 2013) Relocation started in 2009, and according to JTC Corporation, which manages the Park, more than an estimated 19,000 employees work in CBP today. (Whang 2014) CBP also hosts high-tech data and software enterprises such as IBM, Xilinx Asia Pacific, Honeywell and Cisco. (Fig. 2-26)

Since its launch in 1997, the 71-hectare park has been diversifying to support its growing cohort of office workers. Recent developments include a retail mall and boutique hotel-residence within ‘Changi City’ and ‘UE BizHub East’. Nowadays, the park offers a range of dining, grocery (like FairPrice Xtra and Cold Storage), and retail options. Since January 2015, the first phase of SUTD’s academic and residential blocks have opened. As JTC’s officer Hsiao Ling Tang mentioned, “JTC aims to develop CBP to house R&D industries that have strong synergies with SUTD, as well as incubate new industries and enterprises that could emerge from SUTD.” 40 As part of the SUTD-JTC Industrial Infrastructure Innovation Centre, JTC collaborates with the university to develop an integrated master plan for the Park surroundings.41 This plan addresses the vacant plots of land located in the northern part of CBP, just East of SUTD’s new campus.

Bordering Changi Business Parks ‘western edge is the Singapore Expo, a government-owned building managed by Temasek Holdings. Opened in 1999, it is Singapore’s largest convention and exhibition centre with over 100,000 square metres of space spread over ten halls. Because of its relatively remote location, the venue has had to sell its space to functions other than exhibitions and conventions. These now include rock concerts, New Year parties, beauty pageants, musicals, and even weekly services for local churches.42 In fact, Singapore’s major exhibitions or conferences now typically take place in Marina Bay Sands, which is very well connected to Changi Airport through its own private fleet of coaches.

Although the area around CBP shows the promise of what may evolve into a centrality within the airport’s vicinity (Kees Christiaanse 2014, unpublished material), this quarter remains small in scale and does not have differentiating characteristics compared to other business and R&D clusters in other areas of Singapore. For instance, at over 200 hectares—twice CBP’s size—One-North is another JTC business park that clusters R&D and high technology together. Master planned by Zaha Hadid Architects, it is located on the East, at Buona Vista MRT, near educational and research institutes such as the National University of Singapore (NUS), INSEAD, and the Singapore Science Parks. The park includes biomedical sciences, infocomm technology (ICT) and media industries, along with housing, students residences, shopping malls, and tertiary offices.

40  Hsiao Ling, Deputy Director, Land Planning Division, Urban Planning Department, JTC Corporation, interview with the author, July 2013, Singapore.
41  As proved a meeting between JTC and SUTD’s Ass. Prof Andres Sevtsuk when I was there for interviewing the officer Hsiao Ling in July 2013.
42  Since 2001, the Bethesda Community church has been renting the Singapore EXPO Meeting Rooms for weekly services. Since December 2005, the largest church in Singapore, City Harvest Church, used Hall 8 of the Singapore Expo on a weekly basis, while the 10,000-member Faith Community Baptist Church used Hall 10 (The Max Pavilion) till the Urban Redevelopment Authority imposed their terms of religious organisations leasing venues of not more than 20,000 square feet (1,900m²) on February 2011.
IV. CHANGI’S CROSS-BORDER EFFECTS

This chapter has uncovered that the specific spatial imprint of airport-related functions in Singapore are multi-causals and the result of multiple correlated factors and defining parameter. These parameters — of geographic, politic, legislative and infrastructure-related nature— can be listed as follow, with no specific order of importance since they are all correlated together: (Fig. 2-27)

- **A finite Nation with a limited land area**: just over 700 square kilometres, with a maximum distance of 45 kilometres from the airport;
- **A reliably global aviation hub** with worldwide connectivity
- **Effective road infrastructures** provided throughout the city;
- **A primarily state-owned land** enabling comprehensive control by the State;
- **A centralised planning system** comprehensively controlling which functions are allowed on the City-state and where they are located;

Fig. 2-27  Changi Airport Island: defining parameters diagrams
These correlated unique factors lead to the specific spatial imprint of airport-related functions in Singapore: while urban pressure due to size concerns affects most of the island, the close periphery of Changi is as much as possible preserved to enable future airport expansion and infrastructure accessibility. As a result it is the ‘all of Singapore’ that can be seen as an ‘Airport City.’ (Fig. 2-28)

Around the hub of Changi, some airport-related urbanisation like the CBP or the Singapore Freeport is taking place. Its volume, however, is modest compared to other business clusters located in Singapore. Although the airport is starting to act as a destination in itself, attracting Singaporean residents to enjoy the airport facilities for reasons other than aviation — such as public playgrounds, retail amenities, hotel, etc. — Changi’s Airplanes terminus stop acts as a mono-oriented transport hub with a lack of public transport connection. In terms of industries, we have seen that JTC Corporation plans and manages business parks throughout the island. These are supported by effective road infrastructures everywhere in Singapore and good connectivity is therefore not a matter of being close to the airport. For companies to be therefore located in the western industrial estates of Jurong or next to the airport does not really matter. Through the 1966 Land Acquisition Act (LAA) and the 1964 Foreshores Act, the State became the dominant landowner in Singapore, owning close to 80% of the land (Zaccheus 2013). Through this primarily state-owned land factor, coupled with a centralised planning system and a virtually unchallenged one-party rule since its independence, the island nation has been centrally planned as one single entity. In terms of tourism industry, the STB, with the support of the URA and other agencies, developed carefully manicured key tourist ‘attractions’ or areas throughout the island with clear links to Changi Airport.

On the other hand, these specific and unique conditions produce another type of airport-related urban effects as well, which take place beyond the national border. While urban development is strictly controlled in Singapore, specific territorial legislations enabled urbanisation beyond the border — through relocation of land-intensive agriculture, manufacturing facilities and leisure activities — and at the same time secured control of these activities through bilateral agreements and growth-triangle treaties. This research argues that Changi Airport has significant urbanisation effects and an economic role in its hinterland development, throughout the SIJORI cross-border region, reflecting a specific interaction and integration of the airport with its larger territory. In the next two chapters of this thesis, we will uncover how Changi Airport has both facilitated and responded to urban development taking place in SIJORI by helping local SMEs of perishable goods and MNCs of high-value electronics to expand their commercial activities across the border in Johor and Batam (chapter 3); as well as enabling ‘leisure urbanisation’ in Bintan (chapter 4).
Areas of airport related activities

Key Airport related functions/areas

Tourist attractions

Central Business District (CBD)

AGROTECHNOLOGICAL PARKS

Express Ways

JTC’s parks

Mass Rapid Transportation (MRT)

Fig. 2-28  Singapore Airport Island: spatial imprint of airport-related areas

Chapter 2
CHAPTER THREE

Flying fish and chips

Cross-border cargo networks in Johor and Batam

I. INTRODUCTION

Singapore’s air traffic has grown at an astounding rate: the number of passengers has quintupled since Changi Airport opened in 1981 and tonnes of airfreight movements have risen by a factor of ten. In great part, the increase of flows articulated by Changi has been central not only for Singapore’s development, but also—as this thesis argues—to the growth of the larger Singapore-Johor-Riau (SIJORI) cross-border region. Through fieldwork conducted in Singapore, the State of Johor in Malaysia, and the island of Batam in Indonesia, this chapter investigates the air-cargo networks articulated by Changi Airport throughout this larger territory. It uncovers how Changi has both supported and responded to urban developments beyond Singapore’s national borders, by enabling companies to expand their commercial activities across the SIJORI cross-border region. In the concluding analysis, the chapter correlates the spatial imprint of Changi’s regional cargo flows throughout this cross-border territory to specific parameters and factors (among which Singapore’s specific border and geographic conditions; the cross-border agrarian and industrial policies developed by the Singaporean government; the City-state’s efficient and reliable transportation infrastructures; etc.), which together shape the extended Airport Region of Singapore. Specifically, the chapter analyses the spatial manifestations and implications for cross-border regulatory regimes shown in three case studies: the trade of tax-free ‘perishable’ goods, such as fresh cut flowers (1) and ornamental fish (2) organised by local Small and Medium Enterprises (SMEs) across SIJORI’s rural hinterlands; and the offshore production of ‘high-value’ electronics (3) by Multinational Corporations (MNCs) and their transshipment between Changi and the industrial free-trade zones of the SIJORI region. Ultimately the chapter posits the airport, along with its related terrestrial transport links, as a key player of regional integration. Changi Airport does not exist in a vacuum, but relies on a wide range of small-scale, wide-spread transport systems and local operators that move goods between the production sites to the global airport. Together, they support the interactions between the three components of the SIJORI cross-border region, and ultimately, its economic and urban integration. In doing Changi Airport serves as a useful lens to broaden the cross-border perspective of Singapore and probe how this larger territory is being redesigned to facilitate production and global circulation of goods.
II. CHANGI: A CENTRIFUGAL FORCE FOR REGIONAL CARGO FLOWS

Singapore is a wealthy City-state with rising land and labour costs. Since the 1970s, a key element of the nation’s economic development strategy has been to promote the relocation of land and labour-intensive activities to offshore sites. Eased by territorial proximity, two neighbours became the primary recipients of much of this investment: the Malaysian state of Johor, just north of Singapore; and the Riau Islands Province in Indonesia, to the south. Facilitated by common cultural references, a shared history, and intricate cross-border business networks, the interactions between Singapore and these two areas of Malaysia and Indonesia have multiplied and deepened. Implemented in stages, with support from both governments of Indonesia and Malaysia, Singapore’s regionalisation strategy in Johor and in the Riau is the result of years of complex development policies put in place by Singapore. As seen previously, and as will be further developed in this chapter, these strategies enabled, among other things, the phasing out of domestic agricultural production in Singapore, and the regionalisation of manufacturing activities across the SIJORI cross-border region.

Singapore’s lack of natural resources and secure hinterland that led to the development of this transborder urban region, in turn, also drove former Prime Minister Lee Kuan Yew “to recast the City-state as a “global city.”” (Rimmer and Dick 2009, 66) The modernisation or ‘tabula rasa’ (Koolhaas and Mau 1995 & 1998) of Singapore’s restricted space was accompanied by the government’s upgrading of international transport infrastructures and services to attract movements of people, information, and capital. As the economy prospered, the national carrier, Singapore Airlines, and the airport were modernised to be more globally competitive. Changi International Airport was built on land reclaimed from the sea and opened in 1981. Less than forty years later, Changi is considered among the top leading transport infrastructures in the world. The stellar reputation of Singapore Airlines also adds up to the core of the strategy. They ensure the extension of Singapore’s external reach within Southeast Asia and around the world.

Unlike in North America or Europe, the world of aviation in Asia is still very much regulated by national governments. These own airlines, and often airports, but also are directly involved in regulating traffic rights and air traffic control. Both Changi Airport Group (CAG) and the Civil Aviation Authority of Singapore (CAAS) closely calibrate Changi’s interests to serve the Nation-state. As CAG posits in its last annual report, “every interaction at the airport is defined by the Changi Service DNA – personalised, stress-free and positively surprising. Combined with world-class airport facilities, efficient operations and excellent customer service, this is the Changi experience that every passenger and visitor has come to associate with Changi Airport.” (CAG 2012-2013, 40) Changi embodies Singapore’s close bonds with the rest of the world. However this chapter takes a different look at Changi Airport by grounding the international hub in its related larger territorial context.

SIJORI’s current regional context shows steady flows of people and goods in and out of Singapore. The borders that divide, yet bind together, this fragmented tri-national region are characterised by regimes that ‘persist’ with rather complex restrictions for migration or protectionist purposes, but that yet operate within flexible rules—as this chapter will uncover—when it comes to goods trade. The internal disparities in wealth present in SIJORI drive many aspects of proximate cross-border economic collaboration. The wealthy metropolitan Nation-state spills over the adjacent low-skilled and vast hinterland on the periphery. This chapter argues that Changi’s hub and gateway to the world is one of the key forces that then draw
back together the three component territories. Changi international hub’s catchment area extends much further than the island’s borders, into the cross-border region, portraying an enhanced reciprocity of the airport with its larger region.

Through analysis of specific ‘perishable’ and ‘high-value’ regional cargo-flows articulated by Changi Airport, this chapter shows that private firms headquartered in Singapore are linked through production chains with the neighbouring territories of Johor and the Riau. Transport operators cross the borders daily to move goods between these productive hinterlands and the global logistic hub of Changi. The airports of Batam Hang Nadim and Johor Senai are largely overshadowed by Changi Airfreight Centre’s (CAC) facilities and worldwide connections. With a maximum yearly freight handling capacity of 16,230 tonnes for Hang Nadim (Ringkas 2011, 243) and 100,000 tonnes for Senai (Senai Airport 2006), versus three million tonnes for CAC (CAG 2012, 3), the centrifugal position of Changi Airport generates transnational airfreight networks in the cross-border region. (Fig. 3-1)

Singapore is a global distribution hub and at 42% of the overall throughput, ‘transhipment’ constitutes the greatest bulk of goods handled in CAC. Statistical data on cargo traffic originated in the SIJORI cross-border region are not made available by the airport authority. However, for perishable trade, if air-to-air transhipment accounts for close to 40%, the volume of total transhipment cargo handled increases to over 50%, when other inter-modal transhipment modes, such as sea-air or land-air, are included. (CAG 2011-2012, 12) 10% may be considered a meagre flow proportion. Yet, ‘quality’ and therefore ‘value’ should prevail over ‘quantity’ measures when it comes to airfreight, given the high-cost of cargo trade. In fact if only three per cent of total world tonnage are transported by air, these cover over a third of the value of worldwide trade. (Sales 2013, xvii)

If Coolport, CAC’s perishable terminal, allows airlines to fly perishables in bulk to Changi for subsequent redistribution across Asia, it also enables SME’s of perishable goods located in Singapore’s hinterlands to truck their goods to the airport for export all over the world. As logistics firm OHL’s Operations Manager explained, “Perishables make up one-third of our throughput nowadays. We export as much as we import. Expect for perishables where our exports are six times bigger. We specialise in export of ornamental fish and flowers, mainly orchids to the States, to Japan, Amsterdam…. It’s convenient, there are no storage costs involved. We pick up the goods from farms in Singapore and ‘around’ and deliver them straight to the Coolport”.2

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1 Transhipment is when freight is consolidated from trucks, boats or short haul flights arriving from a range of origins and is transferred onto long haul flights for onward shipment.

2 Operation manager of OHL’s operation centre within CAC Cargo Agent building C, interview with the author, November 2012.
III. SUPPORTING SINGAPORE’S ‘AGRARIAN CHANGE’

From its independence in 1965 through the mid-1980s, high pressure on land resources led Singapore to shift its agricultural production outside the nation’s border. As Ufkes explains, the government initiated a comprehensive, fast-paced program to restructure its domestic agricultural sector. “Agricultural restructuring involved a shift toward the production of higher value-added agricultural and horticultural commodities, both for domestic use and for export, a greater spatial concentration of agricultural production, and a recomposition of Singapore’s food import dependence.” (Ufkes 1995, 195) Traditional farming systems were phased out by State mandate, and productions were restricted to state-sponsored high-tech ‘Agrotechnology Parks’.

As Singapore moved from a manufacturing- to a service-based economy, the state responded to the exigencies of world capitalist economic growth by implementing specific land use-, space-, and policy-based transformations. The new agricultural policy promoted that “high-value, aesthetically pleasing and environmentally acceptable agricultural system will remain in Singapore; other foods will be sourced via agreements with various neighbouring countries.” (ibid, 196) In 1986, the Singapore Ministry of National Development approved the ‘Agrotechnology Park Master Plan.’ In terms of net area, major land in these parks was devoted to “export-oriented” aquaculture and horticultural systems—mainly orchids and aquarium fish farming—with “services to be exported within tropical Asia.” (ibid, 206)

As Ufkes notes, “Delimited to state-sponsored ‘Agrotechnology Parks’, agriculture in Singapore has become increasingly sterile and physically compartmentalised from other arenas of social and economic life.” (ibid, 195) Nowadays, the agriculture land remaining in Singapore produces a meagre two percent of the Nation’s food supply. Farms are organized in one of Singapore’s six ‘Agrotechnology Parks’ (Lim Chu Kang, Murai, Sungei Tengah, Nee Soon, Mandai and Loyang), located well outside the residential areas, on the northern fringe of the island. (Fig. 3-2) These ‘high-tech’ agriculture estates occupy a total land area of 1,465 hectare, of which less than half —704—have been allocated to 227 farms. From these 704-hectares, 283 are assigned to the production of ornamental flowers (69 farms) and 174 (75 farms) to the one of aquarium fish. (AVA 2015) This equal to almost 65% of all ‘agrarian’ land aimed at global exportation. The plot sizes inside these Agrotechnology Parks have become highly regulated and the prices have risen dramatically. In fact, land allocation for farming is based upon an open tender system and only firms involved in leading-edge agrotechnology are encouraged to apply.

Singapore’s current, limited agrarian sector mainly produces ornamental goods. Nearly two-thirds of the farms (144 out of 227) harvest aquarium fish and ornamental flowers, primarily orchids, aimed at exportation. As the Agri-Food & Veterinary Authority of Singapore (AVA) explains, “The modern farms in the Agrotechnology Parks develop, adapt and showcase advanced technologies and techniques for intensive farming systems, and for export of high-value and quality products and services to other tropical countries in the region.” (ibid) Testifying to Singapore’s advanced technologies and research, these parks showcase and export the ‘Singapore model’ outside the Nation’s border.3 (Fig. 3-3)

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3 The 6 ‘Agrotechnology Parks’ are Lim Chu Kang, Murai, Sungei Tengah, Nee Soon, Mandai and Loyang. These ‘high-tech’ agriculture estates combine ‘modern technology and life sciences to create intensive farming systems.’ (AVA 2015) Over 50% of their farmland - 357 out of 704 ha - is dedicated to the production of ornamental goods.
### Agricultural Area Size

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<th>Agricultural Area</th>
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<tr>
<td>Murai</td>
<td>50 km²</td>
</tr>
<tr>
<td>Sungei Tengah</td>
<td>12 km²</td>
</tr>
<tr>
<td>Mandai</td>
<td>12 km²</td>
</tr>
<tr>
<td>Nee Soon</td>
<td>12 km²</td>
</tr>
<tr>
<td>Loyang</td>
<td>12 km²</td>
</tr>
</tbody>
</table>

### Number of Farms by Category

<table>
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<th>Chicken Eggs</th>
<th>Fish</th>
<th>Ornamental Fish</th>
<th>Vegetables</th>
<th>Orchids</th>
<th>Ornamental Plants</th>
<th>Dairy</th>
<th>Others</th>
<th>Vacant Land</th>
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<tr>
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</tr>
<tr>
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<td>12</td>
<td>4</td>
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<tr>
<td>Nee Soon</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
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<td>Loyang</td>
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<td></td>
<td></td>
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</tr>
</tbody>
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*Fig. 3-2* Singapore's licensed farms inside the 6 Agrotechnology Parks - Source: Agri-Food and Veterinary Authority (AVA) 2014

*Fig. 3-3* Farm in Lim Chu Kang Agrotechnology Park
As Ufkes notes, the other side of Singapore’s ‘agrarian change’ is the expansion of agriculture within the Southeast Asian periphery. The rural areas of Johor and the Riau Archipelago have experienced steady request of agricultural products by Singapore. Johor has become the main relocation ground for Singaporean farms and is today considered the rural hinterland of the SIJORI cross-border region. For instance, it currently hosts over 100 Singaporean orchid and ornamental fish farms. Johor also accounts for 83% of Malaysia’s ornamental fish farms, a rapidly growing business in the country. Total ornamental fish exports from Malaysia almost tripled in the last decade; the major importer was Singapore. (Badariah Mohd 2008, 7, 28) The Singaporean family-run companies relocated their productive fields in Johor’s rural hinterlands, while maintaining their ‘parent-farm’ in one of Singapore’s Agrotechnology Parks.

The larger orchid and fish farms in Johor are up to 50 times bigger than their bases in Singapore. They also consolidate and redistribute the goods of other Johor-based subsidiaries and independent growers. Every day, local logistics firms truck these so-called ‘made-in Singapore’ goods across the border to Changi Airport, where they are stored in the Coolport before being flown ‘tax-free’ to wholesale distributors around the world. The overwhelming majority—95%—of these farms’ yield is sold abroad. Singapore’s quality orchids are reputed worldwide and, as the biggest fish exporter in the world, and the second main importer in Asia, the City-state is considered “The ornamental fish capital of the world”4

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4 Singapore is the biggest exporter of ornamental fish in the world, accounting for 38% of the turnover, and the second importer in Asia as well. (FAO, 2004)
It is seven in the morning and I wait in a taxi while the Malaysian custom officer reviews my passport. I patiently queue to cross the border between Singapore and the State of Johor in Malaysia. I am surprised how fast we reached the other end of 'The Causeway'. The Causeway represents the main contact point between Peninsular Malaysia and the City-state of Singapore. A short, 1.1 km bridge is guarded by 'The Woodlands' on one hand (Singapore Customs) and the ‘Immigration and Quarantine Centre’; on the other, the Malaysian CIQ. It separates two very disparate worlds. Every day, an estimated 50,000 people cross this bridge for different reasons—cheaper goods, shopping, leisure, vast land resources and affordable labour on one hand—higher wages, better work opportunities and education quality on the other. The traffic I see coming from Malaysia is very thick: buses, trucks, motorcycles and cars. Being in a taxi gives me the benefit of not having to get off twice to cross both Singaporean and Malaysian customs by foot, which is required for the daily bus commuters. Of course, the taxi ride is more expensive than taking the bus (around SG$45 compared to around SG$2), and not every taxi is allowed to cross the border. Two minutes suffice for my immigration clearance and my driver takes me to Kotaraya bus terminal, located a short ride away in the town of Johor Bahru—or ‘JB’ to locals—the capital city of the Johor state. After some negotiations, I hop onto another taxi. “Di mana?” the Malay driver asks. “Where do I want to go?” I try. The driver smiles back. “Kota Tinggi please, in Jalan Tai Hong.” “Oh, Singapore farm there? Big business!” The driver shouts before turning on his meter.

Hock Wee Nurseries is a Singaporean family-run ‘business-farm’ in Kota Tinggi, a town located 42 kilometres northeast of JB. The plantation is managed by two Singaporean-Chinese brothers, Lee Chee Hock and Wee, along with their sister and wives. The family has been growing and selling orchids for over 30 years. Their father founded the parent company, Zion Orchids, in Singapore in 1979. During its rationalisation of agriculture lands, the Singapore Land Authority (SLA) pushed Zion Orchids to relocate to a 2-hectare plot of land in Lim Chu Kang Agrotechnology Park. (Fig. 3-4) The two sons decided to relocate to Malaysia, where they opened Hock Wee Nurseries in Kota Tinggi in 1988. (Fig. 3-5) Their move was supported by the Malaysian government, which granted their company permanent residence and tax-free operation for the first five years.

Hock Wee Nurseries has since expanded to four farms across the state of Johor. In addition to the 100-hectare main farm in Tai Hong, Sungai Tiram was added in 2005, shortly followed by Nam Heng, and later by Bandar Tenggara, which opened in 2007. All together, Hock Wee Nurseries totals 205 ha of ‘owned’ farmland in Malaysia, (Fig. 3-6) while they lease their 2 ha Lim Chu Kang farm in Singapore on a strict two-year contract basis back to the Singapore Authorities. Hock Wee Nurseries employ 625 people, out of which nearly 90% are migrant workers from Bangladesh, China, and Indonesia, who work the more labour-intensive part of the plantation. Each farm provides on-site dormitories for them. Although the production of Zion Orchids’ farm is insignificant compared to the Malaysia-based nurseries, the family remains emotionally attached to their Singapore base in Lim Chu Kang. It is home to Hock’s family: his mother, his wife Tan Mei Ling and their two children. Seven migrants from Bangladesh and Malaysia work the small farm. While Tan Mei Ling commutes everyday between Kota Tinggi and Singapore, Hock is based six days a week in Tai Hong. Their children live in and attend to school in Singapore.

5 The leases of most of the farms located in the Lim Chu Kang Agrotechnology Park were due to expire in 2014. At the time the interviews were conducted (2013), the tenants interviewed reported that their contracts were unlikely to be extended further by the government. In such case, the land is put back onto the market for public bid. The idea is to develop the area with high-tech farming and the government is therefore looking for tenants with capital and knowledge to do so. The farmers have requested help to the SLA to develop such infrastructure and a guarantee of a longer term lease in order to secure return on investment. Negotiations are still on-going.
Chapter 3

Anna Gasco  The Airport and the Territory  111

Fig. 3-6  Hock Wee Nurseries, 205ha in total in Johor - regional cargo flows of orchids towards Changi Airport for global exportation

Orchids Farms  ♦  Independant Orchids breeders in Johor  ♦  Agrotechnological Parks in Singapore  ♦

Perishable worldwide trade from Changi
After a 40-minute drive, just before entering the town of Kota Tinggi, my driver exits the main road and drives onto Jalan Tai Hong. The main farm of Hock Wee borders the eastern side of the narrow road, where I can see one-storey green net structures stretching all across the plain of Kota Tinggi. At first glance, Tai Hong appears as a completely man-made landscape, yet reminiscent of very natural-looking undulating fields that blend with the surrounding countryside. (Fig. 3-7) At the entrance gate where I wait for my host, Mr Hock arrives in his four-by-four and greets me with a confident smile. Inside the well-fenced compound, 70% of the land is devoted to the orchid plantations. Surrounded by this landscape, I find the administrative areas, several warehouses for the treatment and packing of flowers, six one-storey dormitories, and the workers canteen.

As Mr Hock vividly explains, “Without Changi our business would be very different! We depend on that airport to sell our flowers. 95% of our production is sold abroad”... “Where? Wherever cargo airlines go and wherever people buy orchids! For the details, ask my wife.” Mr Hock then proceeds to describe the logistical journey of his flowers. The flowers grown in the secondary farms are trucked every day to the main farm in Tai Hong. Hock Wee Nurseries also buys flowers from around 70 independent growers located all around the state of Johor (mainly Kulai, Ulu Tiram, Ban Foo, Sungai Tiram, Nam Hang and Kota Tinggi) who deliver them daily to Tai Hong. These additional suppliers account for up to 30% of the overall production. In Tai Hong, the flowers are checked and prepared following a strict, well-planned, and labour intensive routine to prepare the stems for air-transport. Depending on the variety, orchids perish within one to four weeks of being cut, so the business needs quick and reliable air-transport to export their flowers. (Fig. 3-6)

After ten bumpy minutes, our tour stops at the bay of a large warehouse where I am warmly welcomed by Tan Mei Ling, Hock’s wife, and Mr Lee Chee Wee, his brother. The space is busy with workers getting the next delivery ready. Mr Wee leads me through the different rooms. “Here, after being checked, the flowers are assembled in branches before going through insecticide treatment.” A Bengali worker dips branch-by-branch inside one of the large vats filled with chemical water. There are at least five of these vats in the room. He later hangs each branch onto a vertical metallic dryer with two electric fans mounted on the back. “Each structure can hold around 1000 branches... 5000 flowers all together.” Wee then brings me through yet another set of four different rooms. “We need around three hours to dry the flowers. They are then packed inside boxes that have been fogged the night before against...
insects. The boxes are then tied together in a bundle of five and transported to the cold room. The entire process takes around four hours. (Fig. 3-8)

A daily schedule is pinned to one wall of the packing room. About twenty clients are listed for each day; next to each name is a detailed timing for flower preparation, loading of the truck and departure time of the airline. The trucks must leave the farm eight hours before the listed air departure in order to reach Changi Airport in time. Every day, with their own system of trucks and drivers, Hock Wee Nurseries send 3-4 lorries loaded with flowers to Changi Airport. “Sometimes even more! Before Valentine or Mother’s day it can go up to six trucks...” says Tan Mei Ling, Mr Hock’s wife. “Our biggest markets are Japan, Australia and Holland. But we literally sell flowers everywhere. Amsterdam, Manchester, London, Zurich, the US... Only 5% of our production is sold in Singapore, our customers are located all over the world.” (Fig. 3-9) Every day Hock Wee Nurseries export around 1,500 to 2,000 parcels—approximately half a million flowers—‘tax-free’ around the globe via Changi Airport. When crossing the border, the flowers are transhipped through Singapore—in other words, not considered to “enter” the country—and therefore are not subjected to Goods and Services Tax (GST) or Customs duties normally imposed on such imports.

The ornamental fish and ‘high-value’ electronic chips discussed in this chapter’s later case studies receive the same tax exemptions. The ‘tax-free’ status of these time-sensitive goods is testament to the regulatory frameworks governing the cross-border movement of cargo. Singapore required this to extend its economy outward, and in response, the regional mobility networks adapted with widespread, locally operated transport systems. The ‘persistent’ borders that bind together this tri-national cross-border region have become porous based on clearly identifiable functional relationships—such as the goods trade described here—between the wealthier core and the adjacent low-skilled yet vast periphery. As Mr Hock claims, “Singapore is a very free country.” These accounts demonstrate the ability of private actors to overcome the inherent territorial complexity of cross-border cooperation, which brings the three countries together.

Hock Wee Nurseries chose Changi over the closer Senai Airport in Johor because Senai is a small, mainly domestic airport. Changi is only 70 kilometres away from Tai Hong. In one day, they deliver at least four truckloads to and from the airport. As Mei Ling points out, "If something goes wrong with the truck we can quickly intervene and send another one to save the flowers and still get them to Changi on time. If we were to transport the flowers to Kuala..."
Lumpur by road, it would mean covering 400 kilometres by truck, which is dangerous and expensive. It just doesn’t make sense... But you know, competition is high in aviation,” She continues, “It’s been over a year that Malaysian Airlines are offering us to ship our flowers for free from Senai Airport to KL. Claiming that from KLIA [Kuala Lumpur International Airport] we would then reach worldwide destinations. But it is too risky for us. The aircrafts operated from Senai are too small. In Changi we can load four tons of flowers per plane in one go. No airline in Senai can offer us that. We would then need several aircrafts per day directed to KL. And we have no clear guarantee of what would happen with the flowers once in KLIA. You know orchids are very delicate. Their rank in the cut-flower world is the same as the one of diamonds in the jewellery business. We just can’t take the risk.”

At that moment, Mr Hock joins us in the packing room and rushes me to the loading bay area. “It’s almost time for the truck to leave, get yourself ready!” They have allowed me to board one of their trucks directed to Changi. At the loading bay, four people are busy sticking ‘airline-bill’ labels on the orchid parcels freshly taken out of the cold room. Some of the labels I see read, ‘Singapore Airline Cargo to JFK,’ … to Manchester, … to Amsterdam, … to London Heathrow, … to Zurich … Mr Hock says, “Ibrahim will assist you during the trip, he has been with us for many years.”

After greeting my hosts, I board the truck with Ibrahim and the driver and we start our journey to Singapore. Ibrahim is curious about why I want to ride in his truck. “I work four days a week. Sometimes I do the night shift from 5pm to 7am, sometimes the day shift from 10am to midnight. Depends on the airline departure! Changi Cargo is opened 24/7.” Ibrahim is Malay but grew up in Singapore; he has been working for Hock Wee for fifteen years. He explains that every day, two trucks are sent to Changi to supply clients in Japan; every week four trucks cross the border for five clients in Amsterdam, and one lorry load is designated for Sydney.

Depending on which side of the border needs to be crossed, the journey from Tai Hong to Changi Airport is nevertheless more uneven than Mr Hock and his wife may suggest. If cross-border trade is facilitated under regulatory framework, the flows of goods entering Singapore are strictly monitored at the City-state checkpoints. The smooth drive to the Malaysian CIQ (Immigration and Quarantine Centre) only takes 30 minutes. One traffic lane going through immigration is dedicated to lorries, leading to a separate area for goods customs; the three other lanes direct motorcycles, cars and buses to another zone. After vehicle screening—as an example of the multiple bonds between Johor and Singapore—the lorries are channelled to the appropriate custom checkpoint: two handle perishable goods, four lanes are dedicated to rock, two for timber, one for oil tankers, and one for sand. On arrival, I give my passport to Ibrahim and get off the truck. The Malay custom officers chat in a little group and give me nothing more than a funny smile. The Cargo Clearance Permit papers are checked and approved within ten minutes. We then board the truck again and set off to cross The Causeway into Singapore.

The traffic is very dense and the truck hardly moves; it takes us two hours to cross the 1.1-kilometre bridge. When we reach The Woodlands (Singaporean immigration and customs), the atmosphere changes. Ibrahim urges me, “No photo now, ok? Put your camera in the bag and stay close to me.” We get off the truck and I follow Ibrahim to the immigration office. The officers are clearly upset by my presence. Ibrahim calmly explains that I am one of the orchid farm’s clients, and that I wanted to check the flowers’ transport. But my Singaporean Employment Pass clearly indicates that I am a ‘Researcher,’ and this doesn’t help. The immigration officer questions me, “Miss! What is your company? What is your percentage of shares?” I remain silent. “Where are you from?” … “Italy?” he then turns and calls a colleague sitting in a cubicle “Hey, she is from Italy!” The man’s face brightens up. “I am travelling to Italy next month!” I quickly list off trip and food advice to put the Singaporean custom officers at ease. Turning their attention from me to the shipment, they cautiously go through every permit, identify the only one that is not
Fig 3-8  Flowers preparations for air-travel

Fig 3-9  Hock Wee Nurseries' Main Export Destinations - Source: Hock Wee Nurseries 2003
for ‘transhipment goods’ and request the payment of the related GST duties. Outside, they screen every angle of our truck with flashlights. After nearly one hour of questioning, we are allowed to enter the City-state.

We have lost a lot of time and need to hurry. Ibrahim is worried that we may not arrive two hours before take off, which would delay the delivery by several hours. Following a frantic fifteen-minute drive along the expressway, the truck pulls up to the gate of Changi Airfreight Centre inside the airport’s Free Trade Zone. It is ten in the evening and there is no queue at the Police Pass Office. In exchange for my reference letter from Mr Hock and my passport, I am handed a Visitor Pass, and enter the Free Trade Zone for the first time. After the goods are given yet another check at the customs entrance, the driver parks at the loading bay of the Coolport. With assistance from the SATS agents, Ibrahim and the driver hurriedly unload the truck. In the rush, my presence goes unnoticed. I manage to snap a couple of pictures and ask the agents a few questions. The parcels are weighed before going to security approval. They finally are transferred to the ‘pre-plane’ cold room, where they wait to be transferred to the aircraft. “We made it!” says Ibrahim, “Now I have to wait for the other truck to arrive and help unload it.” The driver takes me back to the Police Pass Office where I retrieve my passport. It is just before midnight. (Fig. 3-10)

On the taxi back home, I remember what Hock told me, “This is all my life. With my family of course. We all work six days a week, often seven. The orchid business is very competitive in Johor. There are many farms here. Because of Singapore you see. But we can’t complain. The business is doing well. I know a lot of people working in palm oil in Johor, it’s so much more profitable than flowers ... But in the flower business you will always have friends.”
The outsourcing of Singapore agriculture production to the rural hinterlands of Johor was accompanied by the significant Singaporean investment into palm oil production in Indonesia and Malaysia, which are the world’s first and second largest producers today. Together, the two countries account for some 85 percent of global production. (Sim 2013) The negative social and environmental impacts have been criticised on various grounds. The rising demand for palm oil has led to fundamental landscape and structural changes in the state of Johor, which accounts for 16% of the country’s production. (Malaysian Palm Oil Board 2013) As opposed to palm oil, which originated in West Africa but in the last 30 years evolved into a massive global production, the successful family-run economies of ornamental horticulture and aquaculture are part of a long-lasting agriculture history in Southeast Asia, where trading dates back to early 1900 (Vanam 2005). Their productive yield compared to palm oil may be regarded as low, but their production quality and contextual bond substantially increase their trade value. Largely overlooked in the airport’s success story, 95% of production from these SMEs depends on the cross-border perishable trade in SJ/ORI and global reach via Changi Airport.
flying fish
**Flying Fish**

“The one that didn’t get away” - Qian Hu entrance board, Article from Singapore Straits Times, date unknown

Like the global orchid trade, Singaporean ornamental fish farms, along with their subsidiaries located in the state of Johor, have organised their distribution model around proximity to Changi Airport. Johor is Malaysia’s biggest producer of aquarium fish, largely due to its proximity to Singapore, the main fish importer from Malaysia. (Badariah Mohd 2008, 4, 28) After being bred in Johor’s extensive farms, the fish are trucked, tax-free, across the border, where they are prepared and packed for air transport in one of Singapore’s ‘Agrotechnoly Parks’ and branded ‘from Singapore,’ before being flown out of Changi.

The ornamental fish sector moves large numbers of animals globally, and depends on air travel for on-time delivery. According to the Food and Agriculture Organization of the United Nations (FAO), Asia is by far the largest exporter of ornamental fish, accounting for a 55% of worldwide shares. (Fig. 3-11) Europe, North America, and more recently, China, are the main importers. (Ploeg 2004) Strategically located at the centre of Southeast Asia, Singapore is surrounded by a diverse fish population. With its high temperature and rainfall all year round, the conditions in Singapore are ideal for farming tropical fish; excellent network of air connections make it ideal for shipping them. (Ling and Lim 2005) Singapore occupies a pivotal position in this highly perishable world trade. It is the biggest exporter in the world, accounting for 38% of turnover, (Fig. 3-12) as well as Asia’s second highest importer. (FAO, 2004) (Fig. 3-13) According to the chairman of the Singapore Aquarium Fish Exporters’ Association, Mr Fong Ching Loon, business took off in the early 1980s with the opening of Changi International Airport. (Lim 2010)

**Fig 3-11** Market shares of import countries in Asia, Source: FAO 2004

**Fig 3-12** Market shares of export countries in Asia, Source: FAO 2000

**Fig 3-13** World trade shares of main exporting regions in the world, Source: FAO 2004

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Worldwide exports in 2004 totalled USD 251 millions. Dr Alex Ploeg from OFI - Ornamental Fish International - a worldwide organisation representing all sectors of the ornamental aquatic industry, develops in his paper “The Volume of the Ornamental Fish Trade” “For a worldwide industry, the amount of US$ 251 million for 2004 may not sound very impressive. However, if we consider that on average some one third of the value of the fish is spent on airfreight to transport the fish to the importers, some US$ 83 million, this impression changes. And if we also take into consideration that the average mark-up for importers is assumed to be about 125% and the mark-up for the retailers is some 200%, this would make the total retail value of the imports approximately US$ 2.2 billion.” (Ploeg 2004)

120 The Airport and the Territory  Anna Gasco
For Mr Kenny Yap Kim Lee, catching fish grew from a childhood hobby into a multimillion-dollar business. Back in 1985 when the family’s pig farm was shut down by the Singaporean government for environmental reasons, the Yap family converted their old pigpens into concrete ponds and started breeding guppies for the local fish exporters. After a couple of setbacks, Kenny, with the help of his brothers and cousins, funded ‘Qian Hu’ fish farm, which translates to “a thousand lakes” in Chinese. Qian Hu Corporation Limited is now one of Singapore’s leading exporters of ornamental fish, contributing to more than 10% of the nation’s total exports. (Qian Hu Corporation Limited 2014) In 1994 the government relocated the farm to Sungei Tengah Agrotechnology Park, and assigned them 4.2 hectares of land. They managed to lease an extra two hectares in 2010. (Fig. 3-14)

On this land sits several external ponds and about twenty large warehouses. On the southern part of the farm, are the café and a tropical fish retail store for local customers. Although it is located far from the city, Qian Hu is easy to access, thanks to the free return shuttle buses that the farm’s managers operate from the nearby MRT station. The public is allowed to walk into the compound as they please and wander around the farm. In the northern part of the site are the quarantine, office, farming area, and packing room. As with orchids, fish farming is labour intensive. The animals require constant care seven days a week. The 120 migrant workers who are employed for this work are provided with offsite dormitories and daily transport.

While waiting for my interviewee to arrive, I walk through rows of aquariums filled with exotic and colourful fish. Several long partitions covered with published news articles are clearly visible from the entrance: ‘The one that didn’t get away’ reads the headline in The Straits Times; ‘Dragon stud fish that costs as much as a car’ reports Singapore Press Holdings; ‘Swimming ahead’ in SME Today. The press demonstrates the challenges and competition of owning a ‘farm-based’ business in Singapore. After a few minutes, a bus full of primary school children arrives. The children gather near the concrete ponds, where a representative waits to guide them around the farm. Mr Teo Boon Hock, Qian Hu’s General Manager, joins me and invites me to sit near the aquariums. "As you can see, we are well established within the Singapore society. The farm is open and everybody is invited to walk in, take pictures or even ask questions. Singapore is considered ‘The ornamental fish capital of the world’. The government supports our industry and we try to play an informative role as much as we can." This transparency also distinguishes Qian Hu from the other Singaporean ornamental fish farms I tried to approach about my research. Their status has granted them on two occasions the ‘Singapore Quality Award for business excellence,’ in 2004 and 2009.

8 Mr Teo Boon Hock, Qian Hu’s general manager, interview with the author, Qian Hu Farm, Sungei Tengah Agrotechnology Park, Singapore, November 2012
As Mr Teo explains how the Chinese believe the dragon fish is a symbol of luck, wealth and prosperity, and believed to protect against evil spirits, a truck from the international logistical company Air Cargo arrives. The driver manoeuvres it to a stop in front of the “Shipment Pick-Up Area” bay. He checks the papers given to him by a farm representative and proceeds with his assistant to stick the boxes with airline bill labels that read “Qian Hu Live Tropical Fish – Handle with Care.” The boxes are then wrapped together in cellophane paper and loaded inside the truck. Before the end of my interview, the truck departs. “These fish are headed to Changi Airport now,” he explains, “to Europe with SQ and to the Middle East with Emirates. Europe remains a big market for us, although of course Asia is picking up. We really can’t complain. We have two to three deliveries to Changi almost every day. Sometimes more. Especially around Christmas.”

Qian Hu Corporation exports fish from four Asian countries. Including their headquarters in Singapore, they have ten subsidiaries across Malaysia, Thailand, and China. They have six distribution centres in Singapore, Kuala Lumpur, Bangkok, Beijing, Shanghai, and Guangzhou. (Fig. 3-15) “How important is Changi Airport for us?” Teo frowns. “Well it’s almost like water… You wouldn’t think of it, ‘fish flying,’ am I right? But once packed, the fish doesn’t survive more than 35 hours. How do you want me to get them to our customers in the U.S. without an airplane? And it’s not only about our export! 50% of the fish we breed is imported and we import most of our fish by air!” he continues in a lively tone. “We fly fish from all over the world—from Latin America, from Africa, Czech Republic, France, Germany… There is a large trade organized around ornamental fish. Local fishermen, for example, use smaller domestic airports in order to reach hub airports and have their fish shipped to Singapore,” he continues. (Fig. 3-16) The fish are then transported by truck to Qian Hu Singapore, unpacked, quarantined, and bred in aquariums or fishponds. (Fig. 3-17)

*Fig 3-15 Ornamental Fish: Worldwide Exports from Changi Airport and Qian Hu Distribution Centres- Source: Qian Hu 2013*

9 The distribution centres of Shanghai and Guangzhou focus on accessories only, such as aquariums, plastic bags and pet accessories.
Fig 3-16  Ornamental Fish: Worldwide Imports to Qian Hu Singapore via Changi Airport - Source: Qian Hu 2013

Fig 3-17  Qian Hu Farm in Singapore’s Sungei Tengah Agrotechnology Park (6.2 ha)

Fig 3-14  Qian Hu Corporation in Sungei Tengah Agrotechnology Park
In addition to its international fish imports, Qian Hu also buys fish from local breeders. Some of these are located in another Singaporean Agrotechnology Park, but most are located across the border in the neighbouring state of Johor, which houses 83% of Malaysia’s ornamental fish farms. (Badariah Mohd 2008, 4) Singapore is indeed Malaysia’s primary ornamental fish importer and Changi plays a major role in that trade. Qian Hu imports fish from local breeders located in the areas of Kota Tinggi, Ulu Tiram, Simpang Ringan, and Batu Pahat. Every week, these fish are trucked to Qian Hu in Singapore, where they then undergo the same process as the fish imported from overseas. Qian Hu’s subsidiary farm in Johor Batu Pahat is considered the biggest dragon fish breeder of Malaysia.

“We are able to breed around 500 species. Once the fish are ready, we prepare them for export.” (Fig. 3-18) Once packed into plastic bags with infused oxygen and carefully stored inside insulated boxes, an independent forwarder pick them up on a daily basis for delivery to the airport. The fish leave Qian Hu four or five hours prior to the plane’s departure. Not before, and not after, Mr Hock explains. “For delivery, we work backwards. That means from Saturday to Wednesday included, but not on Thursday or Friday because the fish can’t reach their final destination on weekends. They have to be taken care of straightaway upon arrival.” The trucks deliver them to the Coolport in Changi from where every week, thousands of bags of ornamental fish branded ‘from Singapore’ are shipped ‘tax-free’ to over 60 countries around the globe. (Fig. 3-19) The fast, efficient handling, coupled with high standards of breeding, has helped to keep their mortality rate down to acceptable levels of less than two percent. The value of Singapore’s exports of tropical fish exceeds US$60 million annually. (CAAS 2008)
Fig. 3-19  Qian Hu Fish farm: logistical timeline for global exportation
flying chips
Like these perishable goods industries, the 'high-value' electronics business is another trade that relies on airfreight and plays a major role in the development of SIJORI. In Singapore, the manufacturing sector, which remains the highest contributor to the nation's GDP, mainly produces 'high-value' added products that are 'airfreight dependent.' (EDB 2012) For example, as seen previously, the production of electronics is divided in a high-tech manufacturing process, followed by a more labour-intensive assembly. These two steps can be carried out in different parts of the globe depending on labour costs and workforce skill levels. The distances between are quickly overcome with aviation, given the relatively small size and cost per unit. Following Singapore's 'offshoring' of labour-intensive operations, the MNCs headquartered in Singapore and involved in this high-value trade, operate their assembling factories in the industrial 'tax-free' trade zones of the cross-border region.

Both the State of Johor and the Riau Island Province boost a vibrant 'high-value' electronic production (Hutchinson 2012) as opposed to the perishable trade, which is mainly found in Johor. This case study focuses on the free trade Riau island of Batam, which serves as a well-known base for MNC factories. The 'hassle free' policies and 'all-inclusive' packages are designed to attract private investors to the industrial estates. MNCs headquartered in Singapore leverage these advantages, along with Batam's strategic location, combining reliable management and know-how with cheap labour and affordable land resources, at the doorstep of global infrastructure. The manufacturing industry is the leading sector in Batam. In 2010 it accounted for 59% of the Gross Regional Domestic Product. Commodities such as chemicals, plastic moulds, and vehicles parts are manufactured on the island, but the principal products are electronics. In 2011, electronics ranked as the highest exported commodity per value, estimated at USD 2.5 billion. (Ringkas 2011) After the high-tech components are produced abroad, they are shipped to Batam for assembly. The circulation of these goods centers on Changi, and is supplemented by two smaller regional airports, Hang Nadim in Batam and Seletar, a smaller airfield in Northern Singapore. Using turboprop planes, local operators transship these 'high-value' goods on a daily basis back and forth to Singapore, where they are tested, finalised or bundled, before global exportation from Changi Airport.

The term 'Diluted Enclave' refers to Batamindo Industrial Park condition on the island of Batam and was coined by Lindquist in his book Singapore’s Borderlands: Tourism, Migration and the Anxieties of Mobility. (Lindquist 2010)
Flying Chips

“I once flew business class to deliver some electronics chips to Germany…”

Interview with Thomas Wevelsiep, Director of Infineon Technologies Batam, 2012

It is nine am and I sit on the upper deck of the Sindo Ferry, headed towards Batam Island in Indonesia. Leaving from HarbourFront Ferry Terminal, we first pass the colossal Merlion statue on our left, as well as Sentosa island’s many attraction parks and its cable car line to Singapore. After passing several rows of exclusive villas and condos fronting the Singapore Strait, the Sentosa waterfront is replaced by a view of the impressive skyline of central Singapore. To the west is the massive Tanjong Pagar Port, full of colourful containers, lifted up by yellow and green dockside gantry cranes. Right next to the docks, the glittering steel and glass towers of the central business district (CBD) appear, followed by Marina Bay Sands, with the Singapore Flyer finally completing the sequence. This gigantic and completely manmade skyline seems like another world when I think about my destination, which is only an hour’s ferry ride away. (Fig. 3-20/21)

Batam Island is a Free Trade Zone located sixteen kilometres off Singapore’s south coast, just across the Singapore Strait. From the development of Indonesia’s early trade cooperations with Singapore, to the IMS Growth Triangle agreement in 1994, Batam has developed at a rapid pace. The establishment of a special economic zone and free trade agreements attracted many MNCs, which established their factories in one of the island’s industrial estates. Increasing investments, a migrating workforce, and rising tourism have transformed Batam “from backwater into a booming frontier area.” (Lindquist 2010, 34) Foreign investments and value of exports increased almost fivefold in less than five years between late 1980s and mid-1990s. (ibid) Batamindo Industrial Park is Batam’s pioneer and flagship industrial estate, nestled on an area of 320 hectares. Batamindo exemplifies Singapore’s cross-border labour and production shift. Managed by Gallant Venture, a joint enterprise between Indonesian and Singaporean contractual partners, the park’s success story largely contributed to transforming the island’s economy and, more than any other projects in Batam, became the success story of the IMS Growth Triangle. (Lindquist 2010) Today, it contains over 70 MNC manufacturers such as Philips, Siemens, Sanyo, Schneider Electric, Infineon, and more. These companies, which are mainly headquartered in Europe, Japan, USA and Singapore, created 60,000 jobs on the island.

11 Gallant Venture Ltd. is an investment holding company headquartered in Singapore and with focus on regional growth. Gallant Venture is the main commercial developer and management group in the Riau Archipelago, as well as an integrated master planner for industrial parks and resorts in Batam and Bintan. Gallant Venture is a joint venture between Indonesian and Singaporean partners. Their principal shareholders include the Salim Group (IND), the Parallax Group (SG), SembCorp Industries Ltd (SG) and the Ascendas Group (SG). Since the early 1990s, they have operated in four key areas: utilities, industrial parks, resort operations and property developments. In 2004, their operating revenues totalled approximately S$202.0 million while their total assets were valued at approximately S$1.5 billion. Location is their key asset; they take advantage of Singapore and the free-trade zone agreements between the Indonesian and Singapore governments. They leverage on Singapore’s reputation for management, global infrastructure and proven legal system on one hand and on the Riau cheap labour and vast land resources on the other. (Gallant Venture Ltd 2013)

12 The manufacture and assembly of electronic components demand fine motor skills and high levels of concentration for which young - 18 to 24 years old - female workers are preferred. They are enrolled on a 2 years (1+1) contract. After which the MNC must employ them on a permanent contract. This rarely happens and workers tend to rotate firms as well as industrial estates in order to prolong their stay – and revenues earning – on the island.
Fig. 3-22 Batamindo Industrial Park figure ground (350 ha) - Source: Ass Prof Milica Topalovic

Fig. 3-23 A self-sufficient industrial park with different functions and warehouses
The marked difference in my short ferry from Singapore to Batam is characterized by the drastic change in economical development and quality of life on the two islands. After an hour’s breezy ride through one of the world’s busiest shipping lanes\(^\text{13}\), I reach Batam Centre Ferry Terminal. A huge sign reading “WELCOME TO BATAM” rests on the top of a distant hill. The skyline here is rather different from the one located less than twenty kilometres away. Clearly visible from the boat and linked to the ferry terminal by a pedestrian bridge, the ‘Hypermall’ in the ‘Mega Mall’ awaits Singaporean visitors who come on the weekends in search of cheaper food and other goods.\(^\text{14}\) While crossing the bridge from the ferry to the immigration clearance area, I see a glossy advertisement for a new residential development. The caption reads in English, “Foreigners Eligible. Prices start from SGD 33,888.” Like my experience crossing through Singaporean customs at HarbourFront Ferry Terminal, the immigration and customs clearances to enter Batam are smooth and fairly rapid, another sign of the numerous ties between the island and the City-state. Upon exiting the ferry terminal, several taxi drivers approach me, soliciting a fare. After some negotiation, we agree on the fare\(^\text{15}\) and set off to Batamindo Industrial Park, the first and largest of the island’s industrial estates.\(^{\text{Fig. 3-22}}\)

The industrial park’s success can be attributed to its “One-Stop Service” in a “dedicated manufacturing environment” put in place to attract private investors. As Mr Hauw, Batamindo’s Senior Manager, advertises in a presentation,\(^\text{16}\) “The Park is located fifteen minutes away from Batu Ampar cargo port and Hang Nadim Airport.” It is also efficiently connected by excellent road infrastructures. In addition, the management provides “total customer support” including, among other things, license applications, immigration clearance, security and maintenance, logistics and transportation, and manpower recruitment. To further facilitate a foreign company’s establishment of a subsidiary, the Park provides five types of ‘ready-made’ factory facilities, from detached to semi-detached to terraced, in one-, two-, or three-storey structures in sizes ranging from 972 to 9,217 square metres. Because of this full-service strategy, foreign customers can start production “in the quickest possible time frame.” (\textit{PT Batamindo Investment Cakrawala 2012}) As Lindquist notes, new laws that followed the IMS-GT allow 100% foreign ownership of companies on Batam, conditional on a 5% divestment to an Indonesian partner within five years. This divestiture is rather low in comparison to other parts of Indonesia, where domestic ownership is required to reach 51% within fifteen years. (\textit{Lindquist 2010, 158})

The park is master-planned as a “self-sufficient infrastructure.” It is located in the heart of the island, among tropical greenery and surrounded by a well-guarded fence. Among its five gates, only two are open to the public and only until midnight; logistics companies and workers have 24-hour access through the others. Inside the park, is a landscape of rows of factories and 2800 dormitories for migrant workers. Between them are neat tree-lined paved roads with a mini-bus system, the park’s own power and water treatment plant, a telecommunications tower, and a small commercial town centre with shops, a food centre, places of worship, and banking facilities. (\textit{Fig. 3-23})

\(^{13}\) The Straits of Singapore is a 105 km long and 16 km wide channel between the Strait of Malacca in the West and the South China Sea in the East. It is the main shipping lane between the Indian Ocean and the Pacific Ocean, therefore linking major Asian economies with the West. In addition it provides the deep-water entrance to the Port of Singapore. Every year thousand of petrol tankers and vessels carrying traded goods pass through the Strait of Singapore.

\(^{14}\) Batam has four main seaports: Sekupang, Batu Ampar, Batam Centre and Nongsapura. Sekupang is the main domestic passengers port linking Batam to other Indonesian destinations. Batu Ampar is the main cargo and freight port, as well as busiest passenger seaport linking Batam to Singapore. It is well-connected through excellent road infrastructures to the different industrial parks around Batam Island and mainly used by business people. Batam Centre is the arrival port to the centre of Batam: Nagoya. Nongsapura is located in the northern edge of Batam and the main entrance to the resorts areas. The last two are very busy over the weekdays when tourist arrives from Singapore.

\(^{15}\) Batam is also notorious for offering all sorts of entertainments that are illegal, dangerous or more expensive to get in Singapore such as drugs and prostitution. Many Singaporean men travel to Batam over the weekend to enjoy such ‘pleasures’ and the number of Singaporean tourists staying only a day or two has increased dramatically since 1990. (\textit{Lindquist 2010})

\(^{16}\) Most taxi drivers in Batam don’t have a taximeter and fare must be negotiated beforehand.

\(^{17}\) Andy Hauw, Batamindo’s senior manager, interview with the author, Batamindo Industrial Park, Batam, October 2012.

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\textit{Anna Gasco}  
\textit{The Airport and the Territory} 131
Several trucks from a local logistics firm with the phrase “We are Flying Direct to Changi” printed across them are parked in front of the DHL Batamindo office. These are not the only visible reminders of the numerous bounds with the City-state. In its ‘Singapore-like’ self-contained structure, Batamindo functions fairly independently from the rest of the island of Batam. Batamindo Executive Village, located a 15-minute drive away in the Southlinks Country Club, offers the Park’s international managers with “chalet and condominium” housing “with full country club facilities.” (PT Batamindo Investment Cakrawala 2012)

After the IMS Growth Triangle, Batam’s economic development flourished, and is now thriving in comparison to other parts of Indonesia. However, as Graham and Marvin have argued, such free-trade zones that are generally constructed to “combine low costs and minimised regulations and taxes, with an adequate supply of (cheap) labour and the best possible infrastructural connections” are also considered as emblematic of the use of corporate networks to exploit “spatial separation and geographical division.” Within such “closed-off” spaces, far away from the corporate headquarters, leading multinational corporations handily profit at the expense of their workers. (Graham and Marvin 2001, 363) These ‘high-tech,’ globally connected “logistics enclaves” also stand in stark visual contrast with their surrounding contexts. This disconnect is only reinforced by the panoply of related “extra services befitting a modernised enclave” like segregated, modern garden city-style residential communities tailored to the foreign executive (ibid, 364) In their discussion of SIORI’s cross-border regional growth, Graham and Marvin explain how it created uneven and customised infrastructure packages in fuelling the growth of a manufacturing zone around Singapore to create a transborder urban region with a sophisticated division of labour. (Parsonage 1992)

However, as Lindquist argues, even if Batamindo is generally considered as an example of an “enclave” form of development, contained with gated and policed space, the factory workers do not consider the distinction between the park and its surrounding context to be as harsh and clearly defined. For example, workers are free to navigate in and out of the gates and “become engaged in forms of life that can be reduced neither to the disciplinary power of the factory nor to an unregulated regime of the liar [squatters’ homes].” (Lindquist 2010, 46) In spite of this, illegal housing and informal settlements have appeared in large numbers around Batamindo in recent years18. These provide the missing social infrastructure and additional affordable, if inadequate, housing for the Park’s workers. When I mentioned this to Batamindo’s senior manager, he admitted that workers preferred—and were ‘authorised’—to live outside the park. They prefer this option for cheaper rents, but also because dormitories in Batamindo are segregated by gender (although the park provides rooms in the ‘family dormitory’ for married workers with children). Due to these restrictions, the 2,800 dormitories are only partially occupied.19 This evidence led Lindquist to argue how the “development enclave” in practice becomes a “diluted enclave”. (ibid) Research conducted by ETH Zurich Assistant Professor Milica Topalovic further uncovers how the informal settlement of Kampong Selayang, an informal settlement located outside the southern edge of Batamindo’s walls, is interdependent with the industrial estate in many ways. Since the kampong is embedded in the natural reserve, the only way to access the settlement is through a gate built directly into Batamindo’s fence. The kampong informally uses Batamindo’s sewage and electricity system, while the dwelling structures are partly built onto the extended fundament concrete of the industrial estate. In turn, Kampong Selayang provides the factory workers with

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18 Johan Lindquist has described how the numbers of informal housing settlements in the island of Batam have proportionally increased with the growth in number of factories inside Batamindo. (Lindquist 2010)
19 Batamindo’s senior manager, interview with the author, Batamindo Industrial Park, Batam, October 2012
dwellings suitable for families, and social amenities like schools, churches and mosques, as well as a market. (Topalovic et al. 2013)

Mr Thomas Wevelsiep, the director of Infineon Technologies Batam, lives in an executive village villa in Southlinks Country Club. He stays on Batam four days a week and commutes back to Singapore for the other three days, where his wife and two children live full time. As he explains, “Crossing the border is made as easy as possible for frequent commuters. The ferry ride between HarbourFront and Batam Centre only takes 45 minutes. There are text booking or e-cards, which shorten the boarding time in Singapore and allow [us] to directly enter to pre-immigration and boarding gate. The immigration clearances in Batam are also quick and smooth.” The German company Infineon is a leader in semiconductor manufacturing. Its semi-conductors and system solutions are widely applied in energy, automotive, security and chip-card applications. The global semiconductor market is worth over USD 300 billion, with annual sale increases, especially in the Asia-Pacific region. (Rosso 2014) Infineon is one of the three biggest players in this market. The company employs over 26,000 people worldwide, over half of whom are based in Malaysia, Indonesia, and Singapore. Infineon is the largest tenant of Batamindo Industrial Park.

Infineon microchips are a good example of regional ‘high-tech/low-tech’ production split and ‘airfreight-dependent’ global distribution. The process is divided in two: the high-tech silicon wafers are fabricated in the ‘front-end’ factories in Kulim, Malaysia, Villach, Austria, or Dresden or Regensburg, Germany. Once ready, daily shipments of wafers are flown to Singapore, then to Hang Nadim Airport on Batam, where they undergo the ‘back-end’ manufacturing process in Infineon’s four-block, two-storey ‘back-end’ assembling factory in Batamindo. (Fig. 3-24) Following Singapore’s manufacturing regionalisation, this labour-intensive facility was moved from Singapore.

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20 Batam has four main seaports: Sekupang, Batu Ampar, Batam Centre and Nongsapura. Sekupang is the main domestic passengers port linking Batam to other Indonesian destinations. Batu Ampar is the main cargo and freight port, as well as busiest passenger seaport linking Batam to Singapore. It is well-connected through excellent road infrastructures to the different industrial parks around Batam Island and mainly used by business people. Batam Centre is the arrival port to the centre of Batam: Nagoya. Nongsapura is located in the northern edge of Batam and the main entrance to the resorts areas. The last two are very busy over the weekends when tourist arrives from Singapore.

21 In electronics, a wafer is a thin slice of semiconductor material, such as a silicon crystal, used in the fabrication of integrated circuits and other micro devices. The wafer serves as the substrate for microelectronic devices built in and over the wafer. In a complete sterile environment the silicon is melted, manually stretched and undergoes many micro-fabrications such as doping, ion implantation, etching, deposition of various materials, and photolithographic patterning. (Infineon, 2013 and Wikipedia, 2013)

22 Once the wafer is ready, it is flown to a labour-intensive ‘back-end’ factory where it is sliced with a diamond blade. The smaller semiconductors are then glued on a metal base, engraved with gold or copper conductive wires and encapsulated to finally form a microchip. (Infineon, 2013)
According to Batam Logistics’ 2012 cargo load data, over 95% of goods were transported by air. (Batam Logistics Pte Ltd 2013)

As with the orchid case study, this secondary transportation step appears very low-tech relative to the high value of the goods. Once the parcels reach Seletar Airport, they are simply unloaded and left outdoors near the airfield fence while waiting for an available turboprop plane to take them to Hang Nadim. At their arrival in Batam, the Terminal Cargo encapsulates most of the excitement and chaos often visible in a secondary airfield in Southeast Asia. The Cargo Terminal at Hang Nadim is a simple warehouse shed with two means of access: the airfield on the South and the loading bay on the North, where logistics agents load and unload goods. The western side of the warehouse is dedicated to domestic cargo where a wide range of vegetables, fruits, and seafood is handled. Nearby, on the eastern side of the shed, is the ‘International Cargo Terminal’. ‘High-value’ chips parcels are handled alongside heads of lettuce by customs officers playing chess, before being transported to the well-organised enclave of Batamindo Industrial Estate. (Fig. 3-26)

23 Miss Yanti, Batam Logistics’ general manager, interview with the author, Seletar Airport, March 2013

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Infinion Distribution Centre Asia
Batamindo Industrial Park
(Infinion Technologies)
Infinion Test Centre
Infinion HQ
Kallang Industrial Park
CHANGI
SENAI
HANG NADIM
RAJA HAJI FISABILILLAH
SELETAR
BATU AMPAR SEAPORT
PASIR PANJANG SEAPORT
SINGAPORE
MALAYSIA
INDONESIA – RIAU ISLANDS
KARIMUN
JOHOR
BINTAN
BINTAN

Fig. 3-25 High-value Chips: Regional Production Map: Production warehouses/testing/distribution stations
Components delivery to Batam (air) — Raw material from independent suppliers (sea) — Container transport to Batamindo (sea) — Finished products shipped to SG (by air to Selatar/sea) for worldwide trade from Changi —

to Batam in 1996. Infinion’s headquarters, final test centre, and Distribution Centre for Asia (DCA) remain located in Singapore. (Fig. 3-25)

Although they are high-value goods, the freight is too small to be directly flown to Hang Nadim Airport from Changi. In this case, local company Batam Logistics takes over transport of the goods, trucking them from Changi to Seletar Airport where they are loaded in a turboprop plane to Hang Nadim. As Batam Logistics’ General Manager Miss Yanti explains, “We have four flights every day from Seletar to Hang Nadim and back. Two in the morning, and two in the late afternoon. Mostly depending on the cargo arrival and departure in Changi.”

23 According to Batam Logistics’ 2012 cargo load data, over 95% of goods were transported by air. (Batam Logistics Pte Ltd 2013)

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Fig. 3-26 High-Value Chips Logistical timeline from Batamindo to Changi Airport
“Most of our customers are located in Batamindo,” explains Batam Logistics’ Manager, “and 90% of the goods we deliver in Singapore are transhipment goods for worldwide destinations. If our goods pass through customs several times—either in Changi, in Seletar or in Hang Nadim—our customers never pay taxes.” Batam Logistics has operational bases at both Hang Nadim and Seletar airports. Initially located in Changi Airport, it was moved to Seletar by the Civil Aviation Authority of Singapore (CAAS) following their strategic shift away from operating smaller-body aircraft in Changi. The operational costs at Seletar are much cheaper than at Changi, and flight schedules are more flexible. As with the orchids case study, Batam Logistics’ Manager notes, “The airport of Senai in Johor has offered us a very competitive price to move our Singapore operations there. But it is not convenient for us, since we need a direct access to Changi Airport several times a day. So we refused. So far...” she smiles. In addition to the cross-border flows from Batam to Singapore, Infineon’s logistics connections to Changi also include transporting goods to and from the ‘back-end’ factory located in Melaka, Malaysia. Every day, the microchips produced in the Malaysian factory are trucked down ‘The Causeway’ to integrate the global flows of Changi Airport.
In this chapter, the discussion has focused on Changi’s regional cargo networks across the Malaysian State of Johor and the island of Batam in Indonesia. Specifically, it has analysed case studies of tax-free ‘perishable’ fresh cut flowers (1) and ornamental fish (2) organised by Singaporean SMEs in Johor, as well as the offshore production of ‘high-value’ electronics (3) by MNCs in Batam. The case studies of aviation-related industries analysed in this chapter are dependent on Changi. However, the resulting airport-related economic and urban effects across this region are defined by multiple parameters, Changi Airport being central, but part of pluri-causal and correlated factors shaping the extended Airport Region of Singapore. For the regional cargo networks, some of these defining parameters are similar to those shaping the spatial imprint of airport-related functions within Singapore national borders, such as: a reliable world-class global aviation hub with global connectivity; a finite Nation with a limited land area; a primarily state-owned land; and a centralised planning system within the national border (See Fig. 3-X). These parameters are then complemented by specific factors linked to the particular geopolitical conditions of the SIJORI’s cross-border context, such as:

**A strong border condition:** which is created by the highly developed Island-Nation-state condition of Singapore surrounded by developing countries;

**A low-key hinterland:** that offers cheap and large availability of land with minimal costs of labour, which are required factors to enable such intensive industries productions at profitable market prices;

Coupled with **proximity to a highly-developed city:** for the high-value cargo production, this low-key hinterland needs to be complemented with a well-regulated environment in close proximity (Singapore) where headquarters, test and distribution hubs of the producing MNC’s are localised, as well as where high-skilled engineers, regional managers and logistical specialists are based.

**Specific territorial policies and strategies:** in this case, the different regionalisation policies (seen previously) enabled the extended urbanisation beyond the border while ensuring its control by the City-state through:

- The IMS Growth Triangle treaty;
- For the high-value goods production: these strategies also include the implementation of Joint Ventures between Singaporean and Indonesian government-owned corporations in order to develop and manage the industrial parks up-to Singaporean standards.

**Coupled with Flexible land titles and ownerships:** in the case of the State of Johor in Malaysia, foreigner ownership is allowed, the land is therefore directly owned by the Singaporean farms; in the case of the Riau Islands, only Indonesian citizens or Indonesian Registered
Corporations can own land in Indonesia. This limit is overcome with a flexible type of ‘Land Title’ put in place. The ‘Certificate Broking’ gives the right to a private investor to use the land for buildings and other purposes, while the land ownership remains to the state. The ‘Certificate Broking’ has a time limit of 30 years, after which the ‘certificate holder’ is the first on right to renew for an additional 20 years, plus 30 years, plus 20 years and so on... This enables the Joint Venture Gallant Venture to develop Batamindo Industrial Park on a long-term basis and even long-term lease its parcels to foreign MNC.

**Flexible taxe regulations:** the implementation of Free-Trade-Zones in the hinterlands limiting taxes on foreign investors and therefore supporting economic growth; Coupled with a regulated but flexible custom-tax regime at the Singaporean border that enables goods to cross the border without being subjected to Goods and Services Tax (GST) or Customs duties normally imposed on goods imports in Singapore;

**Proximity and minimised transfer time:** Proximity to world-class global aviation hub located within a critical three and a half hour maximum time catching area. Therefore linked through effective transport infrastructures. In this context the roads are complemented by secondary airports (and ferries) for high-value electronic chips given their high cost and small size; Dedicated freight terminal for perishable. For the perishable case studies, the presence of a dedicated temperature control freight terminal (such as the Coolport from SATS) is essential as well;

**Network-type organisation:** Finally, the specific organisation of the networks is also an important factor for the perishable case studies. These flows are based on local and family-run economies with strong contextual knowledge and links throughout the territory connecting independent growers to the main farms and in doing so extending the producing catchment area—from 75km max distance from Changi up to 150km in the hinterland. (Fig. 3-27)
These correlated factors lead to the specific spatial imprint of airport-related industries in the SIJORI Region, out of which a conceptual representation of the extended ‘Airport Region’ of Changi Airport emerges. (Fig. 3-28) This research uncovered that the Malaysian state of Johor is home to over 100 Singaporean-owned orchids and ornamental fish farms, which relocated there following Singapore’s industrialisation. Every day, local logistics firms truck 95% of the total production of orchids across the border to Changi Airport for international exportation. Likewise, with the largest global market-share of ornamental fish and the moniker “Ornamental Fish Capital of the World,” Singapore flies-in fish from across the globe to Singaporean farms—within the City-state and in neighbouring Johor—where they are bred before being flown back to resellers all over the world.

On the basis of this fieldwork, it also becomes clear how air-related electronic MNCs headquartered in Singapore are linked through production chains with Batam’s ‘tax free zones,’ where they operate labour-intensive assembling factories on a large scale—Batamindo Industrial Park has over 70 MNCs alone. The ‘high-value’ electronic chips trade, which is ranked the highest exported commodity per value in Batam, is supported by Changi Airport and two smaller secondary airports: Hang Nadim in Batam and Seletar in Singapore. Changi’s urban effects can be found on a large territorial scale throughout the SIJORI territory. Singapore’s economic extension had an urban effect on his cross-border region, but also required a change in transportation and cross-border regulation as well as. These are clearly illustrated by these regional cargo networks case studies.

What this extended ‘Airport Region’ also reveals is an airport that is economically well integrated with its larger region supporting various centralities that emerge at different scales. More importantly it uncovers an airport that does not exist in a vacuum but connects a wide range of small-scale, spread-out transport systems, ‘middle-men’ and local entrepreneurs who move goods between the rural and industrial hinterland production sites and the global marketplace. While Changi Cargo Airfreight Centre (CAC) remains publicised in PR material as a “state-of-the-art infrastructure” with “automated stacker systems,” and “elevating transfer vehicles” that have “replaced manual labour so that cargo can be handled more efficiently”(CAG 2012-2013); the presence of ‘perishable’ and ‘high-value’ trades testifies to how critical Changi’s terrestrial links are to the SIJORI region. Together, these more flexible and informal systems generate an urban effect at multiple scales.

Tracing these flows, the research reveals the organisation of an Airport Region that has a specific bound with its context. It is the people, the activities and dependencies that evolve from the conditions of this environment that shape the spatial relation between the airport and its larger territory. The ‘high-tech’ facilities such as the Coolport and the airfreight-dependent ‘high-end’ industries headquartered in Singapore have to be understood in conjunction with a larger productive territory as well as their more flexible, informal and widespread mobility networks. Together they deepen the interactions between the three territories and support the economic integration and urbanisation processes of the SIJORI cross-border region. Changi is the hub that draws the three component territories back together. In the next chapter, other parameters defining the extended Airport Region of Changi Airport will be revealed in the study of cross-border tourism destinations. Chapter four will show how Changi Airport also supports leisure-related development in resort enclaves on Bintan Island, Indonesia.
Conclusion

Bandar Tenggara
Zion Orchids
Nam Hang
Sungai Tiram
Tai Hong Hock Wee Nurseries
Kim Kang Aquaculture
Qian Hu
Infi neon Distribution Centre Asia
Batamindo Industrial Park (Infi neon Technologies)
Infi neon Test Centre
Infi neon HQ
Simpang Ringan
Kulai
Batu Pahat
Kota Tinggi
Ulu Tiram
Ban Foo
Kallang Industrial Park
Sungei Tengah
Lim Chu Kang
Mandai
Murai
Nee Soon
Loyang
CHANGI
SENAI
SELETAR
BATU AMPAR SEAPORT
PASIR PANJANG SEAPORT
MALAYSIA
SINGAPORE
INDONESIA – RIAU ISLANDS
BINTAN
BATAM
KARIMUN
RAJA HAJI FISABILILLAH
SEAGAL

Goods flows/productions in Johor and the Riau:
Ornamental Fish
Ornamental Orchids
Independant Fish & Orchids breeders
High-value Chips
Components delivery to Batam (air)
Raw material from independent suppliers (sea)
Container transport to Batamindo (sea)
Finished products shipped to SG (by air to Selator/sea)

Fig. 3-28
Changi's regional flows of cargo in SIJORI:
Ornamental Fish, Chips, Orchids - Regional Production Map
LaGoi Bay
LAGOI - YOURS TO DEVELOP

A secret waiting to be unveiled.
A world class developmental opportunity awaits.
Many will desire but only for a select few.
LaGoi Bay.

INVEST  DEVELOP  ENGAGE

ARE YOU THE ONE?
CHAPTER FOUR
The airport leisure landscape
Cross-border flows of tourism in Bintan

“They don’t have to go to Italy to eat, India to pray and Bali to fall in love. Bintan can offer them all!”
Indonesian former president Susilo Bambang Yudhoyono (2011)

I. INTRODUCTION

This chapter focuses on Bintan Beach International Resorts (BBIR), the resort enclave built in the northern stretch of the Riau island of Bintan in Indonesia. An outcome of the 1990s Tourism 21 plan—Singapore’s regional-scale “collective attractiveness” agenda—BBIR was designed to mitigate Singapore’s limited space by offering an international clientele with a ‘tropical paradise space’ just 45 minutes away from the global metropolis. Drawing on fieldwork conducted in Singapore and on the island of Bintan, the chapter investigates how Changi Airport supports ‘leisure-urbanisation’ in the Singapore-Johor-Riau (SIJORI) cross-border region by supplying the resort town with over 65% of its clients, who fly into Singapore via Changi Airport to combine the World city’s urban experience with a couple of days in Bintan’s tropical paradise. Specifically, the chapter explores the spatial changes of the Bintan’s landscape—through specific built typologies, landscape works, but also border implementation—to attract a more globalised clientele. The chapter also evaluates the related consequences of this strategy for the local environment and native communities. Ultimately, the chapter correlates the spatial imprint of Changi’s ‘leisure urbanisation’ to specific multi-causal factors and parameters, which together shape the extended Airport Region of Singapore. And posits that the airport, along with its related regional effects, is a critical lens for re-examining Singapore’s cross-border perspectives.

II. CHANGI’S REGIONAL TOURISM CIRCUITS BACKGROUND

2.1 Singapore’s extra-territorial tourism strategy in the SIJORI region

In the early 1990s, as Singapore moved from manufacturing towards a service-based economy, the government formalised its outward regional investments to ensure and create an ‘external economy.’ (Yeoh,
These broad strategic intentions were translated into concrete policies and programs\(^1\) to secure Singapore’s continued relevance in the global marketplace, despite its resource-constrained domestic environment. \(^{(ibid)}\) These ‘regionalisation’ strategies, which led to the domestic phasing-out of agricultural production and labour-intensive industries, as analysed in the previous chapters—were also applied to Singapore’s tourism sector. In developing destinations that transcended the City-state’s border, the Indonesia Malaysia Singapore Growth Triangle (IMS-GT) promoted itself as a ‘resort region’ capitalising on Singapore’s air and seaport connections and Indonesia and Malaysia’s natural and cultural landscape. \(^{(Chang 2004)}\) After evaluating the lack of diversity in tourism ‘products’ available in the City-State, the Singapore Tourism Board (STB) outlined the development vision Tourism 21 in 1996. To describe its regional agenda, the STB borrowed the metaphor of shakkei, the Japanese landscaping strategy of “borrowed attractiveness” in which distant scenery is visually incorporated into one’s own garden to beautify it. \(^{(ibid, 3)}\) Tourism 21 tried to overcome Singapore’s spatial limitations by configuring “a new tourism space” in the nearby Riau islands of Indonesia, bundling them as complementary destinations in Singapore’s “collective attractiveness” agenda. \(^{(Bunnell, Muzaini, and Sidaway 2006, Chang 2004, Chang and Yeoh 1999)}\)

Approximately twice the size of Singapore, the Riau island of Bintan lies to the south, a 45-minute fast catamaran ride across the Singapore Strait. \(^{(Fig. 4-2)}\) There, the investment formula utilised for Batam’s offshore business parks was replicated to develop cross-border tourism projects, supported by STB and the Indonesia Directorate-General of Tourism as ‘twin-destinations’ with Singapore. \(^{(BRI 2015)}\) From the early 1990s and continuing to the present, a palm-fringed, white-sands 18,000-hectare site on Bintan’s northern shore has been transformed into Bintan Beach International Resort (BBIR) a ‘purpose-built tourist enclave’. \(^{(Hampton 2009)}\) BBIR is master-planned and managed by Bintan Resorts International (BRI),\(^2\) the tourist subsidiary arm of Gallant Venture, the same Singaporean and Indonesian private consortium behind Batamindo Industrial Park and Bintan Industrial Estate. Built on a gigantic scale—an area one-fourth the size of Singapore—BBIR is developing along 100 kilometres of coastline into “a renowned world-class resort destination with infrastructure, security and stability, amidst ivory beaches and lush forest.” \(^{(BRI 2015)}\)

\(^1\) As seen in the previous chapters of this dissertation: Manufacturing 2000, International Business Hub 2000, Regionalisation 2000, Tourism 2000, IT 2000, etc. \(^{(Yeoh, Koh, and Cai 2004)}\)

\(^2\) “PT Bintan Resort Cakrawala (BRC) is the operational arm of Bintan Resorts International (BIR). Its roles include estate management, utilities provision, operations management and ‘community development’. Both Bintan Resorts International and PT Bintan Resort Cakrawala are subsidiaries of Gallant Venture Ltd, a company listed on the Singapore Stock Exchange. As the developer, master planner and operator of the popular holiday destination Bintan Resorts, Bintan Resorts International and PT Bintan Resort Cakrawala have extensive experience in destination & investment marketing, resort development, operations, infrastructure development and management.” \(^{(Bintan Resorts 2015)}\)
The PowerPoint ‘Investor Presentation’ part of who we are ends by emphasizing that, “Access into the area is restricted only to guests and resort employees.” In fact, entry to BBIR is restricted from the rest of Bintan by a barbed-wire fence and dense vegetation. (Fig. 4-1) At Land Entry Post 1, security officers collect an entry tax of 10,000 Indonesian Rupiah (around SG$1) for all visitors entering BBIR, including local Bintanese. A key concept of the “collective attractiveness” is to offer visitors the scenic and cultural appeal of Indonesia—with limited amount of locals—and with the management standards of Singapore.

In a 2006 interview with The Business Times, Gallant Venture’s CEO Eugene Cho Park reported, “What we have in mind is a Phuket or Bali-type resort just a short ferry ride away from the region’s busiest air hub [and] the biggest tourism gateway.” (Hampton 2009, 12) The combined marketing of Bintan’s ‘beaches with coconut trees and palm trees’ and Singapore’s ‘city experience’ is used to attract international visitors to an emergent transnational tourist region (Bunnell, Muzaini, and Sidaway 2006) and to foster the positioning of Bintan Resorts and Singapore as ‘twin-destinations.’ This pairing is reinforced by the promotional video shown during the ride from Singapore’s Tanah Merah to Bintan’s Bandar Bentan Telani ferry terminal. It starts with the slogan “…just 45 minutes from Singapore…swim in crystal clear seas” set over a persuasive image of tropical paradise, and ends with “a perfect extension to your Singapore vacation” underscored by a backdrop of the Singapore skyline at night. (Bintan Resorts 2010)

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3 Bintan Ferry terminal’s full name is Bandar Bentan Telani ferry terminal.
4 Author’s ferry rides from Singapore Tanah Merah to Bintan ferry terminal between 2013 and 2015.
2.2 Bintan Resorts’ reliance on international aviation infrastructures

International tourists traveling through Singapore Changi Airport before hopping on a catamaran at nearby Tanah Merah ferry terminal make up over 65% of BBIR clients. These generally combine a vacation in Singapore with a few days in the constructed paradise of Bintan. As Asad Shiraz, Marketing Director at BRI, notes, “without the access to the world that Changi offers, Bintan Resorts would never have happened.” From the 478,000 tourists visiting in 2014, the key markets aside from Singaporeans (31%), were China (21%), Korea and Japan (each 6%), and India (5%), followed by Australia, UK, France, and so on. (International arrivals by country of residence, 2014)

In an interview, Shiraz pointed out that, “Even some of our Indonesian clients—our fastest-growing market—prefer to fly through Changi Airport given that it is better connected to BBIR than the surrounding sea- or airports”. Bintan Island’s current airport—Rasa Haji Fisabilillah International Airport— is located over 90 minutes away by car from BBIR. News reports reveal that, in order to increase the appeal of Bintan as twin destination with Singapore, Changi Airport Group (CAG) has stepped up its claim as the “Gateway into Bintan” through a unique collaboration with Bintan Resorts. (Chen 2014)

(...) Changi Airport considers itself the gateway airport to Bintan and Bintan Resorts is a destination served by the airport. To this end we work closely with the CAG group on joined marketing activities like participating in each other’s roadshows overseas (selected) and consumer promos like the Changi Airport shopping vouchers we give to some targeted international visitors combining visits to Singapore with Bintan Resorts. To date, we have run/are running this for visitors from China and India. We also work with Singapore Airlines in selected markets to run special tour programs that include Bintan-like in Japan.” (Shiraz, 2015)

The promise of further growth is spurring collaboration between CAG and Bintan Resorts in the form of ‘transit shopping vouchers’ at the airport for BBIR’s Chinese or Indian visitors or discounted rates on BBIR rooms, food and beverages for Singapore Airlines passengers. With these initiatives, regional outbound tour operators are encouraged to offer more ‘Singapore-Bintan Resorts’ packages. In 2013, Chinese tourists inbound to BBIR broke a new record, with a growth of 16.7% over the previous year, to almost 50,000 annual visitors. (Chen 2014) For example, Mrs Chan travelled to Singapore from Guangzhou, China, to celebrate Chinese New Year with her family. During her interview she explained how she decided to stay at BBIR’s Nirwana Gardens as an ‘add-on’ trip, enjoying discounted rates and “the unpolluted blue sky that we almost never get in China anymore.” In another example, a Belgian family of four said in an interview at Tanah Merah Ferry Terminal that they were on their way to Bintan’s Club Med after traveling from their home in Hong Kong via Changi Airport. They were looking forward to a weekend break before the husband attended a business conference in Singapore.

5 Asad Shiraz, Bintan Resorts Marketing Director, Interview with the author, Bintan Resorts International offices in Singapore, March 2015.
6 International arrivals by country of residence in 2014 via ferries operated by BRI from Singapore (which represent the main gateway to BBIR): Singapore 31%, China 21%, Japan and Korea 6%, India 5%, Malaysia, Australia, UK, Indonesia and Philippines 3%, USA, Hong Kong and France 2%, Germany, Taiwan and Russia 1%, Others 7% (BRI 2015). Looking at the numbers of arrivals by Nationality, including all modes of arrivals (comprising overland via the land entry post 1 of BBIR) the numbers remain proportionally similar to the ‘International arrivals by country of residence’ via ferry only, which is not surprising since it represents the main gateway to BBIR. Except for Indonesians who pick at 20.1% versus their arrival from Singapore which is only 3%. However as Asad Chiraz explains, this number includes people who first arrived by ferry exited the resort enclave to visit Batam’s hinterland and later re-entered BBIR via its land entry post 1. This explains the relative high numbers of foreigners arriving by land—Chinese (14%) Japanese and Korean (around 4%) and Indian (3.6%), etc.
7 Asad Shiraz, Bintan Resorts Marketing Director, Email exchange with the author, Singapore, 17.03.2015
8 Interviews with the author at BBIR Nirwana Garden during CNY 2014
9 Interviews with the author at Singapore Tanah Merah Ferry Terminal during CNY 2014
Changi Airport plays a critical role in bonding Singapore to the rest of the world. However, this work takes a different look at Changi Airport by grounding the international hub in its related larger territorial context. In doing so the thesis probes how Changi’s catchment area extends much further than the island’s borders into SIJORI, portraying an enhanced reciprocity of the airport with its larger cross-border region. The disparities in wealth between the three nations drive many aspects of proximate cross-border economic collaboration. While wealthy, metropolitan Singapore’s core spreads out across the adjacent, larger hinterland for low-skilled workers and greater land area, this thesis argues that one of the key forces linking the territorial components back together is the airport Hub.

BBIR’s reliance on aviation is further illustrated by Gallant Venture’s next megaproject: the construction of a private airport—the first one in Indonesia—to further boost the resort town’s outreach to international and Indonesian passengers. Scheduled to open by the end of 2016, **Bintan Resorts International Airport** will be located a short 25-minute car ride from BBIR. (Fig. 4-1) As noted by Gallant Venture’s CEO, this airport is not ‘yet’ seen as a rival to Changi Airport, but more as a complementary infrastructure. ([GMF and BAI](#)) Although Professor of Aviation Law at the National University of Singapore Alan Khee-Jin Tan writes, “With almost half of the ASEAN population, Indonesia is the largest economy and aviation market of the region.” ([Tan 2014a](#)) In addition to the 65% international visitors (mainly from China, Korea and India), over 20% Indonesian tourists — mainly from Jakarta ([arrivals by nationality](#)) — arrive mostly through Singapore Changi Airport nowadays. Bintan Resorts International Airport will be able to receive large aircrafts such as Boeing 737s or Airbus 320s and will mainly serve domestic routes as well as charted flights from regional countries. With an operation radius of 5 to 7 hours, the new airport will put much of ASEAN as well as southern China and South India within reach. ([Citrinot 2013](#)) (Fig. 4-3)

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10 Asad Shiraz’s interview
11 Arrivals by Nationality ([BRI 2015](#)) including all modes of arrivals (comprising overland via the land entry post 1 of BBIR). The numbers remain proportionally similar to the ‘International arrivals by country of residence’ via ferry only, which is not surprising since it represents the main gateway to BBIR. Except for Indonesians who pick at 20.1% versus their arrival from Singapore, which is only 3%. The 17% difference is proportionally divided amongst all other nationalities, which doesn’t change the 65%+ international arrivals via Changi Airport.
While the original intention was for the airport to focus on local and international chartered tourist flights only, a recent partnership with Indonesian carrier Garuda Indonesia envisions Bintan airport as the airline’s next hub for Maintenance Repair and Overhaul (MRO) facilities, a market expected to grow by 43.4% in Asia Pacific by 2022. The new aircraft maintenance hub will be located in Lobam, within Gallant Venture’s Bintan Industrial Estate’s (BIE), adjacent to the runway of the new airport. The Aircraft Maintenance Centre will be part of the new 177 ha ‘Bintan Aerospace Industrial Park’ that will include Maintenance, Repair and Overhaul (MRO); manufacturing and assembly of aircraft engines and components; an aviation academy; as well as research & development facilities. The Aerospace Park will occupy almost two third of BIE current area. (For more information about BIE, the new MRO hub and the influence of this aviation infrastructure on Bintan’s development see appendix point 4) Further to its new MRO hub, Garuda Indonesia is looking into establishing its regional hub in Bintan as well to target tourists and business destination cities within the ASEAN region, and to potentially “connect East Indonesia with West Indonesia and become the meeting point for our international flights to Europe and the Far East” said Garuda’s president Emirsyah Satar.

Initially scheduled to open in mid 2015 (TTG Asia 2012), Bintan airport’s is planned to be operational by end of 2016. Gallant Venture has so far invested SG$ 300 million in the airport’s development for an expected capacity of 3.5 million passengers per year at the 1st phase (BRI 2015). It is however difficult to believe that 737’s will soon land and take off from the marshland hosting the current construction site. (Fig. 4-4) Roads infrastructures are inexistent and finding the airport site resembles a bit of a treasure hunt. Not only people in BIE are unable to locate it, they don’t even know it exists. Venturing behind BIE’s rows of dormitories, we reach the airport site after a 10 minutes drive through an unpaved narrow road flanked by lakes and forest. At the first visit in February 2014, the only signs of the future infrastructure were a couple of blue boards that read “Runway” or “Taxi way”, another one testifying of the joint venture to construct an airport, as well as trucks going up and down a desert of white sand. Over the last 12 months, works have progressed and the runway is now slowly emerging. Although the foreseen first phase’s launch for end of 2016 seems rather questionable, Changi Airport “closely monitors” this upcoming airport just across the border from Singapore. The related challenge will be discussed in the outlook of this thesis.

12 The joint venture agreement was signed by GMF AeroAsia (GMF) – a member of Garuda Indonesia Group active in Aircraft Maintenance Services – and Bintan Aviation Investments (BAI) – a subsidiary of Gallant Venture – on the 11 February 2014, to develop Bintan Island into a tourism and aviation hub. (GMF and BAI 2014)
13 (Ibid)
14 Asad Shivaz, Bintan Resorts Marketing Director, Interview with the author, Bintan Resorts International offices in Singapore, March 2015.
2.3 Premises of further international cross-border tourism ties with Changi Airport

In contrast with BBIR’s purposely built ‘tourist enclave’ and located outside its secured zone, lies Trikora Beach, a natural beach along Bintan’s east coast. Trikora is scattered with picturesque boulders and rows of kelongs, a local vernacular typology that combines floating house and fishnets. (Fig. 4-5) The fishermen hang nets under the house at night, and attract small fish with a light. In the background of the resorts exists a landscape of kampungs, wild jungle, and plantations accessible by unpaved roads. Trikora is a popular seaside playground for locals but also for tourists coming from Singapore to kite surf during the windy monsoon season, or to simply experience a more authentic and laid-back Bintan experience. The resorts along Trikora Beach tend to be smaller, less expensive, and better integrated with the local context. (Fig. 4-6) They employ local Bintanese staff, use vernacular construction techniques and present a fairly opened plot. Some kelongs are even rented out to tourists. These resorts rely less on Changi Airport than BBIR: for example, the one-star Mutiara Beach Guesthouse relies on the airport hub for a little over 20% of its visitors, while less than 50% of the clients staying at Nikoi Island, a small, private island off of Bintan’s east coast, arrive through Changi. (Fig. 4-7)

Because the Trikora resorts are less dependent on Changi and its aviation connection compared to BBIR, the urbanisation process of this part of Bintan Island will not be analysed in detail in this chapter. It is, however, interesting to note that the eastern coast of Bintan is ‘booming,’ according to Marc Thalmann, Owner of Mutiara Beach Guesthouse. Thalmann identified a trend that Asad Shiraz confirmed: overnight stays within BBIR have reached a ‘plateau’; yet, 80% of Trikora resorts’ clients arrive through Bintan ferry terminal. The ferry is owned and operated by BRI, which includes these additional tourists into their reported arrival statistics for BBIR even though these choose to stay in Trikora beach. The increase of tourist flooding Bintan’s eastern coast explains the rapid changes and developments happening on this once-quiet side of the island. Trikora Beach has been earmarked for big investments, such as a 500-room Russian-owned resort, and a new ferry terminal. The latter, completed in 2013, is still waiting to start operations and will

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15 Marc Thalman, Director at Mutiara Beach Guesthouse, interview with the author, Indonesia, March 2015
16 Giorgia Bordon, General Manager of Nikoi Island, interview with the author, Nikoi Island, Indonesia, March 2015 and Andrew Dixon, Owner and developer of Nikoi Island, interview with the author, NUS UTown, Singapore, 14 April 2015

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Fig. 4-5 Kelongs along Trikora beach on the eastern side of Bintan
Fig. 4-6 Mutiara Beach Guesthouse
reportedly connect the northeastern tip of Bintan with southern Peninsular Malaysia, bypassing Singapore altogether.\footnote{According to Asad Shiraz, the new ferry terminal is a bit of a ‘ferry tale’. Built outside of BBIR area, it will never be linked to Singapore because the connection will be difficult to operate during monsoon season and the Singapore government will not support it financially. In addition, always according to Shiraz, the plans to link it to the south-western part of Malaysia are obscure since there is no real ‘tourist’ market in that area. This may explain why – even if completed since last year, this ferry terminal has not started operations.}

While the northern stretch of Bintan has been deliberately planned and built in direct relationship to Singapore and Changi Airport, the ‘Singapore-Johor’ international tourism ties— one the Malaysian side of the cross-border region— are less formalised than the ‘Singapore-Riau’ ones. As Chang noted ten years ago, although the resorts along the east coast of the State of Johor existed long before BBIR, their growth had been generally sporadic, and relatively few efforts had been undertaken to promote intra-regional travels. \cite{Chang2004} These are tourist developments located in the Desaru area that appeal to local tourists as locations for hosting team-building events. However, since 2006, the State of Johor has been rebranded as Iskandar Malaysia, a special economic zone established to capitalise on synergies with Singapore. \cite{IRDA2014} This trans-border urban region, the main southern development corridor, is part of a larger strategy to foster Malaysia’s economic growth by attracting foreign capital—mainly from Singapore—to develop jobs, higher-standard education, and healthcare facilities, with top-level accommodations.

As Mr. Izhar Hifnei Ismail, the Senior Vice President of the Iskandar Regional Development Authority explains, “there is an increase of international tourists in Iskandar, especially from Indonesia. Tourist infrastructures are currently being developed in Johor. Visitors can benefit from good and cheaper accommodations while having access to Singapore on a daily basis.”\footnote{Mr. Izhar Hifnei Ismail - senior vice president of Iskandar Regional Development Authority (IRDA), interview with the author, FCL Singapore, July 2013.} If in the past the IMS-GT had not entirely lived up to its ‘tourism trilateral vision’ because of its stronger reliance on the Singapore-Indonesia “leg” \cite{Chang2004}, a balance is slowly emerging. Between 2011 and 2012, the State of Johor experienced the highest increase (7.6%) of hotel occupancy rates in Malaysia. \cite{MinistryofTourismMalaysia2013} Malaysia’s tourist arrivals were boosted by an influx of Singaporeans who, followed by Indonesians, were the biggest contributors to Malaysia’s tourist arrivals. The later arrive via Senai, Johor’s revamped international airport. In the past, international traffic from Johor was naturally drawn into Changi Airport. Johorians and tourists travelled to and from Changi, given that Senai was mainly covering domestic routes. However,
competitive international routes operated by Air Asia, a Malaysia-based low-cost carrier, means that more travellers, especially from Indonesia, are using Senai, making it the country’s fastest-growing airport in 2013. (CAPA 2014) The related challenge for Changi Airport will be discussed in the outlook of this thesis.

New tourism developments in Iskandar Malaysia include upgraded resorts along Desaru’s east coast, and new theme parks, such as Legoland near Senai, Pinewood Studios, and Hello Kitty Town. (Tan 2014b) (Fig. 4-8) If the international ‘cross-border tourism’ ties with Changi are less strongly formalised at the government level, there are nevertheless links between these up-and-coming tourism infrastructures and Changi airport. For example, Legoland Park offers direct shuttle cars to and from Changi for less than S$150 per car. However, the correlation between Johor’s upcoming tourist sector and Changi Airport are at the moment negligible in comparison to BBIR’s ones. Singaporeans still make up the majority of tourists to Johor. They are on leisure trips to private holiday homes, or looking for cheaper retail options and golf facilities. Since their travel does not require a trip through Changi, they are excluded from the analysis in this chapter. Through analysis of Changi’s ‘leisure urbanisation’ effects on Bintan, the next section describes the spatial changes of the Bintanese landscape to attract a more globalised clientele.

III. EXTENDING SINGAPORE’S URBAN FRONTIER

3.1 From Enclave To ...

Investment in the “Singaporeanization of the landscape” of Bintan has been significant—estimated at over S$3.5 billion in 2004. (Chang 2004, 3) Although this figure is not accurately available, according to BRI only over S$1 billion has been invested in infrastructure and various resorts thus far.19 The opening of the first hotel, Mayang Sari, in 1994, was quickly followed by the opening of five other megaresorts, managed by key

Fig. 4-8 Tourist sites in Johor and the Riau: direct and less direct connections with Changi Airport
operators such as Banyan Tree or Club Med (in 1995 Banyan Tree Bintan; in 1996 Bintan Lagoon Resort; in 1997 Club Med Ria Bintan and Nirwana; and in 2000 Angsana Resort & Spa). The fast pace of development came to a halt during the Asian Financial Crisis, before resuming in 2008 with two new ‘mixed-use’ mega masterplans within BBIR. The 1,300-hectare Lagoi Bay is being developed by BRI as a ‘slice of paradise’; and Treasure Bay, a 338-hectare ‘Water City Resort’ is under the development of Landmarks Berhad, a Malaysian investment company. By 2013, the first six resorts totalled 1,406 rooms and luxury villas, with four ‘designer’ golf courses by world-renowned professional golfers such as Jack Nicklaus, Gary Player, and Ian Baker-Finch. Upon the anticipated 2020 completion of Lagoi Bay and Treasure Bay, BBIR will contain an additional 6,596 rooms—over 4.5 times their existing capacity. (Fig. 4-9/10)

As Bunnell et al write, “It is hard not to notice how the BBIR has been refashioned as part of a greater Singapore.” (Bunnell, Muzaini, and Sidaway 2006, 10) Most of Singapore’s cross-border tourism investment into neighbouring Bintan has been directly geared to the expectations of international tourists and Singaporeans. (Hampton 2009) Although a ferry passage from Singapore to nearby Bintan would imply a change in context, one experiences little contrast upon exiting the ferry at Bintan Resorts (much unlike what happens when arriving in Batam). Local officers efficiently expedite tourists through immigration; after being welcomed by resort assistants, who wave arrival boards at their guests to a background of Indonesian music, tourists board the shuttle bus to their specific resort. In terms of security, infrastructure, cleanliness, and even roadside landscaping, the tourist finds himself in an environment that was imagined and functions “as part of a greater Singapore.” (Bunnell, Muzaini, and Sidaway 2006, 8)

The facilities and processes that produced this scenario are similar to those of Batamindo Industrial Park in Batam. The similarities in investment and development partnerships in BBIR and Batamindo emerge from similar business models. For instance, when an investor approaches BRI to acquire a plot of land in BBIR, an “investment made easy” process is provided in order to smooth the foreign resort operator’s establishment in the enclave. (BRI 2015) This process bears resemblance to the “One-Stop Service” in a “dedicated manufacturing environment” put in place by Gallant Venture for Batamindo in order to attract foreign MNCs to Batam Island. For example, BRI provides a service that integrates making agreements.

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21 Bintan Resorts International is a subsidiary of Gallant Venture, owner and manager of Batamindo Industrial Park in Batam.

Fig. 4-9 Annual visitors arrivals 1996-2014, Source: BRI 2015

Fig. 4-10 Annual visitors arrivals projections, Source: BRI 2015
with Indonesian Authorities and land procurement\textsuperscript{22}. In addition, as master planners, they develop the infrastructural facilities, including roads, a central power plant, and reservoirs to supply reliable electricity and freshwater to the resorts; they provide logistics transportation through the privately owned and operated Bintan Bandar Bintan Telani ferry terminal; they provide 24-hour security at BBIR’s main gate, which separates the resort enclave from the rest of Bintan. Finally, like Batam, BBIR is a designated Free Trade Zone (FTZ), so that foreign resort operators can also benefit from a ‘tax-free’ environment.

Likewise Batamindo Industrial Park, BBIR has a manicured landscape (Fig. 4-11); clean and immaculate veneered roadsides with streetlights; smoothly paved roads with white lines and legible street signs; a modern, yet localised, resort architecture (Fig. 4-12/14); and golf courses that line the sandy beaches. As Bunnell et al describe,

\textit{For Singaporeans [...] the transformation of the landscape also allows them to relate to the site as an extension of ‘home’, a place where modern city-dwellers can experience a little of the ‘rustic’ (something that has largely disappeared from ‘mainland’ Singapore). As such, the ‘relaxed’ atmosphere of BBIR has become a great pull for visitors; they get to ‘explore’ a little, but return to the comforts of their resorts and air-conditioned rooms at the end of the day. For Singaporeans and others residing in or visiting Southeast Asia’s global city, the proximity of Bintan and the fast ferries — combined with the fact that accessibility, security and local ‘authenticity’ are tightly managed and circumscribed — make it ideal for weekend getaways. (Bunnell, Muzaini, and Sidaway 2006, 10)}

Before becoming Marketing Director at BRI, Asad Shiraz was directly involved in developing the Tourism 21 Strategy, while working for the Singapore Tourism Board (STB) in the 1990s. “Back then,” he explains, “the idea was for Singapore to get an attractive hinterland. To promote it as ‘tropical gateway’ in order to compete in terms of products with Malaysia or Indonesia. They had the city, the culture and the landscape, while Singapore only had the city. Singapore succeeded to do that by ‘borrowing’ land from Indonesia. This ‘extension’ was very important for Singapore. In counterpart, Singapore provided infrastructures, money, jobs, skills in a peripheral region of Indonesia, which was forgotten to the world.”\textsuperscript{23}

\textsuperscript{22}In Indonesia, only Indonesian citizens or Indonesian Registered Corporations can own land. The type of Land Title (Ownership) offered in BBIR is called “Hak Guna Bangunan HGB” – or “Certificate Broking” in English. This allows the right to a private investor to use the land for buildings and other purposes, while the land ownership remains to the state. The “Certificate Broking” has a time limit of 30 years, after which the ‘certificate holder’ must take care of its extension. The administrative process for extensions is relatively smooth and the ‘certificate holder’ is the first on right to renew. The extensions offered are of additional 20 years plus 30 years plus 20 years and so on. Asad Shiraz, Bintan Resorts Marketing Director, Interview with the author, Bintan Resorts International offices in Singapore, March 2015.

\textsuperscript{23}Asad Shiraz, Bintan Resorts Marketing Director, Interview with the author, Bintan Resorts International offices in Singapore, March 2015.
Yet when the land was acquired in the 1990s, the space now occupied by BBIR was “no tabula rasa awaiting an influx of capital, workers and tourists.” (ibid, 11) As Heena Patel, Executive Director of the NGO, The Island Foundation (TIF), explains, BRI has always had very little interest in preserving the local communities. Almost all the villagers, and the more mobile Orang Suku Laut (sea gypsies) who had been residing or moving through the area for thousands of years, were displaced inland to build the resorts. They were given a jetty to access the waters, but with no land transportation, they can hardly get to the now-remote sea. These days, more local residents are being removed with little or no compensation. “The Orang Suku Laut have a different concept of land [ownership] than we do. They often are bullied and intimidated by developers, which exacerbates their already precarious situation.”

In 2014, Heena was approached by one of the heads of BRI who personally offered to fund a soccer stadium within the new Lagoi Bay master plan for the local communities of Bintan. But for them, going to Lagoi equals going to Singapore. And as she notes, given the dramatic contextual change “Locals will never go to Lagoi for entertainment! What they need is funds to renovate their own facilities and to be included in the tourism industry of Bintan, by being employed within the resorts.”

As Chou and Wee already documented in 2003, BBIR developments has undermined custodianship and utilisation of resources by the Orang Suku Laut: “[they] have been completely invisible and disenfranchised. Their existence, livelihood needs, and resource rights are totally ignored. Their livelihood resources are appropriated without compensation or even acknowledgement.” (Chou and Wee 2003, 332)

And as Bunnell et al uncovered in 2006, more than 5,000 existing residents from ten villages were relocated outside the boundaries of the resort area. “[BBIR] led to the demarcation of a ‘Singaporean’ economic space as separate from the rest of Bintan, an area that is reconfigured not only in terms of its physical landscaping but also in terms of permitted people and practices.” (Bunnell, Muzaini, and Sidaway 2006, 11)

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24 The Island Foundation (TIF) was set up by the founders of Nikoi Island. TIF is a charitable organisation working with coastal communities in the Riau Archipelago to help improve their income, health and education. Their objective is to empower the coastal communities in the Riau Archipelago through targeted skills transfer, to create sustainable economic development and self-reliance among coastal villages. Their projects vary from education and literacy programs, village development and health and nutrition programs. TIF is this date the only NGO active in Bintan. (The Island Foundation 2015)

25 Heena Patel, Executive director of the NGO The Island Foundation (TIF), interviews with the author on 11 and 26 March 2015, during a ferry ride to Bintan and visits of local villages supported by TIF, Indonesia.

26 According to Heena, the meeting organised by BRI had no other objective than to evaluate what TIF’s aim was in Bintan and how much of a ‘threat’ they were to BBIR. Heena followed up with proposals on how to involve the locals but BRI never answered her numerous contact attempts.

Fig. 4-12 Fake elephants welcoming tourist at Nirwana Gardens Resort

Fig. 4-13 Sanshaya - colonial ‘black&white’ style luxury hotel set on the pristine sand of Bintan Lagoi Bay
Local Bintan islanders have had little job opportunities from the resorts. The relatively high proportion of Indonesians hired come from other parts of Indonesia, \cite{ibid, Hampton 2009, 17} such as the Balinese, Javanese and Sumatran who are preferred for their reputed ‘culture of service,’ better education and English language skills. Bintanese lack of ‘tourist work ethic’ was further emphasized during interviews with Heena Patel and Marc Thalmann. Both expressed how the concept of ‘service culture’ was not traditionally part of ‘Riau culture,’ which as Marc mentioned are ‘either pirates or fishermen at heart’. At the opening of his small guesthouse, Marc encountered some challenges with hiring Bintanese staff. However he feels that, “it is our social responsibility to hire local staff and train them. At the end of the day, it is their land and it will return to them.” Fifty percent of the Mutiara staff are locals, while the rest come from other parts of Indonesia. All are housed within a local village across the street from the guesthouse, which now counts over 80 families. As Marc mentions, “the influx of workers enables the village to grow and includes villagers in the process.” At the same time, it instils a sense of belonging to the migrant workers, which they may not experience when packed into corporate dormitories. This is the case for most workers of BBIR.

The migrant workers who staff BBIR are housed in around 60 one-storey dormitories, built on a 30-hectares plot of land located within the BBIR zone. \cite{Fig. 4-18} Situated southwest of the ferry terminal, the quarter is connected to the different hotels by the BBIR’s good road infrastructure. Resort operators can rent rooms from BRI in this quarter for their workers hired in Bali, Java and Sumatra. The housekeeping manager at Nikoi Island used to work at Bintan Lagoon Resort. For this resort only, he recalled around 3000 employees (for 460 rooms and villas). Since the rents of BRI’s dormitories are high, resorts operators look for accommodating their staff outside the BBIR’s fence as well, within local villages and other purpose-built migrant’s quarters. Next to the BRI dormitories is Pasar Oleh Oleh, the specially-constructed tourist-oriented ‘traditional-huts village.’ \cite{Fig. 4-17} The promotional material reads, “Set against the charming backdrop of a rustic village scene, this food and shopping hub is a treasure trove for clothes, souvenirs and local delicacies.” \cite{Bintan Island Shopping 2015} But tourists who buy into these advertised expectations are set up for disappointment, as the place is a poor simulacra of a ‘traditional village’—empty, with bad and derelict architecture, and shops supported by poor service. It is always ironic when themed environments fail to maintain the illusion.

\footnote{27 In January 2000 a large demonstration took place at the entrance of BBIR. Villagers supported by students from other parts of Indonesia assembled to protest against BBIR and the Indonesian authorities. However the outcomes only lead to a reinforcement of the boundaries with barbed wire barricades and a step up in security patrolling (Bunnell, Muzaini, and Sidaway 2006, 16).}
Nowhere is the tourist’s disillusion more visible than on BBIR’s palm-fringed, white-sand coastline. A short fifteen-minute walk even on the most maintained beaches will leave one’s feet covered in tar. The oil washes up on shore from ships passing through the Strait of Singapore, one of the most industrialised waterways in the world. Along BBIR’s beaches, hordes of migrant workers can be seen cleaning the shore of garbage brought in by the waters (Fig. 4-15), while others bleach the boulders covered in black petrol back to their picturesque white in order to maintain the illusion. (Fig. 4-16) The bleach water washes away into the sea. Unfortunately, these issues go unreported. The annual Environmental Reports required for resorts by the Indonesian government are not immune to layers of corruption. As source (kept confidential) tells me, “it is just another way for them to make more money, nobody within BBIR really cares about the environment.”

Another example of the local environment depletion is the ‘tide-zone’ clearing by developers to achieve ‘crystal clear seas’ along the beach. Bintan has a spectacular low tide zone of several hundreds of meters, which twice a day reveals a multitude of corals and sea animals. These natural habitats, which have long been one of the primary sources of income for local communities, are being destroyed to make ways for more ferry landings and themed coastal environments for tourists.

BRI’s first master plan in the 1990s called for infrastructure, plot divisions, and design guidelines, such as setbacks from the shoreline and plot boundaries, as well as restricted heights for development. Resort investors are contractually bound to these guidelines when developing the design of their hotels. However as Shiraz notes, “as long as it didn’t affect the overall concept, some developers did get additional floors... it is Indonesia... if the processes have always been smooth, we had to be flexible.” The first six resorts were allocated within four very large plots: around 450-hectares plot for Nirwana Gardens and Mayang Sari; around 300-hectares ‘Laguna Bintan’ plot for Banyan Tree and Angsana Resort & Spa; around 28

28 The Straits of Singapore is a 105 km long and 16 km wide channel between the Strait of Malacca in the West and the South China Sea in the East. It is the main shipping lane between the Indian Ocean and the Pacific Ocean, therefore linking major Asian economies with the West. In addition it provides the deep-water entrance to the Port of Singapore. Every year thousand of petrol tankers and vessels carrying traded goods pass through the Strait of Singapore.

29 Seen by the author on the beach of Nirwana Gardens during Chinese New Year 2013.

30 Once privatised, it is very difficult to monitor what a developer has planned for a particular plot of land. During an interview with Marc Thalman, the area directly north of Mutiara Guest House was being cleared of all its trees to make space for a new Chinese hotel. Chainsaws worked for days on end as reported by Mark and within 1 week from our first visit, the site was left bare bones.

31 Shaw et Shaw described how the elaboration of BBIR golf courses in the tropical context of Bintan required elaborate underground drainage mechanisms to allow tourists to continue to play ten minutes after a tropical downpour, as well as dune reinforcement, and tee construction, transplanting of grass cuttings, weeding and mowing all requiring large amounts of labour. In consequence, the local landscape has been superseded by a new reality whereby imported gangs of grass planters and weeders toil along endless fairways. The native vegetation has disappeared. (Shaw and Shaw 1999)

32 Mayang Sari, Banyan Tree Bintan, Bintan Lagoon Resort, Club Med Ria Bintan, Nirwana and Angsana Resort & Spa.
500-hectares ‘Ria Bintan’ plot for Club Med and Ria Bintan; and finally around 400-hectres for Bintan Lagoon Resort. (Fig. 4-2)

This initial master plan was designed, as Shiraz explains, “While Singapore was sprouting an external wing to its economy.” It devised very large plots, which were conceptually based on a secluded holiday experience. The tourist would enjoy her time in an idyllic setting, with spa and golf courses facilities, while being literally disconnected (by fence) from local reality. However, as Shiraz explains, the issue with these large plots is that the developers were not able to develop them to the extents promised. For example, Nirwana Gardens was supposed to build more rooms than its existing 245. Shiraz estimates that each resort plot has only been developed to 20-25% of its actual capacity. “This doesn’t get anything good for BBIR land. We have grown, but now we ‘plateau.’ And one of the reasons is that we lack offer and diversity.” To this end BRI’s marketing vision and future master plan have shifted from a ‘secluded resort only’ to ‘beyond resort world’ strategy.
3.2 ... To (re)constructed hinterland

BRI’s marketing vision now includes the hinterland of Bintan Island in their promotional story. “To add substance,” Shiraz notes, “because we can’t continue on the ‘hotels/golfs only’ path anymore. Everybody else [other resorts in the region] is now able to offer a golf course, a spa and a nice beach. If we want people to ‘come back’ we have to offer them more. We need to draw strength from the hinterland, from what makes us unique and sets us apart from other destinations.” As Michael Chiam, Senior Lecturer in Tourism at Singapore Ngee Ann Polytechnic, notes, “if you really want to attract visitors, you will need more than just an IR [Integrated Resort]. You will need other attractions, like historical and cultural sites. [On its own] there is not much variety.” (Khew 2014) And so while virtually nothing of the island’s social or political history has been preserved within the tourist enclave, Bintan is now presented as a place “which has a lot to offer in terms of heritage!” BRI is currently devising 3 tours: the ‘Trail of the Sea Gypsies,’ ‘Gods and Dragons’ and ‘Island of the Kings.’ As Shiraz vividly explains, “the title is supposed to make it sound exotic! In the first one, tourists start in a nomadic village [of the Orang Suku Laut], continue to Grotto Santa Maria, pass through the Mutiara Guesthouse for a Spa in an authentic setting, and finish their tour with a pizza next to the Guesthouse!” Under heritage and integration simulacra, the tourist gets to ‘explore’ a little, but returns to the comfort of her resort at the end of the day.

BBIR’s new master planned 1,800 hectare Lagoi Bay—codenamed a ‘Thoughtful Masterplan’—tries to overcome the issues of mono-functional land-use in previous, large-plot BBIR developments by proposing mixed-use developments on smaller parcels. “All sizes for all plans,” from 3 ha to 22 ha sites— as it was advertised in the marketing materials—with a variety of land uses: a ‘Village Centre’ with 177 small plots, 11 prime seafront resort sites, and over 400 ha of residential sites. (BRI 2015) (Fig. 4-19) Central to the plan is a 2.5km-long, manmade clear water lake that has been carved out parallel to the sea to provide more exclusive ‘waterfront’ locations. As in the other parts of BBIR, the installation of roads and manicured landscape remodels the area as part of a greater Singapore. In addition to hotels and resorts, the mixed-use program will include different residential types, from holiday homes to retiree villages, as well as souvenirs shops, groceries outlets, wellness services, restaurants, bars, etc. The land-use diagram even reads ‘Financial District Sites,’ while a large plot of land has been reserved for an academic institution. Plans for medical facilities are currently being evaluated as well. The shift to smaller plots strategy seems complemented by a more ‘mixed’ land-use one; from hotel/leisure only, to ‘second homes’.

In terms of commercial programs, the 5.8 ha Lagoi Beach Village, “the Kuta of Bintan” as described by Shiraz, occupies the central part of the master plan and will offer various food and beverage, retail, spa, and accommodation options within a ‘village’ type of setting. (Fig. 4-20) Shuttle buses will link Lagoi Beach Village to the different BBIR hotels to enable tourists “to walk out of their resort world and enjoy, go shop, dine ‘al fresco’ or go for an independent spa.” Developed and managed by BRI, Lagoi Beach Village is set to open in May 2015, and will host the existing shops from Pasar Oleh Oleh, as well as major supermarket brands from Jakarta. This ‘Village Centre’ will be complemented by a six-hectare Bintan Marketplace, which will include one-star hotels, serviced apartments, and food courts set within 41 two-storey shophouses.

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33 Although in the interview Asad Shiraz assured that the villagers welcomed them during the preparations of BRI’s tours, Heena Patel later clarified that after asking how much the local community would earn, BRI bypassed TIF and visited the Orang Suku Laut with a Chinese and a Korean tour operator. The villagers were intimidated into agreeing to ‘exhibit’ themselves, with very little money in return.

34 Treasure Bay master plan - developed by Malaysian investment company Landmarks Berhad - will also boost the largest man-made seawater lagoon in Asia, completed with artificial sandy beaches and a marina-life pool where tourists “will be able to swim with manta rays” (Khew 2014) within the protection of their artificial pool.
designed to "look like Singapore's Clarke Quay." The built environment is, as much as the landscape, devised to make a globalised clientele feel 'at home.'

In addition to retail facilities, Lagoi Bay will offer different types of hotels and residential developments: three large-scale beachfront resorts, three hotels located in the more 'urban setting' of the Village Centre, and two luxury estates of 'holiday homes' designed by Singapore-based WOHA and DP Architects. According to Asad Shiraz, 45% of all Lagoi Bay sites have been sold, (and all plots along the coastline), and are meant to be fully developed within the next five years. These different categories of accommodation, from one- to five-star, as well as more 'Indonesian' brands will aim to cater for a rising Indonesian middle-class, who represents BBIR's fastest growing market (in 2015, an estimated 20.1% of BBIR clients). As Shiraz notes this change in "demographic landscape affects the development of resorts." For example, a Swiss-belhotel, a leading international hotel brand, has recently opened the Grand Lagoi. As Shiraz explains, Swiss-belhotel is famous among Indonesians, and the brand has more properties in the country than anywhere else in the world. This is just one of 52 new Swiss-belhotels breaking ground in Indonesia by the end of 2015. (Swiss-belHotel 2015)
Finally, various ‘theme park’ activities will be provided in Lagoi Bay, including hydroplane ‘Air Adventures,’ motorsports and sea sports, ‘swimming with sharks,’ and a ‘canopy eco-park.’ These will be complemented by a ‘Safari Park and Lodge’ located south of the existing workers’ dormitories, offering a “collection of indigenous Indonesian flora & fauna” in an “eco-farm experience.” (BRI 2015) To meet tourists’ ‘heritage needs,’ a century-old, Singaporean-owned cruise liner will be transformed into a hotel on a reclaimed land site next to Bintan ferry terminal, which will also undergo expansion. (Fig. 4-21)

In parallel to the Lagoi Bay development, Malaysian investment company Landmarks Berhad is currently building its 338-hectare Treasure Bay master plan, which is to be completed by end of 2020 as Shiraz notes. When questioned about the phasing or complementarity of these two megaprojects, he confessed that they (BRI) has no real means to control it. It has apparently “[…] been challenging to keep track of schedule.” And very little coordination between the two entities—in terms of timing or programming—has been reported. Whether these big plans are so-called ‘white elephants’ is not for this thesis to determine. However, as in the case of Bintan International Airport, it has to be noted that during the four fieldworks visits to Bintan, conducted over the last three years, little progress has been seen in Lagoi Bay.

As Chang predicted in 2004, mixed developments involving foreign and local businesses, as well as large and small enterprises, could provide ways for a more equitable involvement in the tourism growth of the SIJORI region.

[…] subsequent phases must increasingly emphasize the role of indigenous and small-scale entrepreneurs. Since 1998, smaller plots of coastal land (0.1 to 6 hectares) have been earmarked for sale to encourage participation by smaller investors. Venture capital for first-time entrepreneurs and training for indigenous business – to be sourced or supplied by current investors – are also being explored. (Chang 2004)

However, after analysis, the new Lagoi Bay master plan leaves little space to equitable development or involvement of indigenous businesses or communities. This was confirmed at the end of the interview with BRI when Asad Shiraz rationalised, “These are long terms visions for Bintan. One thing Bintan didn’t have was the ‘live-in’ population to make it vibrant!” So after BRI relocated the local communities outside BBIR fence, seeing their presence as antiethical to the development visions of their ‘international enclave,’ they are now integrating secondary homes in their master plan hoping that “these will eventually become the
primary homes of Singaporeans, Indonesians, Malaysians as well as expatriates.” And “create the vibrancy” needed to support such grands projets.

IV. ANALYSIS

This chapter has focused on Bintan Beach International Resorts (BBIR), a resort enclave on the northern part of Bintan Island under development since the 1990s. Intended as a solution to Singapore’s limited leisure space, the dedicated tourist zone promises a ‘tropical paradise space’ 45 minutes away from the City-state global metropolis. The research has highlighted how over 65% of BBIR’s clients are international tourists—mainly from China, Korea, India, but also Indonesia—who fly into Changi Airport for a combined global city and tropical paradise vacation. This chapter connects the airport to the Indonesian island by examining their cooperative promotional campaigns and vacation incentives. Specifically, it analysed the spatial changes of the Bintanese environment over the last 25 years through the use of spatial typologies, landscape works and border regime in order to attract a more globalised clientele. In doing so, the chapter probes how Changi Airport supports Singapore’s extended leisure urbanisation. However, similarly to the case studies of aviation-related industries analysed in the previous chapter, the cross-border ‘leisure urbanisation’ taking place in Bintan is shaped by multiple parameters, Changi Airport being central, but part of pluri-causal relationship and correlated factors.

Fig. 4-21 BBIR site developments map – current and future
Some of these defining parameters are similar to those shaping the spatial imprint of airport-related functions within Singapore national borders and regional cargo network in SJOIRI (see figure 3-x). These parameters are then complemented or altered by unique factors related to the context of tourism-related urbanisation in the SJOIRI’s cross-border region: (Fig. 4-22)

A primarily urbanised Island-nation, which coastline is occupied by key industries and infrastructures. To the west is one of Asia’s busiest container ports and the huge refinery and petrochemical island of Jurong. On Singapore’s eastern tip is one of the world’s most efficient airports. Public access to Singapore coastline is therefore limited and its landscape is characterised by the Strait of Singapore’s industrial and serviced-based environment—a sea flowed with tankers, ferries and container ships—rather than a tropical paradisiac beach;

coupled with the proximity of a low-key hinterland with a tropical beach: which offers cheap and large availability of land with minimal costs of labour, complemented with a natural landscape;

The specific territorial expansionist policies and strategies: in this case Tourism 21 linked the nearby Riau islands of Indonesia, as complementary destinations to Singapore, bundling their tropical beaches to the City-state urban landscape. These policies developed by Singapore enabled the extended urbanisation beyond the border and ensured its control by the City-state, through - The IMS Growth Triangle treaty and - the implementation of Joint Ventures between Singaporean and Indonesian government-owned corporations in order to develop and manage the resorts up to Singaporean standards; coupled with Flexible Land Title ownership: although land ownership remains limited to Indonesian citizens or Indonesian Registered Corporations, the ‘Certificate Broking’ gives Bintan Resorts International (the subsidiary arm of Gallant Venture) to develop BBIR on a long-term basis and even ‘sell’—long-term lease—plot parcels to foreign Resorts Operators;

The implementation of a Free-Trade-Zone: limiting taxes on foreign investors (resorts operators) and therefore supporting economic growth.
Proximity and minimised travel transfer time: between the tropical resorts destination and the international airport through effective ferry connections and roads infrastructure. In this case Changi is located at one and a half hour maximum time catching area. The resorts located further (on Trigora beach for example) are less dependent on the airport although they currently register an increase in international tourists as well.

Direct contractual links between the developer of the resorts and the international airport operator: in forms of promotional campaigns and vacation incentives, as well as guarantee of landing slots for bigger charter airlines.

Along with previously discussed case studies of Changi’s transnational cargo networks, the airport’s regional flows of tourists underline the specific correlated parameters and factors shaping a new representation of the ‘Airport Region’ of Singapore. This extended airport footprint shows a catchment area of Changi that stretches much further than the island into the cross-border region, portraying an enhanced reciprocity of the airport with its larger territory. (Fig. 4-23)

The chapter also reveals the effects of this ‘extended urbanisation’ on the local environment and native communities of Bintan. Minimal government oversight, combined with an influx of capital from wealthier countries, often leads to economic disparities, human rights violations, and environmental degradations. As Chang writes, in the context of the Tourism 21 collaboration with Bintan, Singapore profits from cheap and vast resources combined with affordable labour. How much Bintan benefits in return from tourism is not clear, but the negative impacts of environmental depletion and social inequality are tangible. (Chang 2004) Enclave development often means uneven development across a broader context. Tourist enclaves have been criticised for their limited economic support of local communities, despite reaping high profits for overseas investors. The foreign ownership by transnational firms often keeps tourist areas disconnected from their surrounding local context and people. (Hampton 2009) In their study of the operation and function of resort enclaves in Indonesia (Bali, Lombok and Bintan), Shaw and Shaw conclude that the whole notion of ‘enclavity’ is inherently unsustainable, marginalising local entrepreneurs and widening the economic, cultural and social gaps that already exist between hosts and guests. Enclaves operated by global capital and transnational organisations through a series of spatial networks allow limited benefits unless they are tightly regulated by the local state. (Shaw and Shaw 1999) The situation is no different with Singapore’s extended urbanisation in the Indonesian island of Bintan.

Yet, the urban growth in this peripheral region of Singapore is present and Changi Airport is central in the multi-causal relation shaping this growth. The enclave-type spatial imprint or the detrimental environmental effects, that this ‘airport
leisure urbanisation’ takes, are dependent on the actors who devise them. Within more ‘open resorts,’ for example, it is the case that “opportunities are available for local entrepreneurship, either formal or informal, to take a share of the market.” (ibid) Other Bintan resorts such as Mutiara Beach Guesthouse, or even the more exclusive Nikoi Island, invest the development and training of their local staff, source construction materials and resources from local entrepreneurs (Fig. 4-24), and even develop strategies, such as TIF, to foster more collaborative, sustainable relationships with locals. These resorts, which aim to be better integrated with their contexts, are becoming increasingly popular with some tourists to Bintan. They are gradually welcoming more international passengers who also arrive via Changi Airport.
Captions:

To tourists flows/sites in Johor and the Riau:

Strong connection with Changi Airport

Fig. 4-23   Extended Airport Region of Singapore: leisure-related urbanisation in SIJORI
CONCLUSION

Singapore's Extended Airport Region

I. SINGAPORE'S EXTENDED AIRPORT REGION

This research has focused on the urbanisation related to Changi Airport beyond the Singapore national border—across the Singapore-Johor-Riau (SIJORI) tri-national region—, and seeks to identify urbanisation effects between airports and larger territories. Changi Airport in relation to the SIJORI cross-border region was chosen as the nearly ideal case. Limited in space and surrounded by developing countries, Singapore is dependent on international infrastructures to bind the City-state to a more global and international context. The island is also characterised by a strong border condition in relation to its peripheral neighbours: Malaysia and Indonesia. Within this border, planning processes are highly regulated. Located at the eastern-end of the island, Changi Airport is a dead-end terminal focused on air transport. Its immediate periphery being preserved for infrastructural expansion, some airport-related activities are going on, but the volume is limited compared to similarly successful airports’ hubs. However Singapore’s lack of natural resources led to the emergence of the SIJORI transborder urban region, supported —and controlled— by ‘extra-territorial’ regionalisation strategies, which ensured the City-State’s extended urbanisation beyond the national border, into Johor and in the Riau. The presence of Changi’s successful global airport hub, located within Singapore’s specific geopolitical conditions, has led to a cross-border airport typology, which airport-related activities emerge throughout this tri-national territory.

By investigating key case studies of regional flows of ‘perishable’ and ‘high-value’ cargo (chapter three), as well as cross-border flows of tourists (chapter four) anchored by Changi Airport across the region, the research reveals that Changi is one of the central factors—in a multi-causal relationship—of urbanisation effects in Johor and the Riau. Changi’s regional airport-related activities range from aquaculture and horticulture farms, to business parks and high-value electronics factories, and resorts developments among others. The infrastructural networks and actors who enable these cross-border activities are equally crucial in shaping this particular airport landscape. Uncovering these specific urbanising cross-border flows, the dissertation provides an alternative representation of the Extended Airport Region of Singapore’s cross
The Airport and the Territory

Anna Gasco

Border airport. Changi’s extended footprint is defined by many multi-causal, correlated parameters of geopolitical, human and network-related factors detailed in the following section.

Ultimately by rendering the Extended Airport Region’s footprint, the research seeks to encourage policymakers, practitioners and scholars to gain awareness of the implications of airport’s urban effects on larger regions for urban design, urban planning and land administration of these territories. This research investigates Changi Airport in relation to the political motivations that support its regional effects and the many actors involved in the organisation of this airport region, from entrepreneurs and freight forwarders, to architects and authorities, and finally to passengers. This approach reveals the more informal relationships built on the ground and shaping Changi’s extended landscape and in so doing shows how specific and integrated the airport is with its larger context. While the airport region rendered in this dissertation is specific to Singapore, its expanded view on airport infrastructures contains broader implications that transcend the specific case of the SIJORI region. It presents policymakers and design practitioners with an alternative approach to study and describe airport infrastructures.

After discussing in detail the main empirical findings of this research, the dissertation develops a new outlook for future research. Studying Changi’s effects on regional growth, this dissertation draws attention to the multiple private cross-border initiatives that shape this territory and that yet are practically absent from governmental discussion. In addition to the cross-border activities uncovered in this dissertation, further indicators show the premises of even stronger collaborations related to the secondary airports located in this region, in forms of private transborder networks for budget travellers to access Singapore at cheaper fares than those offered at Changi. The final outlook of this dissertation represents a modest attempt to draw attention to these collaborative initiatives that—if yet minor in passengers share and absent from regional discussion on governmental levels—may have catalytic effects on the region’s future development.

II. ANSWERS TO THE RESEARCH QUESTIONS

The main empirical findings are case study specific and were summarised within each respective empirical chapters (two to four). This section will synthesise these findings to answer the research questions set out at the beginning of this dissertation, with the case of Changi Airport within the SIJORI cross-border region.

- How does Changi’s proximity to Malaysia and Indonesia relate to urbanisation beyond Singapore’s borders?

Changi Airport relates to urbanisation beyond the City-state national border through a set of multi-causal factors and parameters. This dissertation revealed that Changi Airport, through its regional flows of cargo and passengers, both supports and responds to urbanisation in Johor and the Riau. While Changi Airport’s urban effects emerge throughout the rural, industrial and leisure hinterlands of Singapore, the processes enabling such ‘airport-related spatial-imprints’ are by no mean mono-causal—placing the hub airport at the centre—, but of multi-causal nature in which Changi is a crucial element.
**Factors shaping the Airport Island of Singapore:**

The correlated parameters (Table 5-1) lead to the specific condition of the Airport Island of Singapore: through a primarily state-owned land factor, coupled with a centralised planning system, the finite island nation (700 square kilometres only) has been centrally planned as one single entity, allocating airport-related activities (business, industrial or tourism-related) throughout the island and connecting them back to the airport through effective road infrastructures. As a result it is ‘all of Singapore’ that can be seen as an ‘Airport City,’ while Changi’s periphery is more of a dead-end terminal condition, to prioritise airport expansion and accessibility. Although the airport is starting to act as a destination in itself, attracting Singaporean residents to enjoy the airport facilities for reasons other than aviation —such as public playgrounds, retail amenities, hotel, etc.— Changi acts as a mono-oriented transport hub with a lack of public transport connection. Around the hub of Changi, some airport-related urbanisation like the CBP or the Singapore Freeport is taking place. Its volume, however, is modest compared to other business clusters located in Singapore.

**Factors shaping the Airport’s leapfrog effects across Singapore’s national borders:**

The specific factors shaping the Airport Island of Singapore, combined to the parameters related to the SIJORI cross-border context (Table 5-1), produce another type of airport-related urban effects: taking place beyond the national border: the spatial imprints linked to Changi’s regional flows of passengers as well as perishable and high-value cargo. Changi’s transnational cargo networks along with the airport’s regional flows of tourists underline the specific correlated parameters and factors rendering the Extended Airport Region of Singapore. This extended airport footprint shows a catchment area of Changi that stretches up to 150-kilometers into the cross-border region, portraying an enhanced reciprocity of the airport with its larger territory. (Fig. 5-1)
Within Singapore’s Border: THE AIRPORT ISLAND

- a finite Nation with a limited land area (just over 700 square kilometres, with a maximum distance of 45 km from the airport)
- dependent on a reliable global aviation hub
- effective road infrastructures provided throughout the city

Throughout the SIJORI Cross-border Region: THE AIRPORT’S LEAPFROG EFFECTS

Factors related to the Regional cargo flows (V) + :

- a strong border condition: result of the highly developed Island-Nation-state surrounded by developing countries
- a low-key hinterland:
  - enabling at profitable market prices the intensive industries and agrarian productions supported by Changi Airport
  - yet coupled with the close proximity to a well-regulated environment for the high-value goods productions: to host the higher-end phases of the producing MNC’s (headquarters, test and distribution hubs)

Factors related to the Regional flows of tourists (V) + :

- A primarily urbanised Island-nation with a limited public access to the coastline:
  - coastline occupied by key industries and infrastructures (such as the Port, the Airport, the petrochemical island of Jurong)
  - coastline landscape characterised by an industrial and serviced-based environment (due to the Straits of Singapore)
- combined with the proximity of a low-key hinterland with a tropical beach:
  - cheap and large availability of land with minimal costs of labour, complemented with a natural landscape
- Singapore’s specific territorial policies and strategies (enabling extension+ control) - see above:
  - bundling the tropical paradise to the urban environment
enabled by a primarily state-owned land

and a centralised planning system

comprehensively controlling which functions are allowed on the City-state and where they are located

Table 5-1   Multi-causal parameters defining the Extended Airport Region of Singapore

**Flexible tax regulations:**
- Free-Trade-Zones in the hinterlands limiting taxes on foreign investors
- Regulated but flexible custom-tax regime at the Singaporean border that enables goods to cross the border without being subjected to Goods and Services Tax (GST) or Customs duties normally imposed on goods imports in Singapore

**Aviation hub located within a critical three and a half hour maximum time catching area:**
- with dedicated freight terminal for perishable
- therefore linked through effective transport infrastructures (combination of land, sea and air transport)

**Network-type organisation:**
The flows of perishable goods are based on local and family-run economies with strong contextual knowledge and links throughout the territory connecting independent growers to the main farms and in doing so extending the producing catchment area

**Implementation of a Free-Trade-Zone limiting taxes on foreign investors and supporting economic growth**

**Proximity and minimised transfer time to hub airport (one and a half hour maximum)**
- through effective ferry connections and roads infrastructure

**Direct contractual links between the developer of the resorts and the international airport operator:**
- promotional campaigns
- vacation incentives
- guarantee of landing slots for bigger charter airlines

Conclusion
- What are the specific types of flows through Changi Airport with reciprocal urbanisation effects?

Specific cross-border flows of tourism, perishable cargo and high-value goods form the base of the case studies analysed in this thesis as built evidences of Changi’s urban effects. These case studies are, if not unique, particular to the geopolitical context of Singapore in relation to its international airport and to the SIJORI region. The timeline (Fig. 5-2) correlates each case study analysed throughout the SIJORI cross-border region (perishable cargo in green; high-value in purple; tourism-related in pink) and within Singapore’s border (in blue) with Singapore’s development milestones (master plans, key planning strategies, etc.). These specific types of flows through Changi Airport have reciprocal urbanisation effects throughout this territory.

Following Singapore’s 1990s phasing out of domestic agricultural and industrial production’s strategies, airfreight-dependent activities were pushed abroad. These businesses operate facilities in Johor and the Riau but keep their strategic bases in Singapore. Supported by Changi, as well as the networks and actors organising Singapore’s extended Airport Region, over 100 Singaporean-owned orchid and ornamental fish farms, and multinational corporations of high-value electronics, operate cross-border activities both within and beyond Singapore’s national borders. The economic influence is significant. Every day, local logistics firms truck 95% of Johor’s total orchid production across the border to Changi Airport for worldwide export. Meanwhile, ornamental fish are flown in for breeding at Singaporean-owned farms—located within the City-state and in neighbouring Johor—before being globally exported from the “Ornamental Fish Capital of the World.” Of all ‘agrarian’ land area in Singapore (restricted inside the Agrotechnological Parks), 65% is devoted to the production of ornamental goods intended for global export via Changi Airport. Likewise, MNCs headquartered in Singapore link their production chains inside the ‘tax free zones’ of the Indonesian island of Batam to the world via reliable air transport. As Batam’s pioneer industrial parks, Batamindo Industrial Park, hosts over 70 MNCs, which operate labour-intensive assembling factories there. One of Batam’s most important commodities, the ‘high-value’ electronic chips trade, is made possible by Changi Airport, with support from two smaller secondary airports: Hang Nadim Airport in Batam and Seletar Airport in Singapore.

These regional air-cargo networks are complemented by flows of tourists traveling through Changi Airport. Cross-border tourism supports the growth of ‘leisure-urbanisation’ on the island of Bintan in particular. Bintan Beach International Resorts is an 18,000-hectare tourist enclave built following the Tourism 21 strategy. Nowadays over 65% of the resorts’ clients are international passengers—originating mainly from China, Korea, India and Indonesia—who fly into Singapore via Changi Airport. They combine a global city’s urban experience with a couple of days in Bintan’s tropical paradise. As a result, the northern Bintanese landscape and built environment have been transformed through the use of specific spatial typologies and works in order to attract a more globalised clientele, which increases annually.

- Where and at which territorial scales do these flows materialise in the built environment? And what are their characteristics?

The table Changi’s airport-related urbanisation characteristics in SIJORI (Table 5-2) summarises the spatial imprints (areas, land uses, ownership tenures, and distance to airport) of Changi Airport’s transborder
flows, concluding on the multi-causal nature of such airport-related effects. If Changi's airfreight-related activities into Johor extend a maximum of 160 kilometres inland, most of the farms concentrate in an area located around 60 to 100 kilometres from the airport, and two to three hours commute from Changi. Furthermore, the specific organisation of the perishable goods networks, dispatch the productions of the different independent breeders located throughout the State of Johor onto one main farm (such as Tai Hong in the case of Hock Wee Nurseries), which is located less than 75km from Changi and around three
hours commute from the airport depending on traffic and length of controls at the Singapore-side of the border. The air-related, high-value industries in Batam, lie about 50 kilometres from Changi Airport (such as Infineon in Batamindo Industrial Park). The components are transported by air from Batam to Changi (via Batam’s Hang Nadim and Singapore’s Seletar airports) and the time-distance between the back-end production facilities in Batamindo and Changi Airport is of less than two hours all transports included (comprising a 40-minutes flight from Hang Nadim to Seletar).

From these findings, it is reasonable to deduct that the main concentration of airfreight-related activities around SIJORI are therefore found within 100 kilometres from Changi Airport and three hours of commute. As seen in the literature review, in their study of the emerging transport geography of logistics and freight distribution, Hesse and Rodrigue suggest that logistics activities are located not only in and around the physical nodes of seaports, but are also found at inland suburban and hinterland corridors beyond the edge of a metropolitan area. (Hesse and Rodrigue 2004) Illustrating these outcomes, Rodrigue and Notteboom have identified an “extended gateway” in an area of 100-150 kilometres around the port of Antwerp, and links extending over 100 kilometres around Rotterdam. (Notteboom and Rodrigue 2008) The findings of this thesis show an “extended gateway” in an area of 100-160 kilometres around a hub airport as well, in the case of Singapore.

For leisure-based activities, most of the resorts concentrate inside the boundary of Bintan Beach International Resorts (BBIR), which can be reached from the airport via a one-hour and twenty-minutes commute by both ferry (45-minutes) and car. Nevertheless, the eastern coast of Bintan, located up to 70-80 kilometres from Changi Airport, is rapidly developing. As it attracts more and more international tourists willing to commute up to three hours (via more than one ferry and land transport) to more remote and more ‘authentic’ locales, the leisure periphery of Changi—an its related extended footprint—is likewise expanding.

The research also reveals interesting land tenure patterns and scales within Changi’s extended airport footprint. Within Singapore, all areas are owned by one of the State agencies, such as the Singapore Land Authority (SLA) for the Agrotechnological Parks where the perishable farms are located; Changi Airport Group (CAG) for activities within the landside area of the airport; or a Government Linked Company (GLC), such as JTC for the industrial and business parks. While in the Malaysian State of Johor, the Singaporean farms privately own the land they occupy, on the other hand the land dedicated to airfreight- and leisure-related activities in the Riau Archipelago is administered by Singapore-based enterprise Gallant Venture, which is jointly owned by Singapore GLCs (namely JTC and SembCorp Industries) and the Salim Group, Indonesia’s largest business conglomerate. This is due to the Indonesian ownership law as seen previously. The organization behind Gallant Venture provides some guarantees with respect to regulatory issues and government permissions in Indonesia, with the benefits of a ‘Singaporean’ design, development and management ‘style.’

The land areas that these airport-related activities occupy also illustrate the specific conditions of land resources dependencies in this region. For the perishable farms located within Singapore’s border the sizes vary from a half to six-hectares maximum, while outside of the border they are fifty times bigger (Hock Wee’s parent farm in Singapore, Zion Orchids, is of two-hectares versus 100-hectares for Tai Hong, their main farm in Johor). Furthermore given the network-type organisation, grouping several farms and
independent breeders together, Hock Wee’s land area in Johor increases to over 200-hectares, which is over 100 times bigger than the land they have in Singapore. A similar land-size comparison is applicable for the high-value chips production. Within Singapore’s border the land occupied by the MNC’s headquarters or test centres is 6 times smaller (a half hectares) compared to their facilities in Batamindo Industrial Park (three hectares for Infineon Technologies). However the built square-meters show a less steep difference over 100 times bigger than the land they have in Singapore. A similar land-size comparison is applicable for

<table>
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<tr>
<th>Table 5-2</th>
<th>Changi’s airport-related urbanisation characteristics in SOIRI</th>
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<tr>
<td>Launch</td>
<td>Land Area (Hectares)</td>
</tr>
<tr>
<td>ZION ORCHIDS Lim Chu Kang</td>
<td>1979</td>
</tr>
<tr>
<td>BBIR Banyan Tree &amp; Angsana</td>
<td>1997</td>
</tr>
<tr>
<td>BBIR Bintan Lagoon</td>
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<td>BBIR Bintan resorts</td>
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<td>2019</td>
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<tr>
<td>BBIR Bintan resorts</td>
<td>2020</td>
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The causality of such causality is also strong when a peripheral region is located in the catchment area of hub airport. However the nature of such causality is a multi-causal relationship, in which the hub airport is one of the central parameters in the success factors defining the extended airport region. The Extended Airport Region of Singapore presented in this research uncovers the characteristics of peripheral regional urban-growth patterns linked to Changi Airport.

Conclusion
**How are they organised and distributed?**

The case studies analysed in this research reveal that while Changi Airport acts as the main hub through which all flows studied transit, the airport is linked to its rural and industrial hinterlands via the many actors and small-scale infrastructures that extend Changi’s catchment area across the cross-border region. As noted previously the flows of high-value cargo for examples involve local logistic firms and ‘middle-men’, who cross the border in trucks or small propeller planes loaded with the goods manufactured in Singapore’s hinterland to be delivered worldwide via Changi Airport. The perishable goods networks are organised through local connections between independent breeders and main farms, which collect the flowers or fish in order to prepare them for air-transportation, before being trucked by logistic companies to Changi Airport.

The dissertation uncovers an airport that does not exist in a vacuum but connects a wide range of small-scale, spread-out transport systems, ‘middle-men’ and local entrepreneurs who move goods between the rural and industrial hinterland production sites and the global marketplace. Tracing these flows, the research reveals the organisation of an Airport Region that has a specific bound with its context. It is the people, the activities and dependencies that evolve from the conditions of this environment that shape the spatial relation between the airport and its larger territory. Together, these more flexible and informal systems generate an urban effect at multiple scales. They deepen the interactions between the three territories and support the economic integration and urbanisation processes of the SIJORI cross-border region. Changi is the hub that—through its regional flows of cargo and passengers— draws the three component territories back together. (Fig. 5-3)

### III. LIMITATION OF THE STUDY

This research has offered an evaluation of the urbanisation related to Changi Airport beyond the Singapore national border—across the Singapore-Johor-Riau (SIJORI) tri-national region. It was conducted with extensive fieldwork from October 2011 until March 2015 consisting of interviews; sites and more ‘mobile’ (“following the flows”) surveys; workshops; meetings; data gathering and archival research. As direct consequence of this methodology, the study encountered different limitations, which have been taken into account. Firstly, given the large territorial scale and multiple actors involved the findings of this research are constrained by the reasonable amount of time and access to cases possible to undertake by one person within three and a half years of research. Rather than presenting a comprehensive survey of airport-correlated case studies in Singapore and the SIJORI region, these findings use exemplary cases—specific to the context—to portray the Airport Region of Singapore.

Secondly, given the importance of Changi Airport for Singapore, data was reluctantly and scarcely shared by the airport authority. Without access to publicly available detailed data, the empirical information was gathered compiling many different sources such as data made available by private firms and logistic companies; data found on official reports by companies and government; or data found on the Internet. Most of the maps for examples, where traced by hand, based on the satellite map of Google Earth, the related areas or distances calculations are therefore not fully precise. On the other hand, through detailed analysis based on the more precise information obtained during the interviews and site surveys, the research uncovers the less observed and known effects of Changi Airport. The extended airport region of
Fig. 5-3    Singapore's Extended Airport Region
Singapore revealed in this dissertation shows the richness of the networks studied and their importance for the cross-border region development in relation to Changi Airport.

IV. THEORETICAL IMPLICATIONS

Existing studies on airport-related urbanisation in the fields of architecture and urban planning remain limited and seldom rely on empirical findings. The explanatory ‘spatial models’ that they devise (such as the ‘Aerotropolis’, the ‘Airport corridor’, and the ‘Airport City’) tend to generalise and simplify airport’s effects into broad categories regardless of the specificities of each context. They are inadequate to describe different locales and do not offer useful guidelines for sustainable growth. In the field of ‘space-related’ disciplines, more in-depth and quantifiable studies analyse the locational patterns of activities linked to the knowledge economy (high-tech industries and knowledge-creating institution) around airports. These, however, remain restricted geographically as well as programmatically. Reliable and empirical analysis can be found in the field of regional studies on the impact of hub-related logistics activities on larger territorial scales, although these are mainly limited to the domains of logistic or transport geography as well as regional economy. Finally current airports studies mainly concentrate in the West, providing meagre information about the Asian context, where aerial mobility has expanded dramatically over the past three decades.

By probing how far into the region Changi’s urban effects extend, the dissertation adds empirical ground and expands the geographic as well as spatial typological limit of current airport studies. The thesis demonstrates that the airport, along with its related transport links and supporting actors, is a critical lens for studying larger territories and in so doing re-examining Singapore’s cross-border perspective. Changi emerges as a central factor in its related larger territory urbanisation and organisation. Through this contextualised approach, the airport’s relationship with its larger region becomes highly specific in comparison to existing models. The characteristics of Changi’s Extended Airport Region—for example its land-ownership structure; its network-type organisation; its functions; etc.—may be specific to Singapore; but its methodology and parameters are useful lenses for deciphering the larger-scale urban impact of airports in other contexts.
V. OUTLOOK

As uncovered in this dissertation, Changi Airport is one of the key forces that supports and enables Singapore’s extended urbanization throughout the SIJORI cross-border region. As these peripheral regions develop, the small airports they contain—namely Batam’s Hang Nadim and Senai in Johor—expand and support further urban growth in correlation as well. While Changi remains the international hub, overshadowing by its capacity and connections the smaller airports on the fringe, these are starting to develop inventive solutions to compete with Changi through the development of low-cost or even specialized mobility hub, such as Bintan International Airport analysed previously. The final section of this dissertation represents a modest attempt at analysing the rapid developments of SIJORI’s peripheral airports and at drawing attention to these collaborative initiatives that—if yet minor in passengers share and absent from regional discussion on governmental levels—may have catalytic effects on the region development by speed-up an already emerging system of airports in this cross-border region.

5.1 Hybrid transborder infrastructures bridging the gap

The SIJORI tri-national region is characterised by border regimes that are ‘persisting’. While they offer fairly permeable conditions to goods trade—as demonstrated in the previous chapters—Singapore’s border regimes still enact restrictions towards the cross-border mobility of people coming from the peripheral nations, especially for passengers coming from the peripheral airports. Whereas the SIJORI cross-border region falls in the catchment area of a globally linked hub airport ‘persisting border regimes’ limit the free movement of passengers for protectionist reasons. Singapore’s Flight Information Region (FIR)—which includes all of the Indonesian Riau Archipelago—shows one clear ‘unified’ boundary on the sky. However, the SIJORI cross-border region is administratively fragmented and characterised by lopsided stage of development at the level of the territory. (Fig. 1-6) This disconnect creates tensions on the ground but opportunities as well. The smaller and cheaper airports located on the fringe of the international border are currently developing inventive transborder infrastructures through partnership with budget airlines and local operators.

In October 2012, the Malaysian budget carrier Air Asia launched a free SkyShuttle bus from Johor’s Senai Airport to Singapore. The service has seen encouraging response from AirAsia passengers, with almost 2000 passengers crossing the border every month for cheaper fares (2013). Similarly after opening the first MRO facility of Hang Nadim Airport in 2014, the Indonesian budget airline Lion Air is considering to establish one of its domestic and international hubs in Batam’s Airport. Plans for a combined ‘flight-bus-ferry ticket’ from the island to the City-State of Singapore are under way. This may entice Singapore-bound travellers from Indonesia—Southeast Asia’s biggest travel market—to choose Batam over Changi Airport. Batam’s Hang Nadim airport has indeed recently become the new gateway for Indonesian tourists en route to the City-State. Three “Hotel & Ferry” counters located inside Hang Nadim’s arrival hall already enable tourist to directly check-in before making their way to Singapore using Batam’s broad network of ferries. (Fig. 5-4)

As Max Hirsh notes, the penetration rate of low cost carriers (LCC’s) in Southeast Asia is much greater than anywhere else in the world. While 50 to 60% of passengers travel through budget airlines in SEA, LCC’s account for only one fourth of passengers worldwide. (Hirsh 2013) The two biggest carriers in the region are Lion Air and Air Asia. By partnering with local transport operators both airlines have inventively bypassed the need of requesting further approval to Singapore, which has so far refused any kind of cross-border ‘airports-links’ or cooperation. By developing these ‘ad-hoc’ mobility systems that navigate across the inconsistencies of border regimes, SIJORI’s secondary airports informally contribute to the integration of the three territories as well.

**Air and Bus**

AirAsia launched its SkyShuttle bus in 2012, almost a decade after its first attempt at doing so had been rejected by Singapore Land Transport Authority (LTA) in December 2003. This time the low-cost carrier did things differently. Instead of implementing a direct shuttle from Senai Airport to Singapore, AirAsia partnered with the local Malaysian firm Handal Indah —also known as Causeway Link in Singapore— which has been licensed for over ten years to run cross-border bus services on both sides of the border. On the Singapore side, ‘Causeway Link’ buses depart every five minutes at peak hours from three different locations: Newton, Queen Street and Kranji MRT stations. Like all bus commuters crossing the Causeway, the passengers alight at the Woodlands checkpoint for immigration before hopping onto the exclusive AirAsia SkyShuttle bus, which takes them to Senai airport. The service is free for AirAsia costumers and the smooth journey from Singapore to Senai takes about one and a half hour all included. (Fig. 5-5)

This service conveys students, retirees, budget travellers or regular commuters such as Singaporean Mr Jeffrey Lim, who—for a Singapore-bound trip—flew to Senai from Sarawak. Around three years ago Mr Lim emigrated to Malaysia where he founded his automotive spare-parts company. He regularly commutes to Singapore to visit his daughter and to purchase equipment for his business “I used to fly from Miri to

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184  The Airport and the Territory  Anna Gasco
Changi and that would cost me around SG$400. A return ticket from Senai is only SG$100. Now I come a lot more than I used to! Plus Senai Airport is very beautiful now. I will never go back to Changi!” He says.2

According to CAPA, Senai Airport —located about 50km from Changi Airport— was the fastest growing airport in Malaysia in 2013, and one of the fastest growing in Asia, with 44% growth in passengers. This rapid growth is mainly driven by Air Asia, which currently accounts for about two third of total capacity in Senai. (CAPA 2014) AirAsia’s attempt to tap the Singapore market from Johor Airport is not new. The Low Cost Carrier first opened a base in Johor Airport at the end of 2003, which drove a 66% growth in passenger traffic in 2004. The initial motive was to divert flow from Changi without operating in Singapore. The Singaporean authorities were less than cooperative and to protect Changi Airport from competition, rejected AirAsia license to implement a direct shuttle service from Singapore to Senai Airport. As a consequence Senai Airport’s traffic dropped by 13% and experienced essentially flat traffic over an eight years period until 2012. (ibid) The conclusion of an ‘Open Skies’ agreement between Malaysia and Singapore in 2008, which opened up the market to budget carriers, also drove the expansion of AirAsia in Singapore and the further decline of Senai Airport.

The recent revival of AirAsia’s ambitions to develop a hub at Senai and offer an alternative gateway to Singapore was mainly driven by the changing dynamics of the local Johor market. As seen in previous chapters, the State of Johor embraces the special economic zone of Iskandar Malaysia established to capitalise on synergies with Singapore (IRDA 2014), both capital and location. As Izhar Hifnei Ismail, the senior vice president of the Iskandar Regional Development Authority (IRDA), explains: the rapid growth in Iskandar is driving demand for more services at Senai Airport, as more international tourists are “flying-in to enjoy Johor’s recent themed parks and leisure developments while having access to Singapore on a

2 Jeffrey Lim, Interview with the author, SkyShuttle bus pick-up, Johor customs, Malaysia, April 2013
The Airport and the Territory

Anna Gasco

As CAPA notes AirAsia has carried a greater than anticipated amount of traffic on its Johor-Indonesia flights. In addition to the arrival of tourists from Indonesia, Senai Airport also enables the influx of migrant workers flown in to support the booming construction activity of Iskandar and supplement the rather limited local labour pool. (CAPA 2014) Within less than two years AirAsia launched seven new international routes from Johor Bahru to Indonesia, while applications for additional routes from Changi Airport were delayed by Singaporean authorities as an attempt to secure more slots for Singaporean carriers. (ibid) In the past, traffic from Johor was naturally drawn into Changi Airport, given that Senai was mainly covering domestic routes. However as this secondary airport attracts more international services, at very competitive prices, it could be seen as an opportunity to bring travellers, especially those from Indonesia, via Senai to Singapore.

Recent news reports published the plan from Iskandar Malaysia to propose a “Twin-airport concept” to Singapore. (Musa 2013) As Mr Izhar Hifnei Ismail adds “Changi will one day reach its maximum expansion. Senai Airport could cater for the regional and medium-haul services segment. However we do not want to be dependent on Changi to say yes or no anymore. We will get Senai ready. We want to grow together.” Similarly at the launch of Treasure Bay, one of Bintan’s next mega project, the Indonesian former president Susilo Bambang Yudhoyono questioned Singapore’s promotion ‘Visit Singapore Then Bintan’: “Bintan can become well-known and promote itself like ‘Visit Bintan Then Singapore’ […] We do not wish to see only Singapore becomes developed, we want to grow together…” (2011) The groundbreaking ceremony of Bintan Resorts International Airport took place just a year later, in May 2012. Its role in supporting the future redevelopment of Bintan Industrial Estate along with the increase of visitors to Bintan Resorts have been analysed in chapter four.

Air and Ferry

In 2012 the airport of Batam experienced a 15% growth in passengers —mainly from migrant workers flying in from Java and Sumatra to work in the island’s industrial parks— and an 18% increase in cargo traffic. In addition to perishable goods being freighted in other parts of Indonesia, ‘high-value’ microchips are flown on a daily basis from Hang Nadim to Singapore Seletar Airport as seen in chapter three. Expansion plans are being drawn up to increase the current capacity of six million passengers up to eight million by adding a second runway and expanding the cargo terminal.5 Hang Nadim’s potential is also reflected in the decision by Indonesian LCC Lion Air to move its aircraft maintenance repair and overhaul (MRO) base to Hang Nadim in 2013. (Fadli 2013) The airline’s first ‘fully owned’ MRO hangar (six-hectares) opened in 2014 and is currently being complemented by three others, which will bring to twelve-hectares the airport’s MRO facilities by 2016. If this MRO hub will be smaller than the 177-hectares one under construction in ‘Bintan Aerospace Industrial Park’, Hang Nadim’s commercial director tables on the emergence of a “high-value and high-tech new cluster industry in Batam to lead economic changes by increasing skills and education among Batam residents” 6 For this purpose, 90 additional hectares have been set aside for other companies.

3 Mr. Izhar Hifnei Ismail - senior vice president of Iskandar Regional Development Authority (IRDA), interview with the author, FCL Singapore, July 2013.
4 New tourism developments in Johor include resorts along the eastern coast of Desaru and theme parks like Legoland near Senai, Pinewood Studios or the Hello Kitty Town (Tan 2014) Between 2011 and 2012 the State of Johor experienced the highest increase (7.6%) of hotel occupancy rate in Malaysia. (Ministry of Tourism Malaysia 2013)
5 Dendi Gustinandar, Commercial Director, Batam Hang Nadim Airport, interview with the author, Batam, March 2013
6 ibid, July 2014
Lion Air is by far the largest carrier at Batam, accounting for about 55% of shares, followed by Garuda with 37%. (CAPA 2013) Lion Air currently uses Batam as a transit hub to connect several cities in Java and Sumatra. The airline is considering to further position Batam as its major hub for domestic and even international connections —and as an alternative transit point to congested Jakarta and Surabaya— by adding several new routes, including longer domestic flights to central and eastern Indonesia, such as Denpasar (Bali). (Ibid) Following this expansion strategies, the group announced that plans for a ‘flight-bus-ferry’ combination ticket from Batam Island to the City-State of Singapore are under way. Batam’s Hang Nadim airport has indeed recently become the new gateway for Indonesian tourists ‘en route’ to the City-State. Three “Hotel & Ferry” counters located inside Hang Nadim’s arrivals hall currently enable around forty tourists per day (during holiday seasons) to directly check-in before making their way to Singapore using Batam’s broad network of ferries. (Fig. 5-6)

Until Bintan International Airport is completed, Batam remains the only airport in Indonesia that is not owned and operated by Angkasa Pura I or II, the Indonesian State-owned enterprise responsible for management and operation of airports in Indonesia. Instead Hang Nadim is owned by the local Batam government (BIFZDA). Given that the airport is not part of the ‘normal’ bureaucracy of the federal government, Batam “promised Lion Air a ‘hassle free’ and simple administrative environment” according to Hang Nadim’s director Dendi Gustinandar. This coupled with the free-trade-zone environment of Batam will make expansion projects more easy to implement for Hang Nadim Airport. If current cross-border air passengers numbers between Hang Nadim and Singapore are minimal, competitive prices and effective transborder infrastructures could entice more Singapore-bound travellers from Indonesia —Southeast Asia biggest travel market— to choose Batam over Changi Airport.

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7 Data gathered from the 3 ferry companies present in Hang Nadim, Author fieldwork, July 2014.
Each time I tried to discuss these incipient travels with my contacts and interviewee at the Civil Aviation Authority of Singapore (CAAS), they argued that the flat traffic figures did not justify any future coordination between Changi in these smaller airports. “Changi could never benefit from formalising cross-border passenger traffic, nor be threatened by these smaller airports.” Yet these cross-border travels are becoming more prolific with the implementation of competitive and specialised mobility hubs, such as the Hajj centre in Senai in 2013 (see Prelude section to this dissertation) or the upcoming Bintan International Airport, being constructed to serve the ‘resort-towns’ built on Bintan’s northern coast. The journeys from Singapore to both Senai —emerging as Malaysian budget airline Air Asia’s new hub— and Hang Nadim airports currently take around 90 minutes. The unpredictability of traffic linking Singapore to Malaysia makes it more challenging to reach Senai than the more predictable ferry ride to Batam. However, as Aviation Correspondent Karamjit Kaur mentions, where the two biggest carriers in the region —Lion Air and Air Asia— chose to establish their next hub could affect Changi Airport in the long term. But “this does not necessarily have to be in a bad way.” (Kaur 2013)

If the increase in cross-border activities is taken into account at the government level and integrated cross-border infrastructures are considered between the global hub —Changi— and the secondary airports on the fringe (such as dedicated immigration lanes or direct buses and ferries from airport to airport), these currently incipient flows could have catalytic effects on the region’s future development by speeding-up an already emerging system of airports in the SIJORI cross-border region.

5.2 Learning From Other Cross-Border Regions

Unlike its European cross-border region equivalents the border regime within SIJORI are still present and strengthened on different occasions as seen in this chapter. Contrasting with these ‘persisting’ borders, the Basel tri-national region, which spans three countries —Germany, France and Switzerland— offers an interesting example. As Driscoll et all explain, given that Switzerland is not a member of the EU, cross-border cooperation faces different financial and legal obstacles than say between Germany and France. However the Basel tri-national region exemplifies strong cross-border functional linkages and a history of developing joint projects and co-ordination mechanisms both in public and private sectors (Driscoll, Vigier, and Leith 2010). For example, prior to Switzerland joining the ‘borderless’ Schengen zone in December 2008, a special road corridor was implemented between Basel and the French airport of Mulhouse, just across the border. Running parallel to the highway, this ‘green channel’ limited passport checks to the airport and facilitated cross-border road travels for airborne passengers.

The case of Basel illustrates that the presence of an external EU border did not constitute a limiting factor in the scope of cooperation strategies.

Another example more similar to SIJORI, is the cross-border region along the United-States-Mexico border. In both cross-border region cases, given the considerable economic disparities among the territorial components, the governments concerned are seeking to strengthen and regulate their border regime, rather than eliminating them, such as in Europe. However in the case of the US-Mexico border a cross-border pedestrian bridge aiming at connecting Tijuana International Airport in Mexico to San Diego in

8 CAAS officer – anonymous – interview with the author, August 2013, Singapore Aviation Academy, Singapore.
9 December 2008 marked the date in history when Switzerland joined the passport-free zone of the Schengen countries. The Schengen zone relaxes controls on passport checks in line with road and rail border crossing. Until the end of 2008, non-EU residents of Switzerland had to apply for a visa in order to cross the Swiss borders.
the United-States, was granted approval by authorities on both sides of the border. According to Tijuana airport’s operators, more than half of Tijuana’s passengers come from California attracted by lower airfares and a wide range of Mexican connections. Developed by a North-American private venture the expectation is to turn the Mexican airport into a low-cost alternative to San Diego’s airport and avoid long waiting times for passengers at the San Ysidro and Otay Mesa ports of entry. As the CEO of the South County Economic Development Council in San Diego explains, the new port of entry will be unique on the United-States-Mexico border and “is a reflection that we truly are a bi-national region.” (Dibble 2014) Although initiated by a private actor, the project was positively received at the State levels, which enabled its implementation.

Within these bi or tri-national regions examples, the type and level of cross-border cooperation that has evolved is based on clearly identifiable functional relationships and projects that respond directly to a demand. These experiences testify to the ability of the governmental actors to overcome the inherent territorial complexity of cross-border cooperation, which brings together various countries (Sohn, Reitel, and Walther 2009). As probed by the extended urbanisation effects of Changi Airport across the border, mobilities enable transnational business strategies to be implemented and deepen the interactions between the three territories. What this final section hypothesises is that an integrated system of airports for SIJORI could further support the development of this tri-national region.

5.3 An Open Question For The Future Of The SIJORI Tri-National Region

Singapore may not need to be concerned about these smaller airports, as Changi is still about ten to twenty-five times bigger. However their rapid growths —especially the one of Senai and the construction of Bintan Airport— are closely monitored by their much larger neighbour. As CAPA Centre for Aviation, leader in global aviation knowledge, notes, “As the various LCCs establish around the region and as new forms of airline evolve, the challenges for longer established hub airports to make a transition to a more versatile model – while simultaneously catering to the needs of conventional network carriers – become more intense. Changi has always shown a propensity to experiment in forward looking ways; now that process is no longer a luxury, but a necessity.” (CAPA 2014) The emerging transborder passenger’s infrastructures case studies highlight the disconnect between intense ‘on the ground’ private firms collaboration on one hand and lack of governmental discussion and integration on the other. Due to clear competing economic interests the Civil Aviation Authority of Singapore (CAAS) still limit the collaboration with the secondary airports on the fringe.

While the borders joining the three territories have become more permeable over time, persisting border regimes towards the cross-border movement of people still hinder the integration between the three components of the Singapore-Johor-Riau cross-border region. The Indonesia-Malaysia-Singapore Growth Triangle was based on the idea of complementarity and economic gap. However as the growth trends move rapidly, and differently, the 3 parts are gradually drawn closer to each other. The demographic trends are in favour of the Riau and of Johor for instance, with a likely increase of ‘working-age’ population by 2030 against a rise of retired people in Singapore. Batam also boosts one of the highest economic growths of Indonesia, while more and more Singaporeans establish their leisure and retiring base in Johor’s Iskandar. As ETH Assistant Professor Milica Topalovic argues, if the concept of complementarity may still remain in the future, the one of economic disparity may not prevail. (Topalovic and Yabuka 2014, 14) As
this transnational region evolves, the resulting cross-border territory will look very different in 20 to 30 years from now.

Changi’s regional networks of cargo and leisure have highlighted the role of the airport in supporting the development of this larger territory. In 2019, Singapore will return to Indonesia the rights to the airspace it controls above the Riau Archipelago. This administrative change will potentially open up new revenue streams and routes for the smaller airports on Batam and Bintan. The forecasted air-travel growth is estimated to triple by 2030 in the Asia Pacific region. The emerging passenger transborder networks may anticipate the need for Changi’s hub to further expand its catchment area across national border by collaborating with the smaller airports on the fringe. A successful example can be found in Hong Kong Airport, which expanded its passenger’s catchment area by running cross-border buses and ferries to Mainland Chinese airports across the border to Shenzhen. Or in the promising cross-border pedestrian bridge, which will connect Tijuana International Airport in Mexico, to San Diego in the US. The project for a high-speed rail between Kuala Lumpur and Singapore already paves the way and could make transfers more convenient if the trains stop at both Senai and Changi airports. Cross-border traffic between the hub airport and its Indonesian and Malaysian neighbour, could be further facilitate with direct links between Changi’s new Terminal 5 and Tanah Merah terminal (for passengers as well as cargo), or dedicated immigration lanes as well as direct buses and ferries between airports. Integrated cross-border infrastructures could foster regional cooperation and economic prosperity for all components of the SIJORI region.¹⁰

¹⁰ Singapore Prime Minister Lee Hsien Loong and his Malaysian counterpart Najib Razak announced on April 7th 2014 at a press conference that the three Singapore terminals of the proposed high speed rail linking Singapore and KL would be located in Tuas West, Jurong and in the city centre. Although these are proposal stages to be finalised within the next years, Singapore’s authorities seem determined to focus future developments on the west part of the island. This could be a miss-opportunity not only for Changi Airport, but also for future regional cooperation. (Chan 2016)
Appendix

I. METHODOLOGY NOTES

1.1 The Multiple Actors

If we take a look at how airports function and how they, and the areas around them, are developed, a complex overlap of different actors adds to the methodological challenges of studying the urban impact of airports and their transnational flows. To an outsider, an airport may appear as ‘one entity’—in this case, called ‘Changi Airport’—but in practice it is a combination of multiple organisations (Kloppenburg 2013, 187). For example, Changi Airport Group (CAG), the operator of Singapore Changi Airport, is a corporate structure wholly owned by the Minister of Finance in Singapore. CAG focuses on the management and revenue-collecting departments of the airport, as well as undertaking airport operations at both Changi and Seletar airports. CAG was officially launched in July 2009 so that the Civil Aviation Authority of Singapore (CAAS), which previously acted as operator, could then focus on overseeing the regulatory aspects of airports and aviation in Singapore. CAAS regulates air traffic within the airspace jurisdiction of the City-state under its Ministry of Transport.

Likewise, and more related to this study, the planning of the peripheries around Changi and Seletar airports offer a fascinating methodological ground. A look at the actors involved shows there are public and private actors, as well as partnerships operating at multiple levels. The different government agencies and other private firms each have their own defined role and vision of ‘airport-related developments’ in Singapore. The actors at stake on the areas around Changi include the Singapore Land Authority (SLA) which owns the land; the Urban Redevelopment Authority (URA), in charge of broader land-use ‘parcellisation’ or heritage specifications; the Economic Development Board (EDB), which is in charge of attracting key industrial and commercial partners to settle at a specific location; the Land Transport Authority (LTA), which is in charge of mobility infrastructure within and outside the ‘parcels’, JTC Corporation (JTC), Singapore’s principal developer and manager of industrial estates—literally the ‘architects, master developers and master planners of the site’—in charge of the urban design specification of the ‘parcels’, the development and the management of the built industrial or business parks; and Singapore Customs (SC), in charge of ‘bounded’ or ‘licensed’ warehouses where the duties and GST are suspended on imported goods and many of which are located in close proximity of international infrastructures. The coordination and communication channels between the different agencies are complex, as the senior planner in charge of the airport periphery area within URA mentions, “because each agency has a ‘narrow’ or let’s say ‘specific’ concern and no broader idea, the different agencies must join forces when planning future major infrastructures.” An example of ‘agency steering committee’ is the one overarching the airport future expansions: ‘Changi 2036 Steering Committee’ platform, chaired by Josephine Teo, Minister of State for Transport and Finance.

1 Mister X, assistant head of transport engineering at EDB, interview with the author, May 2013, Singapore EDB.
2 Hsiao Ling TANG, director of the urban planning department at JTC, interview with the author, July 2013, Singapore JTC.
3 Bert Wee, senior planner, Physical Planning East Department (PPE), Physical Planning Group (PPG), Urban Redevelopment Authority (URA), interview with the author, February 2013, Singapore URA.
Salter argues that the airport represents “an assemblage of multiple actors operating according to different and often conflicting logics” (Salter et al. 2008, 9) and along the same lines, Kloppenburg writes that, “we should not interpret the airport as a bounded, physical space or a single actor.” (Kloppenburg 2013, 46) My argument is that this agency stretches far beyond the airport fence in terms of the urban impact of airports and their transnational flows. This critical viewpoint meant that my research brought me face to face with many different actors playing various roles inside and/or outside the airport.

1.2 Interviews Practicalities

As Kloppenburg explains, at first sight, it may seem that transport is the responsibility of private companies, and border control or aviation safety the ones of governments, the reality of mobility at airports is more complex than that. “International, national, and local commercial and public-sector actors all engage [...] in intersecting ways.” (Kloppenburg 2013, 44) Doing research within Changi Airport public areas, such as informal observations or interviews with passengers, was relatively easy. Yet as Kloppenburg notes, getting ‘behind the scenes’ of airports is incredibly challenging and I underestimated how many ‘stages of access’ (Kloppenburg 2013, 187) I would encounter. Arranging interviews was further complicated by the many organisations that together form ‘Changi Airport’. The contact I initially made at the CAAS requested to review all interviews questions before she agreed to send my contact or data requests through to the next level of contact—or not because of ‘national security’ or ‘red tape’ reasons. Waiting for responses delayed my research several weeks—or in some cases, several months—with many unanswered phone calls and emails in between. Often, these queries were met with little or no results at all. I realised that doing my research the ‘official way’ in Singapore was rather unproductive and more importantly, very time consuming. When I understood Changi Airport as constellation of different actors that linked it with its surroundings, the overall picture started to become clearer.

For example, instead of contacting CAG Cargo division directly, I worked through back channels, creating connections with the clients—the ‘shippers’—small, local entrepreneurs who were much easier to approach directly, and always curious to know why an architect was interested in learning more about orchids or ornamental fish. Approaching multinational corporations proved to be a little more difficult, and I am grateful for the help of Assistant Professor Milica Topalovic’s team for facilitating my first interview with Infineon Batam. In most cases, MNC’s required me to sign a Non-disclosure Agreement (NDA) for the information and data they disclosed. Through these ‘shippers,’ I was introduced to freight forwarders, who, with the approval of their clients (the shipper), always agreed to let me board their trucks or boats. After I finally managed to interview Changi’s Senior Manager of Cargo & Logistics Development, I couldn’t turn down her offer of an ‘exclusive’ tour of the Airfreight Centre, although I had already visited it many times.

Arranging interviews at the secondary airports across the border was much easier. I contacted the Director of Public Relations and Marketing 4 at Batam Hang Nadim Airport and told him that I wanted to

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4 Dendi Gustinandar director of public relation and marketing at Batam Hang Nadim airport, Interview with the author, Batam Airport, March 2013, Indonesia
understand how the future developments of Batam Airport could impact Changi, in light of the domestic air travel’s growth in Indonesia. He was helpful, accompanying me during two inconsecutive days of performing interviews and gather observations from within the passenger terminal, and in both the domestic and international cargo terminals of Hang Nadim. The same was true at Senai Airport. I contacted the Senior Vice President of the Iskandar Regional Development Authority (IRDA) and invited him for a visit of the Future Cities Laboratory (FCL) in Singapore. The ‘informal’ discussion we had while I was presenting him the lab’s different research projects proved to be very insightful to complement the direct observation I was able to make during my visit at Senai Airport. In both the cases of Hang Nadim and Senai Airports, and much unlike Singapore, my statuses of living in Singapore, working on ‘Changi Airport’, as a ‘researcher for a Swiss university’ worked in my favour.

My strategy for finding travellers in both airports across the border was to contact them upon arrival. In Batam Hang Nadim, I waited at the cross-border ‘Hotel & Ferry’ check-in counters located in the arrival hall. There I was able to meet Indonesian tourists en route to Singapore. With the airport operator’s approval, the officers working at the check-in desks helped me to conduct short interviews in Indonesian Bahasa. For Johor Senai Airport, I purchased an AirAsia flight to Jakarta from Senai Airport and boarded the low-cost AirAsia cross-border bus from downtown Singapore, which gave me the opportunity to conduct interviews with Singaporean passengers starting the trip on the City-state side of the border. I also waited in the arrival hall of Senai Airport, when I knew that a scheduled international flight was landing, and approached the passengers directly. I was less successful, but nevertheless managed to speak to Indonesian tourists landing in Senai to enjoy Johor’s new tourist attractions combined to a quick visit to Singapore.

At both airports, I asked travellers to recount their travel experiences and the reasons for not flying through Changi Airport. The timing I choose to interview passengers in both airports was the week preceding the Eid al-Fitr—the Muslim holiday that celebrates the end of the fasting period of Ramadan—and a busy time for those traveling to be reunited with family members. These specific trajectories enabled me to uncover how the border still enacted tensions and competition fears related to cross-border mobility in this tri-national region. In Singapore, I also interviewed and followed one Belgian expat family arriving from Hong Kong and combining a visit of Singapore with a stay in Bintan Resorts. If the passengers travelling to and from the secondary fringe airports across the border did so because they were traveling on a tight budget, the high-end tourists all started their cross-border journey from Changi Airport. For these, I choose the Chinese New Year holiday weekend, when the Bintan Beach International Resorts (BBIR) are filled with tourists arriving from all over the Asia-Pacific region.

1.3 Transfer Points

In his book The Air Logistics Handbook, Sales looks at the airport from the perspective of cargo. He describes how the ‘traditional’ air cargo supply chain is complex in the way that it works. How like passengers, goods meet and pass through a multifaceted ‘transportation chain’ at different responsibility levels as they move in, through and out of the airport. (Sales 2013) For example, in the case of Changi Airport, a good manufactured by a ‘shipper’ located in the hinterlands of the SIJORI region will be handed over to the ‘carrier’ (airline) to transport the good to Singapore. From there, the ‘consignee’ located in the vicinity of Changi Airport will pick up the good and deliver it to the consumer. The ‘transportation chain’ is made of different levels of responsibility and the task is to ensure that the good arrives at its destination intact and on time. However, the ‘transportation chain’ is complex and has many middle-men that can delay the process. For example, in the case of Changi Airport, the good will pass through different ‘nodes’ such as customs, security, and baggage handling. Each ‘node’ has its own set of rules and regulations that need to be followed. In some cases, the good may need to be processed in a timely manner to avoid delays. This requires collaboration and coordination among different stakeholders. (Sales 2013, xxvi)
over to a freight forwarder licensed by authorities on both sides to cross the border and circulate through the tri-national territory. The forwarder will see the goods through customs—in Malaysia or Indonesia first, then at the Singapore international border, then again at the entrance of Changi Airfreight Centre—where border control will be organised and operated by government officers. The free trade agreements signed by the three parties of the SIJORI region abolished most import and export taxes. If the goods are out-bounded for international exportation, they will be ‘transhipped’ through Singapore. In other words, they will not be considered as ‘entering the country’ when crossing the border, and therefore not subjected to the Goods and Services Tax (GST) or Customs duties that would normally be imposed on imports. Upon arrival at the cargo terminal, it will become the responsibility of the airline’s handling company, the cargo ground handler, which will carry out further security checks before proceeding to load it onto the airplane. The airline will accept the freight on the basis of a ‘limited airport-to-airport contract’ (Sales 2013, 7) and will not be held responsible for delays in consignments reaching their destination or, in case of loss or damage of the goods, in which case, an insurance agent, contracted by the ‘shipper,’ would intervene.

Illustration of ‘transfer points’ investigation: fieldwork notes in Changi Airfreight Centre

It is an early morning in April 2014 and I am joining a fresh seafood delivery at Changi Airfreight Centre (CAC) for the Grand Hyatt hotel in Singapore. Today I will follow the freight forwarder Mandai Link Logistic, which is responsible for the organisation of the airfreight supply chain for this shipment. My day starts with a check at the Police Pass Office located at the entrance of CAC 24-hour Free Trade Zone. Reference letter from Mandai Link Logistic in hands I receive my ‘Visitor Pass’ from the police officers in exchange of my passport.

I then board one of the public buses of the Land Transport Authority – the 9, 19 or 89 – that serve CAC along Airline Road. The bus stops at the main custom checkpoint where my visitor pass is further checked along with the ones of the others incoming personnel. Governments are responsible for border control and for monitoring security and safety. We then proceed through customs and access the 47 ha Free Trade Zone. Several hangars, cargo agents’ warehouses and global express logistics companies’ depots – such as UPS, DHL, Schenker, Nippon Express, etc. - along with courier and maintenance centres, workshops plants, the quarantine and the fuel farm support the different cargo terminals. I meet Mandai Link Logistic at the perishable Coolport located within SATS Airfreight Terminal 2. SATS is Changi’s chief ground-handling agent and holds the license to operate from warehouse premises onto the airport tarmac.

The cargo handler earlier unloaded the fresh tuna parcels from the belly hold space of the QANTAS passenger aircraft,7 X-rayed the shipment and made it available for collection by Mandai Link Logistic—the freight forwarder. From here the forwarder takes responsibility for the goods, prepares and processes the correct documentation – including customs declarations – ensure they conform to the regulation in place in

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6 SATS - Singapore Airport Terminal Services – is Changi’s chief ground-handling agent and in-flight catering service provider. SATS controls about 80% of Changi airport’s ground handling and catering business. SATS runs ground handling and airline catering operations at nearly 40 airports across Asia Pacific: it has established a network in Asia through joint ventures in China (including Hong Kong & Macau), India, the Philippines, Indonesia, Taiwan, Vietnam and the Maldives. (http://www.sats.com.sg) DNATA is Changi’s second ground-handling agent controlling 20% of the airport. It is owned by the Emirates Group and was funded in 1959. It is one of the largest suppliers of combined air services in the world offering aircraft ground handling, cargo, travel, and flight catering.

7 Almost every passenger flight carries some cargo. Commercial airlines can earn 10% or more of their total sales revenue from carrying freight underneath the feet of its passengers. Other major passenger carriers – such as Cathay Pacific, Lufthansa or Emirates – also operate all-cargo freighter aircrafts within their fleets on routes where there is regular heavy cargo demand. In doing so these carriers increase their revenues to around 30% for Cathay Pacific, 40% for Taiwan’s China Airlines and about half of its sales earnings for Korean Air Cargo. (Sales 2013, xxii,2&3)
Singapore and guarantees the delivery of the shipment to its final customer - the Grand Hyatt hotel kitchen in this case - at the right time. As the operation manager of the logistic company OHL once told me “We are the ‘middle men’ between the airlines and the clients. The airline brings in the goods, the forwarder handles the goods. He knows how to load, to clear customs more effectively.”

Yet the luxury hotel is not their direct client. Here another level complements the transport chain, the company that ordered the goods on behalf of the Grand Hyatt. Responsible Seafood specialises in high-end perishable seafood for luxury hotels. They have long-term contracts with fishermen all over Asia-Pacific and directly choose their own products. But as the director and founder of Responsible Seafood explains “We don’t deal with Changi. I have never been in the cargo area of the airport.” Once collected and cleared by Singaporean customs, the tuna parcels are trucked by Mandai Link Logistic to their cold storage supply chain warehouse in northern Singapore where the goods are picked and packed for subsequent redistribution to Responsible Seafood’s clients around Singapore. “Say if the tuna lands at 7am on a Thursday, it is in the kitchen by the afternoon.”

II. HISTORY OF SINGAPORE CHANGI AIRPORT

“Looking into the future, I expect to see Singapore become one of the largest and most important airports in the world.” Sir Cecil Clementi, before Kallang’s completion, Singapore’s first purpose-built aerodrome in 1937.

The history of Changi Airfield commenced during World War II after Singapore fell to the Japanese in 1942. Between 1943 and 1945 the Japanese used war prisoners for the construction of two intersecting earth airstrips for fighter aircrafts. After Singapore reverted to the British in 1945, the airfield became a military base for the British Royal Air Force (RAF) until 1968 when the British withdrew their military presence from Singapore and the airfield was handed over to Singapore Ministry of Defence (Mindef). (Fig. 6-1)

In the aviation boom of the early 1970s Paya Lebar International Airport was becoming increasingly congested. Although plans had been drawn-up to increase the terminal and add a second runway, expanding the centrally located airport proved to be difficult. Located inland at about 11-km from the city centre (and 9-km to the West of Changi), it occupied an area of 373-hectares near densely populated areas. As Lee Kuan Yew describes in his memoirs “A second runway at Paya Lebar would take aircraft right over the hearth of Singapore city.” (Lee 2000, 230) Relocating to Changi meant disrupting fewer residents, allowed future expansions and the proximity to the coast offered less impact in terms of noise and environmental pollution, with airplanes landing and taking off over seawaters. The development benefits associated with freeing-up a centrally located area (such as Paya Lebar) from civil aviation land-use were also critically part of the decision. (Phang 2003) The proposal to shift the civil international airport to Changi was adopted in 1975, after British and then American aviation’s consultants had advised against it (Lee 2000, 230) It was to be

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8 Mr Richard Lim, operation manager of OHL’s operation centre within the Changi Airfreight Centre (CAC) Cargo Agent building C, interview with the author, November 2012, CAC.
9 Mr Richard, director and founder of Responsible Seafood, interview with the author, April 2014, Responsible Seafood headquarter in China Town, Singapore.
10 Mr Richard, director and founder of Responsible Seafood, interview with the author, April 2014, Responsible Seafood headquarter in China Town, Singapore.
11 The plans to extend Paya Lebar Airport were abandoned due the environmental problems - related to noise and pollution - the extension would cause. They were also economic concerns of ‘sterilising’ a sizeable amount of land close to the city and potentially ‘urbanisable’, as well as problems related to population resettlements and limited land area with doubtful ‘load-bearing qualities’ due to the proximity of the Serangoon River. See (Chew 1980, Lee 2000, Lim 2008, Hutton 1981, Probert 2006)
in Lee Kuan Yew’s words “the best S$1.5 million investment we ever made.” As Liew Mun Leong puts it “On the fringe of the water, the airport became expandable with no more footprint on the city.”

Construction of the Civil Airport started in July 1975. The massive planning efforts included reclamation of 870-hectares of land using earth from nearby hills (12-million cubic metres) and from sea-fill. Approximately half of the total area of the airport lies on new land and has an elevation of 7 metres above sea level. Changi commenced operations from Terminal 1 in July 1981 with a capacity of 12-million passengers per annum. Two parallel runways, each 60-metres wide and 4000-metre in length, are separated by a 1.64-kilometre gap, which houses the terminal buildings. “For an airport of that size, the building period was usually ten years. We completed Changi Airport in six. We demolished hundreds of buildings, exhumed thousands of graves, cleared swamps and reclaimed land from the sea. When it opened in July 1981, it was Asia’s largest airport.”

The crucial role of Singapore’s Authorities - and former PM Lee Kuan Yew - in realising the vision of Singapore International Airport is present throughout the literature on Changi’s ‘Success-Story’. It is interesting to note how the role of the controversial Singapore Planning and Urban Research Group (SPUR) in relocating the civil airport to the eastern end of the island is absent from official accounts. As if such a crucial decision for the City-State in the ‘nation-building era’ could only be taken by its government. As Tay Kheng Soon argues SPUR were the first to propose the relocation of the International Airport at Changi.

“A map from the government’s plan to extend Paya Lebar ‘leaked’ from the public work department to us [SPUR]. We were shocked by the proposal! The group studied the implications on noise, pollution, and relocation for the neighbouring areas and went public on the 23rd February 1971 illustrating the implications and proposing to locate the airport at Changi. Howe Yoon Chong [the Permanent Secretary in the Prime Minister’s Office at that time] was very upset.”

SPUR was inevitably drawn into controversy and told to stay on the ‘dreamers side’ by the government. Although Howe Yoon Chong became a key figure in the realisation of Changi Airport, SPUR was never mentioned or included in the planning of the airport.

Changi’s role is crucial in that it epitomises the close bond of the City-State to the world. As Singapore Airlines (SIA) - Changi Airport’s major tenant - said in its promotional literature announcing the construction of the new airport “The aim of this gigantic programme is to place Singapore firmly as the premier junction for passenger and cargo traffic in this part of the world, and to reinforce SIA’s position as the outstanding airline of the region.” The early promotional literature on Changi is filled with such buzzwords as “Garden City”, “Shoppers’s Paradise”, “most”, “biggest”, “largest” or “best”. As Lin notes, given that ‘indigenous’ traffic sustaining airline business “was something that the ‘hinterland-less’ city could ill-afford, one of the earliest strategies undertaken by the city-State was to develop a strong network carrier (SIA) and a new competitive airport (Changi) that would (re)channel a critical mass of international traffic to transit through Singapore.”

13 The earth was reclaimed cutting away 12-million cubic metres and levelling some hills from 26-metres above sea level to a mere 4-metres. (Changi Airport Development Division 1981, 8)
14 Tay Kheng Soon, interview with the author, November 2012, National University of Singapore.
Set up of Selatarairbase by the British RAF after recognizing the importance of Singapore as its Far East headquarters.

Kallang Airport is opened & hailed as one of the finest airport in the British Empire. Air travel at this stage depends mostly on revenue from cargo and air mail services. In the first year of Kallangs opening there are 2,735 passengers arrivals/departures and 32 tons of mail for the whole of Malay.

Japanese forces use POW labour to build air base at Changi & Paya Lebar. Two East/West airstrip are laid out at Changi and used for fighter aircraft.

British RAF takes over the Changi airbase after WWII resulting in the expansion of Changi airport and the surrounding area as the Royal Air Force headquarters. Upgrade of the E/W airstrip and lay out of a North/South bituminous runway.

Plans to replace Kallang airport - increasingly unable to cope with larger and heavier aircraft and located to close to the harbor and built-up area. Paya Lebar – a coconut plantation 8km northeast of the town center is selected. Paya Lebar Airport opens in 1955.

Changi Airport is opened.

Construction begins for Changi Terminal 2 and in 1990 the airport doubles its passenger handling capacity to 24 million/year.

Refurbishment of Terminal 1 and extension of Terminal 2.

Completion of Terminal 1 extension and start of Terminal 3 construction.
### Development

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
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<tbody>
<tr>
<td>1960</td>
<td>The government of Singapore and Malaysia acquire joint majority holding in Malayan Airways, renaming it <strong>Malaysia Singapore Airlines</strong>.</td>
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<tr>
<td>1966</td>
<td>Withdrawal of British Royal Air Forces and take over of military and civil airports by Singapore Ministry of Defence. The Republic of Singapore Air Force take over the <strong>Changi Airbase</strong> from British RAF in 1970.</td>
</tr>
<tr>
<td>1980</td>
<td>Birth of <strong>Singapore Airlines</strong>. After decision to divide MSA into 2 carriers, the second one being Malaysian Airlines System.</td>
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<tr>
<td>1975</td>
<td>Paya Lebar faces congestions and is difficulties of expanding the airport inland. A year later the <strong>masterplan for Changi Airport</strong> is unveiled. Site preparations, including massive earthworks and reclamation from the sea, begin. Paya Lebar will later be handed over to Singapore Airforce.</td>
</tr>
<tr>
<td>1998</td>
<td>The airport handles seven million passengers a year.</td>
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<tr>
<td>2002</td>
<td><strong>MRT</strong> station at Changi opens, connecting the city and airport with a rapid train link.</td>
</tr>
<tr>
<td>2005</td>
<td><strong>Budget Terminal</strong> opens. Changi Airport was the second in Asia to open a dedicated terminal catering to the budget traveller. The terminal now handles seven million passengers a year.</td>
</tr>
<tr>
<td>2006</td>
<td><strong>Terminal 3</strong> became operational on 9 January 2008, increasing the airport's annual passenger capacity by 22 million.</td>
</tr>
<tr>
<td>2008</td>
<td>Changi is voted 'Best Airport in the World' by business Traveller for the 21th consecutive year.</td>
</tr>
<tr>
<td>2010</td>
<td><strong>T4 Terminal of the future &amp; Project Jewel</strong></td>
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<tr>
<td>2011</td>
<td><strong>T3 Mega Terminal and airport extension</strong></td>
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**Appendix**

Anna Gasec  The Airport and the Territory  199
III. HISTORY OF CHANGI AIRPORT’S PERIPHERY (THE AIRPORT AREA)

In 1927 Changi’s strategic location at the mouth of the Strait was chosen as ‘Fortress’ for the batteries of heavy guns to defend the seaward approach in light of the emergence of Japan. Described as partly mangrove swamp and partly virgin forest, Changi was a remote spot at the eastern tip of the island, “far from the buzz of commercial and social activity that marked the downtown area.” (Hutton 1981, 35) As Probert describes it

“The road from Singapore City ended near the mouth of the Changi River, beside the police station, from where a narrow track entered a dark natural tunnel through dense jungle […] Apart from the police station and the nearby village, the only buildings were a private bungalow […] owned by the Public Works Department a little further along the coast, and a Japanese hotel. This was an attap structure built on piles over the sea, with numerous cubicles to house ladies of easy virtue. Early in 1927 the ladies were evacuated and the hotel was reconstructed internally to become the first Officer’s Mess.” (Probert 2006, 1, 3)

The mangrove swamps were filled, the jungle reclaimed and the rubber plantations turned into a military base. The physical growth between 1934 and 1941 was inevitably accompanied by development of several welfare facilities to cater for the growing family population. (Fig. 6-2)

“Many of the attractive old colonial bungalows that still adorn Changi were erected at this time; tree-planting flourished as a deliberate matter of policy, […] For troops and families garrisoned at Changi in the immediate pre-war years, life was good: cinemas, clubs, swimming pools…” (Hutton 1981, 36)

After the British surrendered to the Japanese in February 1942, Changi was turned into a “gigantic prison camp, in which all Allied troops would be concentrated.” (Probert 2006, 27) Between 1943 and 1945 the allied prisoners were used to build an airfield for Japanese fighter aircrafts. But what influenced Changi’s surroundings the most during these early days was the area’s development as the main RAF base east of Suez once Singapore reverted to the British in 1945. The busiest construction period lasted from 1948 to about 1956, with new working accommodation in the area South of Changi Village, followed by the construction of schools - serving around 2000 children in early 1960s (ibid, 74), and other amenities such as the RAF hospital, churches, social clubs, theatres, sports facilities, etc. Coupled with the nearby Changi Village amenities, the beaches and the village-like atmosphere, Changi was “one of the most modern and well-appointed stations in the RAF [and] provided the experience of a lifetime.” (ibid, 83) (Fig. 6-3)

The name Changi comes from Chengai, the local name for one species of Balancarpus, a valuable timber tree once common in Singapore. (Hutton 1981)
Fig. 6-2 Map of Changi -1942, Source: Probert 2006

Fig. 6-3 Map of RAF Headquarters -1965, Source: Probert 2006
IV. UPCOMING REGIONAL MRO’S HUB: BINTAN INDUSTRIAL ESTATE’S REGENERATION

Located at Lobam in the northwest of Bintan Island, the 270ha Bintan Industrial Estate (BIE) was conceived, at the same time than Batamindo’s 320ha Industrial Park in Batam (BIP). BIP and BIE began operations in 1992 and 1994 respectively. Also owned and developed by Gallant Venture with a similar conducive and hassle free business model for foreign investors, both industrial parks served “as an extension of manufacturing space from Singapore” to host labour-intensive industries (Bunnell, Muzaini, and Sidaway 2006). The parks’ designs are broadly identical. Both parks are master-planed as ‘self-sufficient infrastructures’16, surrounded by a well-guarded fence. They both offer direct freight and ferry connections to Singapore: through Batam’s main seaports for BIP; and for BIE, through its own port —Lobam Terminal— located inside the park and offering a dedicated ferry terminal, container port and customs office for this coined “Sea-front industrial park.” (Fig. 6-4/5)

As shown in the previous chapters, BIP boost a rich ‘high-tech’ manufacturing industry. The park has been successfully developed with over 70 MNCs from Europe, Japan, USA and Singapore, and creates employment for 60,000 workers. On the other hand BIE performance remains modest. In 2004 Yeoh and all listed only 35 tenants and 13,000 workers (Yeoh, Koh, and Cai 2004). This number has abruptly dropped to 6 registered companies —and related empty rows of migrant’s dormitories— in 2014 at my last visit in the park17. BIE’s investor profile is largely Singaporean and engaged in relatively low value-added light industries such a textiles, footwear and woodworking. According to Yeoh et all reasons for BIE’s struggle include rising labour costs in recent years (vis-à-vis lower cost locations such as Vietnam, Myanmar and Bangladesh) in a low value-added industry; competitions from newer parks in the vicinity (especially in Batam); and restricted appeal of its operating conditions. (Ibid)

16 Inside, the enclaves’ urban landscapes are dominated by rows of factories and dormitories housing for migrant workers. They contain their own neat tree-lined roads; power and water treatment plants; telecommunication towers; small commercial town centers with shops, food courts, places of worships, etc. BIE includes a separated ‘water-front living’ residential quarter dedicated to managers with townhouse, a pool, a club house and a mini gold-course, while BIP’s international managers ‘Executive Village’ is located 15 minutes away by car in the golf resort of Southlinks Country Club in Batam.

17 Migrant workers interviewed within Bintan Industrial Park, author’s fieldwork, February 2014.
Bintan’s new MRO facility could revive the dormant estate while benefitting from its existing infrastructures, such as a dedicated township, dormitories and town center to cater for the 1,500 technicians and engineers —sourced ‘locally’— that the joint venture is foreseeing to hire in the first five years.\(^{18}\)

BIE was chosen to locate Bintan new MRO centre due to its “sea-front” location, enabling the integration of airport and seaport terminal “so that the movement of aircraft components will be easy and efficient.” (GMF and BAl 2014) The airline operations and the Aerospace Industrial Park will aim to “boost the local economy and create substantial job opportunities as well as upgrading skill sets and standards of living for the people of the Riau Island” said Frans Gianto Gunara, Gallant Venture executive director. The expansion of BIP into an MRO center with premium airport facility linked to the future plans of BBIR —such as Lagoi Bay or Treasure Bay— “will be the spearhead of the economic developments of the Riau Islands province.”

\(^{18}\) To support the development and the operations of MRO activities in Bintan, GMF has established a cooperation with the Regional Government of Riau Islands province to select, educate and train the best local youth to be the future core of technicians and engineers of the Bintan MRO. Currently the selected students are being sent to Suryadharma University in Jakarta to obtain the ‘D3 certificate’ along with the General License. In the first five years, the JV Company will employ more than 1500 employees. (ibid)
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Anna Gasco The Airport and the Territory 207


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