A PUBLICATION BY **PENANG INSTITUTE**

***PENANG ECOSYSTEM STUDIES* SERIES**

Penang's Logistics Industry: **Connecting the Parts**

***Penang Ecosystem Studies* Series**

Penang's Logistics Industry: **Connecting the Parts**

By

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Acknowledgements

The authors are grateful to the industry members in the logistics and freight transportation industry, industry associations, government agencies, and economic development professionals in Penang and overseas who have generously provided their invaluable comments for this report.

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The report is initiated and edited by Dato' Dr. Ooi Kee Beng.

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Executive Summary

- The logistics industry is a key component of Penang's economy, with induced demand from the robust and expanding manufacturing sector. The transportation and storage industry contributed 3.1% (using value-added approach) to Penang's Gross Domestic Product (GDP), with a Compound Annual Growth Rate (CAGR) of 7.2% (2017-2019). It employed more than 22,000 workers in 2020.

- This report assesses the current state of Penang's logistics and freight transportation, and its role in propelling Malaysia as a preferred gateway into and through Asia. Its specific objectives are as follows:
  - To identify the untapped potentials of Penang International Airport (PIA) and Penang Port as the country's main air and sea channels of logistics in terms of efficiency, productivity, and adoption of technologies;
  - To study the state of the free commercial zones (FCZs) of PIA and Penang Port and their ability to attract greater transshipments and higher value-added activities;
  - To evaluate the industrial-logistics synergies in Penang's economy; and
  - To investigate the talent and labour landscape of the logistics industry and the requirements necessary for the industry's upgrading.

- The main trade channels for Penang are the Penang International Airport (PIA) and the North Butterworth Container Terminal (NBCT). In 2021, PIA handled 21.95% (RM 488.83 billion) of Malaysia's trade values, while NBCT managed another 4.67% (RM 104.1 billion) of these. Thus, together, the two trade channels were responsible for 26.62% (RM 592.9 billion) of Malaysia's trade passing through.

- The boom in e-commerce has fueled the logistics sector in Penang and Malaysia.

- Some recent development affecting Penang's logistics industry include: (1) Penang's and Malaysia's rising integration into the global supply chain, (2) New opportunities for expansion in the cold-chain logistics segment, (3) Increase in Penang Port's targeting of ultra-large container vessels (ULCV) and its provision to multinational corporations with regional distribution centre (RDC) set-ups, (4) Initiation of the Digital Free Trade Zone (DFTZ) in Penang and its multiplier effect on the logistics industry, and (5) Rebranding of logistics jobs and programmes to capture the interest of students.

- High-skilled vacancies make up more than 70% of the logistics job vacancies, requiring at least a diploma and above. There exists subsequent skill-related underemployment in the sector.

- Increased innovation in logistics and freight is key to advance efficiency and productivity in the industry. Noticeably, automation and digitalisation are key aspects in Penang's Digital Transformation Master Plan (DTMP).

- Enhanced airport, seaport and their FCZs has a huge potential to become developmental nodes in areas such as Batu Maung, Teluk Kumbar, and Bayan Lepas (in the Southwest district) and Butterworth (in the North Seberang Perai district).

- Issues and challenges for the logistics and freight industry in Penang are within the following areas:
  - Infrastructure and business processes
  - Air and maritime connections to support industrial activities in the state
  - Space of untapped FCZ for scaled-up logistics, warehousing, storage, and transshipment
  - Synergies of logistics with economic activities
  - Skill-underemployment for non-executive jobs

- This study recommends that Penang increases its role in servicing the global supply chain through efficient trade channels and ports operations by enhancing the role of logistics and warehouses. This suggests a move from the role of being a state with channels for trade passing through to becoming an efficient enabler of trade, supporting the national aspiration for Malaysia to become the preferred logistics gateway into the region.

- Key recommendations are grouped under the three large domains:
  - Capitalising on infrastructures that accentuate Penang's comparative advantages in the regional and global economy and increase the catchment of growth industries and companies.
  - Synergising logistics industry developments by incorporating growth trends and new growth areas.
  - Increasing the adoption of technology, digital transformation and advanced efficiency in processes.

Chapter 1
Overview of Penang's logistics industry

1.1 Introduction

Logistics is defined as the process of inbound, outbound, internal, and external movements (Mangan & Lalwani, 2016) and is a cluster of activities involving a range of different players and services (see Vitasek, n.d.). This report focuses on the following areas: freight transportation, freight forwarding, and warehousing and free zones related to these activities in Penang. While the discussions may involve passenger transportations and lines, the main focus is on logistics and freight.

The logistics industry is a key component of Penang's economy, with induced demand from the robust and expanding manufacturing sector. There has been a deepening of industrial activities in Penang over the years, especially in the electrical and electronics industry, directly integrating the state into regional and global supply chains. The transportation and storage industry contributed 3.1% (using the value-added approach) to Penang's Gross Domestic Product (GDP), with a Compound Annual Growth Rate (CAGR) of 7.2% (2017-2019). More than 22,000 workers in 2020 were employed within the industry (see Table 1.1).

Table 1.1: Principal statistics of transportation and storage industry in Penang, 2017-2020

	2017	2018	2019	2020	CAGR (2017-2020)	CAGR (2017-2020)
Value of gross output (RM mil)	5,311	5,659	6,016	4,492	**6.4%**	-5.4%
Value of intermediate input (RM mil)	2,747	2,913	3,069	2,138	**5.7%**	-8.0%
Value added (RM mil)	2,564	2,746	2,947	2,354	**7.2%**	-2.8%
Number of persons engaged	22,163	22,990	23,969	22,583	**4.0%**	**0.6%**
Salaries and wages paid (RM mil)	649	691	749	644	**7.4%**	-0.2%
Value of fixed assets (RM mil)	4,578	4,887	5,203	4,582	**6.6%**	**0.03%**

Note: The CAGR are calculated for the periods of 2017-2019 and 2017-2020, taking note of the economic and Covid-19 challenges in 2020.

Source: Annual Economics Statistics, Department of Statistics, Malaysia

The aim of this report is to assess the current state of Penang's logistics and freight transportation in propelling Malaysia towards being a preferred gateway into and through Asia. Its specific objectives are:

1. To examine the untapped potentials of Penang International Airport (PIA) and Penang Port as the country's main air and sea channels of logistics in terms of efficiency, productivity, and adoption of technologies;
2. To study the state of the free commercial zones (FCZs) of PIA and Penang Port and their ability to attract greater transshipments and higher value-added activities;
3. To evaluate industrial-logistics synergies in Penang's economy; and
4. To investigate the talent and labour landscape of the logistics industry in Penang and the requirements necessary for the industry's upgrading.

The importance of this study is multi-fold. Firstly, the logistics industry plays a key role in connecting supply chains to facilitate the efficient flow of goods domestically and internationally. It is a key support for Penang's manufacturing sector, which is driven by the semiconductor, electrical and electronics, medical devices, and other manufacturing industries. The efficiency of the logistics industry is thus vital to global manufacturing value chains, and to the competitiveness of the country within them (Hofman, 2017).

Secondly, Penang is a pillar of Malaysia's trade and plays a prominent role in supporting the county's status as an export-oriented nation. This is especially important due to the fact that Malaysia exhibits a steady trade surplus in the trade of goods but a deficit in the trade of services. In 2020, Penang's total trade in goods was valued at RM500.4 billion while the state's GDP was RM94.7 billion – hence Penang's trade in goods-to-GDP ratio is 528.4%, far greater than the national trade in goods-to-GDP ratio of 116.0%. Optimal allocations of resources and investments in logistics would allow Penang to punch even further above its weight in support of national development.

Thirdly, the air and sea channels which have played a vital role in supporting Penang's trade can further advance the economic development of its surroundings, turning areas such as Batu Maung, Teluk Kumbar, and Bayan Lepas (in the Southwest district) and Butterworth (in North Seberang Perai district) into developmental nodes.

1.2 Penang's main trade gateways

The main trade channels for Penang are the Penang International Airport (PIA) and the North Butterworth Container Terminal (NBCT). In 2021, PIA contributed 21.95% (RM 488.83 billion) of Malaysia's trade values passing through the airport while NBCT contributed 4.67% (RM 104.1 billion) of trade values passing through the seaport. Together, these two saw 26.62% (RM 592.9 billion) of Malaysia's trade values passing through them.

Penang International Airport

PIA is the airport with the highest value of goods passing through it. In 2020, the total cargo throughput of PIA reached RM402.2 billion at 137,685 metric tonnes (Table 1.2). In comparison, KLIA recorded total cargo throughput of 505,184 metric tonnes, but despite the huge tonnage, this has the value of only RM143.4 billion. PIA's higher value is due in large part to Penang being the stronghold of the electrical and electronics (E&E) industry. The total value of Penang's trade is influenced strongly by this high-tech industry integrating into the global supply chain. In the past 10 years, Penang has attracted at least ⅓ of Malaysia's total E&E investments.

Table 1.2: Cargo passing through PIA

Year	Total trade value (RM mil)	Cargo movements (metric tonnes)
2011	N/A	131,846
2012	N/A	123,246
2013	212,262	153,703
2014	237,205	141,213
2015	250,132	130,392
2016	261,492	130,491
2017	316,444	134,187

2018	367,284	145,649
2019	360,738	139,646
2020	402,151	137,685
2021	488,825	N/A

Source: Malaysia Airports and Department of Statistics, Malaysia

Over the years, more new lines of passenger and/or cargo flights into/from Penang airport have appeared, reflecting Penang/Malaysia linkages to key export/import/trade partners and tourism destinations. These destinations include Medan, Hong Kong, Pekanbaru, Kunming, Seoul, Singapore, Hat Yai, Jakarta, Quanzhou, Shenzhen, and Taipei (Table 1.3).

Table 1.3: New air passenger destinations with Penang airport

<table>
<tr><th></th><th>2013</th><th>2014</th><th>2016</th><th>2017</th><th>2019</th><th>2020</th></tr>
<tr><td rowspan="3">New Route(s)</td><td>Medan-Penang</td><td>Melaka-Penang</td><td>Kunming-Penang</td><td>Singapore-Penang</td><td>Jakarta-Penang</td><td rowspan="3">Taipei-Penang</td></tr>
<tr><td rowspan="2">Hong Kong-Penang</td><td rowspan="2">Pekanbaru-Penang</td><td>Seoul-Penang</td><td rowspan="2">Hat Yai-Penang</td><td>Quanzhou-Penang</td></tr>
<tr><td>Thailand-Penang</td><td>Shenzhen-Penang</td></tr>
</table>

Note: Non-exhaustive.
Source: Annual reports of MAHB

Penang Port

Table 1.4 shows the key operational data of Penang Port. According to MMC Corp, Penang Port underwent major operational improvements with NBCT T1 upgrading works in August 2020. The upgrade expands NBCT's handling capacity from 2.1 million TEUs to 2.4 million TEUs, and makes berth operations much more flexible. The report also highlights Prai Wharf to be developed into a liquid storage facility for petroleum products.

Table 1.4: Penang Port operational data

Capacity (million TEUs)	2.4
Throughput (million TEUs)	1.4
Capacity Utilisation	56%
Local: Transshipment Ratio	92:8
Water Depth (metre)	11.0 -12.0
No. of Container Berths	6
Container Quay Length (KM)	1.5
No. of Container Quay Cranes	12

Source: MMC Annual Report, 2020

Penang Port functions as a major regional port, even if it commands a relatively lower volume compared to other major ports in Malaysia. According to Lloyd's List One Hundred Ports 2019, two Malaysian seaports are included based on throughput, namely Port Klang and Pelabuhan Tanjung Pelepas. Six ASEAN countries' seaports (Singapore, Malaysia, Thailand, Indonesia, Viet Nam and the Philippines) are represented in the Lloyd's ranking (Table 1.5).

Table 1.5: Ranking of ASEAN ports (named among the top one hundred ports) based on throughput, 2020

Ranking (top 100 ports)	Port (Country)
2	Singapore
12	Port Klang (Malaysia)
18	Tanjung Pelepas (Malaysia)
20	Laem Chabang (Thailand)
22	Tanjung Priok (Indonesia)
25	Ho Chi Minh City (Viet Nam)
29	Manila (Philippines)
45	Tanjung Perak (Indonesia)
48	Cai Mep (Viet Nam)

Source: Lloyd's List One Hundred Ports 2020, https://lloydslist.maritimeintelligence.informa.com/one-hundred-container-ports-2020

Penang Port Sdn Bhd (PPSB) has attributed the following factors as their key drivers:

1. **Activities and growth of companies in industries that utilise Penang Port, mainly in the northern region of Malaysia.**
   The port activities are also spurred by activities using maritime logistics. For example, MMC annual report 2020 explains that XSD Paper International (in the paper and paper products industry in Kedah) plans to break bulk at Butterworth Container Depot (BWCT), which will contribute to PPSB earnings.

2. **The industrial growth in the local hinterland and South Thailand, and new businesses and transshipment from the Bay of Bengal.**
   PPSB intends to maintain its position as a 'hub port' to attract cargo volumes from the Bay of Bengal. The focus will be on regional feeder port connectivity and intra-Asian

connectivity. Increasing ad-hoc calls will raise container and cargo handling throughput (MMC annual report, 2020).

Penang Port is also an important container seaport that serves the Indonesia–Malaysia–Thailand Growth Triangle (IMT-GT) region. According to a seaport life cycle analysis by Jeevan et al. (2021), Penang Port is currently in a growth stage and is expected to have continuous growth from 2018 to 2050. Penang Port was designed to handle 2 million TEUs in 2017 and is expected to be fully utilised before 2025, based on the forecasted container throughput. Jeevan et al. have highlighted a need for Penang Port to ensure that its handling capacity caters to long-term future demand, especially from northern Peninsular Malaysia.

Box 1.1 Effects of Covid-19 on the logistics industry in Penang

In an analysis by Penang Institute (2021), trade activity in Penang rebounded after a one-month dip in May 2020 following the movement control order (MCO) in Malaysia implemented in March 2020. This was due to strong external demand despite supply chain disruptions. The trade surplus in Penang's exit and entry points increased by 3.2%, with exports and imports increasing by 6.5% and 8.4% year-on-year, respectively.

When analysed by airport and seaport, the Bayan Lepas airport exhibited a growth rate of 9.8% in 2020. Meanwhile the North Butterworth Cargo Terminal contracted by 7.7%. Penang Port estimated that due the COVID-19 pandemic, throughput volume and ship calls would decline (MMC Annual Report, 2020). This indicates the differences in the experience of air and sea throughput, largely due to the differences in products allowed to be manufactured during MCO and the demand for goods such as electronics and medical equipment.

Based on Penang Institute's interviews with industry stakeholders, the cost of sea freight has increased hugely due to COVID-19 and shipping issues. The shipping cost for some destinations has increased about tenfold.

Besides, the shutdown of production and operation led to a shortage. When production and operations resumed, there were a lot of backlogs, which went on to affect operations and logistics.

Since logistics remained more than ever an essential industry during the MCO, it has not experienced a prolonged drop in income and activities despite the challenging operating conditions.

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Structure of goods passing airport and seaport

Penang's E&E products are mostly, if not all, shipped by air, and these products dominate Penang's exports and imports data. In 2020, in terms of major export product groups, Penang contributed 68.2% of Malaysia's RM189.3 billion in exports of electronic integrated circuits (IC), and 44.0% of RM88.6 billion in other E&E products. In 2020, the electronic IC and other E&E products contributed more than half (53.8%) of Penang's total exports. Other product groups in the Top 10 list such as 'telecommunications equipment, parts and accessories', 'piezo – electric crystals & parts', 'other valves and tubes, photocells, etc.', 'parts and accessories for office machines and automatic data-processing equipment', and 'electrical apparatus & parts' are broadly linked to the E&E industry as well. In terms of major imports by product groups, the electronic IC, piezo-electric crystals & parts, and other E&E products, contributed more than half (54.5%) of Penang's total imports in 2020.

Some of the products that likely pass through the seaport (in the top 20 export/import list) are refined petroleum products, base metals, tin ores, raw beet and cane sugar and plastics (Table 1.6 and Table 1.7).

Table 1.6: Penang's major imports by major products groups, 2015-2020

	2015	2016	2017	2018	2019	2020
	RM million					
Total merchandise exports	181,577	188,455	229,612	284,741	283,972	312,359
Electronic integrated circuits	58,803	57,206	72,717	116,207	113,037	129,103
Other electrical & electronic products	24,812	24,177	31,415	37,994	40,169	39,048
Professional, scientific and controlling instruments and apparatus, n.e.s.	13,517	15,651	17,802	20,884	22,750	24,467
Telecommunications equipment, parts and accessories	15,095	17,620	18,019	17,677	17,992	20,312
Piezo - electric crystals & parts	9,885	10,392	13,655	13,318	16,126	19,113
Other valves and tubes, photocells, e.t.c.	4,939	7,721	8,573	9,901	10,223	10,752
Parts and accessories for office machines and automatic data processing equipment	10,347	8,450	7,076	7,173	5,364	7,607
Electrical apparatus & parts	8,008	7,379	7,288	6,356	6,709	5,437
Jewellery of gold, silver and precious stones, including imitation	6,390	5,869	5,191	4,813	4,925	2,756
Palm based oleochemical	2,482	2,980	3,438	3,086	2,441	2,426
Tin, not alloyed	317	414	518	1,018	669	720

Rubber gloves	304	308	332	297	325	622
Aircraft & associated equipment and parts	537	609	916	954	1,090	557
Wooden and rattan furniture	316	305	333	350	470	554
Palm oil	572	417	708	464	512	496
Other exports commodities	25,253	28,958	41,631	44,249	41,171	48,389
	Percentage share (%)					
Total merchandise exports	100	100	100	100	100	100
Electronic integrated circuits	32.4	30.4	31.7	40.8	39.8	41.3
Other electrical & electronic products	13.7	12.8	13.7	13.3	14.1	12.5
Professional, scientific and controlling instruments and apparatus, n.e.s.	7.4	8.3	7.8	7.3	8.0	7.8
Telecommunications equipment, parts and accessories	8.3	9.3	7.8	6.2	6.3	6.5
Piezo - electric crystals & parts	5.4	5.5	5.9	4.7	5.7	6.1
Other valves and tubes, photocells, e.t.c.	2.7	4.1	3.7	3.5	3.6	3.4
Parts and accessories for office machines and automatic data processing equipment	5.7	4.5	3.1	2.5	1.9	2.4
Electrical apparatus & parts	4.4	3.9	3.2	2.2	2.4	1.7
Jewellery of gold, silver and precious stones, including imitation	3.5	3.1	2.3	1.7	1.7	0.9
Palm based oleochemical	1.4	1.6	1.5	1.1	0.9	0.8
Tin, not alloyed	0.2	0.2	0.2	0.4	0.2	0.2
Rubber gloves	0.2	0.2	0.1	0.1	0.1	0.2

Aircraft & associated equipment and parts	0.3	0.3	0.4	0.3	0.4	0.2
Wooden and rattan furniture	0.2	0.2	0.1	0.1	0.2	0.2
Palm oil	0.3	0.2	0.3	0.2	0.2	0.2
Other exports commodities	13.9	15.4	18.1	15.5	14.5	15.5

Source: Calculations by author based on data from Department of Statistics, Malaysia

Table 1.7: Penang's major imports by major products groups, 2015-2020

	2015	2016	2017	2018	2019	2020
	RM million					
Total merchandise imports	135,411	144,021	177,936	185,654	177,795	187,990
Electronic integrated circuits	34,160	36,668	53,881	60,498	52,548	61,632
Piezo-electric crystals & parts	19,587	20,294	24,141	22,525	27,297	26,553
Other electrical and electronic products	9,691	10,877	13,122	14,104	13,554	14,294
Electrical apparatus & parts	7,435	7,939	8,645	9,904	10,108	12,035
Measuring, checking, analysing and controlling instruments and apparatus	4,657	5,378	5,679	5,375	5,760	6,377
Telecommunication equipment, parts and accessories	4,536	5,395	5,042	4,519	5,100	5,505

Parts and accessories for office machines and automatic data processing equipment	4,274	3,974	4,034	4,753	4,824	5,032
Gold, non-monetary	6,509	6,671	9,197	7,628	6,127	4,552
Other valves and tubes, photocells, e.t.c.	3,214	3,217	3,699	3,874	2,577	2,904
Refined petroleum products	2,183	1,948	2,222	1,874	2,431	2,694
Machinery & equipment specialized for particular industries & parts	1,815	2,174	3,177	2,714	2,480	2,502
Manufactures of base metal, n.e.s.	1,340	1,488	1,658	1,654	1,874	2,026
Tin ores and concentrates	302	355	482	1,161	1,438	1,338
Raw beet and cane sugar	1,410	1,578	1,941	703	615	1,162
Articles of plastics, n.e.s.	924	870	913	980	957	1,099
Other imports commodities	33,373	35,194	40,105	43,387	40,106	38,286
	Percentage share (%)					
Total merchandise imports	100.0	100.0	100.0	100.0	100.0	100.0
Electronic integrated circuits	25.2	25.5	30.3	32.6	29.6	32.8
Piezo-electric crystals & parts	14.5	14.1	13.6	12.1	15.4	14.1
Other electrical and electronic products	7.2	7.6	7.4	7.6	7.6	7.6
Electrical apparatus & parts	5.5	5.5	4.9	5.3	5.7	6.4
Measuring, checking, analysing and controlling instruments and apparatus	3.4	3.7	3.2	2.9	3.2	3.4

Telecommunication equipment, parts and accessories	3.3	3.7	2.8	2.4	2.9	2.9
Parts and accessories for office machines and automatic data processing equipment	3.2	2.8	2.3	2.6	2.7	2.7
Gold, non-monetary	4.8	4.6	5.2	4.1	3.4	2.4
Other valves and tubes, photocells, e.t.c.	2.4	2.2	2.1	2.1	1.4	1.5
Refined petroleum products	1.6	1.4	1.2	1.0	1.4	1.4
Machinery & equipment specialized for particular industries & parts	1.3	1.5	1.8	1.5	1.4	1.3
Manufactures of base metal, n.e.s.	1.0	1.0	0.9	0.9	1.1	1.1
Tin ores and concentrates	0.2	0.2	0.3	0.6	0.8	0.7
Raw beet and cane sugar	1.0	1.1	1.1	0.4	0.3	0.6
Articles of plastics, n.e.s.	0.7	0.6	0.5	0.5	0.5	0.6
Other imports commodities	24.6	24.4	22.5	23.4	22.6	20.4

Source: Calculations by author based on data from Department of Statistics, Malaysia

Box 1.2 Global and regional distributions centres in Penang

Broadcom and B.Braun are two companies with significant distribution hubs being based in Penang.

In 2017, Broadcom relocated its two offshore warehouses into Batu Kawan Industrial Park Global Distribution Warehouse (with Principal hub status). The facility would manage shipment of 4 billion units. The company invested RM59 million for the facility (excluding freight expenses).

B.Braun launched its Regional Distribution Centre (RDC) in Penang in 2004 to serve its customers in the Asia Pacific region, and increase shipments of the company's medical devices from Penang.

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Box 1.3 Trends of e-commerce in Penang and Malaysia

Covid-19 has accelerated the growth of online shopping, a a trend that already begun before the pandemic. A total of 4.2 trillion USD is projected to be spent on e-commerce worldwide for the year of 2021 alone[1]. If online shoppers were a nation, its national expenditure would be slightly lower than Germany's Gross Domestic Product (GDP), and ahead of the United Kingdom[2].

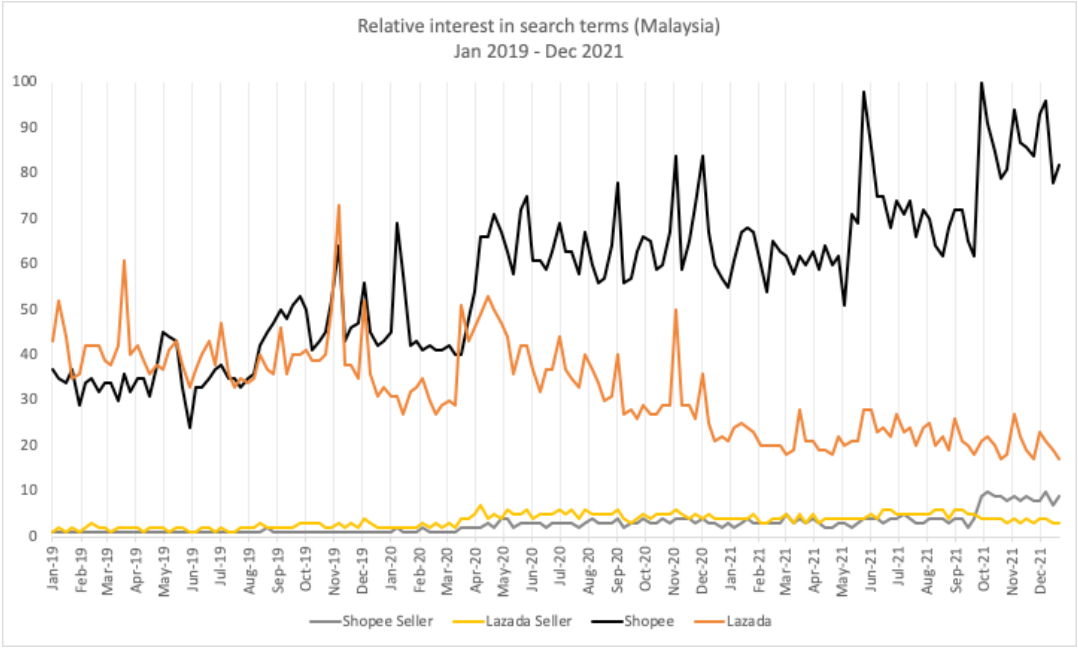
Search interest data from Google measure the amount of interest for a particular term or topic, and not search volume. In this case, the terms of interest are some popular e-commerce platforms: Lazada, and Shopee. Search interest is indexed at 100, which indicates peak interest for a particular time period (Jan 2019 - Dec 2021). This index also allows us to compare interest between different terms.

In general, Malaysians' interest in e-commerce sites increased significantly after the first pandemic lockdown in March 2020 (Figure 1). Interest in terms such as "Shopee" and "Lazada" surged with each new announcement of a national lockdown (March 2020, November 2020, June 2021) as users sought out online marketplaces. In particular, the increased interest in selling on these platforms, as indicated by the terms "Shopee Seller" and "Lazada Seller" strongly suggests that the online marketplace has expanded too.

Interest in Shopee remained at new highs all throughout 2020 and 2021, but the same cannot be said for its competitor. Lazada's popularity peaked in April 2020, and interest in the site has since declined. Relative interest in Lazada was only 20% of that of Shopee at its peak (October 2021).

1 "Adobe Digital Economy Index, Q1 2021". Adobe Analytics. 2021. Retrieved 15 October 2021.
2 "World Economic Outlook Database, April 2021". International Monetary Fund. April 2021. Retrieved 8 May 2021.

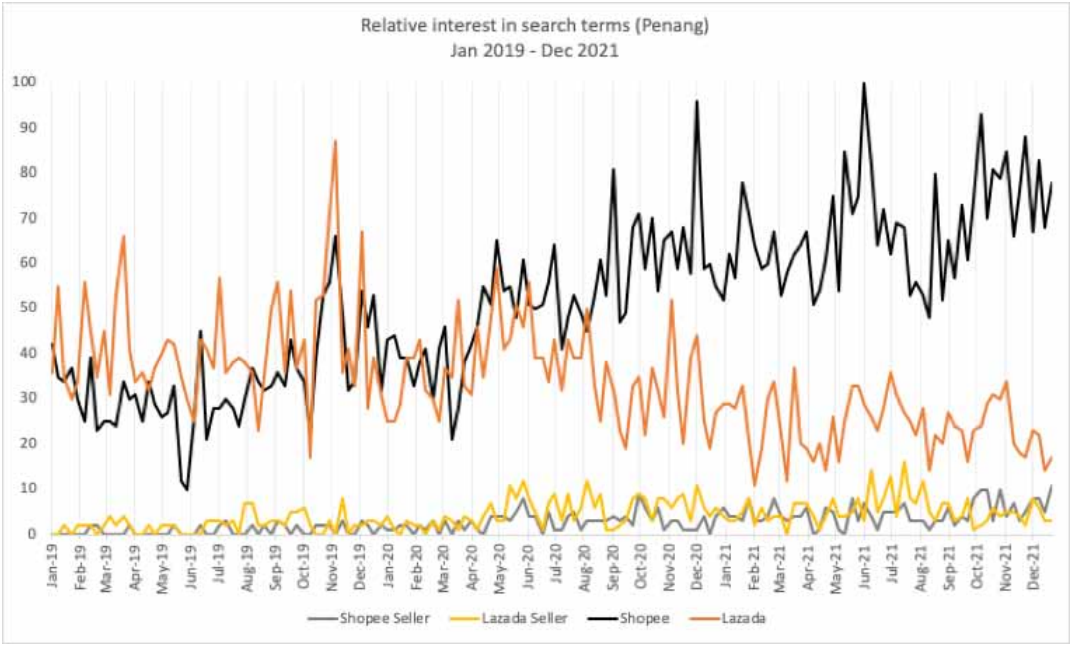
Figure 1: Relative interest in search terms (Malaysia)



In Penang, e-commerce trends are on the rise too (Figure 2). More notably, relative interest in selling is higher in Penang, compared to the rest of Malaysia.

The boom in e-commerce has fueled the development of logistics in Penang and Malaysia. The sheer increase in e-commerce trade has expanded the size of the logistics industry. Not only that, it has matured significantly too. The integration of online shopping into daily life means that buyers and sellers are demanding increasingly sophisticated and convenient forms in the managing of their shipments. For example, to create seamless transactions, Shopee has started providing users with its own delivery service, Shopee Express.

Figure 2: Relative interest in search terms (Penang)



1.3 Lensing on Malaysia's logistics performance index (LPI)

The World Bank's Logistics Performance Index (LPI)[3] allows a greater analysis of the logistics system and infrastructure. LPI allows key differences between nations to be analysed and provides an overview of custom procedures, logistics costs and the quality of infrastructure for sea and land transportation (Marti et al., 2014). The six main components of LPI are customs, infrastructure, international shipments, logistics quality and competence, tracking and tracing and timeliness.

Marti (2014) analysed the importance of LPI on trade in emerging countries by employing the gravity model and found that the most important components of LPI are infrastructure, timeliness and customs. Developing countries need more development in their components of LPI in the complex network of international trade and logistics performance which affects the transportation cost and logistic facilitation on the whole.

Table 1.8: LPI for Malaysia

Year	LPI Rank	LPI Score	Customs	Infra-structure	International shipments	Logistics competence	Tracking & tracing	Timeliness
2018	41	3.22	2.90	3.15	3.35	3.30	3.15	3.46
2016	32	3.43	3.17	3.45	3.48	3.34	3.46	3.65
2014	25	3.59	3.37	3.56	3.64	3.47	3.58	3.92
2012	29	3.49	3.28	3.48	3.40	3.45	3.54	3.86
2010	29	3.44	3.11	3.50	3.50	3.34	3.32	3.86
2007	27	3.48	3.36	3.33	-	-	-	3.95

Source: Logistics Performance Index, World Bank

3 According to the World Bank, the LPI is based on a worldwide survey of operators on the ground (global freight forwarders and express carriers), and supplemented with quantitative data on the performance of key components of the logistics chain in the country of work.

Malaysia saw its LPI (Table 1.8) ranking drop to 41st place in 2018 compared to 32nd in 2016 and its best ranking of 25th in 2014. The lowest score was for the customs component (at 2.90), which is a concern as previous discussions such as in Marti (2014) had highlighted that the customs component is vital for developing countries like Malaysia. In the 2018 LPI, Malaysia's score for infrastructure was also the lowest since LPI was introduced in 2007. Penang as a state with major trade channels for Malaysia can contribute to the improvement of Malaysia's LPI if greater investments into areas of concern and growth are given greater attention. Furthermore, addressing the areas of concern in LPI would attract more high-quality industry operators besides increasing the efficiency of logistics operators already based in Penang and Malaysia.

Chapter 2
Assessment of near-term developments

2.1 Recent developments

The following are some recent developments affecting Penang's logistics industry:

1. Penang's and Malaysia's rising integration into the global supply chain

In DHL Global Connectedness Index 2020, Malaysia ranked second behind Singapore among East Asia and Pacific countries. Malaysia is among the four countries highlighted as top scorers when examined against the extent to which countries' connectedness exceeds or falls short of expectations based on their economic strength, size, and location. As expected, regional supply chains contributed to the reason that four of the top five outperformers are in Southeast Asia. Penang is a key contributor to Malaysia's trade especially in the E&E segment, and strengthens Malaysia's role in the global supply chain. As such, a more efficient and higher quality logistics and transportation segment in Penang will enhance Penang's contribution to the national economy and Malaysia's comparative advantage as an export-oriented economy.

2. Opportunities for expansion in the cold-chain logistics segment

According to PwC (2018), the demand for cold chain logistics will continue to increase with the growing demand for pharmaceuticals, agri-business, and halal food production. Strengthening the ecosystem of logistics, transportation, and warehousing for this segment will allow Penang to grab the opportunity not only from the Penang market but also in the regional northern Malaysian market as well. In the medium- to long-term, Penang should also strategise on expanding the logistics of these products in the IMT-GT region.

3. Increase in Penang Port's targeting of ultra-large container vessels (ULCV) and providing multinational corporations with RDC set-ups

Penang Port has also recognised the importance of RDC and stressed that there will be an increased emphasis on targeting ultra-large container vessels (ULCV) and providing multinational corporations with RDC set-ups (MMC Annual Report, 2020).

4. DFTZ in Penang and the increasing multiplier effect of the logistics industry

The DFTZ planned in Malaysia, which has been realised in Kuala Lumpur and planned in Penang (see Box 2.1) and Selangor should increase the potential economic contribution of the logistics industry in Penang and Malaysia.

Box 2.1 DFTZ in Penang and Penang Development Corporation-Cainiao MOU

In 2019, the Minister of Communications and Multimedia, Gobind Singh Deo announced at the Dewan Rakyat that Penang airport was one of the three locations under the Digital Free Trade Zone (DFTZ) 2019 initiative, to be a regional e-commerce fulfilment hub. The other two locations identified were the Subang airport and Port Klang (AmInvestment Bank, 2019). Since then, there has been little detail on the development of the Penang DFTZ.

On 14 April 2022, the Penang Development Corporation (PDC) signed a memorandum of understanding (MOU) with Cainiao Smart Logistics Network. The MOU stipulates six-month period for Cainiao to prepare a viability and feasibility studies report on the development of the planned distribution park including the proposed components of a lease/joint-venture for their logistics and fulfilment hub at Batu Maung, Penang. If this project is realised, this will be Cainiao's second Aeropolis eWTP Hub in Malaysia after Kuala Lumpur. The components of the distribution park include a regional e-commerce and logistics hub.

The proposed distribution park aims to serve the e-commerce SMEs for business-to-consumer (B2C) and business-to-business (B2B) merchandise. This is to cater to the demand for warehousing and distribution by air cargo operators. The proposed land of the distribution park is outside of the current FCZ.

If this is realised, Penang is expected to reap the benefits currently experienced in eWTP KLIA, which include the following:

(i) help facilitate 24-hour delivery within Malaysia for e-commerce operators, with the ultimate goal of enabling 72-hour delivery to the rest of the world;
(ii) application of smart supply chain technology and knowledge transfer capability in logistics;
(iii) increase the cargo volume in Penang; and
(iv) increase in flight frequency, belly space utilisation, and freighter capacity. (See Malaysia Airports and Alibaba Announce Operation Commencement of Cainiao Aeropolis eWTP Hub, Malaysia, 2020).

According to Alibaba (2020), Cainiao Network aims to further increase the capabilities of the company's global logistics network. Specifically, the company's vision is to be able to fulfill customer orders within 24 hours in China and within 72 hours in other parts of the world.

In the long term, this hub is expected to increase Penang's contribution to the country's cargo and logistics ecosystem spanning air, sea, and land connectivity. This enables Penang to build a greater connection with the global network as part of the strategic initiatives of Penang2030 – strengthening mobility connectivity and digital infrastructure.

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5. Rebranding of logistics jobs and programmes to increase the interest of students (and parents)

In Malaysia, logistics and supply chain management programmes are mainly offered by private higher education institutions. Penang has three private education institutions providing these programmes, namely Wawasan Open University (WOU), AK Academy, and Peninsula College. Among these, AK Academy and Peninsula College are institutions that primarily provide professional certificates and bachelor's degrees in logistics and transport. Both institutions impart (industry-driven) teaching and learning that create a highly employable talent pool. Due to the increased demand in the logistics business, there is a lack of understanding among students and parents on the logistics work; some of the work like ship planning and material management requires technology and computing knowledge to enable and enhance productivity. Daud (2009) suggests the Ministry of Higher Education work closely with logistics practitioners and logistics professional bodies to increase the quality of logistics graduates with sufficient skills.

2.2 Jobs in the logistics industry

As the third-largest GDP contributor, about 6.2% of Penang's employment was in the logistics sector in 2021. The logistics jobs are found in the manufacturing and services sectors. Based on JobStreet.com, manufacturing activities appeared to have the largest share of recruitment for the logistics sector, followed by E&E, transport and logistics services.

High-skilled job vacancies made up more than 70% of the logistics job vacancies that require at least a diploma and above. These include the job functions of procurement, warehousing, production, supply chain analyst, specialist, and planner. Meanwhile, jobs that require low skill are demanded by food & beverage/restaurants, construction/building and wholesale trade in delivery services, storekeeper and warehouse assistant.

There exists skill-related underemployment in the logistics sector. While the non-executive jobs are considered low-skilled, about 13% of vacancies seek to hire university graduates. Anecdotal evidence shows that this includes delivery services, which increased the demand boosted by the COVID-19 pandemic.

2.3 Innovation in the freight industry

Increased innovation in logistics and freight is key to advancing efficiency and productivity in the industry. Noticeably, the logistics industry is already progressing in the adoption of digitalisation and better infrastructure. Automation and digitalisation are also key aspects of Penang's Digital Transformation Master Plan (DTMP). One key highlight from discussions with industry players is that there should be consistency and continuity in the digital aspects of systems used such as the issue of discontinuation of UCustoms, and the need to move along the learning curve for a new system that affects productivity in the short term.

Industry players have also taken note of Penang's memorandum of understanding (MoU) with Fusionex, a data technology specialist, to set up a smart trade facilitation and intelligent logistics platform. The use of other reliable systems and technologies such as blockchain in the logistics industry where there is a lot of paperwork and documentation involved would facilitate the efficiency in this sector and increase the ease of doing business.

The study by Wong et al. (2015) uncovers that the drop in productivity in the logistics industry may be due to the lack of innovation particularly among third-party logistics services providers in Malaysia. Even if such innovation exists, it does not always lead to productivity gains.

In terms of warehousing, there is a lack of clarity among industry players if smart logistics and high-technology automation will be prominent in the warehouses in Penang in the next few

years. Industry players are aware of such technologies being adopted overseas and at some facilities in Malaysia, but the extent of adoption depends on capital allocation, demand from customers and the specialised segments being served by the warehouses.

2.4 PIA and Penang Port as nodes of development

The growth of Penang's satellite townships is catalysed by the development of industrial and commercial jobs, and over the years by job upgrading. Examples of such satellite townships are Bayan Lepas, Seberang Jaya and Batu Kawan. The FTZs, FIZs and industrial parks are instrumental in facilitating growth and robust economic activities.

This section argues that the airport, seaport and their FCZs in Penang have a huge potential to generate developmental nodes in areas such as Batu Maung, Teluk Kumbar and Bayan Lepas (in the Southwest district) and Butterworth (in the North Seberang Perai district). This is in line with the findings of Li and Chen (2021) that showed the development of the logistics industry contributes to the improvement of local economic growth, based on panel data of 21 cities in Guangdong Province in China from 2007 to 2019. In addition, Li and Chen (2021) also suggest that the development of the logistics industry has a positive impact on regional economic development and generates a spatial agglomeration effect.

The most direct effect on the people would be the creation of jobs and upgrading to higher-value jobs in the logistics and freight industry. The current FCZs linked to PIA and Penang Port will require higher value-added activities for more robust economic activities, in addition to increased use of technology. It is pertinent to highlight that the developments of the FCZs is not isolated from Penang's economic activities. Penang's strength in E&E and automation can also spur growth in smart logistics and robotics if the logistics industry and the government push more consistently for the advancement of smart logistics and warehouses in Penang. Port operators and the PDC, which have cumulative industrial and logistics promotion experience, can advance together with the warehousing and other facilities in Penang. If logistics industry investments are well-targeted and linked to technological growth, they can also promote generational long-term benefits.

As evidenced in the LPI, infrastructure is one of the key indicators in logistics development. This study also argues that enhancing the airport, seaport, and their FCZs in Penang holds huge potential for road and infrastructure improvements that will generate better facilities and catalyse private investments. This could be more than an intra-logistics industry development, as efficiency increases to spur the productive capacities of other industries such as manufacturing.

Chapter 3
Issues and challenges

This study compiles the list of key issues and challenges for the logistics and freight industry in Penang as follows:

Infrastructure and business processes
Based on the LPI for Malaysia (in Chapter 1), generally, the infrastructure in Malaysia and the ease of logistics processes including in Malaysia contain areas to be improved. Players in the logistics industry also voiced that there is at times port congestion which increases the cost of doing business.

Industry players have also voiced that there should be greater facilitation of customs and documentation processes, which is largely a national policy. For example, at the time of the interview with industry players, the UCustoms system was discontinued, and industry players faced some problems in familiarising themselves with the new process.

Air and maritime connections to support industrial activities in Penang
Noticeably, there are comparatively lower air and maritime lines to strategic destinations to/from Penang which could support a greater flow of industrial and economic activities. The absence of direct air or maritime connection may lead to an opportunity cost in investment and trade. According to Fugazza and Hoffmann (2017), there is a link between the lack of a direct maritime connection to a trade partner with lower values of exports. Furthermore, any additional transhipment is associated with a lower value of bilateral exports.

In analysing the air and maritime connections, it should also be considered the global trends of reshoring and near-shoring to mitigate the effect of supply chain disruptions that may decrease the throughput passing through the ports in this region.

Space of untapped FCZ for scaled-up logistics, warehousing, storage and transhipment

This report observes that progress on DFTZ in Penang is slower than expected and anticipated. However, this report is cautiously optimistic about the PDC-Cainiao MOU on the distribution hub (see Chapter 2), and if realised, is expected to provide positive effects on the logistics industry in Penang. With the growth of e-commerce, there should also be a need to recognise issues related to infrastructure and facilities for e-commerce.

Synergies of logistics with economic activities

Oftentimes, the logistics industry is not considered holistically in the periphery of investment promotion and economic activities in Penang. The state and federal governments, at times, do not recognise the inter-linkages of logistics and other economic activities (especially manufacturing in Penang) and other economic policies such as trade and free trade agreements.

Skill-underemployment for the non-executive level of jobs in the logistics sector

The job vacancies in Chapter 2.2 show that there are some percentages of tertiary-educated jobs requesting to work in non-executive positions. In contrast, a small proportion of entry-level, junior, and senior executive positions are also seeking logistics candidates who have no tertiary education. These are mostly related to sales executives, customer service, and production planning. Therefore, overeducation occurs in the logistics and transport industry albeit the small proportion.

Chapter 4
Recommendations and conclusion

4.1 Recommendations

This study recommends Penang to increase its role in servicing the global supply chain through efficient trade channels and ports operations and by expanding the roles of logistics and warehouses.

It should evolve from being a state with trade channels to becoming an efficient enabler of trade in support of Malaysia's aspiration to become a preferred logistics gateway for Asia.

The following are key recommendations for achieving the above target:

1. Capitalise on infrastructures that accentuate Penang's comparative advantage in the regional and global economy and increase the catchment of growth industries and companies.
2. Synergise logistics industry developments by incorporating growth trends and new growth areas.
3. Increase adoption of technology, digital transformation and advanced efficiency in processes.

Table 4.1: Recommendations for Penang's logistics industry

Broad recommendations	Specific areas of changes
Capitalise on infrastructures that accentuate Penang's comparative advantage in the regional and global economy and increase the catchment of growth industries and companies.	**Enhance airport and seaport service levels - high efficiency at the port and customs** Penang should benchmark itself against global cargo hubs such as Hong Kong. This includes having the right infrastructure and connectivity for companies to choose Penang for inventory management, labelling, packaging, and other processing procedures. Better infrastructure and investments to ease processes would increase Penang's logistics channels in serving Malaysia and Southeast Asia. This was observed in the case of Hong Kong where China Merchants Port Holdings highlighted that the ease of access, an international airport with a large handling capacity, free port status, and reliable logistics services are factors for Hong Kong to become an ideal cargo transit port, and to connect to the growing demand in China and other Asian countries for high end goods (Poon, 2021). It is also recommended that Penang conducts and publishes LPI for the state on a regular basis, using the currently recognised methodology to address issues closely related to Penang's logistics.
	Promote Penang as a regional hub for logistics firms, and build stronger connectivity The increase in flight connectivity and shipping lines by airport and seaport authorities will strengthen Penang's position, bringing in more economic benefits from a more sizable logistics industry, such as more transshipment and value-added activities. In addition, logistics companies will be encouraged to increase operations in Penang; high frequency and reliable connections to major markets matter for their customers. It is important to emphasise that lower operational costs for MNCs and LLCs are not only in terms of monetary costs but also minimal time to deliver and receive products/components or parts to be manufactured and shipped. Third-party and fourth-party logistics providers are likely to increase their presence in Penang with more robust activities.

	There should be more flights and shipping lines to key destinations of Penang such as China and the United States. The state government can increase participation in negotiations of air and shipping lines for cargo, especially to key export and capital import destinations (US, China, Singapore) including with local air cargo providers such as MAS Cargo, Teleport, Raya Airways.
	Capitalise on opportunities coming from geographic diversification of investments into Penang and Malaysia; the state government should play a greater role in persuading the federal government to increase FTAs with key trade partners The government is also recommended to enhance the facilitation of Penang's logistics in key areas such as cold-chain management and retail logistics. The state government should also play a more bigger role in persuading the federal government to increase FTAs with key trading partners. This is important in ensuring that Penang and Malaysia continue to attract investors in facilitating the trade of their goods into Asia and from Penang, Malaysia and Asia to other parts of the world.
Synergise logistics industry developments by incorporating growth trends and new growth areas.	**Establish clear policies for logistics companies aiming for asset-light operations i.e. REIT and other companies' build-and-lease model** As more companies adopt the global trend of going asset light, the state, port authorities and operators, industrial park authorities and operators should also have well-established policies to facilitate the trend. This would ensure clear policies to guide investments and planning by companies, including information on additional costs for such an arrangement but such policies should be in place to ensure that certain objectives (such as fairer land use) are met, and that they do not restrict the growth of economic activities.
	Infrastructure and facilities for e-commerce - express and small parcel deliveries Penang should continue to pursue and expand DFTZ initiatives and plans. In order to facilitate businesses, especially MSMEs, engaged in e-commerce for express and small parcel deliveries, the government (federal and state) should ensure proper infrastructure and facilitate more players for e-commerce logistics in Penang. The increase in digitalisation and automation would also increase the efficiency in this market.

Increase adoption of technology, digital transformation, and advanced efficiency in processes.	**Promote innovation, infrastructure, and partnerships** Penang should increase the adoption of digital technologies to support the development of the logistics industry. This includes the digitalisation of processes and documentation, navigation satellite systems, and support of IoT in warehouses in FCZs. Blockchain processes can also be adopted in airport and seaport processes. To increase ESG practices, port operators and warehouses can also follow in the footsteps of some multinationals and local large companies in Penang that have adopted solar power generation for their business activities. The state's initiative in the memorandum of understanding (MoU) with Fusionex, a data technology specialist, to set up a smart trade facilitation and intelligent logistics platform, is encouraging. More such partnerships in various areas for transforming the efficiency of Penang's logistics industry should be encouraged. Singapore is also tapping into technologies such as driverless automated guided vehicles, and smart sensors to detect shipping anomalies such as piracy and data analytics to predict traffic congestion spots (Lam and Ramakrishnan, 2017). Such technologies should be explored by operators in Penang as well.

In achieving these recommendations, a structure and channel should be established for logistics industry members to engage in constructive and purposive dialogue with the government and build a strong partnership to realise relevant goals and projects for the industry.

This study suggests a **consultative committee for the logistics and freight transportation industry in Penang to be chaired by the Chief Minister.** Understandably, some industry members have opined that the government's level of engagement with the logistics industry should be enhanced.

4.2 Conclusion

Undeniably, the logistics and freight transportation industry holds a key role in Penang, since the economy is export-oriented and integrated with the global supply chains. The state's air and maritime channels support different segments of the economy and can build on individual strengths to ensure greater spillover effects.

In short, the recommendations coming out of this study are focused on Penang servicing the global supply chain through efficient trade channels and port operations, and enhancing the roles of logistics and warehouses in the state's economic ecosystem.

In terms of study limitations and recommendations, further analysis using more advanced techniques should be conducted such as employing I-O analysis, multiplier analysis, and computable general equilibrium (CGE). Data in Chapter 1 have shown that both the PIA and Penang Port exhibit different trends of throughputs and cargoes, mainly due to the different structures of economic goods served. As such, production outcomes in the economic and industrial spaces these ports and adjacent free zones serve should be analysed in greater detail, and with accompanying forecasts.

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The logistics industry is a key component of Penang's economy, with induced demand from the robust and expanding manufacturing sector. The transportation and storage industry contributed 3.1% (using value-added approach) to Penang's Gross Domestic Product (GDP), with a Compound Annual Growth Rate (CAGR) of 7.2% (2017-2019). It employed more than 22,000 workers in 2020. This report assesses the current state of Penang's logistics and freight transportation, and its role in propelling Malaysia as a preferred gateway into and through Asia.

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