



Rethinking supply chains in Asia Pacific

**A study on supply chain
realignment and competitiveness
across high growth markets**

October 2021

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Foreword

COVID-19 has further exposed supply chain vulnerabilities, which were already reeling under the impact of global trade dynamics. The disruptions in supply chains have had a trickledown effect, impacting sourcing, logistics, production, distribution, and aftermarket services. This has prompted Multi-National Companies (MNCs') to reassess their approach to global manufacturing and sourcing.

MNCs are exploring ways to build resilience and agility into their manufacturing and supply networks, even with the likelihood of an incremental cost. A push is being seen towards adopting a diversified strategy to mitigate supply chain risks arising from excessive dependence on a single geography. Reshoring, diversification, regionalization, and replication are featuring as possible options for discussion in the boardroom agenda for C-suite executives, Supply Chain and Advocacy heads.

For many MNCs scouting for alternate jurisdictions, high performing emerging Asian economies (India, Malaysia, Thailand, Singapore, Taiwan, and Vietnam) seem to have become the preferred choice. Favorable demographics, robust economic fundamentals and strong leadership in these countries have helped position these countries as key stakeholders in the region. There is an increased push by governments in these countries to create additional capacities with a long-term view of attracting fresh investments. Significant efforts are being made to introduce a slew of investor-friendly reforms to drive tax competitiveness, labor reforms, infrastructure development and overall ease of operability.

In addition, in recent years these emerging economies have stepped up their collaboration to overcome fragmentation, close technology gaps and build robust regional technology supply chains. The region's well-developed infrastructure, accelerated 5G development and deployment, and growing skilled labor force are all acting in its favour and stitching an attractive investment story.

Select KPMG firms from the region have come together to present an industry point of view on the potential supply chain realignment opportunities across various high performing countries with a view to fortify the region's attractiveness as a viable investment destination.



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Table of contents

01. The Asia Advantage

As global trade dynamics and the pandemic continue to trigger the relocation of international supply chains, South Asia and the Association of Southeast Asian Nations (ASEAN) region have been emerging as attractive alternatives for companies, owing to lower costs, availability of labor and the accessibility of an established manufacturing base

01



02. The Hong Kong (SAR), China Advantage

The free port status of Hong Kong (SAR) and its business appeal to international and domestic companies have driven the growth of the territory to be one of the most favoured destinations for property, finance, insurance, and banking

09



03. The India Advantage

Over recent years, India has emerged as a potential manufacturing hub for several sectors, owing to the government's strong focus on initiatives, such as 'Make in India', the country's purchasing power parity and a large population of engineers and factory workers

Dominant sector: Specialty chemicals & life sciences

Sunrise sector: Electronics & telecom

15



04. The Malaysia Advantage

The manufacturing sector in Malaysia appears to be in a stable position to leverage supply chain realignment opportunities in the short to medium term, backed by government policy measures, improving external demand outlook, attractive incentives, and its Covid-19 vaccine roll-out program

Dominant sector: Semiconductors

Sunrise sector: Petrochemicals

45



05. The Singapore Advantage

As one of the most important manufacturing hubs in Southeast Asia (SEA), Singapore holds a leading position in several sectors, with manufacturing activities contributing to nearly 20 per cent of the country's Gross domestic product (GDP)

Dominant sector: Semiconductor manufacturing

Sunrise sector: Electric vehicles & wearable devices



61

06. The Taiwan Advantage

Manufacturing is one of the most prominent sectors in Taiwan, supported by government incentives and investments, availability of skilled labor, well developed infrastructure and connectivity

Dominant sector: Semiconductor manufacturing

Sunrise sector: Network communication and telecom products



79

07. The Thailand Advantage

Deep expertise in manufacturing products, lucrative investment incentives, the availability of abundant labor and relatively well-developed infrastructure make Thailand an attractive manufacturing hub in the ASEAN region

Dominant sector: Automotive

Sunrise sector: Food and beverage



97

08. The Vietnam Advantage

Vietnam's attractive manufacturing costs alongside factors, such as infrastructure, trade policies, economic growth and response to the pandemic makes it one of the most preferred destinations for companies looking to diversify or relocate supply chains

Dominant sector: Electronics manufacturing

Sunrise sector: Healthcare




111

01


The Asia Advantage

This report is looking at a subset of territories in Asia: Hong Kong (SAR), India, Malaysia, Singapore, Vietnam, Thailand, and Taiwan. Together, these territories represent:

13 per cent
contribution
to global trade
in 2020




~ 301 seaports
Port of Singapore (world's busiest trans-shipment hub); Port of Hong Kong (World's 9th busiest container port); Port Klang, Malaysia (12th busiest port in the world); Port of Tanjung Pelepas, Malaysia (18th busiest port in the world)



~ 612 airports
Changi Airport, Singapore; Indira Gandhi International (IGI) Airport, New Delhi, India; Suvarnabhumi Airport, Bangkok, Thailand (all three ranked among the top 20 busiest airports in the world)



USD270 billion
of foreign direct investment (FDI) inflow in 2020



Note - Source and details are mentioned in respective country chapters

Asia as a global manufacturing destination

As the global trade dynamics and the pandemic continue to trigger the relocation of international supply chains, Asia and the ASEAN region have been emerging as attractive alternatives for companies, owing to lower costs, the availability of labor and its status as an established manufacturing base. Several companies have announced investments to establish manufacturing operations across various sectors in countries, such as Vietnam, Thailand, and

India. Governments of several nations in the region are also actively pursuing the opportunity to attract manufacturers by offering land, tax benefits, and other incentives. Countries in the region have also entered into several free trade agreements (FTA) and partnerships thereby enabling manufacturers to consider these countries as viable hubs for export.

The region is also host to some of the busiest ports in the world, thereby facilitating seamless

flow of trade for manufacturers. The ASEAN region boasts of a strong demographic dividend with a population of over 661 million¹, with the economic region contributing to over USD3.1 trillion in 2020.¹ The availability of working-age population, increasing industrial stock, and a rapidly growing economy are key drivers propelling the manufacturing landscape in the region.

1. World Economic Outlook, IMF, 6 April 2021

Territories explored in this report

INDIA

GDP: USD2,641 billion
GDP growth (F): 6.8 per cent
FDI: USD57 billion

Major seaport: Jawaharlal Nehru Port Trust (JNPT) port
Major airport: IGI Airport

Dominant sectors: Specialty chemicals (USD6.2 billion chemical exports in FY19); Life Sciences (USD16.3 billion pharmaceutical exports in FY20)

Sunrise sectors: Electronics (USD11.3 billion electronics exports in FY20); Telecom (USD2.7 billion telecom instruments exports in FY19)

VIETNAM

GDP: USD340.6 billion
GDP growth (F): 6.7 per cent
FDI: USD28.5 billion

Major seaport: Hai Phong port
Major airport: Noi Bai International airport

Dominant sector: Electronics manufacturing (USD97.2 billion electronics exports in 2019)

Sunrise sector: Healthcare (USD17.3 billion health expenditure in 2019)

TAIWAN

GDP: USD668.5 billion
GDP growth (F): 4.7 per cent
FDI: USD9.14 billion

Major seaport: Port of Kaohsiung
Major airport: Taiwan Taoyuan International Airport

Dominant sector: Semiconductor manufacturing (USD116.8 billion integrated circuits (IC) exports in 2020)

Sunrise sector: Network Communication and Telecom Products (USD7.9 billion telecom equipment export in 2019)

HONG KONG (SAR), China

GDP: USD346.6 billion
GDP growth (F): 6.5 per cent
FDI: USD119.2 billion

Major seaport: Port of Hong Kong
Major airport: Hong Kong International Airport

Major sectors: Property, Finance, Insurance, Banking

THAILAND

GDP: USD530.3 billion
GDP growth (F): 3.5 per cent
FDI: USD2.7 billion

Major seaport: Laem Chabang port
Major airport: Suvarnabhumi airport

Dominant sector: Automotive (USD19.7 billion automobile exports in 2020)

Sunrise sector: Food and beverage (USD33.9 billion food and beverage exports in 2020)

SINGAPORE

GDP: USD337.4 billion
GDP growth (F): 3.3 per cent
FDI: USD58 billion

Major seaport: Port of Singapore
Major airport: Changi airport

Dominant sector: Semiconductor manufacturing (USD7.4 billion electrical apparatus exports in 2019)

Sunrise sectors: Electric vehicles (44,465 EV registrations in 2020); Wearable devices

MALAYSIA

GDP: USD336.3 billion
GDP growth (F): 4.7 per cent
FDI: USD3.4 billion

Major seaport: Port Klang
Major airport: Kuala Lumpur airport

Dominant sector: Semiconductors (28.8 billion units of semiconductors produced in 2019)

Sunrise sector: Petrochemicals (USD13.3 billion petroleum products exports in 2020)

GDP estimates for 2020; FDI values for 2020; Average of GDP growth rate forecast for 2021 to 2025, EIU

Note - Source and details are mentioned in respective country chapters

Investment attractiveness of the region

Large consumer base

Asia and the ASEAN region are home to a large consumer base, characterized by a rapidly evolving economy, growing middle class and relatively young population. By 2030, ASEAN is expected to become the fourth largest economy in the world with a USD4 trillion consumer market, and its middle class will comprise 70 per cent of the population.² Total consumption is expected to double across the region aided by rising income levels. With its large population, India also

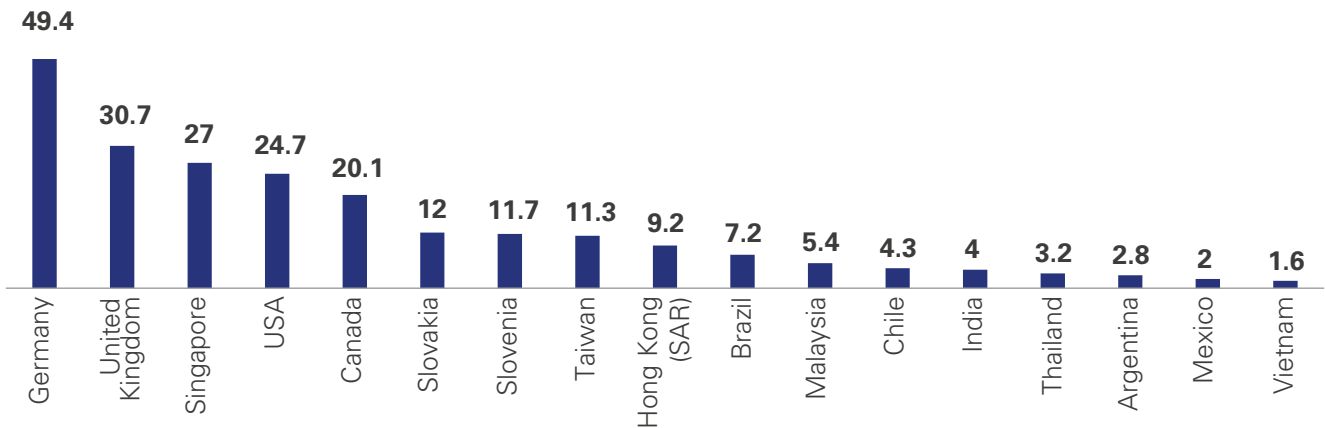
offers a huge consumer base, with rising affluence helping to drive consumption growth. Establishing manufacturing operations in the region would offer companies access to a large domestic consumer base, while also setting up export-oriented units to cater to the global market.

Low cost of labor

Over the years, Asian countries have emerged as manufacturing hubs, primarily due to the cost attractiveness and availability of

their skilled/semi-skilled workforce. Labor costs in developing economies, such as Vietnam, Thailand, India and other countries in Asia and the ASEAN region are significantly cheaper, compared to developed economies in Europe and North America. Cheaper labor costs enable manufacturers to produce goods at competitive prices. However, minimum wages in these regions are on the rise, which could lead to an increase in labor costs over the years to come.

Cost of labor, USD per hour



Source: Labor costs per hour, EIU

Availability of skilled talent pool

Due to high population, countries in Asia and the ASEAN region offer abundant skilled and semi-skilled workers to cater to the manufacturing industry. In order to continuously upskill and upgrade the workforce to equip them with the necessary technological skills to meet the growing needs of the industry, governments of respective countries are also undertaking skill development programs specific to sub-segments within manufacturing, such as electronics, life sciences, and others, and are also utilizing universities to deliver skilled graduates.

Country/Region/Territory	India	Vietnam	Thailand	Taiwan	Malaysia	Singapore	Hong Kong (SAR)
Workforce in manufacturing (million)	40	10.94	5.97	4.25	2.28	0.45	0.08

2. 8 ways ASEAN consumer habits will change by 2030 - shaped by COVID-19, tech and more, WE Forum, 10 June 2020

Robust infrastructure development

Rapidly developing infrastructure is one of the primary factors for companies to relocate to countries in Asia and the ASEAN region. Availability of industrial parks and dedicated manufacturing zones specific to various sub-sectors of the manufacturing industry offer a comprehensive manufacturing ecosystem for companies to establish operations in the region. The presence of important seaports and airports in the region offer connectivity to most of the world, thereby enhancing the region's attractiveness as an export hub for manufacturers. The countries in the region also have well-established road and rail connectivity and governments are increasing investments to further develop their infrastructure.

Country/ Region/ Territory	Number of airports	Annual freight traffic (million mt-km)	Number of sea ports	Coastline in kms	Railroad density (Km/1,000KM ²)
India	464	2,703.9	212	7,000	22.7
Singapore	1	5,194.9	1	193	281.5
Vietnam	22	481.4	44	3,444	7.6
Thailand	38	2,666.3	27	3,219	8.7
Malaysia	67	1,404.4	9	4,675	6.8
Taiwan	17	1,072.7	7	1566.3	45
Hong Kong (SAR)	3	11,739	1	456	102.2

Note - Source and details are mentioned in respective country chapters



Investor-friendly climate

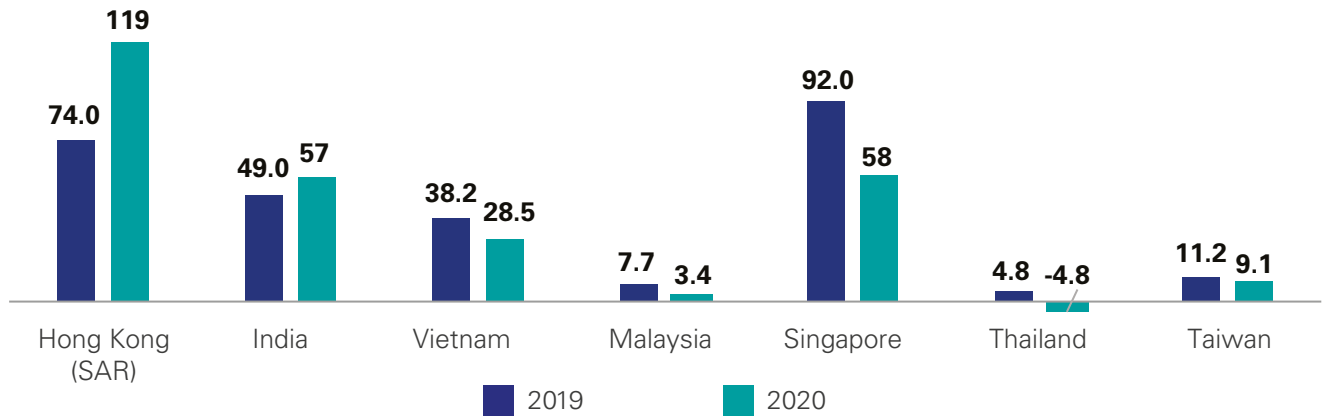
As companies are evaluating alternative manufacturing locations amidst the current trade dynamic and the pandemic, governments in Asia and the ASEAN region have announced various subsidies and incentives to attract companies to establish manufacturing operations in the region. For instance, at the outset of the pandemic the Japanese government announced to offer subsidies for Japanese manufacturers relocating production beyond China to other South Asian or ASEAN countries, in order to diversify Japanese supply chains.

Country/ Region/ Territory	Initiatives taken to promote investment
Thailand	<p>Thailand Plus – Incentives on Corporate Income Tax (CIT) and additional benefits on investments above USD32 million (1 billion Baht)</p> <p>Investors from the field of science, technology, engineering, and mathematics (STEM) can receive tax deductions of up to 200 per cent</p>
Malaysia	<p>Budget and investment fast track – Fortune 500 companies dealing with high-end technology, manufacturing, or value-added industries investing at least USD1.1 billion (5 billion Ringgits) into Malaysia will be provided with incentives worth USD238 million (1 billion Ringgits) over a five-year period</p> <p>Established a channel to cater to investors and businesses looking to diversify their supply chains and to fast track their processes and approvals</p>
Vietnam	<p>The government of Vietnam issued a decree offering preferential treatment to science and technology enterprises. The benefits varied from corporate tax cuts and exemptions to credit incentives, and exemptions or reductions in land and water surface lease fees</p>
Taiwan	<p>Through the Global research and development (R&D) Innovation Partner Program, the government encourages foreign companies to invest in R&D and innovation by providing subsidies of up to 50 per cent of the total R&D spend, especially on technologies that are not mature in Taiwan or have potential to help Taiwan produce leading technologies</p>
India	<p>Launched production-linked incentive (PLI) schemes to attract foreign companies to establish manufacturing bases in India, while also encouraging domestic companies to set up or expand their manufacturing units. Under the scheme, companies are offered incentives on incremental sales from products manufactured in India. The PLI scheme is currently applicable to 13 sectors, including automobiles and auto components, pharma, medical devices manufacturing and electronics</p>
Hong Kong (SAR)	<p>The Hong Kong (SAR) government provides a 100 per cent guarantee on low interest loans to ventures, with the loan ceiling being raised to USD77,000 (6 million Hong Kong Dollars). The government has set aside USD6.4 million (50 million Hong Kong Dollars) for the Professional Services Advancement Support Scheme to subsidise professional bodies for the promotion of investments in the Greater Bay Area</p>

Note - Source and details are mentioned in respective country chapters

Growing FDI and Mergers and Acquisitions (M&A) activities

FDI (USD billion)



Note - Source and details are mentioned in respective country chapters

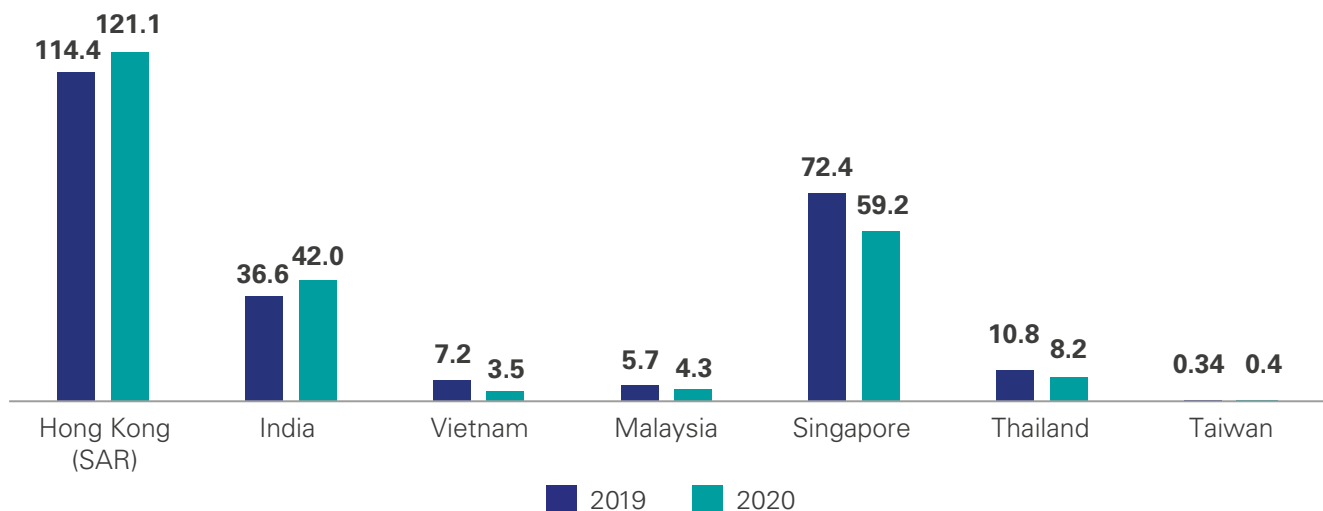
Asia and the ASEAN region are among the most attractive destinations for FDI due to the region's trade-friendly policies, government support, large consumer base, growing middle class and availability of labor. Japan, China, the U.S., South Korea, and the Netherlands are among key economies investing in the region. Owing to uncertainties surrounding the COVID-19 pandemic, FDI inflows in the region declined in 2020. While the region accounted

for a significant chunk of global investments in 2020, overall inflows contracted due to a decline in investments with the largest recipients in the region. However, even amidst the pandemic, India recorded a positive FDI growth of 13 per cent³, boosted by investments in the digital sector. With an inflow of USD13.6 billion in the manufacturing sector, Vietnam recorded a significantly higher inflow of FDI in the sector among other countries in the region. India

is also among the major recipients of FDI in the manufacturing sector in the region, recording inflows of USD8.2 billion in 2020.

The region has also witnessed strong M&A activity over the years with several deals across multiple sectors. While the number of deals declined in 2020 due to the pandemic, the region is exhibiting signs of a staggered recovery with a solid pipeline of deals as economies are expected to become more stable in 2021.

M&A (USD billion)

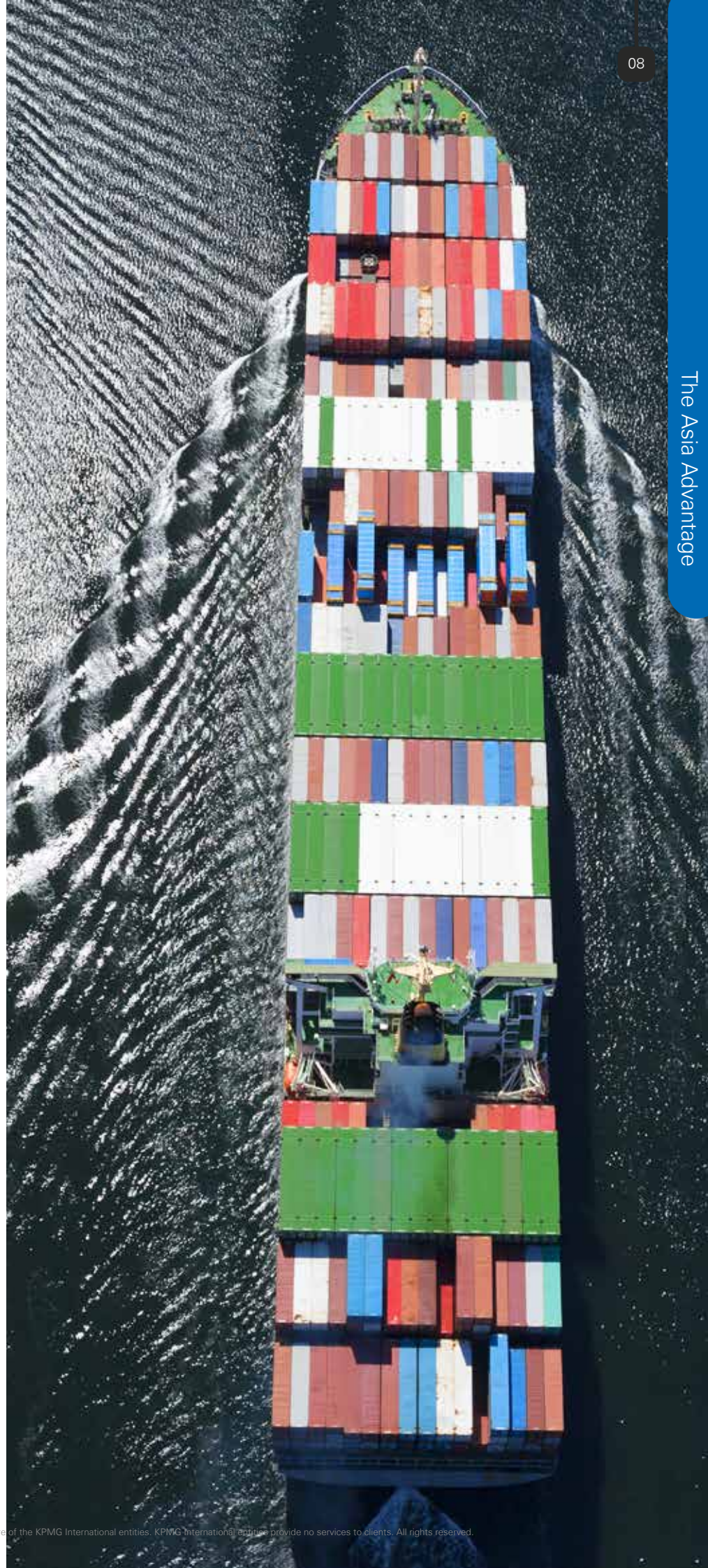


Note - Source and details are mentioned in respective country chapters

3. Global foreign direct investment fell by 42 per cent in 2020, outlook remains weak, UNCTAD, 24 January 2021

Conclusion

Global events, such as the pandemic and geo-political tensions have tested the resilience of global supply chains and exposed vulnerabilities and disruptions to production and logistics. Manufacturers have been forced to rethink their strategies ranging from the sourcing of raw materials to the relocation of production units. As the pandemic has highlighted the challenges companies face due to the reliance on a single geography, manufacturers are diversifying and relocating their supply chains to become more resilient. This has led to the emergence of countries in Asia and the ASEAN region as attractive alternatives. However, as companies redesign their sourcing strategies and plan relocation to other countries/regions, they must take into account associated third-party risks pertaining to cyber attacks and unethical sourcing. Bribery and corruption also remain areas of concern in some markets. Governments must enforce strict Anti-bribery and Anti-corruption laws to instill confidence and attract investments. Companies must also ensure detailed investigation and due diligence prior to choosing alternative suppliers/regions for relocating their manufacturing units.



02

The Hong Kong (SAR), China Advantage

Territory landscape

Macroeconomic indicators

Population



7.47
million

GDP



USD347
billion

GDP growth



-6.1% (2020)
6.5% (2021F)

GDP per capita



USD59,238

GDP by sector



Industry- 1.1%
Services- 93.4%

Inflation



0.3% (2020)

All values are estimates for 2020, unless specified otherwise. GDP provided is nominal GDP

FDI and M&A

Total FDI



USD119.2
billion

Projects licensed



Property, Finance,
Insurance, Banking

Key territories



British Virgin
Islands, Thailand

M&A value



USD121.1 billion
(↑5.7%)

All values are actuals for 2020, unless specified otherwise

Territory attractiveness



8 FTAs



World's 9th
busiest
container port



World's 2nd
busiest cargo
airport



11th most
innovative
economy



673,700
working in trade
& logistics

Source: Hong Kong (SAR) GDP by sector, Census and Statistics Department, accessed as on 17 September 2021; Population, Census and Statistics Department, accessed as on 17 September 2021; FDI, UNCTAD World Investment Report 2021, 21 June 2021; GDP per Capita, World Bank, accessed as on 17 September 2021; Inflation, World Bank, accessed as on 17 September 2021; FTAs, Trade and Industry Department, accessed as on 17 September 2021

Business environment

Hong Kong (SAR), China's long history of trade makes it unique as a sourcing and supply chain hub. It is home to a workforce steeped in the practices of international business. As a free port, the territory has no customs tariffs, while its absence of capital controls and freely convertible currency means capital can be readily transferred in and out of the city.

For decades, it has offered a complete array of services to companies looking to source goods and inputs from mainland China and other parts of Asia. Now, in part due to COVID-19 helping to accelerate the take-up of digital services, Hong Kong (SAR) is transforming itself into a global digital supply chain hub as well.

Ease of doing business (EoDB)

Hong Kong (SAR)'s primary appeal to both international and local companies is its ease of doing business. Setting up a new business is quick and straightforward. Most private limited companies need just one shareholder and one director, neither of whom has to be a resident of the city. There is no minimum share capital required and the capital can be denominated in any currency.

Except for a few sectors, such as broadcasting, Hong Kong (SAR) has almost no restrictions on foreign investment. Business-related legislation is constantly being reformed and updated by the HKSAR government. Recent

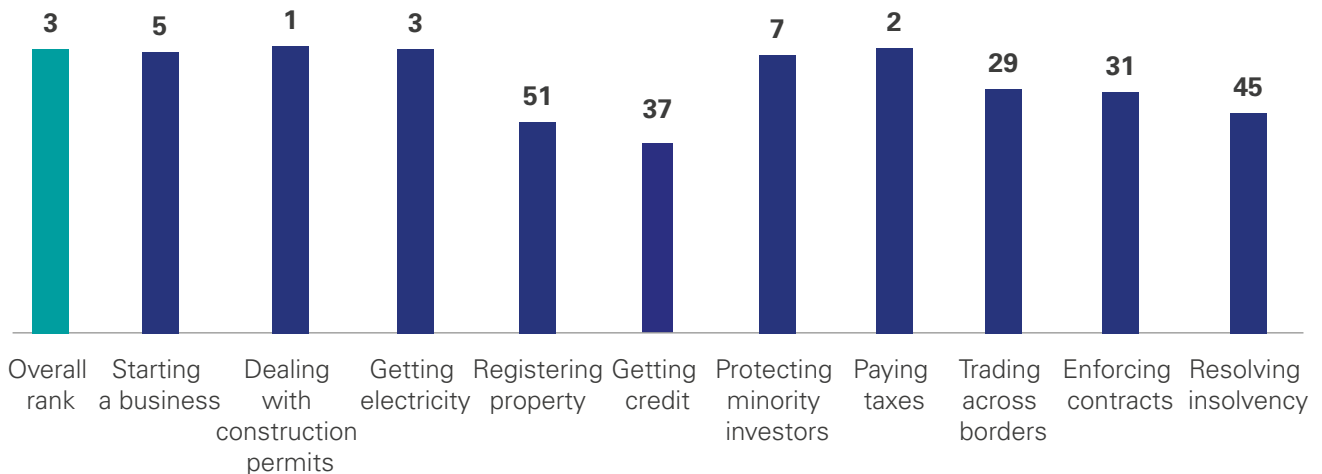
changes in laws have given companies greater flexibility in the ways they can structure their share capital and have simplified reporting requirements for Small and Medium Enterprises (SMEs).

Doing business rankings 2020¹

Hong Kong (SAR) is ranked the world's third best place to do business by the World Bank in its Doing Business report, with particularly high ratings for dealing with construction permits, paying taxes, getting electricity, and starting a business.

Some of the key indicators highlighting the territory's ranking based on the World Bank's doing business report are:¹

EoDB rankings, Global rank 2020



Source: Hong Kong SAR, China, Doing business 2020, World Bank

Once up and running, companies are largely left to their own devices in line with Hong Kong (SAR)'s long-standing laissez-faire approach to economic management. Direct government intervention is largely restricted to a few selected areas, such as the support offered to innovation and technology in recent years (see below), and the provision

of public infrastructure, principally for transport.

Hong Kong (SAR)'s common law legal system stands at the core of the city's business attractiveness. Its judges have extensive experience handling commercial cases involving entities from around the world and a justified

reputation for impartiality. The city also has long-standing cross-border arrangements for the reciprocal recognition and enforcement of judgments between Hong Kong and mainland China, offering confidence to those looking to establish operations of their own in the mainland.

1. Hong Kong – Ease of Doing Business Ranking 2020”, Doing Business, accessed as on 17 September 2021

The efficient financial structure and large pool of liquidity allow for having a corporate treasury centre in Hong Kong (SAR) to support businesses that need to transfer money in and out of mainland China, regionally or internationally.

The use of a currency board to peg the value of the Hong Kong (SAR) dollar at a rate of USD1: HKD7.8 has given the city's financial system rock-solid stability since its introduction in 1983. With reserves of just under USD500 billion, that value looks set to remain for the foreseeable future.²

As the world's largest offshore renminbi market, Hong Kong (SAR) has a thorough understanding of the complexities of dealing in the Chinese currency and the various ways in which money can be transferred into mainland China for investment purposes. Its financial sector also has longstanding links with SEA, where an increasing number of sourcing operations are now run.

Low taxes

The city's tax system is one of the world's most straightforward, with no sales, goods and services or value-added taxes, no capital gains tax, and no withholding tax on management fees paid to overseas companies.

Corporate tax for business activities conducted in Hong Kong (SAR) is 8.25 per cent for the first USD256,954 (2 million Hong Kong Dollars) in profits, and 16.5 per cent on any sum greater than that. Companies whose activities take place outside Hong Kong (SAR) pay nothing. Unincorporated businesses, such as partnerships and sole proprietorships also have two tiers of rates, at 7.5 per cent for the first USD256,954 (2 million Hong Kong Dollars) of profits and 15 per cent on any sum greater than that. Hong Kong (SAR)'s salary tax is capped at a standard rate of 15 per cent.

Comprehensive double taxation agreements exist between Hong Kong (SAR) and Canada, France, India, Indonesia, Italy, Japan, Macau, mainland China, the UK and Vietnam. Other international agreements include tax treaties with members of the ASEAN that make it easy to run holding companies with operations in the region.

The city's backbone is its transport infrastructure. Hong Kong International Airport is at the heart of its connectivity, being the second busiest airport in the world in terms of air cargo. Although more sea freight is now shipped from most nearby mainland ports rather than Hong Kong (SAR), its port still remains in the world's top 10 ports of the world. Links to the mainland have been enhanced in the last four years by the completion of the Hong Kong-Macau-Zhuhai bridge spanning the Pearl River estuary and the Guangzhou-Shenzhen-Hong Kong Express Rail Link, which connects Hong Kong (SAR) with mainland China's national high-speed rail network.

Companies must keep up to date with other developments beyond Hong Kong (SAR) that might affect the cost of their goods. As a result of the ongoing trade dispute between mainland China and the the U.S., not only are exports of Chinese-made products into the the U.S. subject to duties of 25 per cent, but so are those produced in Hong Kong (SAR).



2. Hong Kong's Latest Foreign Currency Reserve Assets Figures Released, Hong Kong Monetary Authority, 7 July 2021

Innovation support

One of the few areas where companies can look for direct government support is spending on technology and R&D. Over the last decade and a bit, the government has launched a wide range of measures aimed at boosting innovation, particularly in the development of new products and services for the trade, finance and professional services sectors. A particular goal is applying new technologies in ways that can transform outmoded practices and help them transition to the low-carbon, data-driven supply chains that will be called for over the next decade.

The Technology Voucher Program, for example, supports the use

of new technologies in all types of businesses, including import and export-related firms. Funded schemes include resource-planning solutions and systems for document management, mobile access, electronic inventory, point-of-sales and electronic procurement management.

Environmental, social, and corporate governance (ESG) reporting

With sustainability playing a growing role in the thinking of governments and consumers, companies are having to pay ever more attention to the environmental impact of how their goods and services are produced, transported, sold and – in some

instances – disposed at the end of their useful lives.

As a result, Hong Kong (SAR) is increasingly set on making itself a centre for ESG reporting and integration, helped in good part by its record of providing supply chain services. On the demand side there are increased regulation and compliance requirements, such as the revised ESG reporting rules for firms listed on the Hong Kong (SAR) Stock Exchange, which came into effect in July 2020.

On the supply side, there are a growing number of companies offering the data-gathering and analytics services needed for companies to be able to monitor what is happening at all points along their supply chain.



Building the Greater Bay Area

The Greater Bay Area initiative is an ambitious scheme to foster strong economic growth across a 56,000-square-kilometre swathe of southern China via the greater integration of the economies of Hong Kong (SAR), Macau and nine cities of the Pearl River Delta in Guangdong province.

As a result of an increased pace of development over the last four decades, the area is already mainland China's most affluent region, home to 86 million people and with a GDP of USD1.67 trillion. The goal is now to make it one of the world's leading centres of

innovation and technology by 2035, at with the the U.S.'s Silicon Valley, and Japan's Tokyo Bay region.³

At the project's core is the notion that the region can become a world-class centre of innovation by combining Hong Kong (SAR)'s strength in finance and connectivity to the world, with the manufacturing expertise of Guangdong, especially the high-tech production of Shenzhen.

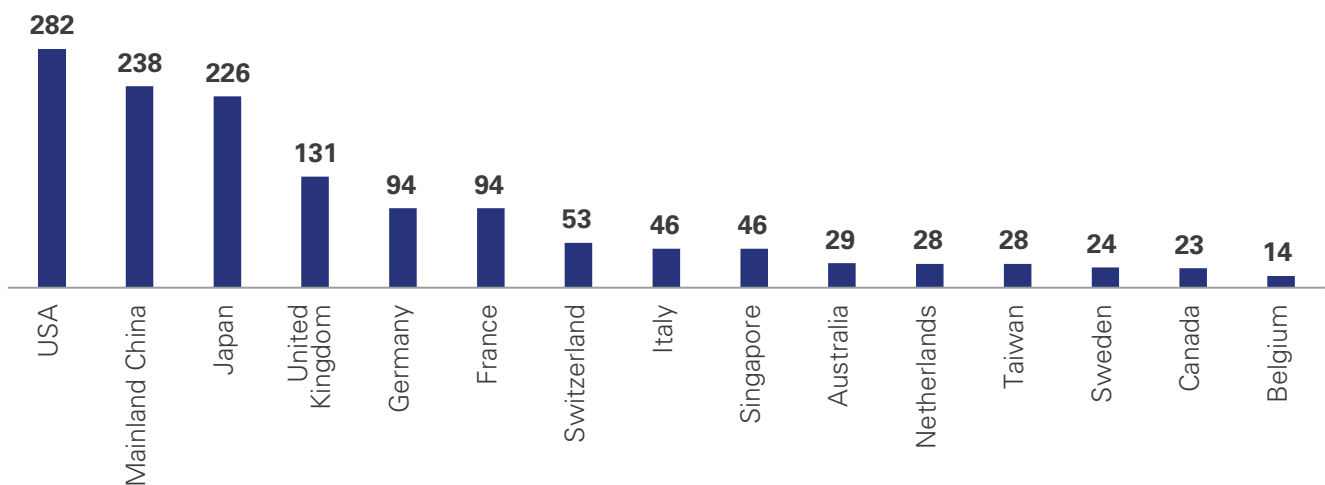
Further integration should enhance the region's strengths as a sourcing base, particularly for electronic goods, as well as for automotive components, pharmaceuticals and

many light industrial products that are made and shipped through the supply networks developed across the area in the last three decades.

But the initiative should also enhance the region's potential to develop new production methods and processes, such as the rapid prototyping ecosystem that is now quickly expanding in Shenzhen.

Hong Kong (SAR) is also the regional headquarters of many foreign companies. The regional headquarter in Hong Kong by country/territory of parent company are as follows⁴:

Regional headquarters in Hong Kong by country/territory of parent company, 2020



Source: Number of Regional Headquarters in Hong Kong by Country/Territory where the Parent Company was Located, Census and Statistics Department, accessed as on 17 September 2021



3. Overview, Greater Bay Area, accessed as on 17 September 2021







4. Number of Regional Headquarters in Hong Kong by Country/Territory where the Parent Company was Located, Census and Statistics Department, accessed as on 17 September 2021

03

The India Advantage

Territory landscape

Macroeconomic indicators

Population	GDP	GDP growth	GDP per capita	GDP by sector	Inflation
 1.4 billion	 USD2,641 billion	 -8.6% (2020) 7.6% (2021F)	 USD1,914	 Agriculture-19.9% Industry- 27.5% Services- 45.3%	 4.8% (2020)






All values are estimates for 2020, unless specified otherwise. GDP provided is nominal GDP

FDI and M&A

Total FDI	Key sectors	Key countries	M&A value
 USD57 billion (↑16.3%)	 Manufacturing, Communication services, Retail, and Wholesale trade	 Singapore, Mauritius, Netherlands	 USD42 billion (↑14.7%)

All values are actuals for 2020, unless specified otherwise

Territory attractiveness

 42 FTAs	 12 major seaports, 200 non-major seaports	 464 airports/ airstrips	 USD8.2 billion FDI in manufacturing (2020)	 40 million employed in manufacturing (2019-20)
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Source: India GDP by sector, EIU; India's trade with its FTA partners: experiences, challenges and way forward, Economic Times, Oct 2019; FDI inflows into India jump by 13 per cent to USD57 billion in 2020: UN, TOI, 26 January 2021; India among top 10 FDI recipients, attracts USD49 billion inflows in 2019: UN report, Business Line, 20 January 2020; A review of India's M&A, equity investments and exits market in 2020, Consultancy.in, 3 February 2021; Travel, tourism jobs are back; 20.7 million employed in Dec quarter: CMIE, Business Today, 19 January 2021.

Situated at the centre of the trans-Indian Ocean routes, India enjoys an important strategic position enabling connectivity to Europe in the West and the countries of Asia in the East, thereby helping the country maintain favorable trade conditions with foreign nations. Being the world's fifth largest economy by GDP¹, India is one of the largest markets for manufactured goods and services. It also has the world's second-largest population, with a rising middle class population² pushing consumption demand. Further, the country is estimated to become the third-largest consumer market globally in the next 10 years³.

Over recent years, India has undertaken various measures to spur economic growth, such as introducing a bankruptcy code, introduction of Goods and Services Tax (GST) to integrate the national market and has also implemented a series of reforms to ease business conductivity. Measures undertaken to improve the business environment supported by a favorable policy regime has enhanced the flow of FDI over the last 20 years. Government initiatives, such as the relaxation of FDI norms, including permission of 100 per cent FDI through automatic route for various sectors (electronics, medical devices, automobiles, etc.) have also boosted the investment climate in the country, with its FDI flow reaching the USD500 billion milestone over April 2000 to September 2020⁴.

With trade representing 40 per cent of the country's GDP⁵, India has become progressively more open to international trade. It has

preferential access, economic cooperation and FTAs with around 54 individual countries.⁶ The country has also signed Comprehensive Economic Partnership Agreement (CEPA)/Comprehensive Economic Cooperation Agreement (CECA)/FTA/Preferential Trade Agreements (PTAs) with nearly 18 countries/territories.⁶ To encourage exporters, the country also has an Export Promotion Capital Goods (EPCG) scheme which allows duty-free import of capital goods under a condition that at least a part of the imported goods are used to produce goods for export.

Though India has progressed from being a protectionist state to an open economy, the country's trade regime and regulatory environment is still relatively restrictive. The government needs to enhance and strengthen its foreign trade policies to promote increased free trade and further develop India as a vibrant and export-led economy. With ESG emerging as one of the primary drivers of supply chains, India has significant opportunity to enter the global manufacturing value chain through the promotion of ESG and socially sustainable business models. While the government is working towards enhancing the pace of ESG compliance at the domestic level through the launch of schemes, such as vehicle scrappage policy, focus on solar energy and other initiatives, more traction is required at the global level to enhance supply chain sustainability. Indian corporations are also enhancing their ESG programs and reinventing their supply chains to improve sustainability and reduce their impact on climate and environment.

Doing business rankings 2020⁷

India's business climate has continuously improved over the years owing to sustained business reforms to make it one of the most investor-friendly countries in the world. According to the World Bank Doing Business 2020 report, India's EoDB ranking jumped 14 places to 63rd position, compared to 77th in 2019.⁸ Some of the key areas in which the country has undertaken reforms include ease of starting a business, dealing with construction permits, resolving insolvency and trading across borders. Between 2014 and 2019, India improved its EoDB rank by 79 positions.⁹

However, despite the jump, the country still has a fairly low rank and needs to make continuous improvements in the areas of ease of starting a business, registering a property, and enforcing contracts. The country can witness significant gains in its doing business ranking if it is able to resolve the challenges faced in the above-mentioned areas.

1. India is now the world's 5th largest economy, World Economic Forum, 19 February 2020

2. U.S. Census Bureau Current Population, US Census Bureau, 22 March 2021

3. India set to become third-largest consumer market by 2030, Business Standard, 9 January 2019

4. FDI equity inflows into India cross USD500 billion milestone, The Hindu, 6 December 2020

5. Foreign trade figures of India, Nordea Trade, accessed as on 8 September 2021

6. Free Trade Agreements, Department of Commerce, 1 April 2021

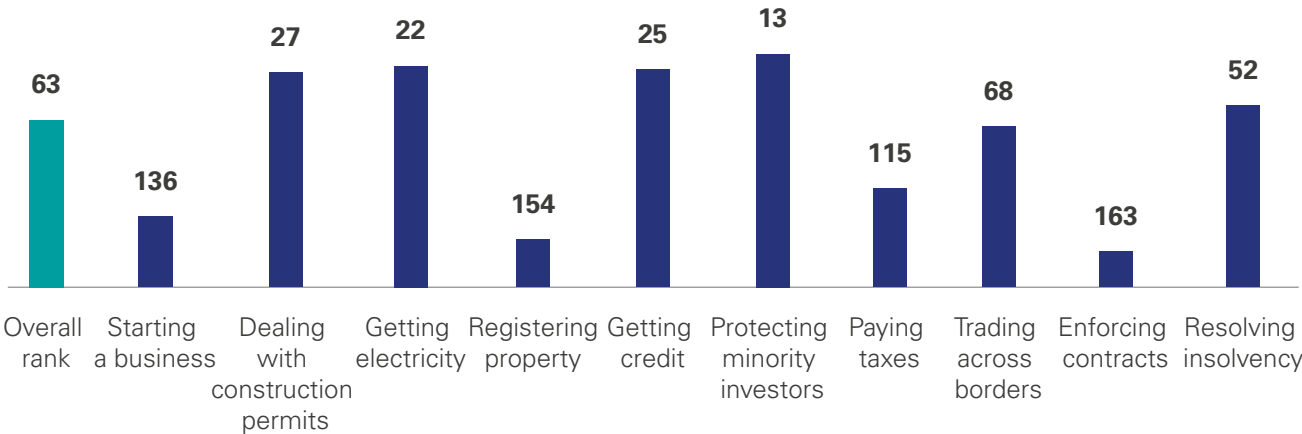
7. Country profile, India, Doing business ranking, World Bank Group

8. Doing Business 2020: Reforms Boost India's Business Climate Rankings; Among Top Ten Improvers for Third Straight Year, World Bank, 24 October 2019

9. India's business climate has been continuously improving: NITI Aayog CEO, The Hindu, 28 August 2020

Some of the key indicators highlighting the country’s ranking based on the World Bank’s doing business report are:

EoDB rankings, Global rank 2020



Source: India, Doing Business 2020, World Bank



Emergence as a manufacturing hub

In the recent years, India has emerged as a potential manufacturing hub for several sectors, owing to the government's strong focus on initiatives, such as 'Make in India', the country's purchasing power parity and its large population of engineers and factory workers. The country offers a favorable geographic dividend and is expected to maintain a young population with a mean age of 31 until 2030¹⁰, unlike several leading economies in the world which are facing a challenge of an ageing population. The availability of both low-skilled labor and a large base of over 35 million graduates, especially in engineering and technical fields¹⁰, provides a significant labor arbitrage opportunity compared to other countries in the region.

In addition, the Atmanirbhar Bharat Abhiyan initiative launched by the government in May 2020 aims to promote the country's manufacturing attractiveness and taps into the opportunities offered by COVID-19 pandemic as companies are looking at alternative manufacturing jurisdictions. The country's improvement in EoDB and FDI policy is expected to aid this initiative as several companies across different sectors are establishing manufacturing operations in the country.

India also offers attractive labor, rental and electricity costs thereby offering an attractive proposition for manufacturers considering alternative jurisdictions.^{11,12,13,14}

Parameter	Value
Average manufacturing labor cost	~USD2 per hour
Average industrial rental price	USD0.2 per sq. ft per month
Average electricity cost	USD0.114 per kWh
CIT (Domestic companies)	<ul style="list-style-type: none"> Up to USD50 million (INR400 crore) gross turnover- 25 per cent Gross turnover that exceeds USD50 million (INR400 crore)- 30 per cent
Surcharge rate (Domestic companies)	<ul style="list-style-type: none"> For total income range between USD0.14 million (INR1 crore) and USD1.4 million (INR10 crore)- 7 per cent as per rate of tax For total income range exceeding USD1.4 million (INR10 crore)- 12 per cent as per rate of tax
CIT (Foreign companies)	<ul style="list-style-type: none"> Royalty or fees received for any technical services from the government or an Indian concern under agreements made before 1st April, 1976, which is approved by the central government- 50 per cent Any other kind of income- 40 per cent
Surcharge rate (Foreign companies)	<ul style="list-style-type: none"> For total income range between USD0.14 million (INR1 crore) and USD1.4 million (INR10 crore)- 2 per cent as per rate of tax For total income range exceeding USD1.4 million (INR10 crore)- 5 per cent as per rate of tax
Health and education cess	4 per cent

Source: Will Modi's Moves Lead to the 'Next China'?, Site Selection, November 2020; Average cost of factory labor at less than USD2 per hour gives India big advantage of wage arbitrage, ET, 3 April 2018; Delhi Ncr Marketbeat Reports, Cushman and Wakefield, 21 January 2021; India electricity prices, Global petrolprices.com, 30 June 2020; Corporate Tax, Bank Bazaar, accessed as on 8 September 2021

However, to transition to a globally competitive manufacturing hub, India needs to invest more in improving its infrastructure and access to electricity. The country's inadequate legal and regulatory systems also pose a concern to foreign investors. India needs to continue rolling out reforms to the country's legal and regulatory framework, introduce more investor-friendly policies and incentives and foster R&D and innovation through increased collaboration between the public and private sector and utilise the supply chain realignment opportunities arising from the pandemic.

10. Will Modi's Moves Lead to the 'Next China'?, Site Selection, November 2020

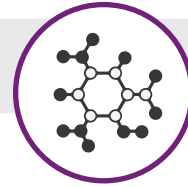
11. Average cost of factory labor at less than USD2 per hour gives India big advantage of wage arbitrage, ET, 3 April 2018

12. Delhi Ncr Marketbeat Reports, Cushman and Wakefield, 21 January 2021

13. India electricity prices, Global petrolprices.com, 30 June 2020

14. Corporate Tax, Bank Bazaar, accessed as on 8 September 2021

Dominant sector: Specialty Chemicals



1. Market opportunity

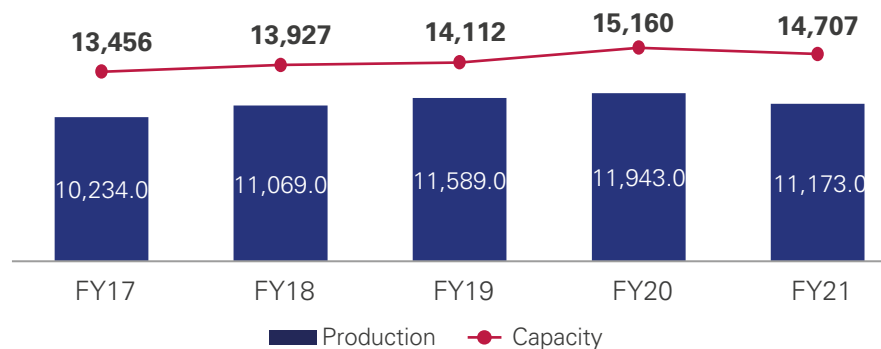
1.1. Chemical manufacturing in India

India is the sixth-largest producer of chemicals in the world and third-largest in Asia (in terms of output). In 2019, the market size of the industry was valued at about USD178 billion¹⁵ and is expected to witness rapid growth at a compound annual growth rate (CAGR) of 9 per cent¹⁵ (during 2019–2025) to reach USD304 billion¹⁵ by 2025. India has over 12,168¹⁶ chemicals and chemical products manufacturing factories, with Gujarat, Maharashtra, and Tamil Nadu accounting for the majority of factories. As of FY20, the country had an installed capacity of 15.2 million metric tonnes¹⁷ for the production of major chemicals. One of the key factors driving the industry is the rising usage of chemicals in industries, such as automotive, personal products, water treatments, construction, and others.

In terms of the industry structure, the sector is extremely diversified as more than 80,000¹⁵ commercial products are manufactured in the country. Further, the industry can be broadly classified into bulk chemicals, specialty chemicals, agrochemicals, petrochemicals, polymers, and fertilizers¹⁶.

On the supply side, there are a growing number of companies offering the data-gathering and analytics services needed for companies to be able to monitor what is happening at all points along their supply chain.

Production of major chemicals, FY17–FY21, 000'MT



Note 1: Major chemicals include alkali chemicals, inorganic chemicals, organic chemicals, pesticides and dyes and pigments
Source: Chemical and Petrochemical Statistics at a Glance – 2020, Department of Chemicals and Petrochemicals

1.2. Specialty chemicals manufacturing

The Specialty Chemicals industry is a pivotal sub-segment of the chemical industry as it makes up about 18 per cent¹⁵ of the total chemicals and petrochemicals industry. It also serves as a strong pillar for other industries as it provides several products to many supporting industries, including papers, paints, textiles, soaps, and detergents. With a market size of about USD32¹⁵ billion (in 2019–20) and expected growth rate at a CAGR of 12¹⁵ per cent during 2019–22, India's specialty chemicals market is one of the fastest growing in the world.

Factors, such as burgeoning domestic demand from end-user industries, increasing export opportunities driven by the global trade dynamic and low per capita consumption of chemicals (India consumes about 1/10th of the world's average consumption of chemical products) are propelling the growth of chemicals in the country.

On the basis of usage in end-user industries, colorants with a share of 21 per cent constitute a major consumer industry for specialty chemicals¹⁸. Specialty

chemicals, such as surfactants, specialty polymers, textile chemicals, dyes are also some of the leading segments (in terms of demand), and are further expected to record high growth in the coming years (mainly due to rising demand from food, textile and automobile industries). Other segments, such as cosmetic chemicals, adhesives and sealants, flavours and fragrances, printing inks, food additives, water management chemicals are some of the emerging segments that are witnessing rapid growth in India.

15. Chemicals sector, Invest in India, accessed as on 8 September 8, 2021

16. Chemicals and Petrochemicals Statistics, Department of Chemicals and Petrochemicals, accessed as on 8 September 8, 2021

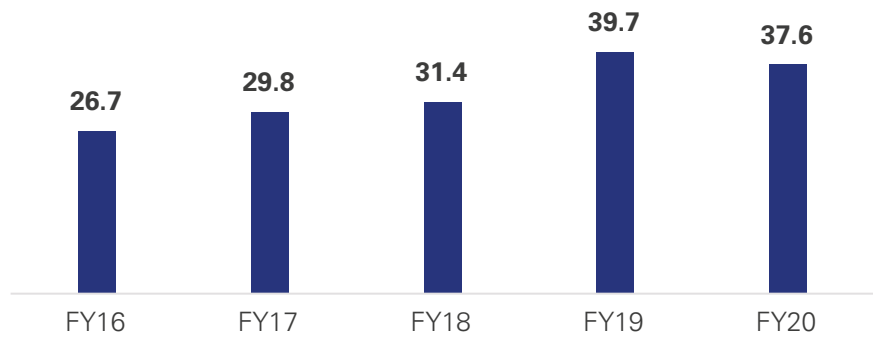
17. Chemical and Petrochemical Statistics at a Glance – 2020, Department of Chemicals and Petrochemicals, accessed as on 8 September 8, 2021

18. India Chemical Gujarat, FICCI, accessed as on 8 September 2021

In terms of exports, the country is the 9th largest exporter¹⁹ of chemicals (excluding pharmaceutical products) in the world, and chemical products constitute about 12.3²⁰ per cent of the overall exports. During 2016–20, chemical exports alone have grown at a CAGR of nearly 7.2 per cent, due to rising demand of chemicals. The chemical and petrochemical market of India is forecasted to reach USD300 billion by 2025, with the demand of the products expected to witness an annual growth of 9 per cent between 2020 and 2025¹⁹.

The U.S., the UAE, the UK, Bangladesh, and Saudi Arabia remained the leading importers of cosmetics, toiletries, and essential oils²¹.

Export of chemicals (USD billion)



Source: Department of Chemicals and Petrochemicals



1.3. Key chemical clusters in India

The Indian chemical industry is estimated to have about 40,000–50,000²² companies, with a small proportion of multinationals present in the sector. Further, the Indian market for specialty chemicals is unorganized, whereas a large number of players who operate only in the specific sub-segments hold significant market share.

Clusters

Petroleum, Chemicals and Petrochemicals Investment Region (PCPIRs):

To promote investment and development in the chemical industry, the government has introduced the policy on PCPIRs. The investment regions will be strategically located in areas with abundant availability of skilled personnel, developed infrastructure and enhanced connectivity with both domestic and international markets. Currently, India has about four approved PCPIRs (A PCPIR is defined as a region with an area of about 250¹⁹ square km. where nearly 40¹⁹ per cent of the area

19. Chemicals sector, Invest in India, accessed as on 8 September 2021

20. Annual Report 2019-2020, Department of Chemicals and Petrochemicals, accessed as on 8 September 2021

21. Chemicals and petrochemicals statistics, Department of chemicals and petrochemicals, accessed as on 8 September 2021

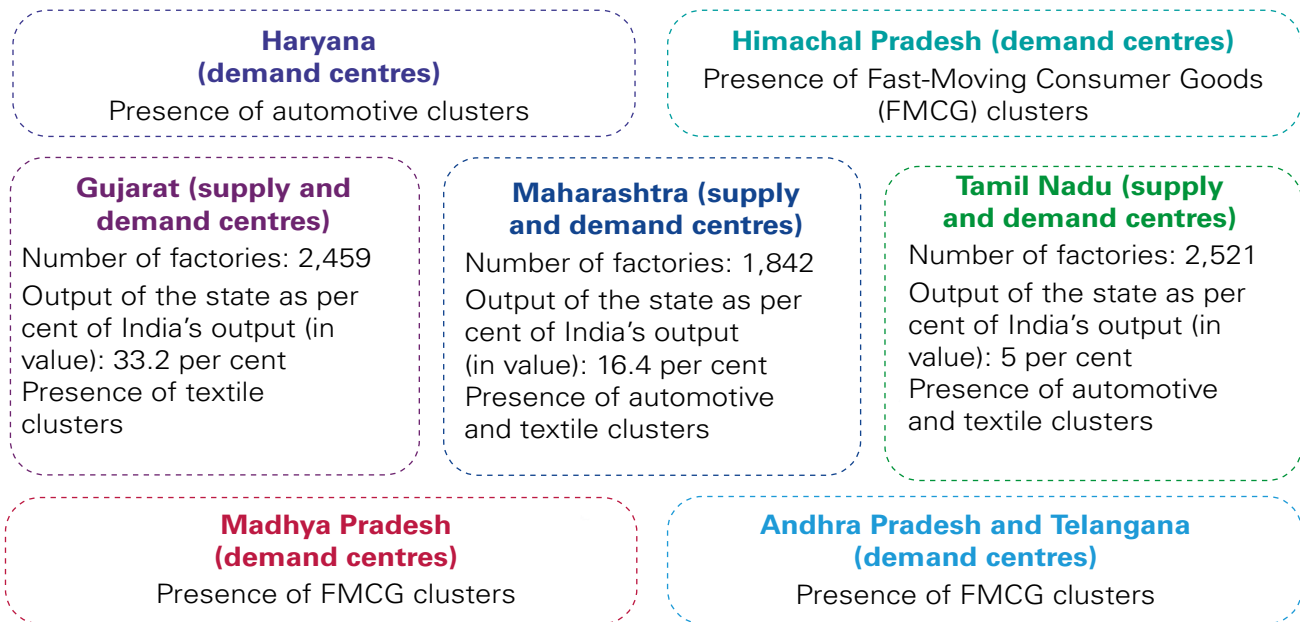
22. Chemical industry, India, International Trade Administration, accessed as on 8 September 2021

is used for processing activities) in the states of Andhra Pradesh, Gujarat, Odisha and Tamil Nadu.

Gujarat and Maharashtra are the key chemical production clusters in the country, accounting for over 60 per cent of India's chemical production. The two states are also a hub for key end-use industries, such as paints, textiles, packaging, automotive. Gujarat, also known as the 'Petro Capital of India', accounts for about 53 per cent²³ of India's total

chemical production (in volume). Chemicals, such as soda ash, polymers, acetic acid, and ethylene are some of the highly produced chemicals in Gujarat.

Apart from Gujarat and Maharashtra, Tamil Nadu is also gaining prominence in the chemical manufacturing sector. Key end-use industries (demand centres) of chemicals also have a pan-India presence. Major manufacturing clusters and demand centres include^{2,24}:



Note 2: The data is as of 2016–2017 as available from annual survey of industries 2015–2016 (updated on 26 March 2019)

Source: Chemicals sector, Invest India

2. Sector attractiveness from supply chain realignment perspective^{25,26}

Over **2 million people** employed in chemical industry



Accounts for about **16 per cent** of the global production of dyestuffs and dye intermediates



Over **70,000** chemical manufacturing units



USD17.8 billion of FDI inflow between April 2000 and June 2020



23. Gujarat chemical sector report, NBSO Ahmedabad, accessed as on 8 September 2021

24. Chemicals and Petrochemicals Statistics, Department of Chemicals and Petrochemicals, accessed as on 8 September 8, 2021

25. Chemicals sector, Invest in India, accessed as on 8 September 2021

26. Chemical Industry in India, Kompas, accessed as on 8 September 2021

2.1. Government support and trade

The government considers the chemical industry as one of the key industries of the country and is aiming to ensure that by 2025 about 25 per cent of the GDP²⁷ (from the current 16 per cent) in the manufacturing sector is derived from the chemical industry. Accordingly, it has undertaken several initiatives – some of which are:

Tax incentives

Some of the tax-based incentives provided by the government include:

Parameter	Value
Corporate tax exemption	<ul style="list-style-type: none"> Effective 2019–20, the corporate tax rate is reduced to 25.17 per cent for all domestic companies For the companies incorporated after October 2019 and commencing production before March 2023, the effective tax rate will be 17.01 per cent
Incentives to Special Economic Zones (SEZ) units	<ul style="list-style-type: none"> 100 per cent exemption on income tax on export income for SEZ units for the first five years, 50 per cent for the next five years and 50 per cent of the ploughed back export profit for the next five years Single window clearance for central and state approvals Import duty is relaxed on the import/domestic procurement of goods for development, operation, and maintenance of SEZ units
Non-tax incentives	<ul style="list-style-type: none"> 100 per cent FDI is allowed via RBI (Reserve Bank of India) in the chemical sector (except for hazardous chemicals) Manufacturing of chemicals, including organic/ inorganic dyestuffs and pesticides is de-licensed

Source: Chemicals sector, Invest in India, accessed as on 8 September 2021

Key schemes introduced by the government

- **CPDS (Chemical Promotion Development scheme):** Through this scheme, the government provides financial support for conducting seminars, conferences, exhibitions, and others to foster development of the chemical sector
- **PLI scheme:** The government is intending to introduce a PLI scheme to reduce import of chemicals by domestically manufacturing them and contribute to the Prime Minister's vision of Atmanirbhar Bharat.²⁸ According to the government, an investment of USD109.2 billion (INR 8 lakh crore) is anticipated in the sector, by 2025.
- **PCPIR policy 2020–35:** As per this policy, the government aims to ensure investment of USD142²⁹ billion by 2025, USD213 billion²⁹ by 2030 and USD284 billion²⁹ by 2035 in all PCPIRS in the country. Projects focusing on the development of airport, road, electricity distribution, water supply and effluent treatment and disposal are being prioritized in the Paradeep PCPIR and Dahej PCPIR.

2.2. Skill/talent availability

The chemical industry is a skill-intensive industry that requires its workers to have a certain level of training to operate machines and production equipment. However, due to the rising demand from supporting industries, this sector is expected to witness significant growth over the next few years. It is estimated that the industry requires more than 8.5 lakh skilled technicians³⁰.

However, the government has acknowledged this skill gap and is planning to invest in setting up central institutes of chemical, engineering and technology at different locations in the country. One such institute is the Central Institute of Plastics Engineering & Technology, Chennai (CIPET), which has 36 functional centres, including seven institutes of plastic technology centres, 24 centres for skilling and technical support and three schools for advanced research in polymers for the purpose of imparting training on required skills to people. Skill development programs undertaken by the government, combined with India's vast labor force provide a competitive advantage for companies as the country offers skilled talent at attractive costs. For instance, the minimum wage for contract workers in India is USD148³¹ per month (as compared to USD234 in China).

27. Chemicals sector, Invest in India, accessed as on 8 September 2021

28. Govt mulls launching PLI scheme for chemical sector to boost manufacturing, Business Standard, 5 March 2021

29. New PCPIR policy moots central funding for infrastructure, Business Today, 7 December 2020

30. Indian chemical industry requires 8.5 lakh skilled technicians, Skill reporter, 4 September 2016

31. The Labor Market in India: Structure and Costs, India Briefing, 17 January 2019

2.3. Infrastructure

With a total coastline of 7,516.6 km³², India is the 16th largest maritime country in the world³³. The country is interspersed with 12 major ports and more than 200 non-major ports³³. The major chemical producing states namely Gujarat, Maharashtra, and Tamil Nadu have the presence of several key ports thereby offering logistical convenience for export of chemicals. Through initiatives, such as the Sagarmala Program, several projects are being undertaken towards port modernization, new port development, and port-led industrialization to enhance connectivity for exports and reduce overall export-import costs. Greenfield ports have been proposed to be developed at various states, including Maharashtra, Tamil Nadu, Odisha, and West Bengal alongside capacity expansion at existing ports, to improve overall port connectivity across the country. Further, the government is also making strong initiatives to facilitate cross-border trade among countries. India is centrally located in the trans – Indian Ocean routes, enabling connectivity between Europe and east Asian countries. The country's proximity to the Middle East also provides access to petrochemical feedstock at a low cost.

As part of the National Industrial Corridor program, the Indian government is also developing several industrial corridor projects. These corridors, being developed along the national investment and manufacturing zones would enable last-mile connectivity through multimodal transport services. Some of the key industrial corridors include Delhi-Mumbai, Amritsar-Kolkata, and Chennai-Bengaluru industrial corridors. High speed transportation network, SEZs, industrial clusters, modern seaports and airports and logistics parks are expected to lower logistics cost, improve delivery time, and thereby improve efficiency of the overall industrial production structure.

In terms of air transport infrastructure, the country has about 464³⁴ airports/ airstrips of which 125³⁵ (29 international and 86 domestic airports) are managed by

the Airports Authority of India (AAI). The country also has a well-connected road transport infrastructure with national highways of about 132,499³⁶ km.

The government has also approved the establishment of 10 plastic parks, an industrial zone dedicated to companies engaged in manufacturing plastic and its allied industries, in the country. Accordingly, these parks are being set up in the states of Assam, Madhya Pradesh, Odisha, Tamil Nadu, Jharkhand, Uttarakhand, and Chhattisgarh.

2.4. Conclusion

The Indian specialty chemicals industry, which was recording modest growth in the past few years suffered an adverse impact due to the outbreak of the pandemic. The impact was mainly led by the fall in the domestic demand of the specialty chemicals (as the usage in industries, such as construction significantly dipped) and reduction in the exports (due to the lockdown and trade disruptions across the world). However, the severe supply chain disruptions and shutdown of manufacturing facilities in China (which constitutes about 20 per cent³⁷ of the global chemical industry) raised uncertainty concerns among the foreign manufacturers. Also, the changing structure of China's chemical industry due to introduction of stringent environmental norms has made investors wary of investing in the country. Several producers also expressed interest in relocating their manufacturing bases to a different country.

In such a scenario, the introduction of favorable policies and incentives are making the country a lucrative investment destination. However, currently the country lacks the requisite infrastructure for expediting the manufacturing of specialty chemicals. Going forward, if the government focuses on revamping its infrastructural facilities and continues to push campaigns, such as Make in India – the industry can record significant growth.

Key highlights

- India is third largest producer of chemicals in Asia, registering over nine per cent growth in production in past five years.
- Andhra Pradesh, Gujrat, Odisha, and Tamil Nadu are major chemical producing states in India driven by high demand from industries, such as automotive, water treatment and construction and dedicated PCPIR declared by the government.
- Indian government is promoting investments in the sector by offering tax incentives, operating SEZs, promoting FDI and non-tax incentives, such as PLI schemes and development of transportation infrastructure, such as ports and railways.

32. India's Coastline, Free Press Journal, 19 October 2018

33. Ports and Shipping, Make in India, accessed as on 15 April 2021

34. Airport Policy, Airports Authority of India, accessed as on 15 April 2021

35. Airports, Ministry of Civil Aviation, accessed as on 15 April 2021

36. National Highways Summary, National Highway Authority of India, accessed as on 15 April 2021

37. Indian specialty chemical industry likely to grow in double digits here are the top 4 stocks to buy, CNBC, 13 October 2020



Dominant sector: Life sciences



1. Market opportunity

1.1. Overview

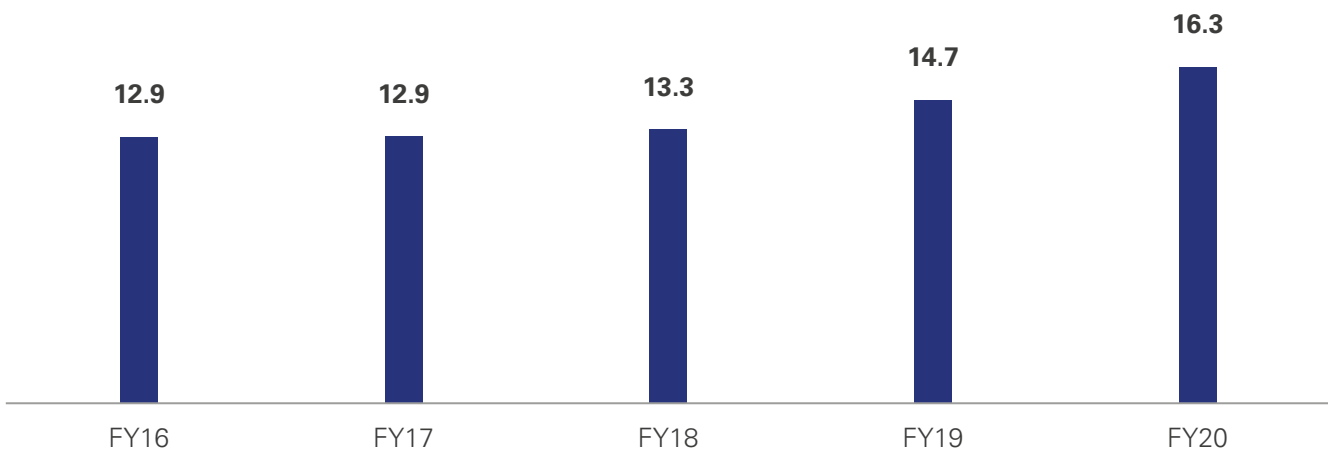
The life sciences sector in India has witnessed significant growth over the last five decades and continues to exhibit promising growth over the years to come. The sector is expanding in the domestic and overseas market, primarily driven by pharmaceuticals and medical devices. While the Indian pharma sector is projected to reach USD130 billion by 2030, the medical device market is expected to reach USD50 billion by 2025.³⁸ The government's thrust on universal healthcare and focus on local manufacturing are key factors which would boost growth in the Indian life science sector. The COVID-19 pandemic has also opened new avenues in the field of supply chain, while R&D and innovation and provides significant opportunities for the country to tap into and further strengthen the sector.

1.2. The pharmaceutical sector

India is among the largest manufacturers of pharmaceutical products in the world and is increasingly referred to as "pharmacy of the world". The country has a prominent presence in the global pharma market, occupying 20 per cent share of the global pharma supply by volume.³⁹ India ranks third worldwide for production of pharma products by volume, and 14th by value.³⁹ India is also the only country in the world with the largest number of United States Food and Drug Administration (US-FDA) compliant pharma plants outside of the U.S. The country is also the third largest market for active pharmaceutical ingredients (APIs) globally, manufacturing over 500 different APIs and contributing 57 per cent of APIs to the prequalified list of the World Health Organization (WHO).³⁹

India accounts for 20 per cent of global exports in generics and also caters to over 50 per cent of the global demand for various vaccines.⁴⁰ The Indian Council of Medical Research (ICMR) and an Indian biotechnology company have jointly developed COVAXIN, India's first indigenous COVID-19 vaccine, with a planned production capacity of 150 million doses per annum.⁴¹ Alongside catering to the domestic market, the vaccine is also being exported to several countries across the globe. Various other COVID-19 vaccines developed in India are also undergoing clinical trials. Exports account for nearly 50 per cent of the pharma sector's total revenue.⁴² Key pharmaceutical exports include bulk drugs, intermediaries, drug formulations, herbal products, biologicals, and surgical products.⁴³

Export of pharmaceutical products (USD billion)



Source: Ministry of Commerce and Industry

38. Indian pharma market expected to hit USD130 billion by 2030: Sadananda Gowda, Financial Express, 8 February 2021

39. Pharmaceuticals, Invest India, accessed as on 8 September 2021

40. Indian Life Sciences Industry – An Overview, Marsh, 22 January 2020

41. Covaxin's Production Capacity 150 Million Doses A Year: Centre, NDTV, 8 March 2021

42. Skilled life sciences specialists give India an edge in times of a pandemic, Skill reporter, 13 May 2020

43. Export Import Data Bank, Ministry of Commerce and Industry, accessed as on 15 April 2021

Exports of pharma products have also shot up significantly amidst the COVID-19 pandemic, with drug formulation surging 18 per cent and bulk drug exports increasing 9 per cent year-on-year during the first half of FY21.⁴⁴ Spike in demand for pharma products due to the pandemic and hoarding of supplies by some nations owing to production disruptions are some factors contributing to the growth of exports. The country supplied critical pharmaceuticals to over 120 countries amidst the pandemic.⁴⁵ As of March 2021, India also exported 5.96 crore doses⁴⁶ of Made in India COVID-19 vaccines to 72 countries across the globe as part of the COVID-19 Vaccines Global Access (COVAX) initiative and bilateral contracts between various governments. With India being one of the largest producers of vaccines in the world, several foreign companies have partnered with Indian pharma players to produce COVID-19 vaccines. The government has also initiated a manufacturing and delivery ecosystem to meet the growing demand for COVID-19 vaccines.

In addition, FDI has also played a key role in the development of India's pharma sector. Over April to December 2020, drugs and pharmaceutical sector attracted FDI of USD1.25 billion, signifying its attractiveness even amidst the pandemic.⁴⁷ Low cost of production and R&D boosts the efficiency of pharma companies in India, thereby leading to competitive exports. The government has recently notified the New Drugs and Clinical Trials Rules, 2019 to streamline clinical trials regulations in India and provide faster approvals. Clearances for bulk drug production projects in the country are also being fast-tracked to increase domestic production. According

to the National Investment Promotion and Facilitation Agency, the pharmaceutical sector in India currently has 10 investible projects representing a USD40.4 million opportunity for investors.⁴⁸ The country's established pharma sector also offers significant opportunities for foreign manufacturers looking at diversifying their supply chains.

1.3. Medical devices manufacturing

Medical device sector in India has grown significantly over the years and is among the top 20 global markets⁴⁹ and the fourth largest in Asia⁴⁹. With a market size of USD11 billion in 2020, the sector is projected to grow 28 per cent annually to reach USD50 billion by 2025.⁴⁹ The Indian medical device sector comprises four broad segments- consumables and implants, including syringes, needles, stents, etc.; equipment and instruments, including surgical and non-surgical equipment; diagnostic imaging, including electro-diagnostic apparatus, radiation apparatus, imaging parts, etc.; patient aid, such as hearing aid, prosthetics and others. Equipment and instruments are the largest segment among medical devices and also offers a potential for domestic manufacturing alongside the patient aids segments, as the demand for these are primarily catered through imports. Overall, the medical device sector in India has a high dependency on imports, with 75 to 80 per cent of the domestic demand met through imports. Currently, manufacturers in India are mostly involved in the production of low-end medical devices, such as syringes, needles, surgical blades, and others for domestic as well as export market. This provides significant opportunities for investors to

establish manufacturing units in the country to cater to domestic demand, while also setting up export-oriented units.

The National Institution for Transforming India (NITI Aayog), a policy think tank of the government of India is developing a roadmap to promote medical device manufacturing in the country. The government is also undertaking initiatives, such as development of infrastructure, offering incentives and promoting FDI to increase domestic manufacturing of medical devices. The government has also formed the National Medical Devices Promotion Council to promote the local manufacturing of medical devices and to attract investments in the sector.



44. India's pharma export shoots up amid coronavirus pandemic; 'China plus one' policy helps, Financial Express, 5 January 2021

45. Australia and India: Capturing the opportunities in life sciences, ORF online, 27 October 2020

46. EXCLUSIVE| With 'Vaccine Maitri', India pulls off diplomatic coup against China in Africa, Money Control, 19 March 2021

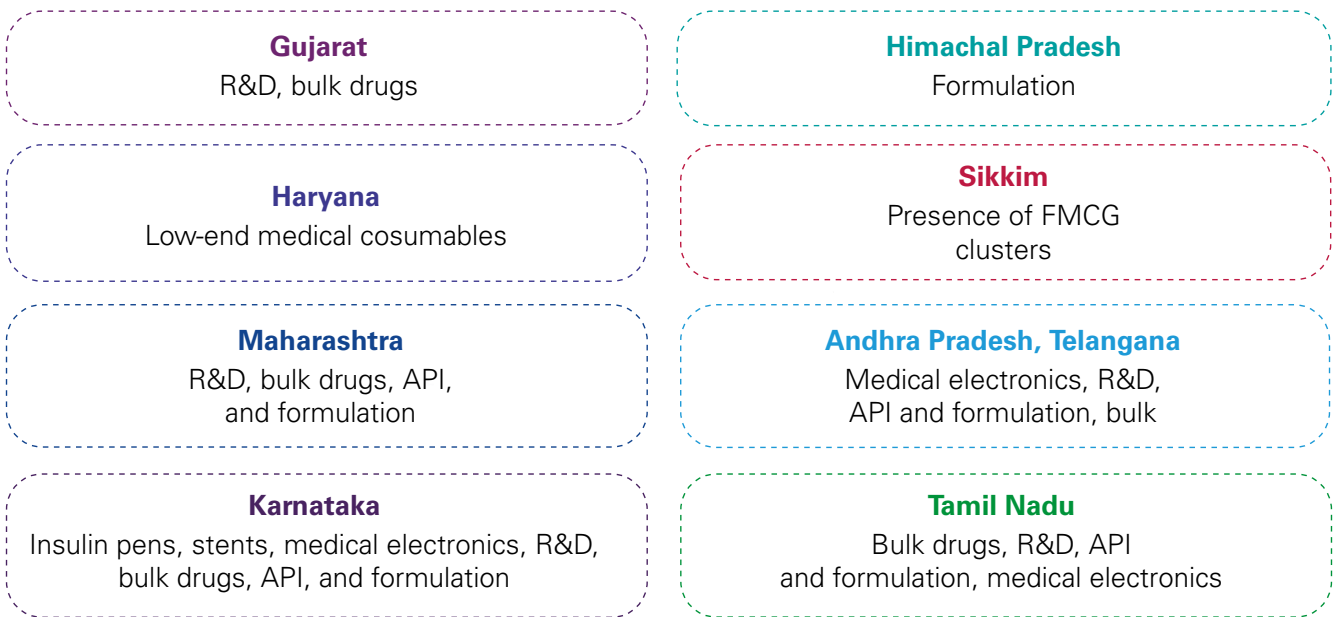
47. Fact sheet on foreign direct investment (FDI), DIPP, 31 December 2020

48. Pharmaceuticals, Invest India, accessed as on 8 September 2021

49. Medical devices, Invest India, accessed as on 8 September 2021

1.4. Key pharmaceutical and medical device manufacturing clusters

The Indian life science sector is home to over 3,000 drug manufacturers with a network of over 10,500 manufacturing units and close to 800 domestic medical device manufacturers.^{50,51} These units are spread across the country in clusters. These clusters cater to specific manufacturing needs across the pharma and medical device value chain, such as bulk drug manufacturing cluster, formulation cluster, R&D, medical electronics manufacturing clusters, medical consumables clusters, and others. The government is also developing medical device and pharmaceutical parks in these clusters to promote efficient domestic manufacturing at lower costs.



Source: Pharmaceuticals, Medical Devices, Invest India

2. Sector attractiveness from supply chain realignment perspective^{50,51,52}



50. Medical devices, Invest India, accessed as on 8 September 2021

51. Pharmaceuticals, Invest India, accessed as on 8 September 2021

52. Skilled life sciences specialists give India an edge in times of a pandemic, Express Pharma, 6 July 2020

2.1. Government support and incentives

To promote growth of the life science sector and boost domestic manufacturing of medical devices and pharmaceuticals, the government has taken various initiatives to attract investments in the sector. The government has now permitted up to 100 per cent FDI under automatic route for manufacturing of medical devices. For pharmaceuticals, up to 100 per cent FDI is permitted under the automatic route for greenfield projects, while for brownfield projects, up to 74 per cent FDI is permitted under automatic route and thereafter under the government approval route. The government has also announced PLI for domestic manufacturing of key starting materials (KSM)/drug intermediaries (DI) and APIs, medical devices and promotion of medical device parks and bulk drug parks.^{53,54,55}

Parameter	Incentive
PLI scheme for medical devices manufacturing	<ul style="list-style-type: none"> • Incentive of 5 per cent on incremental sales of goods manufactured in India across cancer care/radio therapy, radiology, imaging and nuclear imaging devices, anaesthetics, cardio-respiratory and renal care, and all implants • Total incentive to the tune of USD467 million (INR3,420 crore) over scheme tenure of FY21 to FY28, with total maximum incentive of USD16.5 million (INR121 crore) per applicant
Production linked incentive scheme for APIs, KSMs and DIs	<ul style="list-style-type: none"> • Incentive on incremental sales to eligible manufacturers of identified 41 eligible products covering 53 APIs • Incentive for fermentation products: <ul style="list-style-type: none"> – FY 2022-26: 20 per cent – FY 2026-27: 15 per cent – FY 2027-28: 5 per cent • Incentive for chemically synthesized products: <ul style="list-style-type: none"> – FY 2021-27: 10 per cent • Total incentive to the tune of USD947 million (INR6,940 crore) across scheme tenure over FY21 to FY30
Production linked incentive scheme for pharma sector	<ul style="list-style-type: none"> • Incentive scheme for pharmaceutical goods under three categories- Biopharmaceuticals, complex generic drugs, patented drugs among others Category 1, active pharmaceutical ingredients and autoimmune drugs, anti-cancer drugs, anti-diabetic drugs part of Categories 2 and 3, respectively • 10 per cent incentive (of incremental sales value) for Category 1 and Category 2 products for the first four years, 8 per cent for the fifth year and 6 per cent for the sixth year of production • 5 per cent incentive (of incremental sales value) for Category 3 products for the first four years, 4 per cent for the fifth year and 3 per cent for the sixth year of production • Total incentive to the tune of USD2 billion (INR15,000 crore) over FY21 to FY29
Promotion of bulk drug parks	<ul style="list-style-type: none"> • Incentive of USD409.3 million (INR3,000 crore) for construction of common infrastructure facilities in three bulk drug parks with a maximum limit of USD136.5 million (INR1,000 crore) per park over FY21 to FY25
Promotion of medical device parks	<ul style="list-style-type: none"> • Financial assistance up to USD54.6 million (INR400 Crore) for the creation of common infrastructure facilities in four Medical device parks with a maximum limit of USD13.6 million (INR100 crore) per park over FY21 to FY25

Source: Cabinet approves Rs 15,000 crore PLI scheme for pharma sector, ET, 24 February 2021; Schemes for Pharmaceuticals Manufacturing, Invest India, accessed as on 8 September 2021; Schemes for Medic

53. Cabinet approves Rs 15,000 crore PLI scheme for pharma sector, ET, 24 February 2021

54. Schemes for Medical Devices Manufacturing, Invest India, accessed as on 8 September 2021

55. Schemes for Pharmaceuticals Manufacturing, Invest India, accessed as on 8 September 2021

2.2. Infrastructure

India has a robust infrastructure to cater to the growing life sciences sector and is continuing to further enhance facilities to promote domestic manufacturing. The country has an established base of over 10,000 drug manufacturing units⁵⁶ and several medical devices production units. Alongside having over 664 US-FDA compliant pharma plants⁵⁷, India also has over 2,000 WHO Good Manufacturing Practices (WHO-GMP) approved pharma plants and 253 European Directorate of Quality Medicines (EDQM) approved plants.⁵⁸

The country has several medical devices and pharmaceuticals manufacturing clusters across multiple states, including Tamil Nadu, Gujarat, Karnataka, Haryana, and others. Some of the key medical device parks include HLL Medipark in Chennai and AMTZ Medtech Park in Visakhapatnam. These parks simplify end-to-end operations, reduce manufacturing costs and are well-connected to railway stations, highways, seaports, and airports, thereby reducing logistics costs for manufacturers. The government is aiming to further enhance the life science sector infrastructure by offering financial assistance and incentive schemes to promote bulk drug manufacturing parks and medical device manufacturing parks. Several institutions and private companies are also collaborating with state governments to develop medical device manufacturing park.

2.3. Availability of talent

India has a large pool of talented workforce alongside researchers and scientists to meet the needs of the life science sector. The country is the second largest provider of pharma and biotech professionals

in the world, after China.⁵⁸ Being one of the five priority sectors identified by the Niti Aayog, life science sector in India employs about 9 lakh people across various facets of the sector's value chain.⁵⁹ The Life Sciences Sector Skill Development Council (LSSSDC), established in 2014 by the National Skill Development Corporation (NSDC) in collaboration with the Confederation of Indian Industry (CII) has been instrumental in enhancing the skillset of the life science sector's workforce.

The LSSSDC is focused on developing a skilled workforce across manufacturing, sales and marketing, quality control and other verticals. The council has laid emphasis on training candidates across various levels, including organizing skill development programs for youth at school and college levels, encouraging apprenticeship programs and assessment and certification of the employed workforce under the government's Recognition of Prior Learning (RPL) program. Between 2014 to 2019, the council has upskilled over 35,000 candidates for high capital expenditure manufacturing job roles through modern training methods such as simulation and Virtual Reality (VR)-based modules.⁵⁹ LSSSDC also has strong ties with the industry and has set up several centres of excellence with prominent companies in the sector.

The council has also established a roadmap to cater to the growing demand, including usage of new-age technologies to upskill the workforce with scale and speed, further strengthen ties with industry and academia and build capacity to meet future requirements of the Indian life science sector.

2.4. R&D and innovation

The life science sector in India has evolved significantly over the years with respect to R&D and innovation. While India has a comparatively lower R&D spending compared to countries, such as Japan, the U.S., China, Germany, and others, the country's gross expenditure on R&D (GERD) has been consistently increasing over the years. With respect to the pharma sector, the government has been supportive in terms of introducing open-source drug discovery which has helped in conducting high-quality research, fostering innovative discoveries and cures, and has also enhanced the progress of drug discovery. India is the third largest medtech R&D employer in the world, after the U.S. and Germany. The country also has over 3,000 start-ups⁶⁰ focusing on healthtech, thereby promoting innovation in this space. Increased R&D investments in this sector are expected to drive design and manufacturing of medical devices in the country.

COVID-19 has further expedited innovation in the pharma sector with several Indian companies conducting various levels of clinical trials for indigenous vaccine candidates to combat the pandemic. Approval for usage has already been granted to COVAXIN, the country's first indigenous vaccine, while clinical trial results are awaited, for other vaccines being developed in the country.

The government is also working on developing an exclusive R&D policy for the pharmaceutical sector, which is also expected to incentivize scientists on monetization of their innovations. The private sector is also working on increasing innovation through creation of incubators to collaborate with global partners

56. Pharmaceuticals, Invest India, accessed as on 8 September 2021

57. Investment opportunities in India's healthcare sector, Niti Aayog, 30 March 2021

58. India: Pharmacy to the World, Invest India, 31 July 2020

59. Skilled life sciences specialists give India an edge in times of a pandemic, Express Pharma, 6 July 2020

60. Budget 2021: Opportunities for healthtech startups in India, YourStory, 4 February 2021

and incubate start-ups focused in areas of life science, digital health and medtech.

However, India needs to increase expenditure in life science and digital healthcare to further strengthen the life science sector. A close industry-government collaboration is required to tap into opportunities provided by COVID-19 and boost research and innovation in the sector.

2.5. Conclusion

The life science sector in India has evolved significantly over the years, with the country being among the largest suppliers of vaccines and generic drugs globally.

India is also among the top 12 biotech destinations in the world and is ranked third in the Asia Pacific region.⁶¹ The country has a strong talent base of life science professionals and the sector also employs one of the largest R&D workforces. The sector is poised to grow further, with potential to tap into opportunities that have been created due to the COVID-19 pandemic in terms of vaccine development, drug discovery and manufacturing of medical devices.

Though the sector faces certain challenges with respect to infrastructure, domestic logistics and supply chain network and limited design capabilities,

strong support and focus by the government can help address these challenges and boost growth in the sector. Targeted policies, increased R&D expenditure, faster approval process, and enhanced incentives could promote foreign investments in the sector and reduce dependency on imports. The government should increase investment in current good manufacturing practices (cGMP) by upgrading facilities and installing high quality equipment. The sector should also actively pursue the Make in India initiative to promote local manufacturing of medical devices and also improve the country's attractiveness for global manufacturers.



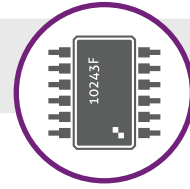
Key highlights

- India accounts for about 20 per cent of global pharmaceutical supply by volume, amounting to almost 20 per cent of global exports of generic and 50 per cent for vaccines.
- Key pharmaceutical exports from the country include bulk drugs, intermediaries, drug formulations, herbal products, biologicals and surgical products.
- In 2019, the government notified New Drugs and Clinical Trial Rules to streamline clinical trial regulations, offer faster approvals for bulk drug production projects and increase domestic production.
- Indian government has permitted 100 per cent FDI for manufacturing of medical devices and greenfield pharmaceutical projects. It has formulated Medical Devices Promotion Council to promote local manufacturing of medical devices.
- Government has announced PLI schemes providing financial incentives to enhance domestic manufacturing of KSM, drug intermediaries, active pharmaceutical ingredients, and medical devices.
- India has an established base of 10,000 drug manufacturing units carrying quality and compliance certifications from authorities, such as US-FDA, WHO, and EDQM. It also houses more than 3,000 start-ups in healthtech space leading to enhanced pace of R&D and innovation in medicine industry.



61. Pharma, Biotech & Lifesciences, India investment grid, 14 October 2020

Sunrise sector: Electronics



1. Market opportunity

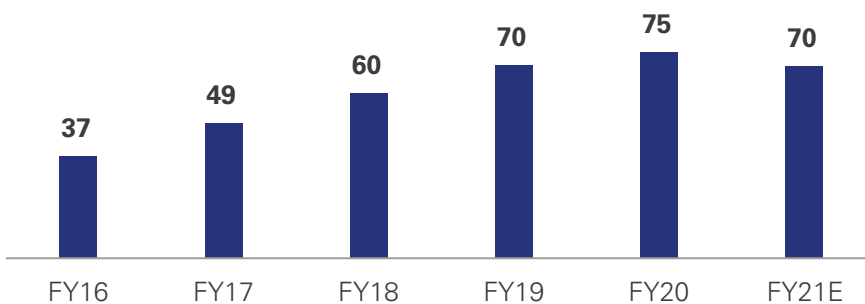
1.1. Electronics sector overview

India has one of the fastest growing electronics sectors in the world, with electronics manufacturing in the country growing at a CAGR of around 13.6 per cent over FY16 to FY21.⁶² The sector comprises consumer goods, industrial electronics, strategic electronics and electronics components and accounts for 2.3 per cent of India's GDP.⁶³ Government initiatives to boost domestic manufacturing such as Make in India and Atmanirbhar Bharat have created a robust ecosystem for the sector's growth. Several domestic and international

manufacturers have established operations in the country owing to the sector's strong growth over the years with significant potential for sustainable long-term growth.

Production of electronic goods in the country has been increasing significantly over the last few years, growing from USD37 billion in FY16 to nearly USD70 billion in FY21.⁶² In FY17, the domestic production of electronic goods exceeded imports and the trend has continued since then. India also accounts for 3 per cent⁶³ of global electronics production.

India electronic goods production (USD billion)



Source: Ministry of Electronics and Information Technology, Annual Report 2020-21

Mobile phones account for nearly 44 per cent of the country's total electronics production.⁶² India is the second-largest mobile phone manufacturer in the world, with over 200 manufacturing units setup in the country over the last five years.⁶⁴ Production of mobile phones has significantly grown over the past five years. In FY21, manufacturing of mobile phones witnessed growth at a year-on-year of 2.8 per cent reaching a value of about USD30 billion (INR2.2 trillion⁶²), despite the pandemic. The production is further expected to reach USD65.5 billion (INR4.8

trillion⁶⁵) by 2022. Under the National Policy on Electronics (NPE) 2019, the government aims to manufacture 1 billion⁶⁶ mobile handsets (valued at about USD177.4 billion or INR13 trillion⁶⁵) by 2025. Other electronic goods produced in the country include Light-emitting diode (LED) products, industrial electronics, computer hardware, consumer electronics, such as TVs, refrigerators, washing machines, microwave ovens, and electronic components, such as semiconductors, printed circuit boards and IC.

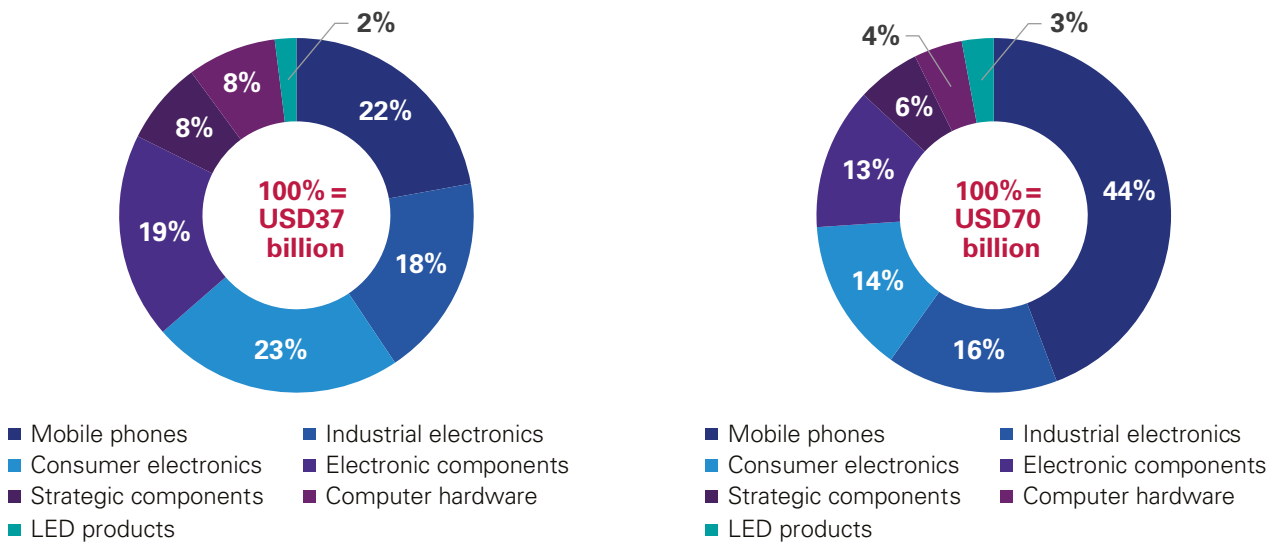


62. Ministry of Electronics and Information Technology, Annual Report 2020-21, accessed on 3 September 2021

63. To become electronics manufacturing leader, India needs to focus on trending and emerging technologies, Data Quest, 9 October 2020

64. India emerges as the second-largest mobile phone manufacturer in the world: Ravi Shankar Prasad, Times Now News, 2 June 2020

Production profile of electronics sector, FY16 & FY21



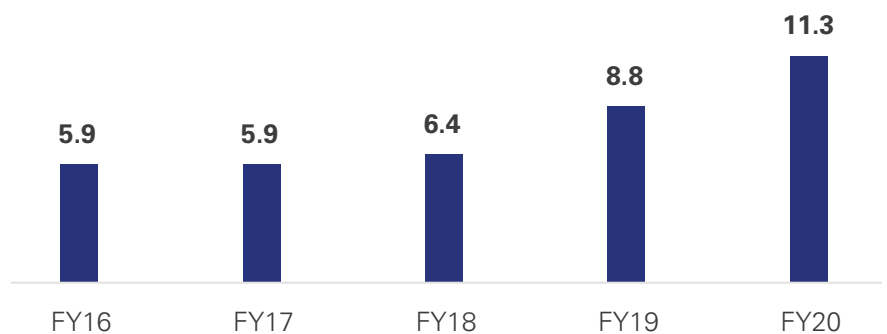
Source: Ministry of Electronics and Information Technology, Annual Report 2020-21

India offers significant potential for investors in the electronic systems design and manufacturing sector. The sector has witnessed exponential growth over the last few years and is expected to generate nearly USD130 billion⁶⁵ in economic value and achieve positive net exports by 2025.

1.2. Electronics exports

Export of electronic goods and components from the country has been increasing over the years, growing from USD5.9 billion⁶⁶ in FY16 to USD11.3 billion in FY20.⁶⁷ Rising domestic demand and schemes launched by the government to promote local manufacturing has helped increase the domestic electronics production and has also led to significant rise in exports. While the UAE and the Middle East are among the largest recipients of India’s electronics exports, the UAE, the U.S., Russia, South Africa, and Italy are among the major export destinations for mobile phones manufactured in the country. Factors, such as the global trade dynamics have also bolstered the growth of electronics exports from India.

Electronics exports, FY20 (USD billion)



Source: Ministry of Electronics and Information Technology, Annual Report 2020-21

While COVID-19 induced lockdowns impacted overall production and exports of electronics goods in 2020, value of exports recovered to pre-COVID levels and also registered an all-time monthly high of USD1.2 billion in December 2020.⁶⁸ Mobile phones contribute to the largest share of exports, accounting for nearly 35 per cent⁶⁸ of the country’s total electronic exports. Other key exports include electronic components and consumer electronics, such as TVs, refrigerators, washing machines and others.

65. Electronic Systems Design and Manufacturing in India: A USD120 Bn Market Opportunity, Invest India, 28 May 2020

66. Ministry of Electronics and Information Technology, Annual Report 2019-20, accessed on 3 September 2021

67. India’s electronic exports can rise 16-fold to USD180 billion by 2025, Business Today, 31 August 2020

68. India’s electronics exports cross pre-Covid levels, touch record high of Rs 8806 Cr in December, ET, 2 March 2021

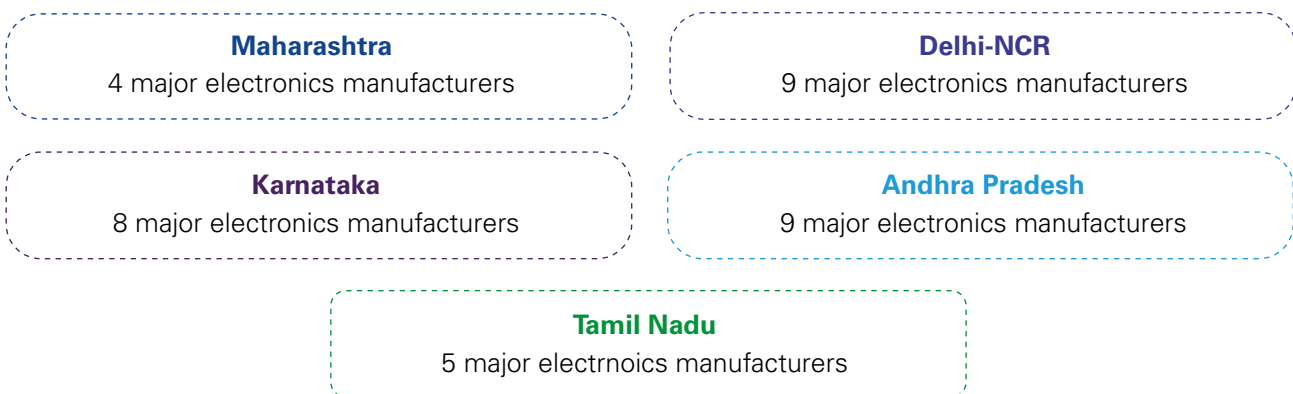
India's Electronics and Computer Software Export Promotion Council (ESC) has chalked a roadmap to increase the value of India's electronics exports to USD180 billion by 2025.⁶⁹ Currently, India contributes to 0.3 per cent⁷⁰ of the global electronics exports. According to the United Nations Conference on Trade and Development (UNCTAD), India has an untapped potential of USD2.7 trillion⁷⁰ in electronics exports, with the ability to mass produce and export products to the global market. Alongside mobile phone manufacturing, India also has the potential to become a global manufacturing and export hub for printed circuit board assembly, with a USD100 billion valuation.⁷¹ Overall, the country has a huge opportunity to attract companies relocating their supply chains post the pandemic, build domestic production capabilities and cater to the global market for electronics products.

1.3. Key electronics manufacturing clusters

To make India a global electronics manufacturing hub, the government is developing Electronics Manufacturing Clusters (EMC) across the country to provide support for creation

of infrastructure and attract investments in the electronics sector. Currently, the country has six major clusters across Andhra Pradesh, Delhi-National Capital Region (NCR), Karnataka, Maharashtra, Tamil Nadu, and Telangana which house the manufacturing units of major domestic and international electronics companies. More clusters are being developed across the country to develop the electronics manufacturing ecosystem. Being the second largest mobile phone manufacturer in the world, India also has over 200 mobile phones and component manufacturing units. Some of the key electronics manufacturing hubs include:

- **Noida, Uttar Pradesh:** With over 80 mobile manufacturing factories⁷² in this region, Noida has emerged as the biggest smartphone manufacturing hub in the country. Its proximity to the country's capital, developing infrastructure and ample availability of affordable labor make the city an attractive manufacturing hub. Further, it is expected that by 2025 the city would manufacture nearly 30 per cent⁷³ of all mobile phones in the world.
- **Karnataka:** Karnataka houses a large number of chip designing units and contributes to 10 per cent of the country's electronic industrial output⁷⁴. Under the industrial cluster development program, Karnataka has developed two electronics manufacturing clusters in Chikkaballapura and Mysuru, focused on manufacturing mobile phone components and Integrated Circuit Board (ICB)/ Printed Circuit Boards (PCBs). The state is also developing three dedicated electronics manufacturing clusters at strategic locations close to Bengaluru.
- **Tamil Nadu:** The state accounts for the manufacturing of about 16 per cent of India's electronics output and is also the second largest manufacturing hub in the country with two exclusive SEZs in Sriperumbudur and Oragadam catering to electronics and hardware manufacturing. By 2025, the state is expected to constitute about 25 per cent of the country's total exports. In the global investors meet in 2019, 304⁷⁵ companies signed agreements worth USD42.1 billion (INR3,004,310 million⁷⁵) with the state.



Source: Electronic systems, Invest India

69. India's electronic exports can rise 16-fold to USD180 billion by 2025, Business Today, 31 August 2020

70. India has USD 2.7 trillion untapped export potential in electronic exports, UNCTAD data, 29 October 2020

71. India can become USD100-billion export hub for printed circuit boards, Business Line, 3 December 2020

72. 'Make in India' hub Noida to churn over 30 crore mobile phones in 5 years, International Business Times, 17 November 2019

73. Noida 'Make in India' Hub to Manufacture 30 per cent Of the World's Mobile Phones By 2025, Inc 42, 17 November 2019


74. Electronic System Design & Manufacturing, Invest Karnataka 2020, accessed as on 8 September 2021

75. Tamil Nadu to be top mobile production hub, The New Indian Express, 30 November 2020




3. Sector attractiveness from supply chain realignment perspective:^{76,77,78}


Over **2 million** employed in electronics manufacturing




2nd largest manufacturer of mobile phones in the world



100 per cent FDI permitted under automatic route



6 major electronics manufacturing clusters



76. Schemes for Electronics Manufacturing, Invest India, accessed as on 8 September 2021

77. Electronic Systems, Invest India, accessed as on 8 September 2021

78. India emerges as the second-largest mobile phone manufacturer in the world: Ravi Shankar Prasad, Times Now News, 2 June 2020

3.1. Government support and incentives

In order to improve the investment climate and attract more investments in the sector, the government has approved 100 per cent FDI for electronics manufacturing under automatic route. To boost the country's electronics sector and create a globally competitive ecosystem by promoting domestic manufacturing and exports, the Ministry of Electronics and Information Technology launched the NPE 2019, in April 2020. Several schemes and initiatives, including PLI scheme for promotion of manufacturing of electronic components and semiconductors (SPECS) and Modified Electronics Manufacturing Clusters (EMC 2.0) Scheme have been formulated under the NPE 2019 to encourage electronics manufacturing in the country.⁷⁹

Parameter	Incentive
PLI for large scale electronics manufacturing	<ul style="list-style-type: none"> • Incentive of 3 to 5 per cent on incremental sales (over base year) of goods manufactured in India • Total incentives of up to USD5.6 billion (INR40,951 crores) over a period of five years
PLI for Information Technology hardware	<ul style="list-style-type: none"> • Incentive of 2 to 4 per cent on incremental sales (over base year) of goods manufactured in India • Total incentives of up to USD996.2 million (INR7,300 crores) over a period of four years
SPECS	<ul style="list-style-type: none"> • 25 per cent incentive on capital expenditure for plant, machinery, equipment, associated utilities, and technology, including R&D on reimbursement basis for manufacturing electronic components and semiconductors in India • Total incentives of up to USD448.3 billion (INR3,285 crores) over a period of eight years
Modified EMC 2.0 scheme	<ul style="list-style-type: none"> • Incentives of up to 50 per cent of project cost subject to a ceiling of USD9.6 million (INR70 crore) for every 100 acres of land for development of infrastructure for electronics manufacturing • Total incentives of up to USD513.4 million (INR3,762 crores) over a period of eight years
Phased manufacturing program	<ul style="list-style-type: none"> • Introduced in FY17 to promote indigenous manufacturing of cellular mobile handsets, sub-assemblies/parts, components, and accessories • Differential excise duty for domestic mobile manufacturers with countervailing duty (CVD) on imports at 12.5 per cent and excise duty at 1 per cent without input tax credit (or 12.5 per cent with input tax credit)

Source: Schemes for Electronics Manufacturing, Invest India, accessed as on 8 September 2021

3.2. Availability of workforce

India has a large pool of workforce, with over 2 million⁷⁹ people employed in electronics manufacturing. The availability of a huge workforce at competitive costs provides an attractive proposition for manufacturers looking to move electronics production from other jurisdictions owing to rising labor costs alongside supply chain disruptions caused due to the pandemic. In order to continuously upskill the workforce to meet growing needs of the sector, the country established the Electronics Sector Skills Council of India (ESSCI), promoted by six industry associations with financial support by the NSDC. The ESSCI facilitates and collaborates with NSDC to strengthen the vocational education system for skill development in the electronics sector and improve workforce productivity.

The ESSCI has developed Qualification-Packs (QPs)/ National Occupational Standards (NOS) to generate training programs for skill development across job roles in electronics design and manufacturing. The council has also trained over one million candidates in various job roles across the electronics value chain and has over 1,100 training partners and 4,550 training centres across the country.⁸⁰ The ESSCI is poised to support the government's vision to boost domestic manufacturing through Make in India, Aatmanirbhar Bharat and other initiatives by ensuring the supply of appropriately skilled workforce and promote India as a global electronics manufacturing hub.

79. Schemes for Electronics Manufacturing, Invest India, accessed as on 8 September 2021

80. Next Five Years For The Electronics Sector Will be Very Interesting: N.K. Mohapatra, Electronics b2b.com, 20 July 2020

3.3. R&D and innovation

India is emerging as an engineering and R&D hub for several sectors, including consumer electronics and semiconductors owing to a large talent base of scientists and engineers. Several electronics manufacturing companies have established India as their core innovation centre due to the availability of talent with digital skills possessing the ability to work on advanced technologies. India has over 1,140 R&D centres of several MNCs operating across multiple sectors, including electronics and employing over nine lakh professionals.⁸¹ The Ministry of Electronics and Information Technology has also setup an Electronics Development Fund to foster R&D in electronics, nano-electronics and information technology.

The Ministry of Electronics and Information Technology is also partnering with several MNCs to boost digital skills among the workforce and also promote R&D.

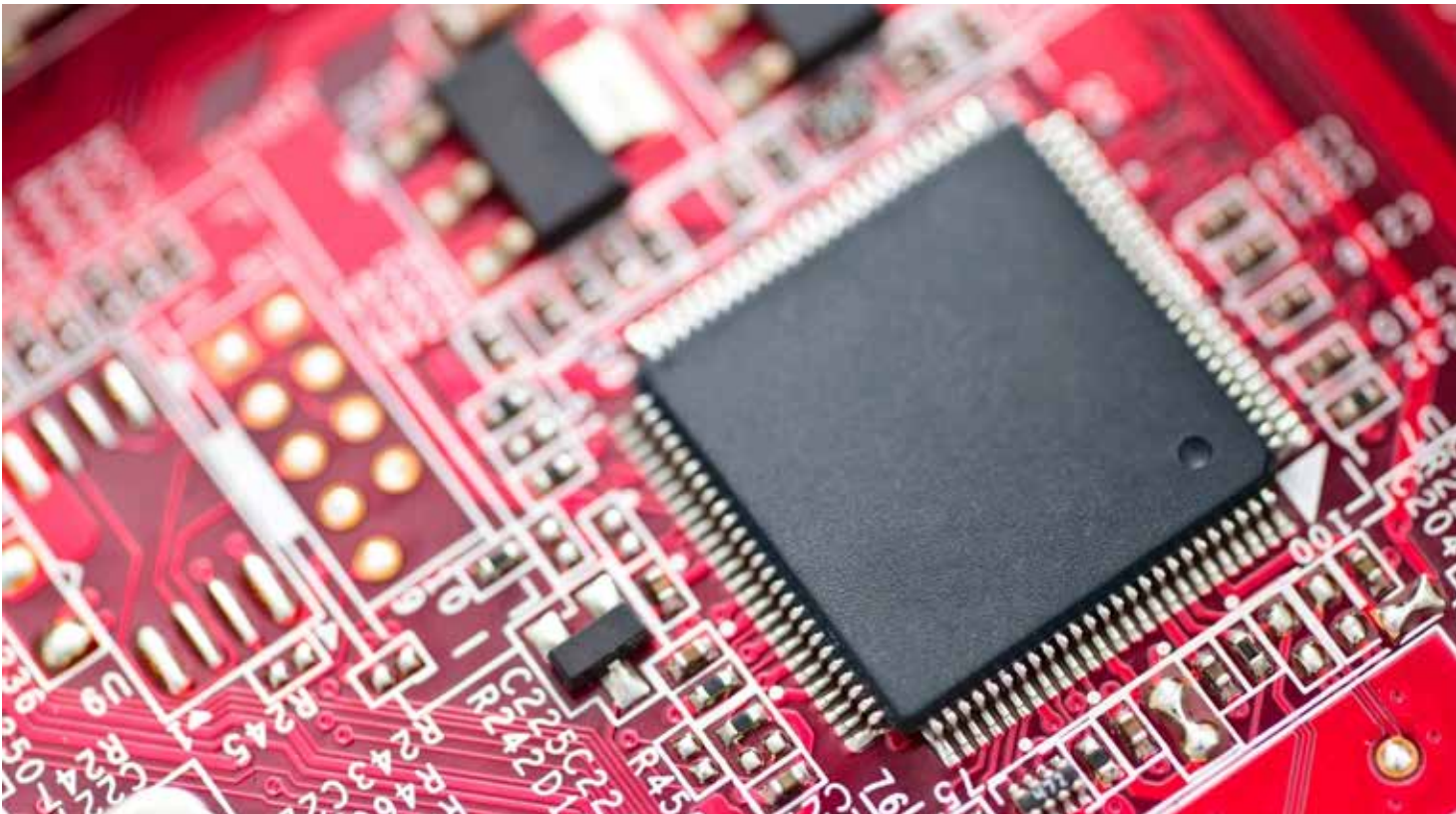
- In March 2021, the Karnataka State Government, in partnership with the National Association of Software and Service Companies (NASSCOM), launched an Engineering, Research and Development (ER&D) policy to foster innovation across five key sectors, including semiconductors, electronics system design and manufacturing, telecom, and software products.

A conducive start-up ecosystem offered by the country has also led to the creation of over 55,000 start-ups since 2015⁸² operating across several sectors,

including electronics. These start-ups have also been instrumental in pioneering innovation across various segments in the country's electronics sector.

3.4. Infrastructure

To promote India as a global electronics manufacturing hub, the government is focused on enhancing infrastructure spending, including creation of more economic corridors, investments in high-speed rail, and dedicated freight corridors. Alongside development of electronics manufacturing clusters, the central government and state governments are also developing electronics manufacturing parks. In June 2020, the Uttar Pradesh government announced the development of an electronics manufacturing park in Lucknow and is offering several incentives to attract investors and promote electronics manufacturing in the state. Tamil Nadu also has two exclusive SEZ for electronics and hardware manufacturing. The Andhra Pradesh government is also undertaking initiatives to promote electronics manufacturing in the state. The government is developing an Information Technology Investment Region to establish Visakhapatnam as a major electronics hub, while an Electronics Hardware Park is being setup at Kakinada. Areas, including Nellore, Chittoor, Visakhapatnam, and Krishna have been designated as brownfield Electronic Manufacturing Clusters.



81. Electronic Systems Design and Manufacturing in India: A USD120 Bn Market Opportunity, Invest India, 28 May 2020

82. Five Indian Start-ups Shaping the Consumer Electronics Industry, The Org, 19 January 2021

3.5. Conclusion

India has significant potential to become a global electronics manufacturing destination backed by a large workforce, strong government policies and incentives to boost domestic manufacturing and presence of several domestic and international companies offering an established electronics ecosystem. Electronics manufacturing in the country is expected to grow at an annual rate of 30 per cent over 2020 to 2025, while exports are expected to grow in the range of 40 to 50 per cent in the same period.⁸³ State governments are also taking efforts to invite electronics companies to establish operations in the respective states by offering favorable business policies and incentives.

However, the sector faces a huge challenge with respect to procurement of certain electronic components. The electronics sector in the country is

heavily reliant on imported components from China, Taiwan, and other nations to manufacture electronic goods. Due to lack of semiconductor fabrication units in India, manufacturers rely on imports to procure critical components, such as microprocessor chips. Though the government has launched targeted schemes to promote the development of semiconductor units in the country, more effort is needed to tackle this challenge to avoid dependencies on other countries and make the electronics sector self-reliant. The sector also needs to increase R&D expenditure to adapt to emerging technologies. Addressing these critical challenges and improving the skillset of workforce alongside development of infrastructure would enhance India's position as a global electronics manufacturing hub.

Key highlights

- India is one of the fastest growing electronics manufacturing markets in the world. Production of electronic goods have almost doubled in last five years to reach USD70 billion in FY21.
- Mobile phones account for almost 44 per cent of India's total electronics production. The government, through the NPE 2019, aims to manufacture 1 billion mobile handsets (valued at USD177.4 billion) by 2025.
- Rise in domestic demand and rise of local manufacturing is promoting exports of electronic goods from India. The UAE, the U.S., Russia, South Africa, and Italy are major export destinations for mobile phones manufactured in India representing nearly 35 per cent of country's total electronic exports.
- India has developed EMCs in states, such as Uttar Pradesh, Karnataka, Tamil Nadu, Maharashtra, Delhi-NCR, and Telangana, housing more than 200 mobile phone and component manufacturing units making the country the second largest mobile phone manufacturer in the world.
- The Indian government has permitted 100 per cent FDI for electronics manufacturing under automatic route and is running financial incentive schemes, such as PLI scheme, SPECS and Modified EMC 2.0 scheme to promote electronics manufacturing.



⁸³. Electronics manufacturing in India to grow 30 per cent annually for next 5 years: IT Secy, Financial Express, 6 August 2020

Sunrise sector: Telecom



1. Market opportunity

1.1. Telecom

With a contribution of about 6.5⁸⁴ per cent to the country's GDP, the telecom sector in India has witnessed substantial growth over the last decade attracting a number of new players across the telecom ecosystem, including mobile operations, value added services, passive infrastructure, and equipment manufacturing. The country is the second-largest telecom sector in the world and has a subscriber base of over 1.2 billion⁸⁴. The sector is also among the fastest growing sectors in the world by becoming the second-largest smartphone market globally by 2025.⁸⁵

However, in terms of equipment manufacturing, the country is still dependant on imports and presents a massive opportunity for both domestic and international players to set up their manufacturing presence in the country. The government, through a slew of favorable policies and initiatives, such as the National Digital Communications Policy (NDCP), Phased Manufacturing Program,

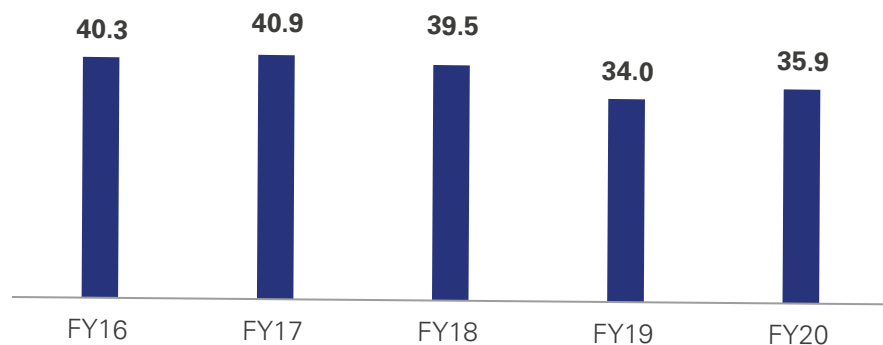
PLIs among others is gradually creating a lucrative environment for local manufacturing of telecom equipment particularly in areas of optical fiber manufacturing and developing the equipment and infrastructure for 5G rollout in the country.

In terms of gross revenue of telecom sector, a constant fall in revenue was observed from FY17 to FY19⁸⁴ primarily driven by the introduction of a tariff war among the telecom companies. However,

signs of recovery were observed in FY20 when a slight increase in the revenue was achieved. Stabilizing tariff wars and increase in the cost of tariff plans were the key factors responsible for growth in the revenue.

The Indian telecom sector broadly consists of various subsectors, including infrastructure, equipment, mobile virtual network operators (MVNO), white space spectrum, 5G, telecom service providers, and broadband.

Gross revenue of telecom sector, FY16–FY20 (USD billion)



Source: Telecom, Invest India, accessed as on 8 September 2021

Snapshot of key Key Performance Indicators (KPIs) in India's telecom industry (as of March 2021)

KPIs	Wireless (millions, unless specified)	Wireline (millions, unless specified)	Total (millions, unless specified)
Total subscribers⁸⁶	1180.96	20.24	1,201.20
Urban subscribers ⁸⁶	645.2	18.57	663.77
Rural subscribers ⁸⁶	535.75	1.67	537.44
Internet subscribers⁸⁶	799.30	25.99	825.3
No. of Broadband subscribers ⁸⁶	755.35	22.75	778.09

84. Telecom, Invest India, accessed as on 8 September 2021

85. Market Study on The Telecom Sector In India, Competition Commission of India, 22 January 2021

86. The Indian Telecom Services Performance Indicators July – September 2020, TRAI, accessed as on 3 September 2021

Apart from the large subscriber base, the country has seen an exponential surge in data consumption over the last few years primarily driven by affordable tariffs, wider availability, 3G and 4G and it stands amongst the top five countries in terms of internet users. However, the hyper competitive nature of the Indian telecom market and introduction of disruptive tariff plans have put operator margins under pressure and resulted in consolidation via mergers and acquisitions.

1.2. An insight into India's manufacturing capabilities for telecom equipment

A surge in subscriber base has led to network expansion and resulted in investment across various avenues of telecom equipment being manufactured in the country, including equipment related to transmission lines (such as optical fibers), telecom infrastructure (such as base stations and towers) and networking equipment (such as modems, routers, switches, local area network and others).

Transmission network, such as optical fiber cable (OFC): India currently has an optical fiber network of 2.8 million km⁸⁷ spanning across the country and aims to enhance the network to 5.0 million by 2024.

With a market size of USD881.5 million⁸⁸ in 2019, the optical fiber cable market in India is emerging as one of the promising sub-sectors of the telecom equipment industry and is poised to reach a size of USD2.1 billion by 2024. One of the key factors attracting manufacturers is the rising demand of OFCs in the production of fiber to the home (FTTH) cables, which in turn, is led by the high potential for FTTH cables in the Indian market. For instance, the country has about 2.9 million⁸⁹ FTTH connections as compared to more than 350 million in China and a low fiber deployment to population ratio of 0.09⁸⁹ (as compared to 1.7 in Japan and the U.S. and 0.87 in China). Thus, there exists immense opportunities for growth in the area. In addition, rising investment in OFC network infrastructure, government initiatives (such as Smart Cities and Digital India), growing demand from telecom sector and increasing usage of mobile phones are also creating a lucrative market for the OFC manufacturers.

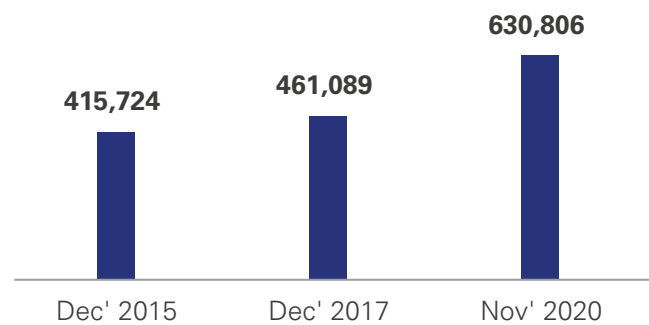
Telecom infrastructure (such as base transceiver station (BTS) and telecom towers): The number of BTSs surged with a CAGR of 23 per cent from 2014 to 2020. The emerging potential of 5G has attracted the attention of several telecom equipment manufacturers who are looking at expediting the production of 5G base stations in the country. Some of the manufacturers have also started exporting 5G radio base stations to several SEA countries. The introduction of government schemes, such as 'Make in India' and PLI for telecom equipment manufacturing have acted as strong driving forces for luring the interests of base station manufacturers.

Number of BTSs, 2014–2020



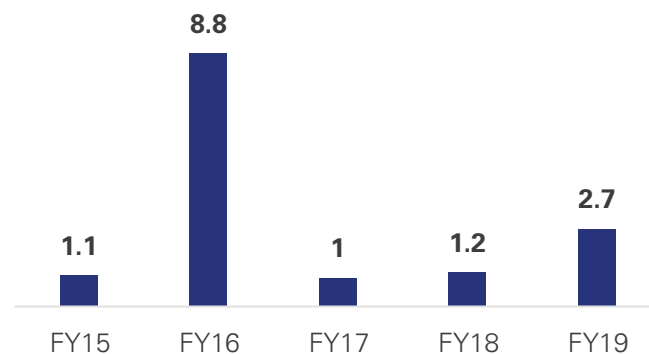
Source: Annual report 2020-21, Department of Telecommunications, Government of India, accessed on 21 October 2021

Number of towers, 2015–2020



Source: Annual report 2020-21, Department of Telecommunications, Government of India, accessed on 21 October 2021

Export of telecom instruments, FY15–FY19 (USD billion)



Source: Telecom Statistics India-2019, Department of Telecommunications, Ministry of Communications, accessed on 21 October 2021; [https://dot.gov.in/sites/default/files/Telecom Statistics India-2019.pdf?download=1](https://dot.gov.in/sites/default/files/Telecom%20Statistics%20India-2019.pdf?download=1)

In terms of manufacturing of telecom towers, the number of towers in the country grew at a CAGR of 8.7 per cent from 2015 to 2020. Adoption of models, such as leasing of telecom towers from tower companies to telecom operators and sharing of towers primarily drove growth in the area. However, rising debt on telecom operators have forced the telecom companies to look for more cost-effective options. Consequently,

87. 'Optic fibre makes a major part of telecom carriers digital infrastructure spend', ET, 14 January 2021

88. India Optical Fibre Cables Market, Techsci Research, accessed as on 8 September 2021

89. Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed, TRAI, accessed as on 3 September 2021

the Telecom Regulatory Authority of India (TRAI) has suggested the Digital Communications Commission to permit the sharing of infrastructure between tower companies, infrastructure companies and internet service providers. The recommendation, if approved, would enable tower companies to share networks, such as antenna, feeder cable, base stations, radio access network, transmission systems, dark fibre, and others. It will also open the entire sector for further investment and facilitate cost-savings for the telecom companies.

Networking equipment:

Networking equipment, such as ethernet switch, router, modem, and wireless local area network (LAN) form an important constituent of the Indian telecom industry. Currently, the country imports a large proportion of such equipment (such as router and switch). However, the government, by introducing the 'Make in India' scheme, is focusing to attract foreign and domestic companies to manufacture such equipment in the country. Further, several other companies who otherwise did not manufacture in India are also considering commencing localised production in the country, primarily to benefit from the PLI scheme.

In terms of export and import, the country is a net importer of telecom equipment, as it imports equipment of more than USD17.6 billion whereas exports a meagre quantity worth USD2.7 billion, in FY19⁹⁰. To boost the manufacturing capabilities of the country, the government is introducing several initiatives in the form of production schemes, incentives, and other benefits for manufacturers. The government's push for Make in India and schemes to boost local manufacturing of telecom equipment provide significant opportunities for investors to establish manufacturing units in

the country to cater to domestic demand and also, make India a hub for exports.

1.3. 5G

India's large subscriber base offers a huge potential for the deployment of 5G services in the country, alongside presenting opportunities for domestic manufacturing of 5G and telecom equipment. Though 5G services are yet to commence in the country, it is estimated that India would have 197 million⁹¹ 5G connections by 2025. This estimate exemplifies the need to create a robust telecom infrastructure to enable 5G, including fiberization of towers, small cells installations, E&V bands, and others. The government has also been pushing for the introduction of 5G with domestically produced telecom equipment. This presents opportunities for manufacturers to upgrade telecom infrastructure, while increasing domestic production of equipment to cater to the demand.

The rapid growth of 5G across the globe highlights the demand for necessary infrastructure and 5G-related telecom equipment. Rising global demand and requirement to establish infrastructure in India to cater to the deployment of 5G opens avenues for domestic manufacturing of telecom equipment. The Indian government is also offering incentives to attract investments and promote local production to transform India into a global telecomm hub.

1.4. MVNOs

MVNOs are a common feature in the global telecom industry. However, India is a relatively recent player. As MVNOs do not own the bandwidth and the infrastructure required to deliver its services, they rely on purchasing it from mobile network operators at wholesale rate. The emerging

business model is more cost-effective and thus, gaining popularity in the country.

The country introduced one of its initial MVNO services in 2017. In the same year, it also provided licenses to about 61 MVNOs to operate in the country. Further, the prevalence of factors, such as rise in the usage of mobile phones and advancements in wireless network technology is creating opportunities for MVNO expansion in India.

1.5. Open Radio Access Network (RAN)

The usage of Open RAN and software in the telecom networks is expected to drive domestic manufacturing of telecom equipment in the country. Open RAN modularises the RANs and virtualises several functions which traditionally rely on hardware, through telecom clouds and software. Open RAN enables telecom operators to source software and hardware components from multiple vendors, rather than relying on a single vendor to source the entire infrastructure. This provides opportunities for several manufacturers to enter the telecom equipment manufacturing market to produce various components across the value chain. Open RAN also enables operators to diversify supply chains through multi sourcing, improve interoperability and agility, and reduce capital expenditure by almost 50 per cent.⁹²

Telecom operators across the globe are focusing on implementing Open RAN networks and enabling supplier diversification. This provides an opportunity for companies to set up manufacturing bases in India to cater to domestic demand and also, establish the country as a hub for telecom equipment exports to cater to global demand.

90. Telecom Statistics India – 2019, Department of Telecommunications, accessed on 19 May 2021

91. India expected to have 197 million 5G connections by 2025, Business Today, 21 September 2020

92. Telecom equipment space presents big opportunity with Open RAN: Vaghela, Financial Express, 20 January 2021

1.6. Key telecom manufacturing zones

Although the country currently does not have any dedicated telecom manufacturing cluster, there are certain regions which are emerging as hubs for manufacturing various types of telecom equipment⁹³.

Jaipur

Base stations manufacturing

Goa

Antenna and fiber cables, patch cords and fiber terminations

Delhi-NCR

R&D services and global service delivery of telecom equipment

Chennai

R&D services, global service delivery of telecom equipment, manufacturing of set-top boxes, optical networking systems, base stations, wireless networking equipment, printed circuit board and others

2. Sector attractiveness from supply chain realignment perspective^{94,95,96,97}

2nd largest number of internet users in the world



Provides employment to over **2.2 million** directly and **1.8 million** indirectly



USD37.6 billion FDI inflow into the telecom sector over April 2000–December 2020



USD1.7 billion funding through PLI scheme to promote domestic manufacturing of telecom equipment



550 million 4G subscribers as of 2019



93. Telecom Equipment Manufacturing, Department of Telecommunications, accessed as on 8 September 2021

94. Annual report 2020–2021, DoT, 24 February 2021

95. Telecom Industry, Invest India, accessed on 8 September 2021

96. The Indian Telecom Services Performance Indicators July – September 2020, TRAI, accessed on 8 September 2021

97. 5G will account for 18 per cent mobile subscriptions in India by 2025, 4G to dominate: Report, Money Control, 17 June 2020

2.1. Government support and incentives

To establish India as an attractive destination for investing in the telecom industry, the government has undertaken several initiatives alongside offering incentives.

FDI

The government has permitted up to 100 per cent FDI in the telecom sector. Telecom is among the sectors attracting a significant amount of FDI, recording USD4.4 billion⁹⁸ in FY20. Over January 2000 to December 2019, FDI in telecom has been registered among the mentioned sub-sectors.

Sub sector	Amount (USD billion)
Telecom	3.44
Radio paging	0.006
Cellular mobile/basic telephone services	6.34
Other (telecom)	0.43

Despite the pandemic, the telecom sector continued to attract investments, registering USD0.36 billion⁹⁸ of FDI inflow over April to December 2020.

Key incentives

Some key incentives offered by the government to boost investments in the telecom sector include:

Parameter	Incentive
Tax-based incentives	<ul style="list-style-type: none"> India's trade ministry has proposed 10 years of complete tax exemption to telecom equipment or electronics companies investing more than USD500⁹⁹ million and a four year tax holiday to companies investing more than USD100 million⁹⁹
Incentives for SEZ units	<ul style="list-style-type: none"> 100 per cent income tax¹⁰⁰ is exempted on export income from SEZ units for first five years, 50 per cent¹⁰⁰ for next five year, and 50 per cent¹⁰⁰ of ploughed back export profit for the next five years Central sales tax, service tax and state sales tax are exempted Single window clearance for Central and state level approvals
Non-tax incentives	<ul style="list-style-type: none"> Cap on FDI increased from 74 to 100 per cent in the sector. In case of telecom services, 100 per cent FDI is allowed, of which, 49 per cent can be availed via automation route and the rest through FIPB (Foreign Investment Promotion Board) <ul style="list-style-type: none"> In case of telecom equipment manufacturing, 100 per cent FDI is permitted via automatic route Up to 100 per cent¹⁰¹ FDI is allowed for infrastructure providers dealing with equipment, such as dark fiber, electronic mail, and voice mail
PLI for telecom equipment manufacturing	<ul style="list-style-type: none"> In February 2021, the government approved a funding of USD1.7 billion (INR12,195 crore¹⁰²) to encourage manufacturing of telecom equipment, including core transmission equipment, access and customer premises equipment, 4G/5G next-generation radio access network and wireless equipment, Internet of Things (IoT)-access devices, other wireless equipment, and enterprise equipment like switches, routers, etc.

98. Fact sheet on foreign direct investment (FDI), DIPP, 31 December 2020

99. Cabinet approves Universal Service Obligation Fund Scheme for providing Mobile Coverage in Arunachal Pradesh and two Districts of Assam under the Comprehensive Telecom Development Plan for North Eastern Region, Live Mint, 9 December 2020

100. Special Economic Zones in India, SEZ in India, accessed on 8 September 2021

101. Telecom Industry, Invest India, accessed on 8 September 2021

102. India Approves Over Rs 12,000 Crore Manufacturing Push for Telecom Equipment, Bloomberg Quint, 17 February 2021

Government initiatives

Other initiatives to promote the telecom sector in the country include:

National Broadband Mission:

The initiative was introduced in 2019 to drive growth in digital infrastructure and provide affordable and universal access to broadband

- Under this policy, the government has also developed a model for right way to work with the states to expand digital infrastructure

BharatNet project

The BharatNet project (launched as national optical fiber network in 2011 and renamed in 2015) was initiated by the government to ensure broadband connectivity in rural areas of the country

- The project, expected to operate until 2023, aims to provide broadband connectivity to about 0.3 million (2.5 lakh) gram panchayats
- To ensure connectivity, the government is also installing 1.3 million wi-fi hotspots in rural areas

Make in India

In 2014, the government introduced the initiative of 'Make in India' to encourage and provide incentives to manufacturers to commence domestic manufacturing of products and equipment

- With respect to telecom manufacturing, the overall objective of the scheme is to become self-sufficient in telecom equipment manufacturing and reduce dependency on foreign countries
- The government is pushing some of the leading telecom manufacturers to produce 100 per cent local products in telecom equipment

- Accordingly, in January 2021, a domestic telecom equipment manufacturer announced the completion of production and shipping of one lakh units¹⁰³ of wireless networking equipment, including Wi-Fi Access Points and Point to Point Unlicensed Band Radios to its customers across the country. The company's milestone of achieving the production figures within a year of commencing production augments the government's Make in India initiative and BharatNet project aimed at enhancing connectivity across the country.

Comprehensive telecom development plan (CTDP)

The government granted approval of the provision of a universal service obligation fund under the CTDP for North Eastern region

- The objective of which is to ensure mobile coverage to 2,374¹⁰⁴ villages in Arunachal Pradesh and to 691 villages in two districts of Assam by 2022, at a cost of about USD276.9 million (INR20,290 million¹⁰⁴)

NDCP

Introduced in 2018, objective of the policy is to provide universal broadband connectivity, create four million¹⁰⁵ new jobs in digital communications sector, make India a digital first world, and drive the implementation of technologies, such as 5G.

As per budget 2021, the government has allocated USD2 billion (INR142,000 million¹⁰⁶) for the development of technology infrastructure in 2021–2022. It aims to establish 0.1 million¹⁰⁶ wi-fi access points and 0.7 million¹⁰⁶ fiber to the home connections in 2021–2022.

2.2. R&D and innovation

To build a strong R&D ecosystem for the industry, the government Department of Telecommunications (DoT) established a public private partnership (PPP) initiative in 2007, according to which, telecom centres of excellence (TCOE) are created in which government works as a facilitator, industry as the user and academia as the research units. Some of the TCOEs in India are, IIMA IDEA Telecom Centre of Excellence, Vodafone IIT KGP Centre of Excellence in Telecom, Reliance IITM Centre of Excellence, Aircel IISc Centre of Excellence in Telecom, and others. The primary role of the TCOEs include creation of synergies amongst academia, government, and the telecom industry, to create new services and applications, generate Intellectual Property Rights (IPR), develop manufacturing capabilities, and promote entrepreneurship. The TCOEs also help in addressing technological and managerial challenges faced by the sector through affordable solutions and services. Workshops are also organized by the TCOEs to discuss the roadmap for the country's telecom sector on various upcoming technologies and topics, such as 5G and others.

103. HFCL Completes 1 Lakh Units of Wi-Fi Products, Business World, 6 January 2021

104. Cabinet approves Universal Service Obligation Fund Scheme for providing Mobile Coverage in Arunachal Pradesh and two Districts of Assam under the Comprehensive Telecom Development Plan for North Eastern Region, PIB Delhi, 9 December 2020

105. National Digital Communications Policy 2018, DoT, accessed as on 8 September 2021

106. Budget 2021: Government allocates Rs 14,200 cr for telecom infra roll out in 2021-22, Financial express, 1 February 2021

2.3. Talent development

Considering the growth of the industry, it is estimated that by 2023 the telecom industry will create job opportunities for about 10 million¹⁰⁷ skilled people. It is expected that factors, such as penetration of telecom services in the rural market, improving tele-density and focus on indigenous manufacturing of telecom equipment will act as prominent drivers in creating employment opportunities.

Further, it is estimated that most of the jobs in the industry will be created in areas related to the development of network architectures, radio technologies, mobility solutions, cyber security and IoT, manufacturing of required infrastructure for 5G network and others.

To cater to the rising need, the country has in place a Telecom Sector Skill Council (TSSC) that aims to develop skilled manpower for the industry. The council, in partnership with many stakeholders and academia, provides courses on technology (5G, IoT, data science), customer management, increasing consumer base and revenue, and others.

2.4. Digital transformation

Digitalization is emerging as one of the strongest pillars driving transformation and economic growth in the country and the telecom industry has emerged as one of key industries supporting the adoption of digitalization. Upcoming technological advancements, such as introduction of 5G and IoT and others are expected to expand connectivity and drive transformation in the industry. To expedite the adoption of 5G, in 2021, the DoT would hold spectrum auctions for 5G networks. It has also assigned USD30.6 million (INR2,240 million¹⁰⁸) for the set-up of an indigenous test bed in the country.

Apart from these factors, the government is also undertaking several initiatives to help India become a digital economy. The most prominent of which is the 'Digital India' program launched in 2015 under which, the government aims to provide universal online access to government services by improving digital infrastructure and internet connectivity.

2.5. Conclusion

The telecom industry is expected to register strong growth in the coming years. Backed by strong domestic demand, growing infrastructure, favorable policies and technological advancements, the industry is expected to attract significant investments in this decade. Going forward, if the government focuses on reducing the financial stress on telecom companies and on reducing the high reliance on imports, India can become one of the key hubs for manufacturing of telecom equipment.



Key highlights

- India houses the second-largest telecom sector in the world, with a subscriber base of over 1.2 billion.
- NDCP, phased manufacturing program, PLI scheme is promoting domestic manufacturing of telecom equipment with special focus on optical fibre manufacturing and infrastructure for 5G.
- Indian government has permitted up to 100 per cent FDI in the telecom sector and is running initiatives, such as National Broadband Mission, BharatNet Project, Make in India, CTDIP and NDCP to develop telecom infrastructure and technology in the country.
- Government is offering various financial incentives, such as tax exemption for telecom equipment manufacturing companies and exports from units based in SEZs and PLI scheme to boost investment in telecom sector.



¹⁰⁷ Over 10 million jobs will soon be generated by the telecom sector: All you need to know, India Today, 27 March 2018

¹⁰⁸ 5G era: A game changer for telecom industry, Telecom Economic Times, 8 October 2020









04

The Malaysia Advantage






Territory landscape

Macroeconomic indicators

Population	GDP	GDP growth	GDP per capita	GDP by sector	Inflation
 32.7 million	 USD336.3 billion	 -5.6% (2020) 7% (2021F)	 USD10,190	 Services- 57% Industry- 35.4% Agriculture- 7.6%	 -1.1% (0.7% in 2019)

All values are estimates for 2020, unless specified otherwise

FDI and M&A

Total FDI	Projects licensed	Key sectors	Key countries	M&A value
 USD3.4 billion (↓56%)	 4,599 (↓10.5%)	 Basic metals, Electrical and electronics (E&E), Machinery and equipment	 China (27.7%), Singapore (13.7%), Netherlands (10.1%)	 USD4.3 billion (↓24.6%)

All values are actuals for 2020, unless specified otherwise

Territory attractiveness

 14 FTAs	 9 seaports with two among the busiest in the world	 7 major international airports and over 60 domestic airports	 1,049 projects approved in manufacturing (2020)	 2.28 million workforce in manufacturing (as of January 2020)
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Source: Malaysia country data, IMF; GDP by sector, EIU; Malaysia performance investment report 2020, MIDA; Monthly Manufacturing Statistics Malaysia, DOSM, January 2020; Malaysia's M&A activity falls for third straight year, mixed views on outlook, The Edge Markets, 2 February 2021

Malaysia- business environment

Malaysia is one of the most vibrant economies of SEA, having successfully diversified from an agriculture and commodity-based economy to one accommodating various industrial and services-based sectors. With a strong manufacturing landscape, the country is among the leading exporters of electrical appliances, electronic parts, and components in the world. In addition, Malaysia's trade to GDP ratio is averaging over 130 per cent since 2010¹, making it one of the most open economies in the world.²

The country is a founding member of the World Trade Organization (WTO) and has been party to the General Agreement on Tariffs and Trade (GATT) since the 1950s, reflecting Malaysia's commitment towards building trade relationships. Malaysia has signed seven bilateral FTAs, seven regional FTAs, including the ASEAN Free Trade Agreement (AFTA),

and is also a signatory of the Regional Comprehensive Economic Partnership (RCEP).

Owing to adequate government and private sector initiatives pertaining to regulatory efficiency, productivity and good governance, the country has shown significant improvement in the EoDB and was ranked 12th among 190 economies in the World Bank Doing Business 2020 report. To further improve the business environment, Malaysia has formed a Special Task Force to Facilitate Business (PEMUDAH), which works in collaboration with members from the public and private sectors.

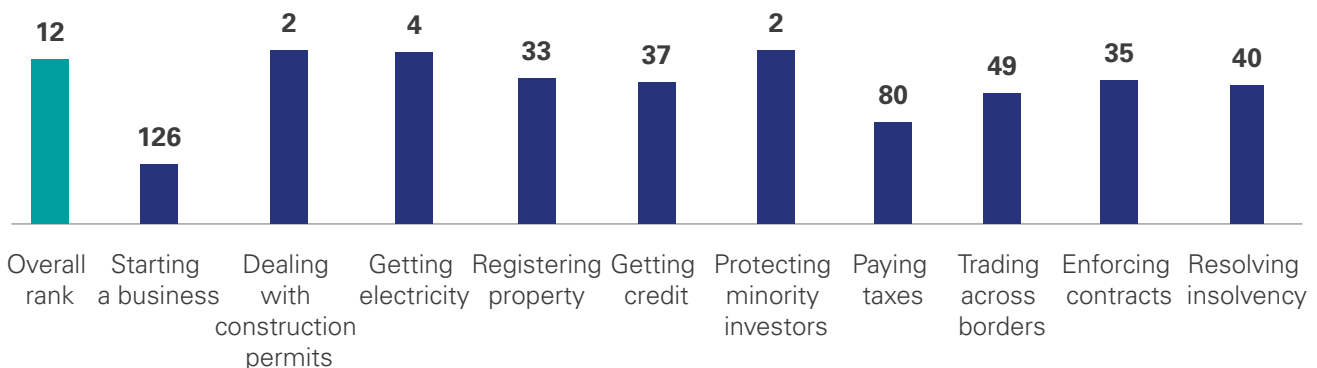
While Malaysia has implemented 29 reforms since 2003-04 to enhance EoDB in the country, improvements are still required in critical areas, including starting a business, paying taxes, legal rights, and enforcement of contracts. Policymakers need to address these challenges and

announce reforms to enhance the country's attractiveness in offering a business-friendly environment. The Malaysian government also needs to address ESG concerns pertaining to several sectors, including infrastructure, manufacturing, agriculture and (O&G). Undertaking reforms in the regulatory environment and business practices and offering comprehensive solutions to environmental sustainability, bribery, and corruption would enable the country to continue attracting significant foreign investment.

Doing business rankings 2020³

Some key indicators based on World Bank's doing business report indicate Malaysia's position as compared to 190 countries across the globe.

EoDB rankings, Global rank 2020



Note: Global ranking, with 1 being the best out of 190 countries

Source: Malaysia, Doing Business 2020, World Bank

1. Overview, The World Bank in Malaysia, 6 April 2020

2. Statistics of Foreign Direct Investment in Malaysia, 2019, Department of Statistics Malaysia, 11 June 2020

3. Malaysia, Doing Business 2020, World Bank, accessed as on 8 September 2021

Manufacturing in Malaysia

Manufacturing is one of the prominent sectors in Malaysia and has played a vital role in the country's economic transformation. The country attracts significant investments in the sector, owing to a strong foundation, developed infrastructure and connectivity, diversified economy, workforce, and proactive government policies. In 2019, Malaysia approved 988 investment projects in the manufacturing sector⁴, and despite the pandemic and uncertainties in the current landscape, it continues to attract investments. A total of 1,049 manufacturing projects were approved in 2020, representing a year-on-year growth of 5.0 per cent in capital investments.^{5,6} Key sectors attracting significant gross FDI inflows include E&E (USD3.4 billion), machinery and equipment (USD1.2 billion) and petroleum products, including petrochemicals (USD0.7 billion), among others.⁶

The growth in the investments could be attributed to the cost advantage provided by the country. According to a recent study by KPMG and The Manufacturing Institute in the U.S., Malaysia ranks 4th among 17 heavy-weight economies in terms of cost of doing business in manufacturing.^{7,8,9,10,11}

While the country offers attractive primary costs (cost directly impacting a firm's bottom line), the country needs to focus on improving secondary costs pertaining to factors, such as quality of labor and infrastructure among others. Development of human capital has been a challenge as the country depends heavily on low-skilled and semi-skilled workforce and foreign labor. Hence, Malaysia needs to improve the quality of labor through upskilling and reskilling the workforce and further enhance infrastructure to boost the country's attractiveness as a manufacturing hub.

Going forward, Malaysia's manufacturing focus is likely to be on the 'industrial output growth' driven by the resumption of economic activities in 2021. The optimistic outlook is attributed to the gradual ease of the movement control order (MCO), Covid-19 vaccination program in the country, improving external demands and continued support from policy measures. As a result, the country's GDP is expected to grow around 6 per cent-7 per cent in 2021. With the rising GDP, it is expected that Malaysia's industrial production index (IPI) growth will also grow around 6 per cent, year-on-year in 2021, driven by the increase in

production activity due to the recovery from the pandemic-induced slowdown in 2020.¹²

As 2020 marked the end of the 11th Malaysian Plan (MP), the government is currently finalising the 12th MP, and this 'post-2020 blueprint' is expected to pave the way for Malaysia's development agenda over the next decade. According to Malaysian Investment Development Authority (MIDA), capital intensive projects involving advanced technology and skilled workforce dominated the manufacturing landscape in 2020 and is likely to be a key focus area in the medium to long-term. The Prime Minister recently launched the 'MyDIGITAL' initiative, which is aimed at accelerating the country's transformation into a technologically advanced economy by 2030. Additionally, the government announced tax incentives under the National Economic Recovery Plan (PENJANA) to boost investment activity, including a 10-15-year tax exemption for new FDI in the manufacturing sector with capital investment of USD73 million (RM300) million or more. The amount accumulated in the stimulus packages till February 2021 was estimated to be around USD80 billion (RM320 billion), equivalent to over 20 per cent of the gross domestic product¹³. Therefore, with the improved government policy measure, such as improving external demand outlook, attractive incentives and Covid-19 vaccine roll-out program, Malaysia's manufacturing sector appears to be in a stable position to benefit from any supply chain realignment opportunity in the short to medium term.

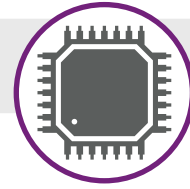
Parameter	Value
Average manufacturing labor cost	USD3.48 per hour
Average factory rental price	USD0.44 to USD0.62 per sq. ft
Average electricity cost	USD0.097 per kWh
CIT (including surcharges/cess)	24 per cent

Source: Malaysia electricity prices, Global Petrol Prices, 1 December 2020; Corporate Tax Rates Table, KPMG, accessed as on 8 September 2021; Hourly Rate for Industry in Malaysia: Manufacturing, PayScale, accessed as on 8 September 2021; Real Estate Highlights, Knight Frank, H1 2020, accessed as on 8 September 2021

4. Malaysia's Manufacturing Environment & Investment Guideline, Asia Perspective, 16 June 2020
 5. Malaysia Continues to be a Vibrant Manufacturing Hub, Recording RM65.3 Billion of Approved Investments in the Manufacturing Sector for Jan – Sept 2020, MIDA, 9 November 2020
 6. Malaysia performance investment report 2020, MIDA, 2 March 2021
 7. KPMG study finds Malaysia among leading global manufacturing destinations, DNA, 4 November 2020

8. Malaysia electricity prices, Global Petrol Prices, 1 December 2020
 9. Corporate Tax Rates Table, KPMG, accessed as on 8 September 2021
 10. Hourly Rate for Industry in Malaysia: Manufacturing, PayScale, accessed as on 8 September 2021
 11. Real Estate Highlights, Knight Frank, H1 2020, accessed as on 8 September 2021
 12. Malaysian Investment Development Authority, 16 March 2021
 13. 'Malaysia offers incentives to attract investors, more strategic ones to be announced, says Muhyiddin', NCER Malaysia, 1 March 2021

Dominant sector: Semiconductors



1. Market opportunity

1.1. E&E

The E&E has been one of the strongest pillars of the Malaysian economy for about five decades. The industry accounted for 6.3 per cent of the country's GDP in 2019¹⁵, and produces several components across consumer electronics, electrical equipment, and components, including Air Conditioners (ACs), cameras, computers, printed circuit boards, batteries, cables, wires and semiconductors for mobile devices, automotive and computer parts. Additionally, the E&E industry is a major contributor to Malaysia's exports, representing 44.7 per cent¹⁵ of the country's total manufacturing exports in 2019, making it the seventh largest E&E exporter in the world.¹⁶

The Malaysian government has identified the E&E industry as one of its nine priority sub-sectors offering high potential growth opportunities as part of the Malaysia Productivity Blueprint (MPB) announced in 2017. To drive growth in the E&E industry and boost its contribution to the national economy, an industrial body led by industries and supported by the government, known as the Electrical & Electronics Productivity Nexus (EEN) was also formed in 2017. This body is focused on enhancing skillset of the workforce, drive digitalisation and innovation, and forge a robust ecosystem to enhance productivity of the E&E industry.

1.2. Semiconductors

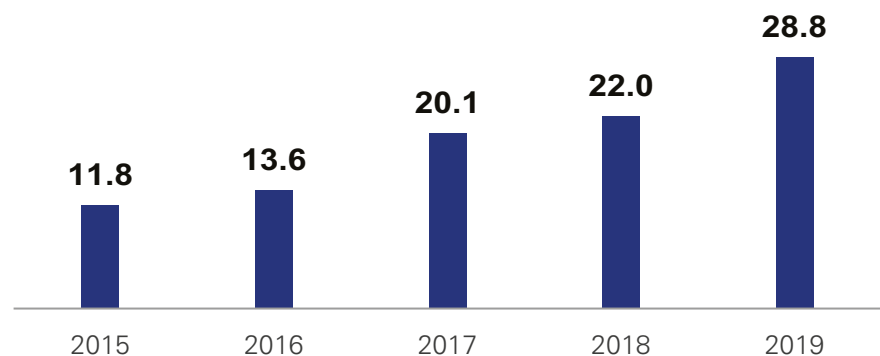
Driven by a strong manufacturing base for E&E, Malaysia has emerged as a prominent cluster of semiconductors in the world. Cost-effectiveness, availability of resources, infrastructure standards, and logistics are some of the key factors contributing to the growth of semiconductors sector in Malaysia. Several major semiconductor manufacturers have established their operations in the country over the years. Led by an increase in manufacturing of E&E components, the production of semiconductors has also risen steadily.¹⁷

Malaysia is a major producer of semiconductors and sensors for cars and is at the forefront of developing semiconductors for electric vehicles. According to CGS-CIMB Research, the Malaysian semiconductor sector is projected to record a 39 per cent net profit growth in 2021¹⁸. Rising production and sales of 5G-enabled smartphones and electric vehicles are key contributors to increasing demand for semiconductors, as 5G-enabled smartphones

require 40 per cent more radio frequency content compared to 4G smartphones, while EVs require about 82 per cent higher semiconductor content value compared to internal combustion engine vehicles.¹⁹ These factors are expected to drive demand and sales in the Malaysian semiconductor sector.

To meet the growing demand, the country has developed an industrial base to support the entire semiconductor value chain, ranging from product assembly, testing, packaging, water fabrication and Integrated circuit (IC) design, with the presence of several domestic and international operators across the semiconductor ecosystem. In addition, Malaysia has strong back-end capabilities with respect to semiconductors, such as integrated circuit packaging and testing. Semiconductor operators in the country have also upgraded their facilities into integrated manufacturing centres to fuse manufacturing activities with R&D, product design and development, marketing, and distribution.

Production of semiconductors (billion units)



Source: Production of semiconductors in Malaysia 2013-2019, Statista, 11 February 2020

15. Electrical & Electronics Industry in Malaysia – Can we move up the value chain?, 27 Group, 6 October 2020

16. E&E industry – the golden goose of Malaysia, The Star, 13 July 2019

17. Production of semiconductors in Malaysia 2013-2019, Statista, 11 February 2020

18. CGS-CIMB upgrades semiconductor sector to 'overweight' on 5G network proliferation, EV penetration, The Edge Markets, 25 January 2021

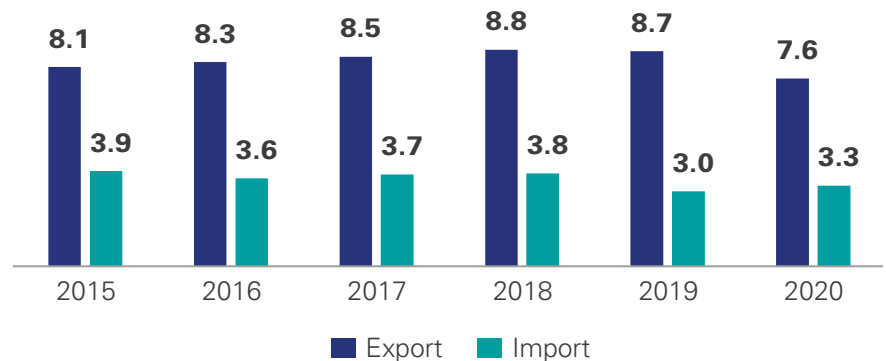
19. Malaysia's semiconductor sector outlook upgraded on 5G tech, electric vehicles demand, MDBC, 26 January 2021

1.3. Semiconductor exports and imports

In 2020, Malaysia was the fifth largest exporter of semiconductor devices, after China, Hong Kong (SAR), Singapore, and Japan. Some of the leading export destinations of semiconductor devices from Malaysia include the U.S., Hong Kong (SAR), Germany, Singapore, Vietnam, China, and Japan.²⁰ Microprocessors, memory chips, and ICs are some of the key semiconductor devices produced in the country.

Interestingly, the country also imports a substantial amount of semiconductor devices, primarily from China and Japan and was the ninth largest importer of semiconductor devices in the world in 2020.²¹

Export and import of electrical apparatus* (USD billion)



*includes parts for diodes, transistors and similar semiconductor devices and photosensitive semiconductor devices

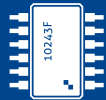
Source: Import/Export data, TradeMap mport/Export data, TradeMap

1.4. Key capabilities and major semiconductor clusters in Malaysia

Malaysia has been home to several domestic and foreign semiconductor manufacturing companies, alongside semiconductor design, assembly, and test centres. While Malaysian firms are primarily involved in the mid to lower-end of the semiconductor value chain, front-end of the manufacturing process majorly comprises global players. Broadly, companies operating across the semiconductor ecosystem in the country are categorised into three groups:

- Outsourced semiconductor assembly and test companies:** Consists of players who provide outsourced services, such as assembly, packaging and testing of semiconductor devices to larger companies
 - Automated test equipment manufacturers:** Comprises companies which offer automation solutions to the semiconductor sector
 - Designers and manufacturers of test sockets:** Consists of companies which have expertise in designing and manufacturing high performance test sockets and other materials
- Penang is one of the most prominent semiconductor clusters in Malaysia, alongside other regions, such as Perak, Kedah, Johor, and others. Penang contributes to nearly 8 per cent of the global back-end semiconductor output²² and is one of the most significant microelectronics assembly, packaging, and testing hubs in the world.

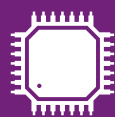
Total investment of **USD3.8 billion** in E&E sector in 2020



19,541 employed in E&E sector in 2020



E&E constitutes for **39.4 per cent** of the total exports



6 out of 12 of the largest semiconductor companies currently operating in Malaysia



Source: Malaysia's E&E Industry, Malaysian Investment Development Authority, 31 December 2020

20. Electrical apparatus; parts for diodes, transistors and similar semiconductor devices and photosensitive semiconductor devices imports by country, TradeMap, accessed as on 3 September 2021

21. Malaysia Electrical apparatus; parts for diodes, transistors and similar semiconductor devices and photosensitive semiconductor devices imports by country, TradeMap,

accessed as on 3 September 2021

22. Electrical & Electronics Industry in Malaysia – Can we move up the value chain?, 27 Group, 6 October 2020

1.5. Government support and incentives:

The Malaysian government offers several incentives, including tax benefits, import duty exemptions, investment tax allowance (ITA), and reinvestment allowance among others to attract investment in the country's E&E and semiconductor sector.

- **FDI:**²³ The Malaysian government allows foreign investors to own up to 100 per cent equity in any corporation established in the manufacturing sector, including the E&E and semiconductor industry
- **Tax incentives:**²³ To promote investments in the E&E sector, the government offers several tax incentives and exemptions. Some of the key incentives include:

Parameter	Incentive
Pioneer status income tax exemption	<ul style="list-style-type: none"> • Income tax exemption ranging from 70 per cent to 100 per cent for a period of five or ten years
ITA	<ul style="list-style-type: none"> • ITA of 60 per cent or 100 per cent on qualifying capital expenditure (factory, plant, machinery, or other equipment used for the approved project) for a period of five years • Higher ITA rates (as well as the percentage of statutory income which can be set-off) and/or a longer incentive period of 10 years may be available, depending on the promoted activities or products
Import duty exemption	<ul style="list-style-type: none"> • Applicable for raw materials/components, machinery, and equipment
Reinvestment allowance for resident companies which have been in operation for not less than 36 months	<ul style="list-style-type: none"> • Companies are eligible for a reinvestment allowance of 60 per cent on qualifying expenditure for a period of 15 consecutive years • For companies that have exhausted their existing reinvestment allowance period, a special reinvestment allowance is available for the years of assessment 2020 to 2022
Companies relocating overseas manufacturing facilities to Malaysia (for applications received by 31st December 2022)	<p>New Company</p> <ul style="list-style-type: none"> • 0 per cent special tax rate for up to 15 years <p>Existing Company</p> <ul style="list-style-type: none"> • ITA of 100 per cent on qualifying capital expenditure available for set-off against 100 per cent of statutory income for up to five years
Customized incentives	Companies involved in high-value projects may apply to the Ministry of Finance for customised / pre-packaged incentives, which are granted on a case-by-case basis

Source: Malaysia's E&E Industry, Malaysian Investment Development Authority, 31 December 2020

- **Investment guarantee agreements:** In order to promote FDI, Malaysia has signed Investment Guarantee Agreements (IGAs) with over 60 countries. These IGAs provide foreign investors with favorable legal rights and protections
- **Industry4WRD policy:** This is a national policy developed to propel SMEs forward to meet the challenges of the Fourth Industrial Revolution for manufacturing sectors and manufacturing-related services sectors, subject to meeting eligibility criteria. To achieve this aspiration, the following tax incentives were introduced:
 - Automation Capital Allowance of 200 per cent on the first USD0.48 million (RM2 million) expenditure incurred within eight years of assessment from 2015 to 2023
 - Tax deductions (single or double) in relation to various prescribed expenses, such as Industry 4.0 readiness assessments, participation in approved programs for training and skills development and the provision of internships and scholarships / bursaries.

23. Malaysia's E&E Industry, Malaysian Investment Development Authority, 31 December 2020

1.6. Talent development programs

Malaysia has a readily available pool of multi-lingual, skilled and technically trained workforce where an estimated 27 per cent of the labor force has tertiary education. In order to develop the human resource capital in Malaysia, the Manpower Department of the Ministry of Human Resources runs 32 Skills Training Institutes [Industrial Training Institutes (ITIs), Advanced Technology and Training Centre (ADTEC) and the Japan Malaysia Technical Institute (JMTI)]. Additionally, vocational and technical schools, polytechnics, and industrial training institutions help prepare the youths for employment in various industrial trades. While they are mostly run by government agencies, several private initiatives complement the government's efforts in producing the skilled workers needed by industry²⁴.

Human Resources Development Fund (HRDF), a Malaysian Statutory Body under the Ministry of Human Resources, provides financial assistance for 'training and development' by contributing employers under certain designated training schemes.

However, the sector faces the challenge of skill and competency mismatch as there is limited qualified and experienced technical talent to participate in higher value-add activities.

Hence, the government has prioritised the creation of a sustainable talent pool to meet the E&E sector's growing needs and has designed courses and programs to enhance the skillset of students by emphasizing the STEM fields. The government also aims to equip the workforce with skills to increase the sector's contribution of high value manufacturing across the E&E sector's value chain, including areas, such as IC design. Some of the key talent development programs include:

- **Post-School Finishing Program in IC Design:**

This is a short-term collaboration platform between industry players, academia, and the government to inculcate specialized talent to meet the requirements of upstream E&E activities

- **The Malaysia Productivity Blueprint (MPB):** Under the 11th Malaysia Plan, MPB had established the Electrical and EEPN, aimed to collaborate between government agencies and experts from subsectors of the E&E industry, in order to accelerate the productivity and growth of the sector. Initiatives²⁵ for talent development include setting up a Centre of Excellence to:

- Strengthen collaboration between industry, government, and universities to ensure supply of industry-ready engineers
- Up-skill workers to foster productive culture
- Build a strong pipeline of skilled workers and gradually reduce the reliance on low-skilled workers

- **Structured Industry Apprenticeship Program (SIAP):** Created by Malaysia's EEPN in partnership with the Ministry of Higher Education (MOHE), SIAP is a university curriculum enhancement and embedment program for IC design and development. The objective of this program is to help students build capabilities in high value areas such as design and development of IC.

24. Malaysia's E&E Industry, Malaysian Investment Development Authority, 31 December 2020

25. Malaysia Blueprint Productivity (11th Malaysia Plan 2016-2020), accessed as on 8 September 2021



1.7. Infrastructure

Malaysia has a well-established infrastructure to cater to the semiconductor sector, owing to the presence of several international companies in the country especially in the wafer fabrication sector. Malaysia is currently the only other country in SEA apart from Singapore, having wafer fabrication infrastructure and capabilities.

The country also has an established supply chain network and is one of the major transshipment hubs in the world, owing to its proximity to the Malacca Strait. Its prime location, competitive costs of operation and strong linkage of supply chains in the regional market offer firms close proximity to their customers. Malaysia has seven federal government-owned, and two state government-owned ports, with Port Klang and Port of Tanjung (PTP) being the 12th and 18th busiest ports in the world, respectively.²⁶ Malaysia also has seven major international airports and over 60 domestic airports.²⁷ The country has a rail network of over 2,700 km²⁸ and over 2,000 km²⁹ of expressways.

Malaysia also has over 200 fully developed industrial parks³⁰, around 22 free-trade industrial zones and licensed manufacturing warehouses³⁰, technology parks and a multimedia super corridor. The country is also developing its first artificial intelligence (AI) park to attract more FDI in the E&E sector and further develop the semiconductor market, is expected to push local manufacturing and supply chain management and bolster the semiconductor sector. More such industrial parks designated for E&E sector are being developed in Malaysia to attract companies relocating their supply chains in the region.

1.8. Industry4WRD³¹

National Policy on Industry 4.0 aims at boosting digital transformation and intensifying the adoption of Industry 4.0 technologies in manufacturing sector. Various incentives under Industry4RWD include Domestic Investment Strategic Fund (DISF), High Impact Fund (HIF), Industry4WRD Readiness Assessment Intervention Program, high-speed broadband connectivity to potential industrial parks and reskilling programs to address the technology and skills gaps in the industrial sector.

1.9. R&D and innovation

Through the Malaysian Investment Development Authority (MIDA), the government is encouraging manufacturers to establish more R&D centres in the country by offering incentives, such as income tax exemptions and ITAs. The government has also set up the Collaborative Research in Engineering, Science and Technology (CREST) Centre, to boost innovation and growth in the E&E industry.

Malaysia has also witnessed a rapid growth in the start-up ecosystem over the last five years, with nearly 3,000 startups operating in the country as of 2019.³² Collaboration between startups and the government is expected to play a significant role in the country's manufacturing ambitions and propel growth and advancement in the sector.

The National Policy on Science, Technology, and Innovation (DSTIN) 2021-2030 announced in December 2020 is expected to drive innovation in the technology sector and accelerate the adoption of Industry 4.0 and other technologies. This would help increase innovation and R&D in the semiconductor sector and the broader E&E sector and enable Malaysia to move up the

manufacturing value chain.

Further, R&D funding in the country would also be slowly raised to 3.5 per cent of GDP by 2030, thereby promoting research in several fields, including E&E.

'Technology Park Malaysia' (TMP) is among the world's most advanced and comprehensive centres³³ for 'R&D' by knowledge-based industries. It was established by the Ministry of Finance, Malaysia in 1996 and operates under the patronage of the Minister of Science, Technology and Innovation (MOSTI). More than 3,000 local and multinational technology driven companies have been a part of TMP since its inception. Most of the tenancy come from Information and Communication Technology (ICT) companies followed by Engineering and Biotech, Telecom and Support Services.

Kulim Hi-Tech Park (KHTP) caters to technology-intensive industries and R&D activities. It is recognised as among one of the preferred hi-tech parks by leading hi-tech multinational companies in Asia. With quality talent, intermodal logistics connectivity, and adequate R&D and industrial infrastructure, KHTP is sought-after for its conducive and business friendly environment from both local and multinationals.

26. PTI Insight: Is Malaysia a major maritime nation?, Port Technology, 19 March 2020

27. 7 International Airports in Malaysia & Other Domestic Airports, Holidify, accessed as on 8 September 2021

28. Malaysia - Total route rail lines, Knoema, accessed as on 8 September 2021

29. National roads, WorldBank, accessed as on 8 September 2021

30. Industrial Diversification In Malaysia, CAREC Institute, 17 May 2019

31. Cost of Doing Business in Malaysia, 2020, Malaysia Highlights, accessed as on 8 September 2021

32. Only 0.25 per cent of Malaysian companies are startups, industry potential untapped, TRP, 18 June 2019

33. KHTP website (updated last in April 2021), accessed as on 8 September 2021

1.10. Conclusion

Though Malaysia offers a conducive business environment, liberal trade policies and competitive manufacturing costs, the country's semiconductor sector faces challenges, including:

- Minimizing the impact of COVID-19 to economic, social and environment, with sound policies.
- Accelerating workforce up-skilling with application of strong online platform mechanism.

- Strengthening productivity and competitiveness through change of up-skilling.
- Strengthening infrastructure development to push for economic recovery.
- Intensifying the adoption of fourth industrial revolution technologies for SMEs and enterprises

The sector needs to quickly adapt to innovation and technology developments and continuously inject new innovations to enhance

the value chain. Workforce in the semiconductor sector needs to be upskilled especially in areas, such as design, to cater to growing demand of 5G, electric vehicles and other products with advanced technologies, such as AI which rely heavily on semiconductors. The government also needs to address issues pertaining to intellectual property (IP) protection, licensing, and R&D spending.



Key highlights

- E&E industry represented about 44.7 per cent of country's total manufacturing exports in 2019. As per MPB announced in 2017, E&E industry is amongst the nine priority sub-sectors offering high growth opportunities.
- Cost-effectiveness, availability of resources, infrastructure standards and logistics are some of the significant drivers attracting major global semiconductor manufacturers to set up operations in the country.
- Domestic Malaysian firms are involved in mid-to-lower end of the semiconductor value chain whereas front-end manufacturing processes majorly comprise global players. Penang, Perak, Kedah and Johor are among the prominent semiconductor manufacturing clusters in Malaysia
- Malaysian government is promoting investments in the semiconductor sector by allowing 100 per cent FDI in equity and financial incentives, such as exemption of taxes, removal of import duties, re-investment allowances, and special relocation benefits for global companies.
- The government is promoting semiconductor R&D in the country by offering financial incentives and setting up centers, such as CREST centers to drive growth in E&E industry.



Sunrise sector: Petrochemicals



1. Market opportunity

1.1. O&G sector

Malaysia is the second-largest oil and natural gas producer in SEA and the fifth-largest exporter of liquified natural gas (LNG) in the world.³⁴

As one of the fastest growing economies in the Asia Pacific region, Malaysia's O&G sector offers a plethora of opportunities for businesses in the upstream, midstream and downstream sectors. The country's O&G sector recorded a total revenue of USD16.6 billion in 2019, with a CAGR of 1.6 per cent over 2015 to 2019.³⁵ As of January 2021, the country had oil reserves of 3.6 billion barrels, which was the fourth-largest in Asia Pacific.³⁶

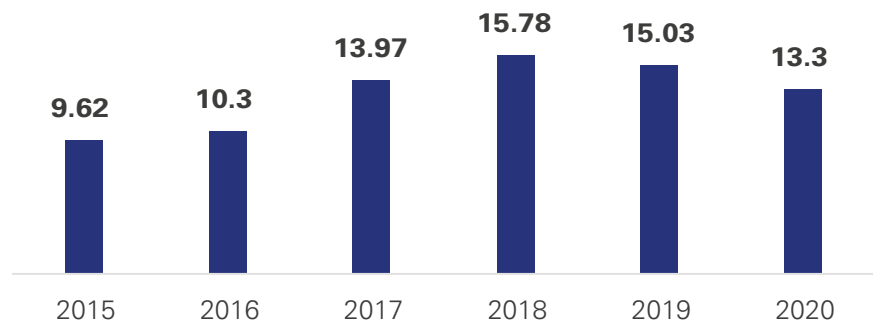
Malaysia is a net exporter of crude oil and exported 276,000 barrels per day (b/d) in 2019, majorly to Australia, India, Thailand and Singapore.³⁶ With a refining capacity of 880,000 barrels per day across seven facilities, Malaysia has the capacity to meet most of the demand for petroleum products with domestic supplies.³⁶

1.2. Petrochemicals

The petrochemicals industry is one of the leading industries in Malaysia. From being an importer of petrochemicals, the country has emerged as an exporter of major petrochemical products, including olefins, polyolefins, aromatics, ethylene oxides, glycols, polyvinyl chloride, and others.³⁷ Over the years, several domestic and international players have established their presence in the

Malaysian petrochemical sector and continue to expand their production capacities. Over 42 petrochemical companies operate in the country, with a combined capacity to produce over 12.9 million tonnes of chemical-related products per annum.³⁸ Malaysia's strong O&G reserves, established supply chain network, infrastructure and the presence of large petroleum companies make it one of the most attractive petrochemical markets in the world.

Malaysia petroleum products exports (USD billion)



Source: Malaysia External Trade Statistics, Department of Statistics Malaysia

Production of a wide range of petrochemical products have also contributed to the development of local downstream polymer and plastics processing activities. The country's petrochemical sector growth is largely attributed to the investor-friendly policies by the government and availability of feedstock. The plastics sector is another contributor to the petrochemical sector's growth. The plastics sector experienced an increase in sales, with the sales value being USD11.9 billion in 2020, with a year-on-year growth of 2.3 per cent, despite the impact of the COVID-19.³⁹

34. Country Analysis Executive Summary: Malaysia, UE EIA, 25 January 2021

35. Oil and Gas in Malaysia, Marketresearch.com, July 2020

36. Country Analysis Executive Summary: Malaysia, UE EIA, 25 January 2021

37. International trade by state, Department of statistics Malaysia official portal, accessed as on 8 September 2021

38. Petrochemical, Pengerang Maritime Industrial Park, accessed as on 8 September 2021

39. Annual report 2021, Malaysia Plastics Manufacturers Association, accessed as on 3 September 2021

1.3. Key petrochemical zones

Malaysia is home to several domestic and international petrochemical companies. The government has established several integrated petrochemical zones which offer centralized utilities, storage services and a comprehensive transportation network to create a value chain and help companies reduce capital and operational costs, while also ensuring the development of downstream petrochemical activities. Some of the key petrochemical zones include:

- **Kerteh:** A petrochemical hub housing the Petronas Petrochemical Integrated Complex (PPIC), which links

the entire O&G value chain – from upstream exploration and production to petrochemical manufacturing. Facilities and infrastructure in this zone include gas processing plants, centralized utility facilities, bulk liquid port, vessel services, and tank storage among others. Some of the key petrochemicals produced in Kerteh include benzene, ammonia, ethylene, butanol, and acetic acid.

- **Gebeng:** This petrochemical hub has the presence of several multinational companies. Peninsular Gas Utilization project, centralized tankage facilities, container and bulk liquid port, cargo handling

are some of the facilities and infrastructure available in this zone. Plants in Gebeng produce polyacetals, syngas, propylene, polyester copolymers, and other petrochemicals.

- **Pasir Gudang:** An established industrial area located next to the Johor port with tank farms for bulk storage of petrochemical liquid, container terminals, free zone, liquid bulk, dry bulk, general cargo and container services, oil storage terminal among other infrastructure and facilities. Key petrochemicals produced include ethylene, styrene monomer, ethylene vinyl acetate, and styrene butadiene rubber.

2. Sector attractiveness from supply chain realignment perspective^{40,41,42}

USD3.7 billion

investment in petroleum products, including petrochemicals over January to September 2020



410,000 labor force employed in petroleum, chemical, rubber and plastic industry in 2020



28th largest reserves of crude oil and condensates in the world (3.6 billion barrels)



24th largest natural gas reserve in the world (42 trillion cubic feet)



40. Malaysia approves RM110bil investments in manufacturing, services & primary sectors in nine months, Strait Times, 1 December 2020

41. Number of people employed in the petroleum, chemical, rubber and plastic industry in Malaysia from 2015 to 2020, Statista, 3 March 2020

42. Malaysia's Petrochemical Industry, Malaysian Investment Development Authority, accessed as on 3 September 2021

2.1. Government support and incentives

With an aim to establish Malaysia as a major regional hub for petrochemicals, the government is offering several incentives for companies to invest in the country's petrochemicals and O&G sector.⁴³

Parameter	Incentive
Tax incentives for income derived from certain upstream petroleum operations	<p>Income derived from petroleum operations in Malaysia is subject to petroleum income tax under the Petroleum (Income Tax) Act 1967. There are several incentives to promote the development of new petroleum reserves and facilitate the exploitation of harder to reach O&G fields, such as:</p> <ul style="list-style-type: none"> • ITA of 60 per cent of qualifying capital expenditure available for set-off against 70 per cent of statutory income from qualifying projects, such as enhanced oil recovery, high carbon dioxide gas, high pressure high temperature or deep-water. • For marginal fields, reduced tax rate of 25 per cent (instead of 38 per cent), accelerated capital allowances and waiver of export duty for oil produced and exported from marginal fields
Pioneer status income tax exemption	<p>Subject to approval, companies granted pioneer status may enjoy partial or full exemption from payment of income tax of statutory income for a period of five to ten years</p> <ul style="list-style-type: none"> • For manufacturing companies, income tax exemption of 70 per cent or 100 per cent on statutory income for five years • For high technology companies, tax exemption of 100 per cent on statutory income for five years • For strategic projects, tax exemption of 100 per cent on statutory income for ten years
ITA	<ul style="list-style-type: none"> • ITA of 60 per cent on qualifying capital expenditure (plant and equipment) available for set-off against 70 per cent of statutory income for a period of five years • Higher ITA rates (as well as the per centage of statutory income which can be set-off) and/or a longer incentive period of 10 years may be available, depending on the promoted activities or products
Global incentives for trading (GIFT) Program	<p>This program has been set up to attract international commodity traders to use Malaysia as their operational and trading base. Under GIFT, commodities companies are required to establish a Labuan International Commodity Trading company (LITC) to conduct trading activities. Key features of GIFT include:</p> <ul style="list-style-type: none"> • 3 per cent flat corporate tax rate on income generated indefinitely • Tax exemption on dividends and royalties received from the LITC • Stamp duty exemption on all instruments for Labuan business activities, merger and acquisition of Labuan companies and transfer of shares • 50 per cent exemption on gross employment income for non-Malaysian professionals <p>Note that Labuan entities have to comply with "substance requirements" under the Labuan tax regime. Such conditions include, amongst others, minimum thresholds for the number of full-time employees and annual operating expenditure.</p>
Global Trading Centre	<p>This is a new tax incentive to attract global MNCs to set up their regional trading hubs in Malaysia.</p> <p>Subject to successful applications received between 1st January 2021 and 31 December 2022, approved companies may enjoy a 10 per cent income tax rate for five years (renewable for another five years) on qualifying activities.</p> <p>(Specific details / guidelines of this incentive are yet to be announced).</p>

43. Malaysia's Petrochemical Industry, Malaysian Investment Development Authority, accessed as on 3 September 2021

Parameter	Incentive
Region-specific incentives	<p>There are also various region-specific incentives for qualifying activities (including O&G related activities) in these economic development areas:</p> <ul style="list-style-type: none"> • East Coast Economic Region (ECER) • Northern Corridor Economic Region (NCER) • Iskandar Malaysia (IM) • Sarawak Corridor of Renewable Energy (SCORE) • Sabah Development Corridor (SDC) • Less Developed Areas <p>Tax incentives (and qualifying activities) vary between each region and include:</p> <ul style="list-style-type: none"> • Income tax exemption of between 30 per cent to 100 per cent for between five to 15 years OR • ITA of between 60 per cent to 100 per cent for a period of between five to 10 years to be set-off against 70 per cent to 100 per cent of statutory income.

Source: Malaysia's Petrochemical Industry, Malaysian Investment Development Authority, accessed as on 3 September 2021



2.4. Talent development

With 410,000 people employed in petroleum, chemical, rubber, and plastic industry in 2020, Malaysia has a strong base of workforce. The government and private sector are focused on building a sustainable pool of skilled workforce in the O&G sector through skill development programs and collaboration with educational institutions to promote skillset specific to the sector.

- Talent Corporation Malaysia, in partnership with the Ministry of Education has undertaken initiatives to collaborate with the Malaysian Technical University Network to develop Bachelor of Technology programs specific to the O&G sector
 - The company has also collaborated with Universiti Malaysia Pahang (UMP) and the Malaysian Oil & Gas Services Council (MOGSC) to conduct workshops to develop BTech programs in the field of O&G Facilities Maintenance
- A government owned O&G company has collaborated with the Construction Industry Development Board (CIDB) to train workers through an apprenticeship program to equip and certify them with skillset required for the O&G sector.

2.5. Digital transformation

The Malaysian government has been actively pursuing digital transformation and adoption of Industry 4.0 in the O&G sector. The Malaysian Investment Development Authority is also offering incentives and grants to companies, including grants for research and design, training, modernization and upgrading of equipment, to promote adoption of automation and Industry 4.0. Companies in the sector are adopting digital technologies to improve operational efficiency, optimize assets and increase productivity.

- A Malaysian O&G company has set up an onshore demonstration facility to perform O&G operations at offshore locations remotely through 5G network to utilize digital technologies to reduce hazard risks at the offshore facility, while reducing time, improving productivity and sustainability
- An engineering services provider based in Malaysia is utilizing digital technologies to promote smart maintenance in the O&G sector. The company has established a Centre of Excellence for maintenance, repair, and overhaul (MRO) and inspection, repair, and maintenance (IRM) activities at Sarawak. Through virtual reality technology, workers can monitor MRO and IRM activities remotely, thereby reducing time-on-site and improving safety performance.

2.6. Conclusion

The petrochemicals sector in Malaysia is set to expand rapidly, with the presence of several petrochemical complexes and an upcoming methanol complex due to start operations in 2023 enabling the country to strengthen its position as an international hub for petrochemicals. The sector would also benefit from Malaysia's diverse manufacturing base and large energy reserves supported by robust growth in petrochemical-consuming sectors, such as construction and automotive. The petrochemical sector's competitiveness, vertical integration and access to a solid local market is expected to drive value added growth and position Malaysia as an attractive petrochemical hub in the Asia Pacific region.

"The Government, through MIDA, continued to be at the forefront to entice more high-value investments in the areas of technology and innovation to position Malaysia as an alternative supply chain hub in Asia. Investors will undeniably derive value by tapping on Malaysia's well-established local supporting industry network and talented workforce to undertake high-tech products manufacturing and high value-added services to serve their clients in the region, in the present and the future," YB Dato' Seri Mohamed Azmin Ali, Minister of International Trade & Industry.



Key highlights

- Malaysia has oil reserves worth 3.6 billion barrels and installed production capacity of more than 0.8 million barrels per day across seven facilities.
- Growth of O&G sector along with established supply chain network and presence of large companies in the country is aiding growth of petrochemical industry. Currently more than 42 petrochemical companies are operational in Malaysia with a combined capacity of 12.9 million chemical related products per annum.
- The government has established petrochemical zones in Kerteh, Gebeng and Pasir Gudang offering storage services and transportation facilities leading to reduced capital and operational costs.
- Major incentives offered to strengthen petrochemical manufacturing include income tax exemption on capital expenditure and investments, income tax exemption for five to ten years and special tax rebates for companies setting up their regional trading centres in the country.
- MIDA has announced financial incentives and grants to promote R&D in the petrochemical industry focused on training and development of technologies, such as Industry 4.0 and IoT.









05

The Singapore Advantage





Territory landscape

Macroeconomic indicators

Population  5.69 million	GDP  USD337.45 billion	GDP growth  -5.4% (2020) 5% (2021F)	GDP per capita  USD58,480	GDP by sector  Services- 74.4% Industry- 25.6%	Inflation  -0.4% (0.6% in 2019)
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All values are estimates for 2020, unless specified otherwise. Contribution of agriculture to Singapore's GDP is insignificant

FDI and M&A

Total FDI  USD58 billion (↓37%)	Key sectors  Finance and Insurance, Wholesale and retail trade manufacturing	Key countries  The U.S. Cayman Islands, British Virgin Islands	M&A value  USD59.2 billion (↓18.2%)	M&A transactions  482 (↓24.7%)
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All values are actuals for 2020, unless specified otherwise

Territory attractiveness

 25 FTAs	 Busiest port in the world in terms of shipping tonnage	 Well-connected and one of the best airports in the world	 Third most innovative country in the world (2020)	 450,000 workforce in manufacturing (2020)
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Source: Singapore country data, IMF; GDP by sector, EIU; Singapore's FDI flows were down 37 per cent in 2020, The Business Times, 26 January 2021; Transaction Trail Report, Duff & Phelps, 2020; MTI Maintains 2021 GDP Growth Forecast at "4.0 to 6.0 Per Cent", MTI Singapore, 15 February 2021; Singapore reduces foreign workers quota in manufacturing sector, The Hindu, 16 February 2021; Premier Global Hub Port, MPA Singapore; List of airports in Singapore, Airports-list.com; Free Trade Agreements, MTI Singapore; Singapore population, Department of Statistics Singapore; Singapore Leaps Up the Rankings in Bloomberg's Innovation Index

Business environment

Singapore, located in the South-eastern part of Asia, provides a gateway to the regional ASEAN market. Despite its small domestic market and lack of natural resources, the country's economy is one of the most stable in the world, with no foreign debt, significant government revenue, and a reliably positive surplus. Since the late 1960s, Singapore has followed a general policy of export-oriented industrialization with a liberalized economy, provision of incentives to attract foreign

investments and establishment of trade zones, such as Jurong Port, Keppel District Park, Pasir Panjang Wharves, and others.

Being a maritime centre that connects over 600 ports in 120 cities¹, Singapore's strategic location allows it to serve as the headquarters for over 37,000² international companies. The country's financial markets provide an important source of funding for businesses that serve a market of about four billion people who live

within a seven-hour flight radius. Singapore is a signatory³ to more than 25 FTAs, including 15 bilateral FTAs and 11 regional FTAs with ASEAN countries, Gulf cooperation council (GCC) countries, European free trade association (EFTA) nations and Trans-Pacific Partnership members. The country has also recently signed the RCEP, which will provide free market access to more than two-thirds of the world's population and about 30 per cent of the global GDP.



1. Premier Global Hub Port", Maritime and Port Authority of Singapore, accessed as on 8 September 2021
2. "S'pore has edge over HK in Asian hub race: EDB", Strait Times, 30 March 2018
3. "Singapore FTAs", Enterprise Singapore, accessed as on 8 September 2021

The country offers multiple financial and non-financial incentives including grants, such as the Local Enterprise and Association Development (LEAD) program for sector-wide development programs spearheaded by trade associations and chambers, the Path to Access to Care and Treatment (PACT) Program for collaborative development, and the Startup SG (Singapore) Accelerator. Singapore⁴ has also signed bilateral investment treaties with about 50 nations, thus creating a favorable environment for investors. Investors can also avail benefit from more than 92

double taxation avoidance (DTA)⁵ agreements in force and about seven others, which are currently being negotiated. The country is also undertaking ESG initiatives to promote sustainable practices in corporate supply chains. The Monetary Authority of Singapore recently announced a sustainable supply chain financing framework in collaboration with a global bank, which aims to engage with large MNCs and their extensive supply chains to adopt sustainable practices and thereby achieve more responsible sourcing and procuring.

Doing business rankings 2020⁶

Owing to the aforementioned advantages Singapore is ranked second globally as per the World Bank's Doing Business report, making it one of the most attractive destination for the companies. However, there are certain parameters, such as 'Trading across borders' (Rank 47) and 'Getting credit' (Rank 37), where it doesn't perform very well. The key performance indicators and global ranks for the 10 primary sub-categories are highlighted below⁶

EoDB rankings, Global rank 2020



Source: Singapore, Doing Business 2020, World Bank

Note: Global ranking, with 1 being the best out of 190 countries

While the country has undertaken multiple initiatives to ease the process of starting a business, enforcing contracts, protecting minority investors, and dealing with construction permits, it needs to improve its legislation

and processes around border compliance for exports and imports as it ranks 47th in "Trading Across Borders" and strengthen the insolvency framework as it ranks 27th in "Resolving Insolvency" as per the report.

4. "International Investment Agreements (IIAs)", Ministry of Trade and Industry – Singapore, accessed as on 8 September 2021

5. "List of DTAs, Limited Treaties and EOI Arrangements", Inland Revenue Authority of Singapore, accessed as on 8 September 2021

6. "Singapore – Ease of Doing Business Ranking 2020", Doing Business, 24 October 2019

Cost of manufacturing

Singapore is one of the most important manufacturing hubs in SEA and has leadership positions in the aerospace, electronics, biomedical sciences, and precision engineering sectors. The country's manufacturing activities contribute nearly 20.0 per cent to its annual GDP and 12 per cent of its workforce⁷. Though the pandemic had an impact on the country, with manufacturing output contracting by nearly 8.1 per cent year-on-year in May 2020⁸, the sector overall, has survived the blow because of diversification. Precision engineering and biomedical engineering, which grew even amidst the pandemic are expected

to drive the growth in the near future. The government in January 2021 announced a new 10-year plan to grow its manufacturing sector by 50 per cent to maintain its current level of contribution to GDP, by 2030^{9,10}. Further, the availability of high-end machinery equipment, experienced talent for running the complex operations, and availability of decision makers from key industrial customer segments are the other aspects that are driving the establishment of high-end operations in Singapore.

Though Singapore has a relatively higher labor cost compared to peers in the region, the unit labor cost of manufacturing has been

consistently declining over the past few years, thereby offering an attractive proposition for manufacturers looking to set up operations in an established semiconductor market with high skilled labor and high productivity. Labor productivity increased in 2020, with manufacturing value-added per actual hour worked increasing by 18.3 per cent year-on-year, while the unit labor cost of manufacturing declined by 22.8 per cent year-on-year.^{11,12,13,14} While the corporate tax rate is lower, the other costs related to labor, rental, and utility charges are considerably high compared to other manufacturing hubs in the ASEAN region.

Parameter	Value
Average manufacturing labor cost	USD27.7 per hour
Average factory rental price	USD1.65 per sq. ft per month
Average electricity cost	USD0.15 per kWh
CIT (including surcharges/cess)	17 per cent

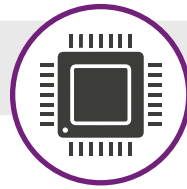
Source: ECONOMIC SURVEY OF SINGAPORE 2020, MTI Singapore, accessed as on 15 February 2021; Global manufacturing risk index – 2020, Cushman & Wakefield, 25 June 2020; New economy sectors gaining ground - Singapore, Colliers, 20 August 2020; Tariff rates, SP Group, accessed as on 8 September 2021



7. "Singapore: A leading manufacturing hub", EDB Singapore, 21 May 2018
 8. "Singapore's manufacturing output continues decline with 6.7 per cent fall in June", Channel News Asia, 24 July 2020
 9. Singapore to grow manufacturing base, attract top industry players: Chan Chun Sing, The Straits Times, 1 February 2021
 10. "IN FOCUS: After COVID-19, where are the Singapore economy, workforce headed?", Channel News Asia, 4 February 2021

11. ECONOMIC SURVEY OF SINGAPORE 2020, MTI Singapore, accessed as on 15 February 2021
 12. "Global manufacturing risk index – 2020", Cushman & Wakefield, 25 June 2020
 13. "New economy sectors gaining ground - Singapore", Colliers, 20 August 2020
 14. "Tariff rates", SP Group, accessed as on 8 September 2021

Dominant sector: Semiconductor manufacturing



1. Market opportunity

1.1. Electronics industry in Singapore

Singapore has a growing and vibrant electronics industry with the presence of several domestic and international companies operating across the electronics value chain, including R&D, design, manufacturing, and distribution. The country accounted for 10 per cent of the global electronics exports in 2019, exporting USD84 billion worth of electronic components¹⁵, and accounted for 39 per cent of Singapore's manufacturing GDP in 2019¹⁶. The electronics industry caters to key activities in semiconductors, consumer electronics, and information technology, alongside catering to niche segments, including encryption technology, satellite communications, integrated circuit design, and wireless technology. In addition, Singapore also plays an important role in global supply chain for various products, including storage and memory products, and microelectromechanical systems (MEMS).¹⁷

Despite headwinds faced due to the COVID-19 pandemic, Singapore's electronics industry has demonstrated growth, attracting significant investments, and creating job opportunities to cater to the demand. In the first nine months of 2020, the sector recorded over USD4.3 billion in fixed assets investment and over USD283.9 million in total business expenditure.¹⁸ Over April to October

2020, the industry has created over 2,800 jobs and traineeships owing to surge in demand for digital goods and services amidst the pandemic.¹⁸ The industry is also witnessing growth as companies are transforming to increase focus on higher-value added manufacturing by leveraging technologies such as, automation, robotics, IoT, and AI, besides increasing capacity to meet demand for electronic components. The electronics manufacturing sector is set to witness further growth in 2021, aided by increasing demand for tech-related products and roll out of 5G in several nations.

1.2. Semiconductor sector

Singapore has one of the most diverse semiconductor sectors in Asia Pacific. Semiconductor is among the largest sectors within Singapore's manufacturing industry and its contribution to the country's GDP has increased from less than 1 per cent in 1990 to 6.9 per cent in 2019.¹⁹ Over the years, the sector has gradually evolved and transformed towards knowledge and capital-intensive manufacturing alongside design and R&D activities.

Despite the onset of pandemic, the semiconductor sector recorded signs of growth with a 1.7 per cent year-on-year increase in output in 1H20. Strong demand for semiconductors from the 5G market, cloud services, and data centres due to increasing adoption

of remote learning, telecommuting and accelerated digitalization of business are the key factors contributing to the growth of domestic semiconductor sector. The country's precision engineering cluster also recorded a 12 per cent year-on-year growth in 1H20, backed by a strong global demand for semiconductor manufacturing equipment. Increase in global demand for semiconductor equipment is largely attributed to investments in advanced manufacturing technologies in anticipation of demand for 5G.



15. Singapore's electronics, manufacturing firms urged to be bold, The Star, 12 January 2021

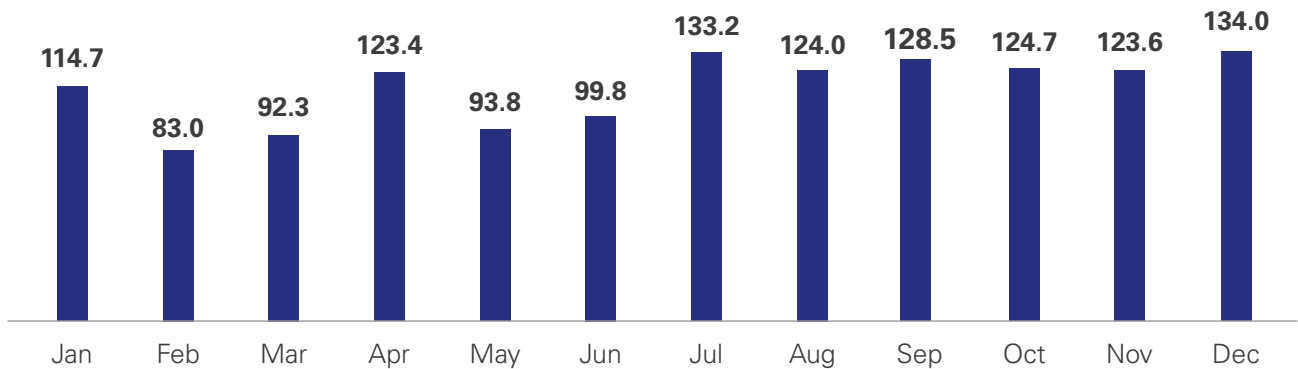
16. Jobs Situation Report 10th Edition (19 Oct), Ministry of Manpower, Singapore, 19 October 2020

17. Electronics, The Singapore Economic Development Board, accessed as on 8 September 2021

18. Electronics sector continues to grow despite COVID-19, offered more than 2,800 opportunities since April: MOM, CNA, 19 October 2020

19. Prospects for Singapore semiconductor industry very bright, says Chan Chun Sing, The Straits Times, 19 October 2020

Industrial Production Index: Semiconductors (base 2019=100), Singapore, 2020



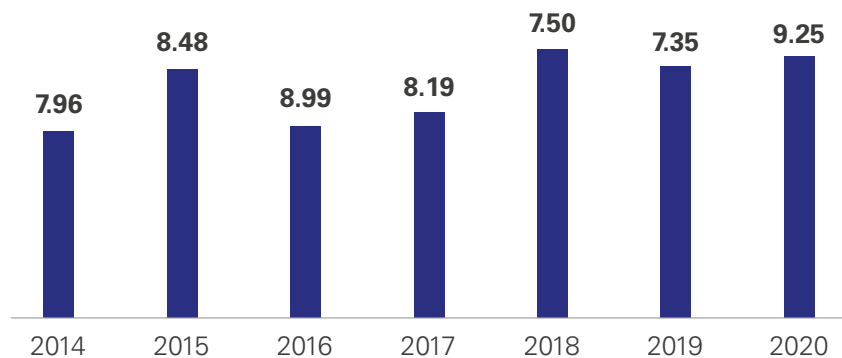
Source: Manufacturing, Department of Statistics Singapore

Technological innovations, such as autonomous vehicles and 5G-enabled ecosystems are expected to positively impact the country's semiconductor sector.

1.3. Semiconductor exports

In 2020, Singapore was one of the largest exporters of semiconductor devices, exporting nearly USD9.25 billion worth of electrical machinery and parts to rest of the world. Some of the leading export destinations of semiconductor devices from Singapore include Hong Kong, Malaysia, China, and the U.S. for 2020.^{20,21}

Export of electrical apparatus* (USD billion)



*includes parts for diodes, transistors and similar semiconductor devices and photosensitive semiconductor devices
Source: World Integrated Trade Solution

1.4. Established electronics and semiconductor base

Singapore is home to over 2,900²² companies operating across the electronics and semiconductor value chain and has presence of some of the world's major outsourcing semiconductor assembly and test companies. The country has 8 of the top 10 fabless semiconductor companies, 21 wafer fabrication plants, and 12 semiconductor assembly and test operations.²³ Singapore

has four wafer fabrication parks in North Coast Drive area, Woodlands, Tampines, and Pasir Ris, which are home to the country's semiconductor and electronics industries. These parks accommodate 14 global semiconductor and electronics companies and employ around 18,600 workers.²⁴ Alongside manufacturing operations, several domestic and international

companies have also established centres of excellence and R&D units in Singapore. These units are focused on incorporating latest manufacturing technologies, such as automation of front- and back-end semiconductor manufacturing. Companies are also collaborating with leading universities in Singapore to build a strong technical workforce to cater to the demands of electronics industry.

20. List of importing markets for the product exported by Singapore in 2020, Trade Map, accessed on 3 September 2021

21. List of products exported by Singapore, Trade Map, accessed on 3 September 2021

22. Electronics Industry profile, Enterprise Singapore, 7 January 2019

23. Electronics, Ministry of Education, Singapore, 3 February 2021

24. Creating a better work environment for electronics industry to attract more workers, The Straits Times, 27 January 2021

2. Sector attractiveness from supply chain realignment perspective^{25,26,27,28}

2.1. Government support and trade

Business-friendly environment and supportive government policies make Singapore a preferred choice for businesses, which are looking to expand their presence.

- **Introduction of new initiatives:**

The government promotes new initiatives to help local manufacturing companies adopt new technology, support the trade ecosystem, and strengthen startups.

- The Agency for Science, Technology and Research (A*STAR) is planning to expand its Operation and Technology Roadmapping (OTR) service that would help companies with same sub-work draft technology roadmaps for common problems.

- To further strengthen Singapore's trade ecosystem, the Singapore Logistics Association (SLA) and Global eTrade Services (GeTS), in September 2017, launched 'hive', a regional Business-to-business (B2B) trade facilitation platform.²⁹

- **Tax incentives:** The Singapore government offers whole range of tax incentives to advance small and medium businesses and develop high-value products and services for long-term, sustainable growth.³⁰ The country has a wide-ranging network of tax treaties with more than 85 countries and territories.³¹

Incentive/Scheme	Tax relief
Pioneer certificate incentive (PC)	Tax exemption for five years, can be up to 15 years or a reduced rate of corporate tax no less than 5 per cent
Development and expansion incentive (DEI)	Concessionary tax rate of 5 per cent for up to 10 years
Research incentive scheme for companies (RISC)	Co-funding support of up to 30 per cent of qualifying project costs (such as manpower, training, consultancy, etc.)
Training grant for company (TGC)	Up to 30 per cent support on qualifying costs, such as trainee salaries and overseas trainee expenses
M&A scheme	Several reliefs, like an allowance, stamp duty relief, Double Tax Deduction on the transaction cost

Source: New initiatives to support manufacturing companies, trade ecosystem and startups in Singapore, Open Gov Asia, 5 March 2018; Industry-Specific Corporate Tax Incentives, Osome, 13 December 2019; Business-friendly environment, The Singapore Economic Development Board, accessed as on 8 September 2021

25. Logistics & Supply Chain Management, The Singapore Economic Development Board, 2 July 2021

26. Three factors that have made Singapore a global logistics hub, World Bank, accessed as on 8 September 2021

27. Singapore FDI: By Industry: Manufacturing, CEIC Data, accessed as on 8 September 2021

28. SingStat Table Builder, Department of Statistics Singapore, accessed as on 8 September 2021

29. New initiatives to support manufacturing companies, trade ecosystem and startups in Singapore, Open Gov Asia, 5 March 2018

30. Industry-Specific Corporate Tax Incentives, Osome, 13 December 2019

31. Business-friendly environment, The Singapore Economic Development Board, accessed as on 8 September 2021



2.2. Skill/talent availability

The electronics industry in Singapore has a workforce of around 70,500 people³² specializing in consumer electronics, semiconductors, information technology, IC design, wireless technology, satellite communication, and encryption technology. However, the country is facing a shortage of STEM talent to cater to advancements in the industry, including adoption of latest technologies, such as robotics, automation, and others.

In order to ensure well-qualified and talented work force in the industry, Singapore is training over 13,000 engineers and technicians every year. The Singapore Economic Development Board (EDB), a government agency under the Ministry of Trade and Industry, is responsible for partnering with companies to train and prepare the next generation of foundry

engineers, IC designers, and AI talent. The EDB partners with companies through platforms, such as the Singapore Industry Scholarships (SgIS), Industry Postgraduate Program (IPP), and the EDB-NVIDIA Future Talents Program.³³

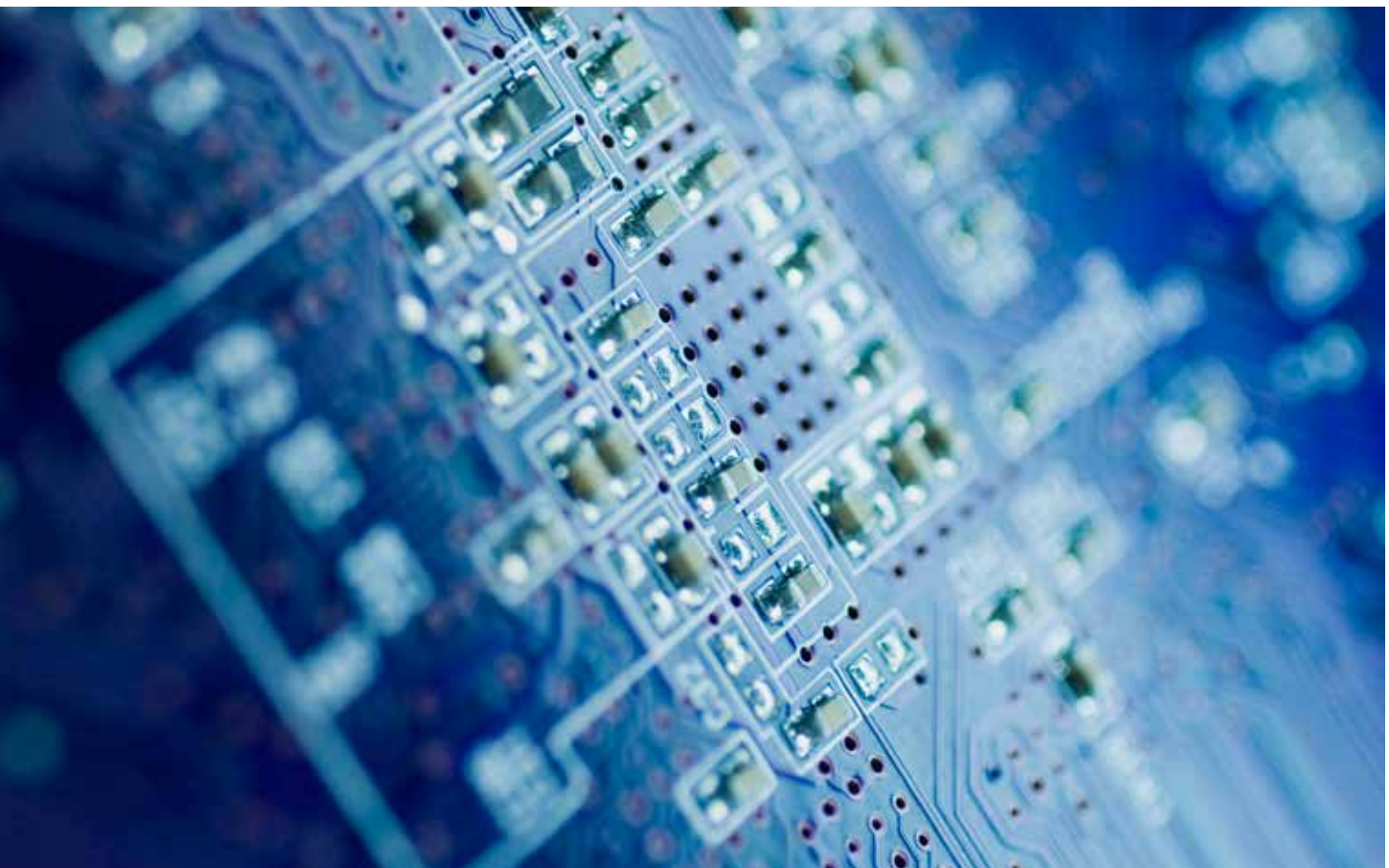
The government must continue to partner with companies to build stronger capabilities and to upskill and reskill workers, in order to successfully meet the growing demand and adapt to technological advancements in the industry.

2.3. R&D and innovation

Singapore is undertaking initiatives to boost the competitiveness of its electronics sector through innovation and R&D. Enterprise Singapore, in collaboration with an electronics component distributor based in Singapore established the PlanetSpark Innovation Centre in Changi

Business Park in January 2021, aimed at developing the electronics and advanced manufacturing sector. This innovation centre would nurture Singapore-based startups, and small and medium-sized enterprises in hardware technology, IoT, and AI sectors. This centre also aims to connect startups to key semiconductor manufacturers to enhance collaboration and drive innovation.

Enterprise Singapore also has a Centre of Innovation for Electronics and IoT to design and develop products and services by leveraging embedded technology, imaging technology, computational intelligence and analytics, wireless communication, and others. The centre would also provide a platform for test-bedding, conducting user-trials and test marketing of new solutions.



32. Jobs Situation Report 10th Edition (19 Oct), Ministry of Manpower, Singapore, 19 October 2020

33. Electronics, The Singapore Economic Development Board, accessed as on 8 September 2021

2.4. Infrastructure

Singapore is one of the high-performing logistics hubs in Asia. The country has the largest transshipment container port in the world and is linked to more than 600 ports worldwide. The country focuses on introducing innovative infrastructure processes in order to keep ahead in the logistics chain. As part of the Next Generation Port 2030, the Singapore port would be able to process nearly 65 million standard shipping containers. Singapore's Changi airport has been consistently rated as one of the best airports in the world and offers connectivity to several countries around the globe. The government has also announced plans to double the capacity of the airport as part of aviation sector reforms.³⁴ The country also has an extensive road network, with over 9,000 land-km³⁵ of roads and expressways. Singapore's Mass Rapid Transit has a network of 200 km and spans

across 130 stations across the country.³⁶ Efforts are also underway to enhance infrastructure of wafer fabrication parks to increase the electronics and semiconductor sectors' attractiveness. Additionally, the upgradation of technological backbone of key infrastructure assets has led to higher efficiency, responsiveness and agility based upon operational challenges.

2.5. Conclusion

Singapore has an established semiconductor manufacturing base owing to the presence of several domestic and international players across the semiconductor value chain and is also among few nations in the world with fab infrastructure and capabilities. Growing demand for 5G-enabled smartphones, advanced devices, autonomous and EVs are expected to boost the country's semiconductor sector. Also, the growing demand for chips in the coming years across 5G, industry 4.0, remote working, low

touch cross border trade and others are expected to place Singapore in a unique position to be the innovation centre for capabilities in the high-tech industry.

The country's commitment to keep supply chains open, offering a conducive business environment and ensuring robust IP regulations would enable semiconductor companies to innovate and produce high-value products and use Singapore as a reliable export hub. However, Singapore is among the most expensive manufacturing locations across the globe and the country's high cost of business and labor is a cause of concern for companies to establish operations. Singapore needs to work on optimizing costs while also enhancing STEM talent to increase the country's attractiveness as a semiconductor manufacturing hub.



Key highlights

- In 2019, Singapore accounted for about 10 per cent of global electronics exports; it occupies a prominent position in global supply of storage/MEMS
- In 1H20, semiconductor and precision engineering sectors recorded a year-on-year growth of 1.7 per cent and 12 per cent, respectively, driven by global demand for semiconductor equipment from manufacturing and technology sectors.
- The country has over 2,900 companies operating in electronics and semiconductor domains housing about 21 wafer fabrication and 12 semiconductor assembly plants. Global companies are collaborating with educational institutions to enhance R&D initiatives and create a robust talent pipeline.
- Singapore government is collaborating with industry players to develop technology roadmaps and trade platforms. It is offering various financial incentives, such as tax exemption, funding support, double taxation relief, reduced tax rates to promote growth of small and medium enterprises, start-ups and promote innovation.
- It is engaged in development of transport infrastructure by investing in modernization and capacity expansion of major sea/airports, railways, and roadways to enhance trade opportunities for wafer fabrication parks and attractiveness of semiconductor manufacturing sector.



34. Three factors that have made Singapore a global logistics hub, The Logistics Academy, accessed as on 8 September 2021

36. Rail Network, Land Transport Authority, accessed as on 8 September 2021

35. Road, Land Transport Authority, accessed as on 8 September 2021

Sunrise sector: EVs



1. Market opportunity

The automotive sector contributes only a small fraction to the total GDP of Singapore, with the bulk of the automotive manufacturing limited to automotive electronics and related components. The country does not host any vehicle production unit and the entire demand is supplied through imports from Japan and Germany.

Despite having the second highest per-capita GDP (by purchasing power parity) globally and a high disposable personal income,

passenger car sales in Singapore have not been at par with the rest of the high-income economies. The country only has about 113.8 passenger cars for every 1,000 people³⁷, which is strikingly low compared to countries with similar prosperity.

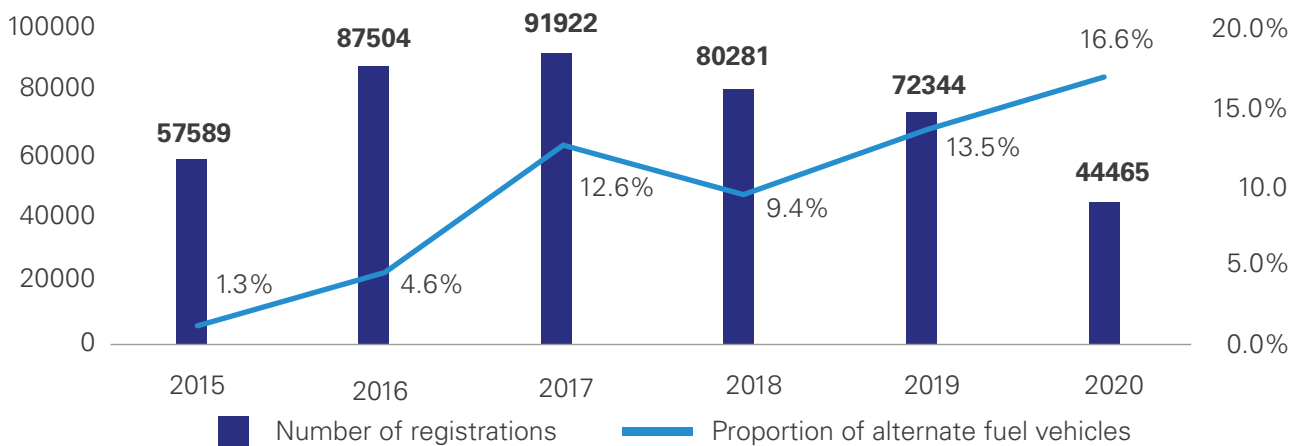
One of the reasons for this trend is the Government's Vehicle Quota System that is aimed at controlling the total number of vehicles on the road and avoiding congestion. Under this scheme, all vehicle

owners must obtain a Certificate of Entitlement (CoE), which is valid for ten years. The government also sets target for the growth in the total number of CoEs that are awarded each year.

1.1. Number of passenger car registrations

The country has seen a sharp decline in the total number of new registrations over the last few years, but a remarkable increase in the proportion of alternative fuel vehicles³⁸.

Number of new passenger car registrations and proportion of alternate fuel vehicles, 2015 - 20



Source: "Statistics", Land Transport Authority – Singapore, accessed on 24 February 2021

The sharp decline in the total number of registrations in 2020 can be attributed to the impact of the COVID-19 pandemic, but the gradual decline since 2017 is a

result of the government's policies, such as the vehicle quota system and the vehicle emission scheme (VES) introduced in July 2018.

37. Industry report – Automotive, Singapore", Economic Intelligence Unit, 3Q20, accessed as on 3 September 2021

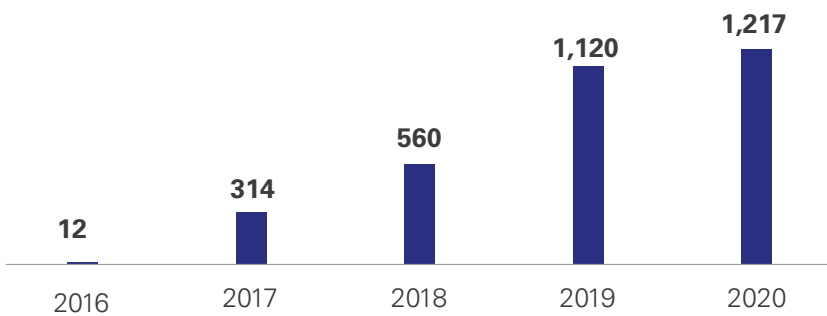
38. "Statistics", Land Transport Authority – Singapore, accessed as on 24 February 2021

1.2. Increase in number of EVs

The number of EVs in the country has risen steadily amidst the decline in the total number of registrations, hinting at a shift in consumer preference. As of 31st December 2020, the city-state had 634,042 cars on road, of which about 1,217 were pure EVs and 42,415 were hybrid electrics,³⁹ with petrol-

electric hybrids accounting for 98.6 per cent of all hybrids. More than 217.0 per cent compounded annual growth rate for EVs in Singapore, can be attributed to the numerous government schemes and national-level initiatives by industry bodies.

Total population of pure EVs, 2016-20



Source: "Vehicle population – by type of fuel used", Land Transport Authority

1.3. Recent investments in the EVs sector

A South Korean carmaker announced⁴⁰ to set up a R&D facility in Singapore, which will also house a small-scale EV production facility. The investment is estimated to be worth USD295 million and will lead to a production capacity of 30,000 EVs by 2025. The plant is expected to be completed by 2022 and will house a test circuit for customers. The investment rationale rests on the fact that electric vehicles require fewer mechanical components and more electronics, which is readily available in Singapore.

However, few manufacturers have also scrapped plans of establishing EV production units citing commercial viability issues. For example, a British household appliances company, which announced to set up a manufacturing unit for EVs in Singapore in October 2018 scrapped the plan a year later redundant as the company decided that the planned product wasn't commercially viable.

39. "Vehicle population – by type of fuel used", Land Transport Authority, accessed as on 8 September 2021

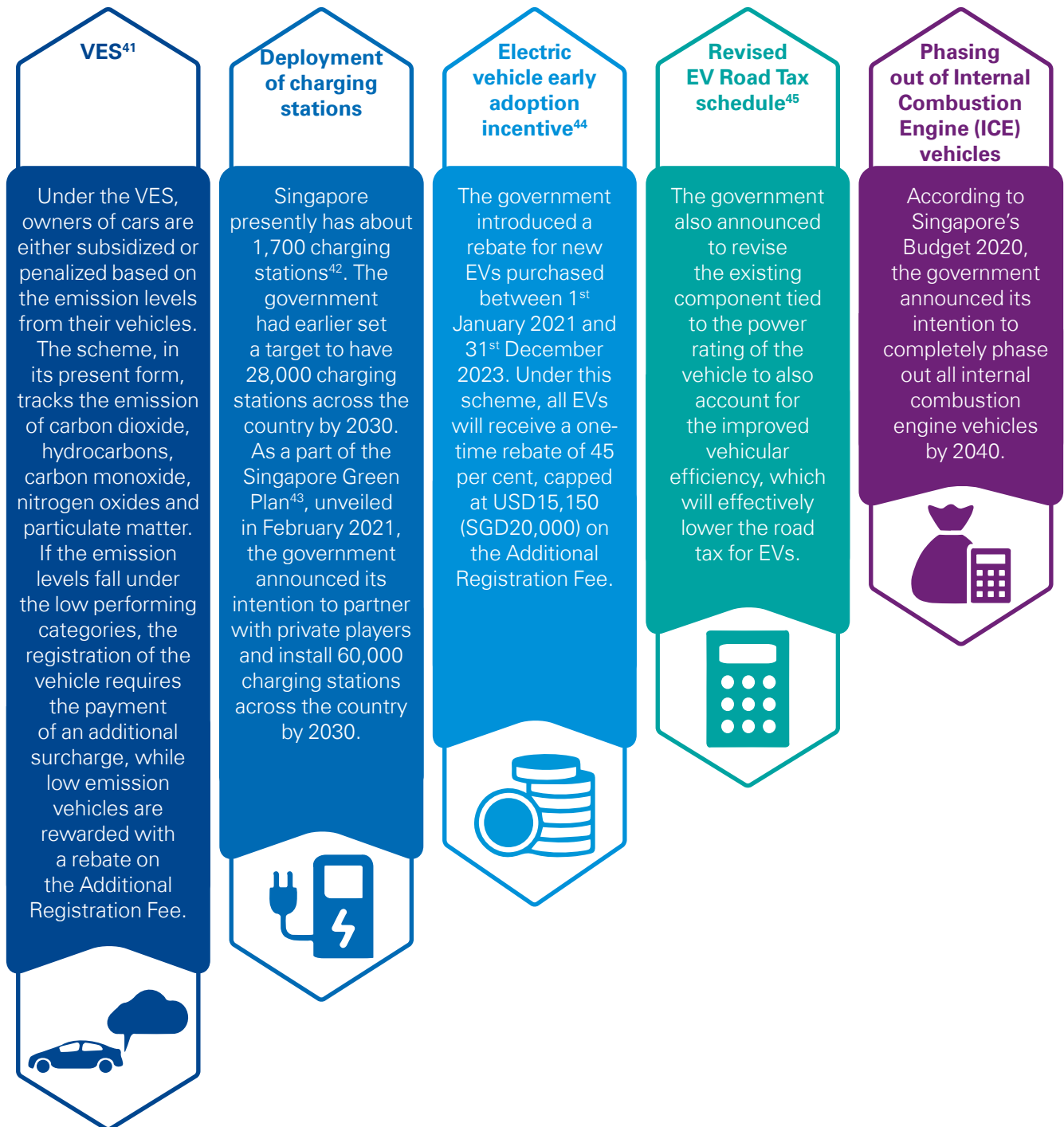
40. "Hyundai begins building electric vehicle hub in Singapore", Reuters, 13 October 2020

2. Sector attractiveness from supply chain realignment perspective

2.1. Government initiatives to boost adoption of EVs

The Government has a dual-pronged approach to boost adoption of EVs – making the EVs more financially attractive compared to other options and combating the major challenges for adoption of EVs such as unavailability of charging stations and congestion.

The major initiatives include:



41. Vehicle emission schemes", One Motoring, accessed as on 8 September 2021

42. "Singapore needs more than the planned 28,000 electric vehicle charging points by 2030", The Strait Times, 14 October 2020

43. "Singapore's electric car charging providers put expansion plans in place amid push from the government", South China Morning Post, 17 February 2021

44. "5 things you may not already know about electric vehicles", DBS, 22 February 2021

45. "Supporting Electric Vehicle Owners in the Transition to the Revised Road Tax Schedule", Land Transport Authority, 5 March 2020

2.2. Trade relations with electric vehicle hotspots

Singapore has FTAs with China, which is the world's largest market for EVs at present and is expected to be the leader at least until 2040, according to Bloomberg⁴⁶. The country also has FTAs with the the U.S., the UK, and the European Union (EU), which are the leaders in adoption of EVs.

2.3. Strong IP rights protection

Singapore has long been considered a leader in IP rights protection and has been ranked third globally in terms of IP protection by the Property Rights Alliance in 2020⁴⁷. The country has also adopted multiple innovations and initiatives⁴⁸ to speed up the processes related to IP rights protection.

- The Intellectual Property Rights Office of Singapore (IPOS) has introduced mobile application-based filing for trademarks, which has reduced the trademark

registration process by about 80.0 per cent.

- Singapore has also entered into a partnership with all ASEAN members, except Myanmar, to expedite the patent application process, for all key emerging technologies related to Industry 4.0 (such as fintech, cybersecurity, robotics, etc.) in the region. This initiative called the ASEAN patent examination co-operation (ASPEC) Acceleration for Industry 4.0 Infrastructure and Manufacturing (ASPEC-AIM) is being run as a pilot project for two years, till 27 August 2021 and is expected to reduce the turnaround time for patent filing to less than six months.
- Other partnerships allow patent applicant in Singapore to use their patent cooperation treaty (PCT) report from ASEAN International Searching Authority (ISA) and the International Preliminary Examination Authority (IPEA) to accelerate their patent application in another ASEAN country.

2.4. Availability of skilled talent

SEA countries experience a shortage of technically skilled workforce, but the government of Singapore has been proactive in addressing the talent crunch through multiple reskilling and skill development programs. Some of the examples include the Global Ready Talent program, which aims to build talent pipeline by exposing nationals to internships and work opportunities overseas, the TechSkills Accelerator (TeSA),⁴⁹ the Professional Conversion programs⁵⁰, and the Tech.Pass Visa Program⁵¹ that allows skilled technology workers from across the globe to work in Singapore.

Singapore also has multiple electronics and semiconductor companies who supply electronic components for automobiles. The workforce presently employed in these roles, can turn out to be an important resource pool for new entrants looking for experienced hires for their electric vehicle operations.



46. "China Set to Dominate Electric Vehicle Battleground For Decades", Bloomberg, 15 May 2019

47. "International Property Rights Index 2020", International Property Rights Index, accessed as on 8 September 2021

48. "Singapore unveils intellectual property initiatives to support Asean Industry 4.0", Business Times, 28 August 2019,

49. "Techskills Accelerator", Skills Future – Government of Singapore, accessed as on 8 September 2021

50. "Professional Conversion Programmes (PCP) for Programme Partners", Workforce Singapore – Government of Singapore, accessed as on 8 September 2021

51. "Tech.Pass", Enterprise Development Board, accessed as on 8 September 2021

2.5. Conclusion

Being a small island nation with a population of less than 6.0 million, Singapore may be a minor market for EVs but can serve as an ideal location for Global EV manufacturers to set up SEA operations as it is located in South East Asia, which is developing as a major manufacturing hub for the world. Further, with the favorable business environment, easy connectivity, large skilled resources, and stable policy environment, EV manufacturers will find it easy to set up and support the SEA markets. In addition, R&D initiatives around prototyping, testing, and launching that require leadership talent, high-end manufacturing equipment and a thriving consumer base willing to adopt the latest technologies will also benefit the industry.

Additionally, the FTAs with all major markets for EVs, including China and the EU, strong IP rights protection, and availability of skilled talent, together with the government's constant push for adoption of EVs make Singapore an attractive location for development of EVs in SEA. However, the key challenge will be to integrate the supplier ecosystem spread across SEA to support the critical components around batteries, motors, and electronic equipment. The country will have to resolve issues with respect to charging points, higher cost of owning EVs, lack of qualified workforce to maintain and repair EVs and installing charging units in housing complexes and condominiums. Considering the barriers, Singapore needs to ramp up its charging

infrastructure and address issues pertaining to traffic congestions, alongside offering attractive incentives to enhance the country's attractiveness as an EV hub. The EVs sector also provides significant opportunity for cross-region collaboration between Singapore, and countries such as Thailand, which have a dominant automobile manufacturing market. Cross-region collaboration would enable the countries to leverage their resources and together enhance the SEA region's attractiveness as a destination for EV manufacturing.

Key highlights

- Automotive demand in Singapore is primarily fulfilled by imports from countries, such as Japan and Germany owing to vehicle ownership regulations and low demand. However, it hosts manufacturing units for automotive electronics and related components owing to high availability of semiconductor and electronic components.
- As of 2020, domestic demand for EVs is on the rise, growing at a CAGR of more than 217 per cent owing to favorable government policies and initiatives by industry bodies.
- Government policies and incentives, such as taxation on vehicle emissions, development of charging infrastructure, rebates on purchase of Electric Vehicles (EVs) and reduced road taxes are expected to drive the demand for EVs in Singapore.
- FTAs with major EV consumer markets, such as the U.S., the UK, China, and EU, high availability of tech talent and favorable IP rights such as fast track patent registration and easy access to ASEAN markets is driving investments in R&D and manufacturing of EVs.



Sunrise sector: Wearable devices



1. Market opportunity

The demand for wearable devices is increasing across the globe and the devices are being designed for multiple applications beyond tracking public health and sport activities. The global market for wearable technology was worth USD27.9 billion in 2020⁵². Smartwatches contribute the largest share of the wearable devices market. However, the increased awareness for health and fitness, as a result of the COVID-19 pandemic is expected to further boost the demand for wearable technologies, with global market expected to reach an estimated valuation of USD74.3 billion⁵² by 2026. Innovative applications, such as contact tracing, health monitoring, etc. and adoption by various governments are expected to be the primary drivers for growth.

Singapore was one of the first countries to introduce a Bluetooth powered wearable device dubbed 'Trace Together' for contact tracing within the city-state, during the COVID-19 pandemic⁵³. The country has also partnered with various wearable device manufacturers^{54 55}, to promote healthy living habits among citizens., which in turn is likely to lead to an addition of over 1.0 million new users for wearable devices in Singapore.

1.1. Market attractiveness for wearable devices in Singapore

According to an estimate by Euromonitor, Singapore had about 385,000 units of wearable devices in 2020, which translates to a 14.0 per cent growth in volume over 2019⁵⁶. The growth is expected to continue till 2025 and reach 734,000 units. The COVID-19 pandemic is expected to accelerate the growth as it has led to a change in preference of consumers, who are spending more time indoors and are feeling a need to track their new lifestyles, activity levels and general health more closely.

Categorized by applications, medical wearables constitute a major segment of wearable electronics market. A recent estimate by Market Data⁵⁷ suggests that the total market for medical wearable devices in the Asia Pacific region is about USD1.1 billion in 2020. The market is estimated to grow at a CAGR of 25.2 per cent and reach a valuation of USD3.3 billion by 2025, driven by continuous improvements in capabilities and addition of new features.

1.2. Recent investments

Health technology startups in Singapore were able to raise funding worth USD105 million⁵⁸ across 21 deals in 2018, according

to data published by the Singapore EDB. About 85.0 per cent of this funding was towards early stage and pre-Stage A financing, while only 3.0 per cent of the funding was directed at Series B financing, indicating the relatively low maturity of the market.



52. Wearable Technology Market - Growth, Trends, Covid-19 Impact, And Forecasts (2021 - 2026), Mordor Intelligence, accessed on 3 September 2020

53. "TraceTogether: Singapore turns to wearable contact-tracing Covid tech", BBC, 5 July 2020

54. "Apple and Singapore will reward Apple Watch owners for healthy activity", CNBC, 15 September 2020

55. "Fitbit Scores Major Deal With Singapore", Motley Fool, 21 August 2019

56. "Wearable Electronics in Singapore", Euromonitor International, 31 October 2020

57. "APAC Wearable Medical Devices Market", Market Data Forecast, 26 February 2020

58. "Singapore healthtech startups attract USD105m in 2018", The Business Times, 26 August 2019

2. Sector attractiveness from supply chain realignment perspective

2.1 Government support

The Health Sciences Authority (HSA) is the regulatory authority for all medical devices, including wearables, telehealth products, and software medical devices. All devices with a lower risk rating (Class A) need to notify the HSA, while others need to be registered with the HSA. In order to boost the market for medical wearable devices, the government of Singapore has taken multiple initiatives to ease the process of registration and commercialization in the city-state.



Regulatory guidelines for telehealth products⁵⁹:

The government published a set of guidelines in 2017 to help manufacturers, developers and importers of a digital health device determine if their device, software, or application are regulated medical devices under the HSA, and relevant regulatory requirements.



Immediate registration pathway for standalone software and mobile applications:

In 2018, the government implemented an updated registration pathway that allows for immediate market access upon successful product registration, while processes related to safety and quality are reviewed later.



Device development consultation scheme:

In order to expedite the process of device registration, the HSA provides consulting services to researchers, developers, and manufacturers. Under its Pre-market Consultation (PMC) scheme, applicants can consult HSA on regulatory requirements during development and receive feedback on their submissions (documents) before final submission.



Regulatory guidelines for software medical devices:

Singapore recently published a guidance in April 2020, aimed at mitigating digital threats, such as cybersecurity, data integrity, and data security for medical wearable devices throughout the product life cycle.

Source: Digital health, Health Sciences Authority, accessed as on 8 September 2021

2.2. Trade relations with rest of the world

Singapore is a signatory to more than 25 FTAs, which provides it access to multiple developed and developing markets, including the the U.S., EU, ASEAN nations, India, and China. The country also provides multiple tax incentives, making it a favorable geography for setting up manufacturing facilities.

2.3. Conclusion

Singapore, being one of the most diverse electronics hubs in SEA, has a strong presence of electronics companies. The country also has great trade relations with China, the largest wearable devices market in Asia and other hotspots in SEA. With its added advantage as a strategic port and availability of talent pool, Singapore can prove to be an attractive geography for manufacturing wearables.

⁵⁹ "Digital health", Health Sciences Authority, accessed as on 8 September 2021



Key highlights

- In 2020, demand for wearable devices in Singapore registered a year-on-year growth (by volume) of about 14 per cent owing to changes in consumer preferences and government initiatives, such as contact tracing devices. The industry is expected to demonstrate continued growth in demand and reach 0.8 million units by 2025.
- Government of Singapore is focused on developing regulatory guidelines for telehealth and software based medical devices, easing registration policies, and providing device development consultation to boost market for medical devices and wearables.
- Easy funding availability for Health tech start-ups and favorable trade policies, such as FTAs are expected to drive growth in the wearable devices manufacturing and development in Singapore.









06

The Taiwan Advantage






Territory landscape¹

Macroeconomic indicators

Population  23.5 million	GDP  USD668.5 billion	GDP growth  3.1% (2020) 4.7% (2021F)	GDP per capita  USD28,310	GDP by sector  Services- 60.4% Industry- 37.9% Agriculture- 1.7%	Inflation  -0.23%
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All values are estimates for 2020, unless specified otherwise

Territory attractiveness

International Hub  2 Major International Airports & 7 international hubs	Highly Skilled labor  More than 52.8% population holds a University Degree	Key countries  Japan, UK, EU, and the U.S.	Key Sectors  Electronics Industry Energy, Finance, and Professional & Technical Services	M&A value  USD393 million (↑ 16.3%)
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All values are actuals for 2020, unless specified otherwise

1. Taiwan country data: International Monetary Fund; Invest Taiwan; Economist Intelligence Unit; Investment Commission, MOEA; Ministry of Transportation and Communications, accessed as on 31 March 2021

Taiwan- business environment

Located along the South China Sea off the south-eastern coast of China, Taiwan is one of the most industrialized economies in East Asia. The territory's Industrialization was initially driven by textile, footwear, athletic equipment, and small appliances manufacturing. However, now companies have transitioned to the manufacturing of semiconductors and electronic equipment, such as radios, television, and computers.

Taiwan has a capitalist economy that is predominantly driven by industrial manufacturing and exports of electronics, machinery, and petrochemicals. Since the 1980s, Taiwan is among the leading producers of computers and computer peripherals. Taiwan is also home to the world's largest manufacturers of semiconductors, including many small and medium sized enterprises manufacturing information- and communication-technology products.

The territory acts as a gateway between Europe, America, Japan, and the economies of Australasia and is the first choice for numerous multi-national company headquarters. As a member of international organizations, such as the WTO, and the Asia Pacific Economic Cooperation (APEC), Taiwan freely engages in economic activities.

Taiwan is an export-oriented nation with exports contributing to about 74.1 per cent of the GDP in 2020.² The territory's trade dependency ratio has been over 100 per cent for many years with the figure for 2020 being 134.2 per cent.²

As a testament to its conducive business environment, Taiwan was named as the third best in the world³ for "State of Cluster Development". The presence of sound industrial supply chains that can be customized according to client needs, makes Taiwan an attractive market for setting up businesses. Furthermore, developed industrial clusters have helped Taiwan to become the world's second-largest information⁴ hardware producer. Taiwan leads the world in the semiconductor foundry industry, and semiconductor packaging and testing industry. IC design and Personal Computer (PC) components manufacturing in the territory also dominates the world at second and third positions, respectively.

Taiwan is ranked third in overall investment environment according to a report published by the Business Environment Risk Intelligence (BERI)⁵. Taiwan is also among the leading countries in Asia in terms of ESG disclosure and has been ranked fourth⁶ among 12 nations surveyed in the Asian Corporate Governance Association's CG Watch 2020, a biennial investigation and rating survey on corporate governance performances in the Asian markets. In August 2020, the territory launched the Corporate Governance 3.0 - Sustainable Development Roadmap to build a robust corporate governance ecosystem and enhance corporates' resilience with respect to ESG risks and align with international trends and norms. Taiwan's location

advantage, availability of skilled labor, investment, and trade friendly policies makes it one of the most favorable countries for doing business in the Asia Pacific region.

Doing business rankings 2020⁷

Taiwan is ranked 15th globally as per the World Bank's Doing Business Report, owing to the favorable business environments, making it one of the most attractive destinations for the companies. The key performance indicators and global ranks for the 10 primary sub-categories are highlighted below:⁸



2. Country profile, Taiwan, EIU, accessed as on 8 September 2021

3. The World Economic Forum's 2019 Global Competitiveness Report, accessed as on 3 September 2021

4. Taiwan, HLB Global, accessed as on 3 September 2021

5. Report on the Evaluation of Environmental Risks of Investment for 2020, Business Environment Risk Intelligence (BERI), accessed as on 31 March 2021

6. ACGA released its preview of "CG Watch 2020" Taiwan cumulative effort has been recognized by ACGA, Financial Supervisory Commission, 25 November 2020

7. Taiwan, Doing Business 2020, World Bank, accessed as on 3 September 2021

8. Taiwan- Ease of Doing Business Ranking 2020", Doing Business, accessed as on 3 September 2021

Parameter	Sub parameter	Indicator	Value
1. Starting a business		Rank	21
	Procedures	Number	3
	Time	Days	10
2. Dealing with construction permits		Rank	6
	Procedures	Number	10
	Time	Days	82
3. Getting electricity		Rank	9
	Procedures	Number	3
	Time	Days	22
4. Registering property		Rank	20
	Procedures	Number	3
	Time	Days	4
5. Protecting minority investors		Rank	21
6. Paying taxes		Rank	39
	Payments	Number per year	11
	Time	Hours per year	221
7. Enforcing contracts		Rank	11
	Time	Days	510
8. Resolving insolvency		Rank	22
	Time	Years	1.8

Source: Taiwan, Doing Business 2020, World Bank

The territory has undertaken multiple initiatives to ease the process of starting a business, dealing with construction permits, getting electricity, and enforcing contracts. Taiwan has a comprehensive legislative procedure and processes, including border compliance for exports, imports and paying taxes. For instance, the establishment of Taiwan Free Trade Zone has propelled the competitiveness of Taiwan's economy by reducing operating costs and improving efficiency of the transportation and manufacturing of goods in and out of Taiwan.

Cost of manufacturing

Manufacturing is one of the most important and prominent sectors in Taiwan and serves as the backbone of the territory's economy. The government incentives and investments, availability of skilled labor, well developed infrastructure, and connectivity have promoted the growth of key manufacturing industries in Taiwan.

In particular, for the strengthening of Taiwan's skilled labor market, the government has been strengthening the means of cultivating bilingual and cross-domain professional talents. Through encouraging collaboration between industry and academia for the R&D of key components, materials, and technologies, the government is actively promoting the transformation of manufacturing into high-end manufacturing.

Despite being a small economy, Taiwan houses some of the

largest manufacturing companies in the world especially in the semiconductor sector. In 2019, the total manufacturing industrial output was estimated to be USD371.4 billion. The manufacturing industry in Taiwan is also expected to grow in double-digits till 2024, including a significant number of sectors achieving over 20 per cent growth.⁹

The growth in the manufacturing sector can be attributed to the

government incentives and business friendly policies (such as the five plus two industry innovation plan, which aims to shift the territory's dependency on contract manufacturing and enable it to adopt more advanced and service-related business models). The production of electronics, smart machinery, IoT devices, and green energy products is more advantageous in Taiwan mainly due to the government incentives provided for these key sectors.^{10,11,12,13}

Parameter	Value
Average manufacturing labor cost	USD3.85 per hour
Average office rental price (2020)	USD2.57 per sq. ft
Average electricity cost	USD0.137 per kWh
CIT	20 per cent

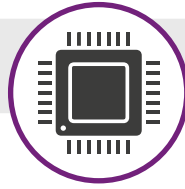
Source: Taiwan electricity prices, Global Petrol Prices, 31 December 2021; Corporate Tax Rates Table, KPMG, accessed as on 3 September 2021; Hourly Rate for Industry in Taiwan: Manufacturing, PayScale, accessed as on 31 March 2021; Taipei Office Q4 2020, Cushman Wakefield, accessed as on 3 September 2021



9. Manufacturing Industry Output Case study, Interact Analysis, 21 September 2020
 10. Taiwan electricity prices, Global Petrol Prices, 31 December 2021
 11. Corporate Tax Rates Table, KPMG, accessed as on 3 September 2021

12. Hourly Rate for Industry in Taiwan: Manufacturing, PayScale, accessed as on 31 March 2021
 13. Taipei Office Q4 2020, Cushman Wakefield, accessed as on 3 September 2021

Dominant sector: Semiconductor manufacturing



1. Market opportunity

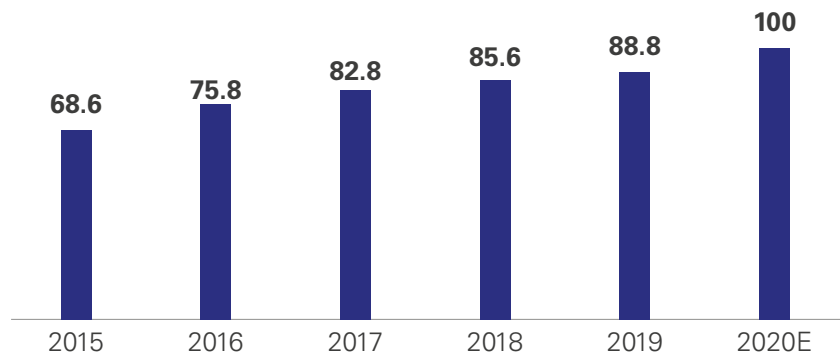
1.1. Overview of semiconductor industry

The semiconductor industry in Taiwan is composed of operators involved in IC design, manufacturing (foundry, memory, and other manufacturing), packaging and testing activities. The industry contributed 15 per cent¹⁴ to the territory's total GDP in 2020 and ranks first in the world in terms of market share in the foundry as well as packaging and testing industry.¹⁵

Taiwan's leading position in the semiconductor industry can be attributed to the presence of global companies, government support initiatives, such as funding and tax benefits, and development in public infrastructure with investments in major science and industrial parks.

The industry is characterized by clustering and vertical integration, with the territory's unique production model providing advantages, such as low costs, flexibility, and customized service. The foundry industry accounts for 49 per cent, IC design industry accounts for 26 per cent, the IC packaging and testing industry accounts for 19 per cent, and the memory industry accounts for 6 per cent of the entire industry.¹⁵ With a global market share of more than 70 per cent, the foundry sector has provided Taiwan with a leading position in the global semiconductor industry.¹⁵

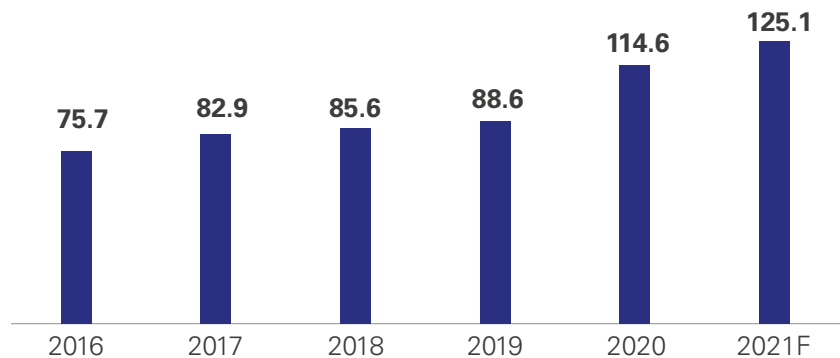
Output value of semiconductor industry (USD billion)



Source: Overview on Taiwan Semiconductor Industry, TSIA, accessed as on 8 September 2021

As per a forecast by the MOEA, the production value is expected to reach USD178 billion by 2030¹⁶.

IC industry revenue (USD billion)



Note: Revenue includes design, manufacturing, packaging, and testing

Source: Overview on Taiwan Semiconductor Industry, TSIA, accessed as on 8 September 2021

Driven by strong demand, the IC revenue reached USD114.6¹⁷ billion in 2020, with an expected growth of 10.9 per cent to reach USD125.1¹⁸ billion in 2021.

14. Taiwan prosecutes semiconductor recruiters accused of illegally poaching talent for Chinese company, SCMP, 10 March 2021

15. Key Innovative Industries in Taiwan: Semiconductor industry, Invest Taiwan, accessed as on 8 September 2021

16. Taiwan invests big to create semiconductor hub, Taiwan News, 3 July 2020

17. Overview on Taiwan Semiconductor Industry, TSIA, accessed as on 8 September 2021

18. SIA Q4 2020 and Year 2020 Statistics on Taiwan IC Industry, TSIA, 1 February 2021

1.2. Semiconductor clusters¹⁹

As of 2020, there were 290 semiconductor companies operating in Taiwan, employing 230,000 people.¹⁹ Most of the companies were located in Taoyuan and the Hsinchu Science Park. There were eight clusters in operation while six are in

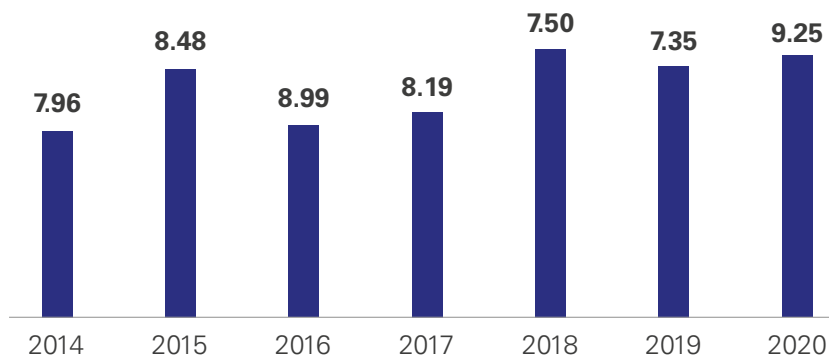
the developmental or planning phases¹⁹. With an aim to spread the risk from natural disasters, new production capacity has been developed in science parks in southern and central Taiwan, while testing and packaging companies are concentrated in Kaohsiung.

Semiconductor clusters in operation

Longtan Science Park
Hsinchu Science Park
Chunan Science Park
Houli Science Park
Taichung Science Park
Huwei Area
Tainan Area
Kaohsiung Area

1.3. Export and import

Export and import value of IC, USD billion



Source: Statistics on Taiwan IC Industry, TSIA

In 2020, Taiwan imported mostly from China followed by South Korea, Japan, Malaysia, and the U.S. Exports are primarily being driven by growing demand for microchips and hi-tech gadgets owing to rise in demand for tech

products to support remote working amid the pandemic. The government expects exports to grow 9.6 per cent in 2021, owing to increased demand for the territory's semiconductors.²⁰

19. Key Innovative Industries in Taiwan: Semiconductor industry, Invest Taiwan, accessed as on 8 September 2021

20. Taiwan's Exports Up for Ninth Straight Month on Chip Demand, Bloomberg, 9 March 2021



2. Sector attractiveness from supply chain realignment perspective

2.1. Government support and incentives

The government of Taiwan continues to focus on bolstering the territory's domestic manufacturing footprint by understanding and addressing issues faced by semiconductor companies, leveraging AI and other new-age technologies to improve capabilities, and optimizing the use of power, water, and manpower. It also continues to offer several tax benefits and subsidies on investments, R&D, import and export of semiconductor technology, and equipment, and hiring of foreign technological specialists.

- **Introduction of new initiatives²¹:** The government of Taiwan has undertaken various measures to bolster its AI-powered semiconductor production capabilities, thereby aiding the territory's position as a global hub and supplier of Edge

AI talent and critical components by 2022.

- It launched the Chip Design and Semiconductor Technology Development and Application Plan in 2018 to develop an integrated industry chain for IoT and AI, including chips, to catapult R&D for the semiconductor industry.
- The Ministry of Science and Technology formulated the AI promotion strategy in 2017. A key initiative was the launch of the Semiconductor Moon Shot Project, calling for integrating R&D into Edge AI production processes and chip systems for developing AIoT (AI + IoT) applications.
- It has also encouraged foreign companies to create industrial-academia cooperative programs with local universities on AI-related semiconductor production

processes, chip designs, technology R&D, or talent development.

- **Tax incentives²²:** To promote investments in the technology sector, the government offers several tax incentives and exemptions. The main incentives are provided under Statute for Industrial Innovation (SII). The SII is enacted for the furtherance of industrial innovation, improvement of industrial environment, and enhancement of industrial competitiveness. The term "industries" as used in the SII refers to agricultural, industrial, and service businesses.²³ The R&D tax credit provided under SII that was originally set to expire on 31 December 2019, has been extended for another 10 years till 31 December 2029. These include:

Parameter	Value
R&D incentives²³ for qualifying R&D expenditure	<ul style="list-style-type: none"> • Under SII, investment tax credit up to 15 per cent of eligible R&D expenditures is available against their current year's CIT or up to 10 per cent of eligible R&D expenditures against its CIT payable over three years • The amount of tax credit is limited to 30 per cent of the current or each year's CIT³
IP incentives for qualifying R&D expenses of self-developed IP	<ul style="list-style-type: none"> • Under SII, the eligible entities could alternatively elect to deduct up to 200 per cent of its R&D expenditures against their current year's taxable income, capped at corresponding income received from assignment or licensing of own-developed IP rights²³ • Deferred recognition of income tax for a company that assigns or licenses IP rights that were researched and developed internally to Taiwanese companies for their own use. New shares acquired as the consideration may opt to exclude from taxable income in the year such shares are acquired
Investment in 5G and smart machinery	<ul style="list-style-type: none"> • Under SII scheme, tax credits of up to 3per cent or 5per cent of expenditures on qualified investments in smart machines and the 5G network²³

21. Key Innovative Industries in Taiwan: Semiconductor industry, Invest Taiwan, accessed as on 8 September 2021

22. Semiconductors, Invest Taiwan, accessed as on 8 September 2021

23. Statute of Industrial Innovation, Ministry of Economic Affairs, amended in 2019, accessed as on 15 March 2021

Parameter	Value
Incentives for investment in buildings, hardware and software or technologies²⁴	<ul style="list-style-type: none"> Investment in buildings, hardware and software or technologies using prior year's undistributed earnings: Surtax may be reduced if qualified investments in construction or acquisition of buildings, hardware and software or technologies that are used by companies for their business operations and productions are made by using the prior year's undistributed earnings;²⁴
Import duty exemption	<ul style="list-style-type: none"> Companies that move into export processing zones, science industrial parks and free trade zones are exempted from import tariffs on machinery and equipment, raw materials, fuel, supplies, and semi-finished products Zero business tax rate for exporters of goods and labor services
Foreign special professionals²⁵	<ul style="list-style-type: none"> Foreign special professionals who meet criteria are eligible for a 50 per cent deduction of total income tax for amounts exceeding NTD3 million

Source: Statute of Industrial Innovation, Ministry of Economic Affairs, amended in 2019, accessed as on 15 March 2021; Invest Taiwan, Key Industries 2020, Semiconductor Industry 2020, accessed as on 3 September 2021

- Subsidies²⁵:** Subject to approval of the MOEA, the government also offers various subsidies to semiconductor (and other technology) companies, using the following initiatives:

Initiative	Description
Global R&D innovation partner program	<ul style="list-style-type: none"> Encourage foreign companies to invest in R&D and innovation in Taiwan by providing subsidies up to 50 per cent of the total R&D spend, especially on technologies that are not mature in Taiwan or have potential to help Taiwan produce leading technologies
Integrated R&D program	<ul style="list-style-type: none"> Subsidies ranging from 40-50 per cent of total project funding, especially for engaging in key and common technology R&D, vertical or horizontal technology integration, and creation of an industrial value chain
Taiwan industry innovation platform program	<ul style="list-style-type: none"> Joint initiative by the MOEA's Industrial Development Bureau and the Ministry of Science and Technology to offer subsidies worth 40-50 per cent of theme-based R&D projects on developing towards greater value and encouraging companies to enter high-end product application markets

Source: Statute of Industrial Innovation, Ministry of Economic Affairs, amended in 2019, accessed as on 15 March 2021; Invest Taiwan, Key Industries 2020, Semiconductor Industry 2020, accessed as on 3 September 2021

Other focus areas: The central and state governments are also focusing on optimizing the investment environment for semiconductor businesses in terms of talent, manpower, water, electricity, and land.

24. Statute of Industrial Innovation, Ministry of Economic Affairs, amended in 2019, accessed as on 15 March 2021

25. Invest Taiwan, Key Industries 2020, Semiconductor Industry 2020, accessed as on 3 September 2021



2.2. Talent development programs

The government has prioritized talent development in the sector, with plans to launch new policies to help recruit sufficient workforce. By 3Q21, the economics, education, and technology ministries aim to introduce programs to help academic institutions produce 10,000²⁶ engineers for the semiconductor industry every year. As of November 2020, the government announced plans to invest ~USD53 million over the next five years to build the workforce needed for future semiconductor industry R&D.²⁷

The Executive Yuan announced three key talent development strategies – promoting cooperation between the industry and academia, enhancing the capabilities for talent development

in higher education institutions, and encouraging companies to increase funding and strengthen recruitment efforts for semiconductor talent development.

2.3. Infrastructure

Over the years, Taiwan has built a robust infrastructure to dominate the global semiconductor market. A major impetus to this industry has been government developing major science and industrial parks, stimulating R&D-related activities, and providing tax incentives and subsidies on the investment, import and production of relevant equipment and technologies.²⁸

Its focus on improving its R&D capabilities is evident from the National Nano Device Lab (NDL), Chip Implementation Centre (CIC), and Taiwan Semiconductor Research Institute (TSRI) annually

undertaking 400 research projects, training more than 9,000 graduate students in IC design and 5,000 in semiconductor fabrication, and facilitating the development of more than 1,800 chips and system prototypes between 2010 and 2020.²⁹

In 2021, the government plans to spend a record USD21 billion to improve public infrastructure, especially its water and supply systems, coupled with the development of Taoyuan Aerotropolis, a large transportation, logistics, industrial and residential complex adjacent to the Taiwan Taoyuan International Airport. This is likely to aid domestic semiconductor companies to address the global shortage of chips and maintain its global presence in the long run.³⁰

26. Taiwan to launch programs to expand semiconductor workforce, ITA, 19 April 2021

27. SEMI Taiwan Talent and Public Policy Initiatives One Key to Industry Growth, SEMI, 30 November 2020

28. Semiconductors helped make Taiwan Asia's top-performing economy in 2020, Quartz, 3 February 2021

29. 'Industry-academia collaboration behind Taiwan's chip manufacturing success', AA, 19 March 2021

30. Taiwan puts forth NTD608 billion infrastructure plan to boost economy, Focus Taiwan, 23 March 2021

2.4. R&D and innovation

The Taiwanese government provides various incentives and grants to support R&D in the semiconductor industry and encourage foreign investment, industrial innovation, and collaboration between industry and academia. Through continuous improvement of advanced manufacturing processes and high yield rates, Taiwan's semiconductor industry is a representative case of applied R&D. Where through applied R&D, Taiwan is progressing towards becoming an advanced manufacturing process centre.

With government cooperation, Taiwanese companies are advancing high-end manufacturing in the information and

communication technology industry. For example, in the development of the information and digital industry, the three major strategies proposed include promoting the next generation of technologies in R&D, strengthening the robustness of the supply chain framework, and expanding the field of digitalization.

2.5. Conclusion

With the presence of global leaders, the industry has shifted its focus from capacity to quality, as companies are now providing hardware and software integration, along with a powerful ecosystem. With efforts from the government as well as operators for the development of the semiconductor industry and related emerging

industries, such as big data, AI, autonomous vehicles, and cloud computing, the industry is likely to witness further growth and retain a leading position in the global semiconductor industry.

Furthermore, under the semiconductor industry and the 5G industry's dual-sourcing supply chain from the U.S. and China, Taiwan's semiconductor industry holds an important position in downstream IC packaging and testing in the global supply chain. Since R&D capabilities are primarily located in Taiwan, this enables Taiwan's semiconductor industry to have room for survival under the dual supply chain.

Key highlights

- IC design, manufacturing (foundry and memory), packaging and testing are prominent domains of semiconductor manufacturing industry in Taiwan. It represents maximum market share (globally) of more than 70 per cent in foundry, packaging, and testing domains.
- As of 2020, the territory has eight semiconductor manufacturing clusters in operation and six are in development phase. There are about 290 semiconductor companies in Taiwan operating majorly from Taoyuan and Hsinchu Science parks.
- Taiwanese government is focused on promoting initiatives, such as chip design and semiconductor technology development and application plan and industry-academia tie ups to leverage technologies, such as AI, IoT and enhance R&D efforts to promote domestic semiconductor manufacturing industry.
- Government is offering various financial incentives, such as tax credits for R&D investments, and equipment upgrades, and exemptions on import duty and services obtained from foreign specialists to promote investments in R&D and expansion of semiconductor manufacturing projects.
- R&D focus of government bodies, such as NDL, CIC, and TSRI have facilitated development of more than 1,800 chips and system prototypes since 2010.



Sunrise sector: Network communication and telecom products



1. Market opportunity

1.1. Network communication

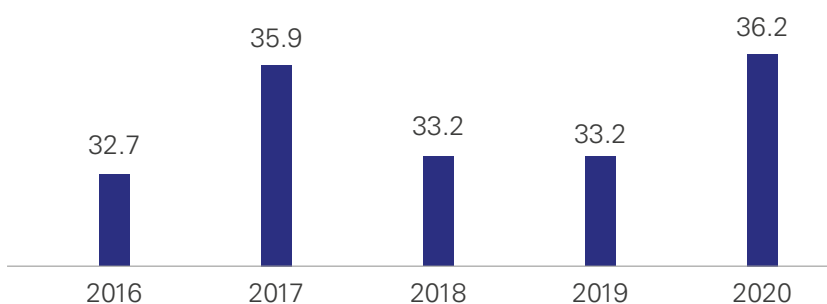
Rapid development in communication technologies over the last few years has established communication industry as the backbone of the digital economy in Taiwan. The industry now plays a vital role in the development of other sectors (such as telecom, electronics, and others) and the overall economy. Major electronics manufacturers have increasingly emphasized cross-domain applications in network communications and have shown trends in carrying out diversified operations in the communications industry.

The territory is home to several network and communication companies and most of them are involved in the development of smart home products. Further, networking and communication

companies specialize in hardware and software services of satellite, fibre, wireless networking, and telecommunication. Most companies are involved in providing set-top boxes, mobile phones, routers, base stations and IP telecom systems to telecoms, multiple service providers (MSOs) and internet service providers (ISPs).

In terms of the communication equipment industry, including network communication equipment and personal mobile devices, the output value of the communication equipment is increasing. Factors, such as high demand from IoT, cloud applications, and emerging technologies, such as AI, 5G, and Edge computing are increasing³¹.

Production value of communication industry, (USD billion), 2016–2020



Source: Communications Industry, Invest in Taiwan, accessed as on 3 September 2021

Note: The production value of the industry includes network communication equipment and personal mobile devices. Also, the values for 2020 are forecasted values as the report was published in Sep 2020.



31. Communications Industry, Invest in Taiwan, accessed as on 3 September 2021

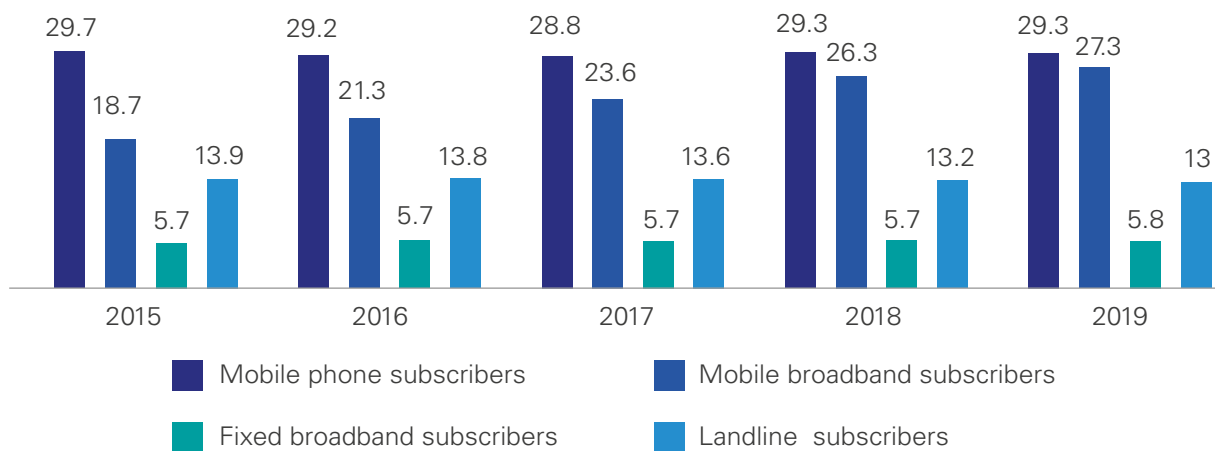
1.2. Telecommunications³²

The telecom industry in Taiwan is emerging to be an essential market for the growth of the economy. Factors, such as developed infrastructure and regulatory certainty are attracting the interests of investors. The Ministry of transportation and communication segregates the telecom companies into two types namely, Type I and Type II.

- **Type I:** Includes the companies that own the telecommunication equipment for its activities
- **Type II:** Refers to entities that rent equipment from other companies to provide value-added services as they do not have their own telecom equipment. There exist about 458³³ companies that provide Type II telecom services

In terms of the fixed broadband market, the territory has in place various technology platforms, such as Digital subscriber line (DSL), fibre, Hybrid fiber-coaxial (HFC), leased lines, and wireless. Among these, fibre is becoming increasingly popular as most of the DSL subscribers are adopting fibre services.

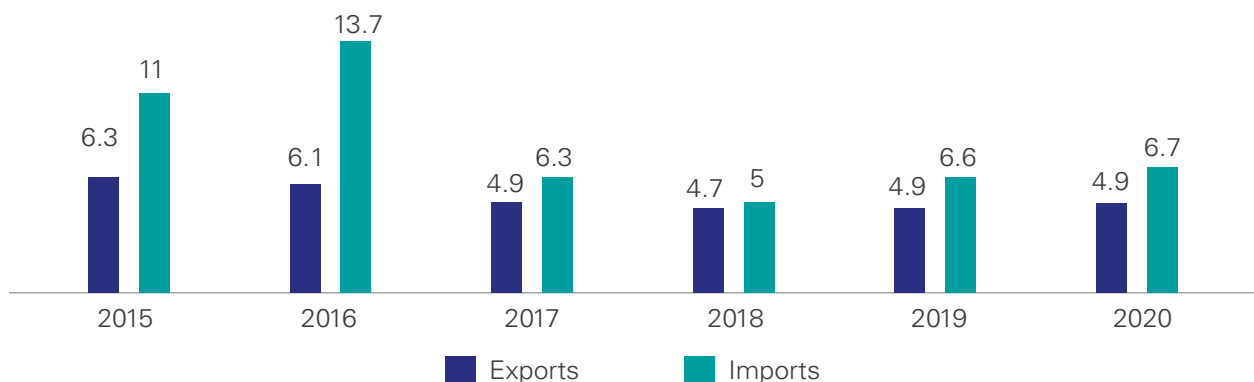
Snapshot of telecom subscribers, (million), 2015–2019



Source: Statistics, National Communications Commission

Further, in terms of manufacturing of components, the territory still holds a prominent position in manufacturing components, such as smartphone chips. Many leading foreign smartphone companies are dependent on Taiwanese suppliers for various components and most importantly, for smartphone chips. One of the biggest chip manufacturing companies in the world is situated in Taiwan and it produces smart phone chips for nearly all the major smartphone brands. Further, to maintain its dominant position, the manufacturers have also started producing chips for 5G smartphones³⁴.

Export and import of telecom equipment, (USD billion), 2015–2020



Source: Statistics, National Communications Commission

32. 2019 NCC performance report, National communications report, 27 September 2019
33. Telecommunication Expenses, Invest Taiwan, accessed as on 3 September 2021

34. Taiwan Imports: Telecommunication Equipment, CEIC data, accessed as on 3 September 2021

1.3. 5G

In 2020, 5G networks were rolled out in Taiwan after securing bids worth USD4.6 billion in the auction ended on January 2020. In the auction, five telecom operators were able to secure spectrum in the 3.5GHz band. The unit price per 10MHz bandwidth touched nearly USD0.18 billion (TWD5.1 billion) – making it the most expensive 5G bandwidth in the world.

Going forward, the latest technology is expected to be a game changer for enhancing the digital infrastructure of the territory. Mainly due to the fact that to drive 5G adoption, significant efforts would be needed to boost digital infrastructure, develop mobile phones compatible with 5G and create a conducive environment for innovating 5G applications. In this line, the government and telecom operators have announced several initiatives, such as:

- The government has announced to invest USD554.5 million³⁵ to expedite the roll out of 5G networks
- The National Communications Commission (NCC) has

established a target of setting up 39,000 base-stations³⁵ over the next two and half years. Whereas, the five telecom operators have planned to develop 16,000 5G base-stations³⁵ over the next five years.

- The government aims to increase the penetration of 5G from the current 50 per cent to 85 per cent³⁵ of the population by 2026.

Under Taiwan's present manufacturing capabilities in 5G hardware terminal devices, the territory will continue strengthening

the establishment of its comprehensive communication equipment supply chain. When following the maturity of the global 5G technology and standards, Taiwan can seize substantial business opportunities.

1.4. Key industrial zones

Taiwan is home to various telecom and communication companies, including equipment manufacturers, equipment branding companies and telecom operators. Key industrial clusters for telecom and communication companies are northern Taiwan, and central, and southern Taiwan.

Northern Taiwan: Areas, such as Greater Taipei, Taoyuan and Hsinchu are key regions for telecom and communication companies.

The region has in place various technology parks, such as Neihu Technology Park, Hsinchu Science and technology Park, Tai Yuen Hi-Tech Industrial Park, and telecom technology centre, which provide the required R&D facilities for the companies.

Central and southern Taiwan:

Communication companies mainly engaged in manufacturing consumer electronics are located. Manufacturers located in this region have access to Kaohsiung Software Technological Park and Southern Taiwan Science Park, which provide the requisite research support to the companies situated in this region.



35. Taiwan govt preps \$555M war chest to speed 5G rollout, Light reading, 21 January 2021

2. Sector attractiveness from supply chain realignment perspective^{36 37 38 39}

90 per cent internet penetration and 21.5 million internet users as of January 2021



286 broadband subscribers per 1,000 inhabitants as of 2019



54.6 fixed telephone subscriptions per 100 inhabitants as of 2019



24.5 fixed broadband subscriptions per 100 inhabitants as of 2019



123.2 mobile cellular subscriptions per 100 inhabitants as of 2019



USD361.9 million approved overseas Chinese and foreign investment in information and communication industry as of 2020



More than one million 5G subscribers since the launch of 5G



2.1 Government support and incentives

To boost investment in the telecom and communications industry, the Taiwanese government has introduced multiple incentives. In addition to the tax incentive according to SII, the government also provided the following incentives:

Parameter	Incentive
R&D incentives for qualifying R&D expenditure of eligible private institution participating in a major infrastructure project	<ul style="list-style-type: none"> Under the Act for Promotion of Private Participation in Infrastructure Projects (PPIPs), if the total R&D expenditure invested by an eligible private institution participating in a major infrastructure project in the same taxable year exceeds NT\$1.5million, or exceeds 2 per cent of its net business revenue, it may credit up to 20 per cent of eligible R&D expenditures. The amount of the tax credit is limited to 50 per cent of the current year's CIT. Any unused tax credit can be carried forward for a period of four years. The 50 per cent tax credit limitation shall not apply to the amount to be off-set in the last year of the aforementioned four years period.⁴⁰
Subsidy schemes	<ul style="list-style-type: none"> NCC provides subsidies of up to 49 per cent⁴¹ of a project's budget for deploying infrastructure for telecom services.

Source: Act for Promotion of Private Participation in Infrastructure Projects, Ministry of Finance, accessed as on 8 September 2021; 2019 NCC performance report, NCC, accessed as on 8 September 2021

In 2020, the government enforced the Telecommunications Management Act (TMA), which aims to liberalize the communications sector, attract new players and increase investments in the sector. Some of the policies introduced under the act include:

- Telecom operators (except the ones that require radio frequencies or telecom numbers by the NCC) are not required to be mandatorily registered with the NCC. Thus, easing the entry of new entrants in the industry
- Companies are allowed to establish their own telecom network without the need of an approval from the NCC
- The NCC can now establish spectrum sharing mechanism or reserve licence exempt spectrums (in advance) to meet the need for innovative technologies and services

36. Digital 2021: Taiwan, Datareportal, 11 February 2021

37. Telecommunications indicators in Taiwan, 2016-2019, NCC, accessed as on 8 September 2021

38. Monthly report, MOEAIC, 31 March 2021

39. Taiwan has over 1M 5G subscribers since July 2020 5G service launch, Tech blog, 15 December 2020

40. Act for Promotion of Private Participation in Infrastructure Projects, Ministry of Finance, accessed as on 8 September 2021

41. 2019 NCC performance report, NCC, accessed as on 8 September 2021

2.2 Infrastructure

In addition to its strategically superior position and developed logistics and transportation services, the territory has access to robust infrastructure and highly integrated industrial supply chain. The government has also significantly focused on establishing commercial and industrial zones in the territory. For instance, Taiwan has about 174 industrial parks, 10 exporting zones and seven free trade zones.

The territory also has well established infrastructure for communication and telecom services. For instance,

- Taiwan has achieved 100 per cent penetration of 4G network. Also, with an average monthly per capita data consumption of 25 GB – the territory is the second highest mobile data consumer in the world
- Remote areas and tribal villages have access to roughly 100 Mbps broadband services. In some of these regions, Gbps broadband services are also available.
 - As of 2019, NCC subsidized deployment of Gbps grade fixed network broadband services to 26 remote villages, deployment of 100 Mbps grade fixed network broadband services to 99 remote areas, increased bandwidth of Wi-Fi hotspot in 215 locations and added 74 4G mobile broadband base stations
- Fixed and mobile base stations are set up in disaster prone areas. As of 2019, NCC had facilitated the development of 89

fixed and 44 mobile base stations for enhanced connectivity in such regions

- Taiwan is the 8th largest territory in terms of IPv6 (Internet protocol version 6) utilization (refers to the latest version of internet protocol), with most domestic internet access service providers and mobile network operators supporting IPv6 systems

Also, 87.6 per cent of Taiwan has hotspots supporting IPv6 services and roughly 50 per cent of public high schools have access to IPv6 compatible ICT services

2.3 R&D and innovation

Among the various research institutes present in the territory, the Industrial Technology Research Institute (headquartered in Hsinchu City) is one of the most vital centres for development of advanced communication technologies. Many telecom and communication services providers, academia and others have collaborated with the institute to develop new technologies and its related infrastructure.

Apart from establishing research organizations, the government has undertaken various programs to boost innovation. Some of which include:

- **Global Innovation and R&D Partnership Plan:** The objective of the plan is to connect with international corporations to attract them to the territory for creating a mutually benefitting innovative ecosystem in Taiwan
- **Advanced technology research plan:** This program aims to

encourage enterprises to invest in the development of advanced industrial technologies in the territory

- **Industrial upgrading and innovation program:** Under this plan, the government aims to accelerate economic growth by increasing the capacity of local industries for value added generation, exports, and employment

Taiwanese businessmen returning from mainland China are seen to leverage the existing foundation and advantages of Taiwan's R&D infrastructure in the ICT industry. By grasping the opportunity to expand their factories and position their operation with Taiwan at its center, the business men want to master the high-end manufacturing of products in the ICT industry.

Taiwan's ICT industry has long been involved in professional original equipment manufacturer (OEM) and has advantages in hardware manufacturing, thus it upholds a complete 5G supply chain, such as upstream IC design, IC foundry, IC packaging and testing, LED and optical components, passive components, PCB manufacturing, PCB material equipment; midstream network communications, communication equipment; downstream industrial computers, notebook computers, and telecommunications companies.

2.4 Talent development

According to the Global talent report 2021⁴² released by a research institute named Oxford Economics, the territory is considered as facing the highest shortage of talent in the world. Factors, such as ageing population and lower birth ratio are contributing to reduced talent pool. In response, the government encourages the recruitment of foreign professionals in Taiwan. For foreign individuals who have special skills, the local employer can apply for "special skilled work permit" and then apply for first-time resident certificate for such individuals, therefore, such foreign individuals having completed over 183 days during their valid working permit period, can enjoy tax incentive of 50 per cent tax exempt on the excess of annual wages of TWD3 million for a maximum of three years during their permit valid period.

For those with special skills but without a Taiwanese employer, they can apply for Employment Gold Card (EGC), a four-in-one card combining work permit, resident visa, Alien Resident Certificate and re-entry permit, to enjoy the tax incentive above.

2.5 Digital transformation

To spur digitalization in the territory, Taiwan needs to build an advanced digital ecosystem and provide enhanced opportunities for network communications and telecom companies. The territory is focusing on its digital strategy. One of the most prominent initiatives undertaken as part of the digitalisation strategy includes:

- In 2016, the territory introduced the digital nation and innovative economic development program (DIGI+, 2017–2025) with the aim of increasing the penetration of digital services from 25.8 per cent to 80 per cent
 - Via this plan, the government aims to grow the territory's digital economy to USD205.9 billion⁴³ by 2025 by focusing on developing infrastructure, talent, and smart cities.

2.6 Conclusion

Going forward, the communications industry will continue to remain the epicentre for economic growth in Taiwan. Advances in 5G network rollout and increased focus on digitalization are expected to pave the way for disruption in

the territory. Further, as a direct consequence of digitalization, related areas, such as the market for smartphones and development of digital infrastructure are projected to witness growth.

In 2020, Taiwan entered into the first year of its 5G era. Taiwan holds a competitive edge in hardware manufacturing in the ICT industry, considering that the global focus on information security has increased, and therefore non-mainland-Chinese 5G equipment have become niche. In "The 5G Economy," a report released by Qualcomm, Taiwan's 5G is expected to create an output value of USD134 billion by 2035 and create 510,000 job opportunities. Therefore, it is apparent that under the changes of the global supply chain, Taiwan's ICT industry, semiconductor industry, and 5G technology are also bringing about changes in the global supply chain where these are industries of great significance to Taiwan and with great development potential.

Key highlights

- Network Communication and Telecom companies in Taiwan offer products and services, such as satellite services, fibre and wireless communication systems, smartphone chips, routers and IP/telecom systems.
- NCC in Taiwan is focused on development and application of 5G networks. It plans to invest more than USD500 million to increase penetration and rollout of 5G services.
- The territory has about 174 industrial parks, 10 export zones, and seven free trade zones. Greater Taipei, Taoyuan, Hsinchu, Kaohsiung Software Technological Park, and Southern Taiwan Science park are key regions for telecom and communication companies.
- In 2020, the government enforced TMA to liberalize communications sector by removing entry barriers and promoting R&D in the sector.
- Tax incentives and special skilled work permits operated by the government are expected to bridge the talent gap in the Taiwanese market.



42. Taiwan's talent shortage a threat, Taipei Times, 6 June 2019

43. Expanding Taiwan's digital economy through the government's 8-year DIGI+ Plan, Open Government, 27 October 2017









07

The Thailand Advantage





Territory landscape

Macroeconomic indicators

Population	GDP	GDP growth	GDP per capita	GDP by sector	Inflation
 69.8 million	 USD501.7 billion	 -6.1% (2020) 0.7%e(2021) 3.9%e(2022)	 USD7,187.20	 Services- 55.4% Industry- 34.8% Agriculture- 8.7%	 0.3 (Core inflation) - 0.8 (Headline inflation)

All values are estimates for 2020, unless specified otherwise. GDP provided is nominal GDP

FDI and M&A

Total FDI	Key sectors	Key countries	M&A value
 USD -4.8 billion (↓198%)	 Manufacturing, Real estate and Construction	 Singapore, Japan, China	 USD8.2 billion (2020)

All values are actuals for 2020, unless specified otherwise.

Territory attractiveness

 13 FTAs	 27 seaports	 38 airports	 USD567 million FDI in manufacturing (2020)	 5.97 million workforce in manufacturing (2020)
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Source: Population, GDP, GDP per capita, GDP per sector; EIU, FDI; Bank of Thailand, NESDC, accessed as on 8 September 2021

Thailand- business environment

Located in the centre of mainland SEA, Thailand is known for its developed transport infrastructure and cross-border trade and being well connected to the economies of China and India. In addition, the country has significantly improved its ranking in the World Bank's Doing Business report¹ as it has gained six positions from the previous year, reaching a rank of 21 in 2020. The Government has introduced various regulations over recent years to ease the process of establishing a business in the country. For instance, the Government has taken measures to strengthen the rights of borrowers and creditors, clarify legislation on corporate governance, ownership, control structures, appointment of independent members to board of directors and others have been

provided. The Stock Exchange of Thailand supports Thai companies to adopt sustainable practices and sustainability reporting, particularly in innovation and supply chain management to drive operational excellence. Thailand also leads the ASEAN countries in terms of average ESG performance owing to moderate ESG risk exposure and commitment and actions by companies towards ESG. The government has implemented the Investment Promotion Act, which offers incentives to invest in advanced technologies, innovative activities and R&D.

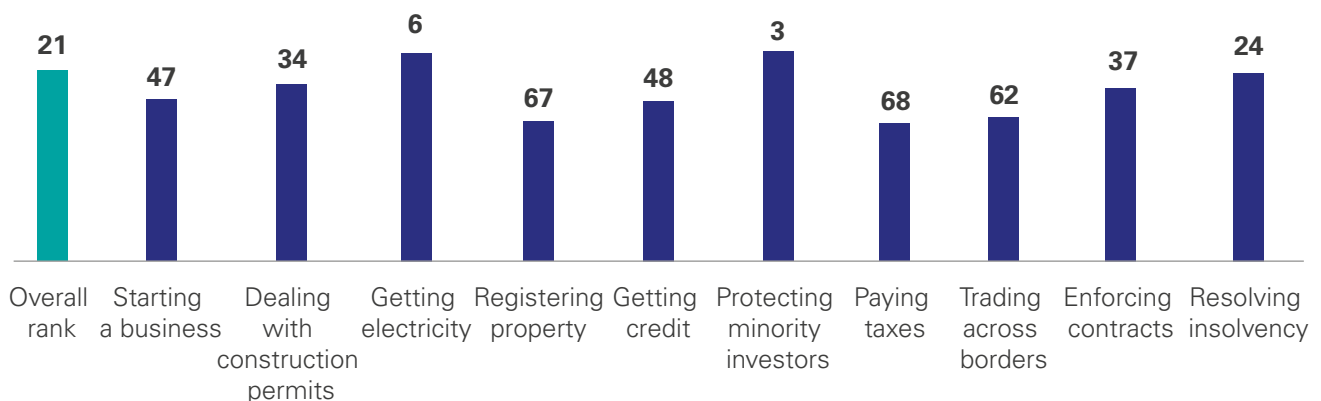
Thailand also has a number of bilateral FTAs and the AFTA with the help of which the country engages in virtually tariff free trade with 18 different nations

(including Australia, China, Japan, New Zealand, South Korea, and India among others). Additionally, the country is part of the RCEP agreement and is expected to participate in the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP).

Doing business rankings 2020²

Some of the key indicators highlighting the country's ranking based on World Bank's doing business report are:

EoDB rankings, Global rank 2020



Source: Thailand, Doing Business 2020, World Bank

1. Doing Business 2020, World Bank Group, accessed as on 8 September 2021

2. Economy profile, Thailand, Doing Business 2020, World Bank Group, accessed as on 8 September 2021

Emergence as a manufacturing hub

The manufacturing sector is one of the hotspots in the country as nearly 25.2 per cent of the GDP (as of 2020, in terms of value added) is derived from manufacturing activities. Factors, such as relatively well-developed infrastructure, lucrative investment incentives, availability of abundant labor and deep expertise in manufacturing products (such as electronics, automotive and others) have led

to the development of Thailand as one of the strong players in manufacturing in the ASEAN region.

Factors, such as favorable policies, strong government push, developed infrastructure, suitable location and robust trade ecosystem (the country exported goods and services of about 51.4³ per cent of its GDP in 2020 and 59.5³ per cent in 2019) are

particularly attracting the attention of foreign companies.

However, the country has a minimum wage rate of about USD311⁴ per month (2020), which is expected to increase further in the future due to the forecasted decline in skilled labor. Therefore, to make its products more cost effective the country is shifting towards advanced manufacturing from labor intensive manufacturing.

Parameter	Value
Average labor cost ⁵	USD3.2 per hour
Average rental price of warehouse (2020) ⁶	USD5.0 per square metre
Average electricity cost ⁷	USD13.7 cents per kWh
CIT ⁸	20 per cent

Source: Thailand logistics property market overview H1 2020, Knight Frank, 2020, accessed as on 8 September 2021; Getting Electricity, Doing Business, The World Bank Group, accessed as on 8 September 2021; The Revenue Department, Thailand, accessed on 8 September 2021; Country profile, Thailand, EIU database, accessed as on 8 September 2021

The Thai government is striving to promote Thailand 4.0, an economic model that aims to create a value-based economy that is driven by innovation, technology, and creativity. This is one of the key strategies to accelerate Thai manufacturing supply chain shifts from traditional to smart supply chain management by increasing automation and digitization with greater focus on knowledge workers and high skilled labor⁹.



- Gross Domestic Product Chain Volume Measures: QGDP 4th quarter 2020, Office of the National Economic and Social Development Council (Thailand), accessed as on 8 September 2021
- Minimum wage rate under the National Wage Committee's notification on minimum wage rate effective on 1 January 2020, Ministry of Labor (Thailand), accessed as on 8 September 2021
- Country profile, Thailand, EIU database, accessed as on 8 September 2021

- Thailand logistics property market overview H1 2020, Knight Frank, 2020, accessed as on 8 September 2021
- Getting Electricity, Doing Business, The World Bank Group, accessed as on 8 September 2021
- The Revenue Department, Thailand, accessed as on 8 September 2021
- Thailand 4.0, Ministry of Commerce (Thailand), accessed as on 8 September 2021

Dominant sector: Automotive



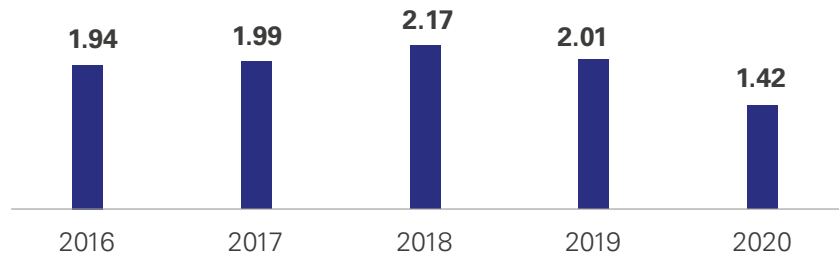
1. Market opportunity

1.1. Automotive manufacturing sector overview

The automotive sector in Thailand, with a contribution of about 10¹⁰ per cent to the country's GDP is one of the key sectors responsible for the economic development of the nation. As of 2020, with a production of 1.42 million¹¹ vehicle units, Thailand was ranked as the largest¹² automaker in the ASEAN region, 5th largest¹² in Asia and 11th largest¹² in the world.

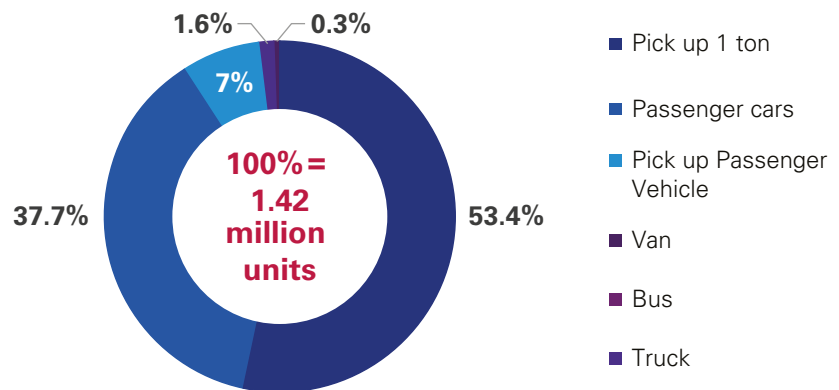
The overall sector (which can be broadly classified under passenger vehicles, commercial vehicles, and auto parts market) is dominated by the passenger vehicles sub-segment. In 2020 domestic sales of passenger cars constituted about 43.3¹³ per cent (about 343.5 thousand vehicle units) of the total domestic vehicle sales in the country. In terms of key vehicles manufactured, the production of pick up 1-ton vehicles was the highest in 2020 and was followed by the manufacturing of passenger vehicles.

Automotive production in Thailand, 2016–2020, million units



Source: Thailand Automotive Institute

Automotive production, 2020, unit



Source: Thailand Automotive Institute

After emerging as the automotive hub in SEA, the country is aiming to strengthen its presence in the space of manufacturing of EVs. Hence, in 2020 the Thai government established the National Electric Vehicle Policy Committee (NEVPC) with the new ambitious goal set in March 2021

of manufacturing about 1.051 million units by 2025¹⁴, 50 per cent of total production by 2030¹⁴ and accumulative 18.4 million¹⁴ EVs by 2035. Thailand has also devised a roadmap to develop the country into a regional EV hub for ASEAN by 2025¹⁵.

10. Car sales to plunge 30-50 per cent in 2020: FTI, Bangkok Post, 18 June 2020

11. Automotive Intelligence Unit, Thailand Automotive Institute, accessed as on 8 September 2021

12. Production Statistics 2020, International Organization of Motor Vehicle Manufacturers (OICA), accessed as on 8 September 2021

13. Automotive Intelligence Unit, Thailand Automotive Institute, accessed as on 8 September 2021

14. Govt ups E-car drive, Bangkok Post, 25 March 2021

15. Roadmap sees Asean EV hub by 2025, Bangkok Post, 12 March 2020

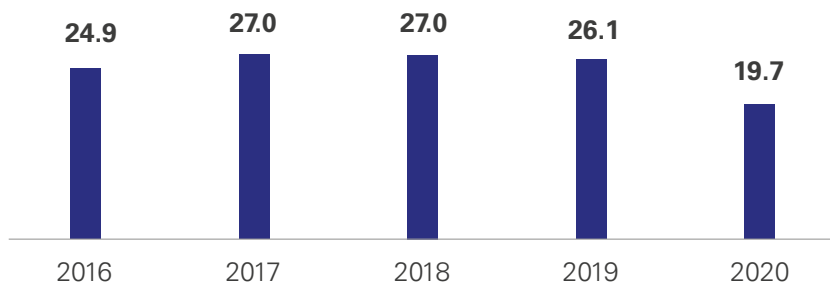
1.2. Automotive sector exports

The country is a crucial export hub for the world's leading carmakers. In terms of sub-segments, passenger cars comprise the majority of exports (nearly 61 per cent) and the remaining 39 per cent is held by exports of commercial vehicles in 2020. Further, the country exports automobiles and automotive parts to various countries – primarily the ASEAN region, Australia, Middle East, and Europe.

However, starting from 2019,

automotive exports are declining. In 2019¹⁶, the decline was mainly led by reduced demand from Australia in the first half of the year and by the negative impact of the global trade dynamic on Thailand's trade partners in the second half of the year. Further, a more significant year-on-year decline of 30.2¹⁷ per cent was seen in 2020 – which was forced by the reduced production and disrupted automotive supply chain owing to the COVID-19 pandemic.

Automotive exports from Thailand, 2016–2020 (USD billion)



Source: The Federation of Thai Industries (FTI)

However, going forward economic growth and relaxation of government policies in trade partners of Thailand, such as Vietnam, are expected to boost the automotive exports from the country.

1.3. Key players and major automotive clusters in Thailand

Thailand's automotive market is dominated by Japanese automakers and the majority of them have developed a production base in the country for one-ton pickup trucks and eco cars for export.

In terms of suppliers, the country has about 720¹⁸ tier 1 auto parts suppliers and about 1,100 tier 2 and 3 suppliers. Also, out of the top

100 auto parts manufacturers in the world – about 50 per cent have their factories in Thailand.

Clusters

The Eastern Economic Corridor (EEC) is a developing economic region, which was approved by the Thai parliament on 1 February 2018. The region's strategic location, which includes access to one of the busiest seaports in the world and adequate infrastructure, makes it convenient for automotive companies to import and export parts. Also, for companies operating in the region the government provides several incentives in the form of tax reductions, deductions for research activities and others, which increase the attractiveness of the region.

16. Automotive Industry Club, Exports, Federation of Thai Industries, accessed as on 8 September 2021

17. Automotive Intelligence Unit, Thailand Automotive Institute, accessed as on 8 September 2021

18. Thailand Industry Outlook 2020 - 2022 - Auto Parts Industry, Krungsri Research, 10 September 2020

2. Sector attractiveness from supply chain realignment perspective

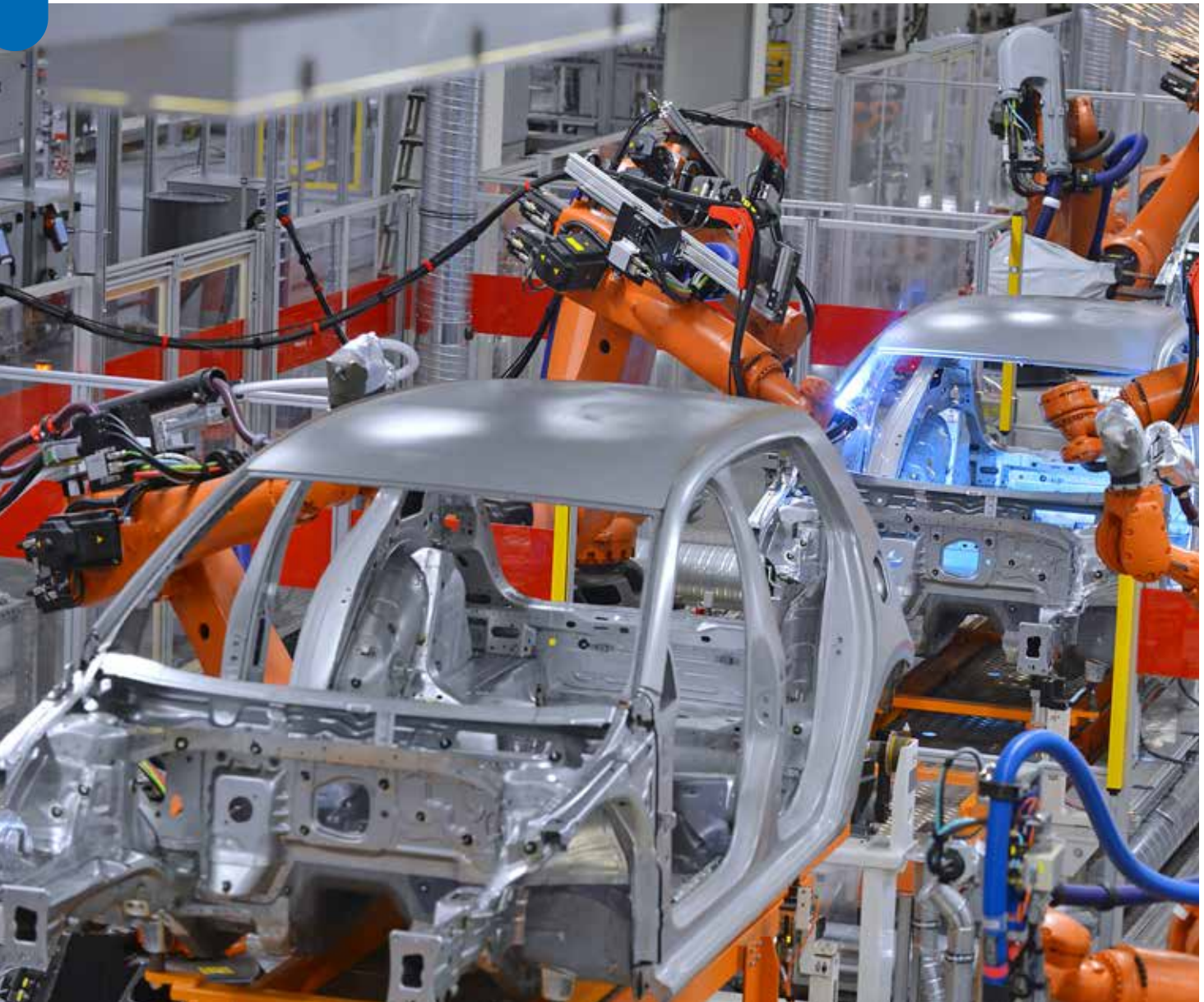
2.1. Government support and incentives

Thailand continues to focus on maintaining the automotive sector as one of the strongest pillars of the country's manufacturing base. To do so, it has enforced a number of policies and tax and non-tax incentives. Also, driven by the global push towards decarbonization and adoption of EVs, the country has laid down various policies to establish itself as one of the strongest manufacturing bases for EVs in the ASEAN region.

- **FTAs:** According to the FTAs that Thailand has signed with several countries, custom duties on both imported and exported goods are reduced and eliminated (in some cases). Auto companies and investors in the country particularly benefit from these FTAs by leveraging opportunities to strengthen and expand their supply chain and gain a competitive advantage by importing raw materials and

other production equipment (with no or reduced import duties).

- **Tax incentives:** To boost the automotive sector, the government offers several tax incentives, some of which are:



Parameter	Incentive
Tax reduction to promote EVs	<ul style="list-style-type: none"> • Tax holidays for qualified EV projects and for businesses in the EV supply chain (such as for producers of battery modules) • Plug-in hybrid electric vehicles (PHEV) projects worth more than USD1.6 million can receive a three-year corporate tax holiday and battery electric vehicle (BEV) projects worth the same are eligible to an eight-year corporate tax holiday • PHEV and BEV projects worth less than USD1.6 million are eligible for a maximum of three-year tax holiday
Import duty exemption	<ul style="list-style-type: none"> • Import duty is exempted on machinery and raw materials used in manufacturing for export
CIT exemption	<ul style="list-style-type: none"> • CIT exemption of up to eight years is provided to foreign investors • 50 per cent reduction of CIT is provided after the expiry of tax exemption period • CIT exemption for the first 13 years and 50 per cent reduction for the next five years. Companies can benefit from a further five year of 50 per cent CIT reduction if they invest a minimum of USD32 million by the end of 2021 • Investors employing skilled workers (with advanced knowledge of STEM) can obtain CIT tax deduction of 200 per cent for training expenses • Companies engaging in automation systems and robotics are qualified to receive a 200 per cent CIT tax reduction
Human resource development and research activities	<ul style="list-style-type: none"> • In 2019, the government introduced a new incentive package to attract enhanced investments in the EEC region. According to the package, businesses can qualify for tax reductions and holidays if they facilitate human resource development activities • Companies engaged in human resource development or educational activities in the EEC region are eligible for a 50 per cent CIT reduction for a period of three years and a two-year tax holiday • CIT is exempted on income derived from the provision of R&D activities for a period of 13 years
Non-tax incentives	<ul style="list-style-type: none"> • Foreign companies are permitted to own land and properties for their business operations or for their residential purpose • Foreign corporations can enter into lease/sublease/lease-out contract of land within the promoted zones for a period of 50 years and can renew the contract upon approval for 49 years • Foreign corporates are permitted to use foreign currencies in the promoted zones

Source: Thailand's automotive industry the next generation, Thailand Board of Investment, accessed as on 8 September 2021

2.2. Skill/talent availability

The country employs about 850,000¹⁹ people in the automotive sector. There are more than 29²⁰ universities and other institutes that provide automotive and mechanical engineering programs. It is expected that by 2021, nearly 61²⁰ per cent of the total workforce in the Thai automotive sector will consist of high skilled labor with vocational diploma, 27²⁰ per cent with bachelor's in engineering

degree and about 5 per cent²⁰ with master's degree or above.

However, due to the intense focus on technology advancements (such as automation), the country is witnessing a shortage in the supply of labor skilled in advanced technologies. Going forward, it is also expected that some of the low-skilled jobs in the sector will be replaced by the implementation

of automation, robotics, and other advanced technologies. While the transition would lower the number of workers in the sector, it would also lead to an increase in the demand for highly skilled workers. To overcome this mismatch, the government is focusing on enhancing training programs and several auto companies are focusing on introducing their own employee training programs.

19. Thailand's car production could be halved in 2020, Thai Enquirer, 11 May 2020

20. Thailand's automotive industry the next generation, Thailand Board of Investment, accessed as on 8 September 2021

2.3. Infrastructure

Located at the centre of the Indochina peninsula (which links it to both SEA and China by land and sea,) Thailand enjoys a favorable geographical position. Additionally, with a coastline of 3,148²¹ km the country has adequate infrastructure required for the export of automotive parts and vehicles. Further, the government has launched a third phase expansion plan of Laem Chabang seaport, which is expected to start operations from 2025. According to the plan, the port's capacity will be enhanced to accommodate three million cars for export (from its previous capacity of 1.3²² million cars). The country has a well-connected air and road transport system with 38 airports²³, including seven international airports and a rail system spanning 4,952 km²⁴ of railways.

The government also has in place a policy for the development of Special Economic Zones (SEZs).

The SEZs are well connected with neighbouring countries and have suitable transport infrastructure, which encourages trade. For the automotive industries located in the Tak and Sa Kaeo SEZ, the government also provides some incentives in the form of 13-year tax incentives and tax deductions of up to 300 per cent on R&D related expenditure.

The government has prepared the new growth hubs by starting with the EEC, which covers Rayong, Chonburi, and Chachoengsao provinces in Thailand, as one of the strategies for accelerating Thailand 4.0's targeted industries, including next-generation automotive to create more value and innovations in all sectors of Thailand's automotive industry.²⁵

2.4. Conclusion

The ongoing pandemic has severely affected the automotive sector in Thailand as according to the Federation of Thai Industries

automotive production suffered a year-on-year decline of 29 per cent²⁶ reaching 1.42 million units in 2020. The exports also suffered a significant year-on-year fall of 30.2²⁶ per cent in 2020. However, it is expected that as the pandemic is controlled and economies start to recover the sector will witness growth by 3-4 per cent per year to reach 1.32-1.33²⁷ million and 1.36-1.38²⁸ million vehicles, respectively.

Going forward, it is expected that the sector will receive a push from the upcoming focus on EV manufacturing. If Thailand succeeds in its attempt of establishing itself as the regional leader of EV manufacturing, the automotive sector could witness growth in the coming years. In terms of workforce, the sector could see a decline in the number of people employed; however – the demand for highly skilled workers would increase.

Key highlights

- In 2020, Thailand's automotive manufacturing industry was the largest in the ASEAN region, the 5th largest in Asia, and the 11th largest in the world, with the passenger vehicles sub-segment dominating the market.
- The Thai government has laid out plans to strengthen the country's EVs manufacturing capability, with the establishment of the NEVPC and setting of EV production goals. The country aims to manufacture around 1.051 million EV units by 2025 and an accumulative 18.4 million EV units by 2035. Thailand also aims to raise EV production by 50 per cent of its total volume by 2030.
- Thailand has a number of policies and tax and non-tax incentives aimed at strengthening the automotive manufacturing industry in the country. These include FTAs, import duty exemptions, and tax reductions among others.
- A favorable geographic position, infrastructure support, such as a good air, rail, seaport, and road connectivity, and the government's seaport expansion plans support the export of automotive parts and vehicles.

21. Seaports, Thailand Board of Investment, accessed as on 8 September 2021
 22. Laem Chabang expansion edges closer, The Nation Thailand, 16 February 2018
 23. Airports, Thailand Board of Investment, 30 October 2020
 24. Railways, Thailand Board of Investment, 30 October 2020
 25. Business Opportunities, The Eastern Economic Corridor Office of Thailand (EECO), accessed as on 8 September 2021

26. Automotive Intelligence Unit, Thailand Automotive Institute, accessed as on 8 September 2021
 27. Thailand Industry Outlook 2020 - 2022 - Automobile Industry, Krungsri Research, 24 July 2020
 28. Automotive Intelligence Unit, Thailand Automotive Institute, accessed as on 8 September 2021



Sunrise sector: Food and beverage



1. Market opportunity

1.1. Food and beverage sector overview

Popularly known as “kitchen of the world”, backed by rich natural resources, quality and product safety, skilled workforce, investment-focused policies, and a strategic geographic location, Thailand hosts one of the most attractive food and beverage sectors in the Asia Pacific region. Food is one of the largest sectors in Thailand and contributes to over 20 per cent of the country’s GDP.²⁹

Thailand is among the few countries in the world with the capacity to produce more food than it consumes. Around 50 per cent of land area in the country is used for agricultural purposes, thereby enabling the food industry to source almost 80 per cent of raw materials locally at competitive prices.³⁰ Key products produced in the country include processed foods, ready meals, food seasoning, high-tech food ingredients, functional drinks and fruit juices. Thailand is among the top ten global producers of

several important agricultural products, including rice, sugarcane, cassava, coconut, and pineapple.³⁰

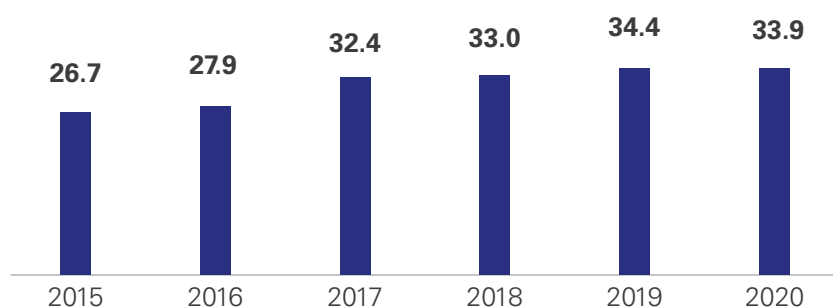
Foreign investors have exhibited strong interest and confidence in the country’s food and beverage sector, with more than USD3 billion worth of investments poured into 526 projects in the agriculture and food processing sector over the past two years.³² Located in the centre of the ASEAN economic community, Thailand is considered an ideal destination for food and beverage investment as it provides access to a group of 650 million consumers in the region.³³ Despite the pandemic, the food and beverage sector witnessed increased investments in 2020, with agriculture and food processing accounting for ~USD1.4 billion worth of FDI, reflecting the sector’s resilience and international food companies’ confidence. The investments cover manufacturing of several products, including semi

and ready-to-eat food, seasonings, frozen meat and fruits, yogurt, health drinks, and others.

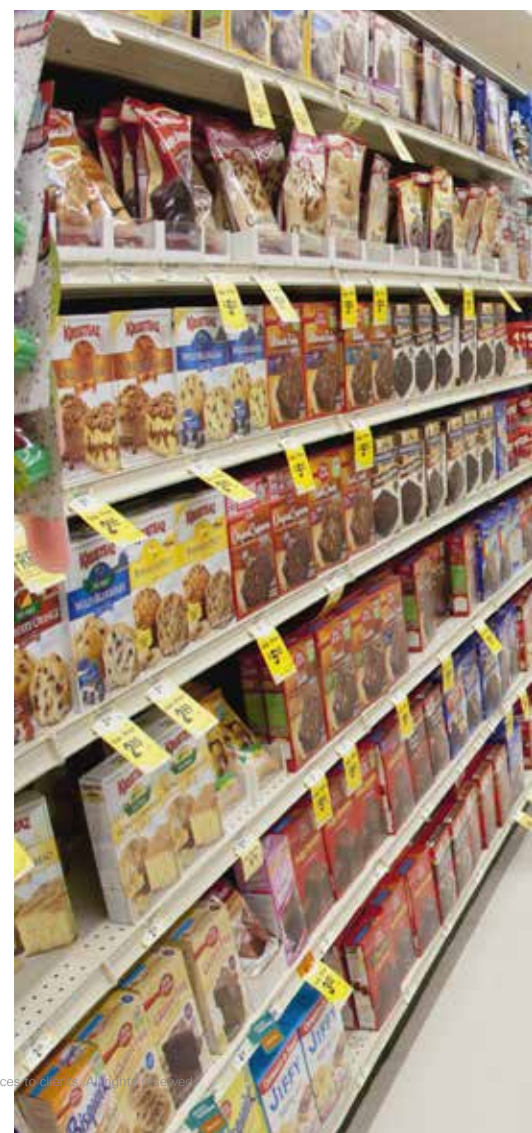
1.2. Food and beverage exports

Thailand is among the largest exporters of food and beverages in the world.³⁴ It is also the second largest food exporter in Asia with more than 35 million tonnes of exported products.³⁵ Thailand is the second largest exporter of rice and sugar in the world and is among the top five exporters of chicken and shrimp.³⁶ Japan, China and the U.S. are among the leading export destinations for Thai food and beverage exports.

Thailand’s food and beverage exports (USD billion)



Source: Bank of Thailand



29. The Increasing Investments in Thailand’s Food Sector Reflects the Confidence in Thailand Despite COVID-19 Outbreak, BOI, 24 July 2020

30. Thailand Food Industry, BOI, accessed as on 8 September 2021

31. Investment Promotion Summary 2020, BOI, accessed as on 8 September 2021

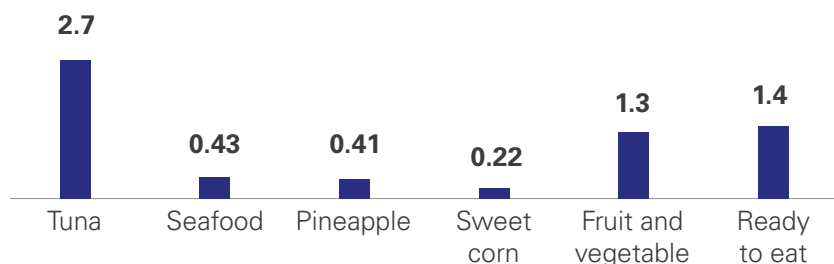
32. Food export value tipped to fall 3 per cent on virus impact, Bangkok Post, 24 June 2020

33. EC_XT_001 Trade Classified by Commodity Group, Bank of Thailand, 25 February 2021

34. Thailand Food Industry, BOI, accessed as on 8 September 2021

35. The Increasing Investments in Thailand’s Food Sector Reflects the Confidence in Thailand Despite COVID-19 Outbreak, BOI, 24 July 2020

Thailand's key processed food exports, 2020 USD billion



Source: Thai Food Processors Association

Thailand is also among the leading exporters of processed food products.³⁶ It is the world's number one exporter of canned tuna, canned pineapple, sweet corn, coconut milk, cassava, and durian. The country is also the 11th largest global supplier of ready-to-eat meals³⁷. Thailand also exports frozen seafood, such as cuttlefish, and fish meat and processed halal foods.

1.3. Development of food parks and clusters

Thailand has around 43,725 factories involved in agribusiness, 9,100 food processing units and 815 beverage manufacturing units.³⁸ The government is developing super clusters consisting of targeted manufacturing bases for specific sectors, including food and beverage. These clusters link manufacturers, suppliers, supporting industries, research and academic institutions, and public and private organizations within the cluster areas. Clusters are also being developed for agro-processing industries according to the availability of raw materials in the regions. Key clusters under development include Northern Region (vegetables and fruits), North-eastern region (tapioca, sugar cane, maize), Lower-Central region (sugarcane, pineapple), Eastern region (fruits) and Southern region (seafood).

The public and private sectors are also collaborating to establish food valleys to create an ecosystem for the food sector and gather the entire value chain in one place. The Food Science Park (Food Innopolis) in Pathum Thani province is one such example of public-private

collaboration. As of now, this park had attracted investments from 32 companies including 11 foreign firms primarily to undertake R&D activities in health and functional food and high value-added food. Other food clusters in the country include:

- **World food valley:** The project in Ang Thong province provides infrastructure and complete industry development services, such as raw materials and quality control, testing, approval, and mentoring services in one place and also promotes Thailand as a major food producer.
- **Northern food valley:** The Federation of Thai Industries, Federation of Industry of Northern Thailand and Industrial Promotion Centre Region have collaborated to create a food valley in the northern region. The objective is to enhance food development technology and to improve food safety throughout the production process and to assist with developing new and innovative food concepts and thereby promote Northern Thailand as a centre of food production within the ASEAN region.



36. Thai Food Processors Association export to world in January-December 2020, Thai Food Processors Association, 22 January 2021

37. Investors Taste Success in Thailand's "Kitchen of the World", Bangkok Post, 29 September 2020

38. Food export value tipped to fall 3 per cent on virus impact, Bangkok Post, 24 June 2020

2. Sector attractiveness from supply chain realignment perspective^{39,40}

Total FDI of ~USD1.4 billion in agriculture and food processing



Over 1.1 million employed in the food sector



53,642 food and beverage factories



11th largest food exporter in the world



2.1. Government support and incentives

Food and beverage is one of the key sectors contributing to the economy of Thailand. The Thailand Board of Investment offers various incentives to attract investors to invest in the country's food and beverage sector.⁴¹

Parameter	Incentive
Companies investing in Food Innovation Industrial Zones (Food Innopolis)	<ul style="list-style-type: none"> CIT exemption of up to 13 years with additional 50 per cent reduction for five years Exemption of import duty on machinery and raw or essential materials used in manufacturing export products
Companies manufacturing active ingredients from natural raw materials	<ul style="list-style-type: none"> CIT exemption of eight years Exemption of import duty on machinery and raw or essential materials used in manufacturing export products
Companies manufacturing medical food or food supplements	<ul style="list-style-type: none"> CIT exemption of eight years Exemption of import duty on machinery and raw or essential materials used in manufacturing export products
Companies manufacturing or preserving food, beverages, food additives or food ingredients using modern technology	<ul style="list-style-type: none"> CIT exemption of five years Exemption of import duty on machinery and raw or essential materials used in manufacturing export products
Companies involved in agricultural and food R&D	<ul style="list-style-type: none"> CIT exemption of 5 to 10 years depending on type of business and level of technological advancement Additional tax holiday of 50 per cent for five years or an additional two more years of tax holiday as applicable

39. Food export value tipped to fall 3 per cent on virus impact, Bangkok Post, 24 June 2020

40. EC_RL_009_S4 Labour Force Survey (New Series ISIC Rev.4), Bank of Thailand, 25 February 2021

41. Thailand: Food industry, Board of Investment, accessed as on 8 September 2021

2.2. Digital transformation

The Thai government has identified food and agriculture as a key sector to be digitized with technologies, such as automation, AI, blockchain, and big data, as this sector has a huge impact on Thailand's economy, income, and livelihood. The government has recently launched a national traceability system, TraceThai, focused on tracking organic foods to ensure food safety, sustainability, and transparency while trading with foreign markets. TraceThai is empowered and encrypted by blockchain and uses Quick Response (QR) codes to maintain data protection and prevent data falsification, thereby boosting consumer confidence in Thai organic products. TraceThai is expected to be fully integrated into a national-level trade facilitation platform for exports of a wider range of food products apart from organic. Work is also underway to integrate the traceability system to the Thai National Single Window and further utilize satellite data and AI to undertake advanced functionalities, such as prediction of production volumes and prices.

Food and beverage manufacturers in Thailand have also started investing in automation technologies and robotics to increase the sector's competitiveness. Manufacturers are also transitioning to Industry 4.0 and have installed robots in production lines to build smart factories and automate production

processes, thereby improving productivity.

2.3. Infrastructure

The Thailand government has established Food Innopolis at the Thailand Science Park, with utility space of over 20,000 square metres. This food park provides easy access to universities, airport and rail network thereby offering a convenient and suitable environment for research, innovation, and development. The Board of Investment (BOI) approved five more sites to develop science and technology zones for food innovation and R&D to further strengthen the Food Innopolis network, thereby increasing the total number of Food Innopolis sites in the country to 13, after granting the title to eight locations previously.⁴² Alongside development of Food Innopolis, the government is also developing super clusters for food and beverage sector and is also working on upgrading infrastructure for the food processing sector. The presence of an established network of food and beverage factories provides added impetus to the sector's attractiveness.



42. BoI's Food Innopolis status extended to five more zones, The Nation, 1 November 2019

2.4. R&D and innovation

The government's Thailand 4.0 strategy aims to establish Thailand as the innovative hub of Asia. High-tech food processing is one of the key sectors identified as part of the strategy and the government has undertaken several initiatives, such as establishing Food Innopolis and enhancing digital transformation in food processing to increase innovation and R&D in the food and agricultural sector. Thailand's Board of Investment is also offering various incentives for investors to conduct R&D and innovation in the

country's food and beverage sector. Apart from offering tax benefits, the country also offers Smart Visas and work permits for foreign specialists and researchers and their families to undertake R&D activities in the country.

2.5. Conclusion

Food and beverage are among the most important and thriving sectors in Thailand, backed by strong natural resources, agricultural land, workforce, and government initiatives to promote investments. The country is

among the primary exporters of several food products and hosts a large number of domestic and international food and beverage companies. Thailand is also well regarded as an attractive location for labor-intensive food production among many international food companies and the country's well-connected logistics network allows for convenient shipment and delivery of food and beverage products in the global market.



Key highlights

- Almost 50 per cent of Thailand's land area is used for agricultural purposes, which enables the country's food industry to locally source almost 80 per cent of its raw materials.
- In spite of the COVID-19 pandemic, the food and beverage sector had witnessed an increase in investments in 2020, with ~USD1.4 billion in FDI in the agriculture and food processing sectors.
- Thailand is a major food and beverages exporter, with major exports, including rice, sugar, chicken, shrimp, canned products, ready-to-eat meals, and frozen seafood.
- Various incentives are available to investors in the country's food and beverage sector, including CIT exemptions and import duty exemption on machinery and raw or essential materials used for manufacturing export products.
- The Thai government is focusing on digitizing the food and agriculture sector utilizing technologies, such as AI, blockchain, and big data. Initiatives, such as TraceThai, the national traceability system for organic foods, are a step in this direction.
- Infrastructure support from the government in the form of food parks such as the Food Innopolis, having good access to resources, such as universities, airport, and the rail network, will also help promote research, innovation, and development in the food and beverage industry.



08

The Vietnam Advantage

Territory landscape

Macroeconomic indicators

Population



97.3
million

GDP



USD340.6
billion

GDP growth



2.91% (2020)
6.7% (2021F)

GDP per capita



USD3,500

GDP by sector



Services- 41.6%
Industry- 33.7%
Agriculture- 14.9%

Inflation



3.8%
(2.8% in 2019)

All values are estimates for 2020, unless specified otherwise

FDI and M&A

Total FDI



USD28.5
billion
(↓25%)

Projects licensed



2,523
(↓35%)

Key sectors



Industrial
manufacturing,
Electronics,
Textiles and
garments

Key countries



Singapore (31.5%),
South Korea (13.8%),
China (8.6%)

M&A value



USD3.5
billion (E)
(↓51.4%)

All values are actuals for 2020, unless specified otherwise. Decline has been highlighted with respect to values for 2019

Territory attractiveness



13 FTAs



44 seaports



22 airports



USD13.6 billion
FDI in
manufacturing
(2020)



10.94 million
workforce in
manufacturing
(As of March
2020)

Source: Vietnam country data, IMF; GDP by sector, EIU; Keeping coronavirus at bay, Vietnam revs up economy to race ahead of rivals, Reuters, 7 January 2021; Foreign investment attraction in 2020, FIA Vietnam, 24 December 2020;

Why Vietnam's Outlook for 2021 Looks Bright, Vietnam Briefing, 18 December 2020

Business environment

Located in the eastern part of mainland SEA, Vietnam is one of the fastest growing manufacturing hubs in Asia and has witnessed significant economic growth and development over the last 30 years to transform into a lower middle-income country. Though the economy was hit hard by the COVID-19 pandemic in 2020, Vietnam's proactive measures have helped contain the health and economic fallout, making it one of the few countries in the world to record upward movement with a GDP growth of 2.9 per cent in 2020¹ and a trade surplus of USD19.1 billion.²

Vietnam's emergence as a popular investment destination can also be attributed to its conducive business environment. According to the World Bank's 2020 Doing Business report, Vietnam ranked 70th out of 190 economies in EoDB as compared to its 93rd rank in 2010. The country's multiple FTA, such as RCEP, European-Union Vietnam Free Trade Agreement (EVFTA), and CPTPP, provide it preferential market access to 55 countries, accounting for two thirds of the global GDP and three

third of the world's population. In addition, Vietnam has also entered into Double Taxation Avoidance Agreements with 77 countries, with an aim to facilitate investment and trade.

For companies looking to establish export-oriented units in Vietnam, Export Processing Enterprises (EPEs) is one of the most popular investment vehicles as this offers lower tax rates and incentives for certain product lines. EPEs are exempt from import and export duties for transactions with overseas entities or other EPEs.

Furthermore, the government is currently revising existing regulations to offer greater convenience to the investors and is also developing a specialized task force to devise new policies and mechanisms to promote foreign investment to Vietnam. Various laws including Investment Law, Law on Enterprises, and the PPP law have been revised to simplify investment procedures and provide incentives for projects in multiple fields including innovation, R&D.

Vietnam also promotes ESG and sustainable growth through the

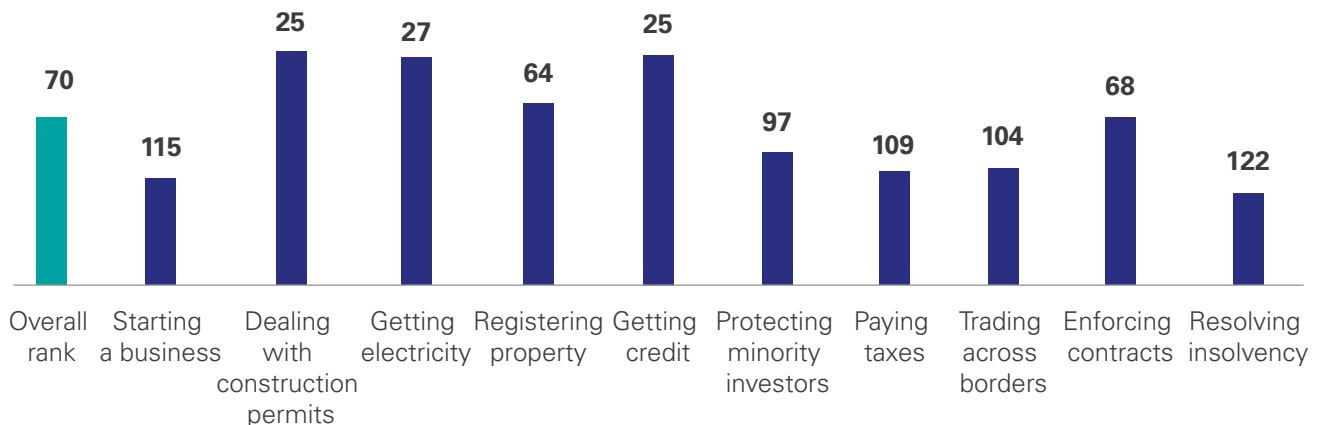
Vietnam Business Council for Sustainable Development. The country's recent trade agreement with the EU also includes certain ESG provisions pertaining to property protection, labor rights, and sustainable development.

However, certain non-tariff barriers such as import licensing, customs regulations, quality and quarantine procedures, and administrative requirements continue to remain a cause of concern for companies trading to and from Vietnam. The government needs to address these concerns to enhance the ease of trading.

Doing business rankings 2020³

Some key indicators based on World Bank's doing business report indicate Vietnam's position as compared to 190 countries globally.

EoDB, Global rank 2020



Source: Vietnam, Doing Business 2020, World Bank

Note: Global ranking, with 1 being the best out of 190 countries

1. Keeping coronavirus at bay, Vietnam revs up economy to race ahead of rivals, Reuters, 7 January 2021
2. Keeping coronavirus at bay, Vietnam revs up economy to race ahead of rivals, Reuters, 7 January 2021
3. Vietnam, Doing Business 2020, World Bank, accessed as on 8 September 2021

Emergence as a manufacturing hub

Over the last decade, Vietnam has emerged as an attractive manufacturing destination in SEA, as companies were looking for alternate manufacturing destinations to offset rising labor costs in developed markets. Over 2018-19, 56 multinational companies moved their manufacturing bases from China to other locations, with 26 of them relocating to Vietnam⁴.

Alongside labor cost, the country also offers competitive electricity, land lease, and construction costs.^{5,6,7}

Parameter	Value
Average manufacturing labor cost	USD3.2 per hour
Average factory rental price	USD2.6 to USD3.5 per sq. m
Average electricity cost	USD13.7 cents per kWh
CIT	20 per cent

Source: Vietnam PM demands no power price hike by year-end, Hanoi Times, 5 November 2020; Industrial real estate a bright spot in VN market, The Phnom Penh Post, 21 January 2020; Corporate tax rates table, KPMG, access

The global trade dynamic and COVID-19 pandemic have accelerated the shift of supply chains to emerging markets like Vietnam, primarily due to careful management of the pandemic. In addition, the government announced several measures and financial stimulus packages to minimize impact on the economy. It also announced monetary policies to help export-oriented industries, technology, and agriculture, including reduction of taxes, land rent, decrease in interest rates and loan payment extensions.

Over the years, the government has developed domestic manufacturing by attracting foreign manufacturers across several sectors to establish manufacturing units in the country.

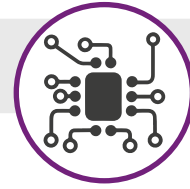
Manufacturing and processing sector receive majority of FDI inflow in Vietnam, and the country's manufacturing goods account for nearly 90 per cent⁸ of its national exports, significantly higher than the global average of 60 per cent. As compared to 2010, the country's manufacturing exports (as a per cent of national exports) has grown by ~30 percentage points, in the next 10 years⁹. The country's attractive manufacturing costs alongside factors, such as infrastructure, trade policies, economic growth and response to the pandemic makes it one of the most preferred destinations for companies looking to diversify or relocate supply chains.

4. COVID spillover: Firms shifting from China to Vietnam has a lesson for India, India Today, 10 June 2020
 5. Vietnam PM demands no power price hike by year-end, Hanoi Times, 5 November 2020
 6. Industrial real estate a bright spot in VN market, The Phnom Penh Post, 21 January 2020

7. Corporate tax rates table, KPMG, accessed on 4 March 2020
 8. Industry 4.0 essential to Vietnam as a manufacturing hub, Futureiot, 9 December 2020
 9. Manufactures exports (per cent of merchandise exports) – Vietnam, World bank, accessed on 4 March 2021



Dominant sector: Electronics manufacturing



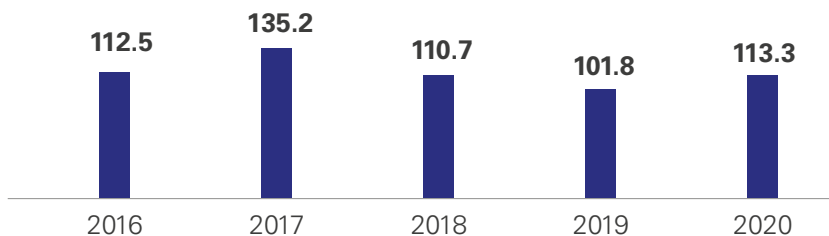
1. Market opportunity

1.1. Electronics manufacturing

Electronics is one of the fastest growing and most important manufacturing sectors in Vietnam. The sector has significantly boosted trade volumes and contributed to Vietnam's GDP over the past decade, owing to the presence of

several international electronics companies' production units in the country. The index of industrial production for the manufacturing of electronic, computers and optical products increased by 11.3 per cent in 2020, compared to 2019.

Index of industrial production, electronics manufacturing



Source: Main industrial products, General Statistics Office, Vietnam, accessed on 3 September 2021

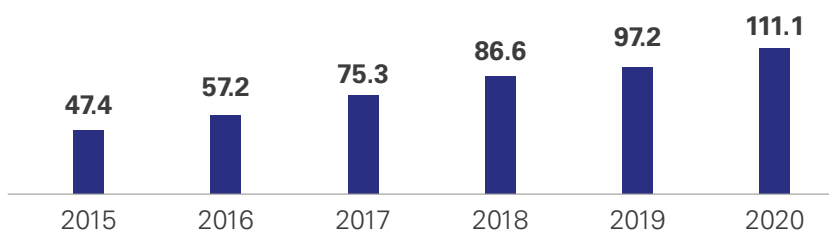
1.2. Electronics industry exports and key components produced

Vietnam has grown as one of the largest electronics exporters in the world, rising from the 47th position in 2001 to 8th in 2020.¹⁰ The share of electronics in total exports increased from 29.3 per cent in 2015 to 39.5 per cent in 2020. Key export commodities include transmission apparatus, mobile phones, TVs, cameras, electrical apparatus, electronic integrated circuits, and micro assemblies. Electronics industry products were

majorly exported to the U.S. (23.6 per cent), China (22.7 per cent), South Korea (7.8 per cent), Hong Kong (5.4 per cent), Japan (4.3 per cent), and India (2.6 per cent).

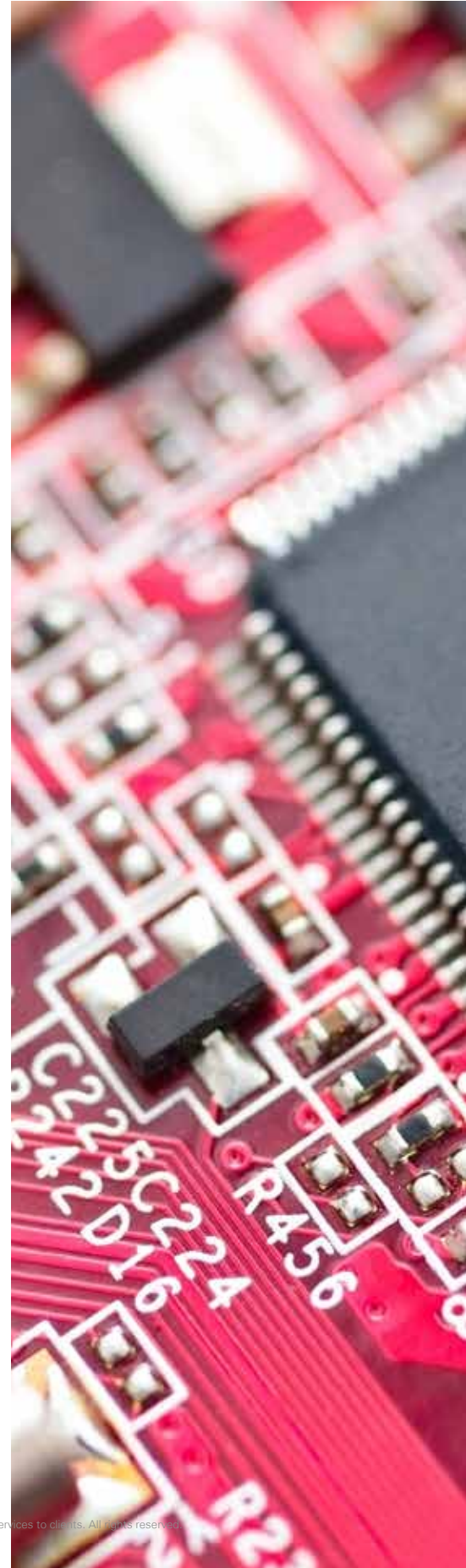
Batteries, mobile phones, lamps, printers, and TVs are among the major electronics products produced in Vietnam.¹¹

Vietnam's electronics exports (USD billion)

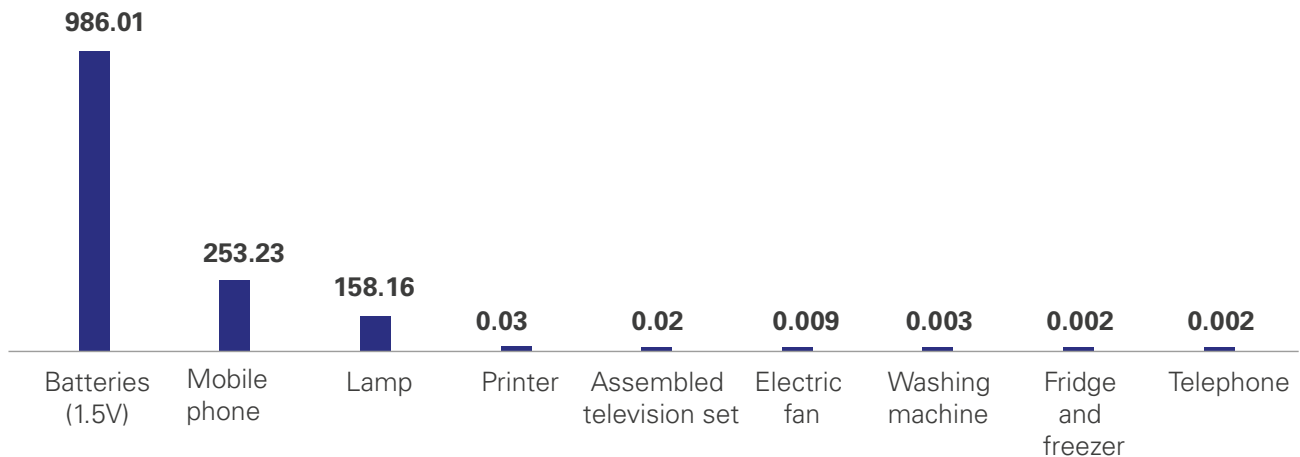


10. Exports of Electrical machinery and equipment and parts thereof, TradeMap, accessed on 3 September 2021

11. Main industrial products, General Statistics Office, Vietnam, accessed on 3 September 2021



Major electronics products produced in Vietnam, 2020 (million units)



Source: Main industrial products, General Statistics Office, Vietnam, accessed on 3 September 2021

1.3. Major electronics clusters in Vietnam

Over 2,000 domestic and foreign companies¹² operate in electronics clusters in Vietnam. The country has established four key economic regions in the North, Central, South and Mekong Delta, with an aim to foster the development of industrial clusters. Computer, electronics, and optical products dominate the Northern Key Economic Region with several companies establishing their operations in this region.

Southern cluster (23 per cent electronics companies)

Key regions: Ho Chi Minh City, Binh Duong, Dong Nai

Northern cluster (73 per cent electronics companies)

Key regions: Hanoi, Bac Ninh, Vinh Phuc, Hung Yen, Hai Phong, Hai Duong, Bac Giang

Source: Manufacturing shift from China, Dezan Shira and Associates, 9 September 2020

1.4. Key expansion plans of companies post 2019

Since 2019, Vietnam has been attracting investments from electronics manufacturers to establish production units in the country to avoid the U.S. tariffs, benefit from lower production costs, and maintain proximity with key markets. Over 2019 to 2020, 11 electronics companies have

moved their production from China to Vietnam. The pandemic has further accelerated investments and movement of production to Vietnam.¹²

- An American technology company invested over USD475 million in a Vietnam plant over June 2019 to December 2020 to

enhance manufacturing of 5G products and core processors

- A Taiwanese electronics contract manufacturer announced an investment of USD270 million in January 2021, to develop a plant to produce laptops and tablets

12. Manufacturing shift from China, Dezan Shira and Associates, 9 September 2020

2. Sector attractiveness from supply chain realignment perspective

2.1. Government support and trade

Electronics is among the top 10 priority sectors approved by the Vietnamese government for the industrial development strategy period 2025–35. The country has gained significant results on the tariff reduction roadmap for electronics goods since January 2006.

- **FTAs:** Vietnam has several policies and trade agreements that simplify the entry of foreign investors to the country. The country is a part of 13¹³ FTAs that allow import and export of goods with reduced or zero customs duties.
 - The EEVFTA, signed in August 2020, eliminates almost 99 per cent¹⁴ of custom duties between the EU and Vietnam. Through this agreement, 71¹⁴ per cent of duties will be eliminated on Vietnam exports to the EU, with the remaining being eliminated over a period of seven years.
 - The CPTPP enables manufacturers to sell Vietnamese commodities and goods to other countries, often free of duty. This would provide Vietnamese exports an advantage when selling into markets, such as Canada, Australia, or Japan over exports from non-CPTPP countries.
- **Tax incentives:** CIT breaks are available for companies operating in the high-tech sector, industrial zones, and electronics industry clusters. Companies can also benefit from preferential tax rates and tax holidays.



13. Vietnam - evaluation of the implementation of the eu-Vietnam Free Trade Agreement, Lexology, 22 July 2020

14. Vietnam-EU Trade: EVFTA Comes into Effect, Vietnam Briefing, 3 August 2020

Parameter	Incentive
Income from new investment projects in areas with particularly difficult socioeconomic conditions, economic zones, and hi-tech zones	<ul style="list-style-type: none"> • Four years of CIT exemption • 10 per cent CIT for 15 years • 50 per cent tax reduction for next nine years
Income from newly invested projects based in areas with difficult socioeconomic conditions	<ul style="list-style-type: none"> • Two years of CIT exemption • 17 per cent CIT for 10 years • 50 per cent tax reduction for next four years
Income from newly invested projects based in industrial zones, apart from areas with advantaged socioeconomic conditions	<ul style="list-style-type: none"> • Two years of CIT exemption • 17 per cent CIT for 10 years • 50 per cent tax reduction for next four years
Projects in hi-tech industries	<ul style="list-style-type: none"> • Four years of CIT exemption • 10 per cent CIT for 15 years • 50 per cent tax reduction for next nine years
R&D projects	<ul style="list-style-type: none"> • Can place 10 per cent of their annual profits into a tax-deductible fund before tax is levied
Business expansion projects	<ul style="list-style-type: none"> • Eligible for CIT incentives if they meet certain conditions as per Vietnam regulations
Import tax	<ul style="list-style-type: none"> • Preferential tax rates that are applicable to import goods from countries having the most-favored-nation treatment in trade relations • Special preferential tax rates applicable to import goods from countries that have signed agreements on special import tax preferences with Vietnam • Ordinary tax rates applicable to goods originating from countries, which do not apply the most favored nation treatment of special preferences on import tax to Vietnam
Import tax exemption	<p>Exemptions to certain product categories, including:</p> <ul style="list-style-type: none"> • Materials, supplies, and components used for manufacturing • Goods temporarily imported for re-exports • Machinery and equipment that are fixed assets of an entity that is eligible for incentives • Raw materials and components, which cannot be domestically produced <p>Exemption of import tax for five years from start of production for raw materials, components, and supplies that are imported for production under projects in domains eligible for special investment incentives or in certain geographical areas or in the domain of manufacturing mechanical, electric and electronic components, and accessories</p>

Source: Vietnam's Electronics Industry: A Guide to Emerging Opportunities, Vietnam Briefing, 24 July 2020

2.2. Skill/talent availability

Vietnam has a favorable demographic structure with a young population and abundant labor force. The country is in the period of its golden population from 2010 to 2040, according to a study by the United Nations Fund for Population Activities (UNFPA). Around 612,000 people¹⁵ are employed in electronics industry in Vietnam. The country has over 52,000 manufacturing talent¹⁶ with skillset in electronics and industrial automation. Vietnam's workforce also has over 200,000 talent¹⁶ skilled in digital technologies, such as cloud, AI and IoT, which can be leveraged by companies to achieve digital transformation goals. Engineers working in Vietnam's electronics sector are also well qualified compared to peers in the region.¹⁷

However, Vietnam needs to further develop dedicated technical, and vocational education and training programs to enable transition to industry 4.0, increase worker productivity, and enhance the country's competitiveness. A structured continuing education and training (CET) needs to be established to up-skill, re-skill, and future-proof the workforce with emerging skillsets to bridge the skill gap and develop manufacturing talent.

2.3. Labor cost:

Low labor cost is one of the primary reasons for companies to establish manufacturing units in Vietnam. Manufacturing labor costs in the country are nearly 50¹⁸ per cent lower compared to China, making it a cost-effective destination for electronics manufacturing. Despite an increase of 5.3 per cent, the minimum wage in Vietnam ranged between USD132 and USD190¹⁸, much lower than other countries in the region, making it one of

the cost effective manufacturing destinations.

2.4. Infrastructure and logistics

Alongside a favorable geographic location, Vietnam's infrastructure is well-established to cater to electronics manufacturing. The country has 44 seaports, with a coastline of over 3,260 kilometres and ranks 19th¹⁹ in the world in liner shipping connectivity. Some of the major ports in Vietnam include Hai Phong, Da Nang, Qui Nhon, and Ho Chi Minh City. Vietnam currently has 22 airports and the government has announced investments to expand existing airports and construct six new airports by 20²⁰. The government is working towards improving road infrastructure, including expressway projects to improve connectivity with major cities. With a total length of 2,600 km, Vietnam's rail network connects most provinces and cities across the country. The domestic rail system is also linked with the Chinese railway, allowing trains to cross borders and reach stations in Nanning and Beijing.

The government has also established industrial clusters and is also promoting the construction of electronics manufacturing parks, such as the Saigon hi-tech park, Hoa Lac hi-tech park, and the upcoming Da Nang hi-tech park. At least 17 more industrial parks are expected to be developed over the next few years.²¹ The hi-tech parks are strategically located with easy access to airports, seaports, railways, and main routes, thereby reducing transportation cost and time. The parks have several facilities, including R&D centres, training centres, high-tech production areas, innovation, and incubation centres. Owing to the strategic location of the

parks backed by multiple facilities have led to several electronics manufacturers, including major Korean and Taiwanese companies establishing their operations there.

2.5. R&D and innovation

Vietnam is also emerging as an attractive destination for foreign companies to establish R&D centres. Companies are focusing on setting up R&D and innovation centres close to their manufacturing units to obtain efficiency and reduce costs. The presence of R&D centres of several electronics giants in the country reflects Vietnam's transition from a purely production economy to an incubator of hi-tech initiatives with higher value add. The government is also prioritizing science and technology, as well as developing a national innovation centre to develop an innovative ecosystem and boost economic growth.

Vietnam also has a thriving start-up ecosystem and is an emerging regional hub for startups in SEA. Technology sector dominates the start-up ecosystem in the country and startups in this sector are expected to act as key enablers for manufacturing innovation and growth in Vietnam. The country is also establishing incubators and innovation hubs to promote innovative startups in fields, such as electronics and IT among others. For example, Saigon Innovation Hub (SIHUB) provides support and incentives to innovative startups in multiple fields, including electronics and IT. The Saigon Hi-Tech Business Incubator (SHBI) promotes entrepreneurship and incubates technology enterprises in priority fields, such as microelectronics, information and communication technologies, automation, and others.

15. Manufacturing shift from China, Dezan Shira and Associates, 9 September 2020

16. Hi-Tech Manufacturing Talent Analysis – Vietnam, Draup, 29 June 2020

17. COVID-19 and the labour market in Viet Nam, ILO, 21 April 2020

18. Manufacturing In Vietnam: 5 Key Factors For Moving From China, Intouch, accessed as on 3 September 2021

19. Port Infrastructure in Vietnam: 3 Regional Hubs for Importers and Exporters, Vietnam Briefing, accessed as on 3 September 2021

20. Vietnam may have 26 airports by 2030, Vietnam Investment Review under the Ministry of Planning and Investment, 4 January 2021

21. Global manufacturers are flocking to Vietnam. Is it ready? Nikkei Asia, 11 November 2020

2.6. Conclusion

While Vietnam offers attractive manufacturing costs, geographic advantage, friendly trade policies and government incentives, the electronics sector faces challenges with respect to skillset of workforce, labor productivity, and infrastructure. Workforce in the electronics sector need to be equipped with skills required

for high-tech manufacturing and adoption of Industry 4.0, automation, and other technologies in order to move the sector up the value chain. The country also has lower labor productivity compared to peers in the region. Increased investments are required to develop more electronics parks and enhance seaport, airport, and road infrastructure.

Increased public, private and academic collaboration is required to infuse investment in education and develop skill enhancement programs to increase the skillset of workforce and enhance infrastructure to further strengthen Vietnam's position as an attractive destination for electronics manufacturing.



Key highlights

- Vietnam was the 8th largest electronics exporter in the world in 2020, with key exports, including TVs, transmission apparatus, mobile phones, and cameras among others.
- The Vietnamese electronics industry is attracting investments since 2019 from manufacturers looking to avoid US tariffs.
- The country's low production costs and proximity to key markets is also attracting investments, with various companies moving their production from China to Vietnam. Investments have further accelerated during the pandemic.
- Government support in the form of policies, trade agreements, and tax incentives are a boost to the sector. The EVTFA is an example of such an agreement.
- Low labor cost is a key factor making Vietnam a favorable location for electronics manufacturing. Good sea, rail, and air connectivity, and the government's plans to expand the airport and road infrastructure will also aid in the growth of the sector.



Sunrise sector: Healthcare



1. Market opportunity

With a population of more than 90 million, Vietnam is one of the most populous countries in SEA, representing a potentially large healthcare and medical equipment market. Alongside economic development, the country's healthcare system has also transformed significantly over the years. Vietnam's healthcare and pharmaceutical market is expected to witness substantial

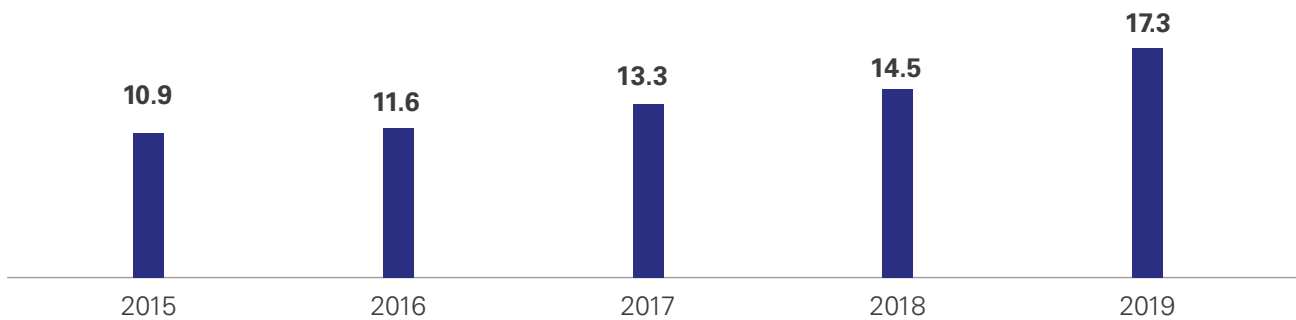
growth as the country continues to improve access to healthcare and medicines.

1.1. Healthcare spending

As a country with rapid economic growth and demographic transformation, Vietnam possesses significant opportunities in its healthcare sector. In 2019, the country's healthcare expenditure was approximately USD17 billion²²,

equivalent to 6.6²² per cent of the GDP. Healthcare spending is expected to reach USD23 billion²² in 2022, with a CAGR of 10.7 per cent over 2019 to 2022.²² Healthcare has been one of the top priorities for the government and people of Vietnam, and the COVID-19 pandemic has further accelerated the need for development of the healthcare sector in the country.²³

Vietnam health expenditure (USD billion)



Source: Healthcare spending, EIU

1.2. Socioeconomic and demographic changes

Socioeconomic and demographic changes in Vietnam provide lot of potential to develop the healthcare sector. Rapid economic development has led to the fast growth of middle-class population, thereby boosting demand for high quality and specialized healthcare services. Disposable income of citizens has rapidly increased over the past several years and is expected to grow at 6.8 per cent through 2023. Urban population is also on the rise, with an annual

growth rate of 2.8 per cent,²⁴ which is one of the fastest growth rates in the Asian region, signifying the need for expansion of healthcare facilities in the urban regions. Ageing population is another important factor, which could accelerate the development of healthcare system in the country. Currently, 11.9 per cent²⁵ of Vietnam's population is aged 65 years and above. By 2038, 20 per cent²⁶ of population is expected to be over 60 years old. Also, the

pandemic and concerns over food safety, pollution, unsafe living and working conditions are making people more willing to spend on medicines and healthcare. Life expectancy in Vietnam is also steadily increasing, thereby highlighting the need for better access to healthcare. These factors provide an opportunity for Vietnam to boost reforms in the healthcare sector to provide quality health services and improve public health.

22. Why Investors Should be Optimistic About Vietnam's Healthcare Industry, Vietnam Briefing, 5 August 2020

23. Current health expenditure (per cent of GDP) – Vietnam, World Bank, accessed on 3 September 2021

24. Investing in Vietnam's Healthcare Sector: Emerging Opportunities and Entry Strategies, Dezan Shira and Associates, 30 October 2020

25. Unlocking the Potential of the Innovative Pharmaceutical Industry in Vietnam, KPMG, accessed as on 3 September 2021

26. Why Investors Should be Optimistic About Vietnam's Healthcare Industry, 21 March 2021

1.3. Medical equipment

According to Vietnam's Ministry of Health, 90 per cent²⁷ of medical devices are imported as the country has very few local manufacturers who can produce sophisticated and specialized devices that meet international standards. Vietnam has only 50 domestic manufacturers²⁷ of medical equipment, producing simple low-value added products, such as medical beds, cabinets, syringes, gloves and others. Along with a shortage of equipment, hospitals also face a challenge of outdated equipment, which require replacement.

The medical equipment market in Vietnam is expected to reach USD1.8 billion by 2022.²⁸ The country offers significant opportunities for foreign companies to manufacture medical devices, including diagnostic imaging equipment, computed tomography scanners, surgical equipment, such as endoscopy and sterilization tools, as domestic demand for these devices is majorly met through imports.

1.4. Pharmaceuticals

The pharmaceutical market in Vietnam grew at a CAGR of 7.9 per cent to reach USD5.4 billion in 2020, over 2016. The Vietnamese government has identified the pharmaceutical industry, which employs nearly 44,000 people,²⁹ as a potential key driver of future economic growth and prosperity in its "National Master Plan for the Vietnamese Pharmaceutical

Industry Development to 2020 with a Vision to 2030". Key focus areas under the master plan include universal health coverage, patient access to quality and innovative medicine and local industry development. However, to meet the local demand, an average of 55 per cent³⁰ of medicines in Vietnam are imported every year. Local manufacturers in the country lack R&D capabilities and the ability to produce drugs meeting international standards. As of 2019, Vietnam had nearly 184 domestic and foreign pharmaceutical manufacturers operating in the market, with majority of them producing generics for local consumption. 90 per cent of the Active Pharmaceutical Ingredients (APIs) for these products are sourced primarily from China and India.²⁹

Foreign investors have significant opportunities to establish R&D facilities in Vietnam through M&A or partnerships with the local manufacturers. This would drive technology transfer, process R&D, and capability enhancement of the local manufacturers. The country's favorable demographics also make it suited for foreign companies to conduct clinical trials. Clinical trials would help boost domestic capabilities and develop an upskilled and advanced workforce of healthcare and life science professionals.

The country has the potential to become a pharmaceutical and medical hub in the region as expansion of domestic pharmaceutical products

manufacturing would subsequently have strong growth potential for pharmaceutical exports. Vietnam registered around 50 pharmaceutical industry FDI projects in 2018, with approximately 60 per cent of the projects designated as medicine manufacturing.²⁹ Foreign investors could establish manufacturing operations in Vietnam to cater to domestic demand and also export to neighbouring countries including Cambodia, Laos, Myanmar and other countries in the ASEAN region.

1.5. Recent investments in healthcare

Various companies in the healthcare sector in Vietnam have announced investments and expansion plans over the past one year. Some of the key announcements include:

- British Real Capital London's Hong Anh Medical Campus project in Ho Chi Minh City, with an investment of USD156 million³⁰
- VinaCapital's investment of USD26.7 million³¹ in Thu Cuc International General Hospital to support the healthcare provider's expansion plans
- Investment of USD203³² million in Vinmec by a consortium led by Government of Singapore Investment Corporation (GIC), to expand its medical and clinical network

27. Why Investors Should be Optimistic About Vietnam's Healthcare Industry, 21 Match 2021

28. Healthcare Resource Guide: Vietnam, Export.gov, 6 November 20

29. Unlocking the Potential of the Innovative Pharmaceutical Industry in Vietnam, KPMG, accessed as on 3 September 2021

30. Support for domestic pharmaceutical industry to rise in Vietnam, Vietnam Plus, 3 September 2021

31. USD156 million medical campus set up in Ho Chi Minh City, Vietnam Investment Review under the Ministry of Planning and Investment, 20 February 2020

32. PE Investment in Thu Cuc Intl Gen Hospital, FT Market, 10 August 2020

33. Consortium led by Singapore's GIC to invest \$203.24 million in Vingroup medical unit, Reuters, 28 December 2020

2. Sector attractiveness from supply chain realignment perspective

Overcrowded hospitals with outdated infrastructure, heavy reliance on imports for pharmaceutical products and medical equipment provides significant opportunities for the private sector and foreign companies to invest in the country's healthcare sector to construct new hospitals and upgrade infrastructure of existing hospitals and medical equipment.

2.1. Government support and incentives

- The government is undertaking several initiatives to expand and upgrade hospital networks, achieve universal healthcare coverage and increase the share of locally produced pharmaceuticals.
- To meet growing demand for medical equipment, the government has set low import duties, no quota restrictions, eased market access and has reduced regulations, providing opportunities for foreign companies. However, domestic production is also increasing with Japanese, the U.S., and European companies utilizing Vietnam's low labor costs and import tax exemptions on materials used for domestic production or assembly of medical equipment.
- **Trade policies:** The EVFTA provides significant opportunity for European companies to invest in medical equipment and pharmaceuticals in the country. For example:
 - In August 2020, a Vietnamese conglomerate entered into a partnership with an Ireland based medical device company, to produce medical

components in Vietnam. These products would be exported to Ireland and the U.S.

- A Swedish-British multinational also announced an investment of USD220 million in Vietnam, over 2020 to 2024.
- **Tax and other incentives:** Foreign companies investing in the healthcare sector are eligible for tax incentives and tax holidays. Some of the benefits include CIT incentive of 10 per cent, tax holidays of four years and 50 per cent tax reduction for nine years or five years, depending on the location of projects. Companies located in hi-tech parks are also eligible for exemption on import duty, land rental and housing, and immigration assistance.

2.2 Adoption of technology and digital healthcare

Vietnam's healthcare sector has made significant progress in terms of digital adoption, though there is potential to further develop and enhance growth of the health tech sector that is in its early development stage. Hospitals in the country have adopted health information technology systems, including telemedicine, electronic medical records, and eHealth. Nearly 95 per cent³⁴ of medical facilities in Vietnam are equipped with prescription management software to offer e-prescription to patients. As of September 2020, it is estimated that approximately 1,000 medical facilities across Vietnam have been connected by the state-owned conglomerate in telecommunication to provide telemedicine services, which is expected to reach 14,000 by 2025.³⁴

- **Initiatives by the government:** Efforts are also underway to develop platforms for telemedicine, smart health management and also build national databases for healthcare. One of the most important legal framework is Decision No. 2628/QĐ-BYT dated 22 June 2020 by the Ministry of Health on approving the scheme for remote medical examination and treatment for 2020–25, which will lay the ground for further managing, consulting, examining, treating, and support by doctors from central level to commune and lower-level health facilities.

Some of the key digital health development priorities of the government include:

- Improving legal framework relating to healthcare IT
- Developing healthcare IT infrastructure
- Establishing smart healthcare and disease prevention systems
- Developing smart healthcare administration
- Promoting R&D and international cooperation
- Developing smart medical service systems

The government has also indicated support for international corporations in digital health, particularly in areas concerning disease tracking and early warning, application-based health information, AI in diagnosis and treatment, electronic medical records, and genetic research.

34. Digital health in Vietnam, Austrade, accessed as on 3 September 2021

2.3 Conclusion

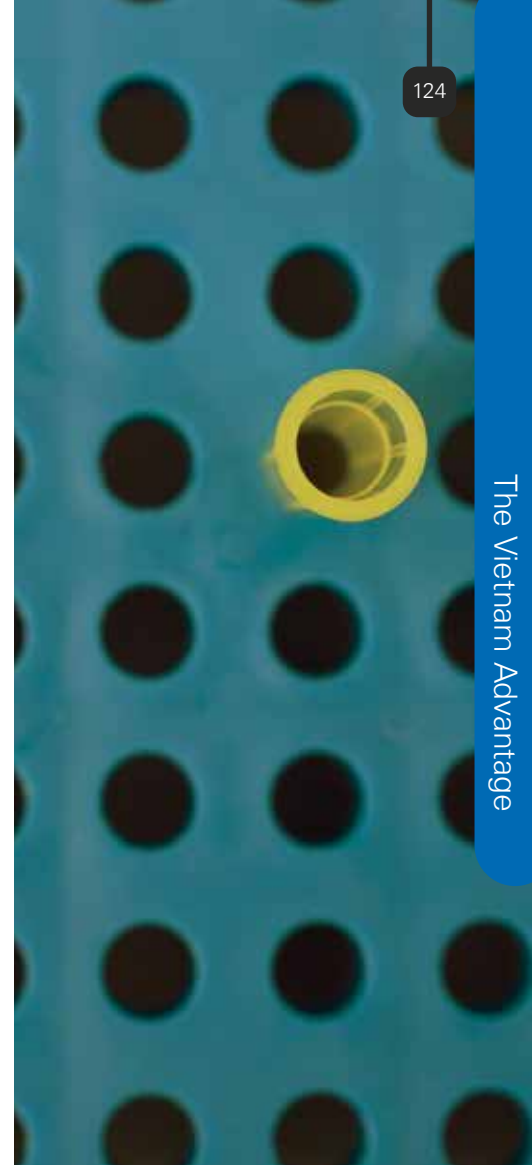
Measures undertaken by the government reflect its commitment towards creating a favorable business environment to meet the demands of Vietnam's growing healthcare sector. However, the government needs to address challenges with respect to

- **Education and workforce development:** Vietnam faces several challenges in terms of upskilling and continuously updating medical education for healthcare workers. Education programs need to be designed through collaboration between universities and industry bodies to upskill the sector's workforce
- **Limited public private collaboration:** Investors have expressed a lack of clarity with respect to regulatory framework and incentive system to explore opportunities through public private collaboration
- **Lack of clarity on policies and incentives:** While

establishing manufacturing operations in the country, investors face challenges due to lack of clarity on policies and incentives. Clearer incentives on procurement and quotas need to be established to attract manufacturers to the country

- **Unbalanced healthcare access and quality:** Unbalanced access and quality of care remain a challenging issue between the cities and the provincial areas. This has led to constant patient overloading in large public hospitals.

In this highly regulated sector, the government has to play a bigger role in promoting collaboration between industry players and other stakeholders to boost growth. It should also consider implementing targeted policies and reforms in areas ranging from investment incentives, and legislation to education, and training of healthcare workforce in the country, to tap the potential offered by Vietnam in the healthcare sector.



Key highlights

- Growing middle-class population, rising disposable income of the citizens, growth in the urban population, and an ageing population are the factors expected to contribute to a growth in Vietnam's healthcare sector.
- The present state of healthcare infrastructure and import-dependence of the healthcare sector offers significant space for investment are private sector and foreign companies in the healthcare sector of Vietnam.
- Governmental policies, such as low import duties and reduced regulations are aimed at providing opportunities for foreign companies to meet the growing domestic demand for medical equipment.
- Low labor costs and exemptions on import tax for materials used for domestic production or assembly of medical equipment from also motivating foreign companies to increase domestic production.
- Tax incentives and tax holidays are offered to foreign companies investing in Vietnam's healthcare sector, which is likely to help boost foreign investments in the sector.



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