

## OPPORTUNITIES IN THE MANUFACTURING SECTOR IN SOUTH EAST ASIA

PREPARED FOR VEDP

AUGUST 2020

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**ORISSA INTERNATIONAL**

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## 1.0 INTRODUCTION TO SOUTH EAST ASIA

Table 1: Key statistics

	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam
<b>GDP (USD Billion)</b>	1,119	364	377	372	544	262
<b>GDP Per Capita (USD)</b>	4,136	11,415	3,485	65,233	7,808	2,716
<b>Consumption (USD billion)</b>	746	261	323	172	360	195
<b>Industry (including construction) value added % GDP</b>	38.9	37.4	30.2	24.5	33.4	34.5
<b>Services value added % GDP</b>	44.2	54.2	61.0	70.4	58.6	41.6
<b>Imports of Goods (USD Billion)</b>	171	205	113	359	240	271
<b>Exports of Goods (USD Billion)</b>	167	238	70	390	245	318
<b>Total Population (million)</b>	270.6	31.9	108.1	5.7	69.6	96.5
<b>Urban Population (%)</b>	56	77	47	100	51	37
<b>Median age (years)</b>	29.7	30.3	25.7	42.2	40.1	32.5
<b>Total Area (sq km)</b>	1,811,570	328,550	298,170	709	510,890	310,070
<b>Currency</b>	Indonesian Rupiah (IDR)	Malaysian Ringgit (MYR)	Philippine Peso (PHP)	Singapore Dollars (SGD)	Thai Baht (THB)	Vietnamese Dong (VND)
<b>Average Annual Exchange Rate per US dollar (2019)</b>	14,147.67	4.14	51.80	1.36	31.05	23,050.24
<b>Official Language</b>	Bahasa Indonesia	Malay	Filipino, English	English, Mandarin, Malay, Tamil	Thai	Vietnamese

Source: World Bank, UN Comtrade, Worldometer

Note: All monetary amounts are in current USD.

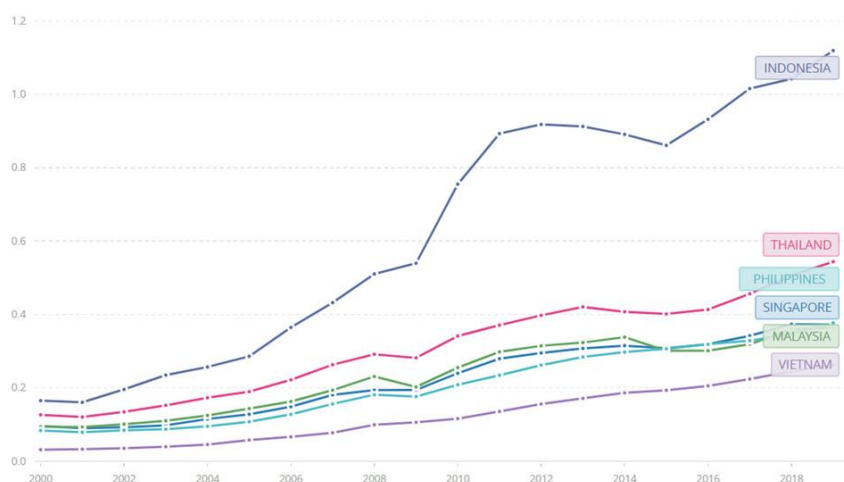


Figure 1: GDP in current USD trillion

Source: World Bank



The six major countries in South East Asia – Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam – have a combined population of 582 million and GDP of USD 3 trillion. If it were a single nation, it would be the third most populous country and the fifth largest economy in the world. It would also have the eight largest consumption expenditure globally.

The region is among the fastest growing in the world, with ASEAN (Association of Southeast Asian Nations) having witnessed an average annual GDP growth of 5.3% between 2000 and 2018, supported by an increasingly well-educated workforce, abundant natural resources and favorable geographic location at the heart of the Asia-Pacific region.

The region's population has a median age of around 30 years, providing an ample labor pool to support growth in the coming years. This youthful demographic profile also translates into receptivity to new technologies.

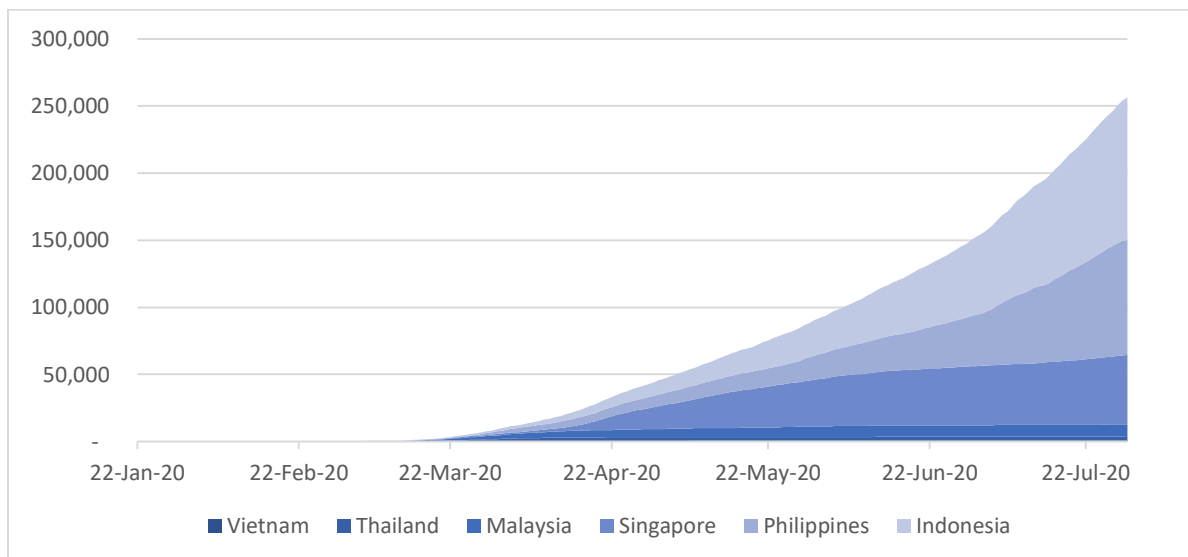
Between 2019 and 2022, 50 million new consumers are expected to join the ranks of the middle class in Indonesia, Malaysia, the Philippines, Thailand and Vietnam by 2022. The middle class will expand to include 350 million people and continue on its upward trajectory, propelled by greater access to the flourishing digital economy and aspirations to better lives for themselves, their families and their communities.

The above makes ASEAN a key export market for the US. In 2019, it was the fourth largest export destination for the US, after Canada, Mexico and China, receiving USD 108 billion worth of exports originating from the US.

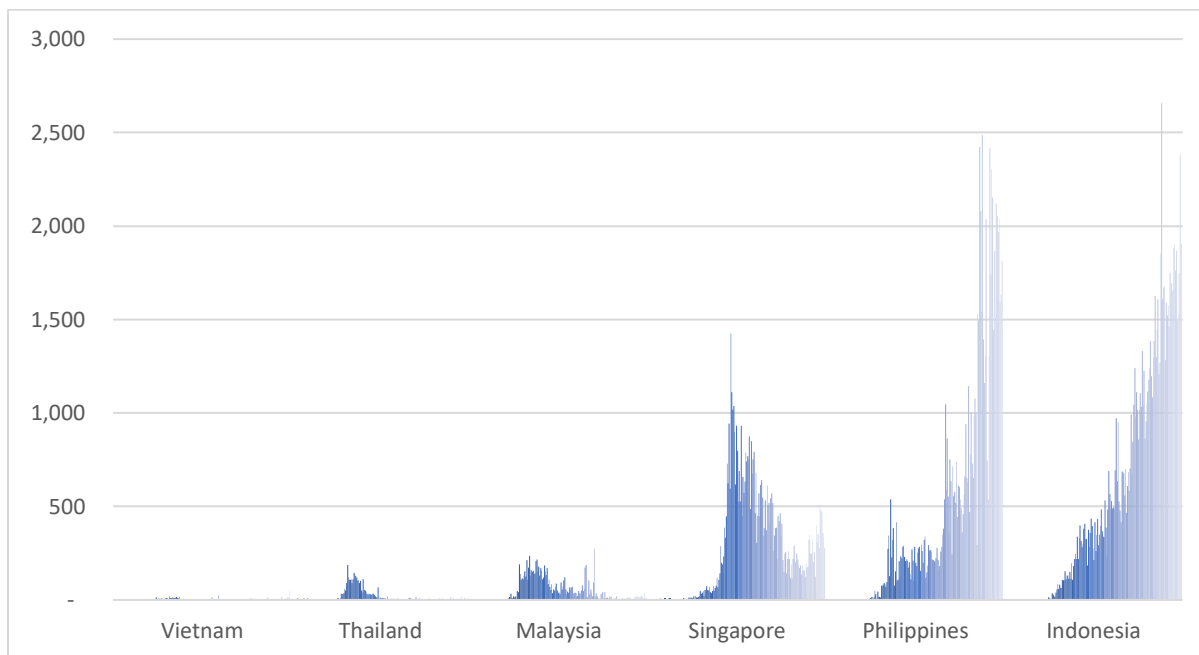


## 2.0 IMPACT OF COVID-19

### 2.1 COVID-19 Situation



**Figure 2: Cumulative confirmed COVID-19 cases from 22 January 2020 to 30 July 2020**  
 Source: Johns Hopkins University Center for Systems Science and Engineering (via United Nations Office for the Coordination of Humanitarian Affairs)



**Figure 3: New COVID-19 cases from 23 January 2020 to 30 July 2020**  
 Source: Johns Hopkins University Center for Systems Science and Engineering (via United Nations Office for the Coordination of Humanitarian Affairs)



**Table 2: COVID-19 status in 6 major South East Asian countries (statistics as of 29 July 2020)**

Country	Total Cases	Total Deaths	Cases in July 2020	Deaths in July 2020
<b>Indonesia</b>	102,051	4,901	48,041	2,147

Indonesia has the highest number of cases and deaths in South East Asia. Instead of imposing a nationwide lockdown, the central government allowed regional governments to restrict the movement of people and goods in and out of their respective localities. The capital Jakarta introduced Large-scale Social Restrictions, starting on 10 April, and this was followed by many other provinces and cities. On 4 June, Jakarta announced entry into a transitional phase, underpinned by the gradual reopening of several essential services sectors. On 14 July, Jakarta officially extended the transition phase by another 14 days.

<b>Malaysia</b>	8,943	124	309	3
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Malaysia started easing its restrictions in May and from June 10, nearly all social, economic and religious activities restarted, while adhering to safe distancing principles. This current phase supposed to last till end-August and is supposed to be a recovery phase. Local cases started to spike again in the third week of July and on 26 July, the minister in charge of managing the coronavirus outbreak said that the government will reimpose a lockdown if the number of new COVID-19 cases surpasses 100 a day.

<b>Philippines</b>	86,673	1,947	48,218	703
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Quarantine measures to contain the virus vary across the Philippines, with different degrees of restrictions, but the strictest and longest lockdown was in Manila, starting from mid-March. The city began to reopen at the beginning of June with limited public transport and offices permitted to have skeleton staff. Since then lockdowns have been re-imposed on several neighborhoods as cases jumped. Overall, cases have continued to rise throughout the country. On 31 July, the president extended restrictions in Manila until mid-August because of the continued high number of coronavirus cases.

<b>Singapore</b>	51,197	27	7,738	1
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A large number of the cases in Singapore are from foreign worker dormitories. Phase 2 of the country's reopening started from June 19, with the resumption of most activities, subject to safe distancing principles. Singapore expects to enter a new normal in Phase 3 at a currently unspecified date, where all activities would be permitted to resume, with restrictions on gathering sizes and strict safe management measures at businesses involving crowds or close contact. Singapore expects to remain in this state, until an effective vaccine or treatment for COVID-19 is developed.



Country	Total Cases	Total Deaths	Cases in July 2020	Deaths in July 2020
<b>Thailand</b>	3,298	58	135	0

Thailand ended its lockdown period on July 1, allowing all businesses to resume operations. But a state of emergency is in place to maintain control of movements into and outside of the country and for state-run quarantine and tracking. On 31 July, Thailand extended its state of emergency by another month to the end of August 2020, to reduce the risk of a second COVID-19 outbreak, as it opens its doors to select foreigners, including migrant workers from neighboring countries. Medical tourists, foreigners participating in international conferences and trade fairs, foreign film production crews and Thailand Elite cardholders (those with long-term residence visas and multiple-entry residence visas) are among those allowed to enter the country.

<b>Vietnam</b>	446	0	91	0
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Vietnam was the first South East Asian country to lift its lockdown, on 22 April. Through a centralized quarantine program and an aggressive contact-tracing system, Vietnam had managed to keep its coronavirus tally to the lowest in the region and avoid any deaths. However, on 25 July, the first locally transmitted COVID-19 infection in nearly 100 days was reported from the central city of Danang, quickly followed by several others taking the total of new cases to 30, as of 29 July. Around 80,000 tourists were evacuated from the city and all transport to and from the city was suspended. Danang has been locked down and the government has warned that every province and city in the country is at high risk of coronavirus infections.

<b>Total</b>	<b>252,608</b>	<b>7,057</b>	<b>104,532</b>	<b>2,854</b>
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Source: Johns Hopkins University Center for Systems Science and Engineering (JHU CCSE), Center for Strategic & International Studies, multiple media outlets

According to the International Air Transport Association, as of 29 July 2020, with certain exceptions such as relatives of citizens or individuals with long-term residency permits, foreigners are not allowed to enter any of these countries. Thailand has started allowing select foreigners to enter, such as those participating in international conferences and trade fairs and foreign film production crews.





## 2.2 Economic Impact

Economies in the South East Asian region have suffered due to the global impact of COVID-19, driven by decline in consumption, investment and trade. Movement restrictions imposed by governments to contain the outbreak constricted economic activity in all countries.

**Table 3: GDP growth rates**

Year	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam
2019	5.0%	4.3%	6.0%	0.7%	2.4%	7.0%
2020f (ADB)	-1.0%	-4.0%	-3.8%	-6.0%	-6.5%	4.1%
2021f (ADB)	5.3%	6.5%	6.5%	3.2%	3.5%	6.8%
2020f (World Bank)	0.0%	-3.1%	-1.9%	NA	-5.0%	2.8%
2021f (World Bank)	4.8%	6.9%	6.2%	NA	4.1%	6.8%
2020f (IMF)	-0.3%	-3.8%	-3.6%	-3.5%	-7.7%	2.7%
2021f (IMF)	6.1%	6.3%	6.8%	3.0%	5.0%	6.5%

Source: ADB, IMF, World Bank

Note:

2019 actuals are from World Bank

f=forecast

The more open trade-dependent economies of Malaysia, Singapore, Thailand, and Vietnam were also hit by slumping global trade and demand. In addition, tourist arrivals plunged in response to stringent travel restrictions and quarantine requirements, hitting the aviation, hospitality, and retail industries. Most countries in the region have relaxed restrictions, at least partially, but business uncertainty and weak consumer confidence may hinder economic recovery.

Moreover, external demand is expected to remain muted for the rest of 2020 due to global economic contraction. However, all of these economies are expected to rebound during 2021, as seen from the projections by the Asian Development Bank (ADB), the World Bank, and the International Monetary Fund (IMF). While the variation in the projections reflects the high level of uncertainty due to the rapidly evolving COVID-19 situation, the common trend in expectations is indicative of the strong macroeconomic fundamentals in the region.

### Indonesia

- Indonesia saw growth in Q1 of 2020 drop to 3.0% year on year, its slowest pace since 2001. Domestic consumption growth fell to 2.8% as households reduced discretionary spending, though public consumption picked up gradually. Growth in fixed investment decelerated to 1.7% as investment in buildings and other structures wound down and investment in machinery and equipment contracted. Meanwhile, sustained demand for palm oil and metal ores partly countered contraction in exports of services and oil and gas.



- The government has announced a fiscal stimulus package of USD 48 billion but less than 20% of this had been spent at end-July 2020. A new National COVID-19 Mitigation and Economic Recovery Committee was established on July 21 to resuscitate the economy.
- The country's COVID-19 cases still have not peaked and economic recovery will depend upon success in bringing virus situation under control and effectively roll out existing assistance schemes to help both the public health sector and ordinary Indonesians.
- The country's economic growth in the longer term is contingent on the ability of the government to renew its pre-COVID agenda to build infrastructure, invest in human capital, and pass structural reforms to reduce bureaucratic hurdles and increase private investment. The President has instructed the country's provincial governments to make preparations to grab opportunities from corporate migrations out of China, while the central government has been intensively lobbying US and Japanese decisionmakers to win their backing in making Indonesia a corporate relocation hub. At the end of June, seven foreign companies, including from the United States, Japan, and other countries, committed to transferring production out of China to Indonesia.

## Malaysia

- Growth in Malaysia fell to 0.7% y-o-y in Q1 of 2020, compared to 3.6% in the previous quarter. As the COVID-19 pandemic affected global supply chains, exports of goods and services shrank by 7.1%. Investment also declined as public investment fell by 11.3% and private investment by 2.3%. Consumption remained a bright spot in the economy, growing by 6.5% as stronger public consumption offset weaker private consumption. However, domestic consumption is expected to have contracted in Q2, due to movement restrictions. External demand is likely to be similarly weak as trade partners continue to grapple with the effects of COVID-19. With the outlook having deteriorated since ADO 2020, the Malaysian economy is expected to contract by 4.0% in 2020 before recovering to 6.5% growth in 2021.
- Initially government response was hampered by an abrupt change of government in February 2020. But since then, the government appears to have controlled local transmissions. It has also issued four stimulus packages worth a combined USD 68 billion dollars. In addition to wage subsidies and tax deductions, SMEs are receiving grants and soft loans to hire, retrain and upskill the unemployed and the youth. The government is also looking at this crisis as a catalyst for optimizing the usage of new technology, business digitalization and e-commerce platforms.
- The economy is beginning to show signs of recovery. An index of leading economic indicators rose by 0.6% y-o-y in May 2020, after rebounding from a fall of 5.7% in April 2020. The Industrial Production Index (IPI) surged 18.2% in May 2020 as compared with the previous month, though it was still 22.1% lower y-o-y. Improvement in domestic consumption and growth in manufacturing production and sales are expected to support economic recovery going forward.



## Philippines

- The Philippines contracted by 0.2% year on year in Q1 of 2020 as border restrictions slashed tourism receipts and quarantine measures depressed domestic demand. Growth in household consumption, comprising three-fourths of GDP, was flat, and investment slumped by 18.3%, as outlays for machinery and equipment went down. However, government consumption rose by 7.1% y-o-y. Exports and imports fell, as external demand weakened and supply chains were disrupted. On the supply side, all major sectors decelerated. Growth in services slipped from 7.1% in Q1 of 2019 to 1.4% with weakening transport and accommodation, food services, and trade. Industry dropped by 3.0% with lower construction and manufacturing, and agriculture fell by 0.4%.
- Going forward, the contraction in the global economy will continue to impose a drag on external trade, tourism and remittances (9.3% of GDP in 2019). Domestic consumption and business confidence could be boosted by the virus being brought under control.
- The government is relying on big-ticket infrastructure projects to counter the effect of the pandemic. In May, media outlets reported that the government was reviewing infrastructure projects from the 'Build Build Build' infrastructure plan (which entails USD 160 billion to be spent between 2017 and 2022) to identify projects with high and immediate economic impact and prioritize them.
- In June 2020, the House of Representatives passed a USD 26 billion stimulus package to help the economy recover from the coronavirus pandemic in the next four years. It is seeking to offer various forms of assistance to micro, small, and medium enterprises (MSMEs) and other key sectors affected by the COVID-19 crisis, while at the same time rebuilding consumer confidence. It is expected to generate some 1.5 million jobs through infrastructure projects and financial assistance for small businesses between 2020 to 2023. But as of end-July 2020, the bill is still pending in the senate. On 24 June, the administration announced that it was seeking a USD 85.9 billion budget for 2021 to support the economic recovery from the pandemic.

## Singapore

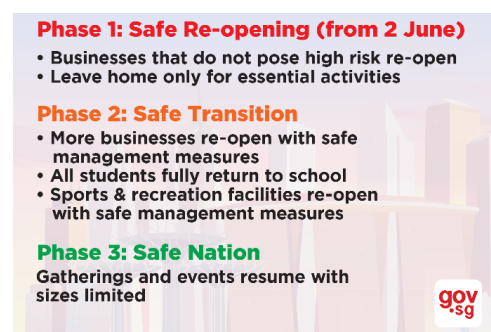


Figure 4: Singapore's three phase reopening plan  
Source: Government of Singapore



- In the second quarter of 2020, Singapore's GDP contracted by 12.6% on a y-o-y basis, following a 0.3% y-o-y contraction during the first quarter. The manufacturing sector continued to grow, expanding by 2.2% y-o-y primarily due to a surge in output in the biomedical manufacturing cluster, though it slowed down from 8.2% during the previous quarter. Weak external demand and workplace disruptions during lockdown weighed on output in the chemicals, transport engineering and general manufacturing clusters. Services declined by 13.6%, as tourism and air transport sector came to a standstill and sectors such as food services, retail and business services were affected by the lockdown. Meanwhile, the construction sector contracted by 54.7%.
- For the rest of the year, construction is expected to suffer as it grapples with interrupted supplies of materials and migrant labor. External demand and trade will be affected by supply chain disruption, but the impact may vary by industry. Oil and electronics will continue to drop, but biomedical manufacturing and precision engineering may see positive demand arising from the pandemic in the short term.
- During the first four months of 2020, the country secured USD 9.5 billion in investment commitments for the next few years, from companies such as Micron and Thermo Fisher Scientific, reflecting the sustained confidence of foreign investors in Singapore.
- The government has released four stimulus packages worth a total of USD 66 billion, to support workers and businesses. In June 2020, the government set up an "Emerging Stronger Taskforce" to establish industry coalitions to spark job growth and prototype ideas in areas such as robotics, e-commerce, environmental sustainability, digitalization of supply chains and the built environment.

## Thailand

- Thailand's economic contraction in 2020 is projected to be the worst by ADB. One reason for that is the high contribution of tourism to GDP, accounting for more than 20% in 2018 and reliance on exports, with merchandise trade at around 100% and export of goods and services at 59.7% of GDP.
- Thailand's GDP declined by 1.8% y-o-y in Q1 of 2020, as consumption and investment slumped, the public side of both categories shrinking as the budget was delayed. Private investment was hampered by weaker domestic consumption and business sentiment under the COVID-19 pandemic. On the supply side, merchandise exports grew moderately, but were constrained as declines hit exports of rice, rubber, vehicles, and chemical and petrochemical products. Service exports dropped in tandem with a significant fall in tourism receipts.
- The government expects the economy to recover gradually after hitting bottom in the second quarter. Thailand's economy improved during June from the previous month due to the gradual relaxation measures implemented in Thailand and abroad, supporting the resumption of economic activity. The Bank of Thailand (BoT) said the value of merchandise exports excluding gold, private consumption and private investment indicators, and manufacturing production contracted at a lower rate.



- The Thai government has issued two stimulus packages worth USD 70.7 billion. The Thai cabinet has also approved a USD 3.2 billion budget for projects targeted at boosting consumption and tourism and 92 public-private partnership projects worth USD 3.3 trillion are being planned to stimulate the economy. In addition, the government is planning to set up an economic recovery task force led by the prime minister, to allow SMEs (small and medium enterprises) to gain greater access to state procurement projects. State agencies may be required to buy SMEs' products or services for at least 30% of their procurements each year.

## Vietnam

- Growth in Vietnam decelerated to 3.8% y-o-y in Q1 of 2020 but recovered partially in May since the lifting of social distancing. Agriculture stagnated under lower external demand for agricultural exports and prolonged drought. Growth in services was halved from 6.5% in 2019 to 3.2% year on year in Q1 of 2020. A strong uptick in domestic tourism in May was not enough to offset a 98% drop in foreign tourists compared to May 2019. The trade surplus in January to May declined significantly as demand from the economy's principal export markets plunged. Growth is forecast to continue to decelerate in 2020 due to sharp fall in external demand. The country is highly reliant on trade, with the highest merchandise trade to GDP ratio in South East Asia at 215% in 2019, and the global slowdown will have an unavoidable impact on exports.
- Notwithstanding the slowdown, Vietnam is expected to outperform its regional peers in 2020, with GDP growth remaining in positive territory. Vietnam relied on early action, targeted testing, extensive contact tracing, effective government communication and widespread public buy-in and compliance to control the outbreak. Being the first country in the region to control the pandemic and reopen the domestic economy has given the country a head start in its economic recovery journey. The government stimulus package is the smallest in the region at USD 3.8 billion of fiscal measures and delayed collection of an estimated USD 7.6 billion in value-added tax, corporate income tax, and land rent, but the economic impact has also been the smallest.



Figure 5: A COVID-19 fight poster in Hanoi, Vietnam  
Source: Asia Power Watch (Credit: Reuters / Kham)

- Vietnam's suspension of non-essential activities lasted only 22 days, significantly shorter than many other countries, easing some of the downward pressure on consumption. Domestic spending has been a key engine of growth for Vietnam, accounting for 71% of GDP in 2019.
- Vietnam is well-positioned to attract companies seeking alternative manufacturing locations. Even before COVID-19, Vietnam was one of the principal beneficiaries of manufacturing facilities relocating out of China, leveraging its strategic location, relatively low labor costs and membership in multiple free trade agreements. In its 2020 ranking of locations for global manufacturing among 48 countries in Europe, the Americas and Asia Pacific, Cushman & Wakefield assessed Vietnam to be the second most cost-competitive manufacturing hub in the world, after China. Once the world economy begins to recover, Vietnam will be able to fully reap the benefits from this shift.



## 2.3 Key Business Trends

While nearly every sector in the six major South East Asian countries have been adversely affected by the outbreak, the virus is also creating opportunities by realigning supply chains, accelerating digitalization and automation, and driving medical sector innovation.

Corporate executives in the region are also planning their future beyond the crisis and using this as an opportunity to address issues such as technology adoption. According to a survey by consulting firm Ernst & Young that was published in May 2020, companies are taking steps to effect change in their global supply chains (50% of survey respondents), digital transformation (27%), speed of automation (SEA 33%), and management of workforce (48%).

- COVID-19 has spurred academic institutions and research organizations in the region to work together to manufacture medical equipment and kits such as negative pressure units, face shields and masks, as well as robotic transporter units. The demands imposed by the pandemic have also acted as a positive catalyst in the rapid emergence of local technologists in these fields as well as greater collaboration, such as that between medical and engineering schools and between academia and the private sector.
- The pandemic is prompting a rethink among MNCs to make their supply chain more resilient by boosting inventories and enlisting suppliers from countries such as Vietnam, Malaysia, and Thailand. Many companies are also shifting or diversifying their manufacturing operations beyond China, accelerating a trend initiated by the trade tensions between the US and China, benefiting low wage manufacturing destinations such as Vietnam and Indonesia.
- With the rise of digital technology in areas such as communications and conferences, education, financial services, medicine, logistics, lifestyle and retail, businesses providing technologies will benefit.
  - Across South East Asia, governments have committed significant funding to helping businesses complete their digital transformation. Singapore has allocated SGD 500 million (USD 364 million) to support businesses digitalize, while Malaysia has pledged around MYR 700 million (USD 166.7 million) to support digital transformation and automation in small and medium enterprises. The pandemic is forcing businesses to recognize the urgency with which they need to upgrade parts of their workflows
  - As part of a continuing study on the growth of digital consumer behavior, Bain and Facebook analyzed the buying patterns of 8,600 digital consumers in six South East Asian countries between January and June 2020. They found that the region's digital consumers expect to spend more time at home after restrictions are lifted, and they have discovered new apps that they intend to continue using. They are buying more essentials online, delaying splurge spending and are favoring value for money and trusted, established brands. In response, consumer goods companies are responding by swiftly increasing product availability and visibility online, targeting digital engagement across platforms and optimizing pricing and value perception.





**Figure 6: Findings from Bain/Facebook survey of digital consumers in South East Asia, conducted between January and June 2020**  
 Source: Bain & Company





## 3.0 INDONESIA

### 3.1 Snapshot of the Indonesian Manufacturing Sector

- Currently, Indonesia's manufacturing industry is ranked as the 12th largest in the world. The inflow of investments is contributing to an upgrade and diversification of the country's manufacturing sector, which benefits from an abundant workforce with low labor costs and strong domestic consumption. The country is on an industrialization drive, with plans to raise the GDP contribution of the manufacturing sector from 20% in 2019 to 25% by 2025.
- One of the government's top priorities is to upgrade and diversify the manufacturing sector through the 'Making Indonesia 4.0' initiative. Launched in 2018, it is designed to enhance the digitization of the manufacturing sector, and promote export-competitive industries. It includes labor-intensive industries, such as food & beverage and textile & garments, as well as capital-intensive industries such as automotive, electronics, and chemical products.
- Indonesia has seen the number of its industrial clusters increase from 74 to 87 between 2014 and 2017, as the government seeks attract foreign investments. As part of these policies, 12 special economic zones (SEZs) were created. In addition, the government is looking to inaugurate seven new SEZs in 2020.



Figure 7: Indonesia's 12 SEZs

Source: Badan Koordinasi Penanaman Modal (BKPN)

- Indonesia is opening up more sectors to foreign investors and rebooting its stringent labor laws. An important new measure launched in March 2020 allows investors to utilize global and domestic custodian banks for investment activity in Indonesia.

- Recognizing the importance of the government's policy measures and the economic growth prospects of the country, credit rating agency S&P upgraded Indonesia's sovereign ratings to 'BBB with a stable outlook', up from 'BBB-'. Moody's and Fitch followed suit.
- The manufacturing sector is concentrated on the main island of Java where manufacturers can benefit from more efficient and developed logistics and transport infrastructure.

Table 4: Indonesia's top manufacturing clusters

	West Java	Central Java	East Java	Banten
<b>Economic weight of manufacturing</b>	60% of Indonesia's manufacturing activities	30% of Central Java's GDP	Largest shipbuilding yard and cement factory in Indonesia	Resource-rich province with major steel industries
<b>Top sectors</b>	Electronics, automotive, machinery	Textiles, food and wood processing	Food industry, machinery, furniture	Chemicals, automotive, food and beverages
<b>Examples of leading players</b>	Samsung Electronics, Suzuki, Mitsubishi	Sritex, Indesso, Kutai Timber Indonesia	Cargill, Heinz, Tropica Furniture, Kubota Machinery	Dover Chemical, Lotte Chemical, Dolphin Food & Beverages Industry
<b>FDI and DDI in 2019</b>	USD 2.2 billion	USD 1.2 billion	USD 732 million	USD 732 million
<b>Opportunities</b>	Livestock and agricultural equipment	Modernization of textiles; international airports/seaports	Manufacturing parts for shipbuilding and export-driven food industry	Export-driven processing industries

Source: Orissa International

- Other parts of the country are witnessing significant investment too. For example, in 2019, Pegatron Corporation, an Apple iPhone manufacturer from Taiwan, opened a factory at the Batamindo Industrial Park in Batam worth USD 40 million. The facility is Pegatron's first operations in South East Asia with the capability to produce 2,000 pieces of miniature circuit breakers per day.
- The country's manufacturing potential remains robust despite the short-term shock brought on by COVID-19. While the IMF has lowered its 2020 GDP growth projection for Indonesia to 0.3%, it expects growth to bounce back to 6.1% in 2021.
- The government announced various fiscal and non-fiscal stimulus measures to counter the negative impact of worldwide lockdowns on the local and global market. For example, the government announced tax breaks for manufacturing industries worth USD 1.46 billion. Manufacturing workers with incomes below USD 14,095 per year are exempted from paying income tax. Corporate income tax for the manufacturing sector has also been cut by 30% and import tax payments deferred.



## 3.2 Industrial Automation in Indonesia

### OVERVIEW

- A key engine for the development of the industrial automation sector is the 'Making Indonesia 4.0' roadmap which aims to transition Indonesia from a resource-based to a knowledge-based economy through the development of technologies such as 3D printing, artificial intelligence (AI), human-machine interface, robotics and sensor technology. The impact of the COVID-19 outbreak has given a new sense of urgency for the implementation of these solutions.
- Examples of companies in Indonesia that have integrated AI and digitalization solutions into their production processes include the world's largest coffee candy manufacturer Mayora, garment producer Sritex, and carmaker Toyota Indonesia.
- The country hosts several Advanced 4th Industrial Revolution (4IR) Lighthouses identified by the World Economic Forum.
  - Schneider Electric's smart factory in Batam, which aims to kickstart Industrial IoT in Asia, is designated as a 4IR Lighthouse. Being part of the global Lighthouse network means Schneider Electric will be able to share knowledge and best practices with peers and engage in new forms of collaboration.
  - Mining company Petrosea transformed itself from a loss-making mine in a remote location (Tabang) into a profitable entity in six months, through Industry 4.0 techniques such as optimized truck dispatch, real-time monitoring, and drone surveys.
- Rockwell, one of the leading automation equipment manufacturers in Indonesia, estimates that the largest buyer of automation equipment is the oil and gas industry. In effect, the industry is one of the largest in the country and companies are investing in integrated automation technologies to be more transparent, given the various regulations related to performance, and tighter limitations on carbon emissions.
- Another leading provider of industrial automation solutions in the country is Universal Robots (UR). An interesting example of a project undertaken by the company is its collaboration with PT JVC Electronics Indonesia (JEIN), a manufacturer of car audio-visual and navigation devices, which has reported reductions of operational costs by more than USD 80,000 yearly thanks to UR's solutions.



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## OPPORTUNITIES

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- One of the promising segments to consider is the automotive industry, which is one of five priority areas in Indonesia's Industry 4.0 roadmap. For example, in May 2020 Hyundai Robotics supplied 370 industrial robotic arms to Hyundai Motors' automotive plant in Indonesia. The Indonesian plant will also be implemented with cutting-edge technologies such as automatic recognition of car types and specs, real-time equipment inspection, and preventive diagnosis.
- Special industrial areas should also be among prime targets, as they represent the environments with the highest concentration of manufacturers, which often have large scale operations and the need to automatize processes. Tellingly, it is at the Delta Silicon Lippo Cikarang industrial park in the Jakarta Eastern Corridor that PT Softpren Industries Indonesia, a Japanese company engaged in the field of industrial automation, began operations from its newest factory in January 2020.
- An additional opportunity area is offered by collaborations with network providers. An interesting case is represented by the partnerships that Microsoft and Telkomsel announced in May 2020. One of the key part of the agreement is the development of digital enterprise solutions that utilize Microsoft's technology platforms for the energy and manufacturing industries, offering IoT, Data Hub, and AI. Microsoft will also facilitate technical and sales empowerment, prepare development programs, provide sales resources, and help Telkomsel improve its sales capabilities.
- Indonesian public institutes are collaborating with foreign players. For instance, in June 2019, the Ministry of Industry of Indonesia announced a collaboration with the Industrial Technology Research Institute of Taiwan and management consulting firm McKinsey to establish a Digital Capability Center (DCC) for the development of Industry 4.0 in Indonesia. A similar agreement was reached with the Fraunhofer Center of Germany.
- In this context, it is also worth highlighting that as part of the Making Indonesia 4.0 initiative, in 2019 the government introduced a super deductible tax program for a set of strategic activities, which include a 300% deduction for investors that undertake R&D activities in the country. Spearheading research efforts in the country is automation specialist ABB Indonesia, which established an R&D center in Bali with 70 local engineers.
- A further possibility for Virginian companies is to provide robots and automation solutions for the Indonesian industrial farming sector. Key opportunity areas include technologies for crop storage, industrial fishing, and smart logistics. Interestingly, it is reported that Australian engineers from the Australian Centre for Field Robotics at the University of Sydney are working with Indonesian farmers to see how agricultural robots and 'data farming' can improve efficiency.



### 3.3 Plastics in Indonesia

#### OVERVIEW

- There is considerable potential for development in the Indonesian plastics industry in Indonesia. It is a vital sector with upstream, intermediate, and downstream scope that is needed by many other industries, and has also a diverse product range. The number of companies in the plastics industry is currently 925, employing 37,327 workers, and producing 4.68 million tons of products. National demand has increased by 5% to 4.6 million tons in the last five years. As it develops, the plastics industry faces various challenges, including supply and demand for raw materials such as polyethylene and polypropylene.
- Many upstream petrochemical industries in Indonesia do not have oil refineries that produce plastics raw material. This limited processing capacity necessitates the importation of 1.6 million tons of naphtha raw materials and 33 million barrels of condensate annually.
- It is estimated that up to 70% of Indonesia's plastic waste goes to landfills, about 15% ends up in rivers and seas, and only about 10% to 15% percent is recycled. In effect, Indonesia is the second-largest ocean plastic polluter in the world – responsible for 1.29 million metric tons (MMT) of mismanaged plastic waste that every year enter the oceans. The urgency of solving the environmental and economic problems created by the country's high levels of plastic pollution are spurring the government to take action. Importantly, in 2020 Indonesia committed to the development of the first national strategy on circular economy.
- About 40% of plastics collected from landfills is rejected by recyclers in the country, as they are mixed with other wastes, and cannot be properly processed into new raw materials. Indonesia's big recycling companies accept only high-grade, clean plastic waste that is not mixed with other materials — which is used to make water bottles, cups and straws, or plastic pellets sold to other manufacturers. Many of these major recyclers turn to imports to meet their requirements.
- In May 2020 it was announced that the capital of Indonesia, Jakarta, decided to ban single-use plastics starting on 1 July 2020. Based on the new regulation, shopping centers, supermarkets and traditional market must offer environmentally friendly shopping bag as an alternative. Aside from Jakarta, there are four cities which have banned the use of single-use plastics. They are Banjarmasin, Balikpapan, Bogor and Bali. This initiative is part of the country's overall goal to lower plastic waste by 70% through reduction, reuse and recycling by 2025.



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## OPPORTUNITIES

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- An opportunity is represented by the growing recycling industry. Examples of companies expanding into this area in Indonesia include local firm PT Tridi Oasis Group which in May 2020 received USD 6 million in investment from Singapore-based Circulate Capital in order to set up a recycling facility outside of Jakarta to recycle PET and other types of plastic. The company developed an integrated process to collect, sort and recycle difficult-to-manage flexible plastic for its own production of flexible products (such as shrink wrap and films) and to sell as high-quality recycled plastic granules to manufacturers across the country.
- Major Indonesian companies have begun plastic recycling programs in which plastic packaging is recycled and processed into other products, such as pallets and construction material. Leading players include Instant noodle producer Indofood, publicly listed food company PT Mayora Indah, and Coca Cola Indonesia.
- Plastic bottle producers represent a potential target. An example is offered by Danone-AQUA, Indonesia's largest bottled water company, which worked with Veolia Services Indonesia, the French global waste management company, for building the largest PET recycling and reprocessing factory in the Pasuruan district in East Java. In 2019 Danone made a commitment to collect more plastic waste than it produces by 2025. Coca Cola also recently launched a new production line called the Affordable Small Sparkling Package (ASSP) bottle. The technology was developed in partnership with German company KHS GmbH, and it enables Coca Cola to produce the first high quality lighter plastic bottles of its kind in Indonesia, and reduce plastic usage by more than 40%.
- An interesting opportunity is the emergence of bio-materials as alternative for plastics. Indonesia, which is the world's second largest producer of seaweed behind China, producing about 8 million tons a year, is currently experimenting with seaweed as an alternative to plastic. For example, Jakarta-based start-up Evoware produces edible seaweed cups, edible food wrapping and single-use sachets.
- As Indonesia lacks advanced capabilities for waste treatment, foreign companies are successfully entering the market through this channel. For instance, in February 2020, it was announced that British recycling company Plastic Energy Ltd is investing USD 200 million to build waste-to-fuel plants in several cities across the province. The plants will convert low-grade plastic waste into diesel fuel. Each plant is expected to process 70 tons of low-grade plastic waste per day, producing 860 liters of fuel per ton of waste, comprising 80% diesel and 20% naphtha.
- Interestingly, foreign companies are also offering ICT solutions and funding to help tackle Indonesia's plastics waste problems. A case in point is offered by Google, which in 2019 offered USD 25 million in research funding to the Bali-based Gringgo Indonesia Foundation to develop AI technologies for sorting and reducing plastic waste.



## 3.4 Automotive in Indonesia

### OVERVIEW

- Indonesia represents the largest automotive market and the second largest automotive producer in South East Asia. Crucially, the government is being proactive in encouraging the development of the segment, and the automotive industry is one of the five key focuses of the 'Making Indonesia 4.0' roadmap.
- The impact of COVID-19 on the automotive industry has been severe, with the Association of Indonesian Automotive Industries estimating that sales of cars for 2020 will be 50% below the initial target of 1.1 million units.
- However, international analysts such as Fitch Solutions still consider that the Indonesian automotive industry remains one of the most attractive globally because of low labor costs combined with a pool of 1.5 million autoworkers in the country who are qualified as skilled workers.
- In 2019, the Ministry of Industry announced that the country aims to become the largest low emission vehicle manufacturer in ASEAN, focusing on Electrified Vehicle (EV) technology, which can benefit from the country's rich supplies of nickel laterite ore, a key component of EV batteries. Importantly, the country has banned exports of the mineral.
- Under official targets, Indonesia is expecting EVs to make up 20% of its entire vehicle market by 2025. Domestic production is expected to commence in 2021.
- In 2019, the government announced a set of incentives targeted at vehicles made from domestic components, as well as at providers of battery swap services and battery waste recycling, charging station installers and other EV infrastructure.
- In terms of local content requirements, two-wheeled EVs must have at least 40% Indonesian parts to qualify for a subsidy from 2023 going forward, and at least 80% from 2026. Four-wheeled vehicles must be at least 35% made in Indonesia by 2021, and 80% by 2030.

### OPPORTUNITIES

- An immediate opportunity is represented by the country's competitive manufacturing costs, which have attracted international manufacturers. One of the latest to come to Indonesia is Hyundai Motor, which in November 2019 struck an agreement with the Indonesian government to produce cars with auto parts supplied by local partners. This is the first time the Korean automaker will produce cars overseas without using Hyundai Mobis, the spare part manufacturing arm of Hyundai Motor Group. Hyundai Motor announced that it will invest around USD 1.55 billion in the Indonesia auto manufacturing plant until 2030, for product development and operational costs.



- Virginian companies are advised to consider the country's rapidly-developing EVs ecosystem. Key companies that are investing in the segment include:
  - Toyota which in 2019 announced that it will invest USD 2 billion to manufacture EVs in Indonesia over the next four years, starting with hybrid vehicles and gradually transition to EVs.
  - Mitsubishi announced in mid-2018 it will partner with the Indonesian government to investigate infrastructure able to accommodate EVs.
  - Meanwhile Hyundai plans to make Indonesia one of its car export hubs, planning to produce EVs with an investment of USD 2.8 billion. The company will commence manufacturing in 2021, aiming for an annual production capacity of 70,000-250,000 cars, including sport utility vehicles, multipurpose vehicles, sedans, hatchbacks as well as electric cars.
- In this context, another key area of opportunity is represented by the development of batteries for EVs, given the country's mineral reserves. French miner and metals producer Eramet has recently decided to open its Weda Bay nickel plant ahead of schedule, targeting a production of 30,000 tons per annum. Chinese battery firm, GEM Co Ltd, plans to start the trial production at its Indonesian nickel and cobalt plant in August 2020. The company expects full operation of the plant by end of 2020. Moreover, Tesla, Volkswagen and LG Chem have expressed interest in building plants for manufacturing batteries for electric vehicles in Indonesia.
- It should also be highlighted that ride-hailing company Grab already has one of the largest EVs fleets in South East Asia, with 200 units of the Hyundai KONA model in Singapore. In Indonesia, Grab has negotiated a deal with state electricity firm, PLN, to co-build a network of EV charging stations. Moreover, Grab announced partnerships with carmakers such as Hyundai, Astra Honda Motor (AHM) and Gesits, to launch a trial of EVs and electric motorcycles in the Greater Jakarta area. For two-wheeled vehicles, Grab is testing 20 electric motorbikes with AHM and Gesits in order to test the feasibility of EV motorbikes on all trips with Grab, including food and goods delivery services in Jabodetabek (the Jakarta metropolitan area, which includes the national capital Jakarta as the core city as well as five satellite cities and four regencies).
- Finally, an interesting point to take note of is the announcement made in February 2020 by Indonesia's President that only autonomous and electric vehicles will be allowed to circulate in the new city that is currently being developed on Borneo island, and which will become Indonesia's capital in 2024. In the early stage, buses will be the first autonomous vehicles as there is no specific infrastructure needed.













## 4.0 MALAYSIA

### 4.1 Snapshot of the Malaysian Manufacturing Sector

- Malaysia has a well-diversified economy, having developed a leading position in the production and export of palm oil, softwoods, petroleum, electronics, chemicals and medical technologies. With over 5,000 foreign companies operating in the country, Malaysia is gearing into becoming a high-end manufacturing base. The World Bank predicts that the country will become a high-income economy by 2024.
- Malaysia is highly reliant on international trade, with a trade to GDP ratio averaging over 130%. The country is part of numerous trade agreements such as the Trans-Pacific Partnership (TPP) Agreement and the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP).

Table 5: Share of exports by product in Malaysia, 2019

Electronics 37.8%	Petroleum products 7.2%	Chemicals 5.8%	Palm oil & related 3.9%
			
Manufactures of metal 4.2%	Machinery & equipment 4.2%	Liquid natural gas 4.2%	Scientific equipment 3.9%
			

Source: Asia Briefing

- Malaysia has been one of the top five beneficiaries of the US-China trade war, especially in its exports of electronic integrated circuits and semiconductor devices. For instance, in 2020 Lam Research Corporation, a California-headquartered global supplier of innovative wafer fabrication equipment and services to the semiconductor industry, announced that it had selected Batu Kawan Industrial Park in Penang as the location for its new advanced technology production facility.
- In effect, an important feature to highlight is that the state of Penang makes up 42% of the total investment directed toward Malaysia's manufacturing sector. Other examples of recent investments in Penang include US semiconductor company Micron Technology Inc.'s new solid-state drive assembly and testing center, and Florida-based Jabil Circuit Inc.'s purchase of 20 acres of land to expand a facility that manufactures electronics and technology companies targeting the enterprise, industrial, medical and aerospace sectors.
- In 2018, Malaysia rolled out its Industry4WRD policy, with the aim to drive digital transformation in the manufacturing sector. The objective of the national policy is to position the country as a primary destination for smart manufacturing and attract more high-tech investments. Industry4wrld aims to



increase labor productivity by 30%, achieve USD 93.9 billion contribution to GDP by the manufacturing sector and 35% high-skilled workers in manufacturing sector by 2025.

- Malaysia also created six economic corridors, which function as special economic zones offering incentives to companies operating in selected sectors.



**Figure 8: Malaysia's economic corridors**

Source: Asia Briefing

- In June 2020, Malaysia announced plans to set up a new unit called the Project Acceleration and Coordination Unit (PACU) to facilitate the approval process and speed up the implementation of approved manufacturing projects nationwide. Under the unit, manufacturing license approval process for non-sensitive industries will be shortened to just two business days.
- The PACU plan is part of Malaysia's new National Economic Recovery Plan (PENJANA), wherein 40 initiatives worth USD 8.2 billion have been announced to counter the economic effects of the COVID-19 pandemic, offering tax and investment incentives for domestic and foreign investment. The government has also announced a full 10-year exemption for companies in the manufacturing sector with investments ranging from USD 70 million to USD 117 million, while investments exceeding USD 117 million will enjoy a full tax exemption for 15 years.
- Thanks to the Malaysian government's stimulus measures, the International Monetary Fund has projected that the country's real GDP will grow at a rate of 9% in 2021, the fastest among the five major developing economies in ASEAN.

## 4.2 Industrial Automation in Malaysia

### OVERVIEW

- As Malaysia moves up the global manufacturing chain, industrial automation solutions are becoming more common. Today, robots are already being deployed in the country's key industries, including electronics, automotive, semiconductor, furniture, and consumer products. McKinsey estimates that the work of 4.5 million workers in Malaysia could be automated by 2030.
- There are about 120 major companies in Malaysia that can produce advanced handling systems for full automation and incorporate intelligent robots, including machine-to-machine communication. Players with global recognition include ViTrox Corp, SRM, Visdynamics Holdings and the Walta Group.
- The government has set out a series of incentives to help companies automate their processes. One of the most important is the Automation Capital Allowance (ACA), thanks to which Malaysian manufacturers can claim up to 200% allowance for a fixed amount of qualifying capital expenditure.
- According to the International Federation of Robotics, Malaysia is well below the global average for the deployment of industrial robots, estimated at 74 per 10,000 people in 2017. SMEs have proven to be particularly slow to adopt these technologies.

Table 6: Installed industrial robots per 10,000 employees, selected countries

Country	Industrial robots, 2017
China	68
New Zealand	49
Thailand	45
<b>Malaysia</b>	<b>34</b>
Mexico	31
Brazil	10
Indonesia	5
Philippines	3

Source: International Federation of Robotics

- Moreover, the government of Malaysia has developed new instruments to support businesses weathering the impact of the COVID-19 pandemic. For instance, Malaysian Technology Development Corporation (MTDC) is introducing robotics, autonomous robotics, 3D printing and drone technologies as production solutions for local small and medium enterprises. It is reported that MTDC is working with a group of companies to deploy autonomous robots in a pilot project at the Hospital Universiti Kebangsaan Malaysia and at the Malaysia Agro Exposition Park Serdang.



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## OPPORTUNITIES

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- Because Malaysia is starting from a relatively low-base, the market presents untapped opportunities, and it is predicted to become one of the fastest-growing in the region. Recognizing the potential of the country, Universal Robots (UR), a Danish robotics firm which is among the leading providers in Malaysia, recently decided to double its distribution network in Malaysia. The company now has a growing network of distribution partners in three main regions – the Klang Valley, Johor Bahru and Penang. UR's robots are distributed by Bizit Systems, EPCO Precision, Multitrade Asiapac, Servo Dynamics, T.E.M. Engineering and TMS Collaboration Automation.
- State investment corporations are actively looking to attract companies specialized in industrial automation. For instance, Malaysia's Johor Corporation (JCorp) is partnering with China's Siasun Robot Investment to develop a large-scale center for robotics research and development. The project, worth USD 3.5 billion, is called the Robotic Future City, and is meant to be a regional base for Siasun's products, including robotics equipment and components, with parts production facilities, R&D labs, and a service center.
- Key targets are represented by American manufacturers which have operations in Malaysia, as such companies are more likely to implement automation solutions in their processes. A good example is represented by SMART Modular Technologies, a leading manufacturer and supplier of specialty memory and storage solutions that is headquartered in California. In 2019, it announced a collaboration with IBM to transform its manufacturing operations in Penang by deploying collaborative robots (COBOTS) powered by IBM PowerAI Vision. In parallel with factory automation, IBM launched a new skills program to upskill and reskill SMART's workforce with new capabilities and expertise aligned to key Industry 4.0 needs such as AI, manufacturing services integration, and data analytics.
- It should be highlighted that Malaysia has one of the largest fruit-processing industries in the region, and local players are focusing on automatizing their processed in order to increase their competitiveness in global markets. For example, in 2020, Pahang's state-owned agriculture agency formed a new company called RPDP-PKPP, which will build, own and operate a large-scale durian processing facility in the Raub district of Pahang state with an investment of around USD 9.2 million. The durian processing facility, which is set for completion by June 2021, will be the largest producing frozen whole fruit, pulp and paste in Malaysia, with an initial freezing capacity of 3,500 metric tons per month thanks to its highly-automated processing lines.
- Finally, another opportunity is represented by logistics automation solutions. A company successfully capitalizing on the local demand is Swisslog, which in 2018 won a USD 15 million project for automating bottled water products maker Spritzer's warehousing and production facilities. In 2020 it received a major order from IKEA Supply Malaysia for automating its regional distribution center in Selangor, the largest in the Asia Pacific region.



## 4.3 Plastics in Malaysia

### OVERVIEW

- The plastic industry is a vibrant industry in Malaysia's, valued at USD 7 billion in 2018. Malaysia has the highest annual per-capita plastic packaging consumption in ASEAN, at about 16.8 kg per person. Consequently, Malaysia aims to become a plastic recycling hub for the region.
- Being an export-oriented economy, a large number of Malaysian manufacturers utilize plastic parts and components as well as plastic packaging materials, with Malaysia being recognized as a top exporter of plastic packaging materials among the Asian countries.
- The two most important polyolefin in Malaysia are polyethylene (PE) and polypropylene (PP). The consumption of imported recycled materials is high among local companies, but Malaysian plastics recyclers are able to recycle plastics from only three out of seven types: PET, HDPE and PP.

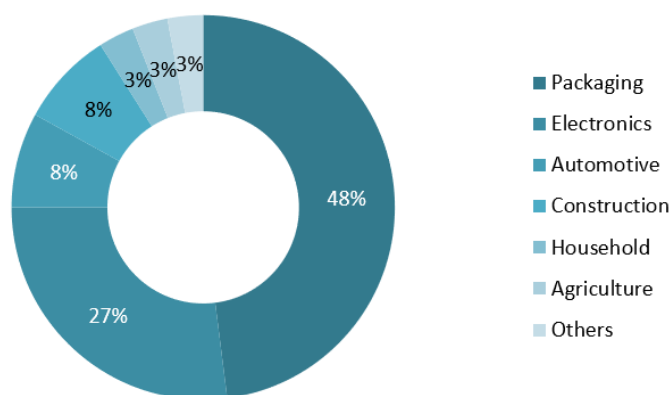


Figure 9: Major Market Segments for Plastics Products

Source: Malaysian Plastics Manufacturers Association

- In 2018, Malaysia launched a 'Roadmap Towards Zero Single-Use Plastic 2018-2030'. During Phase 1, the country will implement a nationwide charge on plastic bags and a ban on plastic drinking straws. In Phase 2 (from 2022-2025), Malaysia plans to significantly increase the expansion scope of biodegradable and compostable plastic products for local use by providing R&D funding on alternative eco-friendly products.
- Malaysia became the leading alternative destination for plastic scrap after China banned imports of such waste. However, in 2019, Malaysia restricted the import of plastic scrap and returned over 3,300 tons of plastic waste to source countries, including UK, US, and Canada.
- Interestingly, the COVID-19 outbreak led manufacturers to develop new products. For instance, the Malaysian Plastics Manufacturers Association is working with a team of local public health and medical experts to produce specialized swab sticks to be used in COVID-19 tests.

- More attention is being paid to certification in plastics recycling in Malaysia. For example, Heng Hiap Industries, a leader in plastics recycling in Malaysia collaborated with two bodies — Control Union and Zero Plastic Oceans — to develop the world’s first third party-verified label, known as the Ocean Bound Plastic (OPB) Certification to certify goods made out of plastic that was destined to be otherwise dumped into the ocean. This certification has become the de facto industry standard for plastic recycling in Malaysia.

## OPPORTUNITIES

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- Many of the existing plastics recycling plants in Malaysia are small operations that are looking to upgrade their capacity, and require better equipment for mechanical recycling, plastic waste labelling and segregation technologies to increase the volume and quality of plastic waste produced. These require modern plastic waste management infrastructure and systems.
- A key target is Petronas, the local oil and gas giant, which has a history of partnering with foreign companies on plastic recycling projects. For example, in June 2019, it commenced a partnership with London-based Plastic Energy, which uses Thermal Anaerobic Conversion technology to convert end-of-life plastic waste into a new feedstock (Tacoil) to create clean recycled plastics or alternative low-carbon fuels. The collaboration includes a feasibility study to establish a facility able to convert plastic waste into Tacoil. The outcome of the feasibility study will inform whether Petronas and Plastic Energy will build a commercial plant in Malaysia.
- A further opportunity is represented by the fact that the government and other actor from the public sector are promoting the development of eco-friendly products. An illustrative example is offered by the project launched by the state of Sabah, which in February 2020 announced the creation of a three-party joint venture called Benta X Project to use technology to convert waste from the timber industry into biodegradable plastics. The venture, which is anticipated to produce 10 million tons of biodegradable plastics over 15 years, will commence operations in 2021.
- The market offer opportunities for innovative new solutions, too. For instance, in 2019 it was revealed that the Public Works Department (PWD) of Malaysia, through its Centre of Excellence for Engineering and Technology (CREATE), is studying road pavement technology utilizing asphalt from waste plastic and latex, in its effort to reduce maintenance costs of retarring asphalts roads which are prone to pothole formation. The study is expected to be concluded in two years. Based on PWD’s accounts, around 2% of the kind of plastic waste generated in Malaysia is usable for the road paving industry.
- Lastly, it should be highlighted that in 2019, it was announced that the Malaysian government is looking to introduce a centralized plastic recycling hub to better monitor and manage the industry. All plastic waste recycling factories outside the park will be considered illegal once the new facility is constructed.



## 4.4 Automotive in Malaysia

### OVERVIEW

- Malaysia is the third largest automobile manufacturing country in ASEAN. In 2019, Malaysian automobile manufacturers produced around 572,000 vehicles, with 534,000 of them being passenger cars. The automotive sector contributed an estimated 4.3% to Malaysia's GDP in 2019. Exports of parts and components by local vendors in 2019 reached MYR 13.7 billion (USD 3.3 billion) and have been recording positive year-to-year increases since 2014.

Table 7: Car productions in ASEAN countries, 2019

Country	Passenger vehicles	Commercial vehicles	Total, 2019
Thailand	796,304	1,217,406	2,013,710
Indonesia	1,045,666	241,182	1,286,848
Malaysia	534,115	37,517	571,632
Vietnam	129,006	47,197	176,203
Philippines	57,238	37,856	95,094

Source: ASEAN Automotive Federation

- Local manufacturers dominate the market, accounting for over 60% of total sales. The key local players are automobile producers Perodua and Proton. The former continues to dominate the passenger vehicle segment with a 44.3% market share in 2019, followed by the latter in second place with 18%. However, they are facing fierce foreign competition, as Honda and Toyota have gained momentum in the Malaysian market, with Honda claiming a 15.4% share of the market.
- It should also be highlighted that Malaysia has the highest vehicle density in the ASEAN region, with around 370 cars per 1,000 people.
- An important development took place in February 2020, when the country launched the National Automotive Policy 2020 (NAP 2020), which aims to propel the country to become a regional leader in automotive manufacturing, and offers a series of incentives to producers. Key goals include: transforming Malaysia into a regional hub for energy-efficient vehicles; expanding digital and ride-sharing solutions; and reducing carbon emission to 5.3 Lge/100km by 2025.
- Interestingly, Malaysia announced that the third national car will be an energy-efficient vehicle. Malaysian firm DreamEDGE has been chosen to lead the plan to develop the project, in collaboration with Daihatsu Motor. The first model is expected to be ready by 2021 and mass production to be initiated by 2031. The company will not build a new factory but will utilize its existing facilities. Daihatsu Motor will provide advanced technological support.



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## OPPORTUNITIES

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- As the country strives to become a leader in car manufacturing, there is a growing opportunity to supply automotive parts, and also collaborate with Malaysian players for local manufacturing. For example, in April 2020, MCE Holdings Bhd, one of the largest automotive electronics and mechatronics parts manufacturers in Malaysia, entered into an agreement with Taiwan-based Juoku Technology Co Ltd to develop, produce and supply automotive lighting parts in Malaysia. Under the partnership, MCE will manufacture, assemble and promote automotive lighting parts, while Juoku will provide the technology for product development and technical assistance to manufacture them.
- It should be highlighted that Malaysia is taking significant steps toward the domestic production of energy-efficiency and electric vehicles (EVs), opening up opportunities. Importantly, the country has initiated a feasibility for its first EV smart manufacturing plant to be set up on a 162-hectare site at the Enstek Industrial Park in Nilai, Negeri Sembilan. The plant requires an investment of USD 1.2 billion, with local and foreign investors expected to partake in the project. The plant is expected to design and manufacture vehicles for local and foreign markets and will be operated using Industry 4.0 technologies, with robotics and AI integrated into the entire supply chain, from design to sales and marketing phases.
- The country is also looking at EV vehicles for its public transport network. The Malaysian Green Technology and Climate Change Center (MGCC) estimates that up to USD 34 million of investments from potential investors will be required to reach the goal of 100 electric buses for public transit. Several implementation mechanisms are being explored, including outright purchase, leasing and transit-oriented developments. In March 2020 MGCC signed a memorandum of understanding with Malaya Green Builder Energy Sdn Bhd (MGBE) and KC Express Co Ltd (KC Express), a Taiwanese firm specializing in total mobility solutions for the introduction of electric buses in Malaysia.
- MARii is seeking to set up a facility to manufacture lithium ion batteries of the type used in Tesla vehicles, in terms of size and energy retention. According to MARii, the batteries can be used not just for powering electric and hybrid cars and buses, but they could also be used in solar energy storage systems in rural areas in Sabah and Sarawak that are off the utility grid.
- A further opportunity is represented by R&D collaborations with local players. Malaysia is collaborating with China to develop South East Asia's first next-generation vehicle (NxGV) hub in Cyberjaya. In 2020, an agreement was inked between MARii and China Automotive Technology and Research Center Co Ltd (Catarc) on knowledge transfer, standardizing technical standards and constructing facilities for a full-fledged NxGV test center. Proton has also agreed to launch related academic and human capital development programs.





## 5.0 PHILIPPINES

### 5.1 Snapshot of the Philippine Manufacturing Sector

- The manufacturing sector contributes to around 22% of the Philippines’ GDP. Major industries within the sector include semiconductors, electronic components, refined petroleum products, computer, peripheral equipment and accessories, and processed food.
- The Philippines has 12 special economic zones, which are also called free port areas and are mostly located around Central Luzon, 22 specific agri-business zones, and further 380 economic zones spread throughout the country. These economic zones are classified into manufacturing/export zones, tourism, digital parks, and medical tourism parks. There are seven main investment promotion agencies (IPAs) with the largest being the Philippine Economic Zone Authority (PEZA).

Table 8: Economic zones in the Philippines

IT parks 283	Export zones 74	Agroindustrial parks 22	Tourism ecozones 19	Med-tourism parks 3
				

Source: PEZA



Figure 10: Regions of the Philippines  
Source: PEZA



- As reflected in the high number of IT parks, the electronics manufacturing industry is one of the biggest economic drivers of the manufacturing sector in the Philippines. It mostly focuses on the production of semiconductors and it is heavily export-oriented, representing more than half of the country's total exports.
- However, the Philippines aims at moving upwards in the value chain, and it strives to attract global manufacturers which can lead to technological spillovers. In this sense, it is worth highlighting some noticeable developments, such as the decision of New Kinpo Group (NKG), one of South East Asia's leading electronic manufacturing companies, to expand its operations in the Philippines, establishing a 24,000 m<sup>2</sup> facility in Lipa City in 2019; and the recent announcement of Cirtek Holdings Philippines Corporation, a contract manufacturer of semiconductor devices, winning a contract to manufacture components for 5G wireless systems for a US-based technology company.
- The Philippines has a rapidly expanding foods and beverage manufacturing sector. The industry's gross value-added output amounted to USD 32.5 billion in 2018, 7% higher than the previous year. Approximately 90% of industry output is for domestic consumption. While most of the roughly 500 food and beverage processors registered under the Philippine Food and Drug Administration are micro to medium-sized businesses, food and beverage processors are also among the largest corporations in the country.
- The Philippine chemical industry is one of the country's largest manufacturing sectors and supplies products used in many other sectors including agriculture/agribusiness, electronics, food processing, healthcare, national defense, and packaging. Products manufactured include fertilizers, perfumes, drugs, paints, plastic products, alcohols, industrial gases, resins, rubber products, including tires and industrial products. As many as 1,405 chemical companies operate in the country, including local companies and multinational companies, such as Dow Chemical, DuPont, and 3M.
- Even if manufacturing output contracted due to the restrictions imposed to contain the COVID-19 pandemic, it is important to highlight that large-scale projects are continuing. A paradigmatic example is offered by D&L Industries, Inc., the country's largest specialty foods ingredients, plastics and oleochemicals firm, which in March 2020 announced doubling its capital expenditure to about USD 59 million for the expansion of its First Industrial Township in Batangas. Moreover, in a June 2020 report, it was reported that the Philippines is in talks with Giant Manufacturing Corporation from Taiwan, the world's largest bicycle manufacturer, to get the company to invest in the country.



## 5.2 Industrial Automation in the Philippines

### OVERVIEW

- The International Federation of Robotics ranked the Philippines among the lowest in the region for automation adoption, with a robot density of three industrial robots installed per 10,000 employees. The McKinsey Global Institute estimates that 48% of employees' activity, equivalent to 18.2 million jobs, could be automated in the Philippines.
- According to McKinsey, the potential for automation in the Philippines is very high:
  - Agriculture: Automation potential is 48%, or 6 million jobs
  - Retail and wholesale: Automation potential is 48%, or 2.4 million jobs
  - Manufacturing: 61% of the existing jobs may be automated, or 1.6 million jobs
  - Transportation: Automation potential is at 55%, or 1.6 million jobs
  - Other sectors expected to be impacted by automation are administrative & support, construction, accommodation & food services, education, finance and healthcare.
- According to ABB, one of the key constraints to a wider adoption of industrial automation solutions is the diffused perception of the high cost of such products. SMEs in particular worry that their deployment will make processes more complex and difficult to monitor.
- To address such concerns, in 2019, Epson launched its N2, T-series and LS3 robots series of industrial robots in the Philippines, highlighting their ease of use, simplicity of installation and its battery-less motors which do not require users to buy new batteries.



Figure 11: Epson launched its robots in the Philippines highlighting their affordability  
Source: Epson

- Some of the early-adopters of robotics and automation solutions in the Philippines include some of the largest multinationals in the fast-moving consumer goods sector, such as Nestlé, Unilever and local giant Jollibee Foods Corp.
- The COVID-19 outbreak has opened a new window of opportunity for the industrial automation sector in the Philippines. Global players such as Universal Robotics are urging manufacturers in the Philippines to integrate robots into their processes and adopt automated solutions to improve productivity.

## OPPORTUNITIES

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- Few industrial automation companies have direct presence in the Philippines. However, local distributors are showing interest in selling industrial robots and related products:
  - In 2018, leading Danish collaborative robotics company, Universal Robots, formed a partnership with Asia Integrated Machine, Inc. (AIM), the main provider of machinery in the country. AIM provides solutions for manufacturing firms, including processing, weighing, packaging, inspection, conveying, palletizing and warehousing. UR is targeting the electronics, automotive and F&B industries in the Philippines.
  - In the same year, American company Rockwell Automation entered into a new distributor relationship with Mheco, a recently formed full line industrial automation distributor in the Philippines.
  - In 2019, FreeWave Technologies, a Colorado-based company which specializes in industrial wireless connectivity and wired edge computing platforms, announced a distribution agreement with Presidium Controls and Industrial Technologies Corporation.
- Some companies are entering the market through joint ventures with distributors with whom they have established solid relationships. One of these is Japanese Mitsubishi Electric Corporation, which in 2019 set up a company in the Philippines called MELCO Factory Automation Philippines Inc. (MELAP) in partnership with Setsuyo Astec Corporation and Integrated Factory Automation Inc. (IFA), a product distributor and long-time partner of Mitsubishi in the Philippines.
- Key targets are represented by the county's free port areas and special economic zones, as they host the most advanced players in the Philippines with a strong focus on international markets. For example, in 2019, Schneider Electric launched its smart factory which makes intensive use of robotics and automation solutions, at the Cavite Economic Zone in Rosario, Cavite. Each of its four sites in Cavite has its respective virtual reality training rooms where employees are mentored whenever new technologies are introduced. According to the company, smart solutions allowed for a 14% increase in production growth and a 13% decrease in energy consumption.



- The petrochemical sector, which is traditionally dominated by a small number of large companies, is proving to be an important target for companies specializing in industrial automation solutions. A case in point is offered by ABB, which in 2018 was awarded an automation contract for the expansion of JG Summit's petrochemical plant, aiming at increase cracker production of ethylene by 50% to 480,000 tpa and propylene by 26% to 240,000 tpa. The expansion required a sophisticated electrical network solution due to the inter-meshing of power systems from the existing plant and the new extension.
- It should also be highlighted that automation solutions are also being introduced in the mining sector of the Philippines. In 2018, OceanaGold Corporation, an Australian gold mining company, integrated automated processes at its Didipio gold-copper mine in the Philippines, a first in the country's mining industry. The Automation Digital and Process Transformation, or ADAPT, system installed includes fiber-optic connections, digital radio and wireless access points throughout the mine coordinated with the surface control room. The technologies will enable equipment to be operated from remote locations.

### 5.3 Plastics in the Philippines

#### OVERVIEW

- There are only a few large companies in the plastics industry in the Philippines, with the majority being small to medium scale enterprises with varying and wide degrees of equipment sophistication. Most of the plastics companies are situated around Metro Manila.
- The industry is characterized by a high degree of segmentation between a few large companies using state-of-the art technologies, mostly from Europe, and smaller players using outdated equipment. The top five players accounting for major share of the market include JG Summit Petrochemicals Group, Chemrez Technologies, NPC Alliance Corporation, Petron Corporation, and Philippine Resins Industries, Inc., among others.
- The large domestic plastic companies are vertically integrated, with a broad product portfolio of plastics for the packaging, building & construction, and automotive sectors, among others. Most micro and small plastic firms are engaged in the production of plastic packaging such as the plastic bags.
- The industry lacks an upstream sector to provide the midstream with ethylene and propylene. Midstream companies manufacture synthetic resins such as polyvinyl chloride (PVC), polystyrene (PS), polypropylene (PP) and polyethylene (PE) using imported materials.
- The Philippines is one of the worst plastic polluters in the world, only behind China and Indonesia. However, there are some bright areas. For example, McKinsey reports that the Philippines has one of the highest PET bottle recovery rates, estimated to be at 90%, due to its high residual value.



**Table 9: Selected plastic residuals generated in the Philippines, 2019**

Type of plastic	Per capita per year	Entire Philippines per day
Sachets (all)	591	163,732,476
Multi-layer sachets	426	117,875,583
Plastic sando shopping bags	174	48,125,813
Plastic labo bags	163	45,228,043
Disposable diapers	76	3,010,025

Source: Global Alliance for Incinerator Alternatives

- Although it has been reported that the Philippines is considering outlawing the use of single-use plastic, no national ban has been imposed so far. The lack of legislative action has not deterred private sector players to initiate changes. For instance, multinationals such as Mondelez, URC, Coca-Cola, Pepsi, Nestlé, Unilever, and P&G are all part of the Philippine Alliance for Recycling and Materials Sustainability (PARMS), and are establishing plastic recovery facilities in the country.
- The COVID-19 pandemic is retarding the switch to more sustainable alternative to plastics in the Philippines. For example, in April 2020, the Philippine Plastics Industry Association announced that it has redirected its environmental funds to the production of disposable protective equipment, in an effort to counter the spread of the COVID-19 outbreak.

## OPPORTUNITIES

- Multinationals are investing in plastic recycling facilities in the Philippines. An illustrative example is offered by Coca-Cola, which in 2019 announced an investment of USD 19.5 million in a food-grade recycling facility in the Philippines, to transform used PET plastic bottles into new, useful beverage bottles. In March 2020 the company announced its partnership with Thai company Indorama Ventures in order to build what will be the Philippines' biggest bottle-to-bottle recycling facility.
- A key opportunity to highlight is the emergence of biodegradable materials as alternatives to plastics for packaging. In 2019, San Miguel Corporation became the first Filipino company to utilize fully-certified biodegradable plastic packaging. The company collaborated with Philippine Bioresins Corporation, which developed and tested the technology which San Miguel is using for food and non-food products, such as cement and feed sacks, grocery bags and food and other single-use plastic packaging. San Miguel also started collaborating with leading materials science company Dow Chemical to study using hard-to-recycle plastics as an alternative raw material for road surfacing, in order to reduce the volume of scrap plastics that end up in the landfills.
- Filipino researchers are also working on the development of such materials. For instance, the Department of Science and Technology developed a biodegradable thermoplastic polymer made of starch and nanoparticle which can be used to produce utensils such as knives, forks and spoons. It is reported that several plastic manufacturers have expressed interest in using the technology.



- The Philippines Plastics Industry Association has a history of collaborations with foreign companies for the development of innovative materials. For examples, it partnered with Nestle for the development of a modular composite brick made with multilayer single use plastic waste broken down into micro-plastic form and cement. It is worth highlighting that recently the president of the Packaging Institute of the Philippines has called for local players to invest in sustainable solutions, stressing the need to adapt to the stringent environmental standards of the countries to which many local companies export.
- Producing building materials with recycled plastic waste could be an interesting opportunity, given the country's booming construction industry. An example of a company that has capitalizing on this opportunity and on the remarkably high volume of plastic sachets consumed in the Philippines is Green Antz Builder, which has developed a system to produce eco-friendly construction hollow blocks, called "ecobricks", made of plastic sachets and other non-recyclable wastes.

## 5.4 Automotive in the Philippines

### OVERVIEW

- The automotive industry of the Philippines is still at its early stage of development, especially when compared with neighboring countries like Thailand and Indonesia. However, before being hit by the COVID-19 pandemic, production in the sector registered a remarkable growth of 16% from 2018 to 2019, the strongest increase among ASEAN countries.

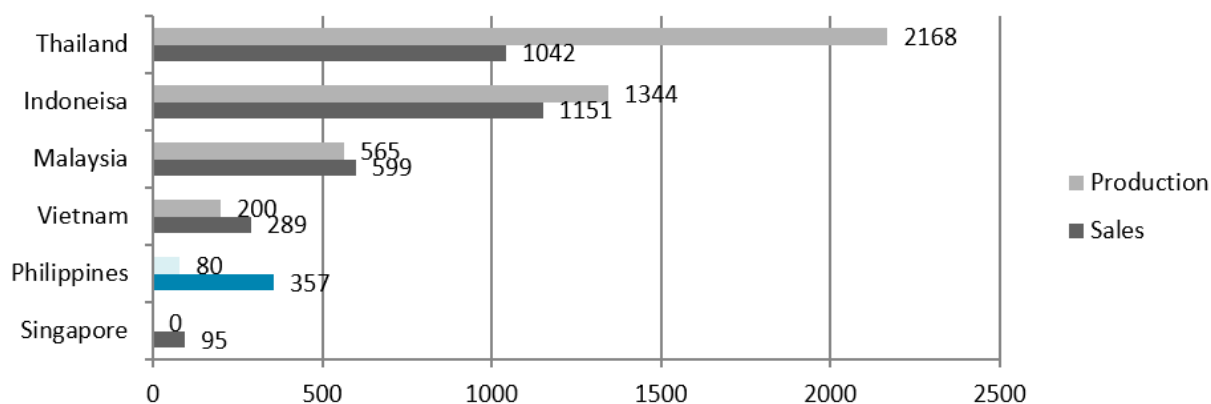


Figure 12: Motor vehicles sales and production in ASEAN, 2017

Source: ASEAN-Japan Center

- Japanese brands dominate the market, accounting for over 75% of total sales in 2019. However, Chinese automakers are making considerable inroads in the market, a trend that it is expected to continue over the next years.



- The participation of the Philippines in the automotive value chain is concentrated in the production of parts and components. The Philippines specializes in producing wiring, electronic components, aluminum components and chassis systems.
- There are roughly 90 Tier-1 auto parts suppliers composed of joint ventures (60%), foreign-owned companies (30%) and purely local suppliers (10%).
- Philippine automobile assemblers have been producing their products at an inefficient level because the automobile industry is oriented towards the small domestic market rather than regional or global markets.
- In order to encourage domestic production, the government launched its Comprehensive Automotive Resurgence Strategy (CARS) program in 2016, which offers PHP 9 billion (USD 183 million) in tax incentives to automakers per vehicle model as long as 200,000 units are assembled in six years.
- The EV industry in the Philippines is financially backed by various local and regional agencies. The Asian Development Bank (ADB) for instance, has allocated the Philippines a USD 500 million facility to support the country's ambition to become the region's EV manufacturing hub. EVs are used to transport local residents and transient employees in major cities in Metro Manila. Electric jeeps and electric tricycles are more commonly found in urban areas and major business districts.
- The Philippines' Department of Trade and Industry is actively trying to attract South Korean manufacturers of EVs to establish production facilities in the country.
- Automotive sales are expected to be badly hit in 2020 due to the COVID-19 pandemic. In 2019, the Philippine auto industry sold 416,637 units. Sales projections for 2020 range between 250,000 to 330,000 new vehicles.

## OPPORTUNITIES

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- Key targets are represented by the country's dynamic pool of parts and components manufacturers, which are the most competitive segment of the local automotive industry and are receptive to technological innovations. Leading players such as Toyota Motor and Mitsubishi Motors use a majority of locally supplied parts when assembling their models in the Philippines. Moreover, the country has become an important supplier of motor vehicle inputs to Japan, Thailand, US, China and Indonesia. The export of parts and components has grown rapidly over the past few decades and today it accounts for virtually the totality of the Philippines' automobile exports.
- Importantly, global manufacturers have started to set up production plants in the Philippines, spurred by the incentives offered as part of the CARS program. A case in point is offered by Toyota Motor Philippines, which in 2019 inaugurated its USD 19 million high-technology press line, allowing the company to begin with onshore manufacturing of side member panels – the first of its kind in the Philippines. The press line includes a 1,600-ton servo type press machine with automated sheet feeder and unloader robot. The





company had to invest in servo press technology to enable it to localize the manufacturing of side member panels.

- There is a strong demand for EVs in the Philippines, particularly in big universities, and in urban areas including Manila, Quezon City and Las Pinas. The growing tourism industry also calls for resorts and local government units to invest in EVs to provide transportation services for the tourists while caring for the environment and reducing the carbon emissions at popular tourist spots, such as the islands of Boracay and Palawan.
- The EV market is expected to boom over the next few years, offering opportunities ranging from partnering with local manufacturers to collaborating building the required infrastructure. By the year 2025, the Philippines is expected to have 10,000 e-jeepneys (jeepneys or jeeps are the most popular means of public transportation in the Philippines, originally made from US military jeeps left over from World War II), and about 200 charging stations. According to its Board of Investment, the Philippines already counts 54 firms engaged in e-vehicle manufacturing, 11 manufacturers of parts and components and 18 traders.
- One of the consequence of the COVID-19 pandemic in the Philippines is the decrease in use of public transportation. With the emergence of this trend, local automakers are seeing window of opportunity for experimenting with new solutions. For example, in July 2020, Toyota Motor Philippines commenced a partnership with Singapore-based startup SWAT Mobility for a corporate smart transportation solution in Manila. The service allows employees and clients of KMC Solutions, the Philippines' largest co-working and staff-leasing company, to book rides through an app. Only authorized employees may book vehicles.



## 6.0 SINGAPORE

### 6.1 Snapshot of the Singapore Manufacturing Sector

- Singapore has built a strong and diverse manufacturing base, with leadership positions in sectors such as aerospace, electronics, precision engineering, processed food and beverages, rubber products, as well as biotechnology, chemical and petrochemical industries.
- Manufacturing plays a significant role in Singapore's economy, contributing to about 20% to its GDP. Singapore's economy depends heavily on exports, particularly in consumer electronics, IT products, pharmaceuticals, and petroleum products. Interestingly, Singapore is the 4th largest global exporter of high tech products, producing 20% of the global semiconductor equipment output. The country produces five of the world's top 10 drugs, and is the 5th largest producer of refined oil.
- Leading firms across industrial sectors such as Shell, Micron, and Merck have chosen Singapore as a strategic manufacturing hub. Around 46% of Asia's regional headquarters (RHQs) are based in Singapore. In terms of technology MNCs, Singapore accounts for 59% of Asia RHQs.
- Singapore has the world's largest port by shipping volume, a wealth of business parks and specialized industrial estates. The country is too small to have space for special economic zones of its own. Instead, it has partnered with Malaysia to create the Iskandar Malaysia, a special economic zone in nearby Johor Bahru, and with Indonesia to create the Batam Export Processing Zone. Both are highly successful, particularly for Singaporean companies, which now use these zones as bases for factory extensions of their manufacturing operations to sell across Asia and beyond.

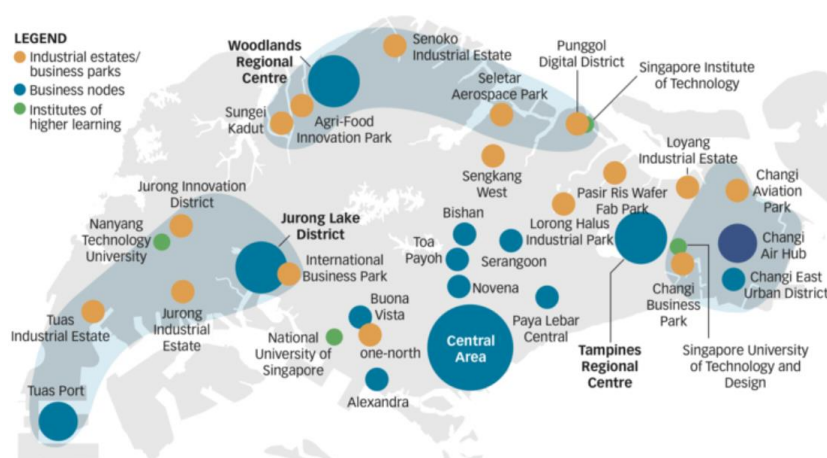


Figure 13: Business parks and industrial areas in Singapore


Source: Development Authority of Singapore

- The country has recently taken steps to free up additional space for the manufacturing sector. In early 2020, Singapore announced its plans to rejuvenate one of its oldest industrial estates, Sungei Kadut, where

200 hectares of land has been reserved for new industries and uses. For a start, 18 hectares of land are being set aside for Phase 1 of an Agri-Food innovation Park to nurture the agri-tech sector.

- Singapore ranks as the most innovative country in the Asia Pacific region according to Bloomberg and INSEAD. The country boasts 55,000 start-ups which the government supports through a network of Centers of Innovation across a broad range of sectors, ranging from aquaculture to food, from health products to electronics, from water technologies to precision engineering.
- Attracted by the dense network of high tech manufacturers, the presence of a robust research community, and the availability of talent, leading technology and solutions providers have established global or regional centers in Singapore. In partnership with lead customers, these centers develop new products which will be exported from Singapore to the rest of the world..

**Table 10: Examples solution providers for advanced manufacturing in Singapore**

Provider	Description	Provider	Description
	Global Digital Solutions Center		Global Internet of Things Center of Excellence
	Additive Manufacturing Center of Excellence		Omron Automation Centre
	Global Integrated Controls & Information CoE		Software Industry Solutions
	Integrated Digitalization Hub		Global IoT Digital Services Centre of Excellence

Source: Singapore Economic Development Board

- The government is encouraging the adoption of innovative technologies in order to help manufacturers withstand the impact of COVID-19. A crucial development took place in May 2020, when Singapore announced its first 5G Industry 4.0 trial, focusing on AI and IoT solutions.
- It is also important to highlight that the economic impact of the COVID-19 pandemic, although severe especially for a global exporter like Singapore, has not deterred local and international manufacturers to keep investing in the country. For instance, in March 2020, ExxonMobil announced a multi-billion-dollar expansion of its Jurong Island refining and petrochemical complex to increase its production capacity for higher-value products and cleaner fuels. Meanwhile, in April 2020, Growthwell Group, a Singaporean producer of plant-based meat alternatives, secured USD 8 million in a funding round led by Singapore's sovereign wealth fund, Temasek, to expand its product range and geographic footprint. With the new capital injection, Growthwell will build a manufacturing center in Singapore that focuses not only on manufacturing but also on R&D.



## 6.2 Industrial Automation in Singapore

### OVERVIEW

- Singapore has become a hotspot for industrial automation solutions. A strong investment in digital infrastructure, a growing pool of IT expertise and an industrial sector focused on advanced manufacturing make the country one of the leading markets worldwide. Interestingly, 90% of robots installed in Singapore are deployed by the electronics industry. Other important applications include healthcare and construction.
- Although robotic installations in Singapore are skewed towards the manufacturing of semiconductors and computer peripherals, recent innovations have seen the use of robotics diversify into new sectors such as warehousing and logistics.
- Universities and tertiary institutes that are playing a major role in robotics innovation include Nanyang Technological University, the National University of Singapore and Singapore Polytechnic.
- According to the International Federation of Robotics, Singapore has the highest density of industrial robots in the world, with over 830 installed robots per 10,000 workers, well above the global average of around 100.

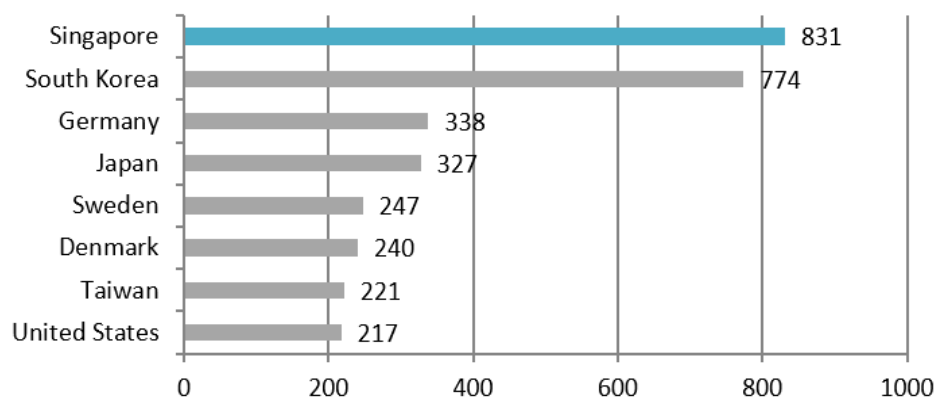


Figure 14: Installed industrial robots per 10,000 employees, 2018

Source: International Federation of Robotics

- The government actively encourages the adoption of industrial automation solutions. For example, the Automation Support Package supports firms in their deployment of large-scale automation, such as robotics and IoT. In December 2019, Singapore launched a Digital and Advanced Manufacturing Program to support technological advancement in the industry. The program is developed in collaboration with the Singapore Industrial Automation Association.
- It is also interesting to see how the COVID-19 pandemic has led local players to adopt new solutions. For example, mall operator Frasers Property and industrial automation company PBA Group are collaborating



to roll out UV-disinfecting autonomous mobile robots, called Sunburst UV Bots, in order to ensure social distancing and cleanliness.

## OPPORTUNITIES

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- A key target is represented by JTC Corporation, which is the lead government agency responsible for developing industrial infrastructure. It has a history of collaboration with foreign players. For example, in December 2019 it signed an agreement with Taiwanese provider of power and thermal management solutions, Delta Electronics, to set up a solutions and training center to support JTC customers, upskill SMEs partners, and offer automation solutions to tackle issues in the local manufacturing sector.
- It should be highlighted that the market is registering a growing interest for collaborative robots, meaning robots that work alongside humans in a shared workspace. Singapore's first collaborative robot production facility was launched in 2018 by Korean industrial robot company Hanwha Techwin and local precision engineering firm PBA Group. The partnership is a first of its kind between a listed Fortune 500 company and a Singapore SME. In the same year, Universal Robots, the pioneer and market leader of collaborative robots, partnered with Singapore's National Trades Union Congress to establish the UR Collaborative Robotics Course. Moreover, in 2019 OnRobot, a Danish company specializing in collaborative robots, launched its regional headquarters in Singapore.
- International players are establishing R&D centers in Singapore, attracted by the country's world class research infrastructure. For instance, in October 2019, it was announced that American provider of robotic finishing systems Acme Manufacturing had officially launched its Singapore operations, which included a standalone R&D center. It is strategically located at the Seletar Aerospace Park, nestled amongst some of the largest aerospace manufacturers in the world.
- It is also possible to partner with Singaporean universities, as in the case of Tiong Seng Holdings. In 2019 the company agreed to a five-year collaboration with Ngee Ann Polytechnic to set up a construction robotics lab in the school's campus. The Tiong Seng-NP Construction Robotics Lab aims to combine the construction firm's technological expertise and market know-how with the polytechnic's strong robotics R&D arm to develop useful robotic solutions for the built environment sector. In the same year, the School of Engineering at the Temasek Polytechnic tied up with the Harbin Institute of Technology Robot Group, one of China's leading robot manufacturers, to set up the TP-HRG Robotics Innovation Center in its campus.
- Singapore is an ideal place to launch and grow a company focusing on industrial automation solutions. In 2018, the country inaugurated a new incubator office and workshop called the Robotics Center to support startups in the robotics and automation sector. Interestingly, some companies that were started in Singapore have subsequently expanded to the US. One of these is robotics and warehousing automation company GreyOrange, which in 2018 set up its US headquarters in Atlanta, and deployed 740 robots at its first American client site. The company also announced plans to build a manufacturing facility in the US.



## 6.3 Plastics in Singapore

### OVERVIEW

- The plastics industry in Singapore has grown from strength to strength, growing from an annual turnover of USD 4.3 billion in 1989 to USD 9.4 billion today, evolving into a high-tech capital-intensive sector. In Singapore, plastics are used in a multitude of products across industries such as electronics and biomedical sciences, for both research and industrial applications.
- Plastic waste in Singapore is either recycled or incinerated. Such wastes are not landfilled. In 2018, approximately 949,000 tons of plastic waste were generated in Singapore. Only around 4% of the plastic waste generated was recycled, and of this, 7% was recycled locally, while the rest was sorted and exported for recycling. The plastics that are recycled are mainly post-industrial plastics that are clean and homogenous, or recyclables from households that have been sorted and baled at Singapore's Material Recovery Facilities.
- The recycling industry in Singapore is however facing some challenges which will need to be addressed in partnership with all societal actors. The lack of local demand for recyclables (which then must compete to be sold in overseas markets), China's recent ban of imports on certain plastic categories for recycling, the low levels of recycling and high levels of product contamination at source represent some key challenges faced by the industry.
- Singapore hopes to further build up local recycling capabilities to better extract resources from plastic waste. Both mechanical and chemical recycling options are being studied. A noticeable development took place in 2018, when NUS' scientists found a way to turn plastic bottles into a highly insulating and absorbent material called aerogel, which has applications for the aviation, car, gas and petroleum industries.
- 3D printing is an example of a new area of application for plastic materials, which can be used across a multitude of sectors. For example, surgeons in Singapore are using 3D printed plastic models of hearts, skulls and limbs for training and to better prepare themselves for complex surgeries. Doctors at KK Hospital's Cardiac Centre have developed an enlarged 3D model of their infant patients' hearts to get a clearer view of what to expect before performing the surgery.



Figure 15: A 3D printed model of a 9-year-old girl's heart at KK Hospital  
Source: The Straits Times

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## OPPORTUNITIES

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- Singapore's researchers are at the forefront of the efforts to convert plastic waste into reusable materials, opening up opportunities for collaboration in this area. Interestingly, in 2019 NTU's researchers developed a new process which uses sunlight to turn plastic waste into reusable chemicals, without generating new pollutants. In the same year, NTU and the French Alternative Energies and Atomic Energy Commission launched a USD 20 million joint research center to develop innovative, energy-efficient solutions for the recycling and recovery of resources from electrical and electronic waste, which have a large share of plastics.
- Singapore is an excellent location for fund-raising for innovative products. A case in point is offered by RWDC Industries, a Singapore-based biotech start-up, which in 2019 raised USD 22 million in an oversubscribed Series A3 round led by Singapore-based venture capital firm Vickers Venture Partners. Founded in 2015, RWDC aims to do away with single-use plastics through developing cost-effective biopolymer material solutions – particularly medium-chain-length polyhydroxyalkanoate (mcl-PHA). The funding is a follow-up to the USD 13 million that RWDC raised during its Series A2 round six months earlier. Since then, RWDC has expanded its PHA production capacity in Georgia in the US, where it initiated development programs on new applications such as non-woven fabrics, and successfully completed trials with its clients on PHA straws and coated paper.
- Interestingly, 3D printed plastic products are being mass produced to counter the spread of the COVID-19 outbreak in Singapore. 3D printing firms converted the majority of their capacity to produce protection equipment such as face shields, nose swabs, and surgical mask straps. One of these is Siege Advanced Manufacturing, which started producing their first face shield using one of the designs from the Czech Republic's Prusa reusable face shield. Another 3D-printing company that specializes in industrial 3D-printing called Additive3D Asia is producing face shields for countries in Africa.
- It should also be highlighted that local universities are partnering with foreign players. For instance, in 2019 the National University of Singapore Centre for Additive Manufacturing signed an agreement with German company TUV SUD to promote research and development in 3D-printed biomedical implants. The center aims to apply 3D-printing in personalized patient treatments, as well as fabricating implants for clinical trials.
- The Singapore Economic Development Board (EDB) is a key actor supporting technological advancements in the local plastic industry, and is actively collaborating with foreign specialists to come to the city-state. For example, in 2019, it supported American company Becton, Dickinson and Company (BD), one of the largest manufacturers of plastic molded products in the world, in opening its Advanced Molding Center in Singapore, the first in Asia. The new center will centralize and insource a majority of BD's Greater Asia plastic molding production. BD will now produce 75 billion units of plastic components at its Singapore plant, an increase of more than 50%.



## 5.4 Automotive in Singapore

### OVERVIEW

- While Singapore's automotive industry is relatively small compared to other domestic industries, the volume of its gross exports is second only to that of Thailand in South East Asia. Singapore has taken advantage of its world-leading industrial and services hubs, such as for electronics, semiconductors, aviation and logistics ports, and creatively identified linkages between those industrial and services activities and the automotive industry. As a result, Singapore's automotive industry focuses on the distribution and sales of CBU cars and exports of auto electronics and automotive applications to regional markets.
- As a small and densely populated country, Singapore depends on efficient and effective transportation solutions to overcome land and manpower constraints. The city-state presents real and challenging use-cases, making Singapore an attractive lead market and location for companies to develop, test and commercialize smart mobility technologies and solutions that can be exported to the global market.
- Singapore wants to phase out internal combustion engine vehicles by 2040. Because of this, the country offers incentives for the use of electric vehicles (EVs) and is expanding its EV charging infrastructure.
- SP Group, the public electricity and gas distribution company, operates Singapore's largest public EV charging network, set to grow to 1,000 points by the end of 2020, of which 250 will be high-speed chargers, capable to charge a car in as little as 30 minutes, compared with six to eight hours for a normal charger.



**Figure 16: Main charging points for EVs in Singapore**

Source: SP Group

- KPMG names Singapore as the globe's top country for autonomous driving. In effect, the country is at the forefront of commercial trials, and in October 2019 announced that All of western Singapore will become a test bed for self-driving vehicles, around 1,000 or one-tenth of the city state's total. It also started



retraining 100 bus drivers as autonomous vehicle bus safety operators, as part of its target to serve three new towns with driverless buses from 2022.

- Grab, the largest ride-hailing company in Singapore, has adapted to Covid-19 lockdown by quickly transitioning many of its ride-hailing drivers to its on-demand delivery verticals and expanding services needed by customers during social distancing measures.
- Car sharing apps are popular in Singapore, and witnessed a surge in demand as the COVID-19 pandemic led to less frequent use of the public transportation systems. One of the most used is BlueSG, which has a fleet of electric cars. After an initial period where it saw a decrease in revenue, in July 2020 the company registered a 50% jump in rentals.

## OPPORTUNITIES

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- Global automotive manufacturers are attracted by Singapore's strong R&D ecosystem. For example, in March 2020, Hyundai Motor Company announced plans to establish a Hyundai Mobility Global Innovation Center in Singapore, with support from EDB. The open innovations lab will explore ideas related to R&D, business, and production for future mobility solutions. Hyundai's new lab will be located in the Jurong Innovation District, an advanced manufacturing hub developed by JTC Corporation. The lab will occupy a footprint of 44,000 m<sup>2</sup> with a building area of 28,000 m<sup>2</sup>. Construction began in May 2020, with completion expected in the second half of 2022. For its next steps, the carmaker also will pursue open innovation with local partners and educational institutions, such as the Nanyang Technological University, by conducting joint projects as well as co-founding research centers.
- A key opportunity area is represented by Singapore's growing EV's infrastructure. For example, in October 2019, ABB won a contract from ST Engineering Land Systems Limited to deliver and commission integrated smart charging points for Automated Guided Vehicles in the new Tuas port of Singapore. Deliveries of the vehicles, which will be deployed to transport heavy shipping containers at the port terminal, are scheduled to begin from September 2020 through to August 2022, with the ABB chargers and supporting infrastructure set to be installed towards the end of 2020. The future port is a major milestone in Singapore's next generation container terminal development with an annual capacity of 65 million containers, and is slated to be the largest port in the world by the time it is completed in 2040.
- International companies are also partnering with local universities in the area of autonomous vehicles. One of these is Volvo Buses, which in March 2019 commenced a partnership with NTU and Singapore's Land Transport Authority to launch the world's first 12-meter fully electric autonomous bus, capable of carrying up to 80 passengers. The city-state is hoping to deploy autonomous buses on public roads in three different districts from 2022.
- Other players are establishing their own R&D centers in Singapore. For instance, in 2018 Germany automotive component maker Continental and French autonomous vehicle technology company



EasyMile announced the opening of a R&D center focused on driverless mobility solutions. The center has been set up at Continental's Singapore-based facility, and develops new technology centered on deep learning in order to prepare autonomous vehicle technology for tests towards safe deployments on private grounds and public roads in the Singaporean metro area.

- Foreign companies are also penetrating the market by offering car sharing services. The most successful in this segment is the already mentioned BlueSG, which is a subsidiary of the French conglomerate Bolloré Group. The company launched the first large-scale electric vehicle car-sharing service in Singapore in 2017, with 30 charging stations and 80 cars. As of December, 2019, the company had 253 charging stations located across Singapore and a fleet of 530 cars.



## 7.0 THAILAND

### 7.1 Snapshot of the Thai Manufacturing Sector

- The manufacturing sector accounts for a remarkable 36% of the country's GDP and is well diversified. Some of the most important industries for the economy of Thailand are: aerospace, automotive, electronics, medical, and food and beverage.
- Thailand has an export-heavy economy, accounting for roughly two-thirds of its GDP. For example, Thailand is the second-largest exporter of computer hard drives and other components used in personal computers, and the second-largest exporter of air conditioners and washing machines. Other important exports include agricultural products (particularly rice, palm oil, rubber, sugar, and seafood), plastics, and automobiles and automotive parts.
- The government provides a full range of incentives for businesses operating in 13 industries located in Special Economic Zones (SEZs). Businesses that set up in SEZs are offered a variety of incentives ranging from eight years corporate income tax (CIT) exemption and an additional 50% CIT reduction for five years. Each has its own target industry.

**Table 11: Targeted industries in Thailand's SEZs**

Sector/SEZ	Tak	Srakaew	Trat	Mukdahan	Songkla	Chiang Rai	Nong Khai	Nakhon Panom	Kamchanaburi
Agriculture	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ceramic	✓							✓	✓
Garments	✓	✓			✓	✓	✓	✓	✓
Furniture	✓	✓			✓	✓		✓	✓
Jewelry	✓	✓				✓		✓	✓
Medical equipment	✓	✓				✓		✓	✓
Automotive	✓	✓						✓	✓
Electronics	✓	✓		✓				✓	✓
Plastic	✓	✓				✓		✓	✓
Medicine	✓	✓				✓		✓	✓
Logistics	✓	✓	✓	✓	✓	✓	✓	✓	✓
Industrial estate	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tourism	✓	✓	✓	✓	✓	✓	✓	✓	✓

Source: Board of Investment of Thailand (BOI)

- The government's "Thailand 4.0" development plan encourages investment into value-based, digital, innovation-driven, as well as services-based industries. In 2018, as part of Thailand's 4.0 strategy, the



government earmarked the Eastern Economic Corridor (EEC) as a pilot area-based development zone to attract investors, with emphasis placed on businesses in 10 focus industries including automotive, electronics, petrochemicals, agriculture and food, as well as new next-generation industries such as automation, aerospace, biotechnology, and medical.



**Figure 17: Location of the Eastern Economic Corridor (EEC)**

Source: ASEAN Briefing

- In 2019 Thailand introduced a stimulus package called “Thailand Plus” that contains a wide variety of measures to attract foreign investment. It covers seven key points, including the introduction of new tax incentives and deductions designed for manufacturers affected by the US-China Trade War planning to relocate full or part of their operations to Thailand.
- It is also worth highlighting the strong linkages between the Thai academic and industrial sectors. Importantly, in August 2019, the Thailand Board of Investment (BOI) entered into an agreement with eight of the country’s leading universities, aiming to stimulate collaboration in private sector demand-driven R&D activities, co-operative education programs and high-skilled workforce recruitment.
- A key focus of the government is the development of the subcontracting industry. The BOI Unit for Industrial Linkage Development (BUILD) has conducted several programs to connect foreign assemblers and manufacturers who are seeking to source parts and components from Thai enterprises.
- The COVID-19 outbreak has had a severe impact on Thailand’s manufacturing output. However, even during the most critical period, the country saw continuity and growth in some areas. For example, in March 2020, Sanmina Corporation, an American electronics manufacturing services provider and Fortune 500 company, expanded its facility in Thailand. More recently, US manufacturer of shelf-stable, plant-based foods, Atlantic Natural Foods announced that it will increase its production in Thailand.



## 7.2 Industrial Automation in Thailand

### OVERVIEW

- According to the International Federation of Robotics, Thailand has the second-highest adoption rate of industrial robots in the ASEAN region, after only Singapore. Moreover, as the country is aging fast, it is forecasted that 15% of Thai manufacturing workers will be replaced by robots by 2030.
- According to the German-Thai chamber of commerce, Thailand is the country responsible for the **highest investment in robots** for industrial production in ASEAN, with an estimated USD 1,581 million directed to the segment in 2019.

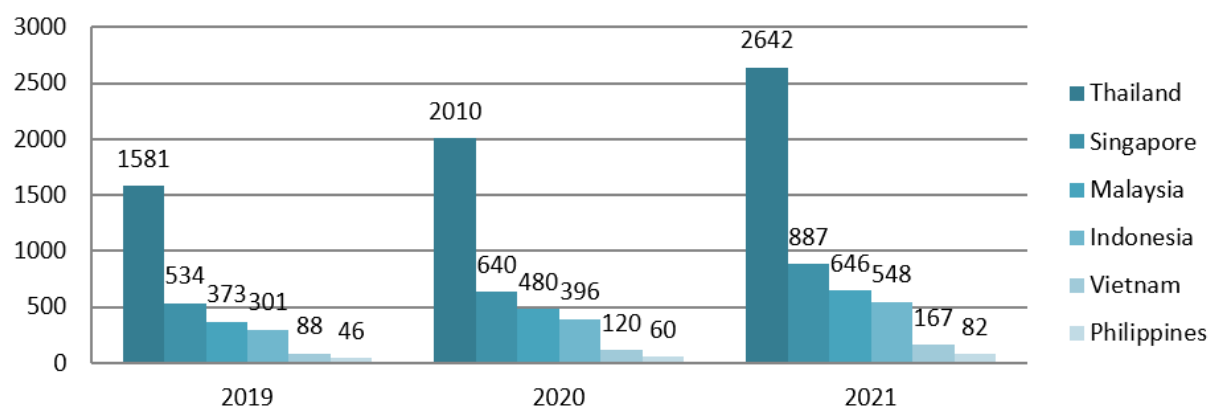


Figure 18: Investment in robots in ASEAN (USD million)

Source: German-Thai chamber of commerce

- The **automotive industry** in Thailand has a high density of robot adoption, with 974 units per 10,000 persons employed, placing Thailand close behind industrial giants like the US, Germany, and Japan at 1,200 units, 1,162 units, and 1,158 units per 10,000 persons employed, respectively.
- Thailand's food manufacturing sector is also looking at enhancing its efficiency by incorporating more robots into the production line. Cobots in particular have been deployed to reduce the production cost, and increase productivity through optimization of processes to stay competitive, while maintaining world-class quality standards.
- To stimulate the use of automation and robotics systems, BOI offers incentives under the Measures for Improvement of Production Efficiency for enterprises which upgrade their technology and machinery for manufacturing. Available incentives include, for example, a 3-year CIT exemption on the revenue of an existing project, with a CIT cap not exceeding 50% of the investment capital. In April 2020, new tax deductions of between 50% and 150% were approved to lower costs for foreign investors in manufacturing automation and robotics.



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## OPPORTUNITIES

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- In terms of sectorial targets, the electronics, automotive and food manufacturing industries are the more likely to adopt industrial automation solutions in Thailand. An interesting example is offered by the collaboration launched in 2018 between Swiss-Swedish multinational automation provider ABB and Cosmos Brewery, one of Thai Beverage PCL's subsidiaries and maker of the famous Chang beer, which automated its beer bottling line with ABB's industry-leading palletizing robotic automation system. ABB's solution included a turnkey high speed palletizing system equipped with two 'plug-and-play' flex gripper clamps that allow robots to pick up to 24,000 bottles an hour.
- However, large companies operating in other sectors should also be taken into consideration. For instance PTT, a Thai state-owned SET-listed oil and gas company, is an important player in the local market and has recently shown considerable interest in industrial automation solutions. For instance, in January 2020, it signed a cooperation agreement with Japanese company Mitsui & Co on the development of robotics and industrial AI solutions. The joint venture will initially focus on developing a system integrator capability to help local Thai firms adopt AI and robotics technologies in the industrial sector.
- Another key target is the Center of Robotics Excellence (CoRE). Established under the initiative of the Ministry of Industry, CoRE is a network of leading organizations related to the development of robotics in Thailand. To enhance its capacity, CoRE is collaborating with research centers in foreign countries such as Germany, Japan, Taiwan, and the United States for the purpose of advanced technology transfers.
- The establishment of the new 5G network is opening up new opportunities for the usage of automation and robotics solutions. An interesting example is represented by the collaboration in 5G research signed in January 2020 between telecommunication company Advanced Info Service (AIS) and business conglomerate SCG. In this framework, the two companies demonstrated the use of 5G technology to operate an unmanned forklift from 110 kilometers away.
- It should be highlighted that universities are active in collaborating with private companies. For instance, in 2018, the Institute of Field Robotics (Fibo) of King Mongkut's University of Technology Thonburi teamed up with three companies for the development of robotics and AI for application in the industrial sector. In February 2020, the university entered into a partnership with American company UiPath to equip students with critical automation skills.
- Aside from strong government support, Thailand's automation and robotics industry enjoys an increasingly robust ecosystem. Private sector entities in the automation and robotics industry have joined together to create the Thailand Automation and Robotics Association (TARA) and the Thai Robotics Society to assist their members in strengthening cooperation and partnerships in the industry.



## 7.3 Plastics in Thailand

### OVERVIEW

- The plastics industry is a major sector of the Thai economy. Thailand is the world's 8th largest plastic manufacturing nation. The country ships about USD 9.6 billion worth of resin and plastic products to various countries in the world including Japan, the United States, Europe, ASEAN, Australia, India, and China, while it imports about USD 6.4 billion. Once combined with plastic parts used in export industries such as automobiles, appliances, refrigerators, air-conditioners, radios, television sets, computers, toys, furniture, and packaging, total exports are valued at USD 12.8 billion per year.
- The industry has a few dominant players and around 400 smaller companies which employ about 7,000 workers. Indorama Ventures, one of the largest PET resins producers worldwide, is headquartered in Thailand.
- Plastic pollution is a major issue in a country that generates approximately 7,000 tons of plastic waste each day. Since the beginning of 2020, Thailand introduced a ban on all single-use plastic bags at major stores, and is gearing towards a complete ban in 2022 to reduce plastic waste and debris in the sea.
- The government also launched the Plastic Waste Management Road Map 2018-2030, which includes an ambitious plan for Thailand to use 100% recycled plastic by 2027 in various forms, including turning waste into energy.
- Thai plastic producers are placing greater emphasis on value-added and environment-friendly products. In particular, Thailand is well positioned to become a global bioplastics hub, as it is a leading producer of the raw materials needed for bioplastic synthesis such as cassava and sugarcane, and is well equipped with advanced technology and technical expertise. Importantly, the volumes of exports of bioplastic resins from Thailand have recently boomed, making the country the third largest exporter in the world.

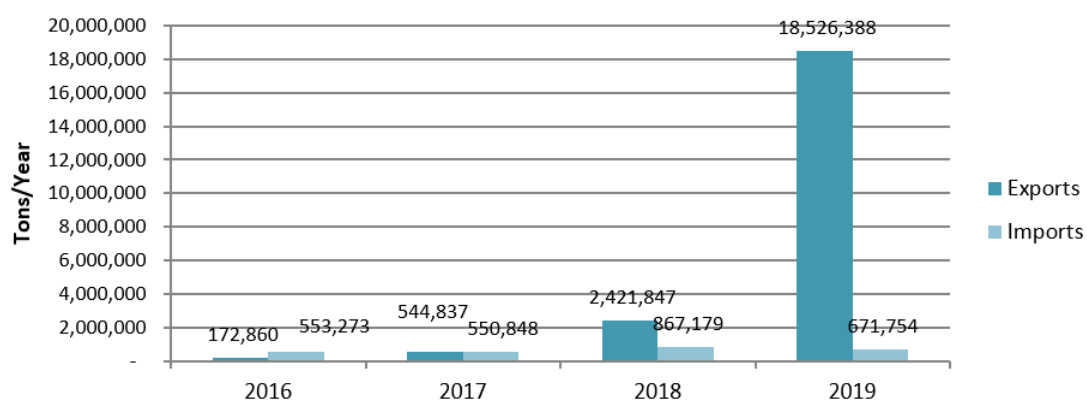


Figure 19: Thailand's bioplastic resins import and export volumes 2016-2019

Source: Board of Investment of Thailand



- The COVID-19 pandemic has led to an increase in plastic waste in Thailand. It is estimated that, as Thais spent more time at home, the amount of plastic waste generated in the country has surged by 15%.

## OPPORTUNITIES

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- A key player at the forefront of the transition towards a more sustainable plastic industry is the previously mentioned oil and gas giant PTT. In July 2019, PTT announced plans to develop a manufacturing facility for recycled plastic pellets. The plant will be a joint venture between PTTGC and Alpla Group Southeast Asia (ALPLA), a global leader specializing in the manufacture of plastic products. The facility will be the first factory for the European-standard recycled plastic pellets in Thailand with an annual capacity of 50,000 tons per annum. It will be located at Asia Industrial Estate in Map Ta Phut district, in Rayong, and will require USD 32 million in investment.
- It is worth noting that local players are collaborating with foreign companies for the development of environmentally-friendly products. One example is represented by PTT MCC Biochem, a joint venture between PPT and Japan's Mitsubishi Chemical Corporation. It has successfully developed bio-based Polybutylene Succinate (Bio PBS), a breakthrough compostable plastic material derived from corn, cassava, and sugarcane, and which has been used in a wide range of applications such as paper coating compounding, synthetic fiber, and flexible and barrier packaging. While being environmentally friendly, Bio PBS has the same level of seal strength as conventional petroleum-based plastics.
- As Thailand is set to use 100% recycled plastic by 2027, companies specializing in plastic recycling are making successful inroads in the market. One notable example is represented by French multinational group Suez, which in 2019 announced plans to build a plastics recycling plant in Thailand, to turn scrap plastics into circular polymers. The plant, which will be located in the Bang Phli District near Bangkok, will convert 30,000 tons of locally collected low-density polyethylene (LDPE) and linear low-density polyethylene (LLDPE) film into high-quality postconsumer recycled plastic (PCR) per year.
- Some companies are taking advantage of the capabilities of the Thai plastic industry to develop bioplastics destined to export markets. The most notable example is Total Corbion PLA (a joint venture between Total, the French oil and gas multinational, and Corbion, a Dutch biochemical company), which manufactures world-class polylactic polymer (PLA) in Thailand, exporting the bulk of its 75,000 tons of annual output to European markets. The plant was opened in September 2019 and is the world's second largest PLA plant.
- The Thai government is offering generous incentives for the promotion of bioplastics in the country. For example, in June 2019, Thailand's cabinet approved a tax deduction up to 125% from January 2019 to December 2021 to companies that purchase and use bioplastics for their products.
- Local companies are studying the possibility of using plastic waste for producing construction materials: in 2018, Magnolia Quality Development Corporation announced an investment of USD 180 million over the next 10 years on R&D for the development of upcycled building materials from plastic waste.





## 7.4 Automotive in Thailand

### OVERVIEW

- Thailand has developed from an assembler of automotive components into a top automotive manufacturing and export hub. The country is the 11th largest car manufacturer in the world and the first in the ASEAN region. The sector employs around 850,000 people and contributes to about 10% of the country's GDP.
- Thailand's automotive ecosystem includes 23 car assembly plants, 8 motorcycle plants, 710 tier-one auto parts makers and 1,700 tier-two and tier-three auto parts makers. More than 60% of 100 largest auto part suppliers in the world have their production hub in Thailand. Local manufacturers supply around 80-90% of the parts used in auto production in the country.

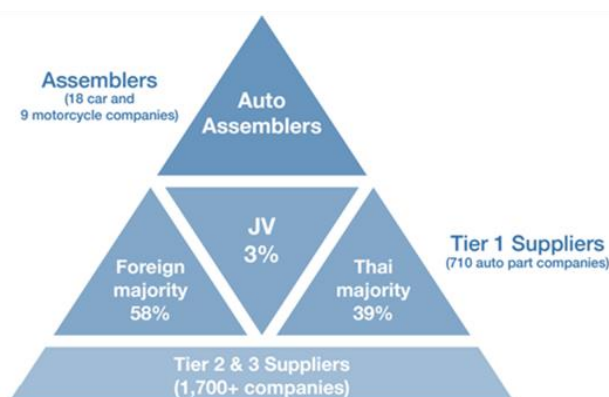


Figure 20: Structure of the Thai automotive industry

Source: Board of Investment of Thailand

- As it is geared towards export markets, the Thai automotive industry is shifting focus towards electric vehicles (EVs), partly due to tightening regulations in major economies like the US, Europe and China. In March 2020, the government announced a new target for EVs at 30% of production, or 750,000 vehicles, by 2030.
- According to the Electric Vehicle Association of Thailand, the number of companies that are part of Thailand's EV industry has risen significantly, from 76 in 2015, to 420 in 2019.
- It is important to highlight that Thailand possesses a developed motorcycle industry, with nine manufacturers currently active, including Honda, Yamaha, Suzuki and Kawasaki.
- The COVID-19 pandemic is accelerating the remaking of Thailand's automotive industry: it is reported that a growing number of Thai companies, especially component manufacturers, are being forced by the difficult market conditions to shift to the EVs market, which is growing faster than its traditional counterpart.

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## OPPORTUNITIES

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- In June 2020 the BOI revealed that it had approved 24 projects by car makers to produce electric vehicles of all types in the country. This includes hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs), with a combined capacity of over 500,000 units per year. The approved projects include Mitsubishi Motors' USD 180 million investment to upgrade the company's existing car production line to allow the annual production from 2023 of a total of 39,000 vehicles, consisting of some 9,500 BEVs and 29,500 HEVs. In June, the BOI also approved another investment by Sammitr Group for the production, in Phetchaburi Province, of 30,000 BEVs.
- As Thailand aims to develop a competitive EVs industry, the country needs to build an ecosystem of local component manufacturers for EVs. An interesting example of a company entering this segment is Thailand-based energy company Global Power Synergy Plc (GPSC), which in March 2020 announced that it is building a USD 35.2 million battery cell plant in the country. GPSC has highlighted that it is considering partnering with players from the EV manufacturing industry. Meanwhile, German carmaker BMW launched production of battery module and battery pack in Thailand in September 2019, in partnership with the DRÄXLMAIER Group, one of BMW's suppliers. Mercedes-Benz and Toyota have also announced plans to produce batteries for EVs in Thailand.
- It should also be highlighted that the government is working on developing EV charging infrastructure in the country, with a detailed roadmap currently being discussed. PTT and the Electricity Generating Authority of Thailand have already announced a collaboration to develop such an infrastructure in Thailand.
- An important target is Amata City, an industrial cluster in the province of Chomburi with a focus on the automotive sector. One of the latest companies to join the complex is Bridgestone, a leading tire maker from Japan, which opened an off-the-road (OTR) tire plant in Amata City in October 2019. The unit is operated by Bridgestone Specialty Tire Manufacturing (Thailand) Co. Ltd. and spans an area of 9.3 million sq ft. The facility opened with a capacity of 35 tons per day. Worldwide, it is Bridgestone's sixth OTR tire plant, including two in the US and three in Japan. Bridgestone has three other tire plants in Thailand — a passenger/light truck tire plant in Nong Khae; a multi-product plant in Ransit; and a radial truck tire plant also in Chonburi.
- Interestingly, joint ventures are increasingly common as a way for new entrant to establish themselves in the market. For instance, in 2019 Thai conglomerate, Charoen Pokphand (CP) Group and China's Foton Motor Group created a joint venture in Thailand, investing USD 15.87 million to manufacture pickups, big trucks, buses and passenger cars. This initiative is the second joint venture between CP and a Chinese company. The first happened in 2012 when CP set up SAIC Motor-CP with Shanghai's SAIC to produce and distribute MG cars.



## 8.0 VIETNAM

### 8.1 Snapshot of the Vietnamese Manufacturing Sector

- Vietnam has established itself as a global manufacturing hub. Labor-intensive manufacturing has been migrating to Vietnam for at least the past decade and today the country is transforming itself into a higher-value manufacturing hub, a trend which is in part accelerated by the COVID-19 pandemic.
- Today, more than 10,000 foreign companies are operating in Vietnam, mostly in export-oriented manufacturing. Examples of key players with presence in the country include Nokia, Foxconn, Sony, Toshiba, Ford, and Intel, while mobile phone and related components, PCs and electronic items are responsible for around one-third of the country's exports.
- Vietnam has become the second biggest exporter of smartphones in the world, after China. Several global electronics manufacturers, led by global electronic giants Samsung and LG, account for up to 95% of Vietnam's electronic production. Today, Vietnam serves as the largest global manufacturing hub for Samsung, producing 40% to 50% of the company's smartphone stocks in the world.

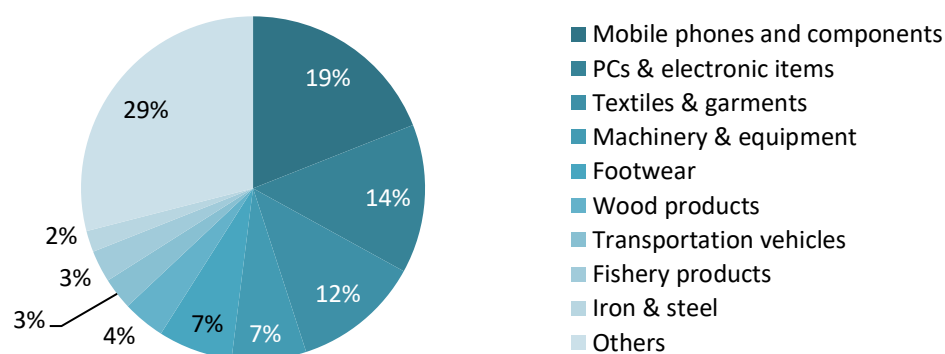


Figure 21: Vietnam's Top Exports in 2019

Source: Vietnam Customs, VinaCapital

- Vietnam is remarkably well-connected to international markets, having signed free trade agreements with key partners. Examples include the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), which came into effect in 2018 and gives access to markets such as of Japan, Canada, Mexico and Australia; and the EU-Vietnam Free Trade Agreement, which was ratified in June 2020 and is expected to boost Vietnam's manufacturing sector.
- Vietnam currently has approximately 260 industrial and export processing zones, which play a crucial role in attracting FDI. Firms investing in these zones have enjoyed preferential policies in terms of tax and land rent incentives, and are concentrated in three key economic zones (KEZs):
  - Northern KEZ: Focused on manufacturing and heavy industries. It is suitable for companies that move manufacturing but still continue operating in China.

- Central KEZ: Rapid urbanization in this zone makes it an attractive market for automotive and construction businesses.
- Southern KEZ: This industrial hub represents the country's most active economic belt, whose favorable investment climate has drawn the highest levels of FDI.

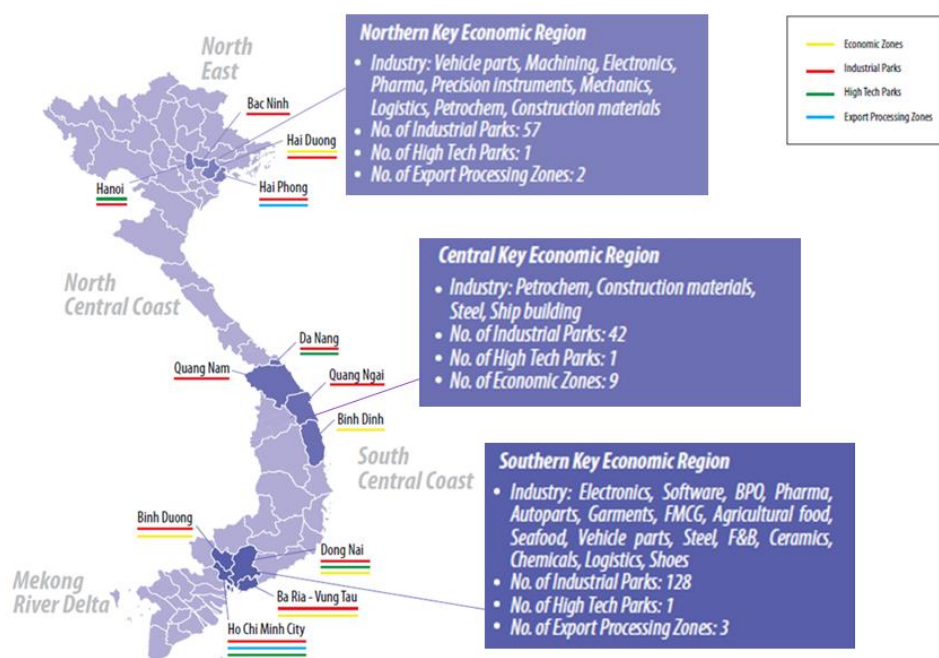


Figure 22: Key Economic Zones in Vietnam

Source: Dezan Shira & Associates

- It is interesting to note that the Vietnamese government has strategically positioned the nation as a viable alternative to China, targeting companies faced with rising costs and stronger enforcement of regulations.
- The manufacturing shift is also fueled by the trade war between the US and China, as companies seek to avoid tariffs imposed by the US on goods from China. For example, in May 2020, Apple announced plans to move the production of 30% of its AirPods from China to Vietnam, where it has been forming a complete acoustics supply chain in North Vietnam.
- The trends highlighted above have been accelerated by the COVID-pandemic. Vietnam has been effective in containing the virus, attracting companies looking for a stable environment from which to restart production activities. For instance it is reported that Google is planning to move the production of its latest smartphone, the Pixel 4a, to Vietnam fearing a second wave of COVID-19 in China. Similarly, Samsung has reportedly shifted manufacturing operations and production to its Vietnam plant, as the company had to shut down its South Korean plant in Gumi for a few days due to rising coronavirus cases.



## 8.2 Industrial Automation in Vietnam

### OVERVIEW

- Industrial automation is still an emerging sector in Vietnam, but there are strong signals that adoption will accelerate over the next few years, as an increasing number of multinationals move to Vietnam and the country reaps the benefits of 5G networks, whose commercial launch is set for 2020.
- Vietnam ranks below Singapore and Malaysia, but is ahead of Indonesia in the 2018 Automation Readiness Index from the Economist Intelligent Unit. A survey from the latest Vietnam Provincial Competitive Index reveals that automation is becoming a priority among companies in the country, with around 75% of firms planning to automate new tasks over the next three years. The key motivations for automating are reducing labor costs, as well as integrating with global supply chains.

**Table 12: Automation Readiness Index, 2018, selected countries**

Rank in the Index	Country	Score
3	Singapore	87.3
9	US	72.0
14	Malaysia	57.7
<b>24</b>	<b>Vietnam</b>	<b>37.3</b>
25	Indonesia	33.1

Source: The Economist Intelligent Unit

- In line with these forecasts, Frost & Sullivan estimates that the total automation and control market in Vietnam will be worth USD 184.5 million by 2021.
- According to the International Federation of Robotics, Vietnam became the seventh largest market for robotics installations in the world in 2017, when it saw a one-off boost of 7,080 installations that was driven by a few major projects, but the number of installations dropped back to 698 units in 2018.
- Most automation suppliers in the country are not domestic companies but global players with a number of firms coming from the United States Rockwell Automation, Emerson Electric Corporation, and Honeywell International.
- It is expected that the strongest demand for industrial automation in Vietnam will come from the automotive, electronics, garments, and food processing sectors. Historically, foreign companies that have a local presence in Vietnam have been the most receptive to such technologies.
- In 2019, Vietnam announced a series of policies aimed at facilitating the transition towards a higher-value production model, branded as Industry 4.0. One of its key targets is to increase the country's labor



productivity by 7.5% per year. Automation technologies are identified as a crucial enabler to achieve this target.

## OPPORTUNITIES

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- Vietnam's is already transitioning towards the manufacture of higher value-added products like chipsets and components for mobile devices, opening up new opportunities for the implementation of automation solutions for precision manufacturing. Interestingly, in 2019 Vietnam and the World Economic Forum signed an agreement to establish a Fourth Industrial Revolution Center in Hanoi, which will focus on technology governance and join a global network of Centers in the China, India, Israel, Japan, South Africa, the UAE and the US.
- Key target industries are automotive and electronics, however there are opportunities beyond these sectors as well.
  - In 2018, Samsung concluded a strategic agreement with CMC, the second-largest ICT service company in the country, to install 6,000 robots at its Vietnamese factory.
  - In the automotive sector, Siemens has worked with VinFast, Vietnam's first volume car manufacturer, creating the first fully digital automotive factory in South East Asia by providing totally integrated automation solutions.
  - Vinamilk, the nation's leading dairy producer, spent USD 104.3 million setting up an automated production line. Transportation and sorting of goods are undertaken by robots at its factories.
- More companies in Vietnam are exploring the use of collaborative robots (cobots). For example, in 2019 leading robotics company Universal Robots helped Vinacomin Motor Industry Joint Stock Company (VMIC) upgraded its production processes with cobots. VMIC, which is one of the first state-owned manufacturers to deploy cobots, has seen productivity increase two to three times, leading to a 50% to 60% rise in orders.
- Some Vietnamese companies are at the forefront of automation solutions in the country, and could be potential partners to introduce innovation solutions in the country.
  - One of these is FPT, the largest private ICT company in Vietnam, which gave its existing customers in Vietnam three months free annual robotics process automation licenses. In 2019, FPT partnered with German company Schaeffler to build a global digital manufacturing plant in Dong Nai worth USD 45 million.
  - Another interesting company is Vingroup, which set up the research institute VinAI Research, tasked with developing AI products which includes solutions in the field of machine learning. In 2019, Vingroup launched VinTech Korea Research (VKR) in Korea, to research the application of IoT technologies, artificial intelligence, robotics, smart manufacturing plants as well as developing



products and solutions for vehicles and transportation. It also signed a cooperation agreement with AJINEXTEK (AXT), a Korean company with more than 100 chipset patents in the field of robots and automation.

- Some foreign players are also establishing research centers in the country, recognizing Vietnam's potential in the area of industrial automation. Towards the end of 2018, ABB inaugurated its Robotics Technical and Service Center which aims to serve global and local manufacturers operating in the northern region of Vietnam. Employing a pool of around 30 engineers experienced in robotics technologies, the facility aims at developing robotics solutions to address users' specific needs through ABB Connected Services.

## 8.3 Plastics in Vietnam

### OVERVIEW

- The plastics industry is one of the fastest-growing industries in Vietnam. It produced 8.89 million tons of products in 2019, earning USD 17.6 billion in total revenues. The industry is seeking to gradually build a complete supply chain encompassing all stages from raw material production to final processing, and increasing the ratio of locally sourced raw materials to reduce reliance on imports. Analyses of trade flows reveal that from 2015 to 2019, US plastics exports to Vietnam grew by a remarkable 211.4%.
- Vietnam's plastics industry is fragmented, with more than 3,300 enterprises concentrated in the southern region, comprising of mostly SMEs. The larger companies are investing in capacity expansion and R&D.

Table 13: Key players in Vietnam's plastic industry

Upstream	Downstream			
	Packaging	Household	Construction	Technical
Binh Son Refinery Nghi Son Refinery Hung Nghiep Formosa TPC Plastic & Chemical AGC Chemical Vietnam Polystyrene Vietnam	An Phat Tapack Batico Liksln Ngoc Nghia	Dai Dong Tien Long Thanh Plastic Duy Tan Plastic	Binh Minh Plastic Tien Phong Plastic Dong Nai Plastic Dong A Group	Hanoi Plastic Medioplast

Source: FPTs Research

- Plastic material production in Vietnam is not diversified. Among more than thirty types of plastic material imported annually, Vietnam can produce only four varieties: PVC, PP, PET, and PS. Plastic material manufacturing is highly PVC-oriented.
- Packaging accounts for the largest application segment. However, the local industry is shifting towards higher value-added products such as pressure pipes, ceiling panels, TV cases, etc.



- Around 80% of plastic materials are currently imported. One of the reasons the plastics industry relies so heavily on imported raw materials is that Vietnam's plastic recycling industry is not as yet developed, and is capable of recycling only 27% of the plastic waste generated in the country.
- Vietnam is of the five largest plastic waste polluters in the world. The country targets to end the use of single-use plastics at supermarket by 2021, and in the country by 2025. It has also announced a ban on scrap plastic imports by 2025.
- Plastic consumption has increased in Vietnam due to the COVID-19 outbreak. The measures aimed at containing the spread of the virus have led to tremendous food consumption in supermarkets, where most products are still wrapped in plastic, and have also increased the demand for protective medical equipment made/wrapped with plastic, such as face masks.

## OPPORTUNITIES

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- Vietnam is intensifying its effort in combatting plastic pollution, creating new opportunities for companies specializing in recycling solutions. A possible entry-route is represented by public private collaborations. An interesting case is offered by the agreement signed in 2020 between the Ministry of Natural Resources and Environment, Dow Chemical Vietnam, Siam Cement Group (SCG), and Unilever Vietnam, which announced a collaboration to transfer technology, raise public awareness, and promote policy dialogue for building a circular economy for plastics waste management and recycling on a national scale.
- The packaging sector is proving to be particularly responsive to environmental concerns in Vietnam. Towards the end of 2019, nine consumer goods and packaging companies formed a recycling initiative called Packaging Recycling Organization Vietnam. The companies include Coca-Cola Vietnam, Nestlé Vietnam, Suntory PepsiCo Vietnam, and Tetra Pak Vietnam. The aim of the initiative, which also involves university research centers to explore suitable recycling solutions, is to improve packaging collection and recycling.
- Innovative solutions are also being experimented at eco-industrial parks. For example, in 2019 Dow Chemical Vietnam and DEEP C Industrial Zones recently completed the first asphalt road enhanced with recycled plastics at a DEEP C industrial zone in Haiphong.
- The use of biodegradable plastics is forecasted to increase dramatically in Vietnam, especially after ban on the use of single-use plastics takes effect. Few products manufactured in Vietnam are currently made from biodegradable plastic. The most popular brand in the market today for this product line is the AnEco brand of An Phat Holdings Group, which decomposes within six months.
- Another interesting opportunity area is represented by the fact that Vietnam is positioning itself as the region's top polymer hub. This is particularly interesting as around 85% of machinery used in the local industry is imported, opening up opportunities for exporters of polymer processing machinery and





equipment. The industry has stepped up investment in technology and facilities and co-operation with foreign partners to make more products to meet the local and export demand. It should be highlighted that the EU-Vietnam FTA enables local producers to sell finished products to Europe at preferential rates.

- Vietnam is also becoming increasingly competitive in the field of injection molding, with several Japanese companies moving their production of automotive plastic parts from China to Vietnam.

## 8.4 Automotive in Vietnam

### OVERVIEW

- Vietnam has a growing automotive industry driven by rising domestic demand. Today, the country has 20 automobile assemblers and more than 200 auto-part suppliers. Domestic output is expected to reach close to 500,000 vehicles by 2025, from around 200,000 in 2019. However the sector is at an earlier stage of development compared to Thailand and Indonesia, which are Vietnam's fiercest competitors.
- Vietnam is largely an automotive-assembling of Completely Knocked Down (CKD) units, rather than an automotive manufacturing. There are few local parts suppliers, so most parts used by in-country assemblers are imported. Localized parts are mostly of low technology products such as tires, seats, mirrors, glasses, cable harnesses, batteries, and plastic products.
- THACO, which produces vehicles for Kia, Mazda, Peugeot, BMW, MINI and Mitsubishi, and the Thanh Cong Group (which has a JV with Hyundai), are the leading local players. A new Vietnamese market entrant is VinFast, which is a part of Vietnam's largest private conglomerate Vingroup, which started producing cars under its own brand in 2019 at a 335 hectare factory in Hai Phong in an attempt to build the first high-volume local brand.

Table 14: Output targets for Vietnam's automotive industry

	Locally manufactured automobiles			Growth (%/year)		
	2020	2025	2030	To 2015	2016-2020	2021-2030
Total	227,496	466,375	862,761	7.10	16.82	14.26
Cars with up to 9 seats	114,053	237,900	451,512	6.51	16.00	14.75
Cars with ≥ 10 seats	14,154	29,102	51,288	8.18	18.00	13.74
Trucks	97,952	197,017	356,115	7.63	17.61	13.78
Special-use vehicles	1,336	2,356	3,846	10.13	19.29	11.15

Source: Vietnam's 2014 Master Plan

- The Vietnamese government is incentivizing the production of certain types of vehicles such as small vans used in agriculture with a capacity of 3 tons, medium and short-distance passenger vehicles, and cars with nine or fewer seats and a cylinder capacity of 1500cc.



- It should be highlighted that the Vietnamese motorbike market is the fourth largest in the world, dominated by Honda, Yamaha, Suzuki, SYM and Piaggio. Around 80% of people in Vietnam use motorbikes, and each year 3 million new motorcycles come on to Vietnamese roads.
- The COVID-19 outbreak has imposed a heavy toll on the Vietnamese automotive industry, with several plants closing temporarily. However, it is expected that the industry will bounce back, the luxury segment particularly rapidly. The government implemented mitigating measures such as cutting registration fees for car buyers by 50% and removing import tariffs for auto parts and accessories that are not available domestically.

## OPPORTUNITIES

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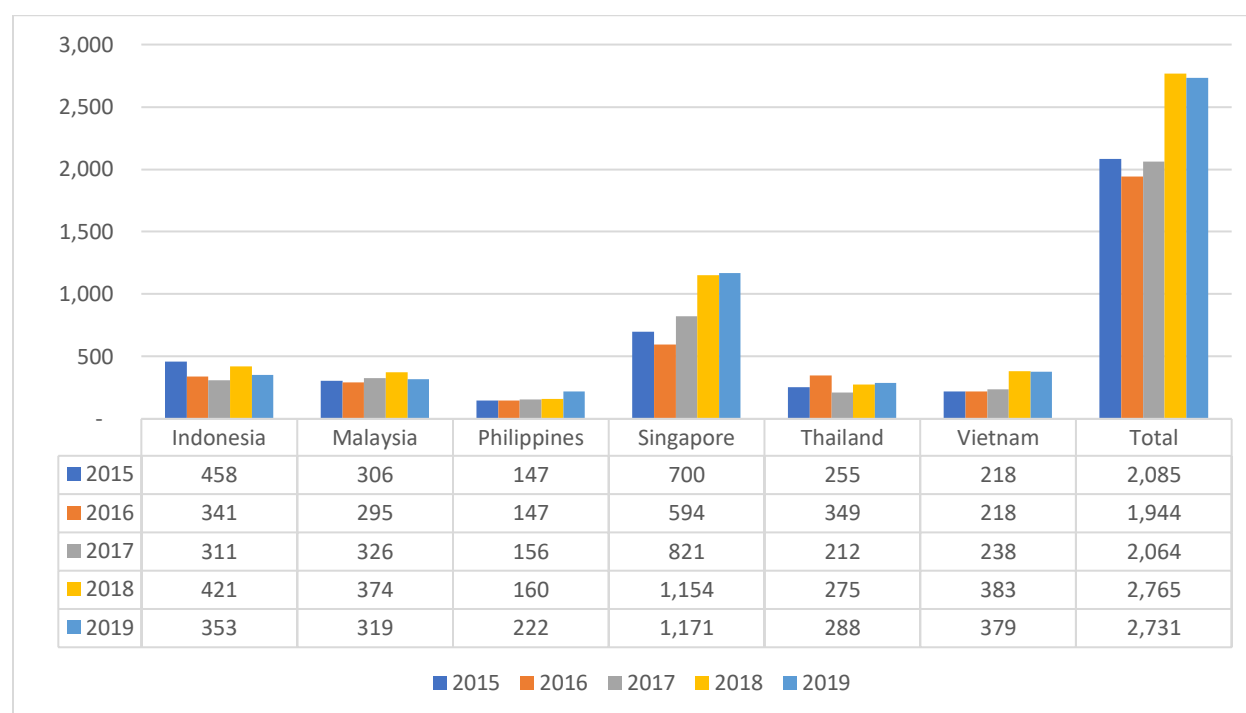
- A key target is VinFast, which in 2020 became the fifth largest car seller in Vietnam and targets to produce 500,000 units per year by 2025. The company is building partnerships with world-class suppliers that are establishing facilities at the production complex's dedicated supplier park. Some of these include Germany's ZF Group, Spain's Grupo Antolin, Lear Corporation from the US, and Thailand's AAPICO.
- Meanwhile, THACO, the only corporation in Vietnam that produces, assembles and distributes all kinds of commercial vehicles and passenger cars, has its own manufacturing complex, and is collaborating with partners for new technologies and technical support, such as Korea's Daewon Group.
- Automotive production is concentrated in dedicated industrial parks. One of the latest to receive approval for construction is the Automobile Assembly Complex in Thua Thien-Hue Province. The USD 117.4 million project will consist of a 50-hectare automobile assembly and manufacturing complex producing cars of up to nine seats with a capacity of 100,000 units per year.
- The government is planning new targets to increase localization ratios, which currently are at around 10-12% for passenger cars, and 45-50% for commercial vehicles and special purpose vehicles. This will drive the development of domestic components producers, to which Virginian companies can sell advanced machinery not available in the market. It is interesting to highlight that Hyundai announced plans to reach 40% localization rate in Vietnam, through cooperation with domestic and foreign businesses.
- The Vietnamese Government aims to stimulate automotive manufacturing and increase the volume use of EVs, which could represent an interesting opportunity area. Vinfast plans to show its first US-bound vehicle, a battery-electric crossover SUV with a range of 300 miles, as early as the 2020 Los Angeles Auto Show. The vehicle is developed with German engineering company Edag, and the batteries are sourced from South Korea's LG Chem as part of a deal forged in 2019 under which Vinfast and LG Chem established a joint-venture battery plant in Hai Phong. Vinfast is also developing electric city cars, electric scooters, and electric buses.



- The electric scooters market of Vietnam is recognized to be one of the most dynamic in the world, with more and more companies entering the market, with total sales around 400,000-500,000 units sold each year. MBI from South Korea is one of the latest entrants, and it is partnering with local companies for developing its own e-scooter product lines in the country.
- Vietnam is also emerging as an automotive R&D center, as FDI in the sector grows. A key example is offered by the Automotive Research & Development Center opened by Bosch in Vietnam in 2014. The center was initially focused on researching automotive technologies, as well as further developing the skills of the company's workforce in Vietnam, and has expanded to lead the product development of electrical components in the application of active safety and engine management systems.



## APPENDIX: EXPORTS FROM VIRGINIA



**Figure 23: Exports from Virginia (USD million)**

Source: United States Census Bureau

**Table 15: Top 10 export items from Virginia to the six major South East Asian markets – Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam**

Item (2-digit HS code and description)	Total export value from 2015 to May 2020 (USD million)
85 Electric Machinery Etc.; Sound Equip; Tv Equip; Pts	233.0
12 Oil Seeds Etc.; Misc. Grain, Seed, Fruit, Plant Etc.	80.8
55 Manmade Staple Fibers, Incl Yarns & Woven Fabrics	27.3
23 Food Industry Residues & Waste; Prep Animal Feed	15.3
39 Plastics and Articles Thereof	17.8
84 Nuclear Reactors, Boilers, Machinery Etc.; Parts	23.1
88 Aircraft, Spacecraft, And Parts Thereof	29.5
44 Wood and Articles of Wood; Wood Charcoal	25.0
48 Paper & Paperboard & Articles (inc Papr Pulp Artl)	11.2
47 Wood Pulp Etc.; Recovd (waste & Scrap) ppr & pprbd	12.3

Source: United States Census Bureau



**Table 16: Top 5 export items by total export value from 2015 to May 2020**

<b>Indonesia</b>	<b>Malaysia</b>
55 Manmade Staple Fibers, Incl Yarns & Woven Fabrics	85 Electric Machinery Etc.; Sound Equip; Tv Equip; Pts
23 Food Industry Residues & Waste; Prep Animal Feed	12 Oil Seeds Etc.; Misc. Grain, Seed, Fruit, Plant Etc.
47 Wood Pulp Etc.; Recovered (waste & Scrap) ppr & pprbd	84 Nuclear Reactors, Boilers, Machinery Etc.; Parts
12 Oil Seeds Etc.; Misc. Grain, Seed, Fruit, Plant Etc.	76 Aluminum and Articles Thereof
39 Plastics and Articles Thereof	39 Plastics and Articles Thereof
<b>Philippines</b>	<b>Singapore</b>
23 Food Industry Residues & Waste; Prep Animal Feed	85 Electric Machinery Etc.; Sound Equip; Tv Equip; Pts
48 Paper & Paperboard & Articles (inc Papr Pulp Artl)	88 Aircraft, Spacecraft, And Parts Thereof
84 Nuclear Reactors, Boilers, Machinery Etc.; Parts	84 Nuclear Reactors, Boilers, Machinery Etc.; Parts
85 Electric Machinery Etc.; Sound Equip; Tv Equip; Pts	39 Plastics and Articles Thereof
02 Meat and Edible Meat Offal	90 Optic, Photo Etc., Medic or Surgical Instruments Etc.
<b>Thailand</b>	<b>Vietnam</b>
12 Oil Seeds Etc.; Misc. Grain, Seed, Fruit, Plant Etc.	44 Wood and Articles of Wood; Wood Charcoal
39 Plastics and Articles Thereof	56 Wadding, Felt Etc.; Sp Yarn; Twine, Ropes Etc.
88 Aircraft, Spacecraft, And Parts Thereof	02 Meat and Edible Meat Offal
84 Nuclear Reactors, Boilers, Machinery Etc.; Parts	52 Cotton, Including Yarn and Woven Fabric Thereof
23 Food Industry Residues & Waste; Prep Animal Feed	84 Nuclear Reactors, Boilers, Machinery Etc.; Parts

Source: United States Census Bureau

