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SUBSECTOR PRODUCTIVITY REPORT

CHEMICALS AND CHEMICAL PRODUCTS



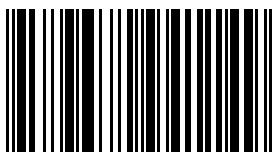


CHEMICAL PRODUCTIVITY NEXUS

SUBSECTOR PRODUCTIVITY REPORT

CHEMICALS AND CHEMICAL PRODUCTS

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Subsector Productivity Report Chemicals & Chemical Products

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Executive Summary

Malaysia's Chemicals and Chemical Products subsector persists as one of the main contributors to manufactured exports. Domestic and globally, chemicals and chemical products serve as the pertinent subsector in the manufacturing sector. The subsector comprises products that cover daily usage and are necessary supporting materials to other industries and manufacturing subsectors. The industry players in the subsector are mainly the small and medium enterprises at more than 90%.

This document reports the productivity performance of the chemicals and chemical products subsector in Malaysia, various challenges faced by the industry, and potential recommendations to elevate the productivity growth of the industry in Malaysia. This report also details the role of the Chemicals and Chemical Products Productivity Nexus (CPN), an industry-led establishment stipulated in Malaysia Productivity Blueprint (MPB)

under the purview of Malaysia Productivity Corporation (MPC) for a period between 2017 to 2021. Deliberation on CPN focuses on how the Nexus impacts the industry at the sectoral and especially at the enterprise level.

Challenges identified within the subsector in Malaysia are the influence of the global trend, impact of the COVID-19 pandemic, limited presence in high value add segments, insufficient talents in the workforce, slow adoption of technology and digitalisation, barriers to expanding globally, and the unnecessary regulatory burdens. In addition, the report presents the outlook for the subsector, especially given the adverse impact of the pandemic. Recommendations put forward are incentives and financial assistance, alignment with the pharmaceutical sector for API, technology adoption, internationalisation, and sustainability.

Statement from the Senior Minister and Minister of International Trade and Industry

“Malaysia’s policy direction is towards accelerating value chain advancement through the strategic adoption of advanced technologies and efficient production of new sophisticated products”



The Ministry of International Trade and Industry (MITI) and its agencies are committed to fast-tracking Malaysia’s economic recovery, growth, and sustainability. Enabling a more robust manufacturing sector will hasten the process, given the sector’s crucial contribution to the country’s economy.

In 2021, the manufacturing sector’s annual economic growth grew to 9.5 per cent, the highest among other main sectors. It attracted the highest approved investment in 2021, with 702 projects worth RM195.1 billion. While other sectors are still performing below the pre-pandemic level, most industries in the manufacturing sector have surpassed their 2019 performance. This forecasts solid and robust growth in the years to come.

The Electrical and Electronics (E&E), Chemicals and Chemical products (C&C), and Machinery and Equipment (M&E) subsectors are the most vital contributors to Malaysia’s manufacturing sector. The subsectors recorded an impressive productivity growth in 2021 – E&E at 12 per cent, C&C at 10.1 per cent, and M&E at 9.0 per cent, the highest among the priority economic areas under MPC’s nine Productivity Nexus.

I congratulate Malaysia Productivity Corporation (MPC) on publishing the 5-year subsectoral reports for the three main subsectors under the manufacturing sector. These reports detail the journey of the E&E, C&C, and M&E subsectors from 2017 to 2021, and with them are the lessons for future growth.

YB Dato’ Seri Mohamed Azmin Ali
Senior Minister and
Minister of International Trade and Industry

Message from the Director General, Malaysia Productivity Corporation

“ 2021 promises enhanced productivity growth to affect national economic recovery positively, and 2022 will be a good year for Malaysia ”



The outlook for Malaysia's productivity growth is promising. Amidst the pandemic, the nation has grown stronger in fighting the repercussions of COVID-19. The nationwide vaccination programme is gaining upward momentum, and economic activities are more vibrant, promising progress in the national recovery plan.

Malaysia Productivity Corporation (MPC), through the establishment of productivity nexus in 9 major economic areas, continues to affect the productivity growth at the sectoral and enterprise levels through various initiatives. In 2021, the efforts were heightened as industries suffered from the impact of the pandemic. Recovery initiatives are multiplied to ensure firms remain in operation.

The Chemicals and Chemical Products Productivity Nexus (CPN) has played an essential part in the manufacturing sector, specifically affecting the industry players directly. The effort aligns with Malaysia Productivity Blueprint

(MPB), which has identified challenges in five areas that affect productivity growth. Challenges in talent, business environment, technology, incentives, and productivity mindset are more pronounced by the disruptive impacts of the COVID-19 pandemic. It calls for a reset in assessing the gaps as the scenario has changed tremendously.

As for the Chemicals and Chemical Products Productivity Nexus (CPN). 2022 promises a busy year for CPN to plan, execute, and realise initiatives to align with the National Industrial Masterplan and 12th Malaysia Plan (12MP). This includes a more rigorous effort to facilitate firms to shift towards the 4th Industrial Revolution (4IR), increase firms' digital technology adoption, and enhance players' capacity, skills, and expertise. 2022 marks the start of a more productive CPN.

Dato' Abdul Latif bin Haji Abu Seman
Director General
Malaysia Productivity Corporation (MPC)

Statement from the Champion, Chemicals and Chemical Products

“Enhanced productivity in the chemicals and chemical products subsector escalates progress and expansion in other manufacturing areas and contributes to overall economic growth”



The establishment of the Chemicals and Chemical Products Productivity Nexus (CPN) is framed based on the proliferation of productivity improvement programmes to uplift dynamism, growth, and expansion in the subsector. The Twelfth Malaysia Plan (12MP) has set a direction for the subsector to progress in the next five years, and CPN is committed to facilitating the journey.

The 12MP has indicated that as Malaysia progresses towards embracing the Fourth Industrial Revolution (4IR), the manufacturing sector will focus on climbing onto higher value-added, more complex and diverse products. The chemicals and chemical products industry is identified as among the key industries that will drive the growth, alongside the electrical and electronics (E&E), machinery and equipment (M&E), and aerospace subsectors. The future focus will also be on leveraging digital technology and capitalising on the benefits of disruptive technologies, in line with National Policy on Industry 4.0 (Industry4WRD). The 12MP projects the overall growth in the manufacturing sector by 5.7% per year during the 12MP duration. The chemicals and chemical products subsector are among the significant contributors.

CPN will have a productive and busy year ahead. The main initiative currently in progress for implementation is the Malaysia Transport Data Exchange (MyTDX) Project which will seamlessly link the relevant required Regulatory Data with that of the industry's e-Roads system. This initiatives would enable the industry players to optimise their operation and manage regulatory, safety & security issues in transporting chemical products. The project would enable the Industry to self-regulate its operations and increase productivity by minimising risks and hazards.

This report presents answers to what is in store for the chemicals and chemical products industry in the near future. The industry is indebted to Malaysia Productivity Corporation (MPC) for the endless support in taking the subsector to a higher level. CPN commits to strengthening further our effort to boost the chemicals and chemical products industry.

Dato' Dr Mohamed Noor Sany
Champion
Chemicals and Chemical Products
Productivity Nexus (CPN)

PART I

CHEMICALS AND CHEMICAL PRODUCTS SUBSECTOR PERFORMANCE



CHEMICALS AND CHEMICAL PRODUCTS SUBSECTOR IN MALAYSIA

AN OVERVIEW

The chemical subsector has contributed consistently to Malaysia's economy, trade, and employment. The industry has high linkages with other industries. Its outputs are necessary input materials for the intermediate and downstream industries, hence creating an inter-industry dependency that one is vital for the business growth of another.

The chemicals and chemical products subsector is a mature industry given the presence of large and successful government-linked companies (GLC) in Malaysia, which have contributed to the subsector's productivity growth. Nevertheless, the subsector is still fragmented as many small and medium

enterprises (SMEs) operate in diverse segments, such as petrochemicals, oleochemicals, and plastics.

As a significant part of the manufacturing sector, the chemicals and chemical products subsector is crucial in revitalising and sustaining long-term economic growth. The subsector includes various products from agriculture and manufacturing sectors to daily use goods. Chemical and chemical products are used as components, among others, in consumer goods, construction, automotive, energy, electronics, transportation, and industrial businesses. Table 1 below illustrates the global usage of chemicals and chemical products according to demands.

Table 1 : Examples of Usage of Chemicals and Chemical Products Based on Demands

Demands	Examples of Usage
Consumer goods	Detergents, hygiene and personal care, textiles, animal food, additives, packaging
Construction	Paints, coatings, sealants, insulation, wires, cables, pipes and fittings, panels, fences
Automotive	Fuel systems, tyres, cooling and heating components, lubricants, car cleaners, emissions and filters
Energy	Batteries, materials for fuel cells, gas diffusion layers, heat transfer, cooling equipment
Electronics	Printed circuits, semiconductors, solar cells, hoses and tubes, insulation and foams
Publishing	Paper processing and finishing, graphic arts, labels, sealants
Agriculture	Herbicides, pesticides, crop protection, fertilisers
Industrial	Inorganic chemicals, petrochemicals, absorbents, catalysts, solvents, monomers, polymers, wastewater treatment
Pharmaceutical	Antibiotics, vitamins, vaccines

GLOBAL PERFORMANCE OF THE CHEMICAL SUBSECTOR

The chemical subsector is valued at nearly USD4 trillion globally. The global performance of the chemicals and chemical products industry recorded an upward trend from 2007 until 2017, indicating the growing demand for chemicals and chemical products. The international shipment of chemical products surpassed USD4 trillion in 2017, with year-on-year growth of about 20%. The growth margin was also stable at around 30% throughout the stated period. In 2019, the chemical industry's cumulative global revenue stood at USD 3.9 trillion. The trend remained stable and promising until COVID-19 disrupted the global longstanding upward performance of the chemical industry.

The pandemic affected most sectors of the economy negatively. Governments worldwide managed the rising infection of COVID-19 by imposing lockdowns and restrictions, which subsequently led industrial activities to almost a standstill, especially from March to June 2020. The situation plundered demand for chemicals, especially in key end-use markets such as electronics, automotive, and construction.¹ Nevertheless, demand for petrochemicals, specifically ethylene, remained steady as ethylene was needed as an essential ingredient for many basic items during the pandemic.² Toilet paper packaging is one of the essentials using ethylene.

The situation in the chemicals and chemical products industry globally fared better in the second half of 2020 as the industry was recovering from

lockdowns. According to the data collected by the American Chemistry Council (ACC), global chemicals production increased since June 2020, and it grew by 1.7% in October 2020 and 1.9% in November 2020.³ A report by the ACC indicated an increase in global chemical production by 3.7% year-over-year on a three-month moving average. The rebound was seen in all regions except the Former Soviet Union. ACC further reported that the industry recorded gains across all segments in the chemical industry profile, with increasing demands for plastic resins, synthetic rubber, manufactured fibres, bulk petrochemicals and organics, inorganic chemicals, other specialities, agricultural chemicals, and consumer products; meanwhile, coatings recorded contraction.⁴

The pandemic affected most sectors of the economy negatively. Governments worldwide managed the rising infection of COVID-19 by imposing lockdowns and restrictions, which subsequently led industrial activities to almost a standstill, especially from March to June 2020.

MALAYSIA'S PRODUCTIVITY PERFORMANCE IN THE CHEMICALS AND CHEMICAL PRODUCTS SUBSECTOR

Figure 1 indicates that the chemicals and chemical products are among the largest contributors to Malaysia's total exports. The growth is contributed by Malaysia's strategic geographical location and

network of significant markets in the region and the Middle East, the firm foundation of supporting services, developed infrastructure, and availability of oil and gas as feedstock.

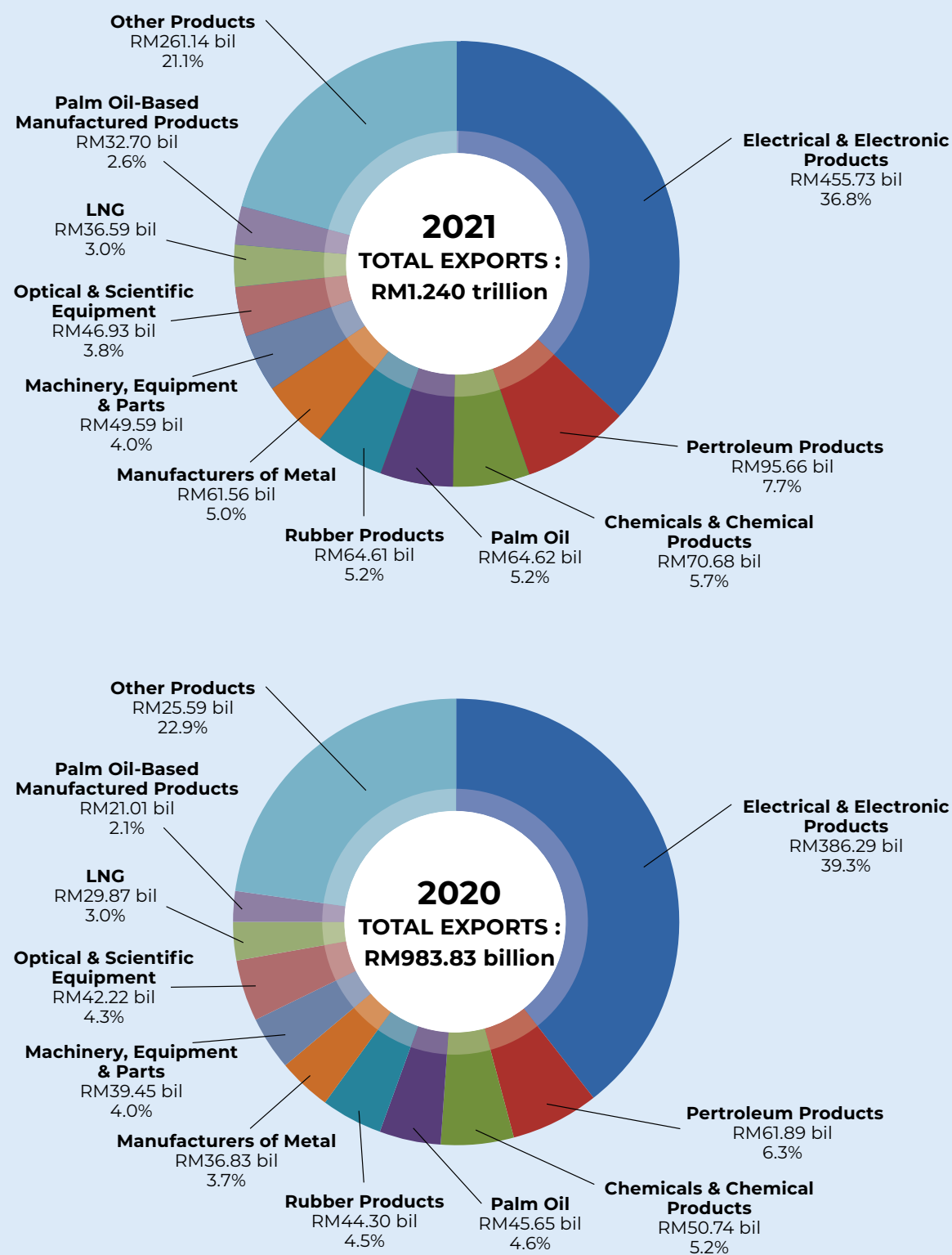
¹ <https://www.nasdaq.com/articles/global-chemical-recovery-continues-to-take-hold%3A-5-top-picks-2021-03-08>

² <https://cen.acs.org/business/CENs-World-Chemical-Outlook-2021/99/i2>

³ <https://www.hydrocarbonprocessing.com/news/2021/01/global-chemicals-output-climbs-for-sixth-month>

⁴ <https://www.hydrocarbonprocessing.com/news/2021/01/global-chemicals-output-climbs-for-sixth-month>

Figure 1 : Malaysia's Exports in 2020 - 2021



Source: Department of Statistics, Malaysia (DOSM, tabulated by MATRADE)

Table 2 indicates the contribution of chemicals and chemical products to Malaysia's economy in 2018 and

2019 by manufactured goods and primary industries classifications.

**Table 2 : Malaysia's Export of Chemicals and Chemical Products
by Top Five Products and Primary Industries in 2018 and 2019**

Industry		2019 (Jan-Sept)		2018	
		RM bil. US\$ bil.	% Share	RM bil. US\$ bil.	% Share
WORLD		728.5	100	1,003.6	100.0
		176.2		248.7	
Manufactured Goods		614.7	84.4	837.1	83.4
		148.7		207.4	
i	Electrical & Electronic Products	276.6	38.0	381.5	38.0
		66.9		94.6	
ii	Petroleum Products	52.4	7.2	76.2	7.6
		12.7		18.9	
iii	Chemicals Chemical Products	42.3	5.8	57.7	5.8
		10.2		14.3	
iv	Manufactures of Metal	31.4	4.3	44.7	4.5
		7.6		11.1	
v	Machinery, Equipment & Parts	30.8	4.2	40.7	4.1
		7.4		10.1	
Primary Industries		108.4	14.9	156.9	15.7
		26.2		38.9	
i	Palm Oil & Palm oil Based Agriculture Products	31.8	4.4	44.7	4.5
		7.7		11.1	
ii	LNG	31.1	4.3	42.3	4.2
		7.5		10.5	
iii	Crude Petroleum	19.8	2.7	36.6	3.7
		4.8		9.1	
iv	Metalliferous Ores and Metal Scrap	5.1	0.7	6.2	0.6
		1.2		1.5	
v	Sawn Timber & Moulding	3.2	0.4	4.5	0.5
		0.8		1.1	

Source: Department of Statistics Malaysia (DOSM)

Within Malaysia's context, in 2017, the subsector contributed RM114 billion in gross output compared with RM75 billion in 2010, registering strong growth over the years. In terms of value added, the subsector recorded RM33 billion in 2021 compared with RM30 billion in 2020, surpassing its pre-pandemic performance in 2019 at RM32 billion. The subsector's value added in 2021 was the highest in the past five years (Figure 2).

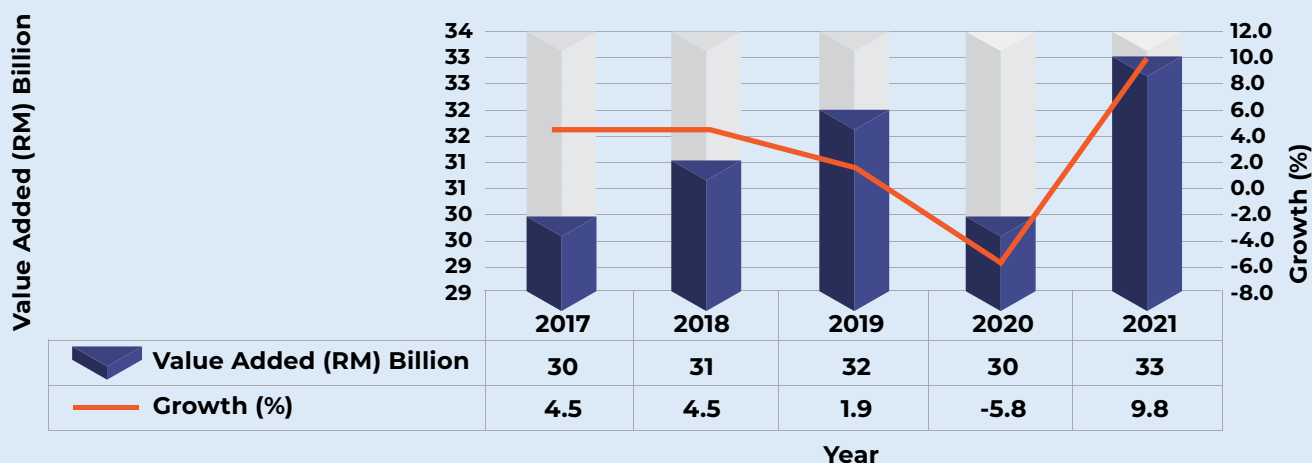
The SMEs are the major industry players in Malaysia's chemicals and chemical products subsector, with more than 90% involvement in the industry. The remaining comprises multinational companies and large local chemical companies.

The chemicals and chemical products industry employed 108,000 Malaysians in 2021 compared with

87,000 in 2010. Over the stated period, the industry's growth implied a positive trajectory of the chemicals and chemical products business expansion. Within the past five years, from 2017 to 2021, employment growth in the subsector increased consistently from 2017 to 2019 but plunged to -1.9 per cent due to the impact of the COVID-19 pandemic. It has since slowly recovered since 2021.

Malaysia's chemical production declined in 2020 by -6.2%, mainly due to the impact of the COVID-19 pandemic.⁵ The repercussion of the pandemic in 2020 had also impacted the average annual growth rate in subsector labour productivity from the period 2018 to 2020, as illustrated in Table 3. The subsector declined in value-added per employment from RM291.100 in 2017 to RM276.827 in 2020, with the annual growth rate contraction at -1.7% between 2018 and 2020.

Figure 2 : Chemicals and Chemical Products Subsector Value Added, 2017 - 2021



Source: Department of Statistics Malaysia (DOSM)

In 2021, the labour productivity of Malaysia's chemicals and chemical products subsector recorded a tremendous increase. Labour productivity level

and growth in value-added per employment in 2021 indicated the highest performance in five years (Figure 3).

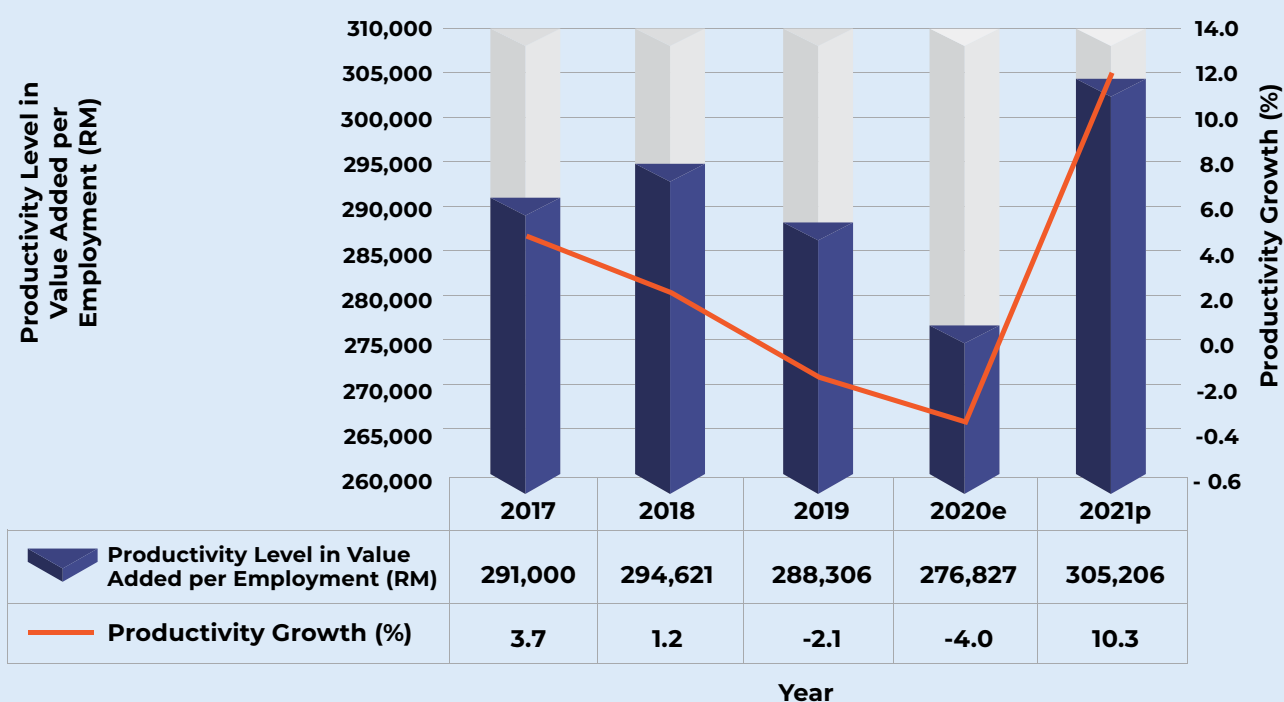
⁵ <https://report.basf.com/2020/en/managements-report/basf-group-business-year/economic-environment/chemical-industry.html> BASF Online Report 2020

Table 3 : Labour Productivity under 9 Priority Subsectors (2017 – 2020)

Sector	Subsector ¹	RM '000 per Worker, at Constant 2015 Prices		Average Annual Growth Rate, %
		2017	2020	2018-2020
Agriculture	Agrofood	89.2	91.9	1.0
Manufacturing	Chemicals and Chemical Products	291.1	276.8	-1.7
	Machinery and Equipment	84.5	86.2	0.7
	Electrical and Electronics	164.8	177.4	2.5
Services	Retail and Food & Beverages	44.4	42.7	-1.3
	Tourism	66.9	37.3	-17.7
	ICT Services	339.2	367.3	2.7
	Professional Services	76.9	78.0	0.5
	Private Healthcare	61.3	59.1	-1.3
	Overall	82.7	82.3	-0.2

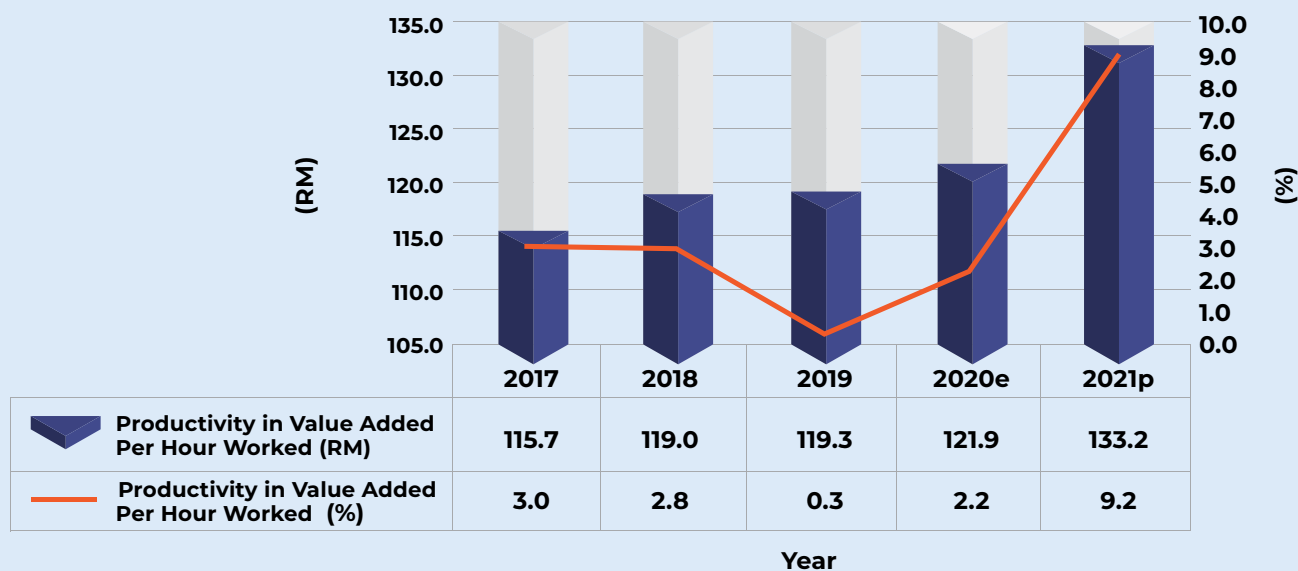
Source: Twelfth Malaysia Plan (12MP)

Figure 3 : Labour Productivity in Value Added Per Employment of the Chemicals and Chemical Products Subsector, 2017 - 2021



Source: Department of Statistics Malaysia (DOSM)

Figure 4 : Productivity in Value Added Per Hour Worked of the Chemicals and Chemical Products Subsector 2017 - 2021



Source: Department of Statistics Malaysia (DOSM)

As indicated in Figure 4, labour productivity in value added per hour worked also increased tremendously in 2021, surpassing the pre-pandemic performance. The data suggests the subsector's future solid trajectory.

The outlook and way forward are promising for the chemicals and chemical products subsector.

One of the significant contributors to Malaysia's trade expansion by March 2021 was the higher global demand for electrical and electronic products, mainly semiconductors, rubber products, manufacturers of metal, chemicals and chemical products, and machinery, equipment and parts.⁶

Department of Statistics Malaysia (DOSM) reported that in the third quarter of 2021, the sales value of the manufacturing sector grew 6.4% to RM382.8 billion

compared to the same quarter in 2020. Petroleum, chemical, rubber & plastic products drove the increase in the sales value by 34.2%. Figure 5 presents sales value by subsector in September 2021, when the sales value of Petroleum, chemical, rubber & plastic products was the highest among all other subsectors, at 29.2%.

DOSM further reported that in terms of economic performance, the manufacturing sector recorded a marginal decline of -0.8% in the third quarter of 2021 (Q2 2021 26.6%), the petroleum, chemical, rubber, and plastic products still grew moderately at 12.6%.

Various data recorded from 2010 to 2021 denoted demands and growth for chemicals and chemical products in Malaysia, which called for the industry to amplify its growth dynamism.

⁶ <https://www.theedgemarkets.com/article/malaysias-total-trade-expands-256-rm1857b-march-2021>

The government's focus on the manufacturing sector in Budget 2022 and emphasis on the chemicals and chemical products industry in the Twelfth Malaysia

Plan (12MP), various stimulus packages, and a high nationwide vaccination rate are the boosters for recovery and revival of the subsector.

Figure 5 : Sales Value by Subsector in September 2021



Source: Department of Statistics Malaysia (DOSM)

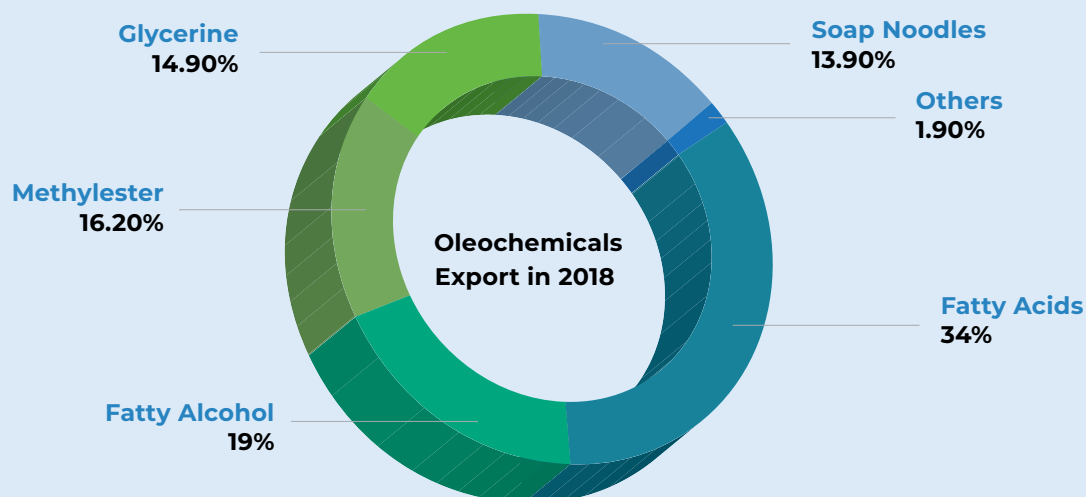
CHEMICALS AND CHEMICAL PRODUCTS SUBSECTOR CATEGORIES IN MALAYSIA

The conventional subsector categories under the chemical subsector are chemicals and chemical products, petroleum products, and plastic products. The Ministry of International Trade and Industry (MITI), Malaysia, outlined eight (8) sub-categories, namely: Oleochemicals; paints and paint products; fertilisers; petrochemical; agricultural chemicals; soap and detergents; industrial gases; and pharmaceutical.

Oleochemicals – Malaysia's chemical products subsector involves oleochemicals production obtained from palm oil and palm kernel oil. Basic

oleochemicals and oleochemical derivatives are among the types of oleochemicals. Basic oleochemicals are fatty acids, methyl esters, fatty alcohols, fatty amines and glycerol, which are the essential components in the oleochemicals industry. Basic oleochemicals produce a wide range of oleochemical derivatives. Figure 6 illustrates Oleochemicals export in 2018.

Key industry players in Malaysia's oleochemical industry are KLK Oleo, IOI Oleochemicals, Sime Darby, and FELDA.

Figure 6 : Export of Oleochemicals in 2018

Source: Malaysian Palm Oil Board

Paints and Paint Products – This category involves producing paints and related products such as varnishes, shellacs, lacquers, thinners, and printing inks. Table 2 below lists paints and paint products made in Malaysia.

Fertilisers – Malaysia is the net exporter of urea, the primary raw material used to produce compound fertilisers. Production of fertilisers includes organic fertilisers from agricultural waste and inorganic fertilisers such as NPK compounds, mixtures and

complexes. Malaysia's requirements for straight phosphatic and potassic fertilisers are met mainly by imports. The government has approved the production of straight fertilisers such as phosphatic and potassic-based fertilisers to cater for market demand since 2018.

Major producers of fertilisers include Agri-Sabah Fertilizers Sdn. Bhd., Kemira-Kuok Fertilizers Sdn. Bhd., CCM Fertilizers Sdn. Bhd., FPM Sdn. Bhd. and Narsco-Kuok Fertilizers Sdn. Bhd.

Table 4 : Paints and Paint Products Produced in Malaysia

Emulsion paint	Prepared lacquer
Water paint	Varnish and shellac
Marine paint	Wood preservative
Aluminium paint	Paint remover
Bituminous paint	Thinner
Gloss/finishing paint	Primer
Undercoat	Distemper

Box Item 1

Malaysian NPK Fertilizer Sdn. Bhd. – Innovation and efficiency through team excellence projects

Malaysian NPK Fertilizer Sdn Bhd (MNF) is one of the National Farmers Organisation (NAFAS) and Petronas Chemical Fertilizer Kedah Sdn Bhd (PCFK) subsidiaries that officially started its operation in 2005. The foundation of this company dates back to the year 1994 when Tun Dr Mahathir officiated Farmer's Day and challenged the local farmers to venture into the large-scale manufacturing industry. In doing so, the farmers' economy expanded significantly, with farmers no longer having to solely depend on their income from harvesting the crops but could generate alternative revenue from high value-added products.

MNF manufactures affordable and quality fertilisers

to maintain the competency and reliability of a world-class factory; maximise shareholders' returns; adhere entirely to the standards of International Health, Safety and Environment (IHSE); to constantly develop the efficiency of human resources. The company also aims to be a world-class manufacturer and exporter of compound fertiliser by producing top-notch and highly competitive fertiliser. Its core

activity is manufacturing various types of fertilisers for paddy plantations, mainly Padi 1 and Padi 2 under the Subsidy Scheme Fertiliser Government Paddy (SBPKP) and Additional NPK Fertilizer known as Padi 3 under the Paddy Production Incentive Scheme (SIPP). Currently, MNF has over 500 local employees in their employment. Although more than half of them are contract employees, their roles and responsibilities are more or less the same as the permanent staff. This indirectly created job opportunities for the residents, thus elevating the living quality of rural areas.

Starting from 2005, various initiatives have been taken by MNF to establish a work culture of excellence as a way to encourage its staff to improve the work process from all aspects

continuously. Through one of its team excellence projects, MNF identified that the conveyor used to transfer raw materials from the warehouse to the process storage bin was made of cleated rubber with a short lifespan and caused a one-month downtime every year. After switching to the bucket lift system, the downtime issue was resolved and boosted overall manufacturing output.

Pesticides – The production of pesticides involves mainly the formulation of locally produced or imported active ingredients. Many active ingredients are made locally, e.g. paraquat salts, MSMA & salts, diuron, glyphosate acid and glyphosates. Imports include technical grade pesticides that are not produced locally and are converted to finished products by mixing, blending and formulation.

Inorganic Chemicals – The category includes the production of Chlor-alkali, acids, and speciality chemicals, for example, silicates, oxides, hydroxide, acids, electronic chemicals, catalysts, and waste treatment chemicals. Other inorganic chemicals produced areas are listed in Table 5.

Agriculture Chemicals – Agriculture chemicals can be classified based on their application target, as listed in Table 6.

Industrial Gases – Common gases for industrial applications such as welding, cutting, blanketing and hydrogenation have a purity level ranging from 99.5% to 99.9%. Some are locally produced, such as oxygen, nitrogen, hydrogen, carbon dioxide, acetylene, argon, and nitrous oxide. Producers' manufacturing plants for industrial gases are usually located near the compound of their significant customers, where gases are supplied through pipelines. Large industrial gases consumers such as steel and petrochemical plants have in-house facilities to supply industrial gases.

Table 5 : Manufactured Inorganic Chemicals

Fumaric acid	Calcium nitrate
Ferric chloride	Calcium carbide
Copper oxide	Calcium oxide
Calcium hydroxide	Calcium carbonate
Polyaluminium chloride	Sodium methoxide
Calcium nitrate	Sulphur powder
Calcium phosphate	Copper sulphate
Hydrogen peroxide	Calcium Silicate
Acetic Acid	

Table 6 : Agriculture Chemicals and Their Application Targets

No.	Agriculture Chemical	Application
1.	Insecticides	Control harmful insect pests that damage field crops
2.	Fungicides	Control diseases that damage field crops
3.	Insect-fungicides	Simultaneously control harmful insect pests and diseases that damage field crops
4.	Herbicides	Control weeds
5.	Rodenticides	Control rats and other rodents
6.	Plant growth regulators	Promote or inhibit the growth of field crops
7.	Attractants	Attract harmful insect pests by odour or other means
8.	Repellents	Create repelling action on harmful mammals and birds that damage field crops
9.	Spreaders	Mixed with other agricultural chemicals to enhance the adherence to these chemicals

Key players with manufacturing licenses to produce industrial gases are MOX-Linde Gases Sdn. Bhd., Southern Industrial Gas Sdn. Bhd, Kulim Industrial Gas Sdn. Bhd. and Southern Industrial Gases Sdn. Bhd.

Plastics – The plastic products industry is one of the most dynamic industries in Malaysia. The supply of locally produced resins contributes to the industry's significant growth. Conducive government policies and incentives facilitate expansion to a highly diversified industry producing a wide array of products. Emphasis on investments in new

machinery and automation increases productivity while reducing dependency on labour, particularly unskilled foreign workers in the plastic industry.

Rubber – Malaysia is the world's eighth-largest rubber consumer, following significant countries like China, the USA, and Japan. Due to the large quantity of raw material available, synthetic rubber, which is a petrochemical-based extraction, lags behind the consumption of natural rubber. This is also attributed to fewer producers of synthetic rubber in Malaysia. The consumption of artificial rubber increases due to research and development efforts to promote and enhance the usefulness of synthetic rubber.

Table 7 : MSIC Codes for Chemicals and Chemical Products

No.	Manufacturing Industry	MSIC Code
1.	Liquefied or compressed inorganic industrial or medical gases	20111
2.	Inorganic compounds	20113
3.	Fertilisers	20121
4.	Plastic in primary forms	20131
5.	Synthetic rubber in primary forms: synthetic rubber, factice	20132
6.	Mixtures of synthetic rubber and natural rubber Or rubber-like gums	20133
7.	Pesticides and other agrochemical products	20210
8.	Paints, varnishes and similar coatings, ink and mastics	20221
9.	Printing ink	20222
10.	Soap and detergents, cleaning and polishing preparations	20231
11.	Perfumes and toilet preparations	20232
12.	Photographic plates, films, sensitised paper and other sensitised, unexposed materials	20291
13.	Writing and drawing ink	20292
14.	Other chemical products	20299

Synthomer is a significant producer in speciality applications of styrene-butadiene (SBR) and acrylonitrile-butadiene (nitrile) latex and a global leader in nitrile latex for dipped gloves as well as in SBR latex for construction. Another major producer of latex products is Revertex, where its main plant for nitrile latex, the largest of its kind globally, is located in Kluang, Malaysia.

Chemicals and Chemical Products Subsector MSIC Code – Table 7 lists the Malaysia Standard Industrial Classification (MSIC) code for the chemicals and chemical products subsector.

PART II

INITIATIVES, CHALLENGES, AND RECOMMENDATIONS



CHEMICALS AND CHEMICAL PRODUCTS PRODUCTIVITY NEXUS (CPN)

Facilitating Productivity Growth of the Chemicals and Chemical Products Subsector

The establishment of the Chemicals and Chemical Products Productivity Nexus (CPN) is framed based on Malaysia Productivity Blueprint (MPB) in addressing the challenges in Malaysia's chemicals and chemical products subsector.

The MPB's productivity agenda is driven by the private sector in partnership with the government. At the sectoral level, the industry-driven initiatives as stipulated in the blueprint have been realised through the establishment of productivity nexus, comprising 11 areas in five major sectors of manufacturing, services, agriculture, mining and quarrying, and constructions.





The 11 productivity nexus, each under the leadership of the selected captain from the respective industry, aim to address sectoral and firm-level productivity performance according to the MPB strategic thrusts – building the workforce of the future, driving digitalisation and innovation, making industry accountable for productivity, forging a robust ecosystem, and securing a reliable implementation mechanism.

Under the manufacturing sector, Chemicals and Chemical Products Productivity Nexus (CPN) has been playing an active role in increasing the productivity of chemicals and chemical products businesses.

In mitigating the diversified issues in the chemicals industry structure, CPN focuses on establishing the Chemical Centre of Excellence, the transition of the SMEs towards high-value-add components in the chemical value chain, and the internationalisation of high potential SMEs. In the aspect of the workforce, CPN's emphasis is on the development of in-house competency-based upskilling training schemes. Meanwhile, for the strategic initiative on technology and innovation, CPN concentrates on the digitalisation and modernisation of the chemical industry.

CPN focuses on managing challenges in the chemicals and chemical products industry in four areas, as illustrated in Figure 7.

Figure 7 : Key Productivity Challenges Addressed by Chemicals and Chemical Products Productivity Nexus (CPN)

 WORKFORCE	 TECHNOLOGY	 INDUSTRY STRUCTURE	 ECOSYSTEM
Insufficient Talent <ul style="list-style-type: none"> ■ Lack of collaboration between industry players & education institutions offering chemical related courses. ■ Lack of quality local graduates, who are not industry-ready and unable to meet the changing demands of the niche chemical industry. ■ Insufficient relevant research on chemical manufacturing in universities. 	Inability of SMEs to adapt to technology changes <ul style="list-style-type: none"> ■ Unaware of investment benefits and unequipped with skills to manage the digital transition. ■ SMEs rarely make the large investments associated with shifting to digitalisation and mechanization. 	Limited presence in high value add segments <ul style="list-style-type: none"> ■ Almost 80% of chemical enterprises operate within the low value add segments. ■ Lost opportunities by not leveraging speciality chemicals as well as the modification and formulation segments. 	SMEs unequipped to effectively expand internationally <ul style="list-style-type: none"> ■ Chemicals and chemical products subsector is also constantly threatened by the shrinking size of the domestic market. ■ Unequipped to expand internationally and form strong partnerships with foreign players.

Productivity improvement programmes under CPN are framed based on five initiatives, indicated as C1 – C5 in MPB.

C1 - The creation of the Chemical Centre of Excellence is based on clear strategies for the chemicals and chemicals products subsector.

The centre will provide an immersive experience in chemical-related advanced technology, navigate relevant technology vendors, enable seamless access to the industry's best practices, benchmarking, and trends, and ensure the industry players move to high-value production. The centre is also expected to bridge the gap between theoretical chemical research and practices on the ground and lead to the industry's productivity improvements. The Centre of Excellence fosters collaboration between and within academia, industry players, and government bodies related to the chemicals industry in research and development, production, and commercialisation.

C2 - CPN's strategic initiative in addressing issues related to the current and future workforce emphasises the development of in-house competency-based upskilling training schemes.

Customised collaboration between the business community and education and training providers is the means to materialise this initiative. The training scheme should comprise the complete training cycle from needs analysis, content design, module delivery, assessment, and programme evaluation. Post-training tracking system should also be in place to monitor the programme's effectiveness. Effectual training schemes focusing on in-demand current and future skills, knowledge, and competency create a workforce ready for existing and future jobs.

C3 - CPN's support for the fast adoption of technology by SMEs helps to increase firms' productivity and performance. While there is a high sense of awareness of the positive impacts of technology, implementation remains in its infancy. The manufacturing industry, including the chemicals and chemical products sector, records a

low level of readiness and capabilities for Industry 4.0, characterised by advanced technology, digitalisation, automation, robotics, data analytics, and artificial intelligence. Barriers that impede the transition towards Industry 4.0 need to be identified and analysed to determine the appropriate support and assistance.

C4 - Through various programmes, CPN supports the chemicals industry players, especially the SMEs, to shift towards high-value segments by identifying the competitive spaces where potential local SMEs can thrive and move away from focusing on low value add primary manufacturing.

Accurate identification of gaps and issues leads to efficient design and execution of support to foster vertical integration. Solid and innovative partnerships between SMEs and large companies in the industry aid this pursuit through knowledge and technology transfers.

C5 - Internationalisation of the high potential SMEs in the chemical industry is the natural curve towards expansion and business sustainability. The growth attends to the growing demands for chemical products. CPN provides the support platform for the industry players to grow their operations and markets globally. Identifying potentially good chemical products and vital SMEs is among the early steps, followed by targeted support and guidance towards internationalisation.

Under the manufacturing sector, Chemicals and Chemical Products Productivity Nexus (CPN) has been playing an active role in increasing the productivity of chemicals and chemical products businesses.

CHALLENGES WITHIN THE CHEMICALS AND CHEMICAL PRODUCTS SUBSECTOR IN MALAYSIA

Identifying the challenges in the chemicals and chemical products subsector assists solution design and execution for productivity growth and progressive expansion.

In gearing towards boosting growth and productivity in Malaysia's chemicals and chemical products industry, the industry should manage challenges impeding its expansion.

INFLUENCE OF THE WORLDWIDE TRENDS IN THE GLOBAL CHEMICAL SUBSECTOR

Influence from the trends in the chemical industry presents both opportunities and challenges to Malaysia's chemical industry landscape. Three global megatrends, namely the increasing population and middle-class income, technological advancement, and sustainability, directly influence the chemical industry's product offering and innovative solutions against stricter legislative requirements and dynamic consumer behaviour.

Rapid and advanced technology and innovation are among the major drivers for the chemical industry in increasing operational efficiency and diversifying products portfolio towards specialised chemical products. For example, development in seed technology and agrochemicals drives improvement in yield per hectare, and the use of thermoplastics helps the auto industry for lighter weight. Technology intertwines with the call for more sustainable and environmental-friendly materials to reduce carbon emissions, energy and water consumption, improve nutrition, and increase safety. Companies such as BASF initiated climate-protection products that managed to avoid the emittance of 320 million tons of equivalent carbon dioxide. Most of these savings came from using alternative cement additives and insulation products in the construction industry. Initiatives to develop solutions that lead to more sustainable and energy-efficient products must be balanced with the need to meet consumer needs.

Over the medium term, four (4) key trends are expected to shape the chemical industry scenario. Firstly, robust capacity additions will influence the chemical industry, mainly in Asia and the US. There will be a massive capacity build-up in the Asia Pacific and the US, which will impact trade flow. Secondly, as the petrochemical sector has emerged from a downcycle, commodities and basic chemicals will be exposed to cyclicalities. Thirdly, chemical firms are pursuing growth in speciality chemicals in which producers are moving towards a higher-value chain, particularly in Asia. Lastly, sustainability-driven business models will continue to gain traction.⁷

The trends create immense opportunities for chemical firms to be more competitive in the marketplace while presenting challenges should firms' readiness is low in adapting to the trends. As the trends are highly potent to indicate the current and future demands in the chemical industry, the inability to adjust to the trends' characteristics diminishes firms' competitive edge. It stunts their productivity, performance, and profitability.

Rapid and advanced technology and innovation are among the major drivers for the chemical industry in increasing operational efficiency and diversifying products portfolio towards specialised chemical products

⁷ 5R Analysis, PETRONAS

⁸ <https://www.nasdaq.com/articles/global-chemical-recovery-continues-to-take-hold%3A-5-top-picks-2021-03-08>

⁹ <https://www.chemengonline.com/petronas-chemical-and-lg-chem-to-build-new-nbl-plant-in-malaysia/>

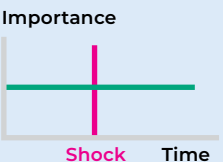
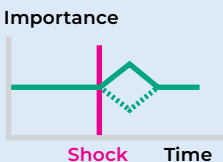
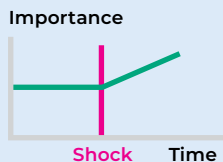
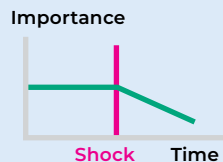
THE IMPACT OF THE COVID-19 PANDEMIC ON THE CHEMICAL SUBSECTOR

Globally, the demand for chemicals picked up from the third quarter of 2020 as global economic activities returned and China's economy rebounded.⁸ The surging demands for safety, hygiene, health products, and the essentials, including chemical-based products such as hand sanitisers, disinfectants, and cleaning products, skyrocketed during the COVID-19 crisis. In addition, the chemical industry provides polypropylene and polyethylene to make PPE and plastic products. Recently, nitrile gloves recorded

strong growth in preventing the spread of COVID-19 and are expected to account for 70% of the entire latex gloves market in 2024.⁹ During this health crisis, the chemical industry played a vital role.

The World Economic Forum's Chemical and Advanced Materials Industry Action Group (IAC) identified visible changes in the global chemical industry, which may challenge chemical firms to adapt their business plan and operations.

Figure 8 : Trend Impact Pattern of the Impact of COVID-19 Pandemic

	I. UNAFFECTED	II. TEMPORARY CHANGE	III. LONG-TERM ACCELERATION	IV. LONG-TERM DECELERATION
				
Economic Trends	<ul style="list-style-type: none"> Shortage of critical talent 	<ul style="list-style-type: none"> Business portfolio restructuring (e.g. M&A) Public-private collaboration 	<ul style="list-style-type: none"> Downstream value chain integration Shift to new innovation sources Structural change in key customer industries 	<ul style="list-style-type: none"> Globalization of supply chains and production networks Focusing of portfolios on few core segments
Environmental Trends	<ul style="list-style-type: none"> Increasing use of bio-based materials 	<ul style="list-style-type: none"> Environmental footprint reduction 	<ul style="list-style-type: none"> Move to circular economic models Transition to renewable energy 	
Geopolitical Trends	<ul style="list-style-type: none"> More regulation on country and EU level non-harmonized regulatory schemes 	<ul style="list-style-type: none"> Concerns for employee health and safety 	<ul style="list-style-type: none"> Erosion of global trade frameworks and increasing protectionism 	
Societal Trends	<ul style="list-style-type: none"> Critical perception of the chemical industry Influence of activist investor 		<ul style="list-style-type: none"> Shift to remote Preference for sustainability-conscious offerings 	
Technological Trends			<ul style="list-style-type: none"> Digitalization, automation of work 	

- Trend Impact Pattern : How a shock like COVID-19 changes key trends in the short and long-term
- Image : Industry Action Group and Accenture Analysis

Source: WEF Industry Action Group and Accenture Analysis

LIMITED PRESENCE IN HIGH-VALUE ADD SEGMENTS

A consistent challenge in Malaysia's chemical subsector is the inability of the chemical firms to penetrate the high value-add segments. The situation decreases opportunities for significant gain and affects the industry's sustainability in general. In MPB's analysis, 90% of firms in the chemical subsector are SMEs who contribute to a small margin of the overall subsector value add. Market mapping indicates that 80% of the chemical enterprises that operate within the low value add segments contribute to this. Limited presence in high value add segments may be due to various reasons. Among others are the high cost of product reinvention and marketing, lack of product diversification, updates, innovation, and limited products that do not fit market segmentation.

PETRONAS has identified firms' movement to a higher value chain as one of the medium-term

trends which will influence the growth of the chemicals industry. Local firms need to venture into the speciality chemical market segment to increase returns and insulate their businesses from market cyclicity. Movements to higher-value segments comprise performance-focused specialities that should be chemistry-driven, less cyclical, trade secret-based, capital-light, and specialised applications. Growing population and rising middle-class income are expected to increase demands for high growth speciality chemicals segments, namely electronic chemicals, speciality polymers, speciality coatings, nutraceutical ingredients, cleaners, and industrial institutions. The end products should capture the markets for automotive, construction, electronics, packaging, food and agriculture, fibres and textiles, household and personal care products, mining, and paper.

INSUFFICIENT TALENTS FOR THE CURRENT AND FUTURE WORKFORCE

Issues concerning the supply and demand of talents for the current and future workforce are compounded by the impact of the pandemic. Inability to hire local workers, high reliance on foreign workers, and lack of high skills workers or workers with specific skills sets are among the challenges in the chemical industry, which leads to low productivity and performance levels. Skills mismatch also presents a barrier for chemical firms to hire graduates who just left university when skills needed in the industry do not match the education received at higher learning institutions. Graduates are not industry-ready. Regarding hiring high skills talents, issues related to high hiring costs limit firms' ability to pursue expatriates when local talents are not available. These limitations create pipeline problems for firms to grow and expand.

COVID-19 has uncovered the compounding impact of insufficient talents for the current and future workforce. The rapid adoption of technology and digitalisation during the COVID-19 crisis indicates that the workforce lacks the readiness to shift swiftly with the fast adoption of technology. This implies low workforce readiness for Industry 4.0, characterised by advanced technology. Fragmented training, upskilling, and reskilling programmes multiply the challenge further when they are not based on the need for critical skills and competencies. Talents in digital marketing and strategy, data analytics, artificial intelligence, machine learning, process automation, business development, software and applications, and the Internet of Things (IoT) are difficult to find in the chemical labour market.

THE INABILITY OF THE SMEs TO ADOPT TECHNOLOGY AND THE SLOW TRANSITION TOWARDS INDUSTRY 4.0

As crucial as finding the right “man” is the challenges in upgrading machines and improving methods alongside technological advancement and digitalisation. According to the 2020 participation in Industry4WRD Readiness Assessment (RA), a tool to assess manufacturing firms’ readiness and capabilities in adopting Industry 4.0, 59% of the participating manufacturing companies were in the “newcomer” profile. The profile is described to ‘have the interest to pursue Industry 4.0 but with none or very minimal efforts’. Though the figure is cumulative of all the participants from the manufacturing industry and not specifically on the chemicals and chemical products industry only, it does imply that many are still at the basic stage in terms of technology adoption and shifting slowly towards Industry 4.0. While awareness is high of the positive impact

of technology adoption on business productivity, profitability, and performance, execution remains low due to high cost, financial constraints, and lack of manpower and skills to operate new machines and processes. As a result, firms are not competitive enough in the marketplace.

In the chemical industry, the challenges are in implementing automation and shifting from manual and conventional production to automated production systems, such as software upgrades, robotics, intelligent manufacturing solutions, and supply chain management systems. The SMEs especially view finance as the main barrier to machine and method upgrades, thus limiting their capacity for expansion.

THE INCAPABILITY OF THE SMEs TO EXPAND INTERNATIONALLY

The SMEs in the chemical industry in Malaysia are unequipped to expand beyond the domestic market. The inability to venture into the international arena can be attributed to the lack of funds, knowledge, network, and competency to explore the global distribution channel, financial constraints to invest in a more effective marketing and promotion plan and execution, and low product diversification and

innovation. As the domestic market is shrinking, the industry players face multiplied challenges to remain sustainable and competitive in the local arena. International visibility and recognition of brands of chemical products from SMEs are low. As COVID-19 has impacted the SMEs the most, their inability to expand internationally is even more pronounced than before.

REGULATORY BARRIERS IMPEDE CONDUCIVE BUSINESS ENVIRONMENT

Unnecessary regulatory burdens may impact the expansion of Malaysia's chemical industry. In 2019, Malaysia's export values of chemicals stood at RM85 billion, with China as the biggest trading partner. 20% of Malaysia's organic chemicals were exported to China, then Singapore at 15% and India at 13%. Regulations related to exports of chemicals and chemical products should ease the process and procedures in getting Malaysia's products abroad. In terms of chemical production, issues related to compliance with environmental regulations must be

made efficient to ease firms in doing business. Some chemical firms in Malaysia face challenges getting and renewing the relevant licences as the process is time-consuming. Some regulations are burdensome to the industry players, for instance, in meeting new regulatory requirements to build a new processing plant.

For any industry to prosper, regulatory concerns on the ground by the industry players must be addressed to facilitate their business operations.

CPN'S PAST INITIATIVES TO CATALYSE PRODUCTIVITY GROWTH, 2017 – 2021

Continuous efforts are pertinent to mitigate current and future challenges and support the business community to revive, sustain, and expand operations.

Since the establishment of CPN in 2017, various initiatives have been conducted to address the identified challenges. Most of the efforts impact the industry at the enterprise level. They are primarily direct solutions to the industry's challenges.

SIRIM-FRAUNHOFER PROGRAMME

In 2017, CPN started working with SIRIM on a productivity improvement programme for SMEs through technology penetration and upgrading. As productivity in the chemicals and chemical products industry was driven mainly by the SMEs, there should be a special mechanism to increase the usage of technology and innovation to elevate SMEs' competitiveness and spur the subsector's growth.

The programme was delivered through the SIRIM-Fraunhofer alliance by adopting Germany's approach to increasing the productivity of SMEs through technological innovation. The programme was delivered within four main scopes: implement innovation management, increase technology uptake by the SMEs, nurture the growth of the SMEs' and develop a cross-cutting programme.

LEAN MANAGEMENT TRANSFORMATION SYSTEM DEVELOPMENT PROGRAMME

The programme's inception in 2018 focused on the plastic and pharmaceutical industries, involving five chemical companies. It consisted of training sessions and site visits between July and November 2018. It

involved the plastic industry (Combi-Pack Sdn Bhd, Zeito Plastic Components Sdn Bhd, See Hau Global Sdn Bhd, and Ekspedisi Sdn Bhd) and pharmaceutical industry (CCMD).

ENHANCING CHEMICAL SAFETY THROUGH RESPONSIBLE CARE

Between September to December 2018, CPN conducted the Responsible Care programme to create awareness of chemical risks in the event of accidents and on the legislation governing occupational safety hazards (OSH). It aimed for the industry players to take cognisance of the global chemical industry's voluntary initiative to continuously improve health, safety, and environment (HSE) performance through Responsible Care. The programme assisted the SME players in implementing the HSE management system based on Responsible Care's Guiding Principles and Codes of Management Practices and relevant government regulations.

192 participants from 101 companies attended the programme. Among the topics shared during the programme's sessions were Measuring Productivity Performance through Productivity Toolkits by MPC, Chemical Risks to Health in SMEs by CICM, OSH Regulations and Implications from OSH Incidents / Accidents by DOSH, Role of BOMBA in Hazardous Material Incidents by BOMBA, and Prevention Programmes & Social Security Schemes & Benefits by SOCSO. From the programme, six companies were identified for Chemical Safety for Productivity Improvement, held in the first quarter of 2019.

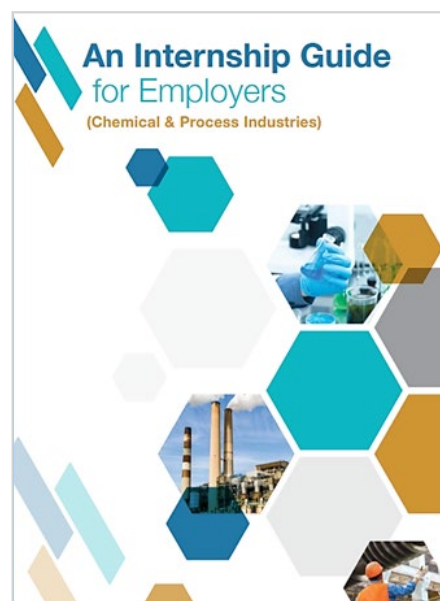
INTERNSHIP GUIDELINES FOR EMPLOYERS

The development of the Internship Guidelines for Employers in 2019 aimed to establish a clear and better understanding of the roles of supervisors/ employers in managing internship students and provide a list of references, R&D projects and areas of expertise from universities and Technical Educational Institutions Offering Chemical Engineering, Chemistry and Process Engineering Courses to the Chemical Industries.

The guidelines were developed via a collaboration framework between selected industry players and relevant education and training institutions, with effective tracking mechanisms. This pilot scheme ensured that educational institutions receive input on updated technological advances and trends related to the industry to enable more targeted curriculum planning and research funding.

The collaboration also allowed industry players to articulate their required skill sets and provide input on the feasibility of proposed research based on experience on the ground. It included a comprehensive framework that outlined potential collaborations for long apprenticeships, sponsored

research and industry-led workshops to develop soft skills, focusing on developing industry-ready graduates. Providing university students with the opportunity to experience practical training in the industry encouraged them to develop a career in chemicals in the future, creating a quality pipeline of talent for the sector.



DEVELOPMENT OF THE REPOSITORY OF SUBJECT MATTER EXPERTS

In 2019, CPN developed the Repository of Subject Matter Experts in Malaysia's chemical industry, which also included researchers in the field of chemical courses offered by higher learning institutions. The repository centralised records of subject matter experts' profiles such as name, area of specialisation, organisation, research work, and contact details for reference.

The project was a part of the effort to establish a Centre of Excellence (CoE) to create easy access to information on chemical experts and researchers. The repository aimed to assist the industry players in strengthening their products and services through research and development via collaboration.

CHEMICAL VIRTUAL ADVISORY CLINIC (CHEM-VAC)

In 2020 when the COVID-19 pandemic hit the economy, CPN launched Chemical Virtual Advisory Clinic or CHEM-VAC as a platform for the industry players to voice their problems and listen to possible solutions from the industry experts.

CHEM-VAC leveraged technology, specifically video-conferencing tools, to deliver virtual or remote advisory and consultation to the business community. Such technology enabled CPN to retain a generally high level of personal service while reducing the operational cost significantly and flattening the COVID-19 contagion.

CHEM-VAC built enterprises' capacity and capability to restructure and resume businesses impacted by the pandemic by providing implementable advice and recommendations in mitigating challenges faced. The one-on-one advisory service focused on three issues, namely branding and marketing, export issues, and market validation for new products.

The industry players were receptive to the model and opined that suggestions from the experts helped them strategise their businesses.



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C&C COMMUNITY OUTREACH PROGRAMME

Until December 2021, CPN conducted C&C Community Outreach Programme to build the database for CPN towards developing the Centre of Excellence (CoE) for the C&C subsector. The outreach programme was conducted through webinars and online engagements with C&C companies and industry experts. The programme was delivered in collaboration with the Fire and Rescue Department of Malaysia, Department of Environment (DOE), Department of Occupational Safety and Health, and Malaysian Society For Occupational Safety & Health (MSOSH).

CPN conducted 50 sessions involving 2500 companies with 15,941 participants. The programme increased CPN industry experts to 81 individuals and garnered FB followers from 104 to 2200 followers. The webinar sessions focused on increasing awareness of health, safety, and the environment, as well as productivity improvement and best practices in the C&C subsector. The programme increased participants' understanding of complying with environmental regulations and knowledge of a safe workplace.

CAPACITY BUILDING PROGRAMMES

Capacity building programmes were conducted via webinar series and talks featuring academicians, captains of the industry, and experts to share insights on the chemicals and chemical products subsector.

In March 2020, CPN conducted a capacity building programme in Kelantan to address the industry's concerns in waste treatment for chemical effluent in the batik industry and new value-added products from the existing ingredients through biochemistry approaches. The interactive session uncovered the

root causes of the issues and proposed solutions. Among views highlighted were the limitation of research opportunities offered by research universities to maximise the impact of waste effluent, high investment cost on R&D for equipment and expertise, ineffective advisory by the relevant authorities, and poor R&D collaboration and assistance from the government. The session was attended by representatives from Koperasi Pembatik, higher learning institutions, various government agencies, and the industry.



Capacity building programme with batik industry players in Kelantan



In facilitating MPC's #MyMudah initiatives, CPN, in close collaboration with captains of the industry, identified 19 issues and recommendations from the industry. One issue was the delays in the approval process for the export permit for Koalin. CPN conducted an engagement session on topics related to export with MATRADE experts and executed SME Global – An Export Ready programme for the chemical sector. A series of webinars on export-related content was organised, featuring industry experts who spoke on various topics on exports of chemicals and chemical products. In facilitating MPC's #MyMudah initiatives,

CPN, in close collaboration with captains of the industry, identified 19 issues and recommendations from the industry. One issue was the delays in the approval process for the export permit for Koalin. CPN conducted an engagement session on topics related to export with MATRADE experts and executed SME Global – An Export Ready programme for the chemical sector. A series of webinars on export-related content was organised, featuring industry experts who spoke on various topics on exports of chemicals and chemical products.

Box Item 2

Petronas Penapisan (Terengganu) Sdn. Bhd. – Innovation towards health, safety, and environment
 Petronas Penapisan (Terengganu) Sdn. Bhd. (PP(T) SB) was established in 1982 and is wholly owned by PETRONAS. This entity produces gasoline, kerosene, distillate fuel, residual fuel, and lubricants. It is located in Kerteh, Terengganu, a refinery crude oil company incorporated with the most modern refineries technologies. The company has a well-laid plan and infrastructure to deliver high-quality products to its clients. Certain significant aspects ensure a strategic position and enable commercial advantages in the organisation. Those aspects are responsive supply, systematic distribution and planning. These aspects also help the organisation strengthen its position despite the ever-changing market demands.

PP(T)SB engages employees through innovation towards health, safety, and environmental (HSE) obligations. The company believes technology and adaptation to changes are beneficial in boosting

competitiveness for betterment. PP(T)SB encourages all employees to engage with innovation. This is because innovation comprises a few crucial stages: generation of ideas, data collection, prioritisation, experiments, and implementation. All these stages involve thinking skills and enhancing soft skills in the work, which is highly beneficial to all employees.

PP(T)SB leverages Innovation and Creative Circle (ICC) as the catalyst for innovation, and this platform is always used in solving issues that relate to work inefficiency and HSE. This approach effectively involves several tools and techniques that transform ideas into actions. It is a regular teamwork exercise to identify, investigate, analyse, and solve work-related problems. ICC has been a part of the total quality improvement in PP(T)SB as many positive outcomes are derived for Page 2 output maximisation. Not only that, ICC helps to improve workers' morale and motivation and helps build confidence and trust among customers.

COLLABORATION WITH POLITEKNIK TUN SYED NASIR (PTSN)

In October 2020, a collaborative effort was inked between CPN and Politeknik Tun Syed Nasir (PTSN) for the Certificate in Chemical and Process Training. The certificate comprised courses on management of chemicals and chemical and lab wastes, environmental engineering, and process unit and utility operation management. The collaboration

denoted deep collaboration between the chemical industry players and educational institutions in delivering chemical-related courses. Supporting sessions via workshops were conducted to enlighten the relevant parties on the details of the certification programme.



Collaboration with Politeknik Tun Syed Nasir (PTSN) for the Certificate in Chemical and Process Training

PARTICIPATION IN THE HIGH VALUE-ADDED SEGMENT - DEVELOPMENT OF MALAYSIA VACCINE ROADMAP

In collaboration with Malaysian Vaccine and Pharma (MVP), MPC-CPN started the initiative to address Malaysia's preparedness for pandemics by developing the vaccine industry roadmap. CPN conducted a deep-dive workshop and engagements with the relevant government bodies, academia, and industry players, deliberating on pandemics' potential health

and economic impact and the importance of building an ecosystem for Malaysia's vaccine industry. Output from the initiative has been used by the Ministry of Science, Technology and Innovation (MOSTI) as the baseline input in developing the National Vaccine Roadmap.

FACILITATING HIGH POTENTIAL CHEMICAL SMES TO EXPAND INTERNATIONALLY

The pilot run for the programme involved six SMEs selected from the Industry4WRD Readiness Assessment that went through ERAT-MATRADE. Facilitation and interventions for the selected companies included designing the business plan, assisting and subsidising for consultancy and R&D, licensing, patent and trademark, business matching domestically and internationally, acquiring

certification and recognition, and training assistance. Upon completion of the interventions, the companies were channelled to Export Acceleration Missions under MATRADE. The six companies served as case studies for reference and learning, aiming to launch more companies into the international market in 2022.

Box Item 3

Kulim (M) Berhad (KMB) – efficiency in the production of quality crude palm oil

Kulim (M) Berhad (KMB) has always been in the quest to be more progressive, efficient, profitable and a premier entity in the industry. This organisation was founded in 1975 and had a headquarters in Johor Bahru. KMB is one of the earliest established corporations and has expanded its business extensively in Malaysia and Indonesia. The plantation by KMB deals with crude palm oil processing & plantation management and consultancy services. It is indeed a fact that KMB has undergone rapid growth in achieving many milestones, including venturing into Oil & Gas (O&G) related business, sea transportation, sales of wood-based products, and many potential areas.

KMB's remarkable achievement is rooted in the efficiency of its employees. Teamwork and a sense of belonging directly support building a spirit towards these achievements. Their attitude towards work has resulted in vast improvement at the workplace. All these are gained through a significant human

capital investment for employees' development. This is crucial in enhancing employees' competencies to provide a foundation for outstanding execution and quality service.

To increase the efficiency in producing quality crude palm oil, KMB had brainstormed to identify the root causes of SFC that led to an often breakdown during transferring FFB to the auto-feeder. This was done based on five factors: man, machine, material, method, and environment. They further observed and collected critical data for verification of possible root causes. The findings confirmed three causes of the problem: excessive FFB during transfer into SFC with no speed control of FFB feeding. Secondly, it was discovered that the position of the SFC gearbox was not suitable, which led to a crack beneath the gearbox. The final concern was that the FFB was always entangled at the sprocket. The Tree diagram was drawn for each root cause to identify the most reliable solutions. The table below shows the root causes, proposed solutions, and actions to resolve the SFC problem.

IN-PROGRESS INITIATIVES TO ADDRESS CURRENT INDUSTRY CONCERNS

Through various Initiative Working Groups established under CPN, several programmes are ongoing to benefit the SMEs primarily in the industry to boost productivity growth.

MALAYSIA TRANSPORT DATA EXCHANGE (MYTDX)

MyTDX is CPN's highest impact project in 2022. The project aims to assist industry players in optimising operations and managing safety issues in chemical transportation. Its objectives are to address concerns in safety and security aspects; manage the dependency on third-party transport service providers with poor control and management over their drivers and vehicles; mitigate the lack of integration in government agencies' framework and systems, and control the unauthorised and unqualified chemical transporters of scheduled wastes and disposals.



MyTDX: Engagement with DOSH

Fragmented governance and lack of data connectivity between the chemical industry and the relevant government agencies are among the root causes affecting safety and security in transporting the C&C products. Current data acquisition is manual, inefficient, and time-consuming, and the lack of data connectivity between regulators and industry creates a challenge in achieving full regulatory compliance. The industry players do not have access to regulators' records on drivers and vehicles. For example, records on blacklisted drivers and vehicles, outstanding summons, invalid licences, drug offenders, criminal involvement, and habitual traffic offenders are not accessible to the industry players in hiring drivers and vehicles to transport goods. Unverified information and lack of data expose the industry to the risk of hiring non-compliant drivers and deploying unfit vehicles.



MyTDX: Engagement with the Ministry of Transport

MyTDX targets enhancing the subsector's productivity and competitiveness as any safety and security issues can impact the operation, leading to higher costs of doing business and the use of resources.

MyTDX aims to upscale the industry's e-Roads platform to optimise performance, enhance safety, and improve the operational sustainability of Malaysia's road transport operations. The implementation of the project is expected to better manage and control the transportation of chemicals and chemical products on Malaysia's roads. Execution of the project involves multiparty collaboration, including MOT, PDRM, DOSH, and DOE. MyTDX is a national level vision towards the industry's self-regulated compliance in the transportation of chemicals in the country.

Successful implementation of MyTDX is expected to self-regulate road transport operations to minimise risks due to high-risk cargoes and road hazards and form a governing body to allow only knowledgeable hauliers and competent drivers and fit-for-purpose approved vehicles to haul dangerous loads. Currently, related data such as licenses, road tax, and PUSPAKOM inspections is updated manually into the database. The system is expected to increase efficiency and reduce errors due to minimised manual intervention.

Full implementation of MyTDX is expected to bring the following benefits:

- i A national assurance mechanism with features of automation/efficiency, transparency, fraud prevention, data verification, and assurance that only fit-for-purpose drivers and approved vehicles are deployed;
- ii Shared national real-time value addition;
- iii One-stop national portal for industry subscribers to verify the status of drivers and vehicles;

- iv Industry self-regulates without over-depending on authorities;
- v Effective monitoring by the government of the industry; and
- vi A high return-of-investment project that increases productivity, safety, and security.



MyTDX: Engagement with JPJ

CERTIFICATION FOR CHEMICAL PROCESS TECHNICIAN PROGRAM

The innovative multiparty collaboration among the government, industry, and academia leads to the development of the Certification for Chemical Process Technician. The programme was officially launched on 25 April 2022.

The Certification for Chemical Process Technician is the brainchild of the cooperation among CPN, Genovasi University College, Politeknik Tun Syed Nasir Syed Ismail, and the Chemical Industries Council of Malaysia (CICM).

The Certification for Chemical Process Technician is an HRD Corp approved programme. It is designed by experienced chemical industry players and accredited by Genovasi University College. A team of lecturers from Politeknik Tun Syed Nasir Syed Ismail delivers the programme's practical training.

The programme targets chemical process technicians or supervisors and employees on the plant or factory floor at the chemical-based companies, either upstream or downstream production. The Chemical Industries Council of Malaysia (CICM) works with the industry players in identifying suitable candidates for the programme.

The programme covers, among others, modules on occupational safety and health, environmental engineering, engineering fundamentals, basic piping and instrumentation diagram, process technology equipment, basic principles of chemical processes, chemical handling, separation process, and operation of the process plant.

FACT-FINDING MISSION ON PRODUCTIVITY IMPROVEMENT PROGRAM

Between February to December 2022, CPN is organising the fact-finding missions targeting 50 companies. The output from the programme gives a better insight and understanding of the issues and

challenges faced by the industry. The fact-finding mission or GEMBA obtains insights to facilitate the industry for productivity improvement.

COMPETENCY PROGRAMME FOR PROFESSIONAL HEAVY VEHICLE DRIVERS OF DANGEROUS GOODS FOR SMES

The programme aims to upskill 100 participants in enhancing the public's safety and protecting the environment from the hazard of road mishaps of chemical transportation. Successful implementation

of the programme will increase the employability of workers in the chemical industry and increase the productivity level in the industry.

CONTINUATION OF THE CHEM-VAC

CPN is continuing the CHEM-VAC programme to provide a platform for the chemicals and chemical products companies to share their business concerns and listen to recommendations to address

their challenges. The clinics will also serve as the platform to collect meaningful data for productivity improvement.

CPN WEBINAR SERIES

Series of webinars continue in 2022 to give awareness and share industry best practices. Participants from the webinar series have access to CPN programmes.

LEVERAGING MPC FLAGSHIP PROGRAMMES - MYRESKILL IOT AND ACADEMY IN FACTORY

The chemicals and chemical products companies also have access to MPC flagship programmes such as MyReskill IoT to enhance digital adoption and

Academy in Factory (AiF) to build the industry's sustainable workforce.

FORWARD-LOOKING RECOMMENDATIONS TO INCREASE THE CHEMICAL SUBSECTOR PRODUCTIVITY

Industries require strategic action plans and forward-looking initiatives to address the dynamic shifts in the business climate.

Moving towards the subsector's expansion and sustainability, recommendations are put forward to work around the barriers in enhancing the productivity growth of Malaysia's chemicals and chemical products subsector, domestically and globally.

HASTEN TRANSITION TO MOVE UP THE VALUE CHAIN

Chemicals and chemical products are identified as one of the key areas in manufacturing to drive the growth into higher value-added, diverse, and complex products.¹⁰ The growth is supported by intense growing demands in chemicals and chemical products domestically and globally. The 12th Malaysia Plan, in its Priority Area A in pushing the acceleration in the development of strategic and high impact industries, highlighted the increased demands for environmentally friendly biochemical-related products and substitutes for conventional products. These might be the areas for firms in Malaysia to venture into.

Harnessing the gains from innovation, technology, and digitalisation may help to accelerate the transition of the industry into a higher value chain. Malaysia has a solid manufacturing base. Hence it may be in an excellent position to take advantage of the new opportunities for value creation in manufacturing. Malaysia Productivity and Investment Climate Survey (PICS-3) report published in January 2021 by the World Bank Group indicated that "In the ASEAN region, taking advantage of Industry 4.0 technologies may increase manufacturing value added by up to 35-40 per cent over the coming decade, representing US\$250 to US\$275 billion in additional value..."¹¹, projects the potential landscape for chemicals and chemical products to expand the diversity and complexity of products.

FORGE A CONDUCTIVE BUSINESS ENVIRONMENT FOR FIRMS TO OPERATE AND EXPAND

The business environment includes the internal and external factors which influence firms' operations and business activities. Issues and challenges in the business environment weaken firms' performance and productivity growth. Withing the chemicals

and chemical products subsectors, barriers in their business ecosystem must be addressed to present a healthier and more supportive landscape for the subsector to grow.

Review regulations and policies to reduce the unnecessary regulatory burdens on businesses

Reviewing regulations that lead to unnecessary regulatory burdens for firms to operate facilitates business operation and expansion. The review includes acts and regulations that are obsolete and irrelevant to the subsector's current and future needs and challenges. Regulations related to

import and export activities, data sharing across the value chain, application of digital technology, and product manufacturing can be further reviewed to ensure their effectiveness and quality in solving the challenges while supporting businesses. Government policies about governance can be fortified to allow

¹⁰ 12th Malaysia Plan

¹¹ Malaysia Productivity and Investment Climate Survey (PICS-3)

more integration, growth, safety, and security in the subsector's business environment. Regulations on the movement of goods for trade, import and export may help firms expand their market and venture into a higher value chain, thus needing reviewing to enable the seamless process. Standardisation

Strengthen multi-party collaborative efforts

The interdependency nature of the chemicals and chemical product subsector within the manufacturing sector calls for enhanced collaborations across various parties. Industrial linkages with other subsectors such as the E&E are expected to strengthen all the subsectors' business ecosystems. Joint ventures and innovative collaborations open doors to new opportunities and innovation as all parties within the supply and demand chain are privy to more information. The multi-party collaboration also provides a platform for exchanges of best practices, transfer of

of product manufacturing through Government interventions may also assist firms to operate in a practical environment where safety and security are controlled while at the same time does not diminish productivity growth.

knowledge, and capacity building programmes to foster human capital building and firms' operations. The element of the shared environment may lead to increased productivity growth, minimised costs and resources, and industry efficiency. In boosting the R&D capacity, collaborations with universities may create high-value-added product commercialisation and innovative solutions. Multi-party partnerships should expand beyond the local establishments to the private companies and governments at the regional and international levels.

STRENGTHEN INCENTIVES AND FINANCIAL ECOSYSTEM TO AID THE CHEMICAL BUSINESS COMMUNITY

In terms of financing, chemical firms require support in tracking their incentive or grant application process

from government agencies, covering for COVID-19 revenue loss and improving loan accessibility.

Incentivise memberships in chemical-related associations

In the current situation, most chemical-related associations in Malaysia are represented by big companies. Memberships from the chemical SMEs are limited due to high membership fees. This deems unattractive to the SMEs, whose contribution to the country's chemical subsector is significant. As issues in the subsector are escalated through

associations, lack of memberships from the SMEs leads to some problems not being able to reach the relevant authorities. Thus, only issues related to big companies are heard and scrutinised. Incentivising and strategising better membership packages to attract more SMEs into associations are needed for inclusivity.

Develop an online incentive/grant application system with a feedback mechanism

Currently, Incentive Coordination & Collaboration Office (ICCO) at MIDA, with its i-incentives portal, serves as a central coordinator for all incentives across sectors. ICCO mainly shares links to incentives or grants available but does not provide online application facilities. Applicants are directed to use various agencies' application systems. Tracking or following up on the application process becomes an issue as an individual agency's system does not indicate application status. In this regard, developing a more effective, efficient, and transparent online method

with a feedback mechanism will help improve the firm's productivity, from the time-saving in checking application status. It saves time for companies to follow up if the documents submitted are complete or whether the application is being processed. It is proposed that CPN leverage the i-incentives portal of ICCO by adding features such as the online incentives application system and promptly enabling online tracking of application status/ feedback mechanism. It should also link the i-incentives portal with the respective agencies that manage the incentives.

Enhance access to R&D funding

While there are programmes provided by the government to help the industry in funding their R&D activities, the coverage is extensive and is not chemical industry-specific. A specific programme for R&D funding for the chemical subsector needs to be created in light of the nature of the industry, which is capital-intensive and highly dependent on R&D and innovation. Considering the government's initiative regarding establishing Research Management Agency (RMA), a specific allocation needs to be given to funding R&D for the chemical subsector.

The newly established RMA should also promote trilateral cooperation involving the government, industry, universities/research houses/labs.

Open innovation concepts with involvement from any interested parties should also be encouraged. A straightforward guide for R&D funding management in the application, selection, setting of KPIs, and others must be established to ensure a transparent and speedy process. This will include a straightforward and interactive application process that enables applicants to track their application from the start until a decision is conveyed, as suggested in the enhancement of the ICCO system.

ESCALATE TECHNOLOGY ADOPTION AND INNOVATION BY THE CHEMICAL SUBSECTOR PLAYERS

As chemical companies strive to meet the needs of customers and consumers, technology and innovation are vital in helping them come up with innovative products and services that are user- and eco-friendly. Therefore, investment in technology, as well as R&D, are crucial to ensure the chemical companies can offer new and innovative products and services and find new markets.

In the context of the chemical subsector, investment in technology and innovation involves enormous risks as a large amount of financing capability is required and the long lead time of the R&D process. While the onus is on the industry to make the necessary investment in human capital and financial capital, assistance from the government in technology and innovation could help reduce the industry's risk.

Government interventions in creating an ecosystem conducive to the industry to improve productivity and efficiency, reduce reliance on labour, and diversify product portfolios are crucial to managing firms' risks in technology adoption and transformation. The government can implement support programmes that encourage the industry to shift towards greater

automation and complexity levels in the production system and use Industry 4.0 technologies such as robotic, artificial intelligence, and intelligent manufacturing systems. This can be done by facilitating access to R&D financing and providing tax breaks for investment in technology and innovation. This is pertinent as an investment in technology and innovation can help the industry secure growth and profitability by creating demand-driven products and services. In strengthening the move for IR4.0, the government may subsidise and incentive transition to develop smart plants. Facilitation may not only cover grants and funds but also comprise content and skills expertise to ensure chemical products are manufactured according to global standards. Tax incentives and easier access to HRDF funds may be leveraged.

Shared data and intelligence insights among the frontiers and SME companies may assist the SMEs to move up from the low-end market towards high value-added and speciality products. Collaboration and supportive regulations are the keys to opening the doors for SME firms to expand beyond their existing operations.

EXPAND BEYOND BORDERS THROUGH INTERNATIONALISATION

In terms of internationalisation, chemical companies in Malaysia need to enhance market expansion and explore international distribution channels to secure continued growth and profitability. They need to align their internationalisation efforts to the needs of customers/consumers of extensive and populous growth markets of China, India, Brazil, Indonesia,

and Russia. While the chemical companies must be proactive in their growth plan and projections, the government can facilitate firms in their international market expansion. These include sharing market intelligence of target markets, encouraging the formation of a joint venture (JV) and merger, and leveraging existing online B2B platforms.

Coordinated market intelligence of target markets

To create inroads for opportunities in vast and populous emerging countries such as China, India, Brazil, Indonesia, Russia, and Malaysia needs to develop a coordinated and comprehensive market intelligence effort. The market intelligence will need to include general information about a particular market and industry-specific information concerning the business environment, regulatory requirements, the key players in the target country, consumer trends, potential market linkers and others. MATRADE can spearhead this effort with the involvement of Wisma Putra, MIDA and other government agencies which have an international presence. Malaysian owned government-linked companies (GLCs) and private companies currently operating abroad could

share on-the-ground information about the target markets. This market intelligence can then be shared with companies registered with MATRADE intending to venture into a specific target market.

MATRADE could also facilitate the companies by providing advisory services concerning a step-by-step guide on penetrating a specific market and the requirements needed to complement the effort in providing market intelligence. Referral of contact persons and networks in the target markets could also benefit Malaysian chemical companies in navigating the host countries' regulatory and business environments.

Encourage the formation of JV/mergers.

Competing internationally, particularly in the global chemical industry, requires immense resources and capabilities. In this regard, Malaysian companies should be encouraged to form a JV or merger with other companies, domestic and international, to become prominent in tapping the available opportunities in target markets. For instance, in tapping the Indonesian market, Malaysian chemical

companies could partner with Indonesian companies, either those directly involved in the chemical business or those engaged in the value and supply chains of chemical products and services. This will enable the companies to pool their resources and capabilities and better navigate the domestic business environment of the host countries.

Leverage existing digital B2B platform

Malaysian chemical companies could also leverage existing online B2B platforms to tap the international markets. The online B2B platform will enable the companies to serve the host countries' buyers/consumers without setting up offices in the target markets. This certainly requires less resources than establishing offices in the target markets.

In this regard, existing platforms such as Everest (Malaysia), Chem-On (Singapore), MIND (Indonesia), and Chemizen (Korea) could be leveraged by Malaysian chemical companies to enter the international market. The government could support the industry by subsidising the cost of listing products on the online B2B platform.

Beyond just listing the products and services in the B2B platforms, the chemical companies will still need a fully functional and informative website. This will enable potential buyers to gain more information about the products or the companies by following

the website link in the B2B platform. The website will also need to be interactive, enable transactions to be made online, and not merely provide background information about the company's products and services.

Attract Premium Foreign Direct Investments

Continuous efforts are underway to attract premium foreign investment into the country, including investments from multinational companies manufacturing speciality chemicals. While MIDA has the mammoth task of bringing FDI into Malaysia, huge responsibility also lies in the state and local governments to facilitate MNCs with premium investments and high-value products. Regulations, processes and procedures can be more agile in

reducing the investors to commence their operations as soon as possible. Executing the agile “premium lane”, which eases the construction of factories and minimises red tapes and bureaucracy, leading to shorter time and optimum costs in a development project, attracts more FDI and retain the country's operation. Local firms can benefit from the quality and premium FDIs by transferring knowledge, skills, and expertise.

MOVE TOWARDS THE MEGATRENDS OF SUSTAINABILITY

Energy

Global megatrend in energy provides both opportunities and challenges for the chemical subsector. While the worldwide chemical subsector has made great strides and technological advances in energy, more needs to be done to ensure increased efficiency, productivity, and chemical products that are people- and environment-friendly. This trend in energy is set to stay in the coming years. The chemical subsector has one of the highest energy consumption rates compared with other industries. It is one of the cost factors that need to be considered by the industry to ensure sustainability in its operations and growth.

Taking the cue from the steady shift of focus in the global chemical industry towards implementing initiatives that can minimise social and environmental impacts associated with chemical manufacturing, Malaysian chemical companies will need to invest their resources to develop solutions to create sustainable and energy-efficient products with the use of renewable sources of energy as well as technologies such as electromobility and battery. This will help showcase the chemical industry's leadership role in contributing to society, the environment and long-term economic growth.

The chemical industry in Europe has been showcasing a good example by working together to create a value-adding production chain involving clusters of interdependent firms and academic and support institutions to increase manufacturing sustainability across the supply chain. These chemical industry clusters drive competitiveness, lower energy intensity, and streamline access to raw materials and energy sources that help contain environmental pollution and health hazards.

The need for a shift towards developing energy-efficient buildings, plants and manufacturing and leveraging the circular economy concept is clear. To help nudge the industry to shift into energy-efficient initiatives, the government could provide tax-break for the investment made by the industry in energy-efficient building, plants and manufacturing. The industry also needs to be encouraged to leverage the circular economy concept to increase optimal resource usage and reduce waste. Detailed discussions about the recommendations on energy are covered in the following subsections.

To support the industry's investment in energy-efficient buildings, plants and manufacturing, assistance such as tax-break can be provided. This way, the industry will better manage its financial requirements to protect the value of the industry's future growth by optimising energy-efficient buildings, plants, and manufacturing. The investment will enable the industry to embed sustainability practices across value- and supply chains.

However, the implementation of this initiative will need to be guided by the current government priorities and financial position. In addition, clear criteria and guidelines will need to be developed to ensure clear and transparent implementation and avoid unnecessary impediments.

Environment

Ensuring a balanced co-existence of chemical business activities and environmental protection is critical to the chemical subsector's long-term sustainability. The awareness level of chemical firms on environmental responsibility is relatively low in Malaysia. Thus efforts are needed to create awareness and encourage environmental compliance of firms through stakeholder engagement via chemical association. Then, their commitment to "Responsible Care" practice can be cultivated. Subsequently, tax breaks, chemical waste research and whistleblowing channel could be the facilitating strategies for achieving long term compliance behaviour. Within Malaysia's context, a few efforts can be made:

1 CICM (Chemical Industries Council of Malaysia) to promote memberships to all sizes of chemical companies - At present, CICM mainly serves big chemical firms. CICM has been working closely with the CPN to encourage its members' well-being. Since small companies are not CICM members, their voices are not represented when CICM has dialogues with government agencies, resulting in small firms' lack of opportunities to network or get assistance from the relevant government agencies. Initiatives by CICM are needed to promote memberships to all chemical companies regardless of their sizes so that issues of small chemical firms are addressed. It is proposed that CICM waives or reduces

entrance fees (RM1,000) for small chemical firms (< 20 employees). On top of that, tax reduction for CICM annual fee payment (RM3100) for SMEs can be initiated.

2 Develop the local standard for "Responsible Care" practice, encourage all (chemical and non-chemical) companies to promote a safe environment – Development of the local standard of "Responsible Care" practices for adoption by companies in Malaysia (regardless of chemical and non-chemical companies) to promote safe environment may help to encourage environmental-friendly practices. The local standards could be developed based on the responsible care self-assessment web tool used by CEFIC (European Chemical Industry Council). To encourage participation, CPN could provide certificates to environmental compliant companies.

3 Provide tax break for investment in environmentally-friendly assets and processes - In addition, tax break could be provided for companies investing in environmentally-friendly assets and operations. The voluntary behaviour of investing in environmentally machines and methods should be rewarded to sustain the behaviours. No budget is needed for tax break implementation.

BUILD INDUSTRY-READY WORKFORCE

The need to build a robust future workforce and strengthen the current talents is imperative for the chemicals and chemical products industry to boost its productivity growth, expansion, and performance. The challenges within the workforce across all subsectors in the manufacturing industry are pre-pandemic issues and compounded by its impacts.

The pandemic has uncovered the seriousness of issues in the local workforce regarding digital talents, knowledge-intensive workers, and highly skilled professionals. Reskilling and upskilling programmes are imperative as the quick win measure to address

the subsector's current and future demands, which calls for specialisation in artificial intelligence, robotics, data analytics, and digitalisation. Local talents must be equipped with high skills and content expertise to drive labour productivity.

Emphasising TVET education and recognising non-formal skills-based training in post-secondary education helps produce more high skill-specific talents ready for the industry. Certification programmes to recognise talents with specific skills provide proof of competency.

WAY FORWARD FOR THE CHEMICALS AND CHEMICAL PRODUCTS SUBSECTOR

The outlook for the chemicals and chemical products subsector's globally and domestically looks promising and stable. The global trends impacting the growth in the chemicals industry are generally influenced by the rise of emerging countries, population growth and rising middle class. In addition, advancement in science and technology as well as greater emphasis on healthier and sustainable products also impacting the global trends. The COVID-19 pandemic created another trend that leads to the high demand for chemicals and chemical products. These trends are both strategic and structural and require consistent, continuous, and significant efforts by the industry.

While these trends potentially present considerable challenges to the chemical industry, they also brought immense opportunities for chemical companies to expand. These trends are expected to stay medium to long-term. Hence the chemicals industry is expected to embrace the dynamism in the demands and innovate for sustainable growth. The global trends indeed have an impact on Malaysia's chemicals industry. Fitting in the big picture of the industry's global expansion, Malaysia's chemicals and chemical products firms are likewise called to adapt and innovate.

In 2020, against the fever pitch pandemic, Moody's issued a 2021 outlook for the global chemical industry. According to the report, the outlook is stable though the industry's recovery was uneven worldwide.¹² The optimism is expected to continue in 2022, primarily upon the benefits of vaccines.

The revival and recovery also influence the positive outlook in 2022 and years to come in the economy, both worldwide and domestically. As countries' international borders reopen, the movement of goods and people increases, and trade activities grow exponentially. Globalisation will soon mark its place again in facilitating economic activities. The positivity is compounded by the COVID-19 vaccination, which has reached a considerably optimum level worldwide. Industries regain confidence in the business environment, and demands are expected to grow exponentially across all industries.

The future growth of Malaysia's chemicals and chemical products industry aligns with national economic recovery from the repercussions of the pandemic. Malaysia's transition into the endemic phase beginning 1 April 2022 presents an opportunity

¹² <https://www.chemicalprocessing.com/industrynews/2020/moodys-issues-2021-outlook-for-global-chemistry-industry/>

for the subsector to expand into a higher value-added market, though marked by potential challenges such as a lack of expertise to spur the growth. The pandemic has opened doors to higher demands in the chemicals and chemical products as demands in other subsectors such as electronic and engineering increase. The interdependency of other subsectors on chemicals and chemical products within the value chain positions the industry to reap the gain from the growing demands for specific chemicals.

The outlook seems bright for the chemicals and chemical products industry in Malaysia. The emphasis of the industry in the 12th Malaysia Plan alongside the E&E and aerospace sectors indicates the upward growth potential in the next five (5) years.

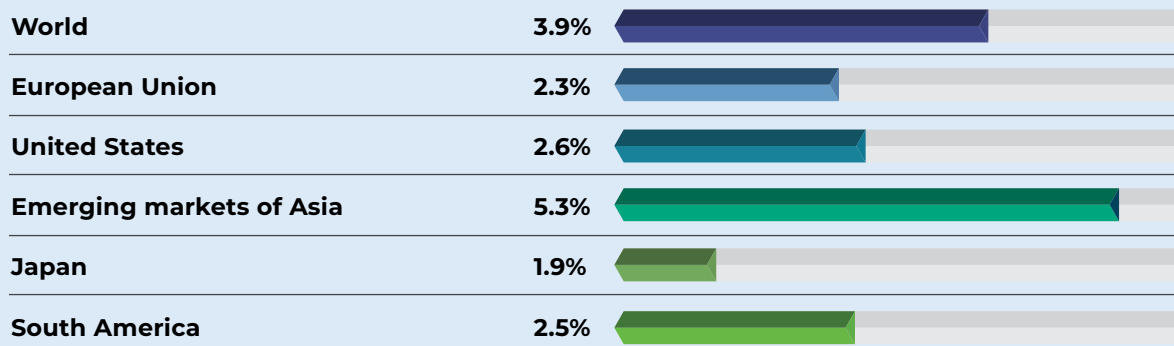
According to BASF Online Report 2020, trends in chemical products will be on the upward trend, with the emerging markets of Asia projected to perform the most.

Embracing the future, the industry players of chemicals and chemical products must face the challenges and barriers that hamper business expansion and the industry's growth on a larger scale. Efforts to accelerate the growth of Malaysia's chemicals and chemical products industry must align with the government agenda so that the sector's contribution affects the national strategy. In addition, the influence of the global trend and market dynamism must be considered to elevate Malaysia's position as a solid manufacturing-based nation.

Figure 9 : Projected Trends in Chemical Production 2021 – 2023

Trends in chemical production 2021-2023 (excluding pharmaceuticals)

Real change compared with previous year



Source: BASF Online Report 2020



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