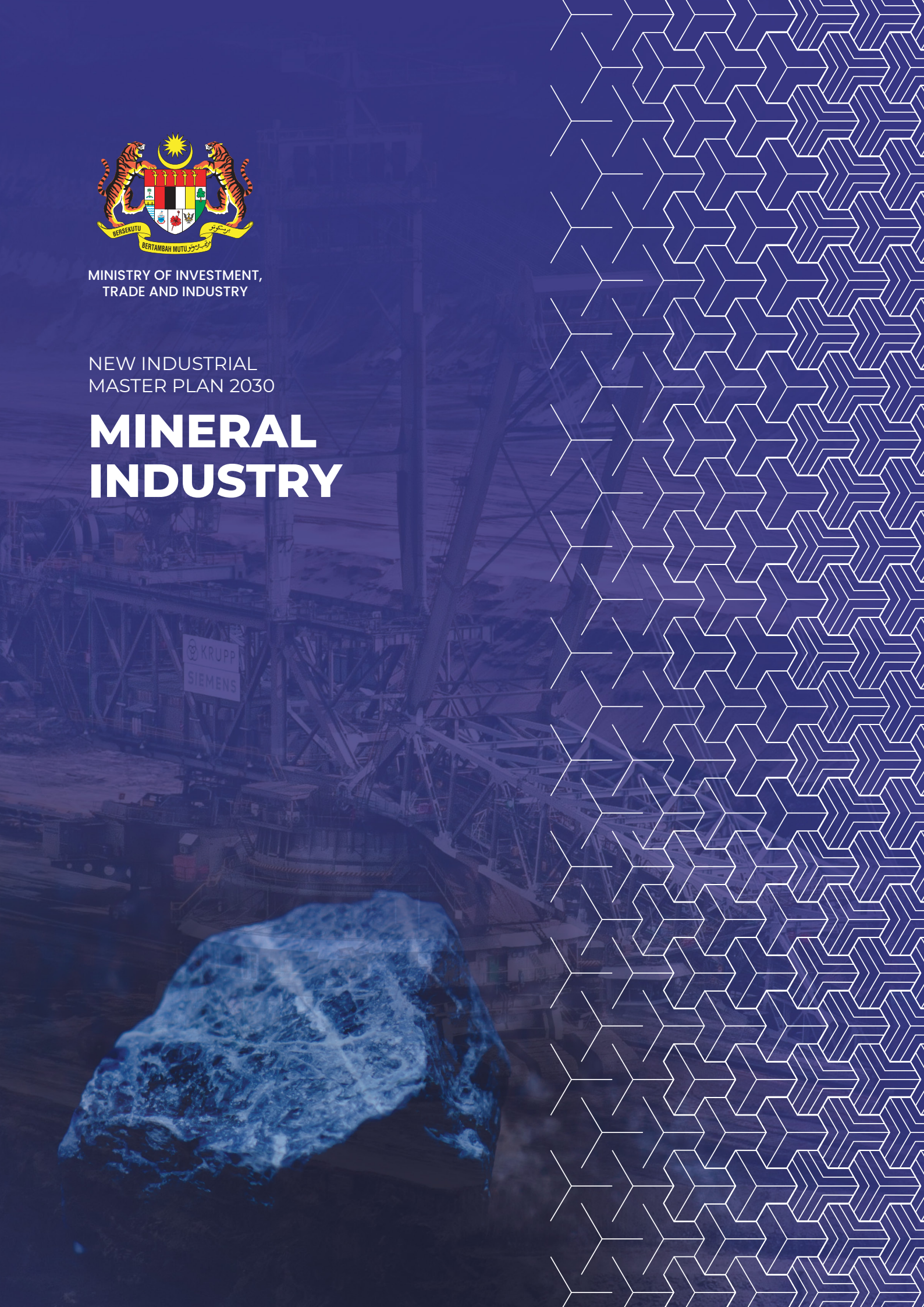
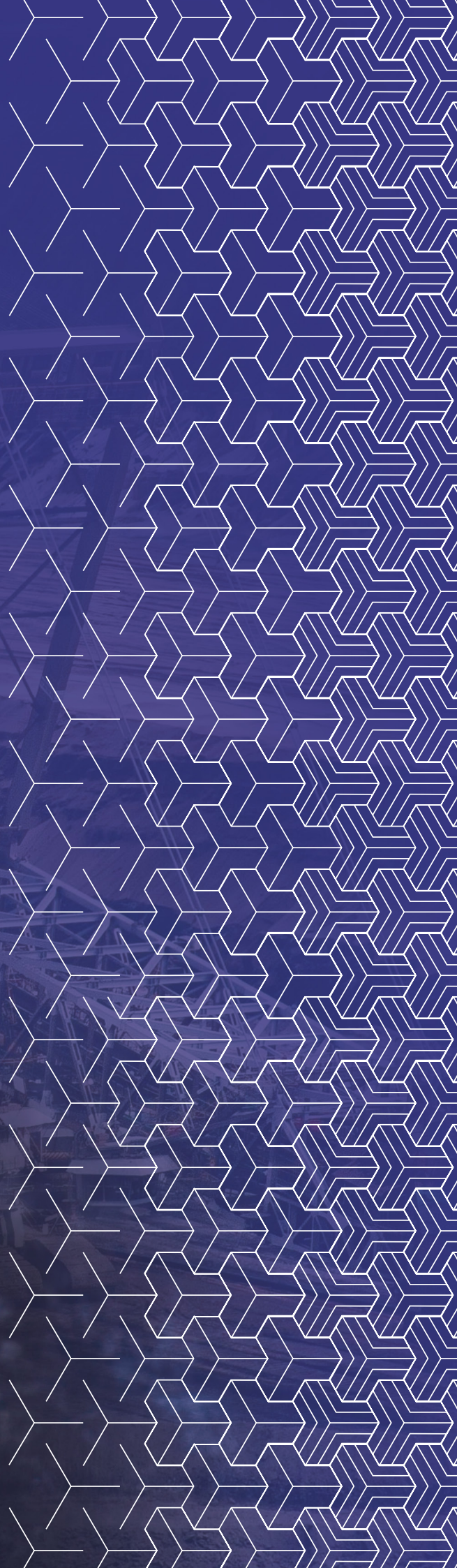


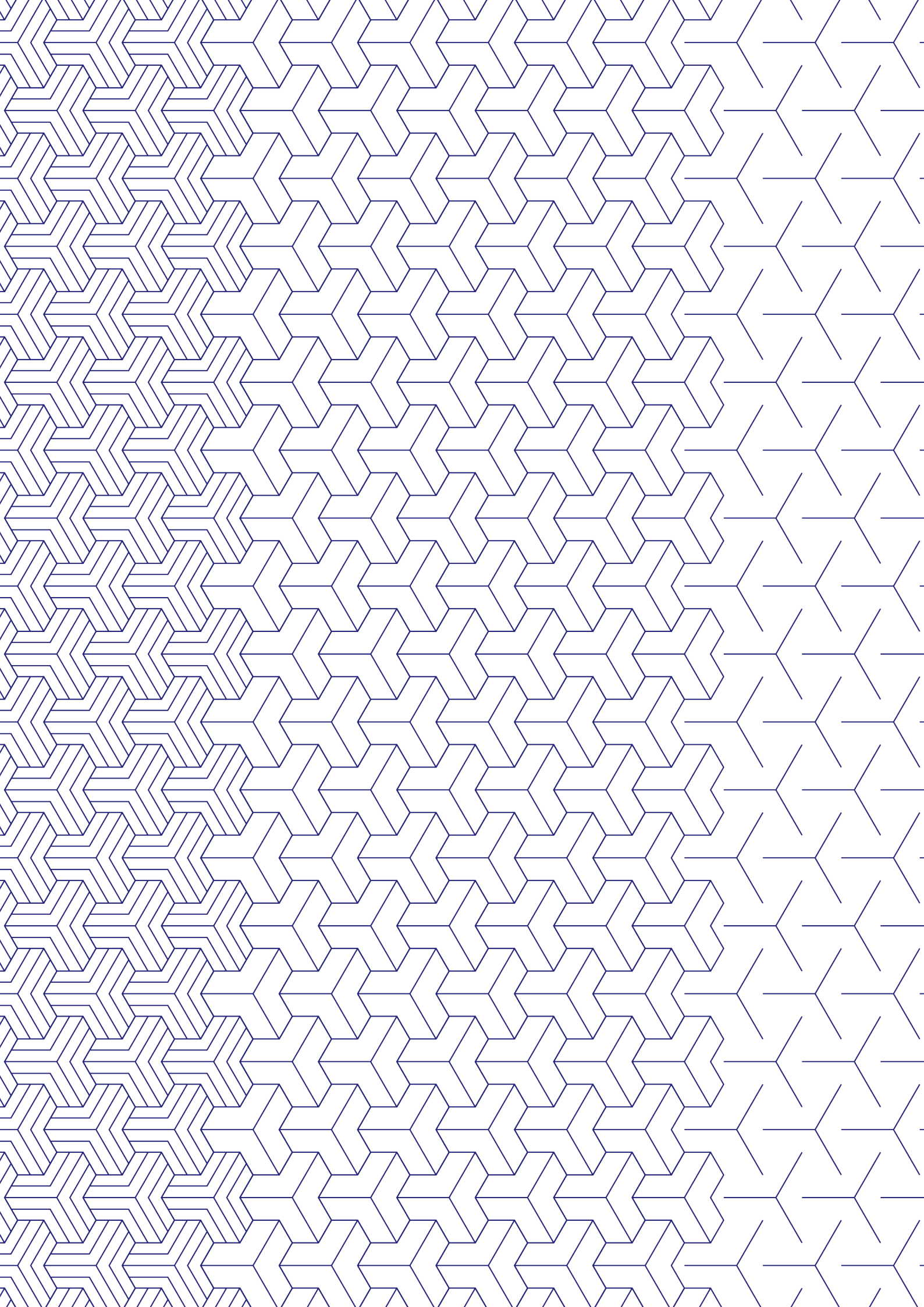


MINISTRY OF INVESTMENT,
TRADE AND INDUSTRY

NEW INDUSTRIAL
MASTER PLAN 2030

MINERAL INDUSTRY





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Menara MITI, No. 7, Jalan Sultan Haji Ahmad Shah,
50480 Kuala Lumpur, Malaysia.

Tel : 603-8000 8000

Fax : 03-6206 4693

Email : webmiti@miti.gov.my

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PREFACE

Malaysia's strength in the manufacturing sector has been significantly driven by the implementation of robust and forward-thinking Industrial Master Plans, first launched in 1986.

The success of the IMP3 (2006-2020) was anchored on innovation, research and development (R&D) and human capital development to drive high value-added industries to transform Malaysia into a knowledge-based economy.

The journey towards formulating the NIMP 2030 is underscored by the need to build a robust industrial sector as an important prerequisite to achieve socioeconomic prosperity. Three previous iterations of the Industrial Master Plans have driven industrial development in Malaysia, with the Government adopting industrial development strategies relevant to the period to transform the economy. Malaysia flourished from a low-productivity agrarian-based economy and is heading towards achieving developed nation status, underpinned by robust manufacturing and services sectors. The strategy has successfully raised the living standards of the Rakyat and propelled remarkable growth in Gross National Income (GNI) per capita, increasing 34 times between 1967 to 2019, making Malaysia one of the fastest growing economies in modern history.

Industrial policies have since become more diverse and complex, incorporating new imperatives including the integration into the global value chain (GVC), development of indigenous capabilities in a knowledge economy, evolution of environmental, social and governance (ESG) criteria and disruptions from the new industrial revolution. The question is not about the necessity of such policies, but rather what new policies are required and how to proceed.

Given the current challenging environment, benchmarking and learning from other country's experiences are no longer sufficient. Malaysia needs to embark on its own path into uncharted territory, to steer the nation into the challenging future. The combined impact of the new imperatives and the recent pandemic has compelled the Government to rethink Malaysia's industrial strategy.

With the NIMP 2030, Malaysia intends to transform the industry into greater heights, capitalising on emerging global trends, supply chain disruptions, current geopolitical landscape, digitalisation and ESG considerations. These trends are moving at an unprecedented pace and Malaysia has to act fast.

Therefore, the NIMP 2030 is designed to achieve the aspirations in a span of seven years and takes on a Mission-based approach for industrial development. This approach unites Malaysia by encouraging collaboration between the Government and the private sector to rally the industries.

Purpose of the NIMP 2030

The NIMP 2030 sets forth Malaysia's future direction in industrial transformation. It provides a national integrated plan for resilient industrial development until 2030 – setting the fundamentals for future policy development and enabling the industry at all levels. It articulates Malaysia's position and participation in the global economic environment.

The NIMP 2030 serves to:

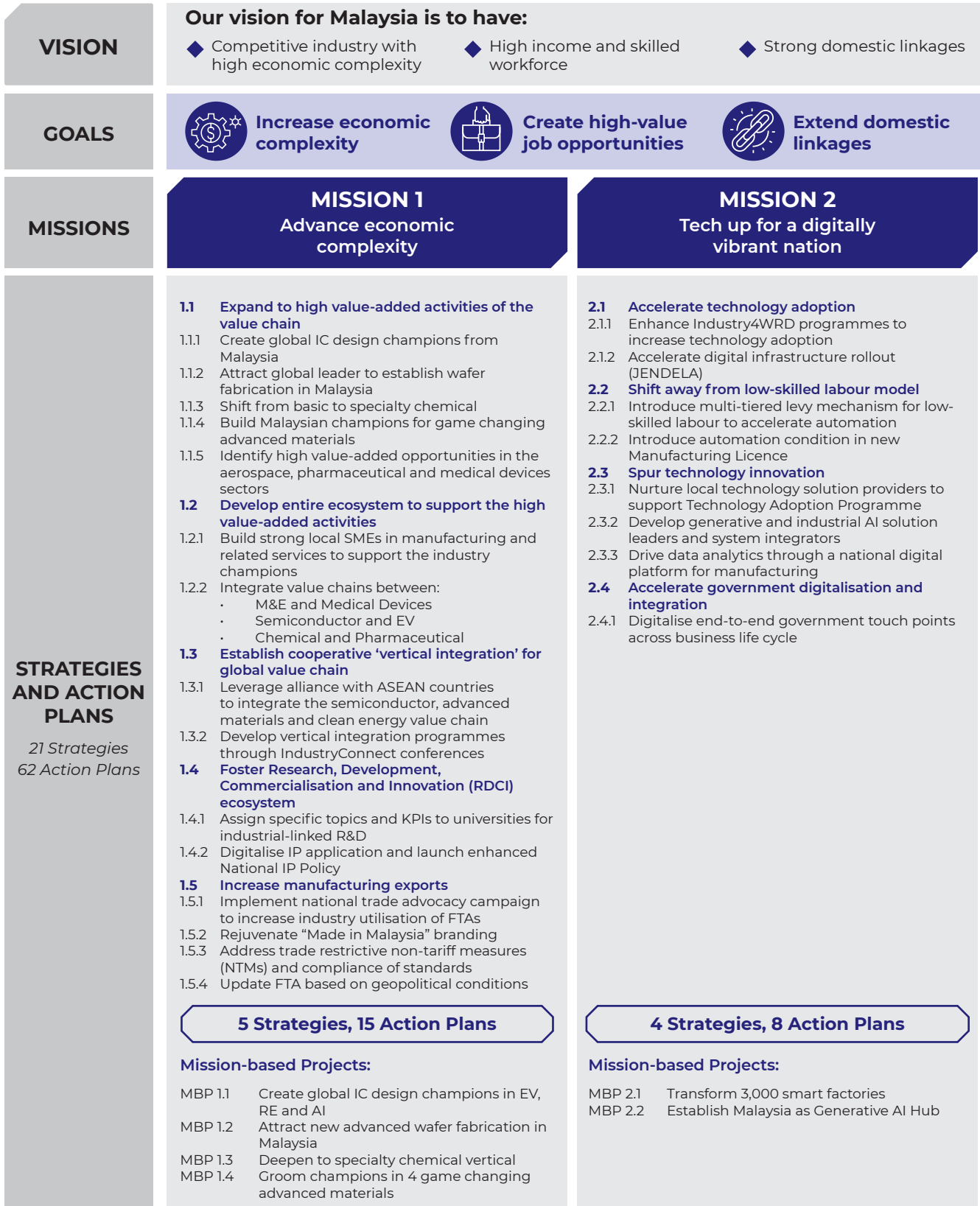
- Provide national strategic direction to lead the industrial development policies;
- Be a conversation piece for investors and other economies on Malaysia's position and direction; and
- Feature the role of the Malaysian Government in shaping the economy.

INTRODUCTION

New Industrial Master Plan 2030

The Missions and Enablers identified will be executed through 21 Strategies and 62 Actions Plans to unlock the needed enabling ecosystems. Several catalytic Mission-based

Projects (MBPs) have been identified to catapult the mission-based implementation. The NIMP 2030 strategic framework is illustrated below:



◆ New and existing industry clusters

◆ Balanced and inclusive participation

◆ Sustainable development

**Develop new & existing clusters****Improve inclusivity****Enhance ESG practices****MISSION 3**
Push for Net Zero**MISSION 4**
Safeguard economic security and inclusivity**ENABLERS****3.1 Accelerate transition towards sustainable practices**

- 3.1.1 Develop sectoral decarbonisation pathways to guide transition
- 3.1.2 Decarbonise "hard-to-abate" sectors
- 3.1.3 Introduce carbon policy, accounting and tax
- 3.1.4 Launch iESG framework and transition programmes

3.2 Transition to renewable and clean energy

- 3.2.1 Enhance adoption scheme for energy efficiency or renewable energy
- 3.2.2 Accelerate availability and accessibility of renewable energy source for the industry

3.3 Catalyse new green growth areas

- 3.3.1 Catalyse EV as a key growth driver
- 3.3.2 Grow carbon capture, utilisation and storage (CCUS) as a new sector
- 3.3.3 Develop circular economy framework for the industry

3.4 Shift towards green infrastructure

- 3.4.1 Accelerate transformation of industrial estates into eco-industrial parks

4.1 Develop resilient supply chain

- 4.1.1 Identify specific supply chain resilience strategies for critical sectors
- 4.1.2 Establish supply chain cooperation and collaboration through G2G and G2B programme
- 4.1.3 Introduce National Mineral Policy for downstream processing of critical minerals

4.2 Foster climate resilient development

- 4.2.1 Develop sectoral adaptation pathways
- 4.2.2 Foster an adaptation industry to provide adaptation products and services (including exports)
- 4.2.3 Instil climate resilience measures for critical economic infrastructure

4.3 Strengthen industrial clusters for regional development

- 4.3.1 Expand clusters for spillover regional impact
- 4.3.2 Align industrial development plan between Federal and States

4.4 Empower Bumiputera participation and create inclusive workforce

- 4.4.1 Uplift capabilities of *Bumiputera* companies in manufacturing via *Tindakan Pembangunan Bumiputera 2030*
- 4.4.2 Develop programme to increase women participation in high-skilled manufacturing employment

E.1 Mobilise financing ecosystem

- E.1.1 Introduce NIMP Industrial Development Fund and NIMP Strategic Co-Investment Fund
- E.1.2 Boost financing for digitalisation and decarbonisation transition
- E.1.3 Establish green *sukuk* to facilitate transition
- E.1.4 Establish supply chain financing for SMEs
- E.1.5 Increase utilisation of the capital market
- E.1.6 Expand the imSME platform to show all available funding options including government funding and capital market
- E.1.7 Review government funding for consolidation

E.2 Foster talent development and attraction

- E.2.1 Leverage mynext and MYFutureJobs for strategic workforce planning to address long-term demand-supply requirement
- E.2.2 Introduce progressive wage system policy
- E.2.3 Improve policy to enable fast and hassle-free access to high-skilled foreign talents
- E.2.4 Expand TVET programmes for high-skilled jobs in critical sectors
- E.2.5 Raise profile of high-tech manufacturing career to attract interest in STEM subjects

E.3 Establish best-in-class investor journey for ease of doing business

- E.3.1 Establish a unified investment strategy and align investment evaluation to new parameters under NIA
- E.3.2 Harmonise and streamline functions and KPIs across IPA landscape
- E.3.3 Review and design competitive, agile and relevant incentives
- E.3.4 Improve One-Stop Portal for seamless investor experience

E.4 Introduce whole-of-nation governance framework

- E.4.1 Establish public-private collaborative councils
- E.4.2 Set up NIMP 2030 Delivery Management Unit
- E.4.3 Develop NIMP 2030 dashboard system

4 Strategies, 10 Action Plans**Mission-based Projects:**

- MBP 3.1 Create decarbonisation pathway role models
- MBP 3.2 Launch locally-manufactured EV
- MBP 3.3 Deploy large-scale CCUS solutions

4 Strategies, 10 Action Plans**4 Strategies, 19 Action Plans**

NIMP 2030 SECTORAL PLAN

There are individual enclosures of 21 sectors included as a supplementary reference to the main NIMP 2030 document.

They provide a view of the respective sectoral perspective in the context of the main NIMP 2030 document, and were developed with reference to individual sectoral roadmaps, where applicable.

The 21 sectors are:

Category	Industry
Priority Sectors	<ol style="list-style-type: none"> 1. Aerospace 2. Chemical 3. Electrical and Electronics (E&E) 4. Pharmaceutical 5. Medical Devices
Sectors	<ol style="list-style-type: none"> 6. Digital and Information and Communication Technology (ICT) 7. Automotive 8. Food Processing 9. Global Services and Professional Services 10. <i>Halal</i> 11. Machinery and Equipment (M&E) 12. Manufacturing-Related Services (MRS) 13. Metal 14. Mineral 15. Palm Oil-based Products 16. Petroleum Products and Petrochemicals 17. Rail 18. Rubber-based Products 19. Shipbuilding and Ship Repair (SBSR) 20. Textile, Apparel and Footwear 21. Wood, Paper and Furniture

This document is the [NIMP 2030 Sectoral Plan – Mineral Industry](#).

OVERVIEW OF THE DOCUMENT

This NIMP 2030 Sectoral Plan – Mineral Industry (Document) provides insights into the sector and its prospects during the NIMP 2030 period.

This Document offers a comprehensive understanding of the industry's direction during the NIMP 2030 period based on its historical performance, opportunities and strategies to overcome existing challenges and achieve its targets.

The Document is presented in five sections:

1. Background

- This section sets the foundation to help readers understand the industry.
- It delves into the industry's focus area, encompassing its sub-sectors, for a comprehension of the industry's breadth.¹
- Readers will find details about the industry's value chain and its key players, including the relevant industry associations, in this section.
- The section lists the policies that are related to the industry.

2. Performance

- This section reports the industry's performance during specific periods.
- There are two notable periods for the review of the industry's historical performance:
 - the IMP3 period (2006 to 2020); and
 - from 2021 to 2022.
- The performance review of the industry's development includes its investment trends, export and import dynamics, employment figures, value-added and productivity measures.

3. Trends and Opportunities

- This section highlights the opportunities and potential avenues for growth that the industry can leverage during the NIMP 2030 period.

4. Challenges

- This section provides insights into potential obstacles that could impact the industry's growth and development.

5. Strategies and Action Plans

- The final section of the document outlines the future trajectory for the industry.
- This section provides the Strategies and Action Plans that are intended to catalyse the industry during the NIMP 2030 period.
- The Strategies and Action Plans set in this Document have been aligned to the Missions set in the main NIMP 2030 document.

¹ Incentives available for this industry as of time of writing can be found in Appendix 1

SECTION 1 BACKGROUND

Areas Covered

- The mineral industry is divided into three sub-sectors and can be categorised as below (Table 14.1).

Table 14.1: Sub-sectors of Mineral Industry

Sub-sectors	Products
Metallic Mineral	<ul style="list-style-type: none"> Aluminium-based Antimony oxide Cobalt oxide Copper-based Gold, non-monetary Iron and steel Lead-based Manganese dioxide Nickel mattes Rare earth-based Tin-based Titanium dioxide pigments Titanium oxides Zinc-based
Non-Metallic Mineral	<ul style="list-style-type: none"> Activated clay Cement (all types) Clay-based and ceramics Glass Glassware Lime Mice-based Monumental or building stone Pottery
Energy Mineral	<ul style="list-style-type: none"> Coal

Source: Department of Mineral and Geoscience Malaysia (JMG)

- The scope of the NIMP 2030 for the mineral industry will focus on manufacturing of non-metallic mineral products.
- The manufacturing of metallic mineral products is covered in the NIMP 2030 Sectoral Plan – Metal Industry.

Value Chain

- The value chain of the mineral industry is illustrated as follows (Figure 14.1).

Figure 14.1: Value Chain of Mineral Industry



Source: Ministry of Investment, Trade and Industry (MITI)

- The mineral industry value chain is divided into three segments:
 - upstream segment – includes exploration and mining activities for raw material extraction;
 - midstream segment – includes activities such as processing, refining, and separation of the extracted materials; and
 - downstream segment – focuses on manufacturing and fabrication of finished products using the processed materials.
- The upstream segment, including mining and quarrying activities, are not covered as a part of the industry's focus area for the NIMP 2030.

Market Players

7. The stakeholders in Malaysia's mineral industry can be categorised into three categories:
 - i. industry players;
 - ii. industry associations; and
 - iii. Ministries and Government Agencies.
8. As to date, there are over 260 local companies approved for manufacturing licence in the non-metallic mineral sub-sector.
9. Apart from industry players, industry associations play important roles in representing the interests of manufacturers. Key functions include representing specific sectors of the mineral industry and promoting the manufacturing and usage of specific mineral products. Examples of these associations include:
 - i. Malaysian Chamber of Mines (MCOM);
 - ii. Tin Industry (Research and Development) Board;
 - iii. Malaysia Glass Association (MGA);
 - iv. Cement and Concrete Association of Malaysia (CNCA);
 - v. Malaysian Lime Manufacturers Association;
 - vi. The Malaysian Tin Products Manufacturers' Association (MTPMA);
 - vii. The Kuala Lumpur Tin Market (KLTM);
 - viii. Malaysian Interior Industry Partners Association (MIIP); and
 - ix. ASEAN Federation of Mining Association (AFMA).
10. Several Ministries and Government Agencies have prominent roles in Malaysia's mineral industry. These include:
 - i. Ministry of Natural Resources, Environment and Climate Change (NRECC);
 - ii. Ministry of Science, Technology and Innovation (MOSTI);
 - iii. Ministry of Investment, Trade and Industry (MITI);
 - iv. Department of Mineral and Geoscience Malaysia (JMG);
 - v. Department of Atomic Energy Malaysia (ATOM Malaysia);
 - vi. Malaysian Investment Development Authority (MIDA); and
 - vii. Malaysia External Trade Development Corporation (MATRADE).

Policies, Laws and Regulations

11. The industry's development is guided by the following:
 - i. National Mineral Industry Transformation Plan 2021-2030 (TIM 2021-2030);
 - ii. National Advanced Materials Technology Roadmap 2021-2030; and
 - iii. National Mineral Policy 2 (DMN2).
12. Law related to the mineral industry is the Mineral Development Act 1994.

SECTION 2 PERFORMANCE

IMP3 Focus and Performance

13. The mineral industry was not included as part of the IMP3.
14. DMN2 was published in 2009 for the development of the industry up to 2020, focused on five key areas:
 - i. enhancing sustainable development and optimum utilisation of mineral resources;
 - ii. promoting environmentally responsible mineral resource development;
 - iii. enhancing the competitiveness and global advancement of the mineral industry;
 - iv. encouraging the use of local minerals and the development of mineral-based products; and
 - v. promoting the recovery, recycling, and reuse of metals and minerals.
15. The performance of the industry during IMP3 period (2006 to 2020) was measured solely on downstream activities and focuses on non-metallic mineral sub-sector – as upstream activities are not within the purview of MITI.

Investments

16. The investment² performance (2006 to 2022) the mineral industry is recorded in Table 14.2.

Table 13.1: Approved Investments of Metal Industry

Items	Units	IMP3			2021	2022	2021-2022
		2006	2020	2006-2020			
Total Investment	RM billion	1.2	2.3	48.2	0.4	5.8	6.2
Domestic Investment	RM billion	0.2	0.6	17.7	0.3	0.5	0.8
Foreign Investment	RM billion	1.0	1.7	30.5	0.1	5.3	5.4
Number of projects	#	29	50	481	17	29	46
Employment	persons	2,344	2,774	39,722	782	3,201	3,983

Source: MIDA

17. During the IMP3 period, a total of 481 projects were approved in the mineral industry with a total investment of RM48.2 billion. These investments committed a total of 39,722 job opportunities.
18. In 2021 and 2022, a total of 46 projects were approved with a total investment of RM6.2 billion. These investments committed a total of 3,983 job opportunities.
19. Overall, the industry's investment trend was attributed to:
 - i. increased consumption of non-metallic mineral, parallel to Malaysia's industrial growth;
 - ii. infrastructure projects which required substantial quantities of non-metallic mineral (e.g. sand, gravel, limestone and granite); and
 - iii. abundant opportunity for production of non-metallic mineral products as Malaysia is home to a number of mineral deposits.

² Includes only non-metallic mineral sub-sector

20. In 2021, investment trend was attributed to:
- the COVID-19 pandemic which caused widespread economic disruption and uncertainty;
 - increased mines operations and production cost due to raised raw materials cost and imposition of new environmental regulations; and
 - increased competition from countries (e.g. China and Middle Eastern countries) with lower cost of production).
21. Subsequently, in 2022, investment trend was driven by investors continuing their investments in Malaysia once COVID-19 restrictions were lifted and new applications for non-metallic mineral products were being developed – e.g. high technology glass for electrical and electronics (E&E) industry.
22. From 2006 to 2022, 401 (76.1 per cent) of the 527 approved projects were implemented.

Exports

23. The export performance of the mineral industry during the period of 2006 to 2022 is recorded in Table 14.3.

Table 14.3: Exports of Mineral Industry

Item	IMP3			2021	2022	2006-2020	2020-2021	2021-2022
	2006	2020	2006-2020			CAGR ³	Annual Growth	
Exports (RM billion)	3.5	8.3	87.9	10.6	11.9	6.4%	26.7%	13.0%

Source: MATRADE

24. During the IMP3 period, exports grew by a CAGR of 6.4 per cent from RM3.5 billion (2006) to RM8.3 billion (2020).
25. In 2021, exports of minerals grew by 26.7 per cent from RM8.3 billion (2020) to RM10.6 billion. Subsequently, in 2022, exports grew by 13.0 per cent from RM10.6 billion (2021) to RM11.9 billion.
26. Generally, the export growth was driven by the increased demand for mineral products due to the economic growth and technological advancement.
27. In 2022, major export countries for the non-metallic mineral products were:
- Singapore (RM3.4 billion, 28.3 per cent);
 - Korea (RM1.0 billion, 8.3 per cent);
 - India (RM1.0 billion, 8.3 per cent);
 - Australia (RM0.6 billion, 5.0 per cent); and
 - Viet Nam (RM0.6 billion, 5.0 per cent).

³ Compound Annual Growth Rate

28. In 2022, top exports of non-metallic mineral products were:
- i. glass and glassware (RM6.1 billion, 50.9 per cent);
 - ii. mineral manufactures (RM3.5 billion, 29.2 per cent);
 - iii. lime, cement and fabricated construction materials (RM1.4 billion, 11.8 per cent);
 - iv. clay construction materials and refractory construction materials (RM0.6 billion, 5.0 per cent); and
 - v. pottery (RM0.2 billion, 1.7 per cent).

Imports

29. The table below presents the import performance of the mineral industry (2006 to 2022) (Table 14.4).

Table 14.4: Imports of Mineral Industry

Item	IMP3			2021	2022	2006-2020	2020-2021	2021-2022
	2006	2020	2006-2020			CAGR	Annual Growth	
Imports (RM billion)	3.1	6.6	83.2	7.4	8.0	5.5%	11.1%	8.6%

Source: MATRADE

30. During the IMP3 period, imports grew by a CAGR of 5.5 per cent from RM3.1 billion (2006) to RM6.6 billion (2020).
31. In 2021, imports of minerals grew by 11.1 per cent to RM7.4 billion. Subsequently, in 2022, imports grew by 8.6 per cent to RM8.0 billion.
32. Generally, the development of technologies in industries such as the E&E and automotive industries have led to an increase in the demand for mineral products.
33. In 2022, major import sources for non-metallic mineral products were:
- i. China (RM3.3 billion, 39.5 per cent);
 - ii. Viet Nam (RM1.2 billion, 14.7 per cent);
 - iii. Japan (RM0.6 billion, 7.5 per cent);
 - iv. United States (RM0.5 billion, 6.3 per cent); and
 - v. Indonesia (RM0.5 billion, 6.3 per cent).
34. In 2022, top imported non-metallic products of the industry were:
- i. glass and glassware (RM3.2 billion, 41.2 per cent);
 - ii. mineral manufactures (RM1.7 billion, 21.0 per cent);
 - iii. clay construction materials and refractory construction materials (RM1.5 billion, 18.4 per cent);
 - iv. lime, cement and fabricated construction materials (RM0.9 billion, 11.3 per cent); and
 - v. pearls, precious and semi-precious stones (RM0.5 billion, 6.3 per cent).

Value-added

35. The industry's value-added (Gross Domestic Product (GDP)) during the period 2006 to 2022 is recorded below (Table 14.5).

Table 14.5: Value-added of Mineral Industry

Item	IMP3		2021	2022	2006-2020	2020-2021	2021-2022
	2006	2020			CAGR	Annual Growth	
Value-added⁴ (RM billion)	4.3	10.6	10.7	11.7	6.7%	1.4%	9.3%

Source: Department of Statistics Malaysia (DOSM)

36. During the IMP3 period, the industry's GDP grew by a CAGR of 6.7 per cent from RM4.3 billion (2006) to RM10.6 billion (2020).
37. In 2021 and 2022, the industry's GDP continued to rise, by 1.4 per cent and 9.3 per cent to RM10.7 billion and RM11.7 billion respectively.
38. The growth was attributed to the increased demand for non-metallic mineral products due to new application in emerging industries.

Employment

39. The employment in the mineral industry during the period of 2019 to 2022 is recorded as follows (Table 14.6).

Table 14.6: Employment in Mineral Industry

Item	IMP3		2021	2022	2019-2022
	2019	2020			CAGR
Employment⁵ (persons)	107,017	103,386	105,600	107,034	0.1%

Source: DOSM

40. Employment grew by a CAGR of 0.1 per cent, from 107,017 persons (2019) to 107,034 persons (2022).
41. The overall decline in industry employment was due to the economic shutdown during the COVID-19 pandemic. Employment grew by a CAGR of 1.2 per cent, from 117,846 (2019) to 122,297 persons (2022).

⁴ Value-added is measured by the GDP of the industry; 2006 GDP data is based on constant 2005 prices, while 2020 to 2022 data are based on constant 2015 prices

⁵ This employment data is based on Monthly Manufacturing Statistics December 2022 and includes manufacturing of non-metallic mineral products only. Due to the change in methodology for employment statistics tabulation in 2019, industry's employment breakdown from 2006 to 2018 is not available

Labour Productivity

42. The industry's labour productivity during the period of 2019 to 2022 is tabulated in Table 14.7.

Table 14.7: Labour Productivity of Mineral Industry

Item	IMP3		2021	2022	2019-2022
	2019	2020			CAGR
Labour Productivity ⁶ (RM)	116,225	102,364	101,657	109,380	-2.0%

Source: DOSM

43. The labour productivity of the industry declined by a CAGR of 2.0 per cent from RM116,225 (2019) to RM109,380 (2022).
44. The decrease in labour productivity was due to the COVID-19 pandemic which led to a decrease of production of mineral products.

⁶ Annual labour productivity is derived from value added per employment

SECTION 3 TRENDS AND OPPORTUNITIES

45. The global mineral industry is expected to reach a market size of RM12.1 trillion⁷ by 2027, with a growth of 6.7 per cent.⁸
46. Malaysia's mineral resources are valued at approximately RM4.1 trillion, with metallic minerals worth RM1.0 trillion and non-metallic minerals worth RM3.0 trillion. This provides great potential for economic growth as it offers a wide range of strategic minerals that are vital for key economic sectors in Malaysia such as:
 - i. non-radioactive rare earth elements (NR-REE);
 - ii. tin ore;
 - iii. silica sand;
 - iv. kaolin; and
 - v. bauxite.
47. These minerals play a crucial role in advanced technologies, electronic devices, pharmaceutical products, aerospace components, automotive materials and chemical compounds.
48. Game changers related to the mineral industry are outlined in the National Advanced Materials Technology Roadmap 2021-2030, including:
 - i. graphene;
 - ii. nickel-titanium alloy (nitinol-based alloy); and
 - iii. rare earth elements.
49. The National Advanced Materials Programmes is designed specifically to act as a catalyst in developing the ecosystem of Malaysia's advanced materials industry.

Silica Sand

50. Silica sand demand is expected to rise due to its versatility and wide range of applications. Extensive processing to remove impurities and contaminants will turn silica sand into high/ ultra-purity silica sand, which contains more than 99.99 per cent silicon dioxide and less than 0.01 per cent impurities. Examples of applications for silica sand include:
 - i. crucial components for renewable energy – silica sand plays an important role in manufacturing solar panels, photovoltaic cells and other renewable energy components. High/ ultra-purity silica sand is becoming increasingly important as Malaysia transitions to clean energy;
 - ii. glass manufacturing – silica sand is a crucial raw material for high-tech glass which is highly in demand due to the development of Augmented Reality (AR) devices, foldable phones, and pharmaceutical packaging;
 - iii. 3D printing – contributed by the competitive growth of Industrialised Building System (IBS) construction in Malaysia, particularly 3D printing housing. Silica can be mixed with binders to create printable sand-based materials for architectural models, foundry moulds and other complex structures; and
 - iv. water filtration and treatment – silica sand's filtration properties make it an ideal medium for water treatment and filtration systems. Its usage in municipal water treatment, industrial processes, and desalination plants promotes cleaner environment in Malaysia, aligned with the country's Sustainable Development Goals (SDG) Investor Map.

⁷ USD2.7 trillion, converted based on exchange rate USD1.0 to RM4.48

⁸ Source: The Business Research Company

51. Having a strong focus on research and innovation in midstream and downstream activities to develop new application for high value-added products in attracting investors is a positive step for development of the mineral industry.
52. Refer to Action Plan 3 (AP3) and Action Plan 4 (AP4) in Section 5 for strategies and action plans related to RDCI and high value-added activities.

Kaolin

53. Kaolin has traditionally been utilised in ceramics, paper production and as a filler in various products. Advancements in materials engineering and nanotechnology have opened up new possibilities for tailoring kaolin to have specific properties suitable for high-tech applications such as electronics, aerospace and energy storage.
54. Kaolin has great potential in Malaysia due to its unique characteristics and wide range of applications. It is highly pure and free of impurities that could impact its properties. This is especially crucial in nanotechnology where even minor impurities can have a major impact.
55. Kaolin is ideal for application where other materials are in proximity as it does not react with other materials. Its characteristics enable easy shaping and moulding into various forms – a valuable trait in nanotechnology for creating precise structures on a small scale.
56. Kaolin is readily available in large quantities, ensuring a stable supply to meet the high demand in nanotechnology. These qualities make kaolin as an attractive mineral, driving investment and exploration in this industry.
57. Nurturing world-class talent to enhance the local research and development (R&D) capabilities and human capital development of kaolin are essential to the future of the mineral industry. Improving the quality and efficiency of kaolin production and developing new applications ensures long-term viability of the kaolin sector.
58. Refer to Action Plan 12 (AP12), Action Plan 13 (AP13) and Action Plan 14 (AP14) in Section 5 for strategies and action plans related to talent.

Graphene

59. The National Advanced Materials Technology Roadmap 2021-2030 highlights graphene as a crucial factor for innovation. Graphene, with its exceptional properties and wide-ranging applications, has the potential to revolutionise various industries.
60. Graphene is a lightweight, strong and highly conductive material – a viable alternative to carbon black in manufacturing which requires lower amounts while achieving better results. Graphene has sustainability benefits, contributing to less carbon footprint compared to other materials.
61. To fully unlock the potential of graphene in Malaysia, it is important to establish a strong foundation. Malaysia can become a significant player in the graphene sector by promoting research, development, and collaborations between industries. This will create job opportunities and drive economic growth.
62. Facilitating the promotion of companies utilising domestically sourced materials, as opposed to imports, serves as a constructive measure to stimulate the growth of the industry.
63. Refer to Action Plan 3 (AP3) and Action Plan 5 (AP10) in Section 5 for strategies and action plans related to research, development, commercialisation and innovation (RDCI) and localisation.

Nickel-Titanium (Nitinol-Based Alloy)

64. Nitinol-based alloys (e.g. nickel-titanium alloy (nitinol)), offer possibilities in shaping memory materials and functional metals.
65. Malaysia aims to become a global nitinol producer by 2030, focusing on production of high-quality medical and dental implants. By leveraging cost-effective manufacturing techniques such as Metal Injection Moulding (MIM), Malaysia can enhance the properties of nitinol while maintaining high-quality standards.
66. Malaysia's abundant resources and strategic location provide a solid foundation for producing nitinol-based alloys and positioning Malaysia well towards becoming a major global producer of nitinol.
67. Investment in R&D is crucial in further enhancing the properties of nitinol and developing new applications for this versatile material.
68. Refer to Action Plan 2 (AP2) in Section 5 for strategies and action plans related to R&D.

Rare Earth Elements

69. Rare earth elements are emerging in Malaysia's mineral industry as abundant reserves are found in states such as Kelantan, Kedah and Perak.
70. Malaysia's experience in processing rare earth elements provides an opportunity for the local advanced materials sector to expand on upstream and downstream activities. The global market for rare earth metals is rapidly growing, driven by increasing demand for electric vehicles and high-purity customised products.
71. By 2030, Malaysia aims to tap into its 18.2 million tonnes of non-radioactive rare earth reserves, valued at RM747.2 billion. This attracts investments and is expected to create 4,000 jobs.
72. Sustainable mining activities and supportive Government policies will be crucial in achieving this goal.
73. Refer to Action Plan 9 (AP9) and Action Plan 11 (AP11) in Section 5 for strategies and action plans related to sustainability and policies.

SECTION 4 CHALLENGES

Regulatory Complexities

74. The existing acts and regulations within Malaysia's mineral industry may require further refinement to effectively address the operational needs of industry players. The growth of the industry heavily relies on supportive and consistent policies and regulations established by the Government.
75. Building a successful ecosystem requires strong collaboration and synergy among various stakeholders, including Ministries, Government Agencies and industry players.
76. It is important to harmonise regulations to create a conducive environment for the mineral industry's growth and development.
77. Refer to Action Plan 11 (AP11) and Action Plan 15 (AP15) in Section 5 for strategies and action plans related to governance.

Sustainability and Awareness

78. Malaysia's mineral industry faces challenges in sustainability. Unsustainable mining practices are found in Malaysia, due to the lack awareness causing adverse environmental impacts and damage local communities hampering the industry's progress towards sustainable development.
79. The circular economy concept can be applied to the downstream segment of the industry to reduce environmental impact. This includes:
 - i. reducing the use of raw materials – by using recycled materials or by designing products that are more durable and can be reused or repaired; and
 - ii. minimising waste – by improving the efficiency of manufacturing or fabrication processes and by finding ways to maximise or recycle waste materials.
80. It is crucial to implement sustainable practices and enhance awareness programmes to promote the concept of circular economy and advanced recycling for advanced materials.
81. Refer to Action Plan 8 (AP8) and Action Plan 9 (AP9) in Section 5 for strategies and action plans related to sustainability and awareness.

Industry Ecosystem

82. Malaysia faces challenges in developing a robust industry ecosystem for the mineral industry.
83. Insufficient downstream activities in the rare earth sector, coupled with a disparity between upstream and downstream activities, would affect the industry's efficiency and development. In this regard, strengthening the downstream activities and enhancing collaboration within the industry is important for the development of Malaysia's mineral industry.
84. This requires a focus on attracting investment, promoting innovation and providing industry incentives to encourage the establishment of higher value-added activities – ultimately fostering the development of a strong and sustainable mineral industry ecosystem.
85. Refer to Action Plan 1 (AP1) and Action Plan 4 (AP4) in Section 5 for strategies and action plans related to high value-added activities.

Technology Application

86. Adoption of advanced technologies and digitalisation is another challenge to Malaysia's mineral industry.
87. Malaysia has limited capability to manufacture high-tech machines and limited adoption of advanced technologies and digitalisation. This hampers the industry's efficiency, productivity and competitiveness.
88. Embracing technology-driven solutions will enable the industry to streamline operations, improve productivity and stay competitive in the global market. This includes:
 - i. establishing a material informatics platform;
 - ii. developing comprehensive inventory and database of mineral resources; and
 - iii. partnering with advanced countries to increase the utilisation of Industry 4.0-based technologies.
89. Refer to Action Plan 5 (AP5), Action Plan 6 (AP6) and Action Plan 7 (AP7) in Section 5 for strategies and action plans related to technology application.

Human Capital Development

90. Human capital development presents a significant challenge to Malaysia's mineral industry.
91. The industry's growth and innovation potential are stagnated due to shortage of skilled workforce and specialised expertise, specifically in the midstream segment such as processing, refining and separation.
92. To address this challenge, it is crucial to enhance training programmes that cater specific needs of the mineral sector.
93. Refer to Action Plan 12 (AP12), Action Plan 13 (AP13) and Action Plan 14 (AP14) in Section 5 for strategies and action plans related to fostering talent development.

SECTION 5 STRATEGIES AND ACTION PLANS

NIMP 2030 Focus

94. During the period of the NIMP 2030, the industry focus includes:
- enhance trade balance and attract investors for high value-added products in midstream and downstream segments;
 - improve local R&D capabilities;
 - increase utilisation of Industry 4.0 technologies;
 - develop comprehensive inventories of mineral resources to attract investments;
 - maximise the use of national mineral resources;
 - enhance human capital development through accreditation programmes; and
 - strengthen governance and laws through collaboration between Federal and State Agencies.

Action Plans

95. Strategies and Action Plans relating to the NIMP 2030's Missions and Enablers are applicable to this industry (Figure 14.2).
96. Further action plans specific to this industry shall be guided by the National Mineral Industry Transformation Plan 2021-2030 and the National Advanced Materials Technology Roadmap 2021-2030.

Figure 14.2: Strategies and Action Plans for Mineral Industry

The following action plans are guided by TIM 2021-2030 and National Advance Materials Technology Roadmap 2021-2030:

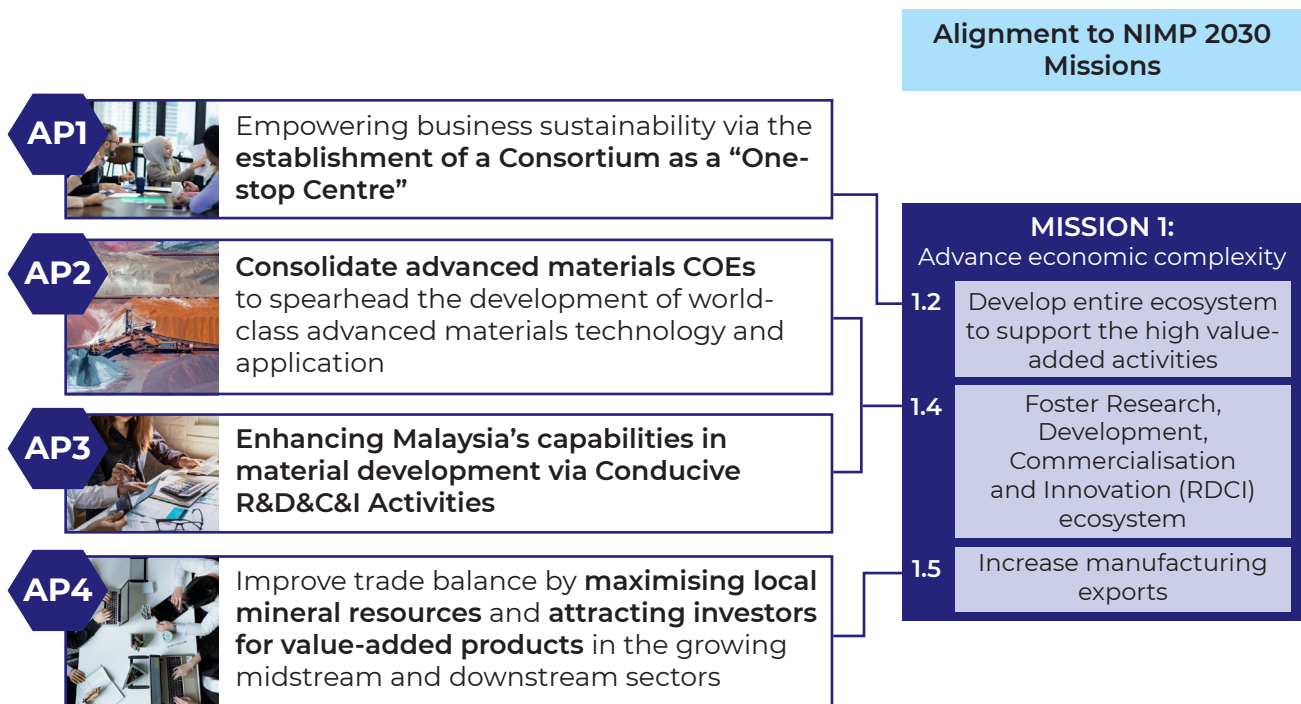
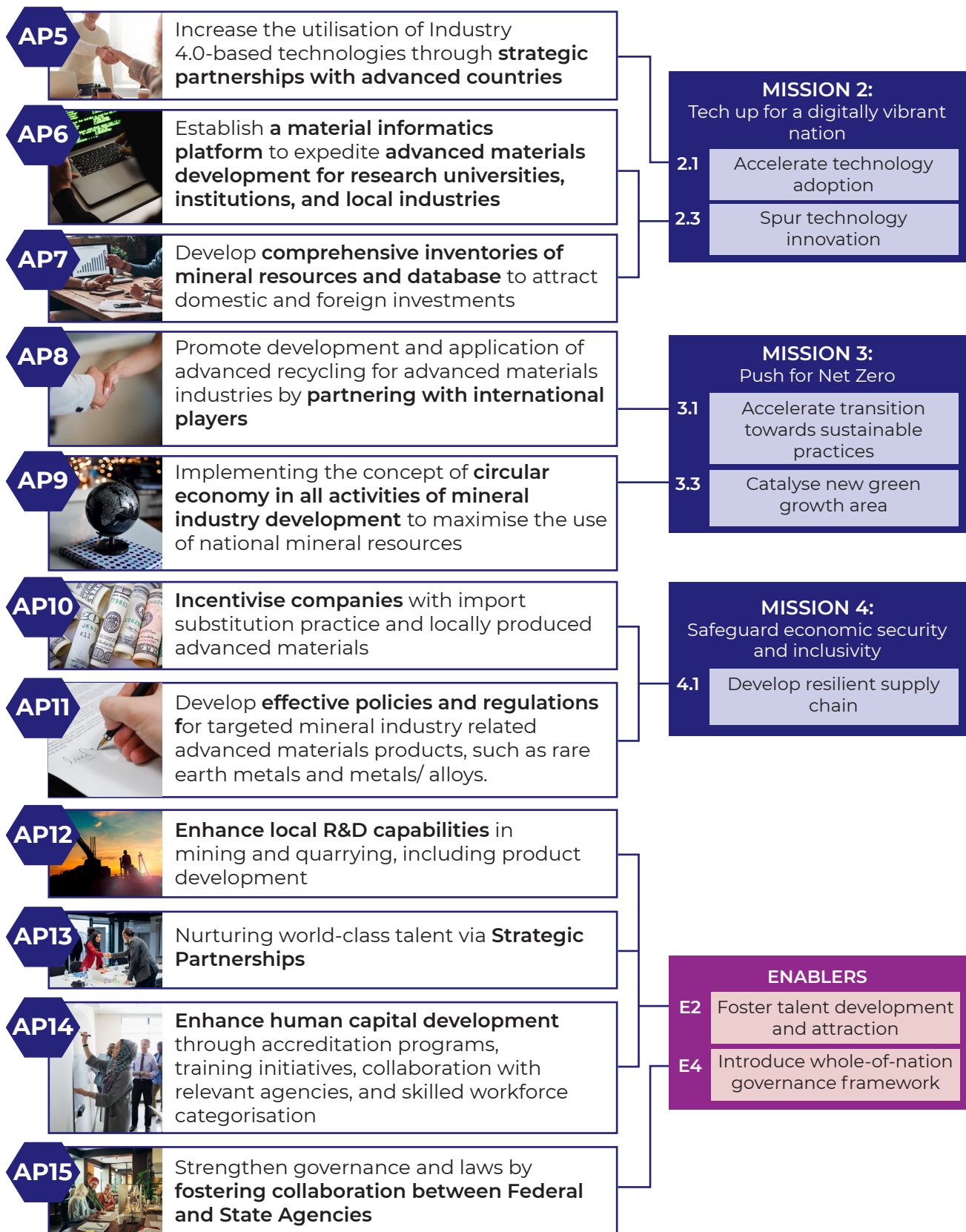


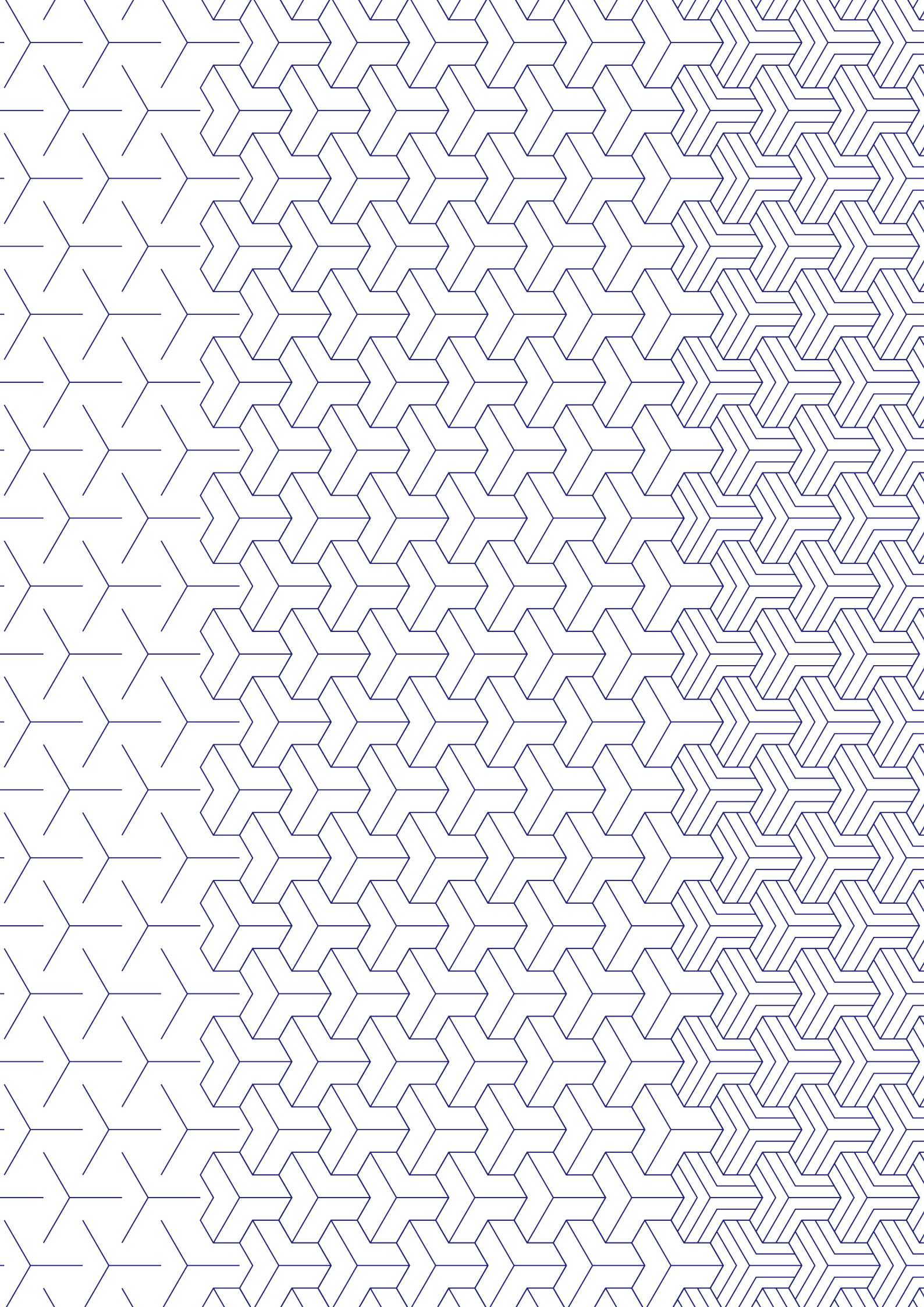
Figure 14.2: Strategies and Action Plans for Mineral Industry

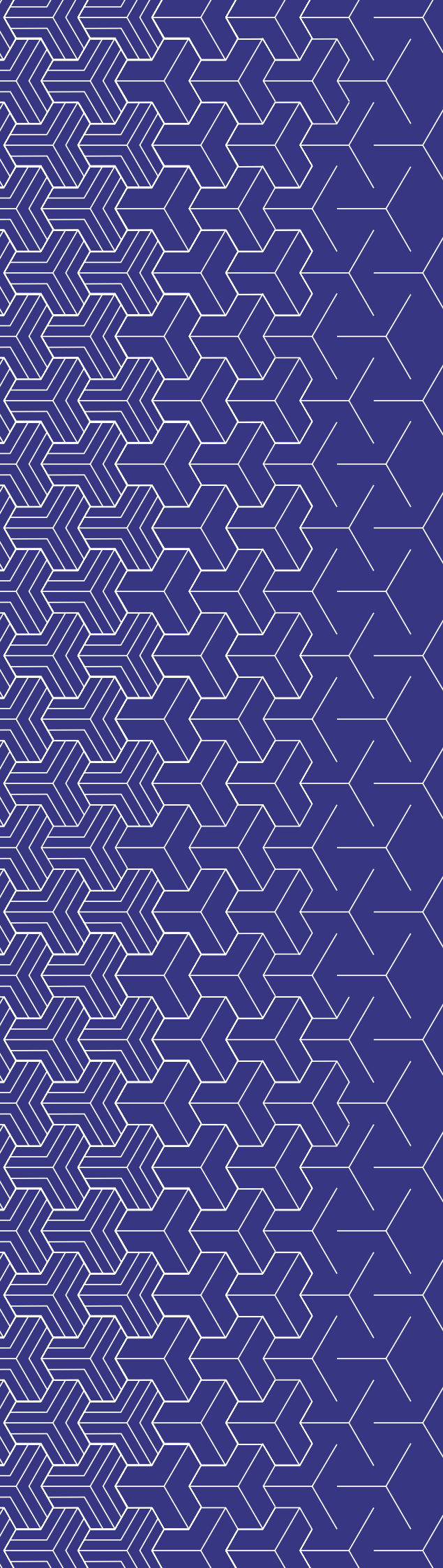


APPENDIX 1 INCENTIVES

There is an array of incentives offered for key players of mineral industry, these includes the following:

Incentives	Agency
Incentives for General Investments	Malaysian Investment Development Authority (MIDA)
Incentives for Small Scale Companies	
Incentives for Strategic Projects	
Incentives for Research and Development (R&D): <ul style="list-style-type: none"> • In-House R&D • Contract R&D Company • R&D Company 	
Commercialisation of Public Sector R&D Findings in Resource-based and Non-Resource-Based Industries	
Incentive for Automation Capital Allowance (Automation CA)	
Import Duty and/ or Sales Tax Exemption on Machinery/ Equipment/ Raw Materials/ Components	
Reinvestment Allowance	





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